PROJECT TITLE: Construction of SMART Academic Building Phase I, Jasaan Campus
LOCATION: USTP Jasaan, Upper Jasaan, Jasaan, Misamis Oriental
OWNER: University of Science and Technology of Southern Philippines
ARCHITECT: AR. FERDINAND A. DUMPA, MiSDS
SUBJECT: SPECIFICATIONS- Summary of Materials and Finishes
DATE: February 10, 2026

DIVISION 00
PROCUREMENT AND CONTRACTING REQUIREMENTS

00 00 00	PROCUREMENT AND CONTRACTING REQUIREMENTS	
00 63 19	Clarification Form (Request for Information during Pre-Bid stage)	1 of 2
00 91 13	Addenda/ Bid Bulletin/ Revisions	1 of 2
00 93 19	Record Clarification Notices	1 of 2
00 94 43	Record Amendments	1 of 2

1. **PART 1 GENERAL**

1.1 RELATED DOCUMENTS

1.1.1 Clarification Form (See ANNEXES for Official Copy of Form)
1.1.2 Addenda: Bid Bulletin
1.1.3 Record Clarification Notices (See ANNEXES for Official Copy of Form)
1.1.4 Record Amendments (See ANNEXES for Official Copy of Form)
1.1.5 Technical Drawings
1.1.6 Specifications

1.2 SUMMARY

This section specifies documentary and procedural requirements for handling technical queries, addenda, and revisions during the pre-bid stages.

1.3 PROCEDURES

1.3.1 CLARIFICATIONS

1.3.1.1 In case of queries, submit clarification forms upon the official release of the invitation to bid.
1.3.1.2 Submit all queries to the official email account of IPFDO (see upper right corner of this page for email address), complete with attachments, i.e. annotated copies of the architectural technical working drawings and/or specifications highlighted in relation to the clarification/query and other attachments deemed necessary by the bidder i.e. sample brochures, etc.
1.3.1.3 Submit equivalent hardcopies of emailed accomplished clarification forms within two days after sending the email. No hardcopies submitted, no official responses will be issued.
1.3.1.4 For phased construction work, include extent of scope of work in clarifications.

1.3.2 ADDENDA: BID BULLETIN

1.3.2.1 Issue Bid bulletins in the event of owner-approved changes/addenda with significant cost impact.
1.3.2.2 Issuance of Bid Bulletins are by proponents, to be fairly published to all participating bidders.

1.3.3 RECORD CLARIFICATION NOTICES

Record all clarification issuances via a roster of issued clarification notices. Include dates of issuance, status of response, and date responded in the records.

1.3.4 RECORD AMENDMENTS

Record all addenda/ amendments issued and answered during the bid phase via a roster of clarification notices. Include dates of issuance, status of response, and date responded in the records.

2. **PART 2 PRODUCTS**

No queries related to product substitution allowed during the bidding phase. Official technical specifications will prevail.

3. **PART 3 EXECUTION**

No queries related to product execution allowed during the bidding phase. Official technical specifications will prevail.

END OF SECTION

DIVISION 01
GENERAL REQUIREMENTS

01 00 00	DIVISION 1 GENERAL REQUIREMENTS	
01 11 13	Work Covered by Contract Documents	1 of 4
01 16 00	Product Requirements	2 of 4
01 17 00	Execution Requirements	3 of 4
01 25 13	Product Substitution Procedures	2 of 4
01 25 16	Execution Substitution Procedures	2 of 4
01 43 13	Manufacturer Qualifications	2 of 4
01 43 16	Supplier Qualifications	2 of 4
01 43 19	Fabricator Qualifications	3 of 4
01 43 23	Installer Qualifications	3 of 4
01 43 39	Mock-ups	1 of 4
01 45 16.13	Contractor Quality Control	2 of 4
01 45 23	Testing and Inspecting Services	3 of 4
01 45 29	Testing Laboratory Services	3 of 4

1. **PART 1 GENERAL**

1.1 RELATED DOCUMENTS

1.1.1 Technical 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 Samples and Mock-Ups
1.1.8 Work Program and Methodology Submittals

1.2 WORK COVERED BY CONTRACT DOCUMENTS

This section specifies work covered by the contract documents to be consistent with issues Instruction to Bidders and Special Conditions of this contract.

1.3 RELATED SECTIONS

1.3.1 01 17 00 Execution Requirements

2. **PART 2 PRODUCTS**

2.1 MANUFACTURER QUALIFICATIONS

Product specifications are itemized per material division with specific manufacturer qualifications, i.e. ISO, ASTM, etcetera. Manufacturer qualifications are relative and pertinent to each material division. Refer to material division in subject for detailed manufacturer qualifications.

2.2 MOCK-UPS

Specific material divisions such as ornamental caseworks and steel fabrications require mock-up approvals prior to implementation. See material division for detailed procedures.

2.3 PRODUCT REQUIREMENTS

Refer to signed physical plans for details on the specified product performance requirements. Secure proper product approval from the designers prior to site implementation. Refer to the procedures process of this section for the general procedure.

2.4 PRODUCT SUBSITITUTION

Requests for product substitutions are subject to the approval of the designers and noted by the owners. Follow the

proper procedure and attach required submittals as specified per material division. The contractor is obliged to indicate whether or not the substitution will incur an impact on the agreed contract costs, such that the agreed contract cost is rendered insufficient or excessive.

2.5 SUPPLIER QUALIFICATIONS

Only contract suppliers with active ISO qualifications and sufficient supply stocks for items specified requiring mass quantities. Ensure that suppliers are equipped with warehousing facilities within the Project's vicinity, have good service performance records for supplying and handling supplies, and have good delivery records to the project site, with minimal delays, in sufficient quantities, and of maximum quality.

2.6 TESTING AND INSPECTING SERVICES

Observe required testing and inspecting services for items marked critical in particular material divisions. Review testing and inspecting requirements as specified in particular material divisions. The job site is subject to inspection by the owner and designer at any time during the progress of work. Any work found inconsistent with technical working drawings are subject to rework, regardless of whether or not the item subject to rework is found later during the work progress.

2.7 PROCEDURES

2.7.1SUMMARY - APPROVALS

Secure all product, execution, and substitution approvals consistent with project timelines. No documentary product approval shall be basis or cause of delays in the approved project implementation schedule.

2.7.2PRODUCT APPROVAL

Attach duly accomplished official approval forms (see Annex), with markings "Product Approval", complete with corresponding submittal attachments and product performance requirements as required per material division to all product approval requests. Attachments will include product samples, mock-ups, manufacturer qualifications, and other documents as indicated in each material division.

2.7.3PRODUCT SUBSTITUTION APPROVAL

Attach duly accomplished *official approval forms* (see Annex), with markings "Product Substitution", complete with corresponding submittal attachments and product performance requirements as required per material division to all product substitution requests.

In addition to official approval forms, attach a duly accomplished *product comparison form* (see ANNEX), complete with samples, mock-ups, manufacturer qualifications, and other attachments required per material division.

2.7.4SOURCE QUALITY CONTROL PROCEDURES

Multiple supply sources are acceptable only if the product is the same, consistent, and duly approved. Secure a separate product approval for similar items procured from different suppliers. Refer to material divisions for required submittals. Follow the procedure for product approval (refer to section 2.7.3. PRODUCT SUBSTITUTION APPROVAL).

3. PART 3 EXECUTION

3.1 CONTRACTOR QUALITY CONTROL

This section shall be consistent with eligibility requirements stated in the Instruction to Bidders.

The proponents/owners of the project are entitled to employing a contractor of choice, by bidding following the RA 9184 otherwise known as THE GOVERNMENT SERVICE PROCUREMENT ACT OF 2016 provided that contractors involved in the works are equipped as follows:

3.1.1All contractors and builders involved in the scope of works of the project, whether general contractors, specialty contractors, or subcontractors are licensed and valid members of the Philippine Contractors Accreditation Board during the time of bidding and the entire duration of the construction of the project.

3.1.2All contractors have the financial capacity to acquire the appropriate equipment and manpower for use in the completion of the scope of works, especially for specialty construction involving expertise, i.e. paint works, steel fabrications, and other items specified.

3.1.3All contractors have a sound organizational structure, with a manpower of experienced technical personnel qualified to administer proper supervision of the required work.

3.1.4All contractors duly comply with civil liabilities as prescribed by the prevailing rule of law in the country and regional jurisdiction wherein the project is situated.

3.1.5All contractors are liable to the annual renewal of his license as prescribed by law.

3.1.6Ensure compliance with basic safety requirements as prescribed by the rule of law, including the national building code of the country and regional jurisdiction where project site is situated.

3.1.7All contractors shall comply with the conditions as stipulated in the Instruction to Bidders and Special Conditions of the Contract.

3.2 EXECUTION REQUIREMENTS

Secure execution approvals by submitting duly accomplished official approval forms (see Annex), with markings "Execution Approval", complete with a detailed work program and methodology. Refer to execution requirements as specified in every material division. Refer to appropriate subsections for detailed execution requirements.

3.3 EXECUTION SUBSTITUTION

Secure execution substitution approvals by submitting duly accomplished official approval forms (see Annex), with markings "Execution Approval", complete with a detailed work program and methodology. Submit execution substitution requests via formally submitted requests.

3.4 FABRICATOR QUALIFICATIONS

Ensure that specialty fabricators follow fabricator qualification requirements as specified in plans.

3.5 INSTALLER QUALIFICATIONS

Ensure that contracted installers will follow qualifications as specified in plans

3.6 TESTING AND INSPECTING SERVICES

Ensure that fabricated specialty items are compliant to competent testing and inspecting procedures. Refer to material divisions for detailed performance requirements, tests, and inspection proceedings required per material. Furnish copies of test and inspection results for all contracted fabricators and constructors.

3.7 TESTING LABORATORY SERVICES

Furnish copies of laboratory tests as specified by each material division.

3.8 PROCEDURES

3.8.1SUMMARY

Approval schedule shall not be in conflict with approved project implementation schedules.

3.8.2EXECUTION APPROVAL

The general procedure will include the official submission of execution approval forms (see Annexes for a copy of the official form to be utilized) with corresponding execution submittal attachments as specified per material division. Attachments will include work program and methodology submittals.

3.8.3EXECUTION SUBSTITUTION APPROVAL

For execution substitution, the general procedure will include the official submission of execution approval forms with a clear indication of execution substitution (see Annexes for a copy of the official form to be utilized) with corresponding submittal attachments and execution performance requirements as specified per material division. The changes and similarities of the specified from the proposed execution must be clearly outlined and justified.

END OF SECTION

01 00 00	DIVISION 1 GENERAL REQUIREMENTS	
01 17 00	Execution Requirements	

1. **PART 1 GENERAL**
   - **1.1 RELATED DOCUMENTS**
     - 1.1.1 Technical Drawings
     - 1.1.2 Specifications
     - 1.1.3 Requests for Interpretation
     - 1.1.4 Land and property surveys certified by surveyor
     - 1.1.5 Final property surveys showing the work performed and recorded survey data
   - **1.2 SUMMARY**

     This section includes general prescribed proceedings in execution of general construction work. Refer to each material division for specific execution requirements, especially for special fabrications. General construction work is listed as follows:

     - 1.2.1 Construction Layout
     - 1.2.2 Field engineering and surveying
     - 1.2.3 General installation of products
     - 1.2.4 Coordination of owner-installed products
     - 1.2.5 Protection of installed construction
     - 1.2.6 Correction of the Work
   - **1.3 RELATED SECTIONS**
     - 1.3.1 Requests for Interpretation
   - **1.4 WARRANTIES**

     The following should be included in the Contractor's warranties:
     - 1.4.1 Warrant that materials and equipment furnished under the Contract are of good quality and new unless otherwise required or permitted by the Contract Documents
     - 1.4.2 Warrant that the Work will be free from defects and conforms to the requirements of the Contract Documents. Work not conforming to the contract documents are defective, therefore subject to revision and correction according to the drawings and specifications.
     - 1.4.3 Warrant that all substitutions implemented on site are properly approved and authorized; work without proper approval are considered defective.
     - 1.4.4 Defects and damages NOT executed by the Contractor, i.e. improper or insufficient maintenance of equipment systems that have been turned-over, improper operation, or normal wear and tear and normal usage are excluded from the warranties. In the event that defects and damages occurred upon partial completion of the project or in the duration of the construction, the Owner and Architect may require the Contractor to furnish satisfactory evidence as to the kind and quality of materials and equipment utilized.
     - 1.4.5 **At the minimum, all warranties should be in pursuant to the provisions of RA 9184 otherwise known as the 2016 GOVERNMENT PROCUREMENT REFORM ACT.**
   - **1.5 CONTRACTOR RESPONSIBILITIES**
     - 1.5.1 Perform and complete works as stipulated in the technical working drawings, the performance specifications, and related contracted documents.
     - 1.5.2 The contractor shall comply with all permitting requirements as needed to commence the project and to facilitate proper turnover for the full occupancy of the owner. Permits include building permit application, permit requests for tree removal, excavation permits, fencing permits for both temporary and permanent facilities, occupancy permits, and other permits as needed to complete the project and facilitate the smooth turnover of the project. In case of conflict between approved scope of works, technical drawings, and this specifications, scope of work and physical plans shall prevail.
     - 1.5.3 In performing the work, the contractor is obliged to keep organized, correct, and truthful records of the progress of construction. Included in this documentation are shop drawings, details, execution and work methodology procedures, as well as information furnished by the owner or the designer. Organize the records such that any changes decided upon during construction are traceable.
     - 1.5.4 The contractor is obliged to thoroughly review all contract documents, technical working drawings, and specification and ensure that the implementation on the project site is as true to the drawings as possible. In case of

inconsistencies between drawings, specifications, actual site conditions, and similar issues resulting to confusion on the work to be implemented on site, the contractor is obliged to file a Request for Interpretation/Clarification to the Design Team. Follow procedures as prescribed during the kick-off conference.

- 1.5.5 Take field measurements and ensure that drawings are feasible. In case of conflict, inform the design team via execution and work methodology approvals or requests for interpretation through the construction management team and wait for official responses prior to implementation.
- 1.5.6 The contractor is obliged to properly inform the Construction Manager of any errors, inconsistencies, or omissions discovered in the technical working drawings. The Construction Manager shall in turn consult with designers to manage and resolve any incurred conflicts.
- 1.5.7 Carefully examine the existing site conditions and ascertain that the actual surveyed location is accurate.
- 1.5.8 Secure a copy of contract documents, soil borings, and relevant data in order to verify the nature, location, and character of the project and the site, including without limitation, the surface and subsurface conditions and all structures and obstruction both natural and man-made within and around the project site vicinity. Contracts may be requested from the IPFDU or procured by the contractor depending on stipulations on the scope of work, terms of reference, instruction to bidders, and special conditions of the contract.
- 1.5.9 The contractor is responsible for all erroneous work administered on site without the due information and approval of the architect. Included in this responsibility is the shouldering of costs in the event that the work is to be revised for correction.
- 1.5.10 All Site supervision, direction, and administration of all site work is the responsibility of the Contractor.
- 1.5.11 Construction means, methods, techniques, sequences, and procedures and for coordinating all portions of the Work under the Contract are the responsibilities of the contractor unless otherwise stated in the contract documents.
- 1.5.12 If the Contract Documents give specific instructions concerning construction means, methods, techniques, sequences, or procedures, the evaluation of the jobsite safety of such means, methods, techniques, sequences or procedures is the responsibility of the Contractor. If specifications are deemed unsafe, the Contractor shall give timely written notice to the Owner and Architect via and shall not proceed with that portion of the Work without further written instructions from the Architect.
- 1.5.13 The contractor is obliged to inform IPFDU through the construction manager or project coordinators of any substitutions to occur on site. If the Contractor is then instructed to proceed with the required means, methods, techniques, sequences or procedures without acceptance of changes proposed by the Contractor, the Owner shall be solely responsible for any resulting loss or damage.
- 1.5.14 The Contractor is responsible for the acts and the quality of work of its employees, subcontractors, including their agents and employees and other work commissioned by the contractor on site.

2. **PART 2 PRODUCTS**

   Refer to specific material divisions for product particulars.

3. **PART 3 EXECUTION**
   - **3.1 SITE INVESTIGATION PRIOR TO COMMENCEMENT OF WORK**

     The contractor is to examine existing conditions and verify location of existing site utilities, existing structures, vegetation, and other considerations existing on site before beginning work. Include subsurface equipment in this investigation. Verify invert elevations at points of connections for sanitary sewers, storm sewers, underground electrical wiring, and water service piping existing on site. Furnish location data acquired to the architect. In case of conflict and inquiries, the contractor shall inform the construction manager to facilitate resolution.
   - **3.2 FIELD MEASUREMENTS**

     Take field measurements as required to fit the Work properly. Recheck measurements before installing each product. Verify all dimensions prior to fabrication. Coordinate fabrication schedules with construction progress.
   - **3.3 CONSTRUCTION LAYOUT**

     Verify all layout shown in the technical working drawings. Engage professional and experienced surveyors to establish information shown on the Drawings, especially related to site benchmarks and layout. In case of discrepancies, inform the Architect via a Request for Interpretation. Record all layout control work, coordinates of benchmarks, including deviations from required lines and levels. Include beginning and ending dates and times of surveys, weather conditions, name and duty of each survey party member and types of instruments and tapes used. Furnish a copy of the records to the Architects on critical progresses of work.

     Engage a professional, experienced, and licensed surveyor to conduct the following activities:

3.3.1 Location and establishment of benchmarks and control points at each story of the construction, and elsewhere needed.
Note: Do not relocate existing benchmarks or control points without securing a written approval from the Architect. Inform the architect of the need for relocation by filing an official Request for Clarification (See Annex for official forms)
3.3.2 Establish dimensions accurately.
3.3.3 Record all benchmark locations, both horizontal and vertical data.
3.3.4 Notify and disseminate to installers, the correct and accurate lines and levels.
3.3.5 Check the accuracy of the location, level and plumb, of every major element as the work progresses and duly notify the Construction Manager of any discrepancies.
3.3.6 Close site surveys with an error of closure equal to or less than the standard established.
3.3.7 Locate and layout control lines and levels for structures, building foundations, column grids, and floor levels, including those required for mechanical and electrical work.
3.3.8 Transfer survey markings and elevations for use with control lines and levels when a written approval by the Architect or Construction Manager has been secured.
3.3.9 Establish temporary reference points necessary to complete and commence specific construction work, provided that these reference points are removed when the work in subject has been completed. Do not delete temporary reference points without proper recording.
3.3.10 Prepare certified survey records showing dimensions, locations, elevations, and angles for every major site improvement completed on site, specifically completion of foundation works, completion of every floor or zone as decided by the construction manager with the conformity of owners and designers.
3.3.11 Prepare and submit a final property survey showing the real records and features of the finished project, namely actual floor to floor ceiling heights, final building height, benchmarks and coordinates of critical underground facilities, if any. Show boundary lines, streets, tree data, adjacent properties, landmarks, grade contours, and the distance and bearing from a site corner to a legal point. Certify this document and certify all data as accurate and true and be labeled by authorities as the official property survey.

3.4 INSTALLATION
3.4.1 Verify that the location of the work to be implemented is accurate, correctly aligned, and correctly elevated.
3.4.2 Plumb all vertical work and level all horizontal work. Work with specific angles must be properly reviewed on the drawings and correctly laid out.
3.4.3 Unless otherwise indicated with special treatment, conceal all pipes, ducts, and wiring in finished areas.
3.4.4 Unless otherwise indicated, all headroom clearances must be maintained at least 2.40M for mechanically ventilated areas and 2.70M for areas with natural ventilation. Follow indications on technical working drawings if prescribed heights are above the minimum.
3.4.5 Comply with written instructions and recommendation for installation as provided by manufacturers and suppliers.
3.4.6 Conduct installation works at times and conditions that ensures the best possible results.
3.4.7 Maintain installed works in good condition throughout the duration of construction until final completion of the project.
3.4.8 Conduct construction and installation work without damaging the operations of other works within its vicinity.
3.4.9 Do not use tools, equipment and methods, that produces noise levels that are hazardous to human health.
3.4.10 Check that the measurements on the shop drawings are in accordance to actual site conditions.
3.4.11 When using anchors and fasteners, secure the fasteners such that they are accurately located and do not obstruct any mandatory clearance heights. Where mounting heights are not indicated, propose to the Architect via a duly written request for clarification/interpretation to mount components according to standards. Installation proceeds when the architect issues an approval.
3.4.12 Install all joints to the best visual effect, such that all joints are of uniform width, and if the work is exposed, that the joints are arranged as neatly as possible unless otherwise indicated by the technical working drawings and specifications.
3.4.13 Ensure the safety of all installation work and take care not to damage any separate work in the vicinity.
3.4.14 Test all equipment and tools to be used and ensure that it is safe and is in good working condition. Replace all parts as needed to ensure maximum efficiency.

3.5 SITE PREPARATION
If upon investigation, existing site conditions are deemed unsuitable for work intended to commence, duly inform the architect and the owners via written notice. Included in this section are issues on utilities, i.e. electrical posts that need to be relocated, water pipe utilities that need to be adjusted, abandoned, or terminated, as well as other pertinent issues affecting the intended design. Included in the written notice are the following information:
3.5.1 Description of the work to be commenced
3.5.2 List of detrimental conditions

3.5.3 List of unacceptable installation tolerances
3.5.4 Recommended corrections.
3.5.5 Authorities that need to be informed.

3.6 PROTECTION OF INSTALLED CONSTRUCTION
Whenever any portion of work is completed prior to the substantial completion of the project, ensure that the installed or completed portion of work is protected, without damage, and without deterioration up to the substantial completion of the project.

3.7 CORRECTION OF THE WORK
3.7.1 Any defective construction should be repaired, removed, or replaced. This includes the restoration of any damages incurred on the finishes or substrates during the time work.
3.7.2 Repairs include material touch-ups on painted finishes and replacement of units on substrates, or the cutting and patching of portions of masonry or chipped portions of the substrate.
3.7.3 Repair all components that are not in good working condition.
3.7.4 Remove and replace chipped, scratched and broken glass, mirrors, and similar surfaces.
3.7.5 Ensure that the original condition of the finish or substrate is maintained after correction.

END OF SECTION

01 00 00	DIVISION 1 GENERAL REQUIREMENTS	
01 17 10	Final Cleaning	1 of 2

1. PART 1 GENERAL

1.1 RELATED DOCUMENTS

1.1.1 Technical Drawings
1.1.2 Specifications

1.2 SUMMARY

This section specifies administrative and procedural requirements for final cleaning upon completion of scope of works. Specific cleaning agents and procedures are specified in each material division. Ensure that cleaning and waste disposal procedures are compliant with local laws and ordinances. Do not dispose flammable, volatile, and poisonous wastes in storm or sanitary drains of the project. Ensure that no debris, rubbish, or other waste material will be burned, buried, and improperly disposed, especially not within the premises of the project site.

2. PART 2 PRODUCTS

2.1 CLEANING AGENTS

Review product-specific requirements of cleaning agents and materials recommended by the manufacturer or fabricator or the surface and material to be cleaned.

3. PART 3 EXECUTION

3.1 SAFETY AND PRECAUTION

3.1.1 Ensure safety handling of cleaning agents that are hazardous to health or safety of the property. Secure the safe storage of volatile cleaning agents and ensure that it is only accessible to authorized personnel.
3.1.2 Organize storage of cleaning materials and agents on site to allow maximum access, no traffic barriers, and no unnecessary material wastage.
3.1.3 Properly dispose debris, scrap, and waste materials on a daily basis. Accumulation of wastes is a safety hazard. Ensure that disposal management proceedings do not destroy the ecology of the project site and its neighboring vicinities.

3.2 PROGRESS CLEANING

3.2.1 Demonstrate sample-cleaning work before cleaning the entire surface area to be cleaned. Check that the cleaning agent and material that was sample-cleaned does not change the immediate properties of its surfaces before proceeding with complete clean-out.
3.2.2 Complete all cleanout works one week prior to the scheduled turnover to ensure maximum time for inspection.

3.3 FINAL CLEANOUT

3.4 Comply with local laws and ordinances for all waste-removal operations.
3.5 Comply with manufacturer's written instructions on maintenance and operations.
3.6 Clean the project site, yard, and grounds of construction activities. Ensure that the landscape development area is clear of any waste material and other foreign substances.
3.7 Sweep and wipe all paved areas and finished flooring. Remove stains and other deposits.
3.8 Do not clean surfaces marked for natural weathering.
3.9 Rake all pervious grounds free from foreign waste.
3.10 Remove all construction tools, machinery and equipment from the project site.
3.11 Clean all exposed surface areas, both interiors and exteriors. Ensure that it is free from stains and similar substances.
3.12 Do not paint over labels, especially specialized marks namely "UL" and fire rating marks. Do not excessively clean these labels such that the surface marks become illegible.
3.13 Vacuum all soft surfaces, i.e. carpet flooring, sofa, wooden ceilings, and all surfaces with crevices etc.
3.14 Clean and polish all transparent materials such as mirrors, glass partitions, door lights, vision windows, etc. Replace broken or chipped glass and mirrors and ensure that surfaces are free from scratches. If the glass surface has a texture enhancement sticker, ensure that the sticker is adjoined to the surface neatly and properly and is not chipped off by excessive cleaning.
3.15 Wipe the surfaces of all mechanical and electrical equipment such that it is dust free. There should be no excess lubricants and similar chemicals on the surface of the equipment.

3.16 Clean plumbing and sanitary fixtures to a sanitary condition. Wipe it free of stains and foreign markings, including hard water marks.
3.17 Replace all disposable air filters. Wipe all diffusers, registers, and grills free from surface dust, stains, and foreign markings.
3.18 Clean light fixtures, lamps, bulbs, globes, and reflectors such that it is free from surface dust, stains, and is functional at maximum efficiency.
3.19 All bulbs must be in working condition. Replace dimmed, old bulbs with new bulbs in good working conditions.
3.20 The following spaces should be clear of debris and surface dust:
3.20.1 Plenum
3.20.2 Shafts and chutes
3.20.3 Vaults
3.20.4 Manholes
3.20.5 Attics
3.20.6 Utility rooms
3.20.7 Other, similar spaces.

END OF SECTION

01 00 00	DIVISION 1 GENERAL REQUIREMENTS	
01 17 30	Operation and Maintenance Data	1 of 3

1. **PART 1 GENERAL**
   - **1.1 RELATED DOCUMENTS**
     - 1.1.1 Technical Drawings
     - 1.1.2 Specifications
   - **1.2 SUMMARY**
     This section specifies administrative and procedural requirements for the management of operation and maintenance data for turnover to the proponents upon completion of the project.
   - **1.3 PREPARATION OF MAINTENANCE MANUALS**
     - 1.3.1 Include in the manual all information specified in individual specification divisions
     - 1.3.2 Ensure that technical personnel charged in the preparation of maintenance manuals are properly trained and experienced. Include clear written instructions to communicate critical steps in maintenance. Accompany written instructions with diagrams and drawings for clarity.
     - 1.3.3 Operation and maintenance manuals must be of a manageable size, bounded by a heavy duty binder, and properly labeled on the front and spine of the hard bound binder.
     - 1.3.4 Neatly fold oversized drawings attach and check that punch holes do not damage any critical information.
     - 1.3.5 Prepare, orient, and transfer knowledge on the following manuals:
       - 1.3.5.1 Building operating systems
       - 1.3.5.2 Equipment operating systems
       - 1.3.5.3 Preservation and maintenance manuals of all products and finishes
   - **1.4 PROCEDURES OF MANAGING MANUALS**
     - 1.4.1 Furnish one copy of the operation and maintenance manual to the design team, and another copy to the owner's side via the property management team.
     - 1.4.2 Duly demonstrate the contents of the manual during the turnover process. Coordinate a schedule for site walk-thru and maintenance demonstration.
   - **1.5 MANUAL CONTENT**
     - 1.5.1 MATERIAL AND FINISHES MAINTENANCE MANUAL
       - 1.5.1.1 Complete manufacturer name
       - 1.5.1.2 Manufacturer's address and contact details
       - 1.5.1.3 Manufacturer's catalog number
       - 1.5.1.4 Care and maintenance instructions
       - 1.5.1.5 Color and Texture code and swatch
       - 1.5.1.6 Re-ordering information
       - 1.5.1.7 Applicable standards
       - 1.5.1.8 Chemical composition
       - 1.5.1.9 Installation details
       - 1.5.1.10 Inspection procedures
       - 1.5.1.11 Maintenance information
       - 1.5.1.12 Repair procedures
     - 1.5.2 EQUIPMENT OPERATION AND MAINTENANCE MANUAL
       Include the following information in the manual:
       - 1.5.2.1 General system or equipment description including functions
       - 1.5.2.2 Start-up procedures
       - 1.5.2.3 Equipment or system break-in
       - 1.5.2.4 Routine and normal operating instructions
       - 1.5.2.5 Regulation and control procedures
       - 1.5.2.6 Instruction on stopping
       - 1.5.2.7 Shutdown and emergency instructions
       - 1.5.2.8 Required sequences for electric or electronic systems
       - 1.5.2.9 Special operating instructions
       - 1.5.2.10 Operating characteristics

       - 1.5.2.11 Servicing schedule
       - 1.5.2.12 Control diagrams
       - 1.5.2.13 Circuit Directories
       - 1.5.2.14 Valve tag diagrams
       - 1.5.2.15 Printed operating and maintenance instructions
       - 1.5.2.16 Maintenance Assembly drawings and diagrams
       - 1.5.2.17 List recommended spare parts that should be stocked
       - 1.5.2.18 Limiting conditions
       - 1.5.2.19 Performance curves
       - 1.5.2.20 Engineering data and tests
       - 1.5.2.21 Complete nomenclature and number of replacement parts
       - 1.5.2.22 Design factors and assumptions
       - 1.5.2.23 Copies of applicable shop drawings and product data
       - 1.5.2.24 System and equipment manufacturer
       - 1.5.2.25 Equipment model number
       - 1.5.2.26 Equipment serial number
       - 1.5.2.27 Operating Instructions
       - 1.5.2.28 Emergency Instructions
       - 1.5.2.29 Wiring diagrams
       - 1.5.2.30 Safety diagrams
       - 1.5.2.31 Inspection and test procedures
       - 1.5.2.32 Maintenance procedures and schedules
       - 1.5.2.33 Precautions against improper use and maintenance
       - 1.5.2.34 Copies of warranties
       - 1.5.2.35 Repair instructions and spare parts listing
       - 1.5.2.36 Routine operations
       - 1.5.2.37 Trouble-shooting guide
       - 1.5.2.38 Disassembly, repair and re-assembly instructions
       - 1.5.2.39 Alignment, adjusting and checking instructions
       - 1.5.2.40 Supply sources of required maintenance materials and related services
       - 1.5.2.41 Index

2. **PART 2 PRODUCTS**
   - **2.1 TAGS**
     Label equipment with proper tags such that it can be properly referred to on the manual.

3. **PART 3 EXECUTION**
   (NOT APPLICABLE)

END OF SECTION

01 00 00	DIVISION 1 GENERAL REQUIREMENTS	
01 17 70	Closeout Procedures	1 of 3

1. PART 1 GENERAL

1.1 RELATED DOCUMENTS

1.1.1 Technical Drawings

1.1.2 Specifications

1.2 SUMMARY

This section includes administrative and procedural requirements for closeout proceedings. Warranties and inspection procedures are included.

1.3 PARTIAL OCCUPANCIES

Partial occupancies will be managed following final closeout procedures. Include documents delineating and demarcating the portion that is ready for turnover, i.e. highlighted and demarcated floor plans and a complete listing of equipment systems for final turnover.

1.4 PROCEDURES FOR INSPECTION

1.4.1 Submit a written request for inspection for substantial completion to the owner side.

1.4.2 Deploy an inspection team composed of duly represented owner sides, designer sides, and builder's side for joint inspection.

1.4.3 On the owner's side, prepare a list of items for re-inspection. A copy of the list must be furnished to the owner and the contractors for reference.

1.4.4 Schedule a time for re-inspection of all items not accepted. Correct all punch-listed items until substantial turnover.

1.5 PROCEDURES FOR RE-INSPECTION

1.5.1 Request for re-inspection when the work identified in previous inspections are completed and corrected.

1.5.2 Prepare punch lists specific to the item of work for closeout. Indicate a remarks column for marking whether items are accepted or for revision. Indicate causes of revision.

1.5.3 Close and resolve all punch lists by the third round of inspection.

1.5.4 Proceed with Final Completion when all punch lists are accepted.

1.6 PROCEDURES AND DOCUMENTS TO ACCOMPLISH PRIOR TO FINAL INSPECTION OF COMPLETION OF WORK

1.6.1 Advise owner on warranty periods, workmanship bonds, maintenance service agreements, final certifications, and similar documents. Furnish a copy of warranties, certificates and similar documents to the owner.

1.6.2 Obtain all release permits that allow the owners unrestricted access and use of the services, utilities, and other features of the building. Include occupancy permits, operating certificates, and similar documents. Facilitate proper turn over and document release to the client.

1.6.3 Prepare and submit project record documents, operation and maintenance manuals, final completion construction photographs, damage or settlement surveys, property surveys, and similar final record information.

1.6.4 Deliver tools, spare parts, extra materials, and similar items to location designated by Owner. Label with manufacturer's name and model number where applicable.

1.6.5 Deliver labeled keys and permanent locks to the owner. Demonstrate to the owner's personnel in charge of security the due location of all locks and instruct accordingly.

1.6.6 Startup and test all equipment systems.

1.6.7 Submit test/adjust/balance records.

1.6.8 Remove and demolish temporary facilities, mock-ups, construction tools, scaffolds, and similar items from the project site.

1.6.9 Complete all final cleaning and restoration requirements, including painting touch ups and repairs of damaged or exposed finishes

1.6.10 Submit a final application for payment.

1.6.11 Submit a copy of all punch listed items with remarks as completed, corrected, and accepted, duly certified by the architect or the technical working group. Clearly indicate in the punch list that all identified works are inspected, corrected, completed, and accepted.

1.6.12 Submit evidence of final, continuing insurance coverage complying with insurance requirements.

1.6.13 Submit pest-control final inspection report and warranty.

1.7 PUNCH LIST CONTENT

1.7.1 Prepare three copies of the punch list, one copy must be furnished to the designers, one copy for the owner's representative, and one copy for the builders.

1.7.2 Organize spaces for inspection in sequential order, according to the route that will be taken on site.

1.7.3 Organize items applying to each space by major element and by category:

- 1.7.3.1 Ceiling
- 1.7.3.2 Individual Walls
- 1.7.3.3 Floors
- 1.7.3.4 Equipment
- 1.7.3.5 Building Systems

1.7.4 Include the following information inside the punch list:

- 1.7.4.1 Project name
- 1.7.4.2 Date of inspection schedule
- 1.7.4.3 Date of re-inspection
- 1.7.4.4 Page number
- 1.7.4.5 Signature of Contractor
- 1.7.4.6 Signature of Architect

1.8 WARRRANTIES

Organize warranty documents into an orderly sequence based on the table of contents of the project manual.

1.8.1 Bind warranties and bonds in heavy-duty, 3-ring, vinyl-covered, loose-leaf binders, thickness as necessary to accommodate contents.

1.8.2 Provide heavy paper dividers with plastic covered tabs for each separate warranty. Mark tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product and the name, address, and telephone number If installer.

1.8.3 Identify each binder on the font and spine with the typed or printed title "WARRANTIES," Project name, and name of Contractor.

2. PART 2 PRODUCTS

Use appropriate cleaning agents as recommended by particular manufacturers. See the final cleanout section of this division for detailed procedures.

3. PART 3 EXECUTION

3.1 PEST CONTROL

Inspect that the project site is free of rodents, insects, and other pests. Submit a certification duly issued, signed and certified by an experienced and licensed exterminator.

END OF SECTION

01 00 00	DIVISION 1 GENERAL REQUIREMENTS	
01 26 63	Requests for Interpretation	1 of 2

1. **PART 1 GENERAL**
   - **1.1 RELATED DOCUMENTS**
     - 1.1.1 Technical Drawings
     - 1.1.2 Specifications
     - 1.1.3 Clarification Form (See ANNEXES for Official Copy of Form)
     - 1.1.4 Record Clarification Notices (See ANNEXES for Official Copy of Form)

   - **1.2 SUMMARY**

     This section specifies administrative and procedural requirements in the event of clarifications, assistances required in plan interpretation, and other similar information required from the technical and design team to assure maximum accuracy in construction. The contractor is obliged to thoroughly review all contract documents, especially technical drawings prior to the commencement of construction.

   - **1.3 PROCEDURE**

     This section specifies administrative and procedural requirements in the event of clarifications, assistances required in plan interpretation, and other similar information required from the technical and design team to assure maximum accuracy in construction. The contractor is obliged to thoroughly review all contract documents, especially technical prior to the commencement of construction.

     - 1.3.1 Submit clarification forms upon issuance of notice to proceed.
     - 1.3.2 Submit all queries to the official email accounts of the IPFDU (see upper right corner of this page for email address), complete with attachments, i.e. annotated copies of the architectural technical working drawings and/or specifications highlighted in relation to the clarification/query and other attachments deemed necessary by the bidder i.e. sample brochures, etc.
     - 1.3.3 Submit equivalent hardcopies of emailed accomplished clarification forms within two days after sending the email. No hardcopies submitted, no official responses will be issued.
     - 1.3.4 The IPFDU will only be accountable to changes that are issued with official approvals issued by the IPFDU.

   - **1.4 RECORD CLARIFICATION NOTICES**

     Record all clarification issuances via a roster of issued clarification notices. Include dates of issuance, status of response, and date responded in the records.

2. **PART 2 PRODUCTS**

   Refer to product approval procedures. Clarification forms are reserved for technical working drawings and specification queries only. All product approvals must be processed accordingly. Refer to the procedure on section 01 25 13 of this division.

3. **PART 3 EXECUTION**

   Execution approvals are separate from clarifications and queries. Refer to the procedure on execution approval in section 01 25 16 of this division.

END OF SECTION

01 00 00	DIVISION 1 GENERAL REQUIREMENTS	
01 26 46	Construction Change Directives	1 of 2
01 26 57	Change Order Requests	1 of 2
01 26 63	Change Orders	1 of 2

1. **PART 1 GENERAL**
   - **1.1 RELATED DOCUMENTS**
     - 1.1.1 Technical Drawings
     - 1.1.2 Specifications

   - **1.2 SUMMARY**

     This section specifies administrative and procedural requirements in the event of modifications on construction directives, such as modifications on the technical drawings, specifications, the adjustment of the agreed scope of work, etc., that shall result to change order requests and change orders. The contractor cannot amend the agreed scope of work unless a change order has been issued by the technical team of the IPFDU.

     The following section includes generic procedural advice for Construction Change Directives, Change Orders, Change Order Requests, and general management of material specifications. Note that material-specific procedural advice is indicated in each material division. **All amendments should be in pursuant to RA 9184 otherwise known as the Government Procurement Act of 2016.**

   - **1.3 MINOR CHANGES IN WORK**

     Minor changes in work are work classified as without cost-impact and can therefore be implemented once a written approval from the IPFDU is secured. This includes resulting advice from Requests for Interpretation, Approved Product Substitution, and approved Execution Substitution. The contractor is obliged to properly indicate product substitutions and execution substitutions submitted and as such mark the attached Approval forms to as "Without Cost Impact".

2. **PART 2 PRODUCTS**

   The designers shall prescribe the performance specification of all materials and finishes on the technical working drawings. The execution of each shall be indicated through this specification or by the prescribed installation manuals and brochures of the approved material. The contractor is obliged to install the material consistent with requirements stipulated on the plans and on this specification. Any material replacement or substitutions shall be approved by the IPFDU. If with cost impacts, such replacements shall incur change orders which shall be reviewed and approved by the procuring entity upon the recommendation of the IPFDU prior to implementation. No changes with significant cost impacts shall be implemented with the approval of the procuring entity.

3. **PART 3 EXECUTION**

3.1 CHANGE ORDER PROCEDURES

- 3.1.1 The owner/ procuring entity will issue via a written request, official changes that are to be implemented on the project.
- 3.1.2 No amendments to the original contract work shall commence on the project site without official approvals and orders by the procuring entity.
- 3.1.3 Amendments that are not aligned with the guidelines of RA9184 are not acceptable.
- 3.1.4 The contractor, owner, and designers are to maintain detailed records of all construction change directives.

END OF SECTION

DIVISION 02
SITEWORKS

02 00 00	DIVISION 2 SITEWORKS	
02 36 1	Termite Control	1 of 3

1. **PART 1 GENERAL**
   - **1.1 RELATED DOCUMENTS**
     - 1.1.1Technical Drawings
     - 1.1.2Specifications
     - 1.1.3Product Brochures
     - 1.1.4Work and Methodology Submittals
     - 1.1.5Structural Engineering Specifications for Excavation Work (By Structural Designer)

   - **1.2 SUMMARY**
     This section includes provisions on termite management systems to be employed on the project site.

   - **1.3 GENERAL PROVISION**
     Include external and internal termite control, namely soil treatment for all elements of the project that are in contact with the ground such as foundations and slabs on ground. Termite control systems employed should be installed such that replenishment/re-treatment systems will not incur any damages/demolition work on the project site throughout the duration of the construction. Chemical Barrier systems are acceptable.

   - **1.4 MAINTENANCE**
     Contracted manufacturers are to advise the proper maintenance procedures of termite control systems, including advised schedules of maintenance, allowable product substitutions if any, proper work methodology. Include provisions on continuous service including monitoring, inspection, re-treatment, and troubleshooting procedures for occurrence of termite activity within the five (5) year warranty and a separate contract options for continuing services after the expiration of the warranty.

   - **1.5 SUBMITTALS**
     Attach the following information to a duly accomplished Product Approval Form and/or Execution Approval Form.

     1.5.1PRODUCT APPROVAL ATTACHMENTS
     The contractor is to facilitate the Product Approval request, regardless of whether the termite control work is subcontracted. Whether subcontracted or applied by the Contractor, submit the following documents"

     1.5.1.1 Technical data including a list of termiticide products to be administered on site, including the Food and Drug Administration-registered (FDA-registered) labels of all products.
     1.5.1.2 Include and emphasize the approximated number of years of effectivity of the termiticide system.
     1.5.1.3 Include lists of completed projects by manufacturer/installer/applicator. The list of projects should include the name of the project, the address, the architects, owners, and builders of previous projects indicated in the list.
     1.5.1.4 A copy of the official accreditation of termiticide manufacturer, if any.
     1.5.1.5 A copy of the license and registration of the termiticide operator's registration from the Food and Drugs Administration.

     1.5.2EXECUTION APPROVAL ATTACHMENTS
     1.5.2.1 Work Methodology indicating the following information:
     1.5.2.1.1 Date and time of application
     1.5.2.1.2 Moisture content of soil before application
     1.5.2.1.3 Brand name and manufacturer of termiticide
     1.5.2.1.4 Quantity of Undiluted termiticide used.
     1.5.2.1.5 Dilutions, methods, volumes, and rates of application used.
     1.5.2.1.6 Areas of application
     1.5.2.1.7 Water source for application
     1.5.2.1.8 Application plan indicating the method or list of steps of how the treatment will be applied

   - **1.6 QUALITY ASSURANCE**

Only contract applicators with significant experience in the application of termite control systems. Application procedures can only be conducted in the presence of qualified installers and specialists, who are duly licenses according to pertinent regulations.

- **1.7 WARRANTIES**
  Submit an application warranty, signed and certified by the Pest Control Operator/ Applicator, and contractor that certifies that the termite control work administered on site will prevent infestation of subterranean termites for at least five (5) years. If termite activity occurs during the warranty period, re-treat the soil, repair and replace damages caused by termite activity or infestation.

2. **PART 2 PRODUCTS**
   - **2.1 PERFORMANCE REQUIREMENTS**
     - 2.1.1Ensure that all termiticide systems applied on site are effective against infestation for at least five (5) years.
     - 2.1.2Ensure that all termiticide systems are approved by the Food and Drug Administration

   - **2.2 TERMITICIDES FOR SOIL TREATMENT**
     - 2.2.1Ensure the use of non-repellent FDA-registered termiticides that are compliant with all legal codes.
     - 2.2.2Ensure the use of termiticides that are not harmful to vegetation.
     - 2.2.3Ensure that the instructions of the FDA-Registered Label are affixed on all containers including the maximum quantity and rate of concentration allowed per use, as well as safety instructions.
     - 2.2.4Chemical solutions should be classified as either Chemical Barrier Systems or Replenish/ Re-treatment systems.

   - **2.3 DELIVERY AND STORAGE**
     - 2.3.1Ensure that the delivery of all termiticides to the project site are done in safe conditions.
     - 2.3.2Ensure that all containers are properly sealed and labeled as supplied by the formulator of the chemicals. Check that all labels are complete and bear correct application instructions.
     - 2.3.3Minimize the length of temporary storage of insecticides at the project site.
     - 2.3.4Ensure that no chemical infests any potable waters stored or managed on site.
     - 2.3.5Ensure that the storage of chemicals are safe and not hazardous to human health.

3. **PART 3 EXECUTION**
   - **3.1 JOB CONDITIONS**
     Do not apply soil treatment solutions until excavating, filling, and grading operations are completed unless otherwise specified by the manufacturer, with the approval of the Construction Manager. Do not apply soil treatment solutions to excessively wet soils or during inclement weather. Ensure that the application instructions of the manufacturer are duly followed.

   - **3.2 PREPARATION AND EXAMINATION OF APPLICATION AREA**
     - 3.2.1Examine all areas for application and ensure that the moisture content of the area for application is of levels suitable to the optimum performance of termiticides. Check substrates, earthworks, landscaping, slab and foundation work, and other conditions that can impact the performance of the termite control system.
     - 3.2.2Correct all conditions that are not suitable for application. Proceed with application of the termite control system only when all conditions that need correction have been implemented.
     - 3.2.3Remove foreign matter and other surface materials that could decrease the effectiveness of the treatment.
     - 3.2.4Loosen, rake, and level all the soil and earth subsurface that need to be treated except areas that require compaction for structural purposes of the project. Secure the approval of the construction manager before loosening soil that is near slabs, foundation, and footings, and other soil compacted for critical parts of the building.
     - 3.2.5If there are wood forms present on site, check whether the wood forms can be exposed to termiticides.
     - 3.2.6Ensure that the application of termiticides do not damage other wood elements available on the project site, unless the approval of the Construction Manager has been secured.
     - 3.2.7Ensure that no vegetation or major trees that are part and critical to the design of the project are hazardously affected by the termiticides for application.
     - 3.2.8Remove all wood and other termite-edible materials such as stakes, formworks and construction waste from soil around foundations.
     - 3.2.9Check and comply all pertinent laws, local codes and ordinances pertinent to the jurisdiction of the project site and ensure that there are no violations.

3.3 APPLICATIONS

3.3.1 Consistently mix all termiticide solutions. Check the labels and prescribed methods of applications of the chemical to be utilized and ensure that it is duly followed.

3.3.2 Ensure that the chemical barrier applied between the building, its structural and other elements can protect the project from infestation of termite colonies.

3.3.3 Treat soil materials beneath ground-supported slabs, foundations, footings, etc., before concrete works are commenced.

3.3.4 Treat soil surfaces surrounding the perimeter of foundation walls, footings, ground-laid pipes and conduits, piers, other bases, i.e. porches, ground lobbies, , and other physical built elements inherent to the structure that have ground contact.

3.3.5 Avoid the washout and similar disturbances of soil surrounding treated surfaces. Upon the technical advice of the applicator, re-treat in case of washout.

3.3.6 Treat voids in masonry, as well as expansion joints, control joints, and other areas where slabs can be penetrated by termites.

3.3.7 Ensure that the termiticide solution is not diluted during application.

3.3.8 Post appropriate warning signs during application to ensure maximum surface.

3.3.9 Reapply soil treatment solution to areas disturbed by subsequent excavation, grading, landscaping, or other construction activities following application.

END OF SECTION

1. PART 1 GENERAL

1.1 RELATED DOCUMENTS

1.1.1 Technical Drawings

1.1.2 Specifications

1.1.3 Structural Engineering Specifications for Excavation Work (By Structural Designer)

1.1.4 Tests and Laboratory work Results

1.2 SUMMARY

This section includes requisites and stipulations on concrete pavement work, namely curbs and gutters, pedestrian ramps, driveways, outdoor concrete stairs on the ground floor level, walkways and sidewalks, embossed pedestrian crossings, unit paver concrete floor base, exterior podiums, concrete stages, and other concrete paving elements consistent to the technical working drawings.

1.3 RELATED SECTIONS

1.3.1 Joint Sealants

1.4 GENERAL PROVISION

1.4.1 Ensure that all concrete mixes follow the specifications of structural designers and landscape architects.

1.4.2 Verify all indications on the technical working drawings and issue Requests for Clarification in case of conflicting indications.

1.4.3 Comply with all local codes and ordinances governing the project site if the local standards are more stringent with than indicated on drawings but do not implement any such standards without verifying with the architect. Secure an official advice from the Architect via a Request for Clarification prior to implementing any work that deviates from the technical working drawings.

1.4.4 Implement all landscape and concrete pavement work such that safe vehicular and pedestrian access is retained and maintained on site, as required for construction and other activities.

1.4.5 Always use form-release agents on formwork surfaces prior to concreting.

1.4.6 Maintain the quality of concrete surfaces as indicated and make sure that removal of forms do not tarnish, destroy, or impair the concrete surface.

1.4.7 Protect existing concrete pavement on site ***ONLY if found suitable to the proposed design*** as indicated in the technical working drawings. Unless indicated in the technical working drawings, do not demolish, damage, or destroy existing concrete pavements, especially pavements that are passable or subject to pedestrian and vehicular use. In case of damages on the existing concrete pavements due to construction work, the contractor is obliged to shoulder repairs of existing pavements. If existing concrete pavements are found in conflict with the design as indicated on the technical working drawings, submit a request for clarification.

1.5 MAINTENANCE

1.5.1 When portion of the pavement work has been completed, ensure that it is properly protected and secured that no pedestrian or vehicular access damages the completed work especially during the curing stages.

1.5.2 Until the work has not been accepted by the parties involved, maintain the pavement as clean as possible. Remove surface stains and material spillage. Regularly sweep the completed concrete pavement work such that it is free of dusts that can affect the quality of the surface material.

1.6 SUBMITTALS

1.6.1 PRODUCT APPROVAL ATTACHMENTS

1.6.1.1 Submit mix design for each mixed to be used.

1.6.1.2 Submit manufacturer's product data, particularly application and installation instructions for cement, additives, and other materials used.

1.6.1.3 For concrete pavement mixes, submit data showing the compressive strength, slump limit, and air content of the concrete. The contractor must certify this concrete mix as true and accurately applied on site.

1.6.1.4 For loose stone aggregates used as site decoration, submit actual samples of the aggregate sample attached to the Product Approval Form. Ensure that the product code and other unique identifiers of the sample are clearly indicated on the approval form.

1.6.1.5 Ensure that all horizontal and vertical exposed surfaces are smooth, continuous, and straight, unless otherwise indicated on the technical working drawings. Refer to the technical working drawings for other details.

1.6.2EXECUTION APPROVAL ATTACHMENTS

1.6.2.1 Detailed work methodology, indicating at least the following

1.6.2.1.1 Date and time of application

1.6.2.1.2 Area of application

1.6.2.1.3 Restoration procedures upon completion of work.

2. PART 2 PRODUCTS

2.1 PERFORMANCE REQUIREMENTS (CONCRETE MIX)

Mix concrete using the standard Portland cement, aggregated, sand, and water combination and ensure that the compressive strength is 3000psi minimum at the 28th day of curing, unless otherwise stipulated by the structural designer. Ensure that the concrete slump limit is at 75mm or 3 inches and that the air content is at maximum 5% to 8%. Comply with requirements of Division 03 Section "Concrete Floor Topping" for details on concrete mix design, sampling and testing, and quality control.

2.2 PERFORMANCE REQUIREMENTS CONCRETE MATERIALS (PAVEMENT)

Follow as indicated in the structural consultant/designer plans. Ensure the following qualities of concrete, unless otherwise specified by the structural designer. In which case, the specifications of the structural designer prevails.

2.2.1Portland Cement: ASTM C 150, Type I; Furnish Grey cement

2.2.1.1 Normal Weight Aggregate: ASTM C 33, uniformly graded, from a single source, with coarse aggregate as indicated in Structural Consultant's Specifications.

2.2.2Ensure that fine Aggregates are free of materials with deleterious reactivity to alkali in cement.

2.2.3Ensure that the sizes, color and percentage of exposed decorative aggregates are as intended for the project. Refer to the technical working drawings for details.

2.2.4Use aggregate Mix Type 1B: 10mm size; percentage as intended for the project.

2.2.5Use aggregate Mix Type 1A: 3mm size; percentage as intended for the project.

2.3 PERFORMANCE REQUIREMENTS — STEEL REINFORCEMENTS

Ensure the following qualities of steel reinforcements, unless otherwise specified by the structural designer. In which case, the specifications of the structural designer shall prevail.

2.3.1Use Plain-Steel Welded Wire Fabric: ASTM A 185, fabricated from as-drawn steel wire into flat sheets.

2.3.2Use Deformed-Steel Welded Wire Fabric: ASTM A 497, flat sheet.

2.3.3Use Reinforcing Bars: Deformed steel bars, ASTM A 615, Grade 60, deformed.

2.3.4Use Joint Dowel Bars: Plain steel bars, ASTM A 615, Grade 60. Cut bars true to length with ends square and free of burrs.

2.3.5Use Steel Bar Mats: ASTM A 184/A 184M; with ASTM A 615/A 615M, Grade 60 (Grade 420), deformed bars; assembled with clips.

2.3.6Use Tie Bars: ASTM A 615/A 615M, Grade 60 (Grade 420), deformed

2.4 PERFORMANCE REQUIREMENTS — CURING MATERIALS

2.4.1When using curing materials, use liquid-membrane forming and sealing curing compound. Comply with ASTM C 309, Type I, Class A and ensure that moisture loss is no more than 0.055 gr./sq.cm. When applied at 200 sq ft/gal., unless specified otherwise on the technical working drawings or by the structural designer.

2.4.2When using anti-spalling compound, use a combination of boiled linseed oil and mineral spirits, complying with AASHTO M-233.

2.5 PERFORMANCE REQUIREMENTS — EXPANSION JOINT MATERIALS

Refer to and comply with requirements of Division 07 Section "Joint Sealants".

2.6 PERFORMANCE REQUIREMENTS — FORMS

2.6.1Use standard form materials, i.e. plywood, metal, metal-framed plywood, phenolic boards, and other standard form materials available in the market.

2.6.2When curved surfaces are indicated on the technical working drawings, ensure the use of flexible forms or curves.

2.6.3All forms must be attached with a commercially formulated form-release agent that does not damage the resulting concrete surface.

3. PART 3 EXECUTION

3.1 SURFACE PREPERATION

3.1.1Compact sub-base surface and remove all loose material before concrete placement. Check any unstable areas and conduct additional compaction when needed.

3.1.2Commence paving works only when all compaction work has been corrected.

3.2 FORM CONSTRUCTION

3.2.1Check technical working drawings to determine accurate setting of forms as to required grades and lines.

3.2.2Check the alignment of the assembled formwork. Ensure that the displacement tolerance of the resulting concrete work is not more than 3mm for horizontal faces and not more than 6mm for vertical faces. Install secure braces on the formworks to ensure alignment.

3.2.3Ensure that forms are applied with the appropriate form-release agent prior to installation to make sure that separation from cured concrete will not incur any damages.

3.2.4Clean forms after each use.

3.3 REINFORCEMENT

3.3.1Refer to the drawing and specifications of the structural designer for the installation of reinforcements. For details in execution, check Division 03 sections of this specification.

3.4 CONCRETE PLACEMENT

3.4.1Comply with requirements of Division 03 sections for mixing and placing concrete.

3.4.2Check all line and grade of forms before concrete placement.

3.4.3If a dampened conditions are required at the time of concrete placement, ensure that the sub-base is properly moistened.

3.4.4Ensure that elevations and alignments of concrete manholes are accurate before placing concrete.

3.4.5Only use concrete placement methods that prevent segregation of the concrete mix.

3.4.6Use internal vibrator to consolidate concrete along face of forms and areas adjacent to transverse joints. Use square-faced shovels via hand spreading to consolidate concrete placed near joint assemblies, reinforcement, or side forms. Do not use a vibrator to consolidate concrete in these areas. Consolidate with care such that dislocation of reinforcing, dowels, and joint devices is avoided. In case of dislocation, make sure to correct the alignment prior to concrete setting.

3.4.7Make sure that a bonding agent is used at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.

3.4.8Make sure that concrete placement in horizontal surfaces is as continuous as possible. If the interruption between concrete placements is more than thirty (30) minutes, use a construction joint.

3.4.9For pavement lanes adjacent to each other and placed separately, do not allow equipment to pass through the lane with previously poured concrete until the lane has cured enough to gain the concrete strength required to carry loads.

3.5 FABRICATED BAR MATS

3.5.1Ensure that fabricated bar mats are clean and free from excessive rust and dust.

3.5.2Check that bars are not distorted in a way that affects its strength or that it deviates away from the indications of the structural engineer.

3.5.3When arranging bar mats, follow the technical working drawings issued by the structural engineer.

3.5.4 Establish a minimum of 2-inch mat overlaps for adjacent maps.

3.5.5 When placing concrete on mats with a required finish surface, place the concrete in two batches. The first concrete placement batch should be up to beneath the finish surface level only. The second batch will be dedicated to the surface finish. Check the thickness of the surface finish according to technical working drawings. If not indicated, un-bonded toppings should be at least 70mm thick. A 50mm topping thickness is acceptable only if bonding agents are used. The time gap between the placements should not be more than 15minutes.

3.6 JOINTS

3.6.1 Construction joints must be installed where necessary such as at the end of concrete placements and in between concrete placements that have a huge time gap between placements. Install dowels for concrete placements designed to withstand heavy loads.

3.6.2 For weakened planes, use contraction joints or expansion joints such that there shall be no unnecessary breakage for the concrete.

3.6.3 Ensure that the layout of contraction joints are as square-shaped as possible. The length to width ratio of the square must never exceed 1 ½ to 1.

3.6.4 For expansion joints between concrete curbs and pavements, catch basins and manholes, inlets, structures, walks, and other objects, use a pre-molded filler to ensure the smooth plane of the abutments.

3.6.5 When using joint fillers, ensure that full width and depth of the joint is not less than 12.7mm or 25mm. The joint filler must be flushed with the finished concrete surface. Refer to Division 07 Section "Joint Sealants" for material and installation performance requirements of joint sealers.

3.6.6 Dry-cut joints are acceptable provided that it is positioned on the pavement within 1-4 hours after the completion of pouring and finishing.

3.6.7 Install isolation joints at the intersections of horizontal and vertical surfaces such as slabs and columns, walls and footings and where curbs or sidewalks meet other concrete structures.

3.7 CURBS AND GUTTERS

3.7.1 Refer to the site development plan details to identify the correct location and details of curbs.

3.7.2 Ensure that required cross-section, lines, grades, finish and jointing are as specified for the formed concrete.

3.7.3 In case of curb inlet manholes, refer to the technical working drawings in the Site Development and Drainage plan.

3.8 CONCRETE FINISHING

3.8.1 Smooth concrete finishes by screeding and floating. The use of mechanical floating device is preferred.

3.8.2 When the use of a mechanical floating and screeding device is not possible, ensure that hand power methods deliver consistent finishes, free from unwanted lumps.

3.8.3 For float finishes, ensure that floating works begin only when bleed-water sheen is no longer visually present on the concrete surface. Check that the concrete of the surface being finished is stiff. Refer to technical working drawings whether the indicated area is dedicated as float finish.

3.8.4 For burlap finishes, use damp burlap across float finished concrete. Ensure that the texture is uniformly installed.

3.8.5 For fine textured-broom finish, use a soft bristle broom across float-finished concrete surface.

3.8.6 For medium to coarse texture broom finish, use a soft bristle broom to etch 1.6mm to 3mm deep marks on the concrete surface.

3.8.7 Check all technical working drawings for the appropriate application areas of respective concrete finishes.

3.8.8 Check all planes and slope marks of the finishes.

3.8.9 When finishing, ensure that the slope marks as indicated in the technical working drawings are followed. Avoid surfaces that allow for water accumulation unless indicated in the technical working drawings.

3.8.10 Check that the texture of the final finish is approved. Submit a mock-sample of the concrete finish to the designers and secure an approval prior to completion of work. Indicate the area of application.

3.8.11 Use an edging tool to round-finish edges of slabs, gutters, back top edge of curb, and formed joints. Round up to 12.7, radius unless otherwise indicated on the technical working drawings.

3.8.12 Eliminate all excess moisture or surface sheen on the concrete

3.9 CURING

3.9.1 Do not allow any traffic on the concrete during first fourteen (14) days of curing.

3.9.2 Refer to Division 3 provisions of this specification for specific curing methods depending on area of application.

3.10 REPAIRS AND PROTECTION

Ensure that all finished concrete surfaces are properly protected until acceptance of work. In case of damages and any chipping, repair all chipped or damaged portions. Use a bonding agent when repairing damages to ensure proper adhesion to the original concrete surface.

Make sure that all concrete surfaces are washed clean and free of stains, discolorations, dirt and other foreign material.

END OF SECTION

02 00 00	DIVISION 2 SITEWORKS	
02 78 0	Unit Pavers	1 of 5

1. **PART 1 GENERAL**

1.1 RELATED DOCUMENTS

1.1.1Technical Drawings
1.1.2Specifications
1.1.3Shop Drawings – Tile Setting Layout

1.2 SUMMARY

This section includes provisions and recommendations on the installation of unit pavers along parking areas and other areas as indicated in the technical working drawings.

1.3 RELATED SECTIONS

1.3.1Concrete Finishes
1.3.2Concrete Floor Topping

1.4 GENERAL PROVISION

1.4.1For all unit pavers to be installed on site, submit an actual sample to the technical team for approval. Verify shape and pattern of concrete pavers on the working drawings. Submit product samples as per specified items on drawings. Refer to the technical drawings for the cut, pattern, design, material size and prescribed dimensions of the unit pavers if any.
1.4.2If pavement unit designs available in the market significantly differ from the specified items, request for product substitution and justify. Products approved by IPFDU designers will prevail over specified unit designs.
1.4.3Prior to complete installation, prepare a mock-up sample on site at least 1000mm X 1000mm and have it approved by the IPFDU prior to complete installation. Attach photos of the mock-up to the official request for approval and request for the architect and/or the architect's representative to see the actual mock-up. Refer to Division 01for procedures on request for approval.
1.4.4Verify all indications on the technical working drawings and issue Requests for Clarification in case of conflicting indications. Refer to Division 01for procedures on requests for clarification.
1.4.5Implement all unit paver works such that safe access is maintained on site, as required for construction and other activities. Zone the pavement works such that ample vehicular and pedestrian access is maintained on site to continue other construction activities.
1.4.6Do not modify the surface texture of approved unit paver samples. Do not paint, polish or scratch the unit pavers installed on site such that its visual and compressive properties are substantially altered by the modification. Install unit samples as originally approved.

1.5 MAINTENANCE

1.5.1In case of damages during installation, take care to remove the defective units and replace with fully functioning and visually acceptable units. Ensure that the replacement of unit pavers do not damage the adjacent pavers already installed.
1.5.2Keep the installed pavements clean and free of discoloration, foreign substances, and other elements. In case of stained unit pavers, make sure to clean, wipe, and restore the stained units to its original surface quality.
1.5.3For phased construction work, make sure to protect all completed pavement work subject to damages due to exposure to heavy equipment. Restore any damages incurred during construction work.

1.6 SUBMITTALS

1.6.1PRODUCT APPROVAL ATTACHMENTS
1.6.1.1 Submit samples of unit pavers for approval. Refer to the technical working drawings for the indicated area of application. Label and code the samples according to the area of application. If the architect finds unacceptable and unapproved samples installed on site, these items are subject to re-work. Samples without proper are not acceptable.

1.6.1.2 Indicate the compressive capacity of the sample. Ensure that the sample submitted for approval is labeled as "for vehicular traffic" if the compressive capacity of the unit paver is suitable for heavy vehicular access. If the capacity of the sample submitted for approval is only for pedestrian traffic, indicate "for pedestrian traffic only" on the sample label. Check the technical working drawings and verify the appropriate area of application. In case of conflicts, submit a request for clarification. Refer to section "01 26 63 Requests for Interpretation.
1.6.1.3 Sample data showing compressive strength and water absorption capacity.
1.6.1.4 If the unit paver is concrete, submit data showing the concrete, water, and aggregate mixture proportioning.
1.6.1.5 If the unit paver is stone, submit data showing the abrasive Hardness of the stone, the compressive strength. Attach engineering test analysis results or compressive strength certifications for stone unit pavers.

1.6.2EXECUTION APPROVAL ATTACHMENTS
1.6.2.1 Submit a detailed work methodology, indicating at least the following
1.6.2.1.1 Date and time of application
1.6.2.1.2 Area of application
1.6.2.1.3 Curing period and certifications of shortened curing periods by manufacturers, if any.
1.6.2.1.4 Shop drawings showing the tile layout, with complete indications on the start and end of the tile layout. Legibly indicate the sloping and drainage direction of surface water runoff. Be sure that shop drawing submittals are in the correct and legible scale. Include detailed shop drawings on the configuration of the paving unit, showing height, width, length, thickness dimensions, etc. for every unit paver design specified on site.
1.6.2.1.5 When using stone unit pavers on thresholds, stair units nosing, stair steps and risers, be sure to indicate in the shop drawings the mortar bedding method and the dimensions of the proposed lippage.

1.7 QUALITY ASSURANCE

1.7.1Guarantee that installers are experienced and have successfully completed paver installations similar to the approved sample.
1.7.2The contractor is responsible for sourcing the materials.
1.7.3In case of multiple sources or suppliers, confirm and guarantee that the installed pavers are similar by seeking the approval of the design team through the assistance of the construction manager. When proposing to utilize unit pavers from a second source, submit both the existing sample on site from the original source, and the second sample from the new source. Label the samples properly and accordingly. Indicate areas of application and indicate whether the sample is for pedestrian or vehicular access. Repeat approval process for every new unit sample from a new source supplier, in case of multiple sources.
1.7.4Install a mock-up at least 1000mm x 1000mm on site. Notify the architect at least one week in advance to request for a site visitation and have the mock up approved by the architect through a request for execution approval. Attach a photo of the mock-up the approval form. The photo should be properly labeled with the following information: (1) location of installation, (2) date of mock-up approval. Wrongly installed unit pavers without mock-up approvals will be subject to re-work.
1.7.5When weather during unit paver work is extremely hot, ensure that the substrate or the area of application is cooled enough such that temperature and humidity conditions will not cause excessive evaporation of setting beds and grout. Do not install pavement units on wet areas.

1.8 DELIVERY STORAGE, AND HANDLING

1.8.1When unit paver items are delivered on site prior to installation, ensure that the pavers are stored without any damages. Properly discard unit pavers with chipped corners, split pavers with hairline cracks, and other cracks that affect the quality of the unit both visually and strength-wise. Do not install defective unit pavers on site.
1.8.2Stored unit pavers must be kept clean. Store unit pavers away from substances, i.e rain, chemicals, and other materials that can cause discoloration and disintegration on the pavement units affecting its strength and visual quality.
1.8.3Store grout and mortar materials in areas where it will not be damaged by excessive moisture content and unfit temperature. Keep the storage location of mortar and grout materials dry, or enclose the items in water proof containers.
1.8.4If using combustible grout and mortar materials, ensure that the storage location of items on site are away from fire, heat, or other flammable conditions.
1.8.5The contractor is responsible for replacing unusable items due to damages incurred during site storage.

2. PART 2 PRODUCTS

2.1 PEDESTRIAN CONCRETE PAVERS

2.1.1Concrete mix used for pavers is a mixture of Portland Cement Type II or Type III, Fine and Course Aggregates at ASTM 33.
2.1.2Concrete strength shall be 20Mpa (3000-psi) compressive strength attained at 28 days of curing, ASTM C 39
2.1.3Water absorption maximum 5%

2.2 VEHICULAR CONCRETE PAVERS

2.2.1Verify shape and pattern of concrete pavers on the architectural working drawings.
2.2.2Concrete mix used for pavers is a mixture of Portland Cement Type II or Type III, Fine and Course Aggregates at ASTM 33.
2.2.3Concrete strength shall be 55Mpa (8000-psi) compressive strength attained at 28 days of curing, ASTM C 39.
2.2.4Water absorption maximum 5%

2.3 STONE UNIT PAVERS FOR VEHICULAR TRAFFIC

2.3.1Ensure that all stone unit pavers for vehicular traffic are at least 750mm thick, unless otherwise indicated on the drawings.
2.3.2For, stone unit pavers under 750mm thickness but with compressive capacity equal or greater to 55MPa (8000-psi), submit product data certifying the compressive strength and submit engineering/test analysis if any.
2.3.3Ensure that the minimum abrasive hardness of stone unit pavers are at 12.0 unless otherwise indicated in the technical working drawings.
2.3.4Check technical working drawings to verify stone patterns. Submit samples that are exact or nearest to the required color, size, dimensions, and properties of each stone unit paver as indicated on the drawings.
2.3.5Check joint width between stones in accordance to the technical working drawings. If not indicated, submit a request for clarification to the architectural design team.
2.3.6Ensure ASTM conformance of stone unit pavers as follows:
2.3.6.1 Granite: ASTM C615; verify dimensions on area of application as indicated in technical working drawings.
2.3.6.2 Limestone: ASTM C568; verify dimensions on area of application as indicated in technical working drawings.
2.3.6.3 Marble: ASTM C503; verify dimensions on area of application as indicated in technical working drawings.
2.3.6.4 Quartz-based Stone: ASTM C616; verify dimensions on area of application as indicated in technical working drawings
2.3.6.5 Slate: ASTM C629; verify dimensions on area of application as indicated in technical working drawings.
2.3.6.6 Serpentine: ASTM C1526; verify dimensions on area of application as indicated in technical working drawings.
2.3.6.7 Travertine: ASTM C1527; verify dimensions on area of application as indicated in technical working drawings.

2.4 PORTLAND CEMENT MORTAR SETTING BED

2.4.1Verify the correct area of application in the technical working drawings. In case of queries, submit appropriate requests for clarification.
2.4.2Use Portland Cement ASTM C 150 Type I or Type II.
2.4.3Use Hydrated Lime ASTM C 207, Type S of ASTM C207. When using hydrated lime, be sure to wet out the lime in the mixing procedure. Check the execution requirements for lime mixing.
2.4.4Use aggregates complying to ASTM C 144.
2.4.5Use potable water that is free of oils, acids, alkalis, salts, organic materials or other substances that are damaging to mortar or any metal in the wall.
2.4.6When using reinforcing wire fabric, use galvanized welded wire fabric 100mm X 100mm (W1.4/W1.4), ASTM A 185.

2.5 MORTAR MIXES

2.5.1Use Portland Cement/Lime Setting-bed Mortar, Type M of ASTM C 270 with at 2500psi.
2.5.2Ensure high compressive strength of the mortar mix to avoid re-works and breakage on site.

2.6 ACCESSORIES

2.6.1Use tile spacers when possible to ensure consistency of distances.

2.6.2Assume 5mm grout thickness, unless otherwise indicated on the technical working drawings. Verify grout-grout distances on the technical working drawings.

3. PART 3 EXECUTION

3.1 PROJECT CONDITIONS

Ensure that on-site weather is suitable for unit paver works. Do not install unit pavers during extremely hot weather conditions in order to ensure good quality of work. Use industrial cooling fans and other appropriate cooling methods on site to ensure that the temperature of the substrate is ready for accepting the mortar setting beds and unit pavers. Do not apply mortar to substrates with temperatures of 38 degree C (100 degree F) and above.

Contractor must keep traffic off the completed installation works for at least 48 hours, unless otherwise required or certified by the unit paver manufacturer.

3.2 PREPARATION

Make sure that substrates and areas subject for work are free of dirt dust, debris, and loose particles. Sweep, vacuum, or wash the substrate area clean prior to application. When washing the substrate clean, take care to remove any excessive amounts of water from the surface before beginning mortar setting and unit paver layout.

3.3 INSTALLATION, GENERAL

3.3.1Allowable grouting between units is from 0mm minimum to maximum 5mm.
3.3.2Use motor-driven masonry equipment when cutting unit pavers.
3.3.3Ensure that modified pavement units are cleanly and sharply cut, and free of unchipped edges.
3.3.4Double-check the patterns and cut the units accordingly to fit and match the ***approved*** tile layout.
3.3.5For portions of the pattern requiring full units, use full unit pavers. Do not adjoin cut pavers to make one full unit.
3.3.6Do not hammer cut the units to avoid chipping and wastage.
3.3.7For unit pavers adjoining curbs, slabs, and other homogenous surfaces, do not exceed 1mm vertical flush or lippage to the abutting faces, especially for pavement areas with pedestrian access. Ensure that the finish surfaces are level and following the slope requirements indicated in the technical working drawings.
3.3.8For stone pavers,

3.4 REPAIR, POINTING, CLEANING, AND PROTECTION

3.4.1Neatly remove excess grout from exposed surfaces. Scrub and wash the surfaces clean and take care not to damage the original surface condition of the unit pavers.
3.4.2Point the grout following the requirements of the technical working drawing. For flush pointing, ensure that the grout is level with the unit pavers allowing for no more than 0.20mm lippage. For bucket handle, recessed, and weather struck pointing, a maximum depression of up to 0.30mm is tolerable, unless otherwise indicated in the technical architectural drawings.
3.4.3Protect all completed unit pavement work so that it stays free of damages.
3.4.4Remove and replace all unit pavers damaged during installation.

END OF SECTION

DIVISION 03
CONCRETE

03 00 00	DIVISION 3 CONCRETE	
03 33 00	Architectural Concrete	1 of 11

1. PART 1 GENERAL

1.1 RELATED DOCUMENTS

1.1.1Technical Architectural Drawings
1.1.2Specifications
1.1.3Shop Drawings — Setting Layout

1.2 SUMMARY

This section includes provisions and recommendations on cast-in-place and pre-cast concrete works with both architectural and structural purposes, foundations, floors and slabs on grade, equipment pads and anchors, light pole bases, thrust blocks, manhole bases, pits and vaults.

Architectural precast works include pre-cast partitions for interiors, wall panels, concrete pads for mechanical equipment, wheel stops, interior precast concrete as indicated in the Architectural technical working drawings.

Verify instructions for specialized architectural concrete elements particularly statues, concrete louvres and any architectural element with specialized aesthetics. For specialized architectural concrete elements, refer to specifications on technical working drawings or to the specifications of a designated designer if any.

Control, expansion and contraction joint devices associated with concrete work not part of pavement work, including joint sealants, are also discussed in this section.

1.3 RELATED SECTIONS

1.3.1Concrete Pavement
1.3.2Concrete Finishes
1.3.3Concrete Floor Topping
1.3.4Final Cleaning

1.4 GENERAL PROVISION

1.4.1Ensure that all concrete mixes follow the specifications of structural designers and architects.
1.4.2Verify all indications on the technical working drawings and issue Requests for Clarification in case of conflicting indications.
1.4.3Do not modify the appearance, strength, and durability of the concrete architectural elements without any approval issued by the architect of record and the structural designer of record. Submit a request for approval for any modifications proposed. Any modifications found on site without corresponding approvals are subject to re-work at the expense of the contactor.
1.4.4Do not modify designs as indicated in the drawings. If modifications are necessary due to actual site conditions, submit shop drawings and annotate reasons for modification. Take care to highlight and explain the portion to be modified by indicating annotated technical drawing clouds.
1.4.5Comply with all local codes and ordinances governing the project site. If the local standards are more stringent or conflicting with that indicated on drawings, submit a request for clarification and indicate the code or cause of conflict. Do not implement any such code standards without verifying with the architect.
1.4.6Secure an official advice from the Architect via a Request for Clarification prior to implementing any work that deviates from the technical working drawings.
1.4.7Implement all concrete casting work such that safe vehicular and pedestrian access is retained and maintained on site, as required for construction and other activities.
1.4.8Always use form-release agents on formwork surfaces prior to concreting. Refer to the formworks portion of this section.

1.4.9Contractor may request for design mix substitution to be approved by the structural designer. Refer to the Section 01225 13 Product Substitution Procedures of this specifications for product substitution procedures.
1.4.10 Never overlay fresh concrete on existing concrete found on site unless otherwise approved by the structural consultant. Refer to the execution portion of this section for instructions on batch-laid concrete casting. Ensure that the maximum strength of the concrete is attained. Submit concrete samples subject to laboratory test work. Refer to submittal attachments required for details.
1.4.11 For exposed concrete finishes with specialized texture and color, secure an approval of the final finish from the architect of record. Refer to Division 03 35 0 Concrete Finishes.

1.5 MAINTENANCE

1.5.1Maintain the quality of poured concrete surfaces as indicated and make sure that removal of forms do not tarnish, destroy, or impair the concrete surface.
1.5.2Keep the casted concrete free of discoloration, foreign substances, and other elements.
1.5.3Keep pre-cast concrete delivered on site free of discoloration, foreign substances, and other elements. Refer to the delivery, storage, and handling portion of this Section for details.
1.5.4In case of damages or surface alterations as a result of on-going construction work and other similar activities that modify the qualities of the concrete after pouring, ensure that the quality of the concrete surface is restored according to indications on the technical working drawings or by the approved shop drawings before final turnover.

1.6 SUBMITTALS

1.6.1PRODUCT APPROVAL ATTACHMENTS
1.6.1.1 Submit manufacturer's product data, particularly application and installation instructions for cement, cementitious materials, additives, admixtures, bearing pads, and other materials used. Submit material certificates as signed or certified by manufacturers.
1.6.1.2 For concrete surfaces subject to weather exposure and surface water run-off, submit the manufacturer's data of the approved waterproofing material. Include manufacturer's application and installation instructions for waterproofing, particularly data on concrete surface finish and conditions as needed.
1.6.1.3 Submit mix design for each concrete mix to be used.
1.6.1.4 Submit a minimum of three properly labeled samples of each concrete mix delivered on site and for every mix approved by the designers.
1.6.1.5 Submit separate sample cylinders for every 115 cubic yards of concrete mix delivered.
1.6.1.6 Label all concrete cylinder submittals properly and submit laboratory test reports indicating the concrete mix performance for every 7th, 21st, and 28th day of curing. Laboratory test results should include:
1.6.1.6.1 Slump requirement
1.6.1.6.2 Air content requirement
1.6.1.6.3 Project number
1.6.1.6.4 Project name
1.6.1.6.5 Project location
1.6.1.6.6 Area of application (Indicate in drawings)
1.6.1.6.7 Sample date
1.6.1.6.8 Cure type
1.6.1.6.9 Actual slump according to test
1.6.1.6.10Actual air content according to test
1.6.1.6.11Unit Weight (Fresh)
1.6.1.6.12For areas with exterior exposure, indicate water absorption test results.

1.6.2EXECUTION APPROVAL ATTACHMENTS
1.6.2.1 Detailed work methodology, indicating at least the following
1.6.2.1.1 Date and time of application
1.6.2.1.2 Area of application
1.6.2.1.3 Restoration and cleaning procedures upon completion of work.
1.6.2.1.4 Shop drawings showing fabrication details, for items i.e. concrete railings, if any, wheel stoppers, and other similar architectural elements. Include plans, elevations, shapes and cross-sections in drawings. All drawings must be properly labeled, drawn to scale, and complete with dimensions. Include reinforcement details, locations, tolerances,

and dry joint treatments if casting is in multiple phases. If the architectural concrete will be accepting veneer, i.e. stone units, indicate relationship of architectural pre-cast concrete units to adjacent materials.

1.6.2.1.5 On shop drawings submitted with proposed modifications, clearly indicate modifications through drawing clouds.

1.7 QUALITY ASSURANCE

1.7.1 Comply with ACI 117-90 for Tolerances for Concrete Construction and Materials, unless otherwise indicated on drawings and specifications.

1.7.2 Unless, otherwise specified by the designer, comply with ACI 301 for specifications for Structural Concrete for Buildings.

1.7.3 Comply with field-testing requirements as specified in ACI 301.

1.7.4 Ensure that testing agencies for field tests of concrete samples as required shall be by an ACI Concrete Field Testing Technician Grade I certified in accordance with ACI CPI or equivalent. Ensure that testing agencies are independent and qualified according to ASTM C 1077 and ASTM E 329.

1.7.5 For pre-cast architectural concrete fabricated off site, ensure that the fabricator is experienced in producing architectural pre-cast concrete units similar to items specified in the project.

1.7.6 Measure the fresh concrete temperature at the point and time of discharge in accordance with ASTM C 1064/C1064M. Frequency of temperature determination shall be in accordance with ASTM C 94/C 94M and at the option of the inspector.

1.7.7 When working in hot weather, ensure that the temperature of freshly produced concrete at discharge will not exceed the maximum allowable concrete temperature as specified by structural designers or herein specified standards.

1.7.8 Reduce hot temperatures on site bay casting shade on aggregate stockpiles, sprinkling water on coarse aggregate stockpiles; using chilled water for concrete production; substituting chipped or shaved iced for portions of the mixing water; and cooling concrete materials using liquid nitrogen. Submit work methodologies on concrete cooling methods that will be used. Indicate the order of initiation in the case of multiple methods.

1.7.9 For pre-mixed concrete freshly delivered on site, ensure that deliveries are in accordance with ASTM C 94/C 94M. As such, discharge pre-mix fresh concrete within 1-1/2 hours or before the truck-mixer drum has revolved 300 revolutions, whichever comes first.

1.7.10 Conduct concrete placement and finishing operations as quickly as on-site conditions will allow.

1.7.11 In hot weather, control concrete surface bleed-water evaporation with application of evaporation reducers, plastic sheeting fog spray, or wind breaks. Use materials and method in accordance with ACI 308.1

1.7.12 Cure concrete in accordance with ACI 308.1. Maintain curing conditions until specified levels of durability in the concrete have been achieved. Apply ACI 308R "Standard Practice for Curing Concrete", unless otherwise specified.

1.7.13 The Contractor is required to provide impermeable, watertight concrete and joints in structures and divider walls designed to hold water or other solution.

1.7.14 Repair honeycomb, cracks and such imperfections developed in casted concrete at the Contractor's expense until such is approved. Concrete work or joints with imperfections that cannot be successfully repaired are subject to rework at the contractor's expense.

1.7.15 Test concrete surfaces exposed to surface water run-off by filling each basin, tank, or compartment with water to within one 300mm of the top of the structure. If the water level in the basin, tank or compartment being tested falls more than 25mm in 24 hours, determine and repair the cause of leakage until water tightness is achieved.

1.7.16 All repair work required as a result of the tests for water-tightness shall be the Contractor's expense.

1.8 PERFORMANCE REQUIREMENTS

1.8.1 FIRE PERFORMANCE RATING

1.8.1.1 Comply with 1 hour fire resistance rating for party walls and corridor walls.

1.8.1.2 Comply with 2 hour fire resistance rating for fire-barrier walls, particularly vertical fire exits and shafts.

1.8.1.3 Comply with requirements of the governing Fire Code of the Philippines (RA 9514) and the Philippine Building Code (PD 1096).

1.8.2 STRUCTURAL PERFORMANCE

1.8.2.1 Ensure compliance of load requirements for dead load, live loads, seismic loads, and other applicable loads as computed and designed by the Structural consultant and designers.

1.8.2.2 Provide positive anchorage for pre-cast, pre-fabricated architectural concrete attached to the building. Anchorage details must be properly evaluated and approved by qualified professionals and structural designers.

1.8.2.3 Ensure compressive strength of 7.0 to 10.5Mpa unless otherwise stated in specifications by structural designers.

1.8.2.4 Check concrete weight at 185.53 to 307.59 kg/sqm unless otherwise specified or approved by structural designers.

1.8.3 TERMITE RESISTANCE

Ensure that concrete walls are free of cracks, such that termite entry is prevented.

1.8.4 MOLD RESISTANCE RATING

Ensure that all concrete elements and walls are properly treated such that walls are free of food sources that encourage mold growth.

1.8.5 SOUND PERFORMANCE RATING

If possible, attain 51 to 62 Sound Transmission Class (STC) in decibels (dB).

1.8.6 ZOCALO

Provide 100mm high reinforced concrete upstand zocalo at floor level for all toilet and kitchen applications, and where indicated by the architect. Provide proper anchorage and ensure waterproofing requirements. Refer to Division 7 Thermal and Moisture Protection.

1.8.7 VISUAL APPEARANCE OF CONCRETE WALLS

All finished concrete surfaces should be consistent in appearance unless otherwise indicated in the technical working drawings.

1.9 DELIVERY AND STORAGE

1.9.1 Store all raw materials, equipment, and accessories for cast-in-place concrete in an organized manner such that it doesn't obstruct any on-going construction works.

1.9.2 Allocate proper spaces in anticipation of pre-mixed concrete delivery trucks. Time the delivery so as not to obstruct other on-going construction works, and day-to-day activities within the project site vicinity.

1.9.3 Store pre-cast concrete units properly to prevent contact with soil, staining, cracking, distortion, warping, or other physical damage.

1.9.4 Organize stored pre-cast units so labels are clearly visible and items are easily identifiable. Avoid arrangement of pre-cast units that could cause cracking or damage.

1.9.5 Arrange on-time delivery of architectural precast concrete units in quantities and at times that does not disrupt agreed construction schedule.

1.9.6 During delivery, take care to protect pre-cast units during shipment on non-staining shock-absorbing material. Handle and transport units in a position consistent with their shape and design in order to avoid excessive stresses that could cause cracking or damage.

1.9.7 Lift, transport, and handle the transfer of units to the installation site properly such that items are kept free of deformities.

1.10 WARRANTIES

Ensure a Five (5) year warranty for all interior pre-cast concrete items and ten (10) years for exterior concrete specified under this section, for protection against water penetrations, air penetrations, sealant disengagement, falling-off of surface finish resulting to breakdown in weather-tightness and thermal resistance; failure on mold, termite and seismic resistance. Warranty count shall begin from date of substantial completion and project turnover.

2. PART 2 PRODUCTS

2.1 MATERIALS

2.1.1 CEMENTITIOUS MATERIALS

2.1.1.1 Use Portland Cement: ASTM C 150, Type I or III, standard gray or white cement.

2.1.1.2 Do not use fly ash and gray silica fume for exposed exterior surface applications.

2.1.1.3 Limit use of fly ash to 20 to 40% replacement of Portland cement by weight; ground granulated blast-furnace slag to 15 to 25% of Portland cement by weight; and metakaolin and silica fume to 10% of Portland cement by weight.

2.1.1.4 When using fly ash, comply with ASTM C 618, Class C or F with maximum loss on ignition of 3%.

2.1.1.5 When using metakaolin, comply with ASTM C 618, Class N.

2.1.1.6 When using Silica Fume, comply with ASTM C 1240 with optional chemical and physical requirements.
2.1.1.7 When using coloring admixtures, comply with ASTM C 979, synthetic or natural mineral-oxide pigments or colored water-reducing admixtures. Use non-fading color admixture. Check stable temperature.
2.1.1.8 Ensure that chemical admixtures are certified by manufacturers as compliant and compatible with other admixtures. Components of admixtures cannot contain calcium chloride or more than 0.15% chloride ions or other salts by weight of admixture.
2.1.1.9 When using water-reducing admixture, comply with ASTM C 494/ C 494M, Type A.
2.1.1.10 When using, Retarding Admixture, comply with ASTM C 494/ C 494M, Type B.
2.1.1.11 When using, Water-Reducing and Retarding Admixture, comply with ASTM C 494/ C 494M, Type D.
2.1.1.12 When using, Water-Reducing and Accelerating Admixture, comply with ASTM C 494/ C 494M, Type E.
2.1.1.13 When using, High-Range, Water-Reducing Admixture, comply with ASTM C 494/ C 494M, Type F.
2.1.1.14 When using, High-Range, Water-Reducing and Retarding Admixture, comply with ASTM C 494/ C 494M, Type G.
2.1.1.15 When using plasticizing Admixture to increase plasticity of concrete, comply with ASTM C 1017/ C 1017M.

2.1.2AGGREGATES
2.1.2.1 Source aggregates from a uniform supplier or ensure that the quality of aggregates for use are consistent and in accordance with specifications.
2.1.2.2 Comply with PCI MNL 117, ASTM C 33, for normal weight coarse aggregates Class 5S requirements. Provide and stockpile fine and coarse aggregates for each type of exposed finish from a single source (pit or quarry) for Project.
2.1.2.3 Check that selected coarse Aggregates are hard, durable; free of material that reacts with cement or causes staining; to match selected finish sample.
2.1.2.4 Check that selected fine Aggregates, natural, or manufactured sand are of a material compatible with coarse aggregate selected to match selected sample finish.
2.1.2.5 Check that backup concrete aggregates comply with ASTM C 33 or C 330.
2.1.2.6 Comply with PCI MNL 117, ASTM C 330, for light weight aggregates. Check that absorption less than 11%.

2.1.3WATER
Use potable water free from any deleterious materials affecting color stability, setting, durability or strength of concrete. Check that the resulting concrete will comply with ASTM C 1602/ C 1602M within chemical limits of PCI MNL 117.

2.1.4STEEL, PLATES, ANGLES, ANCHORS, AND EMBEDMENTS
2.1.4.1 When using Carbon-Steel Shapes and Plates, comply with ASTM A 36 / A 36M.
2.1.4.2 When using Carbon-Steel Headed Studs, comply with ASTM A 108, Grades 1010 through 1020, cold finished, AWS D1.1 / D1.1M, Type A or B, with arc shields and with minimum mechanical properties of PCI MNL 117, Table 3.2.3.
2.1.4.3 When using Carbon-Steel Plate, comply with ASTM A 283 / A 283M.
2.1.4.4 When using Malleable Iron Castings, comply with ASTM A 47 / A 47M, Grade 32510 or 35028.
2.1.4.5 When using Carbon-Steel Castings, comply with ASTM A 27 / A 27M, Grade 60-30 (Grade 415-205).
2.1.4.6 When using High-Strength, Low-Alloy Structural Steel, comply with ASTM A 572 / A 572M.
2.1.4.7 When using Carbon-Steel Structural Tubing, comply with ASTM A 500, Grade B or C.
2.1.4.8 When using Wrought Carbon-Steel Bars, comply with ASTM A 675 / A 675M, Grade 65 (Grade 450).
2.1.4.9 When using Deformed-Steel Wire or Bar Anchors, comply with ASTM A 496 or ASTM A 706 / A 706M.
2.1.4.10 When using Carbon-Steel Bolts and Studs, comply with ASTM A 307, Grade A or C (ASTM F 568M, Property Class 4.6) carbon-steel, hex-head bolts and studs; carbon-steel nuts (ASTM A 563 / A 563M, Grade A); and flat, unhardened steel washers (ASTM F 844).
2.1.4.11 When using Studs, include stud stock and threaded bolts.
2.1.4.12 When using High-Strength Bolts and Nuts, comply with ASTM A 325 / A 325M or ASTM A 490 / A 490M, Type 1, heavy hex steel structural bolts, heavy hex carbon-steel units, (ASTM A 563 / A 563M) and hardened carbon-steel washers (ASTM F 436 / F 436M). Use high-strength bolts for friction-type connections between steel members. Do not high strength bolts between steel and concrete to avoid concrete creep and crushing. As per ASTM A 490 / A 490M do not use galvanized bolts.
2.1.4.13 Non-galvanized steel items shall be of Shop-Primed Finish, except those surfaces to be embedded in concrete and as such shall comply according to requirements in Steel Structures Painting Council, Surface Preparation SSPC-SP3 and shop-apply lead-and chromate-free, rust-inhibitive primer, complying with performance requirements in MPI 79 according to SSPC-PA 1.

2.1.4.14 When using Zinc-Coated Finish for steel items in exterior walls and items indicated for galvanizing, apply zinc coating by hot-dip process according to ASTM A 123 / A 123M, after fabrication, ASTM A/ A 153M, or ASTM F 2329 as applicable or electro-deposition according to ASTM B 633, SC 3, Type 1 and 2 and F 1941 and F 1941M.
2.1.4.15 For steel shapes, plates, and tubing to be galvanized, limit silicon content of steel to less than 0.03% or to between 0.15 and 0.25% or limit sum of silicon content and 2.5 times phosphorous content to 0.09%.
2.1.4.16 Galvanizing Repair Paint: High zinc-dust-content paint with dry film containing not less than 94% zinc dust by weight, and complying with DOD-P-21035A or SSPC-Paint 20. Comply with manufacturer's requirements for surface preparation.

2.1.5CONCRETE MIX
2.1.5.1 READY-MIX CONCRETE
2.1.5.1.1 The Contractor is solely responsible for amount of water added and resulting strength of concrete. If concrete strength does not conform to 28 day compressive strength requirements, it shall be removed and replaced at no cost.
2.1.5.1.2 Comply with requirements of ASTM C94, with the following exceptions:
2.1.5.1.2.1 During hot or cold weather conditions affecting the compressive strength of the concrete upon the 28th day of curing, only add or remove water to the mix with the approval of the structural designers and engineers.
2.1.5.1.2.2 When air temperature is between 85o F and 90oF, reduce mixing and delivery time from 90 to 75 minutes.
2.1.5.1.2.3 When air temperature is above 90oF, reduce mixing and delivery time to 60 minutes.

2.1.5.2 DESIGN CONCRETE MIXES
2.1.5.2.1 Provide normal weight concrete with the following properties, as indicated on applicable details:
5,000 psi 28-day compressive strength. (Type II Cement).
4,000 psi 28-day compressive strength. (Type II Cement).
3,000 psi 28-day compressive strength. (Type II Cement).
2.1.5.2.2 For Slump Limits, proportion and design mixes to result in concrete slump at point of placement as follows:
Reinforced foundation systems and treatment tanks — Not less than 1 inch or more than 4 inches.
Concrete with high range water reducing admixtures — Not more than 8 inches.
Ramps and sloping surfaces — Not more than 4 inches.
Slabs and floors - Not less than 1 inch and not more than 3 inches.
Miscellaneous Concrete — Not less than 1 inch and not more than 4 inches.
2.1.5.2.3 The maximum permissible water-cement ratio will be as follows:
5,000 psi concrete — maximum water/cement = 0.40
4,000 psi concrete — maximum water/cement = 0.45
3,000 psi concrete — maximum water/cement = 0.50
2.1.5.2.4 The minimum cement content utilized for the concrete mix design shall be as follows:
5,000 psi concrete — 715 pounds per cubic yard.
4,000 psi concrete — 611 pounds per cubic yard.
3,000 psi concrete — 564 pounds per cubic yard.

2.1.6GROUT MATERIALS
2.1.6.1 When using sand-cement grout, use Portland cement, ASTM C 150, Type I, and clean, natural sand, ASTM C 144 or ASTM C 404. Mix at ratio of 1 part cement to 2-1/2 to 3 parts sand, by volume, with minimum water required for placement.
2.1.6.2 When using non-metallic, non-shrink grout, use pre-mixed, packaged non-ferrous aggregate, noncorrosive, non-staining grout containing selected silica sands, Portland cement, shrinkage-compensating agents, plasticizing and water-reducing admixtures, complying with ASTM C 1107, Grade A for dry-pack and Grades B and C for flowable grout and of a consistency suitable for application within a 30-minute working time.
2.1.6.3 When using Epoxy-Resin Grout, use two-component mineral-filled epoxy-resin complying with ASTM C 881/ C 881M to suit type, grade, and class requirements as specified.

2.1.7FORMWORK
2.1.7.1 Use standard form materials, i.e. plywood, metal, metal-framed plywood, phenolic boards, and other standard form materials available in the market.
2.1.7.2 When curved surfaces are indicated on the technical working drawings, ensure the use of flexible forms or curves.

2.1.7.3 All forms must be attached with a commercially formulated form-release agent that does not damage the resulting concrete surface.
2.1.7.4 Store formworks to minimize task hazards, i.e. tripping, unnecessary deformation and damages to formworks.
2.1.7.5 Provide appropriate bracing to formworks to avoid warping and other deformations detrimental to the quality of the resulting concrete surface.
2.1.7.6 Erect formworks systematically and progressively such that it is stable and safe.
2.1.7.7 Whether using traditional or modular formwork systems, comply with loadings and general principles of formwork erection according to ACI 347: Guide Formwork for Concrete.
2.1.7.8 Use formwork materials and equipment fit for the intended purpose and design of the concrete item being cast.
2.1.7.9 Unless otherwise specified by the structural engineer, follow a safety factor of 2.0 in the design and implementation of all formwork accessories, except formwork anchors supporting form weight, concrete pressures, wind loads, construction personnel live loads.
2.1.7.10 For formwork supporting form weight, concrete pressures, wind loads, personnel live loads, use Safety Factor 3.0.

3. PART 3 EXECUTION

3.1 MOCK-UPS

3.1.1 Construct full-sized mockups to verify selections approved via sample submittals.
3.1.2 Build mock-ups in the location and of the size indicated in the technical working drawings.
3.1.3 Notify architect in advance to secure mock-up approvals prior to implementation.
3.1.4 During construction, maintain mock-ups so as not to incur any damages during construction.
3.1.5 Demolish and remove mock-ups if found unacceptable, or if directed by written notice.

3.2 EXAMINATION AND PREPARATION OF WORK AREA

3.2.1 Verify that subsurface and field conditions are acceptable and ready to receive work. Prepare previously placed concrete by cleaning with steel brush and applying bonding agent in accordance with manufacturer's instructions. In locations where new concrete is doweled to existing work, drill holes in existing concrete, insert steel dowels and pack solid with non-shrink grout.
3.2.2 Verify requirements for concrete cover over reinforcement.
3.2.3 Verify that anchors, seats, plates, reinforcement, and other items to be cast into concrete are accurately placed, positioned securely, and will not cause hardship in placing concrete. In case of inconsistencies in drawings, submit a request for clarification.
3.2.4 Do not place concrete against surfaces of absorbent materials that are dry.
3.2.5 Do not place concrete against surfaces that have free water.
3.2.6 Prepare all materials required for accepted evaporation control measures and have them available on site so that specified measures can be executed as needed. Initiate accepted evaporation control measures when concrete and air temperatures, relative humidity of the air, and the wind velocity have the capacity to evaporate water from a free water surface at a rate that is equal to or greater than 1000 sq.m per hour, unless otherwise specified.
3.2.7 Inspect and complete formworks, reinforcing steel, and items to be embedded or cast-in-place.
3.2.8 Notify other trades to check slope, degrees, and positioning of conduits and other embedment, and secure approval from involved trades prior to casting.
3.2.9 Install homogenous vapor barrier under interior slabs on grade. If using multiple sheets, lap joints should be minimum 150 mm and seal with watertight sealant applied between overlapping edges and ends.
3.2.10 In case of damaged vapor barriers during casting, repair remaining vapor barrier with 150 mm laps over damaged seal watertight.

3.3 PLACING CONCRETE

3.3.1 GENERAL PROVISIONS
3.3.1.1 Place concrete in accordance with ACI 301, ACI 304, ACI 305, ACI 306 and ACI 318.
3.3.1.2 Ensure approved reinforcement, inserts, embedded parts, and formed expansion and contraction joints are not disturbed during concrete placement.
3.3.1.3 Maintain records of concrete placement. Record date, location, quantity, air temperature, and test samples taken for each structural pour.

3.3.1.4 Place concrete continuously between predetermined expansion, control, and construction joints. Do not interrupt successive placement; do not permit cold joints to occur.

3.3.2 CONCRETE CAST IN FORMS
3.3.2.1 Deposit concrete into forms continuously or up to thickness levels and layers such that no concrete will be placed on concrete which has hardened to cause formation of seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as specified. Deposit concrete as nearly as practicable to its final location to avoid segregation.
3.3.2.2 Deposit concrete in forms in horizontal layers not deeper than 600mm. Avoid inclined construction joints. Where placement consists of several layers, place each layer while preceding layer is still plastic to avoid cold joints.
3.3.2.3 Use mechanical vibrating equipment supplemented by hand-spading, rodding, or tamping, to consolidate placed concrete. Use equipment and procedures for consolidation of concrete in accordance with ACI recommended practices.
3.3.2.4 Do not use vibrators to transport concrete inside forms.
3.3.2.5 Insert and withdraw vibrators vertically at uniformly spaced locations not farther than the visible effectiveness of machine. Consolidate placed layers and at least 150mm into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to set. At each insertion, limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing segregation of mix.

3.3.3 CONCRETE CAST IN SLABS
3.3.3.1 Deposit and consolidate concrete slabs in a continuous operation, within accepted standard limits of construction joints, until the placing of a panel or section is completed.
3.3.3.2 Consolidate concrete during placing operations so that concrete is thoroughly worked around reinforcement and other embedded items and into corners.
3.3.3.3 Bring slab surfaces to correct level with straightedge and strike off. Refer to correct levels and slope requirements as indicated in the technical working drawings. Double check and verify the surface finish requirements and finish the concrete surface accordingly such that it is ready to accept the finish as specified in the technical working drawings.
3.3.3.4 Use bull floats to smooth surface, free of humps or hollows.
3.3.3.5 Do not disturb slab surfaces prior to beginning finishing operations.

3.4 CONCRETE FINISHES

3.4.1 Request for an execution approval from designers to clarify concrete finish if not clearly indicated in the technical working drawings floor and wall finish plan. Include shop drawings showing plans, elevations, and sections, clarifying the final finish for all textures.
3.4.2 Upon removal of forms, maintain concrete surfaces in form-finish and refer to the technical working drawings Floor and Wall finish schedule, and Concrete Finishes section of this Division for surface finish specifications and appropriate area of application.
3.4.3 Repair and patch concrete surfaces defected due to formworks, i.e. tie patches and tie holes, and other defective portions, i.e. excessive honeycomb or damages on the concrete surface caused by embedded debris.
3.4.4 When working patches, utilize the appropriate concrete adhesive to ensure durable patchwork and comply with ACI 301, or until the work is approved and accepted.
3.4.5 Commence surface work within 24 hours of form removal. Moisten concrete surfaces and smoothen with an abrasive tool until a uniform color and texture is produced.
3.4.6 Un-exposed concrete finishes, i.e. areas for water cistern, may be maintained as form-finished, unless otherwise indicated in the technical working drawings. Repair areas affected by form-facing materials such as tie holes. Repair and patch defective areas so as to avoid detrimental water seepage. Use concrete adhesives in all patchworks.
3.4.7 For Horizontal surfaces, i.e. tops of walls, horizontal wall offsets and surfaces occurring adjacent to formed surfaces, verify form finish as indicated on the technical working drawings. Attach shop drawings to request for clarifications if not indicated.
3.4.8 On monolithic slab surfaces to receive membrane or elastic waterproofing, membrane or elastic roofing, verify instructions with manufacturer of the approved waterproofing material. Attach manufacturer's recommendations for concrete finish on the request for execution approval. Refer to waterproofing specifications

divisions for performance requirements of waterproofing membrane for approval. Submit waterproofing material approval prior to commencement of concrete casting for surfaces subject to waterproofing. Allot proper time schedules so as not to affect timely delivery of work.

3.4.9 After screeding, consolidating, and leveling concrete slabs, do not work surface until ready for floating. Begin floating when surface water has disappeared or when concrete has stiffened sufficiently to permit operation of power-driven or manual floats. Consolidate surface with power-driven floats or by hand-floating if area is small or inaccessible to power units.

3.4.10 Check and level surface plane to a tolerance not exceeding 5mm in every 1meter, unless otherwise specified on the drawings and the Concrete Finish section of this Division. Cut down high spots and fill low spots. Uniformly slope surfaces to drains. For horizontal surfaces with critical drainage slope requirements, i.e. slab on grade with drainage inlets, roof slabs with roof drainage, canopies, toilets and baths, slab work in exterior corridors, and other surfaces with exposure to wet weather, ensure precision in sloping such that surface water will run-off to the desired direction as indicated on the drawings.

3.4.11 For flooring and walls with specific finish plans, verify the wall and floor finish floor plans to check appropriate concrete finish as specified in the Concrete Finishes Section of this specifications and the technical working drawings.

3.5 SURFACE SEALING

Comply with Division 03 Section 03 35 0 Concrete Finishes.

3.6 PROTECTION OF WORK

Protect the concrete against thermal shrinkage cracking due to rapid drops in concrete temperature greater than 22 °C (40 °F) during the first 24 hours unless otherwise specified. Acceptable protection materials to prevent excessive temperature drops are insulating blankets, batt insulation with moisture-proof covering, layers of dry porous material such as straw, hay, or multiple layers of impervious paper meeting ASTM C 171. Do not apply protection materials until the concrete surface temperature has become steady or is beginning to decline.

3.7 CLEANING

3.7.1 Comply with Division 01 Section 01 17 10 Final Cleaning.

3.7.2 Clean all surfaces of precast concrete to be exposed to view, as necessary, prior to installation.

3.7.3 Clean mortar, plaster, fireproofing, weld slag, and any other deleterious material from concrete surfaces and adjacent materials immediately.

3.7.4 Clean exposed surfaces of precast concrete units after erection and completion of joint treatment to remove weld marks, dirt, stains and other markings.

3.7.5 Perform cleaning procedures, if necessary, according to precast concrete fabricator's recommendations. Protect adjacent work from staining or damage due to cleaning operations.

3.7.6 Do not use cleaning materials or processes that could change the appearance of exposed concrete finishes or damage adjacent materials.

3.8 JOINT SEALING

3.8.1 Joint sealing between pre-cast concrete and concrete cast-in-place. Separate slabs on grade from vertical surfaces with isolation joint material. Place joint filler in floor slab pattern. Set top to required elevations. Secure to resist movement by wet concrete. Extend joint filler from bottom of slab to within ¼ inch of finished slab surface. Install joint devices in accordance with manufacturer's instructions. Install joint device anchors. Maintain correct position to allow joint cover to be flush with finished surfaces. Install joint covers in longest practical length, when adjacent construction activity is complete.

END OF SECTION

1. PART 1 GENERAL

1.1 RELATED DOCUMENTS

1.1.1 Technical Architectural Drawings

1.1.2 Specifications

1.1.3 Schedule of Finishes

1.1.4 Shop Drawings – Tile Layout

1.2 SUMMARY

Refer to this section parallel to the schedule of floor and wall finishes as indicated in the technical working drawings. This section includes concrete finish provisions in preparation of the final finished surfaces of the project.

1.3 RELATED SECTIONS

1.3.1 Concrete Pavement

1.3.2 Concrete Floor Topping

1.3.3 Thermal and Moisture Protection

1.4 GENERAL PROVISION

1.4.1 Perform patching, when permitted, in compliance with applicable provisions of the Structural Specifications.

1.4.2 Ensure that concrete surface conditions are appropriate and compliant to the requirements of the material for final application on the indicated surface area. Check the Wall and Floor Finishes on the architectural working drawings to identify areas of coverage. Submit Requests for Clarifications in case of queries.

1.4.3 On areas requiring specific concrete finishes to accommodate the final finishing material such as homogenous tiles, pavements, and the like, comply with the concrete surface condition requirements by the manufacturer of the approved finish material. Refer to the manufacturer's printed instructions.

1.4.4 Allow concrete to cure not less than seventy-two (72) hours before commencing surface finish work, unless otherwise acceptable to the Architect or as prescribed by the manufacturer of the final finishing material.

1.4.5 Provide the following concrete finishes appropriate to the requirements of the Schedule of Finishes and Materials:

1.4.5.1 Troweled

1.4.5.2 Floated

1.4.5.3 Brushed

1.4.5.4 Broomed.

1.4.5.5 Fair-faced finish (Rubbed).

1.4.5.6 Straight to finish structural slab and power floated.

1.4.5.7 Smooth form finish

1.4.5.8 Sand Washed Finish

1.4.5.9 Other finishes necessary in conjunction with the required floor finishes.

1.5 FINISHES

Unless otherwise specified in the technical working drawings, take note of the following:

1.5.1 STRUCTURAL SLAB: Steel trowel or power float to give a smooth untextured/textured finish. Provide where required in Schedules to receive hardener/dust proofer, retarder, and other scheduled floor finishes were directed by the Architect as requiring smooth untextured/textured finish. Trowel to Class A tolerance. Moist cure only.

1.5.2 SLABS TO RECEIVE HOMOGENOUS TILES: For slabs to receive thickset homogenous and ceramic tiles, stone flooring and other scheduled flooring finishes requiring lightly roughened textured finish for substrate preparation, provide a roughened texture. Use stiff brush. Trowel to Class A Tolerance. Striate uniformly with fine-haired broom.

1.5.3 SLABS TO RECEIVE WATERPROOFING AND CONCRETE TOPPING: For slabs to receive thin-set homogenous tiles, ceramic tiles, and stone flooring, ensure fins are removed and all honeycombs and voids are repaired. Comply with manufacturer's requirements. Provide even textured finish unless otherwise specified by the manufacturer. Refer to Division 07 Thermal and Moisture Protection.

1.5.4 SLABS TO RECEIVE RESILIENT WOOD FLOORINGS: For slabs to receive laminate wood flooring, vinyl coverings including vinyl tiles, sports floor coverings, and epoxy flooring, use steel trowel to give smooth untextured finish.

1.5.5 SLABS TO RECEIVE THICK-SET STONE PAVING: For concrete slabs to receive pre-cast concrete pavers for vehicular ramps, natural stone paving, use heavy-broomed concrete finish as substrate preparation.

1.6 SUBMITTALS

1.6.1PRODUCT APPROVAL ATTACHMENTS

1.6.1.1 300mm x 300mm sample work for each type of required concrete finish for the color and texture review of the architect.

1.6.1.2 Where used, submit grout samples, complete with manufacturer's data indicating grout color, brand, and other codes of identification.

1.6.2EXECUTION APPROVAL ATTACHMENTS

Detailed work and methodology indicating:

1.6.2.1 Date and time of finishing

1.6.2.2 Area of finish application

1.6.2.3 Restoration and cleaning procedures upon completion of work.

1.6.2.4 Shop drawings indicating area of location.

1.7 QUALITY ASSURANCE

Establish a mock-up surface at least 1000mm x 1000mm to 3000mm X 3000mm, complete with joint and edge termination details if any for the approval of the architect.

2. PART 2 PRODUCTS

2.1 PREMIXED PRE-PACKAGED CEMENTITIOUS GROUT

Request for color approval from the architect. Do not apply grout materials that are not compatible with the finish material as indicated in the schedule of finishes. If used for patching and resurfacing damaged concrete surfaces, use one-component, polymer-modified, shrinkage-compensated renovation mortar.

2.2 EPOXY BONDING AGENT

Unless otherwise approved by structural designer, use two-component solids liquid epoxy bonding adhesive for warm environments.

2.3 CEMENT

Comply with ASTM C150, Type to match original concrete surface.

2.4 AGGREGATE

ASTM C33, one hundred percent (100%) passing the No. 30 mesh sieve.

2.5 BOND COAT MORTAR

Use mortar of the same material as the bond patching mortar and of approximately the same proportions as used for the concrete, excluding coarse aggregates. Mortar ratio shall be (1) part cement to not more than one (1) part sand by damp loose volume.

2.6 PATCHING MORTAR

Use patching mixture of the same materials and of approximately the same proportions as used for the concrete, excluding coarse aggregates. Mortar ratio shall consist of one (1) part cement to not more than two and one-half (2-1/2) parts sand by damp loose volume. White Portland cement may be substituted for a part of the gray Portland cement on exposed concrete in order to produce a color matching the color of the surrounding concrete. Implement a trial patch or mock-up prior to commencing work completely, as determined by a trial patch. Use appropriate amount of water needed for handling and placing. Mix patching mortar in advance and allow to stand with frequent manipulation with a trowel, without addition of water, until it has reached the stiffest consistency that shall permit placing.

2.7 WATER

Only clean potable water shall be used. Use a calibrated measuring device to measure the proper amount of water to be added to pre-packaged grouts and mortars.

3. PART 3 EXECUTION

3.1 PREPARATION

3.1.1 In repairing surface defects, measure all concrete surface temperatures, and if needed, cool surfaces down to facilitate maximum quality repair.

3.1.2 For honeycombs and other defects, remove down to sound concrete and chip if necessary. Ensure that no reinforcements will be compromised during the chipping process. Always use the appropriate solids-liquid bonding agents during the patching work. Refer to approved material by the structural designer.

3.1.3 Clean and dampen the chipped area for patching and dampen an additional 150mm surrounding it, unless otherwise specified by the manufacturer of the approved bonding agent. Comply with manufacturer's requirements.

3.1.4 Prepare bonding grout mixtures prior to patching.

3.2 CLEAN-UP AND PROTECTION

Clean up and remove concrete chips, dust and debris on all areas of work upon each day of application and upon completion. Prevent migration of airborne dust and debris by using windbreaks. Cooperate with other trades for protection of completed finishes.

3.3 PATCHWORK AND REPAIRS

3.3.1 FLATWORK SURFACES — GENERAL

3.3.1.1 Set bulkheads and screed strips to facilitate continuous concrete placement and to produce cross sections within tolerances specified. For cambered steel or concrete beams, place screed strips or other indicators along the beam centerline to maintain constant slab thickness. Float, trowel, broom, cure, seal and apply other surface treatments to the top of the structural slab or to the top of concrete fills as shown in the Contract Documents.

3.3.1.2 Power Float and Hand Float after water sheen has disappeared to push down aggregate, raise mortar, and level.

3.3.1.3 Power Trowel and Hand Trowel as soon as surface can be worked without cement paste clinging to the blades.

3.3.1.4 Non-Slip: Where non-slip is called for with any finish, embed particles at the rate of 1 kilogram per square meter with the final tooling.

3.3.1.5 Tolerances: 1.Class A: Level to within 3 millimeters in 3 meters (1/1000).

3.3.2 TIE HOLES

Fill tie holes and repair as patchwork unless otherwise specified in the drawings.

3.3.3 SMOOTH FORM FINISH

3.3.3.1 Arrange facing material in a symmetrical and orderly manner to reduce seams.

3.3.3.2 Ground smooth all surface texture defects caused by formworks, such as raised grain, torn surfaces, worn edges, patches,

3.3.3.3 Use patching mortar to fill air voids on formed surfaces.

3.3.4 FAIR-FACED CONCRETE FINISH (RUBBED)

3.3.4.1 Begin surface grinding, using power-driven, abrasive stone grinders, after wearing course has hardened sufficiently to prevent dislodgment of aggregate particles. Keep surfaces wet during grinding process. Remove ground-off material and flush with water.

3.3.4.2 Fill air holes, pits, and other blemishes with cement grout. Spread grout over surface and work into openings with a steel straight edge. Rub grout into surface by use of grinding machine. Keep surface moist an additional three (3) days before final grinding.

3.3.4.3 When surface is in proper condition, begin second or final grinding to remove grout film and polish surface. After final grinding and polishing, wash thoroughly and remove surplus material.

3.3.5Conduct grinding operations and use such techniques as required to provide surface finish to match Architect's samples.

END OF SECTION

03 00 00	DIVISION 3 CONCRETE	
03 35 2	Concrete Floor Topping	1 of 4

1. **PART 1 GENERAL**

1.1 RELATED DOCUMENTS

1.1.1Technical Architectural Drawings
1.1.2Specifications
1.1.3Schedule of Finishes

1.2 SUMMARY

Refer to this section parallel to the schedule of floor and wall finishes as indicated in the technical working drawings.

1.3 RELATED SECTIONS

1.3.1Concrete Finishes
1.3.2Thermal and Moisture Protection

1.4 GENERAL PROVISION

1.4.1Ensure that all concrete mixes follow the specifications of structural designers and architects.
1.4.2Do not modify the appearance, strength, and durability of the concrete architectural elements without any approval issued by the architect of record and the structural designer of record. Submit a request for approval for any modifications proposed. Any modifications found on site without corresponding approvals are subject to re-work at the expense of the contactor.
1.4.3No concrete topping should be less than 50mm thick.

1.5 SUBMITTALS

As required by structural consultant.

1.5.1PRODUCT APPROVAL ATTACHMENTS
1.5.1.1 Submit manufacturer's product data, particularly application and installation instructions for cement, cementitious materials, additives, admixtures, bearing pads, and other materials used. Submit material certificates as signed or certified by manufacturers.
1.5.1.2 For concrete surfaces subject to weather exposure and surface water run-off, submit the manufacturer's data of the approved waterproofing material. Include manufacturer's application and installation instructions for waterproofing, particularly data on concrete surface finish and conditions as needed.
1.5.1.3 Submit mix design for each concrete mix to be used.

1.5.2EXECUTION APPROVAL ATTACHMENTS
1.5.2.1 Detailed work methodology, indicating at least the following
1.5.2.1.1 Date and time of application
1.5.2.1.2 Area of application
1.5.2.1.3 Restoration and cleaning procedures upon completion of work.

1.6 QUALITY ASSURANCE

Repair and replace areas of concrete topping that fail to bond with the substrate, produces a hollow sound when tapped, and disintegrates.

1.7 WARRANTIES

Contractor agrees to a two (2) year warranty to rectify work, which deteriorates excessively or otherwise fails to perform as required, due to failure of materials and or workmanship.

2. **PART 2 PRODUCTS**

2.1 CEMENT AND AGGREGATES

Use Portland Cement, ASTM c 150 Type I. Furnish grey cement. Combine with standard aggregate ASTM C 33. Fine aggregates using sand, crushed stone screenings should be clean, hard, and free from deleterious matter. Follow grades and sieves:

Fine aggregates:

9.53mm (3/8")	-	100 percent.
No. 4	-	95-100 percent.
No. 8	-	80-90 percent.
No. 16	-	50-75 percent.
No. 30	-	30-50 percent.
No. 50	-	10-20 percent.
No. 100	-	2-5 percent.

Coarse aggregates:

12.7mm (1/2")	-	100 percent.
9.525mm (3/8")	-	30-50 percent.
No. 4	-	0-15 percent.
No. 8	-	0-5 percent.

2.2 REINFORCEMENT

Use ASTM A 185, welded steel wire fabric for all concrete topping thicker than 50mm. Use WWF 4 x 4 — W1.4 x W1.4.

2.3 MISCELLANEOUS

2.3.1Epoxy Adhesive: ASTM C 881, two-component material suitable for use on dry or damp surfaces. Provide material "Type," "Grade" and "Class" to suit project requirements. Apply as per manufacturer's recommendation.

Concrete Hardener and Dust proofer must be colorless, odorless, non — toxic (contains no VOC as per U.S. Federal requirements), non-combustible, and non — flammable.

Depth of Wear, comply with ASTM C 779.
Abrasion resistance — Revolving disks 32.5% improvement at 30 minutes.
Surface Adhesion, comply with ASTM D3359
Compressive Strength, comply with ASTM C39
Rebound Number, comply with ASTM C805
Friction, comply with ASTM C-1028
Light Exposure Degradation, comply with ASTM G23
Depth of Wear, comply with DIN 52 108
Determination of Water Permeability, comply with DIN 1048 T.5

2.4 STANDARD TOPPING MIX

Ensure that compressive strength of topping material is at 3000psi.

3. **PART 3 EXECUTION**

3.1 MIXING

Use batch type mechanical mixer for mixing topping material at project site. Use only mixers which are capable of mixing aggregates, cement, and water into a uniform mix within specified time, and of discharging mix without segregation.

Mix each batch of 1.5 cubic meters (2 cu. yd.) or less for at least 1-1/2 minutes after ingredients are in mixer. Increase mixing time (15 seconds) for each additional cubic meter or fraction thereof.

3.2 CONDITION OF SURFACES

3.2.1When topping hardened concrete, remove dirt, loose material, oil, grease, paint or other contaminants. Ensure that the surface is washed clean.

3.2.2Roughen surface of base slabs that are not suitable for bonding performance by chipping or scarring before cleaning.

3.2.3Before placing topping mixture, dampen slab surface. Do not leave standing water on the surface. Apply approved epoxy adhesive on dampened surface. Place topping mix while epoxy adhesive is not fully dry.

3.2.4For reinforced toppings, maintain position of reinforcing mesh through necessary chairs or supports.

3.2.5Consistently mark locations of joints in base slab and align with joints on the top course.

3.3 PLACING AND COMPACTING

Float Finish: Spread-topping mixture evenly over prepared base to the required elevation and strike-off. Use highway straightedge, bull float, or darby to level surface. After the topping has stiffened sufficiently to permit the operation, and water sheen has disappeared, float the surface at least twice to a uniform sandy texture. Re-straighten where necessary with highway straightedge. Uniformly slope surface to drains.

Where joints are required, construct to match and coincide with joints in base slab. Provide other joints as shown on drawings.

3.4 TROWEL FINISH

After floating, begin first trowel finish operation using power driven trowels. Continue troweling until surface is ready to receive final troweling. Begin final troweling when a ringing sound is produced as trowel is moved over surface. Continue final trowel operation to produce finished surface free of trowel marks, uniform in texture and appearance.

3.5 CURING AND PROTECTION

3.5.1Protect freshly placed topping from premature drying and excessive cold or hot temperatures. Apply evaporation retarder to topping surfaces in hot, dry, or windy conditions before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying topping, but before float finishing.

3.5.2Begin curing immediately after finishing topping. Cure by one or a combination of the following methods, according to topping manufacturer's written instructions:

3.5.2.1 Moisture Curing: Keep surfaces continuously moist for not less than seven days with water. Cover topping surfaces and edges with 12-inch (300-mm) lap over adjacent absorptive covers.

3.5.2.2 Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 300mm (12 inches), and sealed by waterproof tape or adhesive. Cure for not less than seven (7) days. Immediately repair any holes or tears during curing period using cover material and waterproof tape.

3.5.2.3 Curing Compound: Apply uniformly in two coats in continuous operations by power spray or roller according to manufacturer's written instructions. Re-coat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.

END OF SECTION

DIVISION 04
UNIT MASONRY ASSEMBLIES

04 00 00	**MASONRY**	
04 81 0	Unit Masonry Assemblies	

1. PART 1 GENERAL

1.1 RELATED DOCUMENTS

1.1.1Technical Architectural Drawings

1.1.2Specifications

1.1.3Requests for Interpretation

1.1.4Product Samples and Brochures

1.1.5Manufacturer's Data Sheets and Certificates

1.1.6Material Safety Data Sheets

1.1.7Work Program and Methodology Submittals

1.2 SUMMARY

This section includes Unit Masonry Assemblies as specified for fixed wall systems as indicated in the project, namely Reinforced Concrete Hollow Blocks for the toilet and pantry partition and the Concrete Masonry Units for the exterior walls as indicated.

1.3 RELATED SECTIONS

1.3.1Anchorage Devices

1.3.2Joint Sealants

1.4 GENERAL PROVISION

1.4.1Prior to complete installation of masonry work, build field mock-ups at least 1000sqmm in area for the approval of the architect.

1.4.2Comply with ASTM C-90- Load Bearing Masonry Units.

1.4.3Comply with ASTM C-129- Non- load Bearing Masonry Units.

1.4.4Comply with ASTM C-140- Testing Concrete Masonry Units.

1.4.5Comply with ASTM C-744-Specification for Pre-Faced Concrete and Calcium Silicate Masonry Units.

1.4.6Comply with ASTM E-119- Fire Tests with Building Construction and Materials.

1.4.7Provide special shapes where required for lintels, jambs, corners, sash, control joints, headers bonding, and other special conditions.

1.4.8Comply with required face size and texture for the exposed face.

1.4.9Hollow Load-Bearing Block ASTM C-90, normal weight (125 lbs. per cubic foot dry weight).

1.4.10 E. Solid Load-Bearing Block: ASTM C-90n normal weight (125 lbs. per cubic foot dry weight)

1.5 MAINTENANCE, DELIVERY AND STORAGE

1.5.1Upon delivery on site, ensure that materials are stored in a dry area. Make sure that storage area is weather protected to avoid disintegration of masonry units.

1.5.2Do not accept damaged or unsealed materials during delivery.

1.5.3Store cementitious materials off the ground, under cover, and in a dry location.

1.6 SUBMITTALS

1.6.1PRODUCT APPROVAL ATTACHMENTS

1.6.1.1 For prefaced concrete masonry units, submit product data for each type of masonry unit indicating inherent strength of the material in psi and the proportioning of cement, sand, gravel and other cementitious materials or additives as included in each unit. Indicate whether materials is load bearing or non-load-bearing.

1.6.1.2 Submit shop drawings showing prevailing dimensions and detailed sections of the material. Indicate mortar thickness, if any or if needed by the assembly.

1.6.1.3 For prefaced concrete masonry units, submit material samples showing final face of the material for the approval of the architect. Concurrently acquire finishing approval from the architect. Submit a raw-surfaced sample and another sample containing the finished face of the material.

1.6.2EXECUTION APPROVAL ATTACHMENTS
1.6.3Submit a detailed work methodology showing the time and date of application. Indicate steps and procedures to be followed down to the finishing stage of the material. Include instructions on jointing and mortar applications.

1.7 QUALITY ASSURANCE
1.7.1Source exposed masonry units from a single source and ensure uniform texture and color.
1.7.2Source mortar materials from a single supplier to ensure material compatibility.
1.7.3Ensure that masonry units are compliant to fire performance characteristics as require by the code. Employ material that has undergone testing compliance with ASTM E 119.
1.7.4Do not install masonry units with defects such as chipped corners, discoloration, and other such defects that affect the face and strength of the material. Dispose all defecting masonry units properly.
1.7.5Do not apply concentrated loads on the masonry assembly for at least 12 hours after erection.
1.7.6Prevent ground, mortar or soil from staining the face of masonry to be left exposed. Immediately remove ground or mortar in contact with the masonry and restore to original condition.
1.7.7Do not lay wet masonry units. When laying masonry units during inclement weather, ensure that the area of application is protected from bad weather by temporary rainwater protection such as tents and tarpaulin films.
1.7.8Do not lay masonry units with ground stains.

2. PART 2 PRODUCTS

2.1 MORTAR AND GROUT MATERIALS
2.1.1Portland Cement: ASTM C-150, Type I, except use Type III for construction below 40
2.1.2Degrees F. Provide natural color or white cement as required to produce required mortar color.
2.1.3Hydrated Lime: ASTM C-207, Type S.
2.1.4Aggregate for Mortar: ASTM C-144, except for joints less that 1/4 inch use aggregate graded with 100% passing the No. 16 sieve.
2.1.5Aggregate for Grout: ASTM C-404.
2.1.6Water: Clean and potable

2.2 CONCRETE HOLLOW BLOCKS
2.2.1Size: manufacturer's standard units, at least 200mm height, 100mm thick, and 400mm long or approved equivalent.
2.2.2Face: rough face for plastering
2.2.3Minimum compressive strength: 800psi for each CHB
2.2.4Reinforcements: laid in mortar in both horizontal and vertical spaces following specifications by structural engineer.

2.3 EXPOSED CONCRETE MASONRY UNITS
2.3.1Size: manufacturer's standard units, at least 600mm height, 75mm to 100mm thick, and 1200mm long or approved equivalent.
2.3.2Face: rough face for use as exposed surface
2.3.3Minimum compressive strength: 1000psi for each CHB or as certified by manufacturer.
2.3.4Solid load-bearing blocks shall comply with ASTM C-90n normal weight
2.3.5Hollow load-Bearing Block shall comply with ASTM C-90n normal weight.

2.4 JOINT REINFORCEMENT, TIES AND ANCHORS
2.4.1Where anchorage is needed to connect to structural framework, comply with specifications by structural designer. Complete all joint reinforcement, ties, and anchors as needed for the structural soundness of the assembly.
2.4.2Use galvanized metallic accessories appropriate to the load requirements of the assembly.

3. PART 3 EXECUTION

3.1 INSPECTION AND PREPARATION
3.1.1Verify plumb-ness and all tolerances of receiving surfaces. Ensure accuracy and compliance with technical working drawings. If conditions are not met, comply and restore.
3.1.2Verify proper size and location of masonry units to be installed.
3.1.3Establish lines, levels, and coursing. Protect lines from any type of disturbance.
3.1.4Remove laitance, loose aggregate, and other materials that prevents bonding between mortar and foundation.
3.1.5Ensure uniformity in bond patterns and concrete masonry placement.
3.1.6Comply with course heights as specified by manufacturer.

3.2 PLACEMENT OF UNITS
3.2.1Lay units with bed and head joints filled from the faces of the units to a distance in not less than the thickness of the face shell.
3.2.2Webs are fully mortared in all courses of piers, columns, pilasters, starting course on footings or foundations, and where adjacent to cells or cavities to be reinforced or filled with concrete or grout.
3.2.3Spread out full mortar bed including areas under cells, for starting course on footings where cells are not to be grouted.
3.2.4Vertical cells to be grouted are aligned and unobstructed openings for grout are provided in accordance with drawings.
3.2.5Keep cavity airspace and weep holes clean or mortar, clean out promptly if mortar falls into cavity airspace or plugs weep holes.
3.2.6In-Progress Cleaning: Remove excess mortar, dry brush exposed masonry prior to the end of each workday, protect wall from mud splatter and mortar droppings, set scaffolds and scaffold boars so that mortar is not deflected onto masonry.
3.2.7At end of each workday turn scaffold boards so that rainwater is not deflected onto masonry.
3.2.8Place Concrete Masonry Unit such that mortar does not run down the face of the wall or smear the masonry face.
3.2.9Adjustments: Do not shift or tap Concrete Masonry Unit after mortar has taken initial set, remove unit and mortar and replace. After joints are tooled, cut off mortar tailings with trowel and dry brush excess mortar burrs and dust from the face of the masonry, fully bond external and internal corners and properly anchor intersecting wall.
3.2.10 Termination of Wall Height: For the fire-rated walls, construct walls to finish against bottom of roof or floor deck and fill voids in fire stopping. For other than fire-rated walls, cut units to match the slope of the roof deck and finish construction to within 2-inches of a parallel to roof deck.
3.2.11 Isolate masonry partitions from vertical structural framing members with the control joint.

3.3 MORTAR AND GROUT MIXES
3.3.1Do not use calcium chloride in mortar or grout. Use only the specified additives to mortar and grout mixes.
3.3.2Mixing: Combine and thoroughly mix cementitious materials, water, aggregates and admixtures
3.3.3 in a mechanical batch mixer.
3.3.4Comply with applicable ASTM standards and material manufacturer's recommendations for mixing time and water content. Measure and batch materials by volume so that required proportions can be accurately controlled and maintained.
3.3.5Mortar for Unit Masonry: Comply with ASTM C-270, Proportion Specifications, Cement-Lime Mortar, for types of mortar required, unless otherwise indicated.
3.3.6Use Type N mortar for interior non-load bearing walls.
3.3.7Air Content: 8-14% Maximum.
3.3.8Colored Aggregate Mortar: Produce mortar of color required by use of colored aggregates in combination with selected cementitious materials.
3.3.9Color: To be selected by Architect.
3.3.10 Limit cementitious materials in mortar to Portland cement-lime.
3.3.11 Grout for Unit Masonry: Comply with ASTM C-476. Use grout of consistency which at time of placement will completely fill all spaces intended to receive grout.
3.3.12 Place grout within 1-1/2 hours of introducing of mixing water and prior to initial set.
3.3.13 Prevent grout from flowing onto or otherwise staining faces of CMU intended to be exposed.
3.3.14 Confinement: Confine grout to the area indicated on the Drawings.
3.3.15 Grout Pour Height: Use fine or coarse grout in accordance with requirements in technical working drawings

3.3.16 Consolidate grout at the time of placement. Consolidate grout pours 300mm or less in height by mechanical vibration or puddling.

3.3.17 Consolidate grout pours exceeding 300mm in height by mechanical vibration and reconsolidate by mechanical vibration after initial water loss and settlement has occurred.

3.4 CONCRETE HOLLOW BLOCKS

3.4.1 **Apply architectural plaster as indicated on the technical working drawings**

3.5 CONCRETE MASONRY UNITS

3.5.1 **For prefaced masonry units, ensure that obtained masonry units are of a rough surface material.**

3.5.2 **Prepare masonry unit surfaces as indicated in the technical working drawings and as advised by the manufacturer. Do not apply chemicals on the material that are detrimental to original face and make of the material.**

3.6 CLEANING AND PROTECTION

3.6.1 Clean unit masonry as Work progresses by dry brushing to remove mortar fins and smears before tooling joints.

3.6.2 After mortar has set, reached initial curing; within 7 days of completion of work for custom masonry units, clean exposed masonry as follows:

3.6.2.1 Remove large mortar particles by hand with wooden paddles and non-metallic scrape hoes or chisels.

3.6.2.2 Cut out any defective mortar joints and holes and re-point with mortar.

3.6.3 Protect non-masonry surfaces from contact with cleaning solution by covering them with liquid strippable masking agent, polyethylene film, or waterproof masking tape.

3.6.4 Clean Concrete Masonry Units with proprietary masonry cleaner. Thoroughly wet surface of masonry. Scrub using non-metallic brushes. Immediately rinse with water. Do small sections at a time. Work from top to bottom. Do not use high pressure cleaning methods.

3.6.5 Cleaned surface shall appear as represented by mockup wall panel.

3.6.6 Maintain protective boards at exposed external corners that may be damaged by construction activities. Provide protection without damaging work.

3.6.7 Protect the base of walls from rain-splashed mud and mortar droppings.

END OF SECTION

DIVISION 05
METALS

05 00 00	DIVISION 5 METAL	
05 12 00	Structural Steel Framing (Refer to specifications by Structural Engineer)	

DIVISION 05
METALS

05 00 00	DIVISION 5 METAL	
05 50 0	Metal Fabrications	

1. **PART 1 GENERAL**

1.1 RELATED DOCUMENTS

1.1.1 Technical 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 the following metal fabrications as follows:

1.2.1 Grill Works
1.2.2 Metal bars gratings/ trench gratings
1.2.3 Railings and handrails
1.2.4 Steel nosing
1.2.5 Access panels
1.2.6 Welded wire fabric enclosures as specified
1.2.7 Steel-framed stairs and ramps
1.2.8 Truss, Rafter, and Purlin Works for Roofing Assemblies
1.2.9 Miscellaneous steel fabrications

1.3 RELATED SECTIONS

1.3.1 Division 01 26 63 Requests for Interpretation
1.3.2 Division 09 91 1 Interior Painting
1.3.3 Division 09 96 5 Exterior Painting

1.4 GENERAL PROVISIONS

1.4.1 Schedule and sequence all metal fabrications and work such that rework is avoided. Mount handrails on completed/finished surfaces only. Do not finish handrails or metal fabrication works such that it is exposed to construction work that will damage the metal assembly. Any such faulty sequencing resulting to damages will be absorbed by the Contractor.

1.5 PERFORMANCE REQUIREMENTS

1.5.1 Assemblies shall allow for thermal movements resulting from change in ambient and surface temperatures due to both mechanical and weather-induced heat gain and heat loss.

1.5.2 Always use non-shrink, pre-mixed, factory-packaged, corrosion and erosion resistant, non-metallic grout complying with CE CRD-C621 when anchoring steel to concrete. Check all labels by manufacturers and follow proper handling and application instructions. Use waterproofing sealers or coatings as recommended by the manufacturer, especially for metal fabrications exposed to exterior use.

1.5.3Do not exceed the allowable working stress of the assembly, including considerations on its materials, anchors, and connections. Consider the following:

1.5.3.1 For Top Rail of Stair Railings, Guardrails, and hand rails, comply with the following structural loads:

1.5.3.1.1 Any point of the railings shall be capable of withstanding concentrated load at least 136 kgs, whether applied vertically or horizontally.

1.5.3.1.2 The railing assembly shall be capable of withstanding a uniform load of 135kg per linear meter.

1.5.4Ensure that all metal fabrications are compliant to structural requirements, such that it is capable of withstanding structural loads as determined by professional structural designers. Determine allowable design working stresses according to following standards:

1.5.4.1 For aluminum materials, comply with AA 30 "Specifications for Aluminum Structures"

1.5.4.2 For Stainless Steel fabrications, comply with ASCE 8, "Specification for the Design of Cold-Formed Stainless Steel Structural Members."

1.5.4.3 For Cold-Formed Structural Steel, comply with AISI S6-673, Part I, "Specification for the Design of Cold-Formed Steel Structural Members.

1.5.4.4 For Structural Steel, comply with AISC S335, "Specification for Structural Steel Buildings Allowable Stress Design and Plastic Design with Commentary."

1.6 MAINTENANCE AND STORAGE

1.6.1Ensure that assemblies are protected from corrosion due to weather and chemical exposure. Apply protecting films and keep materials away from corrosives.

1.6.2When metal works are completed, restore any defects incurred on the assembly during the time of construction. No discoloration or any early markings indicative of early stages of corrosion will be accepted upon substantial completion of work.

1.6.3Regularly clean surfaces where fabricated assemblies are completed, stored or kept. Ensure that the areas of work and storage are free of corrosive substances.

1.6.4Clean all metal fabrications and ensure that items are free of marks, bulges, discolorations, prints, finger marks, etc. Wrap in polyethylene or an equivalent protective material and keep completed metal works protected until substantial completion.

1.7 SUBMITTALS

1.7.1PRODUCT APPROVAL ATTACHMENTS

1.7.1.1 Submit product data. Describe steel composition, including nominal thicknesses for hollowed tubes, finish type. Include detailed description of paint products to be affixed on the steel parts, weld points, etc.

1.7.1.2 For metal assemblies to accept paint works, submit manufacturer's data on the proper handling of paint products, including instructions on application, storage, and maintenance.

1.7.1.3 Indicate areas of application on all requests for approval.

1.7.2EXECUTION APPROVAL ATTACHMENTS

1.7.2.1 Submit a detailed work methodology, indicating at least the following

1.7.2.1.1 Date and time of application

1.7.2.1.2 Area of application

1.7.2.1.3 Welder's certificates compliant to the Quality Assurance portion of this section.

1.7.2.1.4 Shop drawings showing the location of the installation on the project site. Detail all dimensions. Show typical weld points, cross section details of railings, clearly defining relative points of measurement for survey and/or laying out. All drawings shall be to scale. Include plans, elevations, sections, and other drawings required. Properly label all components of the assemblies. If using hollowed sections, indicate nominal thicknesses. If using steel plates, indicate gauge of plate. Label all bolts and anchors, including prescriptive sizes if any. Certify that assemblies on the shop drawings are structurally sound, otherwise drawings will be forwarded to the structural engineer for verification. Clearly label finish types and verify that finish types are consistent with technical working drawings issued. In case of inconsistencies, submit requests for clarification.

1.8 QUALITY ASSURANCE

1.8.1Ensure fabricators are experienced in fabricating metal assemblies similar to the items indicated in the technical working drawings of this project.

1.8.2Ensure installers are equally familiar with fabricators and are in constant communication on the proper installment procedures.

1.8.3Certify that all welders for fabrication assemblies have satisfactorily passed AWS qualifications for welding in accordance to the structural welding code-steel D1.1, D1.2, and D1.3.

1.8.4The contractor is to make sure that all metal fabricators and installers are duly supervised by qualified professional engineers, licensed and experienced in supervising construction works.

1.8.5Do not complete works prior to mock-up approvals. Install a handrail/rail mock up to verify selections and shop drawings and have the mock-ups approved prior to the completion of work. Always build mock-ups in intended locations.

1.9 WARRANTIES

Metal fabricators are to comply with minimum five (5) years warranty, certifying against rusts, corrosion, and any form of metal deterioration.

2. PART 2 PRODUCTS

2.1 METALS

All metal fabrications exposed to views or areas with high user traffic shall be free from surface blemish. Do not use deteriorated materials. Unless otherwise specified or indicate in the technical working drawings, follow the prescribed thicknesses of given metal sections below. In case of conflict, submit requests for clarification. Do not implement any work prior to the verification of the architect.

Only use Welding Rods and Bare Electrodes compatible with steel/ or metal alloy to be welded. Comply with American Welding Society Standards (AWS) specifications.

2.1.1GENERAL METALS

2.1.1.1 For Steel Plates, Shapes, and Bars, comply with ASTM A 36.

2.1.1.2 For Rolled Steel floor Plates, comply with ASTM A 786.

2.1.1.3 For Steel Bars for Gratings, comply with ASTM A 569 or ASTM A 36.

2.1.1.4 When using Wire Rod for Gratings Crossbars, comply with ASTM A 510.

2.1.1.5 For Cold-Formed Steel Tubing, comply with ASTM A 500, Grade A, unless otherwise specified.

2.1.1.6 For Cold-Rolled Structural Steel Sheet, use ASTM A 611, Grade A, unless otherwise specified.

2.1.1.7 For Uncoated Non-structural Cold-Rolled Steel Sheet, comply with ASTM A 366.

2.1.1.8 For Structural Quality Galvanized sheets, comply with ASTM A 446, Grade A, unless another grade is required for design loading, and G90 coating designation unless otherwise directed.

2.1.1.9 For Galvanized finish Steel Pipes for exterior installations and where indicated, comply with ASTM A 53; Type F, Schedule 40, unless otherwise directed, or another weight, type, and grade required by structural loads and/or by technical working drawings.

2.1.1.10 For Malleable Iron Castings, comply with ASTM A 47, grade 32510.

2.1.1.11 For Brackets, Flanges and Anchors, use Cast or formed metal of the same type material and finish as supported rails, unless otherwise directed.

2.1.1.12 When using Concrete Inserts, use Threaded or wedge type, galvanized ferrous castings, either malleable iron, ASTM A 47, or cast steel, ASTM A 27. Provide bolts, washers, and shims as required, hot-dip galvanized per ASTM A 153.

2.1.1.13 When using Wrought Iron, conform to ASTM designation A-41.

2.1.1.14 When using Gray Iron Castings, conform to ASTM A 48, Class 30.

2.1.2FOR STAINLESS STEEL:

2.1.2.1 For Stainless Steel Bar Stock, comply with ASTM A 276, Type 302.

2.1.2.2 For Stainless Steel Plate, comply with ASTM A 167, Type 302.

2.1.2.3 For Stainless Steel Pipe, comply with ASTM A 312, Grade TP 316.

2.1.2.4 For Stainless Steel Castings, comply with ASTM A 743, Grade CF 8 or CF 20

2.1.2.5 For Stainless Steel Tubing: ASTM A 554, Grades MT301, MT302 or MT304.

2.1.3ALUMINUM

2.1.3.1 Refer to technical working drawings to verify temper, finish, and coats of the Aluminum.
2.1.3.1.1 For Extruded Bars and Shapes, comply with ASTM B 221, 6063-T6
2.1.3.1.2 For Extruded Pipe and Tube, comply with ASTM B 429, 6063-T6.
2.1.3.1.3 For Drawn Seamless Tubes, comply with ASTM B 483, 6063-T832
2.1.3.1.4 For Plate and Sheet, comply with ASTM B 209, 6061-T6
2.1.3.1.5 For Die and Hand Forgings, comply with ASTM B 247, 6061-T6
2.1.3.1.6 For Castings, comply with ASTM B 26, 356.0-T6.
2.1.3.1.7 Minimum Thickness of Plates shall be 3mm.
2.1.3.1.8 Minimum Extrusions shall be 3mm.

2.1.4FASTENERS

Use zinc-coated fasteners for exterior use or where built into exterior walls. Performance Requirements of Fasteners shall be as follows:
2.1.4.1.1.1 When using Bolts and Nuts, use Regular hexagon head type compliant with ASTM A 307, Grade A.
2.1.4.1.1.2 When using Lag Bolts, use Square head type FS FF-B-561.
2.1.4.1.1.3 When using Machine Screws, use Cadmium plated steel FS FF-S-92.
2.1.4.1.1.4 When using Wood Screws, use Flat head carbon steel FS FF-S-111.
2.1.4.1.1.5 When using Plain Washers, use Round, carbon steel, FS FF-W-92.
2.1.4.1.1.6 When using Toggle Bolts, use Tumble-wing type, FS FF-B-588, type, class, and style as required
2.1.4.1.1.7 When using Lock Washers, use Helical spring type carbon steel, FS FF-W-84
2.1.4.1.1.8 When drilling expansion anchors, comply with FS FF-S-325, Group VIII anchors, expansion, non-drilling, Type I (internally threaded tubular expansion anchor) and machine

2.1.5PAINT

Use shop primers to ensure protection of metal fabrications. Use primers as follows:
2.1.5.1 For ferrous metals, use fast-curing, lead-free, universal modified alkyd primer selected for good resistance to normal atmospheric corrosion, for compatibility with finish paint systems indicated. Primer should be compatible with field-applied topcoats and compliant to requirements of FS TT-P-645.
2.1.5.2 For galvanized steel, use primers with zinc-dust, zinc-coated steel compatible for priming zinc-coated steel and finish paint systems as indicated. Comply with SSPC-Paint 5.

2.1.6CONCRETE FILL AND REINFORCEMENT

Comply with Division 03 Sections for normal weight concrete. Use reinforcements compliant with ASTM A615, Grade 60 unless otherwise directed.

3. PART 3 EXECUTION

3.1 EXAMINATION AND PREPARATION

3.1.1Properly label metal assemblies, and fixtures such as urinals and lavatories in coordination with labels of receiving anchors to avoid incorrect installations.
3.1.2Coordinate with concrete casting schedule and material deliveries to ensure the proper integration of anchorage to be embedded in concrete or masonry construction.

3.2 GENERAL INSTALLATION

3.2.1Provide anchorage and fastening devices in all necessary areas to structurally secure metal fabrications in place. Use toggle bolts, lag bolts, and other masonry inserts and connectors as required for structural soundness without compromising the aesthetic quality of exposed areas.
3.2.2Plumb, set, level, align, edge, measure, and layout all metal fabrications from established lines and levels to ensure accurate fabrication and installation.
3.2.3Comply with AWS Code for procedures of manual shielded metal-arc welding for all feld weldng work.
3.2.4Remove all welding flux immediately.
3.2.5Finish all exposed welds to match adjacent metal surfaces.
3.2.6Coat all exposed steel or metal fabrications for corrosion protection.

3.2.7For metals assemblies specified to receive paint, apply primer on all surfaces including grind smooth welded connections. Comply with Division 09 Section Interior and Exterior Painting.
3.2.8Pre-drill holes on the metal fabrication to receive exposed bolt anchorage.
3.2.9For concrete surfaces, use drilled-in expansion shields and concealed hanger bolts or exposed lag bolts as applicable.
3.2.10 For hollow masonry anchorage, use toggle bolts having square heads.
3.2.11 Install framing and supports to comply with requirements of items being supported, including manufacturers' written instructions and requirements indicated on Shop Drawings, if any.
3.2.12 Manually clean all metal and concrete surfaces to receive anchorage work. Remove all dirt, weld splatter, grease, and similar loose substances that affect adhesion. Chip, scrape and wire brush to remove dirt on metal.
3.2.13 Correct all chippings on concrete surfaces as affected by installation work. Comply with Division 03 Concrete for all concrete patchwork.
3.2.14 Clean aluminum and stainless steel with through soap and clean water wash and rinse.
3.2.15 Touch up all painting works damaged by installation work.
3.2.16 Restore all other complete finish work damaged during installation work.

3.3 GENERAL FABRICATION

3.3.1Comply with performance requirements as indicated above and as indicated in the drawings. Verify drawings and ensure that metal fabrications are compliant. Use types of materials as specified.
3.3.2All angles, surfaces, edges whether smooth or straight shall true to line and levels and consistent with drawings.
3.3.3Shearing and punching of metals must done cleanly and accurately.
3.3.4Buff exposed edges to no more than 0.8mm unless otherwise indicated in the drawings. Ensure that buffing or easing work will not damage grains or impair work in any way.
3.3.5No sharp, flesh-cutting edges allowed, whether exposed or unexposed.
3.3.6Smoothen exposed welds.
3.3.7Weld corners and seams continuously.
3.3.8Remove welding flux immediately.
3.3.9Fabricate metals such that hairline joints are minimal Conceal hairline joints.
3.3.10 Exposed fasteners shall be consistent as indicated on drawings. If not indicated, use flathead countersunk screws or bolts. Verify drawings for the accurate positioning of fasteners. If not specified on drawings, fabrication shall consider equal and structurally sound spacing of fasteners.
3.3.11 Space anchoring devices to provide adequate support as approved by structural drawings. Refer to approved shop drawings. Consider prescribed anchoring distances during the fabrication stage.
3.3.12 Fabricate weep holes where water is likely to accumulate. Ensure that the metal assembly is fabricated such that no part is subject to accumulation of corrosives and therefore damaging the unit.

3.4 GENERAL FINISHES

3.4.1Prepare steel fabrications to receive the finishes as specified in drawings.
3.4.2Exposed fasteners shall be finished with matching appearance, including color and texture of the steel fabrication, unless otherwise indicated in the approved drawings.

3.5 ROUGH HARDWARE

The contractor shall furnish all custom fabricated bolts, plates, anchors, hangers, dowels, and other miscellaneous steel and iron shapes as required for all rough support and anchoring work.

3.6 RUNGS, LADDER, and SAFETY CAGES

3.6.1Fabricate all rungs and ladders, and safety cages as indicated on the working drawings and as required by the project. Rungs, ladders and safety cages should be provided on elevated water tanks, elevator pits, machine rooms, or where access is necessary for maintenance.
3.6.2All exterior rungs, ladders, and safety cages shall be in stainless steel, and welded to be structurally sound enough to accept one or two persons. Ensure that no warping, disengagement of members, and any other form of deformation occurs when items are in use; check that anchorages are soundly installed and tested.
3.6.3Situate rungs and ladders in the most accessible locations with least visual and traffic obstruction, or as indicated in the working drawings.
3.6.4Do not install ladders and rungs where it becomes inaccessible and unfit for use.

3.6.5Do not install ladder rungs in areas where its exposure destroys building aesthetics. Secure an approval from the architect as to the appropriate location of the ladders and rungs.
3.6.6Submit shop drawings on rungs, ladders, and safety cages and secure approval prior to fabrication and installation.

3.7 METAL GRATINGS
3.7.1Where required or as indicated in the drawings, provide metal bar gratings.
3.7.2Fabricate gratings such that it is able to carry designed structural loads.
3.7.3When required by the drawings of the architect, provide hinges on gratings that require access for maintenance.

3.8 RAILINGS AND HANDRAILS
3.8.1Fabricate all railings and handrails to comply with all indications on approved shop drawings.
3.8.2Fabricate all assemblies such that splicing and on-site disassembly is minimized.
3.8.3When splicing is necessary due to delivery or installation restrictions, ensure that all units are properly labeled and coordinated for reassembly.
3.8.4Join railing and hand-railing members by butt welding, unless otherwise indicated.
3.8.5At tees, intersections, and crossings, weld around all creases to ensure sound jointing. Where hollowed tubes are specified, joints must be welded such that corrosives are not allowed into the interiors of the tubes.
3.8.6Anticipate all anchorages during fabrications and where possible, ensure a nearly homogenous and sound connection.
3.8.7Especially for hollow tubes, Close all exposed pipe ends by welding a 4.7625mm thick steel plate to ensure that corrosives do not enter the interiors of the tubes, unless otherwise indicated.
3.8.8Grind all joints and anchorages smoothly to match adjacent surfaces.
3.8.9Handrails, posts, and other steel sections shall be at least schedule 20 to schedule 40 or as required by the Structural Consultant to carry design loads.
3.8.10 Finish railings and handrails in compliance to interior painting requirements if painted finish is specified in the drawings. Refer to Division 09 Section "Interior Painting".
3.8.11 Stainless steel railings and handrails shall be in hairline finish unless otherwise indicated in the drawings or as approved by the architect.
3.8.12 Secure handrails to walls with proper wall brackets and end fittings unless otherwise indicated on drawings as approved by the structural designer.
3.8.13 Follow required slopes for handrails and railings as indicated in drawings, or to match the alignment of the stairs, ramp, and similar sloping surfaces. Follow slope installations according to approved shop drawings.
3.8.14 Use steel flanges as indicated in approved shop drawings. Accurately follow technical working drawings.

3.9 NOSINGS
3.9.1Provide steel nosing as required in the technical working drawings
3.9.2Only use anti-slip strip and nosing surfaces.
3.9.3Nosing shall be at least 25mm thick and shall run along the full length of the step/tread. Check that strips are installed in alignment or as indicated in the drawings.
3.9.4Level all accepting nose strips and use patching compounds to fill cracks, holes, and other depressions or irregularities on the treads/steps.
3.9.5Clean surfaces of application and check that receiving steps/treads are free of any substances, i.e. wax, dust, oil, salts that affect the adhesion of the nosing strip. Do not use solvents that disintegrate and loose adhesion due to thermal conditions. Where necessary support adhesive with screws, rivets, and similar anchorage devices.
3.9.6Do not join nosing strip materials. Nosing strips must run homogenously along the tread.
3.9.7Unless otherwise specified in drawings, embed nosings in concrete steps or curbs and flush with riser and tread face levels.

3.10 ACCESS PANELS
3.10.1 Verify location of Access Panels as indicated in technical drawings. Always place Access Panels in obscure locations, accessibly by service personnel.
3.10.2 No Access Panel shall be lesser than 600mm X 600mm in dimensions.
3.10.3 For access panels placed on ceilings, locate it adjacent to the nearest to the wall.
3.10.4 Fabricate access panels according to materials as indicated in the drawings or as needed in the project site.
3.10.5 Fabricate access panels using materials that comply with fire rating as required by the code.

3.10.6 Unless otherwise required or specified, provide at least 2 pieces of steel butt hinges, painted to match the color of the corridor wall, or ceiling where the access panel is located.
3.10.7 Use silicone to adhere borders/perimeters of the access panels.
3.10.8 Where the access panel is a combination of fiber cement boards and steel perimeters, comply with Division 03 Fiber Cement Boards.
3.10.9 Submit detailed shop drawings showing dimensions, reference elevations, and materials for access panels installed in exposed areas. Fabricate access panels according to approved shop drawings.

3.11 WELDED WIRE FABRIC ENCLOSURES FOR MECHANICAL EQUIPMENT)
3.11.1 Frames and supports for welded wire fabric enclosures designated for mechanical equipment shall be fabricated with 50mm X 50mm x 2.8mm diameter tubular heavy duty steel unless otherwise intended by the architect or structural designers. Submit shop drawings prior to implementation.
3.11.2 Angular and flat bars may be used for frames not bearing critical structural load.
3.11.3 divisi accessories.
3.11.4 All welded wire fabric enclosures shall be painted. Refer to Division 09 Section for Paint type and procedure requirements.

3.12 STEEL FRAMED STAIRS AND RAMPS
3.12.1 Conform to sizes, arrangements, dimensions as indicated in stair details on technical working drawings.
3.12.2 For fabricated steel stringers, treads, and newels, balusters, and other stair components with hollow sections, provide closure on exposed ends. Use prescribed steel plates and join by full butt welding such that no corrosives may enter the interiors of the assembly.
3.12.3 Unless otherwise indicated on drawings, use 6mm thick built steel concrete pans (concrete-filled steel pans) to form stair treads and landings. Bolt steel pans to supporting brackets.

3.13 MISCELLANEOUS
3.13.1 Provide steel framing and supports for all applications as required to complete structural steel frameworks and as required to complete works.
3.13.2 Integrally weld and anchor all steel fabrications into concrete or building masonry and ensure structural soundness.
3.13.3 Furnish inserts, if units must be installed after concrete is placed.
3.13.4 Except as otherwise indicated, space anchors 609.6mm (24 inches) on center and provide minimum anchor units in the form of steel straps 31.75mm x 6.35mm x 203.2mm (1-1/4 inches wide x 1/4 inch x 8 inches) long.
3.13.5 Epoxy-prime all framings and supports.
3.13.6 For lavatory counter, urinal, and other similar finish supports, provide steel angle supports capable of supporting the dead load of the item to be installed.
3.13.7 Protect all finishes of handrails and railings in exposed areas from damage during construction. Provide temporary protective covering to be removed only upon substantial completion of all construction work
3.13.8 Restore finishes damaged during installation works.

END OF SECTION

05 00 00	DIVISION 5 METAL	
05 51 36	Decorative Metals	

1. **PART 1 GENERAL**

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

1.2.1This section includes provisions on ornamental metals intended for the project, such as decorative steel for elevators and customized metal works with ornamental and intricate patterns, such as
1.2.1.1 Decorative metal signage
1.2.1.2 Miscellaneous ornamental steel requirements as intended for the project

1.3 RELATED SECTIONS

1.3.1Exterior Painting
1.3.2Metal Fabrications

1.4 SUMMARY

1.4.1This section includes provisions on ornamental metals intended for the project, such as decorative steel for elevators and customized metal works with ornamental and intricate patterns, such as
1.4.1.1 Decorative metal signage
1.4.1.2 Miscellaneous ornamental steel requirements as intended for the project

1.5 GENERAL PROVISIONS

1.5.1Fabricate all ornamental metals in conformance to design, dimensions, sizes, and other specifications indicated on technical working drawings or as approved by the architect.
1.5.2Ornamental metals shall be delivered on site and installed on the project in its completely finished state.
1.5.3Before fabrication, submit sample swatches of the finished metal showing a complete modular assembly for the approval of the architect.
1.5.4Restore any finishes damaged during installation work.
1.5.5Prior to fabrication, submit Shop Drawings to the Architect of Record for approval. Indicate structural anchorage on the shop drawings.
1.5.6Submit approved shop drawings by the architect to the structural designer for approval on structural soundness. Ensure that shop drawings have sufficient data to check structural computations.
1.5.7Protect all ornamental work until substantial completion of the project. Ensure that surfaces are free of scratches.
1.5.8Do not exceed the allowable working stress of the assembly, including considerations on its materials, anchors, and connections. Ensure that all metal fabrications are compliant to structural requirements, such that it is capable of withstanding structural loads as determined by professional structural designers. Determine allowable design working stresses according to following standards:

1.5.8.1 For aluminum materials, comply with AA 30 "Specifications for Aluminum Structures"
1.5.8.2 For Stainless Steel fabrications, comply with ASCE 8, "Specification for the Design of Cold-Formed Stainless Steel Structural Members."
1.5.8.3 For Cold-Formed Structural Steel, comply with AISI SG-673, Part I, "Specification for the Design of Cold-Formed Steel Structural Members.
1.5.8.4 For Structural Steel, comply with AISC S335, "Specification for Structural Steel Buildings Allowable Stress Design and Plastic Design with Commentary."

1.5.9EXTERIOR ASSEMBLIES
1.5.9.1 Ornamental Metal Assemblies for installation on exteriors shall allow for thermal movements due to weather-induced heat gain and heat loss without any visual distortion or damage to the anchorage.
1.5.9.2 Fabricate exterior metal assemblies in anticipation of weather disturbances such as rain and strong winds. Assemblies should be able to carry design loads such as wind pressure, live loads, and dead loads.
1.5.9.3 Fabricate weather-exposed assemblies with weep holes to drain any rainwater and moisture accumulation on any part and point of the assembly that can lead to corrosion and degradation.
1.5.9.4 Use materials with inherent strength capable of withstanding weather exposure. Comply with drawings specifications.
1.5.9.5 Use waterproofing sealers or coatings to protect exterior assemblies to weather exposure. Submit waterproofing and sealing products for approval.
1.5.9.6 Apply approved waterproofing and sealing products as recommended by the manufacturer,
1.5.9.7 When anchoring steel to concrete, always use non-shrink, pre-mixed, factory-packaged, corrosion and erosion resistant, non-metallic grout complying with CE CRD-C621. Check all labels by manufacturers and follow proper handling and application instructions.
1.5.9.8 Do not apply final paint coat finishes on exterior metal assemblies without the color swatch approval of the architect. Refer to product and execution submittals of this section for details.

1.5.10 INTERIOR ORNAMENTAL METAL
1.5.10.1 Validate levels, reference lines and grades according to actual site conditions and indicate true data on shop drawings for approval.
1.5.10.2 Do not fabricate interior metal ornaments without the approval of the architect.
1.5.10.3 For intricate metal work such as signage, install mock-ups and templates of the signage made of thin gauged metal sheets, cardboard, or other cheaper materials for verification of sizes, dimensions, mounting heights, and thicknesses.
1.5.10.4 Coordinate fabrication and delivery schedule with approval periods and mock-up installations such that the schedule of substantial completion is on time. Seek drawing and mock up approvals with a healthy lead time.

1.6 MAINTENANCE AND STORAGE

1.6.1For interior ornamental metal assemblies, ensure that assemblies are protected from corrosion due to weather and chemical exposure.
1.6.2Apply protecting films and temporary protective coverings to keep completed work and materials away from scratches, discoloration, and other defects affecting its original quality upon completion of work.
1.6.3Keep materials away from corrosives especially during the construction phase.
1.6.4When metal works are completed, restore any defects incurred on the assembly during the time of construction. No discoloration or any early markings indicative of early stages of corrosion will be accepted upon substantial completion of work.
1.6.5Regularly clean surfaces where fabricated assemblies are completed, stored or kept. Ensure that the areas of work and storage are free of corrosive substances.
1.6.6Clean all metal fabrications and ensure that items are free of marks, bulges, discolorations, prints, finger marks, etc.
1.6.7Exterior metal assemblies already installed on the project need not be wrapped in polyethylene, however all finishes damaged during the time of construction shall be restored, repainted, and cleaned at the time of the project turnover.

1.7 SUBMITTALS

1.7.1PRODUCT APPROVAL ATTACHMENTS
1.7.1.1 Submit product data for each metal type used in the ornamental work. Describe steel composition, including nominal thicknesses for hollowed tubes, finish type, and other data needed for structural computation as well as other data affecting the overall quality of the fabrication.
1.7.1.2 For ornamental work to receive paint, include detailed description of paint products to be used, as well as application instructions as specified by the manufacturer. Submit manufacturer's data on the proper handling of paint products, including proper storage, and maintenance.
1.7.1.3 Indicate areas of application on all requests for approval.

1.7.1.4 For finished steel, submit finish steel swatches at least 100mm x 100mm in size if steel plates for the approval of the architect. Properly label the swatches according to finish, grade, and grain whether satin, hairline, or as indicated on the drawings.

1.7.1.5 For ornamental steel to be finished in paint, submit finish steel swatches at least 100mm x 100mm in size if steel plates and at least 100mm cut portions if hollowed tubes, angular bars, flats, and similar components. Each submitted swatch shall be fully primed and finish coated, compliant to Division 09 Exterior Paint Section. Submit swatches in every color required on the ornamental steel work and only apply paint finish on metal sections conforming to approved drawings. Submit painted angle bars when painted angle bars are indicated on approved drawings; submit painted steel plates where painted steel plates are indicated on approved drawings, and so on. For example, where steel plates are indicated to receive different colors, submit one swatch of steel plate for every color specified.

1.7.2EXECUTION APPROVAL ATTACHMENTS

1.7.2.1 Submit a detailed work methodology, indicating at least the following

1.7.2.1.1 Date and time of fabrication

1.7.2.1.2 Area of installation

1.7.2.1.3 Welder's certificates compliant to the Quality Assurance portion of this section.

1.7.2.1.4 Shop drawings dedicated to showing the location of the installation on the project site. Detail all dimensions. Show typical weld points, cross section details, clearly defining relative points of measurement for survey and/or laying out. All drawings shall be to scale. Include plans, elevations, sections, and other drawings required. Properly label all components of the assemblies. If using hollowed sections, indicate nominal thicknesses. If using steel plates, indicate gauge of plate. Label all bolts and anchors, including prescriptive sizes if any. Certify that assemblies on the shop drawings are structurally sound, otherwise drawings will be forwarded to the structural engineer for verification.

1.7.2.1.5 Submit separate shop drawings with a clearly defined legend for finish types, especially for metal fabrications to receive paint finish. On the finish legend, clearly indicate the color and finish boundaries on the metal assembly.

1.8 QUALITY ASSURANCE

1.8.1Ensure fabricators are experienced in fabricating metal assemblies similar to the items indicated in the technical working drawings of this project. Fabricators should observe systematic proceedings and shall be capable of accomplishing required fabrication in the given amount of time.

1.8.2Ensure installers are equally familiar with fabricators and are in constant communication on the proper installment procedures.

1.8.3Certify that all welders for fabrication assemblies have satisfactorily passed AWS qualifications for welding in accordance to the structural welding code-steel D1.1, D1.2, and D1.3.

1.8.4The contractor is to make sure that all metal fabricators and installers are duly supervised by qualified professional engineers, licensed and experienced in supervising construction works.

1.8.5Contract experienced firms in the application of finish coatings to high-performance metal surfaces such as aluminum extrusions.

1.8.6Do not cut or disassemble delivered metal assemblies on site. If assemblies delivered are incompliant to module specifications, have the fabricator redo the assembly work.

1.9 WARRANTIES

For exterior metal assemblies, metal fabricators are to comply with minimum five (5) years warranty, and for interior ornamental metals such as signage one (1) year warranty, certifying against rusts, corrosion, and any form of metal deterioration.

2. PART 2 PRODUCTS

2.1 METALS

All metal fabrications exposed to views or areas with high user traffic shall be free from surface blemish. Do not use deteriorated materials. Unless otherwise specified or indicated in the technical working drawings, follow the

prescribed thicknesses of given metal sections below. In case of conflict, submit requests for clarification. Do not implement any work prior to the verification of the architect.

Only use Welding Rods and Bare Electrodes compatible with steel/ or metal alloy to be welded. Comply with American Welding Society Standards (AWS) specifications.

2.1.1GENERAL METALS

2.1.1.1 For Steel Plates, Shapes, and Bars, comply with ASTM A 36.

2.1.1.2 For Rolled Steel floor Plates, comply with ASTM A 786.

2.1.1.3 For Steel Bars for Gratings, comply with ASTM A 569 or ASTM A 36.

2.1.1.4 When using Wire Rod for Gratings Crossbars, comply with ASTM A 510.

2.1.1.5 For Cold-Formed Steel Tubing, comply with ASTM A 500, Grade A, unless otherwise specified.

2.1.1.6 For Cold-Rolled Structural Steel Sheet, use ASTM A 611, Grade A, unless otherwise specified.

2.1.1.7 For Uncoated Non-structural Cold-Rolled Steel Sheet, comply with ASTM A 366.

2.1.1.8 For Structural Quality Galvanized sheets, comply with ASTM A 446, Grade A, unless another grade is required for design loading, and G90 coating designation unless otherwise directed.

2.1.1.9 For Galvanized finish Steel Pipes for exterior installations and where indicated, comply with ASTM A 53; Type F, Schedule 40, unless otherwise directed, or another weight, type, and grade required by structural loads and/or by technical working drawings.

2.1.1.10 For Malleable Iron Castings, comply with ASTM A 47, grade 32510.

2.1.1.11 For Brackets, Flanges and Anchors, use Cast or formed metal of the same type material and finish as supported rails, unless otherwise directed.

2.1.1.12 When using Concrete Inserts, use Threaded or wedge type, galvanized ferrous castings, either malleable iron, ASTM A 47, or cast steel, ASTM A 27. Provide bolts, washers, and shims as required, hot-dip galvanized per ASTM A 153.

2.1.1.13 When using Wrought Iron, conform to ASTM designation A-41.

2.1.1.14 When using Gray Iron Castings, conform to ASTM A 48, Class 30.

2.1.2FOR STAINLESS STEEL:

2.1.2.1 For Stainless Steel Bar Stock, comply with ASTM A 276, Type 302.

2.1.2.2 For Stainless Steel Plate, comply with ASTM A 167, Type 302.

2.1.2.3 For Stainless Steel Pipe, comply with ASTM A 312, Grade TP 316.

2.1.2.4 For Stainless Steel Castings, comply with ASTM A 743, Grade CF 8 or CF 20

2.1.2.5 For Stainless Steel Tubing: ASTM A 554, Grades MT301, MT302 or MT304.

2.1.3ALUMINUM

2.1.3.1 Refer to technical working drawings to verify temper, finish, and coats of the Aluminum.

2.1.3.1.1 For Extruded Bars and Shapes, comply with ASTM B 221, 6063-T6

2.1.3.1.2 For Extruded Pipe and Tube, comply with ASTM B 429, 6063-T6.

2.1.3.1.3 For Drawn Seamless Tubes, comply with ASTM B 483, 6063-T832

2.1.3.1.4 For Plate and Sheet, comply with ASTM B 209, 6061-T6

2.1.3.1.5 For Die and Hand Forgings, comply with ASTM B 247, 6061-T6

2.1.3.1.6 For Castings, comply with ASTM B 26, 356.0-T6.

2.1.3.1.7 Minimum Thickness of Plates shall be 3mm.

2.1.3.1.8 Minimum Extrusions shall be 3mm.

2.1.4FASTENERS

For interior use, use same basic metal alloy for fasteners as the fastened metal prescribed. Especially for signage and elevator sill plates, and the like, make sure that the fastener does not corrode faster than the metal being fastened.

Use zinc-coated fasteners for exterior use or where built into exterior walls. Performance Requirements of Fasteners shall be as follows:

2.1.4.1.1.1 When using Bolts and Nuts, use Regular hexagon head type compliant with ASTM A 307, Grade A.

2.1.4.1.1.2 When using Lag Bolts, use Square head type FS FF-B-561.

2.1.4.1.1.3 When using Machine Screws, use Cadmium plated steel FS FF-S-92.

2.1.4.1.1.4 When using Wood Screws, use Flat head carbon steel FS FF-S-111.
2.1.4.1.1.5 When using Plain Washers, use Round, carbon steel, FS FF-W-92.
2.1.4.1.1.6 When using Toggle Bolts, use Tumble-wing type, FS FF-B-588, type, class, and style as required
2.1.4.1.1.7 When using Lock Washers, use Helical spring type carbon steel, FS FF-W-84
2.1.4.1.1.8 When drilling expansion anchors, comply with FS FF-S-325, Group VIII anchors, expansion, non-drilling, Type I (Internally threaded tubular expansion anchor) and machine

2.1.5PAINT

Use shop primers to ensure protection of metal fabrications. Use primers as follows:

2.1.5.1 For ferrous metals, use fast-curing, lead-free, universal modified alkyd primer selected for good resistance to normal atmospheric corrosion, for compatibility with finish paint systems indicated. Primer should be compatible with field-applied topcoats and compliant to requirements of FS TT-P-645.

2.1.5.2 For galvanized steel, use primers with zinc-dust, zinc-coated steel compatible for priming zinc-coated steel and finish paint systems as indicated. Comply with SSPC-Paint 5.

2.1.6CONCRETE FILL AND REINFORCEMENT

Comply with Division 03 Sections for normal weight concrete. Use reinforcements compliant with ASTM A615, Grade 60 unless otherwise directed.

3. **PART 3 EXECUTION**

3.1 EXAMINATION AND PREPARATION

Comply with Division 05 50 0 Metal Fabrications Section of this Specifications.

3.2 GENERAL INSTALLATION

Comply with Division 05 50 0 Metal Fabrications Section of this Specifications.

3.3 GENERAL FABRICATION

Comply with Division 05 50 0 Metal Fabrications Section of this Specifications.

3.4 GENERAL FINISHES

3.4.1Prepare steel fabrications to receive the finishes as specified in drawings.
3.4.2Exposed fasteners shall be finished of the same material as the fastened metal including color and texture of the steel fabrication, unless otherwise indicated in the approved drawings.

3.5 ORNAMENTAL METALS, MISCELLANEOUS TRIMS, and OTHER DECORATED ITEMS

3.5.1Provide stainless steel sections with finish profile and size as intended in detailed architectural drawings.
3.5.2For signage as indicated in architectural working drawings, use stainless steel in hairline finish, cut and jointed seamlessly to a homogenous appearance. Anchor ornamental signage plates to structural concrete and follow plate thicknesses, impressions and depressions as specified in architectural detail drawings.
3.5.3Buff, clean, and smoothen signage edges.
3.5.4Protect finished metals from damage due to construction. Apply strippable temporary protective covering on completed and installed work to be removed only upon substantial completion of the project.
3.5.5Touch up and restore all finish surfaces damaged during installation work.

3.6 MISCELLANEOUS HARDWARE

The contractor shall furnish all custom fabricated bolts, plates, anchors, hangers, dowels, and other miscellaneous steel and iron shapes as required for all rough support and anchoring work.

END OF SECTION

DIVISION 06
WOOD AND PLASTICS

06 00 00	**DIVISION 6 WOOD AND PLASTICS**	
06 10 0	Rough Carpentry	

1. **PART 1 GENERAL**

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

This section includes provisions on:
1.2.1Marine plywood backing requirements
1.2.2Marine plywood underlayment for solid surface material countertops
1.2.3Marine plywood backing for mirrored glass and cladding

1.3 RELATED SECTIONS

1.3.1Interior Architectural Woodwork
1.3.2Mirrors
1.3.3Solid Surface Countertops

1.4 GENERAL PROVISION

Unless otherwise specified, C-Marine Type Plywood. Verify plywood thickness per purpose.

1.5 QUALITY ASSURANCE

Apply non-toxic wood preservatives on the backing surface.

2. **PART 2 PRODUCTS**

2.1 BACKING FOR MIRRORED GLASS

Unless otherwise specified, Use 5mm C-Marine Type Plywood, more or less 6.7kgs per piece.

2.2 ACCESS PANEL MATERIAL

Marine Plywood may be used as an alternative to steel access panels for dry areas not exposed to high levels of humidity. Unless otherwise specified, Use 11mm C-Marine Type Plywood, more or less 14.7kgs per piece. Use treated Tanguile or Lawaan wood as frames. Comply with Division 9 Interior Painting Section for finish preparations.

2.3 SOLID SURFACE COUNTERTOP

Unless otherwise specified, Use 18 mm C-Marine Type Plywood, more or less 24.0kgs per piece. Apply preservatives.

3. **PART 3 EXECUTION**

3.1 GENERAL INSTALLATION

Cut wood and plywood framing conforming to dimensions of the material to be supported. Refer to technical working drawings for finish material dimensions. When splicing is necessary, ensure that splices do not fall between bearing points. Surface backing to receive nails, bolts, and similar fasteners should be relatively homogenous in area or point of fastening.

3.2 NAILING

Minimum distances between nails and wood edges should be at least ½ the nail length. Drill holes where necessary to prevent wood splitting. Use nail sizes appropriate to the thickness of the backing material and such that penetration to the second material is not less than ½ of the nail length.

3.3 LAG SCREWS

Do not hammer lag screws into place. Provide malleable washers under screw heads where necessary. Install screws with anchorage embedment into piece lagged of not than 60% of screw length of 8 diameters. Place lag screws by screwing in an angle perpendicular to the surface it will adhere to.

END OF SECTION

06 00 00	DIVISION 6 WOOD AND PLASTICS	
06 40 2	Interior Architectural Woodwork	

1. **PART 1 GENERAL**

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

This section includes provisions on architectural woodwork, namely:
1.2.1Built-in cabinet works, drawers and countertops for pantries, toilets, and kitchens
1.2.2Custom cabinetry/woodwork for pigeon holes
1.2.3Custom wooden paneling works

1.3 RELATED SECTIONS

1.3.1Metal Fabrication
1.3.2Mirrors
1.3.3Solid Surface Countertops
1.3.4Toilet and Bath Accessories

1.4 GENERAL PROVISION

1.4.1Refer to the architect's working drawings on cabinetry detail and custom ornamental woodwork to match work requirements, i.e. design and dimensions, mounting heights, hardware specifications, wood type, staining, and other similar details necessary to complete work.
1.4.2No hand-cut wood allowed. All woodwork shall be machine-cut.
1.4.3Include and provide all fastening items necessary to complete and install all woodwork. Refer to Division 5 Section Metal Fabrication for metal fastening and anchorage specifications.
1.4.4Coordinate timely sample submission for approval such that the completion work schedule is kept free of delays. All samples, shop drawings, and similar submittals should be approved before the required schedule of placing orders for delivery on site. The architect is not responsible for sample approvals submitted at a much later time.

1.5 MAINTENANCE

1.5.1Keep completed and installed architectural woodwork free of dust, discoloration, defects, and similar irregularities throughout construction.
1.5.2Restore all defects, replace dysfunctional hardware, hinges, and touch up all damaged paint and finish work such that all woodwork are turned to its original condition at the time of substantial completion of the project.

1.6 SUBMITTALS

1.6.1PRODUCT APPROVAL ATTACHMENTS
1.6.1.1 Submit all wood treatment data for each type of wood specified, including: Type of preservative solution, pressure process used, amount of preservative retained, and moisture content of wood after kiln drying
1.6.1.2 On ornamental wood work requiring wood transparent stains, submit sample stained and finished wood cut at least 150mm if the lumber is in strips, and 200mm X200mm if the wood is in sheets. Label each sample according to the location of installation. State specie, dimensions, manufacturers of wood, and indicate all wood stains applied on each wood material. State color, chemical composition, brand, and amount of all stains and finish coatings applied. Only submit the actual wood to be used for installation or as specified by the architect in the technical working drawings. Wood installed on site that differs from the approved material is subject to rework.

1.6.1.3 On ornamental wood work requiring veneer and laminates, submit sample finished work at least 200mm X200mm, showing applied veneer sheets and edgework. Label each sample according to the location of installation. State color, code, grade, thickness, and brands of the laminates as well as the adhesives used.

1.6.1.4 On ornamental wood work requiring opaque paint finish, submit sample finished work at least 200mm X200mm, showing applied finish paint. Label each sample according to the location of installation. State color, code, number coats, and brands of paints and primers used.

1.6.1.5 Submit one sample each of all cabinet hardware and accessories. State product code and labels of each accessory in coordination with labels on shop drawings.

1.6.2EXECUTION APPROVAL ATTACHMENTS

1.6.3Shop drawings showing location of each woodwork item and actual dimensions, lines, levels, and reference elevations on the actual area of installation. Drawings must be drawn in full detail, showing locations and sizes of furring, blocking, hanging strips, veneer layers, surface finish, hardware type, miter joints, etc.

1.7 QUALITY ASSURANCE

1.7.1For repeating ornamental woodwork in typical areas, i.e. typical cabinet pantries, fabricate and install one build mockups for each form of construction and finish required to verify selections made under sample Submittals and to demonstrate aesthetic effects and qualities of materials and execution. Build mockups to comply with the following requirements, using materials indicated for the completed Work:

1.7.2Build mockups in the location and of the size indicated or, if not indicated, as directed by Architect.

1.7.3Notify Architect seven days in advance of dates and times when mockups will be installed.

1.7.4Demonstrate the proposed range of aesthetic effects and workmanship.

1.7.5Obtain Architect's approval of mockups before starting interior architectural woodwork fabrication and installation on other units.

1.7.6Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.

1.7.7Demolish and remove mockups when directed.

1.7.8Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.8 WARRANTIES

Provide lumber only from wood manufacturers and suppliers offering a minimum of five-year warranty.

2. PART 2 PRODUCTS

Comply with requirements of referenced quality standard for moisture content of lumber in relation to relative humidity conditions existing during time of fabrication and in installation areas. Provide wood with moisture content not greater than 12 percent (%).

2.1 WOOD PRESERVATIVES

Wood preservative shall not contain copper chrome arsenic (CCA) or any of the following toxic substances:

2.1.1Methyl Bromide and Chloropicrin

2.1.2Chlorpyrifos Fenitrothion

2.1.3Cupirichydroxide.

2.1.4And other harmful chemicals

2.2 PLYWOOD

Provide solid wood edging for all work requiring marine plywood.

Use Type I C-marine type plywood in thicknesses compliant to drawing details. Marine plywood quality shall be of premium grade quality, with weight/density as follows:

5mm thick C-Marine Type shall be 6.7kgs more or less per piece

9mm thick C-Marine Type shall be 12.0kgs more or less per piece

10mm thick C-Marine Type shall be 13.4kgs more or less per piece

11mm thick C-Marine Type shall be 14.7kgs more or less per piece

18mm thick C-Marine Type shall be 24kgs more or less per piece

Only use Grade A/B for face and back of plywood. For Exposed plywood subject to paint finish, expose Grade A facing.

2.3 LUMBER

Use kiln-dried Tanguile for opaque and transparent applications where required. Follow dimensions as approved on shop drawings and architectural working details.

2.4 FINISHES

All cabinet-work finishes shall be of natural, clear satin finish. Samples showing actual stains and finished sample shall be approved by the architect.

2.5 HARDWARE

All hardware finishes must be in uniform stain chrome finish, unless otherwise indicated and approved by the architect.

2.5.1When using hinges, use self-closing concealed hinges.

2.5.2Always use Cabinet and Drawer Pulls

2.5.3Always use heavy-duty drawer guides with size to match indications on working drawings.

2.5.4Finish of keyed cylinders shall match finish of Cabinet and Drawer Pulls

3. PART 3 EXECUTION

3.1 GENERAL FABRICATION AND INSTALLATION

3.1.1 All fabrication and installation work shall be done as intended by the Architect.

3.1.2 Coordinate with masonry work, paint work, and with other relevant trades to ensure timely completion of project with least restoration work.

3.1.3 Obtain and comply with Woodwork Manufacturer's and Installer's coordinated advice for optimum temperature and humidity conditions for woodwork during its storage and installation. Do not install woodwork until these conditions have been attained and stabilized so that woodwork is within plus or minus 1.0 percent of optimum moisture content from date of installation through remainder of construction period.

3.1.4 Where woodwork is indicated to be fitted to other construction, check actual dimensions of other construction by accurate field measurements before manufacturing woodwork; show recorded measurements on final shop drawings. Coordinate manufacturing schedule with construction progress to avoid delay of work.

3.1.5 All woodwork installations shall be plumb, level, true, and straight with no distortions. Install to a tolerance of 3mm in 2.40m for plumb and level and with no variations in flushness of adjoining surfaces.

3.1.6 Anchor woodwork to anchors or blocking integrally attached to substrates. Secure woodwork to substrate, grounds, or horizontal and vertical levels by means of concealed fasteners, blind nailing, concealed stripping and blocking as required to complete installation. Ensure that anchoring work is done as neatly as possible. Always install for uniform appearance unless otherwise required by drawings approved by the architect.

3.1.7 Adjust all damaged and defective woodwork where possible to eliminate functional and visual effects.

3.1.8 Fabricate woodwork to dimensions, profiles, & details as indicated in approved shop drawings. Ease edges to radius indicated for the following:

3.1.8.1 Corners of cabinets & edges of solid wood (lumber) members less than 25mm in nominal thickness: 1.59mm (1/16 inch).

3.1.8.2 Edges of rails and similar members more than 25mm in nominal thickness: 3.175mm (1/8 inch). All arises on joinery are to be rounded to a radius of 1.5mm whether shown on the drawing or not.

3.2 CLEANING AND PROTECTION

3.2.1Clean, lubricate, and adjust all hardware to ensure smooth and true operation, latching and movement of cabinetry.

3.2.2Clean woodwork on all exposed and semi exposed surfaces.

3.2.3Touch up applied finishes to restore defective areas.

3.2.4Provide protective films for on all ornamental woodwork so that all completed work remains in good visual and functional conditions at the time of Substantial Completion.

END OF SECTION

06 00 00	DIVISION 6 WOOD AND PLASTICS	
06 42 0	Wood Paneling	

1. PART 1 GENERAL

1.1 RELATED DOCUMENTS

1.1.1Technical Architectural Drawings
1.1.2Specifications
1.1.3Requests for Interpretation
1.1.4Work Program and Methodology Submittals

1.2 SUMMARY

This section includes provisions on architectural woodwork, namely:
1.2.1Custom ornamental wood panels for movable walls

1.3 RELATED SECTIONS

1.3.1Interior Architectural Woodwork
1.3.2Flush Wood Doors

1.4 GENERAL PROVISION

1.4.1Refer to the architect's working drawings on custom ornamental paneling to identify work requirements, i.e. dimensions, mounting heights, hardware specifications, wood type, staining, and other similar details necessary to complete work.
1.4.2Paneling includes wood furring, blocking, and shims for installing paneling, unless concealed within other construction before paneling installation
1.4.3Include and provide all fastening items necessary to complete and install all woodwork. Refer to Division 5 Section Metal Fabrication for metal fastening and anchorage specifications.
1.4.4Coordinate timely sample submission for approval such that the completion work schedule is kept free of delays. All samples, shop drawings, and similar submittals should be approved before the required schedule of placing orders for delivery on site. The architect is not responsible for sample approvals submitted at a much later time.

1.5 MAINTENANCE

1.5.1Keep completed and installed architectural woodwork free of dust, discoloration, defects, and similar irregularities throughout construction.
1.5.2Restore all defects, replace dysfunctional hardware, hinges, and touch up all damaged paint and finish work such that all woodwork are turned to its original condition at the time of substantial completion of the project.

1.6 SUBMITTALS

1.6.1PRODUCT APPROVAL ATTACHMENTS

1.6.1.1 Submit all wood treatment data for each type of wood specified, including: Type of preservative solution, pressure process used, amount of preservative retained, and moisture content of wood after kiln drying.

1.6.1.2 On ornamental wood work requiring wood transparent stains, submit sample stained and finished wood cut at least 150mm if the lumber is in strips, and 200mm X200mm if the wood is in sheets. Label each sample according to the location of installation. State specie, dimensions, manufacturers of wood, and indicate all wood stains applied on each wood material. State color, chemical composition, brand, and amount of all stains and finish coatings applied. Only submit the actual wood to be used for installation or as specified by the architect in the technical working drawings. Wood installed on site that differs from the approved material is subject to rework.

1.6.2EXECUTION APPROVAL ATTACHMENTS

1.6.2.1 Shop drawings showing location of each woodwork item and actual dimensions, lines, levels, and reference elevations on the actual area of installation. Drawings must be drawn in full detail, showing locations and sizes of furring, blocking, hanging strips, surface finish stain legends,

1.7 QUALITY ASSURANCE

1.7.1Fabricate and install one mock-ups for each form of construction and finish required to verify selections made under sample Submittals and to demonstrate aesthetic effects and qualities of materials and execution. Build mockups to comply with the following requirements, using materials indicated for the completed Work:

1.7.2Build mockups in the location and of the size indicated or, if not indicated, as directed by Architect.
1.7.3Notify Architect seven days in advance of dates and times when mockups will be installed.
1.7.4Obtain Architect's approval of mockups before starting interior architectural woodwork fabrication and installation on other units.
1.7.5Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
1.7.6Demolish and remove mockups when directed.
1.7.7Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.8 WARRANTIES

Provide lumber only from wood manufacturers and suppliers offering a minimum of five-year warranty.

2. PART 2 PRODUCTS

Comply with requirements of referenced quality standard for moisture content of lumber in relation to relative humidity conditions existing during time of fabrication and in installation areas. Provide wood with moisture content not greater than 12 percent (%).

2.1 WOOD PRESERVATIVES

Wood preservative shall not contain copper chrome arsenic (CCA) or any of the following toxic substances:
2.1.1Methyl Bromide and Chloropicrin
2.1.2Chlorpyrifos Fenitrothion
2.1.3Cupirichydroxide.
2.1.4And other harmful chemicals

2.2 FINISH

2.2.1Comply with referenced quality standard for sanding, filling countersunk fasteners, sealing concealed surfaces, and similar preparations for finishing paneling, as applicable to each unit of work.
2.2.2For Back priming: Apply two coats of sealer or primer, compatible with finish coats, to concealed surfaces of paneling. Concealed surfaces of plastic-laminate-clad paneling do not require back priming when surfaced with plastic laminate.
2.2.3Confirm with Project specifics as to use of lacquer or varnish finish by means of sample approval.
2.2.4Match approved sample stains for colors.
2.2.5Wash Coat for Stained Finish: Apply wash-coat sealer to woodwork made from closed grain wood before staining and finishing.
2.2.6Do not apply filler to open-grain woods.
2.2.7Apply wash-coat sealer after staining and before filling.
2.2.8Confirm sheen with Project requirements: [Flat, 15-30] [Satin, 31-45] [Semigloss, 46-60] [Gloss, 61-100] gloss units measured on 60-degree gloss meter per ASTM D 523

2.3 LUMBER

Use kiln-dried Tanguile, for opaque and transparent applications where required. Follow dimensions as approved on shop drawings and architectural working details.

2.4 HARDWARE

Use rough hardware as required to complete sound installation.

3. PART 3 EXECUTION

3.1 GENERAL FABRICATION AND INSTALLATION

3.1.1All fabrication and installation work shall be done as intended by the Architect.
3.1.2Coordinate with masonry work, paint work, and with other relevant trades to ensure timely completion of project with least restoration work.

3.1.3Obtain and comply with Woodwork Manufacturer's and Installer's coordinated advice for optimum temperature and humidity conditions for woodwork during its storage and installation. Do not install woodwork until these conditions have been attained and stabilized so that woodwork is within plus or minus 1.0 percent of optimum moisture content from date of installation through remainder of construction period.
3.1.4Where woodwork is indicated to be fitted to other construction, check actual dimensions of other construction by accurate field measurements before manufacturing woodwork; show recorded measurements on final shop drawings. Coordinate manufacturing schedule with construction progress to avoid delay of work.
3.1.5All woodwork installations shall be plumb, level, true, and straight with no distortions. Install to a tolerance of 3mm in 2.40m for plumb and level and with no variations in flushness of adjoining surfaces.
3.1.6Anchor woodwork to anchors or blocking integrally attached to substrates. Secure woodwork to substrate, grounds, or horizontal and vertical levels by means of concealed fasteners, blind nailing, concealed stripping and blocking as required to complete installation. Ensure that anchoring work is done as neatly as possible. Always install for uniform appearance unless otherwise required by drawings approved by the architect.
3.1.7Adjust all damaged and defective woodwork where possible to eliminate functional and visual effects.
3.1.8Fabricate woodwork to dimensions, profiles, & details as indicated in approved shop drawings. Ease edges to radius indicated for the following:

3.1.8.1 Corners of cabinets & edges of solid wood (lumber) members less than 25mm in nominal thickness: 1.59mm (1/16 inch).

3.1.8.2 Edges of rails and similar members more than 25mm in nominal thickness: 3.175mm (1/8 inch). All arises on joinery are to be rounded to a radius of 1.5mm whether shown on the drawing or not.

3.2 CLEANING AND PROTECTION

3.2.1Clean, lubricate, and adjust all hardware to ensure smooth and true operation, latching and movement of cabinetry.
3.2.2Clean woodwork on all exposed and semi exposed surfaces.
3.2.3Touch up applied finishes to restore defective areas.
3.2.4Provide protective films for on all ornamental woodwork so that all completed work remains in good visual and functional conditions at the time of Substantial Completion.

END OF SECTION

07 00 00	DIVISION 7 THERMAL AND MOISTURE PROTECTION	
07 16 0	Integral Waterproofing	

1. PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

This section includes provisions on integral cementitious waterproofing found in the following areas:
1.2.1Weather-Exposed corridors and patios
1.2.2Water tanks, concrete sewage holding tank,
1.2.3Walls and floors of fuel storage tanks
1.2.4Roof Decks
1.2.5Kitchen and Pantry
1.2.6Toilet
1.2.7Other indicated below ground areas and spaces where required or directed by the architect

1.3 GENERAL PROVISION

1.3.1No leakage allowed from the concrete placed with integral waterproofing. Comply with recommendations for testing as per COE CRD-C 48 at 140m exposed to vertical water head.
1.3.2Test chemical resistance of concrete samples with integral waterproofing. Immerse samples in sulfuric acid and weigh daily.
1.3.3The compressive strength of concrete mixes cast with integral water proofing should be 10% stronger than the regular concrete mix without admixtures. Comply with ASTM C 39/C 39M after 28 days for testing procedures.
1.3.4Use permanently watertight Hydrophilic integral waterproofing system compliant to the following performance requirements:

1.3.4.1 Compressive Strength, 28 day (ASTM C39/C 39M); equal to and up to 8% increase.
1.3.4.2 Water permeability, CRD C48-92; > 70% reduction.
1.3.4.3 Capillary absorption, ASTM C-1585; > 40% reduction
1.3.4.4 Drying Shrinkage performance shall be compliant to testing results of ASTM C157 or equivalent.
1.3.4.5 Resistance to Chloride penetration, ASTM C1202; 10% improvement
1.3.4.6 Materia shall be self-sealing as certified by independent testing; capable of treating concrete for cracks with width of 0.5mm or greater.
1.3.4.7 Sulphate resistance, ASTM C1012; .33% improvement in 6 months
1.3.4.8 Length change, ASTM C-157, up to 20% reduction
1.3.4.9 Capillary absorption, ASTM C-1585; > 40% reduction
1.3.4.10 NSF International — NSF61 Potable water approval
1.3.4.11 Corrected 30 Minute Water Absorption, Age at Test 7 Days (BS 1881-122): Not greater than 1.0%.

1.4 SUBMITTALS

1.4.1PRODUCT APPROVAL ATTACHMENTS

1.4.1.1 Product data including manufacturer's written instructions for evaluating, preparing and treating substrate, technical data, and tested physical and performance properties of waterproofing.
1.4.1.2 Submit all material safety data sheets of products intended for the project.

1.4.1.3 Submit product test reports from qualified independent testing agency.
1.4.1.4 Field quality control reports or project references.

1.4.2EXECUTION APPROVAL ATTACHMENTS
1.4.3Detailed Work methodology

1.5 QUALITY ASSURANCE
1.5.1Only engage experienced installers and applicators with experience in completing integral waterproofing work of similar size and scope of the project.
1.5.2Obtain integral waterproofing materials from one same bonafide manufacturer. Make sure that all waterproofing products used are compatible as certified by the manufacturer.

1.6 WARRANTIES
Manufacturer to submit a certification guaranteeing a five (5) year warranty.

2. PART 2 PRODUCTS
2.1.1HYDROPHILIC INTEGRAL WATERPROOFING
2.1.1.1 Minimum cement content of concrete mix with integral waterproofing shall be 350kg/ cu.m.
2.1.1.2 Concrete shall contain high range reducer such that free water-cement ratio shall not exceed 0.45 to ensure concrete workability for placement.
2.1.1.3 When subjected to sulfuric acid tests, use 5% sulfuric acid exposed for 70 days. Minimum weight loss for concrete shall be 20% less the original weight.
2.1.1.4 Concrete shall contain any admixture to comply with absorption requirements resulting to water-repellency for at least 15 years, without detrimentally affecting the structural strength and properties of the concrete.
2.1.1.5 When including slump-retaining Superplasticizer as admixture for the purposes of reducing batching water requirements, superplasticizers shall be sourced from acceptable manufacturers and shall comply with ASTM C494, Type F.
2.1.1.6 When using evaporation retardant, curing compound, water stops, polypropylene fiber reinforcement, and similar accessories, obtain materials that are compatible to the approved waterproofing cementitious material. Follow recommendations of approved manufacturer.
2.1.1.7 Dosage of the waterproofing admixture shall be at 2% by mass of all cementitious content of the concrete up to a maximum of 8kg/m3 (13.5 lb. / cu. yd.).

3. PART 3 EXECUTION
3.1 APPLICATION
Comply with recommendation of the manufacturer.

3.2 EXAMINATION
Check that site conditions are ready for concrete pouring. Coordinate with manufacturer for pre-inspection schedule. Acquire certification from the manufacturer that site conditions are acceptable for placement.
For mixing, transporting and placing concrete under conditions of high temperature or low temperature, follow concrete practices as referred to in ACI 305R-10 (Hot Weather Concreting) and ACI 306R-10 (Cold Weather Concreting) respectively. For flatwork being placed in either hot, dry or windy conditions, surface humidity must be maintained by fogging or use of monomolecular film (evaporation retardant). Shotcrete walls must be water cured following the procedures in ACI 308 or treated with a curing compound conforming to ASTM C309.

3.3 PREPARATION
Conduct trial mixes to determine workability, setting times, and strength.

3.4 CONCRETE PLACING
3.4.1Comply with COSH safety requirements as well as other regulations for health and safety. Comply with manufacturer's instructions as stated on the material safety data sheet provided by the manufacturer.

3.4.2Place, consolidate and cure concrete in compliance with ACI 301, ACI 305, ACI 306, ACI 308 and ACI 309. Install water stop system components in compliance with the drawings

3.5 FIELD QUALITY CONTROL
Comply with manufacturer's requirements.

3.6 CURING AND PROTECTION
Protect installed work from damage due to subsequent construction activity on the site. Follow ACI 308 curing guidelines. Apply evaporation retardant on flatwork. Where wet curing is not possible, apply curing compound following ASTM C309. Apply curing compound immediately to finished or stripped surfaces.

END OF SECTION

07 00 00	DIVISION 7 THERMAL AND MOISTURE PROTECTION	
07 19 3	Polyethylene Sheet Damp-proofing/ Vapor Barrier	

1. **PART 1 GENERAL**

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

This section includes provision on polyethylene sheets used to serve as damp-proofing/ vapor-barrier work under all floor and stair slabs in contact with the ground.

1.3 RELATED SECTIONS

1.3.1Architectural Concrete
1.3.2Concrete Finishes

1.4 GENERAL PROVISION

1.4.1Verify with structural specifications. Ensure that polyethylene barriers do not compromise the structural strength of concrete.

1.5 SUBMITTALS

1.5.1PRODUCT APPROVAL ATTACHMENTS
1.5.2Submit product samples of damp roofing polyethylene sheets not less than 1000 mm X 600 mm long, showing the 600mm overlap on one side as required. Properly label samples. Indicate grade and brand of damp roofing material.
1.5.3Submit product data on adhesives used for overlap. Submit brand, label, and manufacturer's instructions for storage and application.

1.5.4EXECUTION APPROVAL ATTACHMENTS
1.5.5Submit detailed work methodology. Clearly state the required overlap

1.6 QUALITY ASSURANCE

1.6.1Obtain all materials for damp-roofing and waterproofing from a single source at all times, unless otherwise recommended by manufacturer.
1.6.2Only engage installers with relevant experience in installing damp roofing materials, to a size and scope similar to that of the project.

2. **PART 2 PRODUCTS**

2.1 ADHESIVE AND MISCELLANEOUS MATERIALS

Use adhesive compounds as recommended by the manufacturer for bonding to substrate and overlaps, for sealing of seams in membrane, and for sealing of joints between membrane and flashings, adjoining surfaces and projections through membrane.

When using Plastic Cement, comply with ASTM D4586, Type 1. Sand shall comply with ASTM C 144 or ASTM C897.

2.2 POLYETHYLENE SHEET DAMPROOFING

Use chlorinated polyethylene formed into uniform flexible sheets, plain, 0.008-inch thick, compliant to ASTM C171.

3. **PART 3 EXECUTION**

3.1 PREPARATION AND EXAMINATION

3.1.1Check and comply with manufacturer's instructions on surface preparation requirements.
3.1.2Conduct an on-site pre-conference with installer and manufacturer representatives to check for work details, material selections, and site conditions, whether or not conditions are appropriate for performing work.

3.2 INSTALLATION

3.2.1Check and comply with manufacturer's instructions on installation.
3.2.2Schedule all installation work in the best possible time to optimize a timely construction schedule.
3.2.3When maximum length of the sheet is not enough for the work surface area, overlay a second sheet length. Provide minimum 300mm overlap at edges of polyethylene sheets. Fill overlap with adhesives at the full length.
3.2.4Extend sheets beyond flashings or at perpendicular surfaces, such as walls to provide complete coverage. Seal overlapping edges with adhesive. Bond to both vertical and horizontal surfaces, or as manufacturer shall recommend.
3.2.5Where pipes, and other permanent penetrations and punctures are necessary, seal damp proofing sheets around punctures with adhesives and tapes.

3.3 CLEANING AND PROTECTION

Neatly remove all excess laps, remove masking materials, and clean all stains on exposed surfaces as caused by installation work.

Do not allow any traffic on unprotected installed membranes and stored membrane materials.

END OF SECTION

07 00 00	DIVISION 7 THERMAL AND MOISTURE PROTECTION	
07 55 3	Building Insulation	

1. PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

This section includes provisions for both thermal and acoustic insulation materials installed in the following areas:
1.2.1Mechanical Equipment areas to disperse excess noise
1.2.2Thermal Insulation under Sheet Metal Roofing

1.3 RELATED SECTIONS

1.3.1Sheet Metal Roofing

1.4 GENERAL PROVISION

1.4.1Refer to Technical Working Drawings to identify areas of application.
1.4.2For Thermal Insulation Material under Metal Sheet Roofing, install insulation on all surface areas beneath the Sheet Metal Roofing, where specified by the architect. See products in this section for descriptions on insulating material. All insulating materials installed under sheet metal roofing shall be supported with a 10mm square welded wire mesh, primed and painted according to provisions in Division 9 Interior and Exterior Painting Sections. Comply with color and paint finish as specified by the architect.
1.4.3For Mechanical Equipment areas, use ASTM E-84, Class A, non-combustible, fire retardant wool with aluminum foil on one side, mounted and supported by Metal Furring Assemblies and/or built up steel assemblies using, with facing material 10mm square welded wire mesh, primed and painted. Comply with Division 9 Interior and Exterior Painting Sections. Comply with color and paint finish as specified by the architect.
1.4.4Test acoustical installations for machine and equipment areas. Ensure that when all acoustical installations in place, no point outside the mechanical equipment room that is subject to work conditions requiring focus shall receive noise levels higher than 80db at a time when all mechanical equipment installed are running.
1.4.5Do not use Spray-Applied Insulation unless otherwise approved. If approved, do not apply spray insulation until all installation of pipes, ducts, conduits, and other similar openings are completed. Do not seal or obstruct such similar openings with spray-applied insulation.
1.4.6Do not block necessary openings such as pipes, ducts, conduits, wirings, windows, and similar items.

1.5 MAINTENANCE

1.5.1Upon delivery on site, protect insulation materials from physical damage. Store away from wet areas or areas with high moisture content. Comply with manufacturer's instructions on handling and storing.

1.6 SUBMITTALS

1.6.1PRODUCT APPROVAL ATTACHMENTS
1.6.2Material and Safety Data Sheets for all Insulating Materials
1.6.3Technical Data Sheets for all Insulating Materials
1.6.4Product Sample 300mm x 300mm for each insulating material.
1.6.5Manufacturer's written installation, maintenance, storage, and protection instructions.

1.6.6EXECUTION APPROVAL ATTACHMENTS

1.6.6.1 Submit detailed work installation methodology.
1.6.6.2 Submit scaled and detailed shop drawings for all installation strategies, especially fastening, welding points, spacing of furring, etc.

1.7 QUALITY ASSURANCE

1.7.1Provide insulation materials compliant to UL Testing, or other testing and inspecting agency acceptable to authorities.
1.7.2Surface Burning characteristics of the insulating material shall be compliant with ASTM E 84, such that:
1.7.2.1 Class A Flame Spread shall be at 0-25; smoke-developed 0-450
1.7.2.2 Class B Flame Spread shall be at 26-75; smoke-developed 0-450
1.7.2.3 Class C Flame Spread shall be 76-200; smoke-developed 0-450

1.7.3Fire resistance rating of the material shall comply with ASTM E 119.
1.7.4Combustion characteristics of the material shall comply with ASTM E 136.

1.8 WARRANTIES

Insulation items shall be entitled to at least one (1) year warranty.

2. PART 2 PRODUCTS

2.1 INSULATION MATERIALS

2.1.1INSULATION FASTENERS
2.1.1.1 Use Self Adhesive Aluminum Foil Tapes complying with recommendations by the manufacturer of the approved insulating material. Minimum width of tape shall be 75mm to ensure proper fastening. Holding power shall be 1,50+Min in compliance to test method PSTC-7. Peel adhesion shall be at 20N/25mm in compliance to PSTC-1 test methods.
2.1.1.2 For metal assemblies, comply with metal fasteners as specified in the metal fabrication section.

2.1.2MINERAL WOOL
2.1.2.1 Use ASTM E-84, Class A, non-combustible, fire retardant wool with aluminum foil on one side.
2.1.2.2 Encase mineral wool in Metal Furring Assemblies and/or built up steel assemblies with one or two faces using 10mm square welded wire mesh, primed and painted. Comply with metal fabrications division of this specifications.
2.1.2.3 Aluminum on foil side shall be foil-scrim-kraft or foil-scrim-polyethylene vapor retarder with maximum flame spread of 25 and smoke development index of 5.

2.1.3THERMAL INSULATION FOR SHEET METAL ROOFING UNDERSLAB
2.1.3.1 Use fire-resistant Aluminum Foil Scrim Kraft Paper with three-way fiberglass scrim; actual thickness 150 microns or 85 gsm, 1200mm X 120,000mm in standard length (one roll); silver color.
2.1.3.2 Minimum reflectivity of the surface material shall be 95%.
2.1.3.3 Burst strength of insulation material shall at least be 30N/cm2, compliant with ASTM D774.
2.1.3.4 Temperature resistance shall be compliant with ASTM C1263.
2.1.3.5 Water Vapor Permeability shall be at 5.75/N.s
2.1.3.6 Tensile strength of material shall be MD-130N/25mm or XD-50N/25mm compliant with ASTM D828.
2.1.3.7 Install using a metal-assembly of angle bars, flat bars, and 10mm square welded wire mesh, primed and painted in dimensions as recommended by the manufacturer and approved by the architect.

3. PART 3 EXECUTION

3.1 PREPARATION AND EXAMINATION

3.1.1Obtain installer's requirements and conditions for installations. Check that area to receive installation is ready to receive insulation work. Together with installer, inspect that all bolts, anchors, and fasteners for sheet metal roofing are stable and ready to receive work.
3.1.2For wool and metal assemblies for thermal and acoustic insulation in mechanical equipment areas, check that the installation schedule shall not disrupt critical schedules of testing and other construction work.

3.2 INSTALLATION

3.2.1Comply with the installation requirements and instructions by the manufacturer of approved material insulation.
3.2.2Do not pierce or cut through insulation material aluminum facing. When faces are accidentally cut, replace damaged sheets.
3.2.3Single-layer installation of insulation sheets is acceptable provided installed work is free of tears and damages.
3.2.4Do not install torn insulation sheets.
3.2.5For mineral wool, ensure that the wool density is sufficient to absorb above level acoustic noise. Comply with ASTM C 1015 and manufacturer's written instructions.
3.2.6Separately prime and paint metal assemblies prior to installation of insulation whether under sheet metal roofing or on horizontal and vertical surfaces of rooms with mechanical equipment. Comply with Division 9 Interior Paints Section of this specifications for painting requirements. Only paint touch ups are allowable upon installation.
3.2.7Do not smear finishing paint on insulation material. Completed insulation installation shall be clean, and free of smears and other unwanted smudges. Restore all affected insulation sheets as needed.
3.2.8All metal assemblies supporting insulation shall be primed with red oxide, and non-gloss painted elastomeric paint, black color unless otherwise indicated on drawings and approved by architect. Comply with paint division of this specifications.
3.2.9All metal assemblies supporting insulation work shall be fabricated according to approved shop drawings.
3.2.10 When using mineral wool, do not place insulation assemblies near lighting fixtures and other electrical equipment not fire rated or protected from contact with insulation material.
3.2.11 All aluminum facing shall be set placed towards areas of high humidity.
3.2.12 Where there are openings such as windows, access panels, duct ends, electrical devices and boxes, ducts, air registers, and any such similar openings, neatly cut the insulation sheets such that these openings are not obstructed and are able to function, Show all opening locations on shop drawings. Neatly seal by manufacturer-approved adhesive tape the cut insulation sheets to ensure adhesion to nearby surfaces. Maintain visual neatness of installation.

3.3 PROTECTION

Protect installed insulation from weather exposure and other construction work that exposes it to damages. Schedule insulation installation work such that no critical construction work conflicts with its installation.

END OF SECTION

07 00 00	DIVISION 7 THERMAL AND MOISTURE PROTECTION	
07 60 00	Sheet Metal Roofing	

1. PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

This section includes provisions on Sheet Metal Roofing, where indicated by the architect as referenced in the technical working drawings.

1.3 RELATED SECTIONS

1.3.1Metal Fabrications
1.3.2Exterior Painting

1.4 GENERAL PROVISION

1.4.1Only use pre-painted metal sheet and roofing accessories fabricated from cold rolled galvanized iron sheets tempered for extra strength and durability; compliant with PNS 67:2014 Hot-dip Metallic-Coated Steel Sheets for Roofing.
1.4.2Coordinate with structural designer to comply with purlin spacing requirements by manufacturer.
1.4.3Comply with ASTM A653/A653M, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
1.4.4Length of sheets shall be long span, cut to lengths approved by the architect. Comply with special lengths for roof span exceeding 18000mm. Sheet metal roofing shall be homogenous when possible.
1.4.5Comply with profiles, thickness, and desired colors as approved by the architect.
Utilize Gauge Designation as follows:

1.4.5.1 BASE METAL THICKNESS, DESIGNATED GAUGE
1.4.5.1.1 0.400 mm thick, Gauge 28
1.4.5.1.2 0.500 mm thick, Gauge 26
1.4.5.1.3 0.600 mm thick, Gauge 24
1.4.5.1.4 0.800 mm thick, Gauge 22

1.4.5.2 PROTECTIVE COATINGS, THICKNESS
1.4.5.2.1 Zinc shall be minimum14 microns, (100 gm/ni)
1.4.5.2.2 Paint coatings Top coat shall be 15.20 microns thick
1.4.5.2.3 Paint coatings Bottom coat shall be 6.8 microns thick

1.4.5.3 BASE METAL THICKNESS, OVERALL THICKNESS WITH PROTECTIVE COATS
1.4.5.4 0.400 mm, with thickness 0.427-451 mm
1.4.5.5 0.500 mm, with thickness 0.532-551 mm
1.4.5.6 0.600 mm, with thickness 0.638-651 mm

1.5 MAINTENANCE

Protect paint and galvanized coating of sheets via proper handling.

1.6 SUBMITTALS

1.6.1PRODUCT APPROVAL ATTACHMENTS
1.6.1.1 Submit all product data sheets, material safety data sheets, and technical specifications.
1.6.1.2 Submit all product and manufacturer certificates.
1.6.1.3 Submit Product samples at 300mm x 300 mm of each sheet metal material
1.6.1.4 Submit Manufacturer's written instructions for handling, installation, and cleaning.

1.6.2EXECUTION APPROVAL ATTACHMENTS
1.6.3Detailed work methodology
1.6.4Shop drawings, namely roof plan indicating boundaries and location of finish area and detailed drawings of connections for rolls, ridges, hips and valleys, gutters, and other special connections as required to complete roofing installation and as indicated in technical working drawings. Show purlin distances, riveting details and/or any applicable fastening method. Submit these drawings to both architectural and structural consultants.

1.7 QUALITY ASSURANCE
1.7.1Only engage installers with specific training experience in installing sheet metal roofing works.
1.7.2Installers shall be supervised by the manufacturer's technical representative.
1.7.3Only source material from one manufacturer to ensure uniform application. Coordinate construction schedules properly to ensure timely completion.
1.7.4Only source materials from tried and tested manufacturers with minimum of five year satisfactory performance in the field of roofing systems.
1.7.5Metal roof panel systems shall have no water leakage tested compliant to ASTM E1646.
1.7.6All sheet panels shall be designed such that it is capable of supporting 140kgs temporary concentrated loads at mid-span in installed conditions, unless otherwise specified by the structural designer.

1.8 WARRANTIES
1.8.1Warranty period by manufacturer shall at least be two (2) years from Substantial Date of Completion.

2. PART 2 PRODUCTS
2.1 METAL ROOF PANELS
2.1.1Use Rib-Type, standard nominal dimensions, seam type, and thickness by manufacturer as specified and approved by architect.
2.1.2Base metal type shall be Galvalume steel sheet, G90, conforming to ASTM A653, Galvalume steel sheet AZ50, conforming to ASTM A792 for painted and unpainted panels, Galvalume steel sheet AZ55, conforming to ASTM A792 for unpainted panels.
2.1.3Texture of surfaces shall be smooth. Follow finish on sample approved by architect.
2.1.4Color Fading shall not be more than 5 Hunter, tested according to ASTM D 2244.
2.1.5Chalking shall not be in excess of a No.8 rating, tested according to ASTM D 4214.
2.1.6Solar Reflectance Index shall be calculated according to ASTM E 1980.
2.1.7Fire Classification shall be Class A-90.

2.2 ACCESSORIES AND FASTENERS
2.2.1Color and material of all accessories and fasteners shall be uniform to that of approved sample.
2.2.2Use Rubber-Asphalt sealing compound, compliant to CAN/CGSB-37.29.
2.2.3Cleats shall be of same material and temper sheet metal, minimum 50mm wide with thickness or gauge as approved/ indicated by the architect in the technical working drawings.
2.2.4Conceal all fasteners, unless otherwise indicated or approved by the architect.

2.3 LONG SPAN ROOFING (CRIMP LOK SYSTEM)
This item is specified particularly for continuous roofing with a span beyond 18M, unless otherwise specified by the architect.
2.3.1Base metal type shall be Cold Rolled Steel; 275 MPa or 40,000 psi.
2.3.2Substrates shall be Galvalume 55, Aluminum-Zing Alloy-coated steel complying with ISO 9364.
2.3.3Paint coating shall be oven-baked epoxy primer and regular polyester finish.

2.3.4Top coating shall be 25 microns thick.
2.3.5Finish coating shall be 20 microns thick.
2.3.6Primer coat shall be 5 microns thick
2.3.7Bottom coat shall be a total of 10 microns, composed of backing coat at 5 microns and primer coat at 5 microns.
2.3.8Total thickness of metal sheet shall be from 0.40mm to 0.60mm, using a seam lock process of 180 degrees.
2.3.9Metal sheet shall withstand Salt Spray Test with a Class 1000 rating as per PNS 201:1990.
2.3.10 Texture of surfaces shall be smooth. Follow finish on sample approved by architect.

3. PART 3 EXECUTION
3.1 EXAMINATION AND PREPARATION
Engage a technical representative from the manufacturer of the approved product to check actual site conditions, whether compliant to manufacturer's prerequisites for installation. Conduct a pre-installation on-site conference and product inspection.

3.2 INSTALLATION
3.2.1Follow approved shop drawings for spacing of cleats, alignment of panels, flashing details, and other drawing indications.
3.2.2No cleat shall be spaced beyond 600mm apart measured on center.
3.2.3Form all seams in direction of the water-flow.
3.2.4Ensure water tightness of all seams.
3.2.5Begin installation of metal panels at the eaves, or at the lowest slope point of the roofing. Loose lock pans to valley flashing and edge strips at eaves and gable rakes.
3.2.6Observe lap requirements by manufacturer.
3.2.7Form valleys of sheets not exceeding 3 m in length. Lap joints 150 mm in direction of flow. Extend valley sheet minimum 150 mm under roofing sheets. At valley line, double fold valley and roofing sheets and secure with cleats spaced 450 mm oc.

END OF SECTION

07 00 00	DIVISION 7 THERMAL AND MOISTURE PROTECTION	
07 92 0	Joint Sealants	

1. **PART 1 GENERAL**

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

1.2.1This section includes provisions on joint work in the following areas:
1.2.1.1 Exterior and interior joints between all fenestration frames, i.e. louvers, doors, windows, skylights, and similar fenestration components and wall masonry.
1.2.1.2 Exterior and interior joints for concrete pavement and flooring.
1.2.1.3 Exterior and interior joints for unit pavers and pre-cast concrete curbs.

1.3 RELATED SECTIONS

1.3.1Architectural Concrete

1.4 GENERAL PROVISION

1.4.1Use airtight and watertight elastomeric joint sealants.
1.4.2Provide joint sealants where indicated on technical working drawings and in standard areas for joint sealing, unless otherwise specified by the architect.
1.4.3Unless otherwise indicated on drawings, joint sealers shall match the color and type of the adjacent finish.
1.4.4Do not install joint sealers in ambient and substrate temperatures not within the recommendations of the manufacturer. Do not install joint sealers when substrates are wet due to rain or other condensation.
1.4.5Remove all contaminants on the substrate that affect the adhesion of joint sealers.
1.4.6Comply with manufacturer's requirements on required width of joints for accepting joint sealers.
1.4.7Install all joint sealers within 21 to 30 days from completion of waterproofing work.
1.4.8Provide fire-resistant joint sealers in areas prone to combustive behavior, namely utility areas, electrical rooms, and service chutes.
1.4.9Where applicable, bond breaker tapes shall be utilized to prevent adhesion to rigid surfaces that can cause sealant failure.
1.4.10 Use non-staining absorbent type masking tapes compatible with joint sealant surfaces.

1.5 MAINTENANCE, DELIVERY, STORAGE, AND HANDLING

1.5.1Deliver all joint sealing products in sealed containers, complete with labels and instructions. Containers with tampered seals shall not be accepted.
1.5.2Comply with manufacturer's instructions for proper storage of all joint sealing materials.
1.5.3Ensure that cleaners use chemical cleaners of type and make compatible to the joint sealant used.

1.6 SUBMITTALS

1.6.1PRODUCT APPROVAL ATTACHMENTS
1.6.1.1 Submit samples of all joint sealers in exposed areas. Ensure that the color of the joint sealer is approved by the Architect. Indicate area of application on the sample submittal. Include a list of alternative colors as provided by the manufacturer.
1.6.1.2 Submit product data for all joint sealer products required. Include technical data and material safety data sheets, indicating proper methods for storage and application.

1.6.1.3 Copies of product warranties.

1.6.2EXECUTION APPROVAL ATTACHMENTS
1.6.2.1 Detailed work methodology indicating date and time of application.

1.7 WARRANTIES

Warranties shall not cover damages due to structural movements, such as settlement. However, all joint sealers are expected to be of quality and shall not showing any marks of disintegration for at least 5 years from the date of the Substantial Completion of the project.

2. **PART 2 PRODUCTS**

2.1 GENERAL MATERIALS

2.1.1Ensure that all joint sealers, fillers, and related materials are compatible with joint substrates and waterproofing materials. Check manufacturer's recommendations and comply with instructions on proper handling of materials.
2.1.2For liquid-applied Elastomeric Sealants, comply with ASTM C 920.
2.1.3Elastomeric sealants in areas continually exposed to water shall comply with ASTM C 1247.
2.1.4Elastomeric sealants in areas continually exposed or in contact with food shall comply with 21 CFR 177.2600.
2.1.5All sealants shall be UV resistant, non-chalking, non-staining, non-yellowing, self-cleaning, dirt pick resistant, and chemical resistant.
2.1.6For seals required in toilets and kitchens, i.e. sanitary seals, control and expansion joints, joints between mirrored glass and plywood backing, joints between stone countertops, and other joints required in sanitary areas, use mildew-resistant silicon sealant, formulated with fungicide and algaecide, and shall be intended for sealing interior joints with non-porous substrates.
2.1.7For sealing vertical joints on exposed surfaces in interior applications, i.e. interior unit masonry, concrete walls and partitions, joints between glazed aluminum frames and masonry at interiors interior steel door frames, masonry termination, ensure that joint sealers are paintable, with fungicide and algaecide. Sealers shall be capable of withstanding movement at +/-50 and shall be compliant to ASTM C 719.
2.1.8Use acoustical sealants for concealed joints where needed. Acoustical sealants shall be non-drying, non-hardening, non-skinning, non-staining, and gunnable.
2.1.9Where compression seals are necessary, use pre-formed Hollow Neoprene Gaskets. Comply with ASTM D 2628.
2.1.10 Fire resistant joint sealers where needed shall be compliant to ASTM E 814 and considered acceptable by the inspecting agency of the locality where the project is located.

3. **PART 3 EXECUTION**

3.1 EXAMINATION AND PREPARATION

3.1.1Examine that indicated areas of application are compliant to the manufacturer's conditions.
3.1.2Comply with manufacturer's requirements on surface area preparations of areas to receive joint sealers.
3.1.3Remove all foreign material affecting adhesion of joint sealers to indicated area of application.
3.1.4Clean receiving areas by brushing, grinding, blast cleaning, and other methods necessary to remove loose particles.
3.1.5Remove all forms of laitance.
3.1.6Use appropriate chemical cleaners for surfaces such as metal, glass, porcelain enamel. Glazed ceramic, and other similar non-porous surfaces. Ensure that chemical cleaners are compatible with both the receiving area and the joint sealers.
3.1.7Prime joint substrates where recommended by manufacturer.
3.1.8Use masking tape where needed to prevent unwanted contact of sealant onto adjoining surfaces. Carefully remove making tapes after tooling. Take care to keep applied joint seals undisturbed.

3.2 INSTALLATION OF SEALERS

3.2.1Comply with manufacturer's instructions to applicable products and areas of application.
3.2.2Comply with recommendations of ASTM C 962 for use of joint sealants as applicable.
3.2.3For Acoustical Sealants, comply with recommendations of ASTM C 919 as applicable.

3.2.4Do not leave gaps between joint fillers.
3.2.5When handling, do not stretch, puncture, twist, or tear pre-formed joint fillers.
3.2.6Use bond breaker tapes between sealants and joint fillers, compression seals, or back of joints.
3.2.7Begin tooling of non-sag sealant immediately before setting and curing begins, unless otherwise instructed by the manufacturer.
3.2.8When tooling, form smooth, uniform heads to eliminate air pockets. Remove excess sealant from adjacent surfaces. Do not use tooling agents that damage the sealant or adjacent surfaces. Provide concave and flushed joints, unless otherwise indicated in drawings.
3.2.9When installing pre-formed foam sealants, install immediately after removal of protective wrapping. Do not stretch, twist, or pull the material. Ensure continuity between ends, turns, and intersections of joints. When applying during low temperatures, apply heat to sealant as needed following prescriptions by manufacturer.
3.2.10 Install all gaskets within tolerances and conditions allowed by the manufacturer. Use the appropriate adhesives and when required, always provide watertight joints.
3.2.11 For fire-stopping sealants, comply with installation requirements established by the testing and inspecting agency.

3.3 CLEANING AND PROTECTION
3.3.1Remove excess sealant and smears adjacent to joints. Only use appropriate cleaning materials.
3.3.2Protect accomplished joint sealer work during and after curing period.
3.3.3In case of damages before the time of Substantial Completion, remove damaged and deteriorated portions but cutting and immediately replace and reseal with new materials such the original work and repair work is indistinguishable.

END OF SECTION

08 00 00	DIVISION 8 DOORS, WINDOWS, and OPENINGS	
08 11 0	Steel Doors and Frames	

1. PART 1 GENERAL

1.1 RELATED DOCUMENTS
1.1.1Technical Architectural Drawings
1.1.2Specifications
1.1.3Requests for Interpretation
1.1.4Product Samples and Brochures
1.1.5Manufacturer's Data Sheets and Certificates
1.1.6Material Safety Data Sheets
1.1.7Work Program and Methodology Submittals
1.1.8Finish Hardware Schedule and Door Schedule
1.1.9Schedule of Doors and Windows

1.2 SUMMARY
1.2.1This section includes provisions on both fire-rated and non-rated Wooden Doors, Steel Doors, Steel Door Frames, Louvers, and Vision panel assemblies.

1.3 RELATED SECTIONS
1.3.1Joint Sealants
1.3.2Door Hardware
1.3.3Glazing

1.4 GENERAL PROVISION
1.4.1Check all door assembly requirements on the technical working drawings. Check quantities according to types of door assemblies. In case of discrepancies, submit a request for interpretation to the Architect. Do not place final orders for door assemblies without approval and verification from the architect.
1.4.2Verify actual dimensions of all openings through field measurements and indicate on shop drawings based on actual conditions. Ensure the door fabrications shall be consistent with actual dimensions. Indicate actual dimensions of pre-installed anchorages and indicate on shop drawings.
1.4.3Manufacturers shall provide complete instructions on anchorage requirements for door assemblies. Contractor to comply with manufacturer's requirements.
1.4.4Provide proper labels on all doors. Indicate fire rating, location, and testing results according to ratings required. Do not paint over door labels. All labels shall be affixed by the manufacturer.

1.5 MAINTENANCE, DELIVERY, STORAGE AND HANDLING
1.5.1All Door Assembly deliveries shall be completely protected by crates, cardboard wrapping, or other means of protection as warranted by the manufacturer.
1.5.2Inspect doors and frames upon delivery. Do not accept damaged deliveries and do not accept deliveries inconsistent with drawing requirements.
1.5.3Storage of delivered door assemblies shall be completely weather protected. Use appropriate wood blockings and take care to store door assemblies according to the manufacturer's requirements. Do not store door assemblies in areas with high humidity and other areas that can affect the quality of the finish.

1.6 SUBMITTALS

1.6.1PRODUCT APPROVAL ATTACHMENTS
1.6.1.1 Detailed Shop drawings of each type of door indicated in the drawings as listed according to the Schedule of Doors. Be sure to indicate door designation, type, location of door installation, model of door, material description, core description, construction details, label compliances, sound and fire resistance ratings and finishes.

1.6.1.2 Shop Drawings shall include elevations of each door design, door details, frame details for each frame type, shall be drawn to scale, with proper dimensions, complete with indications for locations of reinforcement and preparations for hardware, anchorages, accessories, joints and connections, glazing frames, and other glazing requirements.

1.6.1.3 Submit painted steel swatches from manufacturer's color charts following the color indicated in the drawings. Submit samples for each type of exposed finish not less than 75mm X 125mm in size and must be of the same thickness as the actual material.

1.6.1.4 Submit glazing samples with complete description of glazing performance.

1.6.1.5 Use the same door designation as indicated in the drawings.

1.6.2EXECUTION APPROVAL ATTACHMENTS

1.6.3Detailed work methodology indicating manufacturer's instructions for installing anchorages, sleeves, concrete inserts, anchor bolts, and other similar items.

1.7 QUALITY ASSURANCE

1.7.1Engage manufacturers with significant experience in completing projects of the same size and scale as of the project.

1.7.2Ensure material and assembly consistency.

1.7.3Manufacturers shall have good records in on-time delivery, provides support services in installation demonstration, and with good after-sales service records.

1.7.4Only source required metal door assemblies from a single manufacturer unless manufacturer is proven to be a poor performer.

1.7.5No door assembly from two different manufacturers shall be allowed for installation on site unless the door assemblies are proven consistent and similar in make to the approved shop drawings. Submit new shop drawings for every manufacturer.

1.8 WARRANTIES

Material and installation of door assemblies shall be warranted for two (2) years.

2. PART 2 PRODUCTS

2.1 FINISHES

2.1.1Comply with finish color and texture as indicated and required in the technical working drawings.

2.1.2All steel doors and frames shall have a layer of factory-applied, rust-inhibiting primer. Comply with ANSI A250.3 for performance and acceptance criteria.

2.1.3Final paint finish of the door assembly shall be factory-applied. Comply with ANSI A250.3.

2.1.4In case of damages during handling on site, restore finishes to its original condition as delivered.

2.1.5For fire rated doors, manufacturer shall provide one-coat of baked-on prime coat paint.

2.1.6Primers shall be of rust-inhibitive enamel or paint, applied vie air-dry or baking.

2.2 STEEL DOORS

2.2.1For both fire-rated and non-rated fire doors, use GA No.18 Steel for all door faces and use Ga. No. 16 Steel for hinge and lock rails, and top and bottom channels.

2.2.2All doors both non-fire rated and fire-rated steel door and access door systems shall comply with ANSI/SDI 100.

2.2.3Hot-rolled steel sheets used as material for door facing shall comply with ASTM 569/A 569M, Commercial Steel (CS), Type B. All sheets shall be free of scale, pitting, and other surface defects.

2.2.4Cold-rolled steel sheets used as material for door facing shall comply with ASTM A 366/A 366M, Commercial Steel (CS), Type B, stretcher-leveled.

2.2.5Metallic-Coated Steel Sheets used as material for door facing shall comply with ASTM A 653/A653M, Commercial Steel (CS), Type B with A40 (ZF120) zinc-iron alloy galvanized coating, stretcher-leveled.

2.2.6Only use electrolytic Zinc-Coated Steel Sheet for unexposed applications. Comply with ASTM A 591/A 591M, Commercial Steel (CS), Class B coating.

2.3 FABRICATION

2.3.1Prepare doors to receive specified hardware, i.e. lock rails, door handles, door sills.

2.3.2Unless otherwise indicated, all doors shall be 44mm thick as measured from finish to finish of top and bottom channels and rails.

2.3.3Comply with ANSI A250.8.

2.3.4Fabricate steel door and frame assemblies to be rigid, neat, and free from warps, buckling, and other defects visually affecting its appearance. Close top and bottom edges of doors such that fabrication is integral.

2.3.5Square off all edges unless otherwise required.

2.3.6For allowable tolerances, comply with SDI 117

2.3.7Provide for countersunk flat or oval heads for exposed screws and bolts.

2.3.8Comply with ANSI A115 series specifications for door and frame hardware preparation. Prepare doors and frames to receive concealed finish hardware. Provide cutouts, reinforcements, spaces, and other similar provisions as applicable.

2.3.9For frames, fabricated with mitered corners. Continuously weld until face is seamless. Mechanically interlock or continuously weld stops and rabbets. Comply with ANSI/SDI 100.

2.3.10 Allowable clearances shall be as follows:

2.3.10.1	Jambs and heads	3.2mm
2.3.10.2	Between pairs of doors	6.4mm
2.3.10.3	Bottom of door	19mm

2.4 GLAZING, HARDWARE AND ACCESSORIES

2.4.1Provide a minimum of four anchors for each door jamb. Wall to jamb anchors shall be located opposite each other and in same relative position on side jambs.

2.4.2Provide floor anchors drilled for at least 9mm at bottom of each jamb member.

2.4.3For zinc-coated inserts, bolts, and fasteners, refer to manufacturer's standard units and comply with ASTM A 153, Class C or D as applicable.

2.4.4Provide weather-stripping and sound-stripping for jambs, heads, and sills as shown on drawings.

2.4.5All glazing for vision panels shall be of wired, safety glass as indicated in schedules.

2.4.6Provide Astragals as required by NFPA 80 for fire rated spaces.

2.4.7Provide for door louvers where indicated.

2.4.8Provide door silencers where required.

3. PART 3 EXECUTION

3.1 GENERAL INSTALLATION

3.1.1Comply with manufacturer's requirements for general installation procedures

3.1.2Comply with SDI 105.

3.1.3Comply with NFPA 80.

3.1.4Set frames in accurate positions. Plumb, align and brace securely until permanent anchors are set.

3.1.5Remove temporary braces and spreaders upon completion of installation.
restore all damaged surfaces.

3.1.6Provide at least three wall anchors per jamb. Use acceptable masonry wire and T-anchors where needed.

3.1.7Always install additional anchors for door assemblies higher than the standard 2100mm height.

3.1.8For smoke-control doors, comply with NFPA 105.

3.2 CLEANING AND ADJUSTEMENTS

3.2.1Restore all surfaces damaged during installation. Smooth any rusted or damaged areas.

3.2.2Remove protective wrappings upon substantial completion of project.

END OF SECTION

08 00 00	DIVISION 8 DOORS, WINDOWS, and OPENINGS	
08 21 1	Flush Wood Doors	

1. **PART 1 GENERAL**

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

This section includes provisions on door specifications for the following areas:
1.2.1Solid –core and Hollow-core doors with laminated facing situated in Toilet, Service Areas, and other areas as specified in the technical working drawings.
1.2.2Other wooden doors as needed on the project.

1.3 RELATED SECTIONS

1.3.1Division 6 Wood and Plastics Rough Carpentry
1.3.2Division 6 Interior Architectural Woodwork
1.3.3Division 8 Door Hardware

1.4 GENERAL PROVISION

1.4.1Submit Shop Drawings for approval prior to purchase from manufacturer and production of door assemblies for delivery.
1.4.2For Fire rated doors, comply with NFPA 80.
1.4.3Comply with hardware requirements. Double check door hardware schedule

1.5 MAINTENANCE, DELIVERY, STORAGE

1.5.1All door assemblies delivered shall be properly protected and accurately labeled according to its location and type of handle. Door quantities shall be consistent with requirements on the technical working drawings.
1.5.2Store delivered doors according to standards specified by the manufacturers in their written instructions.
1.5.3Store doors in dry, weather-protected areas. Ensure that storage areas are weather tight.
1.5.4Do not deliver doors during bad weather.

1.6 SUBMITTALS

1.6.1PRODUCT APPROVAL ATTACHMENTS

1.6.1.1 Submit product data for each type of door. Declare core details, material and construction of edge, factory-finish and colors.

1.6.1.2 Samples at least 200mm X150mm, of actual thickness for each material finish and wood specie. The sample should be a complete assembly using actual glue and wood for use in the project site, reflecting actual laminate to be used for approval. Include brochures for laminate options and other samples for finish choice. Samples shall be cut from the corner portion of the door.

1.6.2EXECUTION APPROVAL ATTACHMENTS
1.6.3Detailed work methodology on installation and restoration instructions.
1.6.4Shop drawings indicating location, size, actual dimensions of openings on site, hand of each door, elevations, construction details, and required hardware blocking. Show location of mortises and holes for hardware, anticipate cut-outs for hardware.

1.7 QUALITY ASSURANCE

1.7.1Only engage the services of qualified manufacturers with punctual delivery records and quality products.
1.7.2Only obtain flush wood doors from a single manufacturer. In case of a change of manufacturers, ensure approval of new samples.
1.7.3Manufacturers shall properly label all doors in accordance to specifications in the technical working drawings.

1.8 WARRANTIES

1.8.1Manufacturer's warranty should include an agreement to repair or replace door assemblies with workmanship and material issues. Material issues include all forms of warping of core and/or face veneers.
1.8.2All doors shall be guaranteed of good quality for at least two (2) years from date of Substantial Completion.

2. **PART 2 PRODUCTS**

2.1.1INTERIOR SOLID-CORE DOORS

2.1.1.1 Exposed Vertical and top Edges shall be of closed-grain hardwood.
2.1.1.2 Core shall be glued wood stave or structural composite lumber.
2.1.1.3 Stiles and rails shall be bonded to the core, and the entire door face, planed abrasively prior to veneering.
2.1.1.4 Performance Grade shall be Heavy-Duty, WDMA I.S. 1-A.
2.1.1.5 Door thickness shall be 44mm.
2.1.1.6 Fire rating of Interior Solid-Core Doors shall not be less than 45minutes, unless otherwise required by the architect.

2.1.2INTERIOR HOLLOW-CORE DOORS

2.1.2.1 Use premium grade facing, with exposed vertical and top edges of any closed-grain hardwood, standard duty. Compliant to WDMA I.S.1-A.
2.1.2.2 Door thickness shall be 44mm.

2.1.3HEAVY DUTY FIRE-PROTECTION-RATED DOORS

2.1.3.1 Door material shall not contain urea formaldehyde, with mineral core specified according to required fire-protection. Stiles, edges, and astragals where needed shall also be of fire-retardant materials. Complete assemblies with intumescent seals.
2.1.3.2 Color and finish of edges and astragals shall be of the same color as the door facing unless otherwise specified.
2.1.3.3 Mineral-core doors shall be of non-combustible mineral product with 125mm blocking for top-rail, mid-rail, and bottom-rail.

3. **PART 3 EXECUTION**

3.1 EXAMINATION AND PREPARATION

3.1.1Check delivered door assemblies and match with appropriate openings. Check swings and handle requirements. Double check plumb jambs. Reject assemblies not fit to project requirements.
3.1.2Ensure that openings are ready to accept door installation.
3.1.3Check finishes of doors to be free from imperfections. Do not install doors that are not finished according to the approved finish.

3.2 INSTALLATION

3.2.1Comply with manufacturer's written instructions and NFPA 80 for installation procedures.
3.2.2Seal edges of doors, cutouts, and mortises after fitting and machining.
3.2.3Ensure alignment and correct fit of doors. All clearances shall be uniform and beveled as indicated on drawings or as specified:

3.2.3.1 Provide 3.2mm clearances at heads, bottom of doors to top of finish, jambs, and between pairs of doors.
3.2.3.2 Where a threshold is required, provide 6.4mm clearances between bottom of door and top of threshold. Provide a door bottom seal.
3.2.3.3 Bevel all doors at 3 ½ degrees along the lock and hinge edges.

3.2.3.4 Test swinging of doors and ensure that operation is free and smooth. Re-hang or replace door assemblies otherwise.
3.2.3.5 Install hardware appropriate hardware. Refer to Division 8 "Door Hardware" for details.
3.2.3.6 Clean and restore all door surfaces and finishes damaged during installation back to original conditions.

END OF SECTION

08 00 00	DIVISION 8 DOORS, WINDOWS, and OPENINGS	
08 42 00	Entrances	

1. **PART 1 GENERAL**

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

1.2.1This section includes provisions on aluminum framed doors for entrances as specified on technical working drawings. Verify door specifications on drawings.

1.3 RELATED SECTIONS

1.3.1Hardware
1.3.2Glazing

1.4 GENERAL PROVISION

1.4.1Comply with door specifications as indicated in the technical working drawings. Aluminum-framed doors powder coated aluminum metal. Submit brochures, samples/ shop drawings showing door assemblies drawn to scale for the approval of the architect.
1.4.2Do not install handles on aluminum.
1.4.3All aluminum frame members shall withstand minimum 25psf wind load and shall be provided with internal reinforcing if necessary.
1.4.4Use EPDM Rubber between glazing and framing.
1.4.5Include top and bottom mohair in assembly.
1.4.6Only use H-type handles, installed vertically.
1.4.7Only use lever-type door locks.
1.4.8Comply with manufacturer's standards for the structural attachment of framing members.
1.4.9Use standard pivot hinges.
1.4.10 Use heavy-duty soft-closing door closers. Install alongside the top rail.
1.4.11 Use heavy-duty deadbolt locksets with keying mechanisms to be installed at the bottom rail only.
1.4.12 All exposed areas shall be finished with a Class 1 electrolytically deposited color in clear anodized finish.

1.5 MAINTENANCE, DELIVERY, STORAGE, AND HANDLING

1.5.1Protect installed and finished doors with strippable membrane, with proper markings for safety. Keep membrane on glass until substantial completion of project.
1.5.2Upon substantial completion, restore glazing and thoroughly clean glass surface.
1.5.3Comply with manufacturer's lead-time requirements.
1.5.4All materials shall be delivered in protective packaging, sealed, undamaged, and properly labeled. All labels shall indicate precise location and orientation of doors. Handle all deliveries with care.
1.5.5Maintain temperature, humidity, and ventilation on site and storage area within recommended limits by the manufacturer.
1.5.6Adjust all moveable parts until operation is ensured smooth and safe prior to acceptance.
1.5.7Label all keys to match all doors prior to turn-over.

1.6 SUBMITTALS

1.6.1PRODUCT APPROVAL ATTACHMENTS
1.6.1.1 Submit data on manufacturing and installation details.

1.6.1.2 Submit product data on fasteners and sealants.
1.6.1.3 Submit sample section cuts showing final finish and profile of framing material. Do not manufacture and install on site without approval from the architects. Sample profiles shall be cut in 200mm lengths. The sample profile should be submitted as a complete assembly showing the corners of the door. Do not submit disintegrated samples.
1.6.1.4 Submit sample cuts of glazing material at least 200mm X 200mm. Show true color and make of glazing. Only approved glazing can proceed with fabrication and site installation.
1.6.1.5 Submit shop drawings of all profiles cut at the jamb, head, lock-stile. Indicate nominal thickness of all aluminum sections to be used in the assembly. No aluminum section shall be less than 1.2mm thick.

1.6.2EXECUTION APPROVAL ATTACHMENTS
1.6.2.1 Submit design calculations and shop drawings. Properly label dimensions and material specifications for each part. Indicate location and specification of hardware and fastener. Indicate door assembly labels and areas of installation.
1.6.2.2 Submit detailed work methodology indicating order of installation of the assembly.
1.6.2.3 Submit restoration procedures upon completion of work.

1.7 QUALITY ASSURANCE
1.7.1Only source door assemblies from experienced manufacturers with good records in the timely delivery and installation of door assemblies. Manufacturer shall be capable of providing field services during and after construction.
1.7.2Only source aluminum door assemblies from one manufacturer/ a single source.
1.7.3Only engage installers with specialized expertise in the installation of door assemblies in a project size and scope similar to the project.
1.7.4Conduct pre-installation walk thru meetings to inspect readiness of installation area.
1.7.5Provide a mock-up installation complete with surface preparation techniques. Have the mock-up approved prior to complete installation.
1.7.6Do not proceed with work when assemblies delivered have defects due to workmanship, color, finish, sheen, and other conditions degrading the quality and appearance of the material.
1.7.7Do not conduct installation works in environmental conditions not recommended by the manufacturer.
1.7.8Comply with manufacturer's prescribed tolerances.

1.8 WARRANTIES
1.8.1Ensure two (2) year warranty beginning after the date of substantial completion. Warranty shall include replacement and repair of defective units or hardware installed.
1.8.2In case of breakage of glass due to improper safety management, the contractor shall replace all breakage.

2. PART 2 PRODUCTS
2.1 ENTRANCE DOORS
2.1.1Use aluminum frames compliant with ASTM B221; 6063-T5 and T6 alloy and temper. Major load-supporting aluminum sections shall be of minimum 3mm nominal thickness. No aluminum section with a supporting function in the assembly shall be lesser than 1.2mm thick, unless otherwise approved by the architect.
2.1.2All storefront doors shall comply as indicated on technical working drawings.
2.1.3All storefront doors situated along the faculty rooms shall be standard pre-assembled storefront system complete with narrow door stiles.

2.2 GLAZING
2.2.1All glazing shall be minimum 6mm thick, shall be impact-resistant, and adhered with weatherproof silicone sealants, and weatherproofed extruded EPDM glazing gaskets.
2.2.2All glazing shall be free of warp and twist
2.2.3Refer to Section 08810 Glass and Glazing requirements

2.3 ACCESSORIES
2.3.1DOOR STOPS: Install heavy duty flooring door stops to match all operable door leafs. Use heavy duty floor stops of steel chrome, hairline finish installed at flooring.
2.3.2DOOR SWEEPS AND DRIP CAPS: Equip all aluminum storefront doors with door sweeps and drip caps.

2.3.3WEATHERSTRIPPERS/ JAMB SEALS: Install weather strippers to seal doors at meeting stiles for pairs of doors, door tubing, and astragals.
2.3.4LATCH HANDLES: Only use lever-type door handles with finish matching the storefront finish. Submit samples and brochures of cylinder locks to be used to the architect for approval.
2.3.5CYLINDER LOCKS: Only use cylinder locks as locking mechanisms unless otherwise approved by the architect. Submit samples and brochures of cylinder locks to be used to the architect for approval.
2.3.6HINGES: Only use offset-pivot hinges installed according to manufacturer's prescriptions.

3. PART 3 EXECUTION
3.1 INSTALLATION AND PREPARATION
3.1.1Only uncrate/unpack delivered door assemblies upon commencement of installation. Check labels to match indicated location and orientation.
3.1.2Check plumb-ness of receiving door unit. Inspect gaps and allowable tolerances to match manufacturer's requirements.
3.1.3Examine and verify all actual field measurements prior to fabrication. Reflect recorded measurements on shop drawings.
3.1.4Clean and prepare all substrates prior to installation.
3.1.5Follow manufacturers' approved standard installation procedures for aluminum door installation.
3.1.6Align all assemblies and ensure smooth operation of all operable windows and adjust accordingly. Door assemblies shall be free of warp and twists of any kind.
3.1.7Test doors in locked conditions to withstand static air pressure at 1.57 psf. Test in accordance to ASTM E 283.

3.2 PROTECTION
3.2.1Protect all areas adjacent to area of work to avoid damages.
3.2.2Protect installed products until completion of project.
3.2.3Upon completion of project, remove temporary coverings and protection of adjacent areas.
3.2.4Remove all construction debris from the project site in a safe and proper manner. Dispose debris properly.
3.2.5Clean all installed products in accordance to manufacturer's prescriptions.
3.2.6Touch-up, repair, and replace damaged products prior to Substantial Completion.

END OF SECTION

08 00 00	DIVISION 8 DOORS, WINDOWS, and OPENINGS	
08 51 00	Metal Windows	

1. **PART 1 GENERAL**

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

1.2.1This section includes provisions on all metal windows as specified on technical working drawings.

1.3 RELATED SECTIONS

1.3.1Hardware
1.3.2Glazing

1.4 GENERAL PROVISION

1.4.1All metal windows of jalousie type, fixed, casement, or awning types shall be powder coated aluminum finish, white-colored.
1.4.2Submit brochures, samples/ shop drawings window door assemblies drawn to scale for the approval of the architect. No material can be installed on site without the approval of the architect. All materials shall be approved prior to mass fabrication.
1.4.3Refer to technical working drawings and Division 8 Hardware for details on metal window hardware specifications.
1.4.4All aluminum frame members shall withstand minimum 25psf wind load and shall be provided with internal reinforcing if necessary.
1.4.5Use EPDM Rubber between glazing and framing.
1.4.6Only use lever-type handles and latch type locking mechanisms for casement and awning windows.
1.4.7Comply with manufacturer's standards for the structural attachment of framing members.
1.4.8Use standard side hung hinges for casement windows opening from 0 to 30 degrees.
1.4.9Use standard top hung hinges for awning windows, opening from 0 to 80 degrees.
1.4.10 All exposed areas shall be finished with Class 1 electrolytically deposited color in clear anodized finish.
1.4.11 Comply with gravity, wind, and earthquake load requirements as per the National Structural Code of the Philippines (NSCP).
1.4.12 Consider thermal movements from ambient and surface temperature changes.

1.5 MAINTENANCE, DELIVERY, STORAGE, AND HANDLING

1.5.1Protect installed and finished window assemblies with strippable membrane, with proper markings for safety. Keep membrane on glass until substantial completion of project.
1.5.2All window assemblies shall be safely stacked horizontally with heavy duty spacers unless otherwise specified by the manufacturer.
1.5.3Upon substantial completion, restore glazing and thoroughly clean glass surface.
1.5.4Comply with manufacturer's lead-time requirements for fabrication and delivery so as not to disrupt construction schedule.
1.5.5All materials shall be delivered in protective packaging, sealed, undamaged, and properly labeled. All labels shall indicate precise location and orientation of window assemblies. Handle all deliveries with care.
1.5.6Maintain temperature, humidity, and ventilation on site and storage area within recommended limits by the manufacturer.
1.5.7Adjust all moveable parts until operation is ensured smooth and safe prior to acceptance.

1.6 SUBMITTALS

1.6.1PRODUCT APPROVAL ATTACHMENTS
1.6.1.1 Submit data on manufacturing and installation details, indicating step by step work methodology and substrate preparation requirements.
1.6.1.2 Submit product data on fasteners and sealants.
1.6.1.3 Submit sample section cuts showing final finish and profile of framing material. Do not manufacture and install on site without approval from the architects. Sample profiles shall be cut in 200mm lengths. The sample profile should be submitted as a complete assembly showing the corners of the window assembly. Do not submit disintegrated samples.
1.6.1.4 Submit sample cuts of glazing material at least 200mm X 200mm. Show true color and make of glazing. Only approved glazing can proceed with fabrication and site installation.
1.6.1.5 Submit shop drawings of all profiles cut at the jamb, head, lock-stile. Indicate nominal thickness of all aluminum sections to be used in the assembly. No aluminum section shall be less than 1.2mm thick.

1.6.2EXECUTION APPROVAL ATTACHMENTS
1.6.2.1 Submit design calculations and shop drawings. Properly label dimensions and material specifications for each part. Indicate location and specification of all hardware and fastener. Indicate window assembly labels and areas of installation. Shop drawings must show corrected dimensions of openings to receive the window assembly.
1.6.2.2 Submit detailed work methodology indicating order of installation of the assembly.
1.6.2.3 Submit restoration procedures upon completion of work.

1.7 QUALITY ASSURANCE

1.7.1Only source assemblies from experienced manufacturers with good records in timely delivery and quality installation. Manufacturer shall be capable of providing field services during and after construction.
1.7.2Only source aluminum window assemblies from one manufacturer/ a single source to ensure uniformity of material as specified on technical working drawings.
1.7.3Only engage installers with specialized expertise in the installation of window assemblies in a project size and scope similar to the project.
1.7.4Conduct pre-installation walk thru meetings to inspect readiness of installation area. Comply with manufacturer's requirements.
1.7.5Provide a mock-up installation complete with surface preparation techniques. Have the mock-up approved prior to complete installation.
1.7.6Do not proceed with work when assemblies delivered have defects due to workmanship, color, finish, sheen, and other conditions degrading the quality and appearance of the material.
1.7.7Do not conduct installation works in environmental conditions not recommended by the manufacturer.
1.7.8Comply with manufacturer's prescribed tolerances.

1.8 WARRANTIES

1.8.1Ensure two (2) year warranty beginning after the date of substantial completion. Warranty shall include replacement and repair of defective units or hardware installed.
1.8.2In case of breakage of glass due to improper safety management, the contractor shall replace all breakage.

2. **PART 2 PRODUCTS**

2.1 FIXED, TOP-HUNG, AND CASEMENT WINDOWS

2.1.1Use aluminum frames compliant with ASTM B221; 6063-T5 and T6 alloy and temper. Major load-supporting aluminum sections shall be of minimum 3mm nominal thickness. No aluminum section with a supporting function in the assembly shall be lesser than 1.2mm thick, unless otherwise approved by the architect.
2.1.2All window assemblies shall comply with make and design as specified in the technical working drawings. Validate and verify measurements as per actual conditions on site prior to fabrication and installation.
2.1.3All metal windows of jalousie type, fixed, casement, or awning types shall be of anodized aluminum finish, silver-colored, hairline finish aluminum metal in its metal parts, unless otherwise approved by the architects. No material can be installed on site without the approval of the architect.

2.2 GLAZING

2.2.1All glazing shall be minimum 6mm thick, shall be impact-resistant, and adhered with weatherproof silicone sealants, and weatherproofed extruded EPDM glazing gaskets.
2.2.2All glazing shall be free of warp and twist
2.2.3Refer to Section 08810 Glass and Glazing requirements.

2.3 ACCESSORIES

2.3.1WEATHERSTRIPPERS/ JAMB SEALS: Install weather strippers to seal doors at meeting stiles for pairs of doors, door tubing, and astragals.
2.3.2LATCH HANDLES: Only use lever-type door handles with finish matching the storefront finish. Submit samples and brochures of locks to be used to the architect for approval.
2.3.3HINGES: Use standard friction hinges for top-hung and casement windows. For top-hung windows, hinges shall be unhanded. Refer to technical working drawings to determine handedness for casement windows. Comply with technical working drawings. Comply with manufacturer's recommendations for maximum allowable weight capacity of hinges. Only use stainless steel grade 430 for all hinges.
2.3.4FASTENERS AND ACCESSORIES: Use fasteners and accessories of the same fastened metal as the aluminum

3. PART 3 EXECUTION

3.1 INSTALLATION AND PREPARATION

3.1.1Only uncrate/unpack delivered window assemblies upon commencement of installation. Check labels to match indicated location and orientation.
3.1.2Check plumb-ness of receiving window units. Inspect gaps and allowable tolerances to match manufacturer's requirements.
3.1.3Examine and verify all actual field measurements prior to fabrication. Reflect recorded measurements on shop drawings for approval.
3.1.4Clean and prepare all substrates prior to installation. Comply with manufacturer's cleanliness requirements.
3.1.5Follow manufacturers' approved standard installation procedures for installation.
3.1.6Align all assemblies and ensure smooth operation of all operable windows and adjust accordingly. All assemblies shall be free of warp and twists of any kind.
3.1.7Test windows in locked conditions to withstand static air pressure at 1.57 psf. Test in accordance to ASTM E 283.

3.2 PROTECTION

3.2.1Protect all areas adjacent to area of work to avoid damages.
3.2.2Protect installed products until completion of project.
3.2.3Upon completion of project, remove temporary coverings and protection of adjacent areas.
3.2.4Remove all construction debris from the project site in a safe and proper manner. Dispose debris properly.
3.2.5Clean all installed products in accordance to manufacturer's prescriptions.
3.2.6Touch-up, repair, and replace damaged products prior to Substantial Completion.

END OF SECTION

08 00 00	**DIVISION 8 DOORS, WINDOWS, and OPENINGS**	
08 70 00	Hardware	

1. PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

1.2.1This section includes provisions for finish hardware for doors and windows where intended for this project.

1.3 RELATED SECTIONS

1.3.1Section Steel Doors and Frames
1.3.2Flush Wood Doors
1.3.3Interior Architectural Woodwork
1.3.4Rough Carpentry

1.4 GENERAL PROVISION

1.4.1Comply with specifications as indicated in the door hardware schedule.
1.4.2The contractor shall provide a key-cabinet of a hinged-panel type that can be secured by a lockset. The Key cabinet shall house all keys to all portions requiring a locking mechanism. Situate the key cabinet in an secure area, not exposed to the public, and accessible only to the owner's administrators.
1.4.3Use appropriate hardware size in proportion to the door/window/panel/any surface requiring the hardware. Check load capacity of hardware, especially hinges to match the load requirements of the door/window/panel/any surface requiring the hardware mechanism.
1.4.4The contractor shall provide and install all necessary hardware intended for the project. This includes the following but not limited to:

1.4.4.1 Hinges
1.4.4.2 Locks and Dummy Trims
1.4.4.3 Cylindrical locks with lever handle
1.4.4.4 Tubular locks with lever handle
1.4.4.5 Deadbolts
1.4.4.6 Fire Exit and Panic Exit Devices
1.4.4.7 Door Closers
1.4.4.8 Floor Closers
1.4.4.9 Door stops
1.4.4.10 Door trims
1.4.4.11 Silencers
1.4.4.12 Door pulls
1.4.4.13 Push plates
1.4.4.14 Armor Plates
1.4.4.15 Kick Plates
1.4.4.16 Flush bolts
1.4.4.17 Door Viewers
1.4.4.18 Door Coordinators
1.4.4.19 Flush pull
1.4.4.20 Door seals and weather-stripping

1.4.4.21 Other required hardware finish

1.5 MAINTENANCE

1.5.1Store all hardware in properly labeled containers, with complete sets to match appropriate installation procedures.
1.5.2Secure all hardware storage and secure all hardware keys.
1.5.3Only deliver the keys directly to the owner and/or bonafide representative of the owner upon substantial completion of the project.
1.5.4Tag each hardware item and its completed set properly for appropriate identification of pieces. Match tags/ identifications with related hardware. Include basic installation instructions in all labels.
1.5.5Store hardware in cool and dry areas.

1.6 SUBMITTALS

1.6.1PRODUCT APPROVAL ATTACHMENTS
1.6.1.1 Submit product brochures detailing the mechanisms and handedness of hardware to match the doors and windows it is specified for. Brochures should include complete hardware codes and a list/code of areas of installation.

1.6.2EXECUTION APPROVAL ATTACHMENTS
1.6.2.1 Submit detailed work methodology indicating installation requirements and procedures.
1.6.2.2 Indicate on shop drawings the proper labels and codes to match the hardware specifications as indicated on technical working drawings.
1.6.2.3 Deliver keys directly to Owner complete with proper labels.

1.7 QUALITY ASSURANCE

1.7.1Source all hardware type from a single manufacturer to ensure uniform quality.
1.7.2Suppliers shall be recognized architectural hardware suppliers with manufacturing capability suitable to the quantity and quality required by the project.
1.7.3Tag all hardware with proper identifying labels related to hardware schedule. Include installation requirements.

1.8 WARRANTIES

1.8.1Manufacturer/ contractor shall agree to replace all defective hardware within two (2) years from date of substantial completion.

2. PART 2 PRODUCTS

2.1 GENERAL PRODUCTS

2.1.1Provide Panic Exit Devices for Fire Rated applications/means of egress intended for fire.
2.1.2All hardware finishes shall be in satin stainless steel finish. Be sure that all hardware are of consistent finishes.
2.1.3Use hardware that is compliant with UL requirements and conforming to NFPA No. 80 requirements.
2.1.4Use hardware compliant to the following:
2.1.4.1 Mortise Hinges: Mortise Hinges: ANSI / BHMA A156.1.
2.1.4.2 Locks and Latches: ANSI / BHMA A156.2
2.1.4.3 Tubular locks: Grade 3 type tubular locks shall not have less than 5 pin tumblers.
2.1.4.4 Cylindrical locks: Grade 2 cylindrical locks shall not have less than 6 pin tumblers.
2.1.4.5 Deadbolts: ANSI / BHMA A156.5; Grade 2.
2.1.4.6 Door Closers: UL Listed.
2.1.4.7 Fire Exit Devices: BHMA / ANSI A156.3, Grade 1, UL Listed.
2.1.4.8 Door Coordinators: ANSI/BHMA A156.3, Type 21A; UL Listed for installation on labeled frame
2.1.4.9 Seals and Weather stripping: BHMA / ANSI A156.22
2.1.4.10 Aluminum Extrusions: B6060+5.
2.1.4.11 Neoprene with service temperature of 40°C to 70°C.
2.1.4.12 PVC extrusions with service temperature of -5°C to 70°C.
2.1.4.13 Silicone with service temperatures of -60°C to 230°C.
2.1.4.14 EPDM with service temperature of -40°C to 100°C.
2.1.4.15 Threshold: BHMA / ANSI A156.21.

2.2 DOOR HARDWARE FOR METAL/ALUMINUM FRAMED STOREFRONT DOORS

2.2.1Coordinate with requirements of manufacturers.
2.2.2Comply with required hardware as specified in the technical working drawings.
2.2.3Only install cylindrical deadbolts with keying mechanisms on the lower rails of doors.
2.2.4Use heavy-duty UL Listed cylindrical deadbolts to be installed on bottom rail of door.
2.2.5Install heavy-duty door closers on the top rail.

2.3 DOOR HARDWARE FOR WOOD PANEL DOORS

2.3.1Coordinate with requirements of manufacturers.
2.3.2Comply with required hardware as specified in the technical working drawings.
2.3.3Verify installation and hardware mechanisms and secure fit with door panels.
2.3.4Use heavy duty cylindrical locks with lever-type handles. Verify handedness of each lever-type installation.
2.3.5Use heavy-duty UL Listed cylindrical deadbolts to be installed on bottom rail of door.
2.3.6Install heavy-duty door closers on the top rail.
2.3.7Install heavy-duty door closers alongside top rail.

2.4 DOOR HARDWARE FOR TOILETS

2.4.1Use heavy-duty privacy locksets, lever-type handles. Verify handedness of each lever-type installation.

2.5 KEYING SYSTEM

2.5.1Provide at least three sets of keys for every lock, group, or set of locks. Test all key sets and verify matching locks. Label properly and store all key sets in key cabinet to be provided by contractor.
2.5.2Provide a master key for all utility spaces.
2.5.3Situate all keys in hinged key cabinet, wall mounted key cabinet. Situate key cabinet in a secure area accessible to administrative staff or security personnel only. Provide extra 50% capacity in the key cabinet on top of all required keysets. Label key sets accordingly.

3. PART 3 EXECUTION

3.1 GENERAL INSTRUCTIONS

3.1.1Comply with manufacturer's instructions for lockset installations.

3.2 GENERAL INSTALLATION

3.2.1NUMBER OF HINGES REQUIRED:
Comply with the following quantities of hinges, unless otherwise specified in the technical working drawings and/or as needed/recommended by the manufacturer to comply with warranties.

Provide two (2) pieces hinge for doors with heights up to 1500mm.
Provide three (3) pieces hinge for doors with heights over 1500mm but not over 2290mm.
Provide four (4) pieces hinge for doors with heights over 2290mm but not over 3000mm.
For doors over 3000mm in height, provide additional hinge for each additional 750mm of door height or fraction thereof.

3.2.1.1 LOCATION OF HINGES:
TOP HINGE: Not over 244mm from inside of frame rabbet at head to center line of hinge.
BOTTOM HINGE: Not over 264mm above bottom of door frame to center line of hinge
CENTER HINGE: Located at equal distances between top and bottom hinges.

3.3 CLEANING AND PROTECTION

3.3.1Protect hardware from damages by covering.
3.3.2Ensure all hardware are working and operating smoothly at the time of substantial turnover.

END OF SECTION

08 00 00	DIVISION 8 DOORS, WINDOWS, and OPENINGS	
08 80 00	Glazing	

1. **PART 1 GENERAL**

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

This section includes provisions on glazing requirements as specified above the ring beam of the project, central to the atrium/entrance lobby. Also included in this section are glazing requirements in all other areas of the project as indicated, i.e. wall partitions, clerestory windows, specialized glazing as instruction boards, or as indicated on drawings.

1.3 RELATED SECTIONS

1.3.1Metal Windows
1.3.2Louvers and Screens
1.3.3Metal Fabrications

1.4 GENERAL PROVISION

1.4.1Only use tempered/heat-treated glass on all portions of the project site.
1.4.2Comply with combined printed recommendations of glass manufacturers, of manufacturers of sealants, gaskets and other glazing materials, except where more stringent requirements are indicated, including those of referenced glazing standards.

1.5 MAINTENANCE, DELIVERY, STORAGE AND HANDLING

1.5.1Protect glazing materials from damage. Wrap delivered glazing in protective film to protect it from scratches and breakage.
1.5.2Use wood blocks to separate glass panes and avoid breakage.
1.5.3Protect glass from edge damage during handling and installation. Remove from project and dispose of glass units with edge damage or other imperfections of kind that, when installed, weakens glass and impairs performance and appearance.
1.5.4Apply primers to joint surfaces where required for adhesion of sealants, as determined by pre-construction sealant-substrate testing.

1.6 SUBMITTALS

1.6.1PRODUCT APPROVAL ATTACHMENTS
1.6.1.1 SAMPLE: Submit 300mm X 300mm sample glazing with sealant samples showing actual thickness and color of glaze and sealant.
1.6.1.2 PRODUCT DATA OF SEALANT: Include manufacturer's standard curing procedures, installation requirements, Type, Grade, and Class.

1.6.2EXECUTION APPROVAL ATTACHMENTS
1.6.2.1 Complete shop drawings, i.e. elevations, sections, and key plans showing exact area of installation.

1.7 QUALITY ASSURANCE

Source all glazing from a single manufacturer to ensure uniformity.

1.8 WARRANTIES

Comply with manufacturer's requirements for warranties. Warrant glazing for at least two (2) years from substantial completion of project.

2. **PART 2 PRODUCTS**

2.1 GENERAL PRODUCTS

2.1.1FLAT GLASS: Compliant to ASTM C 1036 "Standard Specification for Flat Glass"'.
2.1.2HEAT-TREATED GLASS STANDARD: Compliant to ASTM C 1048 requirements.
2.1.3CLEAR FLOAT GLASS: Type

2.2 SILICON SEALANT, AND OTHER GLAZING ACCESSORIES

2.2.1Only use clear sealants.
2.2.2Select glazing compatibility of sealant with other materials on the assembly, namely frames and glass and other parts of the system.
2.2.3GASKETS: Neoprene extrusions of size and shape as needed by the assembly. Use color intended for the project. Comply with ASTM C 542.
2.2.4SETTING BLOCKS: : Neoprene, EPDM or silicone blocks as required for compatibility with glazing sealants, 80 to 90 Shore A durometer hardness
2.2.5SPACERS: Neoprene, EPDM or silicone blocks, or continuous extrusions, as required for compatibility with glazing sealant, of size, shape and hardness recommended by glass and sealant manufacturers for application indicated.
2.2.6EDGE BLOCKS: Neoprene, EPDM or silicone blocks, as required for compatibility with glazing sealants, of size and hardness required to limit lateral movement (side-walking) of glass.
2.2.7COMPRESSIBLE FILLER RODS: Closed-cell or waterproof- jacketed rod stock of synthetic rubber or plastic foam, flexible and resilient, with 5-10 psi compression strength for 25 percent deflection.

3. **PART 3 EXECUTION**

3.1 GENERAL EXECUTION

3.1.1Do not proceed with glazing works when glazing is wet due to rain and/or subject to condensation due to ambient weather conditions.
3.1.2Install setting blocks of proper size in sill rabbet, located one quarter of glass width from each corner, but with edge nearest corner not closer than 150mm (6") from corner, unless otherwise required. Set blocks in thin course of sealant which is acceptable for heel bead use.
3.1.3Provide spacers inside and out, of correct size and spacing to preserve required face clearances, for glass sizes larger than 50 united inches (length plus height), except where gaskets or glazing tapes with continuous spacer rods are used for glazing. Provide 3.175mm (1/8") minimum bite of spacers on glass and use thickness equal to sealant width, except with sealant tape use thickness slightly less than final compressed thickness of tape.
3.1.4Provide edge blocking to comply with requirements of referenced glazing standard, except where otherwise required by glass unit manufacturer.
3.1.5Set units of glass in each series with uniformity of pattern, draw, bow and similar characteristics.
3.1.6Tempered Glass: Glass shall have clean-cut, factory fabricated edges. Field cutting will not be permitted.
3.1.7Provide compressible filler rods of equivalent back-up material, as recommended by sealant and glass manufacturers.
3.1.8Force sealant into glazing channels to eliminate voids and to ensure complete "wetting" or bond of sealant to glass and channel surfaces.
3.1.9Tool exposed surfaces of sealant to provide a substantial "wash" away from glass. Install pressurized tapes and gaskets to protrude slightly out of channel, so as to eliminate dirt and moisture pockets.
3.1.10 Where wedge-shaped gaskets are driven into one side of channel to pressurize sealant or gasket on opposite side, provide adequate anchorage to ensure that gasket will not "walk" out when installation is subjected to movement.
3.1.11 Miter cut wedge-shaped gaskets at corners and install gaskets in manner recommended by gasket manufacturer to prevent pull away at corners; seal corner joints and butt joints with sealant recommended by gasket manufacturer.
3.1.12 Lock-Strip Glazing: Comply with ASTM C 716 and gasket manufacturer's printed recommendations. Provide supplementary wet seal and weep system unless otherwise indicated.

3.2 EXAMINATION

3.2.1Conduct pre-fabrication on-site meetings to inspect actual site conditions prior to fabrication. Inspections shall be in the presence of manufacturing.
3.2.2Check installation tolerances, including size, squareness, and offsets at corners. Check if functionality of weep systems will not be impeded.
3.2.3Do not commence glazing works until unacceptable conditions are corrected.

3.3 FABRICATION

3.3.1Verify actual dimensions of frames and receiving areas on site prior to fabrication of glazing.
3.3.2 Fabricate glass according to exact measurements needed on site. FIELD CUTTING IS NOT ALLOWED.

3.4 PROJECT CONDITIONS

3.4.1Do not proceed with glazing works when glazing is wet due to rain and/or subject to condensation due to ambient weather conditions.

3.5 PROTECTION & CLEANING

3.5.1Affix non-permanent labels on installed glass surfaces for safety purposes. Use DO NOT CROSS streamers. DO NOT PAINT or use permanent markers on the glass. Ensure safety labels are non-permanent.
3.5.2Remove non-permanent labels and clean surfaces upon substantial turnover.
3.5.3Examine installed glazing at every key point of construction. Remove and replace broken, chipped, cracked, abraded, or any form of damages on glass, including vandalism and damages caused by natural conditions.
3.5.4Wash glass on both surfaces prior to date of inspection for turnover.
3.5.5Comply with manufacturer's methods for glass cleaning.

END OF SECTION

08 00 00	DIVISION 8 DOORS, WINDOWS, and OPENINGS	
08 81 4	Mirrors	

1. PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

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

1.3 RELATED SECTIONS

1.3.1Rough Carpentry
1.3.2Toilet and Bath Accessories

1.4 GENERAL PROVISION

1.4.1Mirrors installed in Toilets and Baths shall be adhered to the backing material using prescribed adhesives. No bolts and screws shall protrude or be reflected on the mirror.
1.4.2Unless otherwise indicated on the technical working drawings, all mirrors in toilet areas shall be mounted 150mm above the top of the lavatory.
1.4.3Align and flush all mirrors with the wall tile layout. Indicate in shop drawings and secure mounting height approvals from the architect.

1.5 SUBMITTALS

1.5.1PRODUCT APPROVAL ATTACHMENTS
1.5.1.1 Sample showing final finish edges of the material. Sample size shall be 300mm x 300mm, adhered to backing material. Samples shall be properly labeled indicating thickness and grade/quality of mirror.

1.5.2EXECUTION APPROVAL ATTACHMENTS
1.5.2.1 Submit shop drawings showing mounting height of mirrors. Reflect actual heights of lavatory, and neighboring finishes as seen on site. Reflect distances from existing finishing grooves such as tiles and similar items.

1.6 QUALITY ASSURANCE

Glazing Standards: Comply with recommendations of Flat Glass Marketing Association (FGMA) "Glazing Manual" and National Association of Mirror Manufacturers (NAMM) in its publication "MIRRORS, Handle with Extreme Care, Tips for the Professional on the Care and Handling of Mirrors", unless more stringent requirements are indicated.

1.7 WARRANTIES

1.7.1Warranties shall include replacement of item in case of cracks or defects in mirror silver coatings and other damages occurring due to undue cause, i.e. changes in ambient temperature, that damage the final quality of the mirror.
1.7.2Warranties shall be in effect after installation, during construction and one (1) year from substantial completion of project.

2. PART 2 PRODUCTS

2.1 GLASS

2.1.1Compliant to ASTM C 1503, must be low in lead content and shall be copper free.

2.1.2Glazing quality shall be low-iron, ultra-clear with 91% visible light transmission.
2.1.3Minimum nominal thickness shall be 6.0mm
2.1.4Mirror Edges: Flat and slightly rounded or buffed on corners. Seal edges with edge sealer
2.1.5Fabricate mirror sizes according to sizes indicated on approved shop drawings.
2.1.6Only install mirrors whose grade and quality does not decline upon exposure to areas with heavy moisture.

2.2 MISCELLANEOUS HARDWARE
2.2.1Unless otherwise approved by the architect, no extra accessories will be allowed on mirrors other than anchors and inserts that have no impact on the exposed side of the mirror.
2.2.2Use compatible mirror mastics as prescribed by manufacturers.

3. PART 3 EXECUTION
3.1 EXAMINATION
3.1.1Examine substrates or surface areas on which mirrors are to be mounted. Check for compliance with installer's requirements on tolerances, substrate preparations, and other conditions affecting work.
3.1.2Proceed with installations once substrate conditions are acceptable.
3.1.3Check installation requirements of approved manufacturer's prescribed mastic. Comply with written installation instructions.

3.2 INSTALLATION
3.2.1Provide 3mm air space between back of mirrors and mounting surface for air circulation to avoid undue damages on silver coating of mirror.
3.2.2Use pressure sensitive adhesive tapes and appropriate mirror hardware that do not affect the exposed side of the mirrors. Comply with manufacturer's written instructions on adhesives.
3.2.3Mirror installation shall appear seamless.

3.3 CLEANING AND PROTECTION
3.3.1Protect mirrors from breakage and contamination during construction. Cover surfaces with protective films.
3.3.2Do not exposed edges of mirrors to standing water.
3.3.3Keep installed mirrors clean. Wash exposed surfaces of mirrors clean and dry, free of visual damages prior to substantial completion.
3.3.4Do not use chemicals that damage the quality of the mirror film and the glass surface.

END OF SECTION

09 00 00	**FINISHES**	
09 30 0	Tile	

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

1.2 SUMMARY
This section includes provisions on tile installations as specified for the toilet, and other areas as indicated on the schedule of finishes.

1.3 RELATED SECTIONS
1.3.1Concrete Finishes

1.4 GENERAL PROVISION
1.4.1Comply with ASTM C207, Specifications for Hydrated Lime for Masonry.
1.4.2Maintain air temperature and structural base temperature at ceramic tile installation area above 12°C for 48 h before, during, and 48 h after, installation.
1.4.3Do not install tiles at temperatures less than 12°C or above 38°C.
1.4.4Do not apply epoxy mortar and grouts at temperatures below 15°C or above 25°C.
1.4.5Provide minimum 2% of each type and color of tile required for project for maintenance use. Store where directed.
1.4.6Maintenance material to be of same production run as installed material.
1.4.7Turn over product, item code, and other pertinent information to owner for product maintenance.
1.4.8Set mock-ups for the approval of the architect prior to complete installation. Do not proceed with installation until approved. Mock-up installations can be retained once accepted and taken down until acceptable.
1.4.9Consider extra tile quantities for mock-up installations.
1.4.10 Do not use tile trims.

1.5 DELIVERY, STORAGE, and HANDLING
1.5.1Deliver, store and handle products in a manner to avoid damage or contamination.
1.5.2Have materials delivered to job site prior to installation.
1.5.3Deliver all products to job site in manufacturer's unopened cartons with all labels intact and legible.
1.5.4Keep cartons dry and protect from vandalism and away from heavy traffic area.
1.5.5Store cartons in upright position.

1.6 SUBMITTALS

1.6.1PRODUCT APPROVAL ATTACHMENTS
1.6.1.1 Sample ceramic tile 150mm x 150mm cut from the actual material for approval. Mark each sample to show type, size, product code, and brand. Sample shall show actual texture and pattern of the material.
1.6.1.2 Technical data on dry-set Portland cement mortar and grout. Indicate brand, color, and product code.
1.6.1.3 Sample divider strips and tile spacers.

1.6.2EXECUTION APPROVAL ATTACHMENTS

1.6.2.1 Shop drawings, i.e. floor plans and wall elevations highlighting area of application and tile setting layout. Indicate start of tile, end of tile, grout distances, tolerances, dimensions of cuts for drains, and similar utility holes. Show dimensions of tiles cut from original tile dimensions.

1.7 QUALITY ASSURANCE

1.7.1Employ tile setters with minimum experience from projects of the same size and scale as the project.
1.7.2Only install approved tiles sourced from the same manufacturer.
1.7.3Observe standard tolerances for slopes and drains.
1.7.4Do not install tiles with visible defects such as chipped edges.
1.7.5Ensure maximum bonding of tiles to substrates. When tapped, no more than 20% of the tile surface area shall emanate a hollow sound.

1.8 WARRANTIES

Two (2) years.

2. PART 2 PRODUCTS

2.1 FLOOR TILES

2.1.1.1 Refer to Technical Working drawings for coverage of area of application

2.2 WALL TILES

2.2.1.1 Refer to Technical Working drawings for coverage of area of application.

2.3 MORTARS AND ADHESIVES

2.3.1Portland cement: to CSA-A5, type 10.
2.3.2Sand: to ASTM C144, passing 16 mesh.
2.3.3Hydrated lime: to ASTM C207, Type N. Latex additive: formulated for use in Portland cement mortar and thin set bond coat.
2.3.4Mortar bed for floors: 1 part Portland cement, 4 parts sand, 1 part water. Adjust water volume depending on water content of sand. Latex additive may be included. Mortar bed for walls 1 part Portland cement, 1/5 Dry set mortar: mix to manufacturer's instructions.
2.3.5Organic adhesive: pre-mixed.
2.3.6Mix bond and levelling coats, and grout to manufacturer's instructions.
2.3.7Adjust water volumes to suit water content of sand.
2.3.8Water: potable and free of minerals and chemicals which are detrimental to mortar and grout mixes.
2.3.9Dry set mortar: to ANSI A118.1.

2.4 GROUT

2.4.1COLOR: dark grey, brand and type compliant to manufacturer's prescriptions of the approved tile.
2.4.2Portland cement grout: as recommended by tile manufacturer.
2.4.3Dry curing wall grout: as recommended by tile manufacturer.
2.4.4Grout preparation: to manufacturer's instructions.

2.5 CLEANING COMPOUNDS

2.5.1Use materials compatible to the approved material. Cleaning materials shall not impede bonding of tile setting materials.
2.5.2Do not use caustic and acidic cleaning materials.

3. PART 3 EXECUTION

3.1 EXAMINATION AND PREPARATION

3.1.1Check conditions and quality of substrates to be ready to accept finish. Apply tile to clean and sound surfaces.

3.2 INSTALLATION

3.2.1Fit tile around corners of fixtures, drains and other built-in objects. Maintain uniform joint appearance. Cut edges smooth and even. Do not split tiles unevenly. Refer to approved shop drawings for approved tile layout.
3.2.2Ensure joints between tiles are uniform, 0.00mm wide, plumb, straight, true, and even and flush with adjacent tile.
3.2.3Sound tiles after setting by tapping. Replace hollow sounding tiles.
3.2.4Allow minimum 24 hours setting time after installation before grouting.
3.2.5Clean installed tile surfaces immediately after installation before grout is cured. Remove excess grouts immediately.

3.3 MAXIMUM ALLOWABLE TOLERANCES

3.3.1SURFACE TOLERANCE
1:800
3.3.2LIPPAGE, MAXIMUM ALLOWABLE DEVIATION:
± 1,0 % of the total thickness of the approved tile
3.3.3STRAIGHTNESS OF SIDES, MAXIMUM ALLOWABLE DEVIATION:
± 0,1 % of true plumb and horizontal level
3.3.4RECTANGULARITY, MAXIMUM ALLOWABLE DEVIATION:
± 0,1 % of true plumb and horizontal level

3.4 CLEANING AND PROTECTION

3.4.1Clean installed tile surfaces regularly. Ensure surfaces are free from dust, stains, and other materials affecting its visible appearance upon substantial completion.
3.4.2Replace tiles damaged tiles.

END OF SECTION

09 00 00	FINISHES	
09 67 0	Fluid-Applied Flooring	

1. **PART 1 GENERAL**

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

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

1.3 RELATED SECTIONS

1.3.1Concrete Finishes

1.4 GENERAL PROVISION

1.4.1Secure approval from architect for final finish style and application. Submit finish samples. Refer to the Submittal portion of this section for details.
1.4.2Coordinate work of this Section with work of other trades for proper time and sequence to avoid construction delays.
1.4.3Conduct 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

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

1.6 SUBMITTALS

1.6.1PRODUCT 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.

1.6.2EXECUTION APPROVAL ATTACHMENTS

1.6.2.1 Submit 300 × 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

1.7.1Source 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

1.8.1Warrant applications and installations from manufacturers able to provide five (5) year warranty.
1.8.2Comply with manufacturer's requirements for warranty.

2. **PART 2 PRODUCTS**

2.1 GENERAL MATERIALS

2.1.1Unless otherwise indicated, provide factory-mixed coatings.
2.1.2When required, mix coatings to correct consistency in accordance with manufacturer's instructions before application.
2.1.3Do not reduce, thin, or dilute coatings or add materials to coatings unless such procedure is specifically described in manufacturer's product instructions.
2.1.4VOCs need to be confirmed by using the products EDS sheets.
2.1.5Submit all pertinent product data as needed to complete project. Facilitate submittals in one set.

2.2 GENERAL PROPERTIES OF FLOORING ONE CURED:

2.2.1COMPRESSIVE STRENGTH: 8,590psi, comply with ASTM C579
2.2.2TENSILE STRENGTH: 2,500psi, comply with ASTM D 638
2.2.3FLEXURAL STRENGTH: 5,100psi, comply with ASTM D 790
2.2.4HARDNESS, SHORE: 85, comply with ASTM D 2240
2.2.5BOND STRENGTH: >400 comply with ASTM D 4541
2.2.6ABRASION RESISTANCE: 5mg loss, comply with ASTM D 4060
2.2.7WATER ABSORPTION: <0.1%, comply with ASTM C 413
2.2.8RESISTANCE TO FUNGI GROWTH: comply with ASTM G21

2.3 PRIMERS

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

2.4 POLYURETHANE CONCRETE SEALER

2.4.1Use 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.
2.4.2Comply with substrate preparation requirements by manufacturer.
2.4.3Material shall be resistant to oil, gasoline, water, salt, and chlorine. Compliant to ASTM D-1308
2.4.4Material shall be resistant to tire-marks.
2.4.5GLOSS: 25 for 1 coat
2.4.6PRACTICAL COVERAGE: 14 to 28 sqm per 4 liters/coat, depending on substrate porosity
2.4.7SURFACE DRY: 1 hour, allow for 2 hours in between recoats.
2.4.8DRY THROUGH: 24 hours for foot traffic, 72 hours for vehicular traffic
2.4.9THINNING: as required by manufacturer and as certified compatible
2.4.10 Application by roller or spray gun

2.5 ACCESSORIES:

2.5.1COATING 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

3.1.1Verify 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.
3.1.2Remedy all unacceptable conditions. Remove all items not necessary that affects quality of work. Coordinate schedules with construction manager.
3.1.3Do not proceed with work completion until all substrates and preparations are acceptable.
3.1.4If substrate is concrete, ensure that the surfaces have been properly cured in accordance to requirements by the manufacturer. Follow manufacturer procedures.
3.1.5Test moisture content of concrete. Match manufacturer's requirements.

3.2 GENERAL APPLICATION

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

3.3 CLEANING AND PROTECTION

3.3.1Remove surplus materials, rubbish, tools and equipment from project site. Dispose properly in accordance to local codes.
3.3.2Protect installed product from any damages during construction. In case of damages, repair any damaged surface prior to substantial turnover.
3.3.3Repair 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	

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

This section includes provisions on 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

1.5.1PRODUCT APPROVAL ATTACHMENTS
1.5.1.1 Product data for each type of product specified.

1.5.2EXECUTION 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

1.7.1Warranties 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.

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

1.1.1Technical Architectural Drawings

1.1.2Specifications

1.1.3Requests for Interpretation

1.1.4Product Samples and Brochures

1.1.5Manufacturer's Data Sheets and Certificates

1.1.6Material Safety Data Sheets
1.1.7Work Program and Methodology Submittals

1.2 SUMMARY

This section includes provisions on 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 Floor Surface
1.3.5 See drawings for location, quantity and extent of surfaces to receive paint and varnish.
1.3.6 All pertinent provisions of the General Conditions form part of this Section.

1.4 GENERAL PROVISION

1.4.1Only use appropriate painting products on surface areas.
1.4.2Comply with gloss levels as specified herein or on technical working drawings.
1.4.3Furnish 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

1.5.1Furnish extra materials from the same products applied for maintenance purposes to owner upon substantial completion.
1.5.2Store materials in tightly covered containers that are accurately labeled. Keep containers in well ventilated areas with comfortable ambient temperatures as prescribed by manufacturers.
1.5.3Paint containers shall be free of foreign materials and residue.
1.5.4Store unused rags, brushes, and other accessories in clean and dry storage areas.
1.5.5Store 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

1.6.1PRODUCT 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.

1.6.2EXECUTION APPROVAL ATTACHMENTS
1.6.3Submit detailed work methodology. Indicate number of coats per paint product to be applied. Manufacturer's instructions are acceptable

1.7 QUALITY ASSURANCE

1.7.1Establish 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.
1.7.2Only source from manufacturers with minimum of 15 year experience in the market, manufacturing products as specified.

1.7.3Only 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.
1.7.4Source 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

1.8.1Warrant 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).
2.2.5 Floor Surface: Non- Toxic Epoxy Paint
2.2.5.1 Primer: (1 coat) Epoxy Primer White B2200
2.2.5.2 Top Coat: (3 coats) Epoxy Enamel White B2100

3 PART 3 EXECUTION
3.2 EXAMINATION AND PREPARATION
3.2.5.2 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.

3.2.5.3 Use metal etchers as prescribed by the manufacturer.
3.2.5.4 Use wire brush to scrape rusted materials.
3.2.5.5 After scraping rust, use water to wash surfaces clean and dry for at least 15 minutes before application of primer.
3.2.5.6 Comply with manufacturer's written instructions as warranted.
3.2.5.7 Ensure adhesion of approved material to substrates.

3.3 APPLICATION

3.3.5 Prime and finish all metal assemblies prior to any installation on project.
3.3.6 Use applicators and techniques suited for the quality coating of the substrates.
3.3.7 Do not apply to wet or damp surfaces.
3.3.8 Uniformly apply coatings using methods prescribed by manufacturer. Do not allow runs, sags, brush marks and inconsistent sheens.
3.3.9 Apply as many coats as necessary for uniform appearance.
3.3.10 Paint surfaces behind movable equipment and furniture.
3.3.11 Paint backsides to match exposed surfaces.
3.3.12 Paint access panels, including back sides, removable hinges and covers, and other items to match exposed surfaces.
3.3.13 Primers may be omitted if fabrications are factory-primed.
3.3.14 Comply with manufacturer's written instructions for application conditions.
3.3.15 Do not apply finish coats in imminent weather.
3.3.16 Ensure that application is uniform.

3.4 INSPECTION OF FINISHED SURFACES PRIOR TO ACCEPTANCE

3.4.5 Secure approval from architect as endorsed by construction supervisor.
3.4.6 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.
3.4.7 Rejected surfaces shall be made good by the Contractor.
3.4.8 MASONRY (NEW SURFACE):
3.4.8.2.1 All areas to be painted must be dry and free of dirt, grease, oil, dust, loose grit or mortar and other contaminants.
3.4.8.2.2 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.
3.4.8.2.3 Apply one coat Concrete Primer & Sealer.
3.4.8.2.4 Fill up all hairline cracks and crevices with Concrete Putty. Allow to dry, sand smooth, dust off, then spot prime before applying finish coats.

3.4.9 MASONRY (OLD SURFACE):
3.4.9.2 Remove scaling, flaking, blistering and peeling off paint either with the use of paint remover, wire brushing, or scraping.
3.4.9.3 For chalking old paint, use Masonry Surface Conditioner as primer.
3.4.9.4 In case of mildew infestation, treat with Fungicidal Wash Solution by scrubbing or brushing. To ensure adequate treatment, allow to remain on the surface for twenty four (24) hours. Brush off and rinse with water. Let dry.
3.4.10 WOOD (NEW SURFACE):
3.4.10.2 All areas to be painted must be dry and free of dirt, dust, grease, oil and other foreign matter.
3.4.10.3 Sand surface until wood is smooth to touch and no slivers or rough edges remain.
3.4.10.4 Dust off completely, then wipe with clean rag.
3.4.10.5 Apply one coat of Interior Primer & Sealer or Exterior Wood Primer.
3.4.10.6 Fill nail holes, cracks, dents and damaged areas with Plastic Wood Dough or Glazing Putty.

3.4.11 METAL (NEW SURFACE):
3.4.11.2 Remove dust, dirt, grease, oil, wax, loose scales and other contaminants by wiping with rag soaked in lacquer thinner or naphtha.
3.4.11.3 Sand, wire brush or scrape all rusty metal exposed to the weather for some time.
3.4.11.4 Treat surface with Rust Converter. Let stand overnight, then wipe off white residue with clean rag soaked in lacquer thinner of naphtha.
3.4.11.5 Apply one coat yellow zinc chromate primer. Let dry overnight before finishing with one or two coats of recommended topcoat.

3.4.12 The following conditions are considered unacceptable:
3.4.12.2 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.
3.4.12.3 Evidence of poor coverage at rivet heads, plate edges, lap joints, crevices, pockets, corners and re-entrant angles.
3.4.12.4 Damage due to touching before paint is sufficiently dry or other contributory cause.
3.4.12.5 Damage due to application on moist surfaces or caused by inadequate protection from the weather.
3.4.12.6 Damage and/or contamination of paint due to blown contaminants (dust, spray paint, etc.)
3.4.12.7 Visible defects are evident, i.e. lack of uniformity or color, sheen, and texture across full surface area.

3.5 CLEANING AND PROTECTION

3.5.5 At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.
3.5.6 After completing paint application, clean spattered surfaces. Remove spattered paints by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.
3.5.7 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.
3.5.8 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**
     - 1.1.1Technical Architectural Drawings
     - 1.1.2Specifications
     - 1.1.3Requests for Interpretation
     - 1.1.4Product Samples and Brochures
     - 1.1.5Manufacturer's Data Sheets and Certificates
     - 1.1.6Material Safety Data Sheets
     - 1.1.7Work Program and Methodology Submittals

   - **1.2 SUMMARY**

     This section includes provisions on toilet and bath accessories as needed for project completion. Accessories include:
     - 1.2.1Tissue Dispensers
     - 1.2.2Soap Dispensers and Holders
     - 1.2.3Grab Bars
     - 1.2.4Towel Bars
     - 1.2.5Curtain Holder
     - 1.2.6Other accessories as needed and indicated

   - **1.3 RELATED SECTIONS**
     - 1.3.1Mirrors
     - 1.3.2Interior Architectural Woodwork
     - 1.3.3Rough Carpentry
     - 1.3.4Hardware

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

   - **1.5 SUBMITTALS**

     1.5.1PRODUCT 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.

     1.5.2EXECUTION 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**

     1.6.1Ensure that all finishes installed are approved. Use appropriate anchorages, of stainless steel make to ensure structural stability of installation.

     1.6.2Ensure that installed accessories do not fall off due to rustication of anchors and inserts.

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

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

3. **PART 3 EXECUTION**
   - **3.1 INSTALLATION**
     - 3.1.1Comply with manufacturer's written instructions and methods. Use fasteners as prescribed by manufacturer to be appropriate to the substrate.
     - 3.1.2Ensure that all installation is plumb, level, and firmly attached to heights indicated as approved.

   - **3.2 CLEANING AND ADJUSTING**
     - 3.2.1Adjust toilet accessories for proper and smooth operation.
     - 3.2.2Clean 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

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

1.2 SUMMARY

This section includes provisions on solid surface countertops as indicated in the following areas:
1.2.1Pantry/Kitchen/ Toilet
1.2.2Information and Display Counters
1.2.3Other parts of the project as indicated on technical working drawings

1.3 RELATED SECTIONS

1.3.1Plumbing Fixtures Section
1.3.2Interior Architectural Woodwork
1.3.3Rough 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

1.5.1PRODUCT 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.

1.5.2EXECUTION 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

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

1.7 WARRANTIES

1.7.1Comply 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:
3.6.1TOLERANCES:
Countertop level tolerances: 3mm in 2.4m, maximum 6mm. Maximum vertical difference between connected planes of two units: 0.4mm.
3.6.2FASTEN:
Comply with manufacturer's requirements for installation. Always apply sealants to wall gaps.

3.7 CLEANING AND PROTECTION
3.7.1Protect 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**
     - 1.1.1Technical Architectural Drawings
     - 1.1.2Specifications
     - 1.1.3Requests for Interpretation
     - 1.1.4Product Samples and Brochures
     - 1.1.5Manufacturer's Data Sheets and Certificates
     - 1.1.6Material Safety Data Sheets
     - 1.1.7Work Program and Methodology Submittals

   - **1.2 SUMMARY**

     This section includes provisions on Smoke Detection systems as needed by the project. Includeed 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**
     - 1.3.1Electrical Fixtures

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

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

   - **1.6 SUBMITTALS**

     1.6.1PRODUCT APPROVAL ATTACHMENTS
     1.6.1.1 PRODUCT DATA, including operation manuals, installation procedures,

     1.6.2EXECUTION 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
     - 2.1.1Unless otherwise specified by designer, Smoke detectors shall be photoelectric type and UL listed for use with the fire alarm control unit being furnished.
     - 2.1.2Smoke 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.
     - 2.1.3Detectors 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.
     - 2.1.4All spot type and duct type detectors installed shall be of the photoelectric type.
     - 2.1.5Photoelectric 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.
     - 2.1.6Detectors 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.
     - 2.1.7Battery shall be of the sealed, maintenance free type, 24-volt nominal

   - **2.2** ALARM BELLS
     - 2.2.1Shall be electric, single stroke or vibrating, heavy duty, under dome, solenoid type.
     - 2.2.2Unless 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).
     - 2.2.3Mount on removable adapter plates on outlet boxes.
     - 2.2.4Bells 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
     - 3.1.1Installation 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.
     - 3.1.2All conduits, junction boxes, conduit supports and hangers shall be concealed in finished areas and may be exposed in unfinished areas.
     - 3.1.3All 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.
     - 3.1.4All smoke detectors shall be installed on ceiling, surface mounted.
     - 3.1.5Check 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

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

1.2 SUMMARY

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

1.3 RELATED SECTIONS

1.3.1Joint Sealants
1.3.2Solid Surface Countertops

1.4 GENERAL PROVISION

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

1.5 MAINTANANCE, DELIVERY, STORAGE, AND HANDLING

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

1.6 SUBMITTALS

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

instructions and source manufacturers for replaceable parts.

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

1.7 QUALITY ASSURANCE

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

1.8 WARRANTIES

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

2. **PART 2 PRODUCTS**

2.1 WATER CLOSET

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

2.2 LAVATORY FAUCET

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

2.3 PANRTY FAUCET

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

2.4 SHOWER SET

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

2.5 LAVATORY

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

2.6 GREASE TRAP

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

2.7 STAINLESS SINK

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

2.8 FITTINGS

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

2.9 FIXTURE SUPPORTS

Ensure that fixture supports are structurally sound and stable.

3. **PART 3 EXECUTION**

3.1 INSTALLATION

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

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

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

END OF SECTION

16 00 00	ELECTRICAL	
16 51 00		

16.1 SCOPE

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

16.2 APPLICABLE DOCUMENTS

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

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

16.3 GENERAL PROVISION

16.3.1 GENERAL

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

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

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

16.3.2 APPLICATION

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

16.3.3 SUBMITTALS

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

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

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

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

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

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

16.3.4 CONNECTION TO OTHER EQUIPMENT

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

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

16.3.5 COORDINATION DRAWINGS

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

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

16.3.6 OPERATION AND MAINTENANCE MANUAL

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

16.3.7 POSTED OPERATING INSTRUCTIONS

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

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

16.3.8 INSTRUCTION TO OWNER PERSONNEL

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

16.3.9 DELIVERY AND STORAGE

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

16.3.10 CATALOGUED PRODUCTIONS/SERVICE AVAILABILITY

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

16.3.11 MANUFACTURER'S RECOMMENDATIONS

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

16.3.12 RECORD DRAWINGS

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

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

16.3.13 CODES, PERMITS, INSPECTIONS, AND OWNER REQUIREMENTS

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

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

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

16.3.14 ELECTRIC CHARACTERISTICS

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

16.3.15 ELECTRIC REQUIREMENTS

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

16.3.16 GENERAL NOTES

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

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

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

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

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

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

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

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

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

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

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

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

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

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

N. All receptacle outlets shall be grounding type.

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

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

16.4 PRODUCTS

16.4.1.1 Standard Products

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

16.4.2 Approval of Materials

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

16.4.3 Conduit and Conduit Fittings

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

16.4.4 Wires and Cables

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

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

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

16.4.5 Outlets

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

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

16.4.6 Pull Boxes, Junction and Utility Boxes

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

16.4.7 Device Plates

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

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

16.4.8 Wiring Devices

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

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

16.4.9 Panelboards

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

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

1) Circuit breaker shall be molded bolt-in type with frame size and trip settings as shown on the drawings. Molded case circuit breakers shall conform to NEMA standard publication 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 [75o C conductors (30-100 Ampere) or 75oC conductors (200-600 Ampere)].

All current carrying parts shall be plated to resist corrosion.

E. SWITCH MECHANISM

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

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

16.4.10 Lamp and Lighting Fixtures

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

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

    ii. 10-90% down-lighting.
    iii. LAMPS/BULBS: LED Type, Warm White Color
15) COVE/CANAL LIGHTING
    i. CASING: Surface mounted, ballast case, body of casing shall be of powder coated aluminum white
    ii. 10-90% down-lighting.
    iii. LAMPS/BULBS: Slim Type Tube CFL, Warm White Color, 36WATTS

16) SURFACE MOUNTED SLIM TYPE CFL
    i. CASING: Surface mounted, ballast case, body of casing shall be of powder coated aluminum white
    ii. 10-90% down-lighting.
    iii. LAMPS/BULBS: Slim Type Tube CFL, Warm White Color, 18WATTS

17) WALL LAMP
    i. CASING: Wall mount, square/cube/Rectangular, shall be of aluminum make powder coated black, matte finish.
    ii. Use square type direct-indirect lighting, with 60-90% uplight and 60-90% downlight.
    iii. Maximum width of fixture shall be 120mm.
    iv. LAMPS/BULBS: LED Type, Warm White Color

18) DROPPED LIGHT
    i. CASING: 0.30M diameter, for architect's approval
    ii. LAMPS/BULB LED Type, Warm White Color
    iii. Verify suspension distances with architect

19) PENDANT LIGHT/ DROPPED LIGHT
    i. CASING: 2.0M diameter, for architect's approval
    ii. LAMPS/BULB LED Type, Warm White Color
    iii. Verify suspension distances with architect

20) UPLIGHT
    i. CASING: Recessed; floor mounted, flushed type, circular disc shape, 116mm diameter. Body of casing shall be of aluminum or steel make, hairline or satin finish.
    ii. 10-90% uplighting. Use LED lamps bulbs only.
    iii. LAMPS/BULBS: LED Type, Warm White Color

21) SPOT LIGHTS
    i. Use lightweight spotlights manufactured from aluminum, coated in powder black color, matte finish.
    ii. WATTAGE: For architect's approval, specific to area/location of installation.
    iii. ROTATION: 350 degrees
    iv. ADJUSTMENT: 180 degrees
    v. WIDTH: 95mm
    vi. Comply voltage requirements with local conditions and code.
    vii. LAMPS/BULB LED Type, Warm White Color

16.4.11 EXECUTION

A. EXAMINATION AND PREPARATION

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

B. INSTALLATION

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

C. CLEANING AND PROTECTION

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

16.5 CCTV SYSTEM

16.5.1 General

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

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

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

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

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

16.5.2 Submittals

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

16.5.3 SYSTEM COMPONENTS

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

Indoor Camera

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

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

Outdoor Camera

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

DIGITAL VIDEO RECORDER (DVR)

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

MONITOR

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

PERIPHERAL EQUIPMENT/ACCESSORIES

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

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

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

16.5.4 CONTRACTOR'S RESPONSIBILITY

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

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

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

16.5.5 GUARANTEE

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

16.6 STAND ALONE FIRE DETECTION AND ALARM SYSTEM (FDAS)

16.6.1 GENERAL:

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

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

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

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

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

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

. 16.5.2 Submittals

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

16.5.3 SYSTEM COMPONENTS

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

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

16.5.4 CONTRACTOR'S RESPONSIBILITY

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

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

16.5.5 GUARANTEE

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

END OF SECTION

DIVISION 17
MECHANICAL

17 00 00	MECHANICAL	
16 51 00		

17.1 AIR-CONDITIONING SPECIFICATIONS

17.1.1 GENERAL

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

17.1.2 SCOPE OF WORK

a. WORK INCLUDED:

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

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

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

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

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

17.1.3 APPLICABLE SPECIFICATION, CODES, ORDINANCES, PERMITS AND FEES

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

- The Philippine Mechanical Code
- National Building Code

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

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

17.1.3.3 The Contractor shall obtain all necessary allowances, pay royalties, etc. in connection with the use of any patented device or system and shall save the owner harmless from any claim or lawsuit arising from such use.

17.1.4 SHOP DRAWINGS, SAMPLES AND OTHER SUBMITTALS

17.1.4.1 The Contractor shall prepare and submit for the following;

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

17.1.5 ACCEPTANCE TEST

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

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

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

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

17.1.6 WORKMANSHIP AND COORDINATION OF WORK WITH OTHERS

17.1.6.1 The Contractor shall be held fully responsible for the work of any manufacturer or sub- contractor supplying materials to or performing work for, as it is intended that the entire Air-Conditioning system shall be ready in every respect for satisfactory and efficient operation when finally delivered to the Owners.

17.1.6.2 The Contractor shall assume full responsibility and shall provide the services of a qualified Engineer to supervise the complete installation of equipment and to conduct the final acceptance tests.

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

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

17.1.7 AIRCONDITIONING UNITS

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

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

17.1.8 HANGERS & SUPPORT

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

17.1.8.2 Hangers Installation

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

17.1.9 PIPE SLEEVES

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

17.1.10 MINOR MODIFICATIONS AND TIME COMPLETION

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

END OF SECTION

AR. FERDINAND A. DUMPA, uap, MiSDS
Architect, USTP