REPUBLIC OF THE PHILIPPINES
DEPARTMENT OF BUDGET AND MANAGEMENT
GENERAL SOLANO STREET, SAN MIGUEL, MANILA

BIDDING DOCUMENTS FOR THE

RENOVATION OF THE DBM ARCACHE BUILDING

PROJECT ID NO.: DBM-2017-33

CHECKLIST OF ELIGIBILITY AND TECHNICAL DOCUMENTS FOR SUBMISSION

Class "A" Documents

(1) Legal Documents

- ☐ PhilGEPS Certificate of Registration with Annex A; or
- ☐ Class "A" eligibility documents
  - o Reg. Certificate
    - DTI Certificate – for sole proprietorship
    - SEC Certificate of Registration – for corporation
  - o Current and Valid Mayor's/Business Permit
  - o Tax Clearance per Executive Order No. 398, series of 2005, as finally reviewed and approved by the BIR
- ☐ PCAB Registration (Valid PCAB Registration required for this Project Category A, Medium B for Building)

(2) Technical Documents

- ☐ Statement of all Ongoing Private and Government Contracts, Including Contracts Awarded but not yet Started, if any
- ☐ Statement of Single Largest Completed Contract, which is similar in nature, within five (5) years from the date of submission and receipt of bids
  - ☐ Photocopy of Single Largest Completed Contract or Purchase Order (at least 50% of the ABC)
  - ☐ Notice of Award and/or Notice to Proceed
  - ☐ Project Owner's Certificate of Final Acceptance issued by the Owner other than the Contractor or the Constructors Performance Evaluation System (CPES) Final Rating, which must be at least satisfactory. In case of contracts with the private sector, an equivalent document shall be submitted.
- ☐ Bid Security in any of the following forms:
  - Cash or cashier's/manager's check, bank draft/guarantee or irrevocable letter of credit issued by a Universal or Commercial Bank (2% of the ABC); or
  - Surety bond (5% of the ABC) with a Certificate from the Insurance Commission; or
  - Bid Securing Declaration
- ☐ Project Requirements, which shall include the following:

- ☐ Organizational Chart for the contract to be bid
- ☐ List of the Contractor's personnel to be assigned to the contract to be bid, with their complete qualification and experience data
    - Individual Resumes, PRC Licenses/Other Accreditation
- ☐ List of the Contractor's major equipment units, which are owned, leased and/or under purchase agreements, supported by proof of ownership, certification of availability of equipment from the equipment lessor/vendor for the duration of the Project as the case maybe
    - Proof of Ownership, Lease and/or Purchase Agreement
- ☐ Statement of Availability of Key Personnel and Equipment
- ☐ Affidavit of Site Inspection
- ☐ List of subcontractors, if applicable

☐ Sworn Statement of Compliance with the Drawings and Specifications

☐ Omnibus Sworn Statement

☐ Authority of the Signatory

(3) Financial Documents

☐ Net Financial Contracting Capacity (NFCC) computation or Committed Line of Credit

☐ Latest Audited Financial Statement (if not PhilGEPS Platinum Member) stamped "received" by the BIR or its duly accredited and authorized institutions, for the preceding calendar year which should not be earlier than two (2) years from the date of bid submission.

<u>Class "B" Documents</u>

☐ JVA or the Duly Notarized Statement in accordance with Section 23.1(b) of the 2016 Revised IRR, if applicable

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Section I. Invitation to Bid

REPUBLIC OF THE PHILIPPINES
DEPARTMENT OF BUDGET AND MANAGEMENT

GENERAL SOLANO STREET, SAN MIGUEL, MANILA

Invitation to Bid for the Renovation of the DBM Arcache Building

1. The Department of Budget and Management (DBM), through Multi-year Obligational Authority No. MYOA-BMB-C-17-0102130, intends to apply the sum of **One Forty Million Five Hundred Thousand Pesos (P140,500,000.00)** being the Approved Budget for the Contract (ABC) to payments under the contract for the Project, "**Renovation of the DBM Arcache Building**," for eight (8) months. The funding source is through the authorized appropriations under the FY 2017 General Appropriations Act. Bids received in excess of the ABC shall be automatically rejected at bid opening.

2. The DBM now invites bids for the Project, "Renovation of the DBM Arcache Building." Works shall be within two hundred forty (240) days from the starting date of construction. Bidders should have completed, within five (5) years from the date of submission and receipt of bids, a contract similar to the Project. The description of an eligible bidder is contained in the Bidding Documents, particularly, in Section II. Instructions to Bidders.

3. Bidding will be conducted through open competitive bidding procedures using a non-discretionary "pass/fail" criterion as specified in the 2016 Revised Implementing Rules and Regulations (IRR) of Republic Act (RA) No. 9184, otherwise known as the "Government Procurement Reform Act."

   Bidding is restricted to Filipino citizens/sole proprietorships, cooperatives, and partnerships or organizations with at least seventy five percent (75%) interest or outstanding capital stock belonging to citizens of the Philippines.

4. Interested bidders may obtain further information from the DBM-Bids and Awards Committee (BAC) Secretariat and inspect the Bidding Documents at the address given below during office hours from 9:00 a.m. to 4:00 p.m.

5. A complete set of Bidding Documents may be acquired by interested Bidders on December 7, 2017 from the address below and upon payment of a fee in the amount of Fifty Thousand Pesos (P50,000.00).

   It may also be downloaded free of charge from the website of the Philippine Government Electronic Procurement System (PhilGEPS) and the website of the Procuring Entity, provided that Bidders shall pay the applicable fee for the Bidding Documents not later than the submission of their bids.

6. The DBM will hold a Pre-Bid Conference on December 14, 2017, 10:00 a.m., at the BAC Conference Room, Ground Floor, DBM Building III, General Solano St., San Miguel, Manila, which shall be open to prospective bidders.

7. Bids must be duly received by the BAC Secretariat at the address below on or before December 28, 2017, 9:00 a.m. All Bids must be accompanied by a bid security in any of the acceptable forms and in the amount stated in ITB Clause 18.

   Bid opening shall be on December 28, 2017, 9:00 a.m., at the BAC Conference Room, Ground Floor, DBM Building III, General Solano St., San Miguel, Manila. Bids will be opened in the presence of the bidders' representatives who choose to attend at the address below. Late bids shall not be accepted.

8. The DBM reserves the right to reject any and all bids, declare a failure of bidding, or not award the contract at any time prior to contract award in accordance with Section 41 of RA No. 9184 and its IRR, without thereby incurring any liability to the affected bidder or bidders.

9. For further information, please refer to:

   DBM-BAC Secretariat
   BAC Conference Room
   Department of Budget and Management
   Ground Floor, DBM Building III, General Solano St., San Miguel, Manila
   Telefax No. 657-3300 local 3115
   Email address: **procurement@dbm.gov.ph**

CLARITO ALEJANDRO D. MAGSINO
Chairperson, DBM-BAC

Section II. Instructions to Bidders

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A. General

1. Scope of Bid

1.1. The Procuring Entity named in the **BDS**, invites bids for the construction of Works. as described in Section VI. Specifications

1.2. The name, identification, and number of lots specific to this bidding are provided in the **BDS**. The contracting strategy and basis of evaluation of lots is described in **ITB** Clause 27.

1.3. The successful Bidder will be expected to complete the Works by the intended completion date specified in **SCC** Clause 1.17.

2. Source of Funds

The Procuring Entity has a budget or received funds from the Funding Source named in the **BDS**. and in the amount indicated in the **BDS**. It intends to apply part of the funds received for the Project, as defined in the **BDS**, to cover eligible payments under the Contract for the Works.

3. Corrupt, Fraudulent, Collusive, Coercive, and Obstructive Practices

3.1. Unless otherwise specified in the **BDS**, the Procuring Entity, as well as bidders and contractors, shall observe the highest standard of ethics during the procurement and execution of the contract. In pursuance of this policy, the Funding Source:

(a) defines, for purposes of this provision, the terms set forth below as follows:

(i) "corrupt practice" means behavior on the part of officials in the public or private sectors by which they improperly and unlawfully enrich themselves, others, or induce others to do so, by misusing the position in which they are placed, and includes the offering, giving, receiving, or soliciting of anything of value to influence the action of any such official in the procurement process or in contract execution; entering, on behalf of the Procuring Entity, into any contract or transaction manifestly and grossly disadvantageous to the same, whether or not the public officer profited or will profit thereby, and similar acts as provided in Republic Act 3019;

(ii) "fraudulent practice" means a misrepresentation of facts in order to influence a procurement process or the execution of a contract to the detriment of the Procuring Entity, and includes collusive practices among Bidders (prior to or after Bid submission) designed to establish bid prices at artificial, non-competitive levels and to deprive the Procuring Entity of the benefits of free and open competition;

(iii) "collusive practices" means a scheme or arrangement between two or more Bidders, with or without the knowledge of the Procuring Entity, designed to establish bid prices at artificial, non-competitive levels; and

(iv) "coercive practices" means harming or threatening to harm, directly or indirectly, persons, or their property to influence their participation in a procurement process, or affect the execution of a contract;

(v) "obstructive practice" is

(aa) deliberately destroying, falsifying, altering or concealing of evidence material to an administrative proceedings or investigation or making false statements to investigators in order to materially impede an administrative proceedings or investigation of the Procuring Entity or any foreign government/foreign or international financing institution into allegations of a corrupt, fraudulent, coercive or collusive practice; and/or threatening, harassing or intimidating any party to prevent it from disclosing its knowledge of matters relevant to the administrative proceedings or investigation or from pursuing such proceedings or investigation; or

(bb) acts intended to materially impede the exercise of the inspection and audit rights of the Procuring Entity or any foreign government/foreign or international financing institution herein.

(b) will reject a proposal for award if it determines that the Bidder recommended for award has engaged in corrupt or fraudulent practices in competing for the Contract; and

(c) will declare a firm ineligible, either indefinitely or for a stated period of time, to be awarded Contract funded by the Funding Source if it at any time determines that the firm has engaged in corrupt or fraudulent practices in competing or, or in executing, a Contract funded by the Funding Source.

3.2. Further, the Procuring Entity will seek to impose the maximum civil, administrative, and/or criminal penalties available under the applicable laws on individuals and organizations deemed to be involved in any of the practices mentioned in **ITB** Clause 3.1(a).

3.3. Furthermore, the Funding Source and the Procuring Entity reserve the right to inspect and audit records and accounts of a contractor in the bidding for and performance of a contract themselves or through independent auditors as reflected in the **GCC** Clause 34.

4. Conflict of Interest

4.1. All Bidders found to have conflicting interests shall be disqualified to participate in the procurement at hand, without prejudice to the imposition of appropriate administrative, civil, and criminal sanctions. A Bidder may be considered to have conflicting interests with another Bidder in any of the events described in paragraphs (a) through (e) and a general conflict of interest in any of the circumstances set out in paragraphs (d) through (g) below:

(a) A Bidder has controlling shareholders in common with another Bidder,

(b) A Bidder receives or has received any direct or indirect subsidy from any other Bidder;

(c) A Bidder has the same legal representative as that of another Bidder for purposes of this Bid;

(d) A Bidder has a relationship, directly or through third parties, that puts them in a position to have access to information about or influence on the bid of another Bidder or influence the decisions of the Procuring Entity regarding this bidding process;

(e) A Bidder submits more than one bid in this bidding process. However, this does not limit the participation of subcontractors in more than one bid;

(f) A Bidder who participated as a consultant in the preparation of the design or technical specifications of the goods and related services that are the subject of the bid; or

(g) A Bidder who lends, or temporarily seconds, its personnel to firms or organizations which are engaged in consulting services for the preparation related to procurement for or implementation of the project, if the personnel would be involved in any capacity on the same project.

4.2. In accordance with Section 47 of the IRR of RA 9184, all Bidding Documents shall be accompanied by a sworn affidavit of the Bidder that it is not related to the Head of the Procuring Entity (HoPE), members of the Bids and Awards Committee (BAC), members of the Technical Working Group (TWG), members of the BAC Secretariat, the head of the Project Management Office (PMO) or the end-user unit, and the project consultants, by consanguinity or affinity up to the third civil degree. On the part of the Bidder, this Clause shall apply to the following persons:

(a) If the Bidder is an individual or a sole proprietorship, to the Bidder himself;

(b) If the Bidder is a partnership, to all its officers and members;

(c) If the Bidder is a corporation, to all its officers, directors, and controlling stockholders;

(d) If the Bidder is a cooperative, to all its officers, directors, and controlling shareholders or members; and

(e) If the Bidder is a joint venture (JV), the provisions of items (a), (b), (c) or (d) of this Clause shall correspondingly apply to each of the members of the said JV, as may be appropriate.

Relationship of the nature described above or failure to comply with this Clause will result in the automatic disqualification of a Bidder.

5. Eligible Bidders

5.1. Unless otherwise indicated in the **BDS**, the following persons shall be eligible to participate in this Bidding:

(a) Duly licensed Filipino citizens/sole proprietorships;

(b) Partnerships duly organized under the laws of the Philippines and of which at least seventy five percent (75%) of the interest belongs to citizens of the Philippines;

(c) Corporations duly organized under the laws of the Philippines, and of which at least seventy five percent (75%) of the outstanding capital stock belongs to citizens of the Philippines;

(d) Cooperatives duly organized under the laws of the Philippines.

(e) Persons/entities forming themselves into a JV, i.e., a group of two (2) or more persons/entities that intend to be jointly and severally responsible or liable for a particular contract: Provided, however, that, in accordance with Letter of Instructions No. 630, Filipino ownership or interest of the joint venture concerned shall be at least seventy five percent (75%): Provided, further, that joint ventures in which Filipino ownership or interest is less than seventy five percent (75%) may be eligible where the structures to be built require the application of techniques and/or technologies which are not adequately possessed by a person/entity meeting the seventy five percent (75%) Filipino ownership requirement: Provided, finally, that in the latter case, Filipino ownership or interest shall not be less than twenty five percent (25%). For this purpose, Filipino ownership or interest shall be based on the contributions of each of the members of the joint venture as specified in their JVA.

5.2. The Procuring Entity may also invite foreign bidders when provided for under any Treaty or International or Executive Agreement as specified in the **BDS**.

5.3. Government owned or controlled corporations (GOCCs) may be eligible to participate only if they can establish that they (a) are legally and financially

autonomous, (b) operate under commercial law, and (c) are not attached agencies of the Procuring Entity.

5.4 (a) The Bidder must have an experience of having completed a Single Largest Completed Contract (SLCC) that is similar to this Project, equivalent to at least fifty percent (50%) of the ABC adjusted, if necessary, by the Bidder to current prices using the Philippine Statistics Authority (PSA) consumer price index. However, contractors under Small A and Small B categories without similar experience on the contract to be bid may be allowed to bid if the cost of such contract is not more than the Allowable Range of Contract Cost (ARCC) of their registration based on the guidelines as prescribed by the PCAB.

(b) For Foreign-funded Procurement, the Procuring Entity and the foreign government/foreign or international financing institution may agree on another track record requirement, as specified in the **BDS**.

For this purpose, contracts similar to the Project shall be those described in the **BDS**.

5.5. The Bidder must submit a computation of its Net Financial Contracting Capacity (NFCC), which must be at least equal to the ABC to be bid, calculated as follows:

NFCC = [(Current assets minus current liabilities) (15)] minus the value of all outstanding or uncompleted portions of the projects under ongoing contracts, including awarded contracts yet to be started coinciding with the contract for this Project.

The values of the domestic bidder's current assets and current liabilities shall be based on the latest Audited Financial Statements (AFS) submitted to the BIR.

For purposes of computing the foreign bidders' NFCC, the value of the current assets and current liabilities shall be based on their audited financial statements prepared in accordance with international financial reporting standards.

6. Bidder's Responsibilities

6.1. The Bidder or its duly authorized representative shall submit a sworn statement in the form prescribed in Section IX. Bidding Forms as required in **ITB** Clause 12.1(b)(iii).

6.2. The Bidder is responsible for the following:

(a) Having taken steps to carefully examine all of the Bidding Documents;

(b) Having acknowledged all conditions, local or otherwise, affecting the implementation of the contract;

(c) Having made an estimate of the facilities available and needed for the contract to be bid, if any;

(d) Having complied with its responsibility to inquire or secure Supplemental/Bid Bulletin/s as provided under **ITB** Clause 10.4.

(e) Ensuring that it is not "blacklisted" or barred from bidding by the GoP or any of its agencies, offices, corporations, or LGUs, including foreign government/foreign or international financing institution whose blacklisting rules have been recognized by the GPPB;

(f) Ensuring that each of the documents submitted in satisfaction of the bidding requirements is an authentic copy of the original, complete, and all statements and information provided therein are true and correct;

(g) Authorizing the HoPE or its duly authorized representative/s to verify all the documents submitted;

(h) Ensuring that the signatory is the duly authorized representative of the Bidder, and granted full power and authority to do, execute and perform any and all acts necessary to participate, submit the bid, and to sign and execute the ensuing contract, accompanied by the duly notarized Special Power of Attorney, Board/Partnership Resolution, or Secretary's Certificate, whichever is applicable;

(i) Complying with the disclosure provision under Section 47 of RA 9184 and its IRR in relation to other provisions of RA 3019;

(j) Complying with existing labor laws and standards, in the case of procurement of services. Moreover, bidder undertakes to:

(i) Ensure the entitlement of workers to wages, hours of work, safety and health and other prevailing conditions of work as established by national laws, rules and regulations: or collective bargaining agreement; or arbitration award, if and when applicable.

In case there is a finding by the Procuring Entity or the DOLE of underpayment or non-payment of workers' wage and wage-related benefits, bidder agrees that the performance security or portion of the contract amount shall be withheld in favor of the complaining workers pursuant to appropriate provisions of Republic Act No. 9184 without prejudice to the institution of appropriate actions under the Labor Code, as amended, and other social legislations.

(ii) Comply with occupational safety and health standards and to correct deficiencies, if any.

In case of imminent danger, injury or death of the worker, bidder undertakes to suspend contract implementation pending clearance to proceed from the DOLE Regional Office and to comply with Work Stoppage Order; and

(iii) Inform the workers of their conditions of work, labor clauses under the contract specifying wages, hours of work and other benefits under prevailing national laws, rules and regulations; or collective bargaining agreement; or arbitration award, if and when applicable, through posting in two (2) conspicuous places in the establishment's premises; and

(k) Ensuring that it did not give or pay, directly or indirectly, any commission, amount, fee, or any form of consideration, pecuniary or otherwise, to any person or official, personnel or representative of the;

Failure to observe any of the above responsibilities shall be at the risk of the Bidder concerned.

6.3. The Bidder, by the act of submitting its bid, shall be deemed to have inspected the site, determined the general characteristics of the contract works and the conditions for this Project and examine all instructions, forms, terms, and project requirements in the Bidding Documents.

6.4. It shall be the sole responsibility of the prospective bidder to determine and to satisfy itself by such means as it considers necessary or desirable as to all matters pertaining to this Project, including: (a) the location and the nature of the contract, project, or work; (b) climatic conditions; (c) transportation facilities; (c) nature and condition of the terrain, geological conditions at the site communication facilities, requirements, location and availability of construction aggregates and other materials, labor, water, electric power and access roads; and (d) other factors that may affect the cost, duration and execution or implementation of the contract, project, or work.

6.5. The Procuring Entity shall not assume any responsibility regarding erroneous interpretations or conclusions by the prospective or eligible bidder out of the data furnished by the procuring entity. However, the Procuring Entity shall ensure that all information in the Bidding Documents, including supplemental/bid bulletins issued are correct and consistent.

6.6. Before submitting their bids, the Bidders are deemed to have become familiar with all existing laws, decrees, ordinances, acts and regulations of the Philippines which may affect the contract in any way.

6.7. The Bidder shall bear all costs associated with the preparation and submission of his bid, and the Procuring Entity will in no case be responsible or liable for those costs, regardless of the conduct or outcome of the bidding process.

6.8. The Bidder should note that the Procuring Entity will accept bids only from those that have paid the applicable fee for the Bidding Documents at the office indicated in the Invitation to Bid.

7. Origin of Goods and Services

There is no restriction on the origin of Goods, or Contracting of Works or Services other than those prohibited by a decision of the United Nations Security Council taken under Chapter VII of the Charter of the United Nations.

8. Subcontracts

8.1. Unless otherwise specified in the **BDS**, the Bidder may subcontract portions of the Works to an extent as may be approved by the Procuring Entity and stated in the **BDS**. However, subcontracting of any portion shall not relieve the Bidder from any liability or obligation that may arise from the contract for this Project.

8.2. Subcontractors must submit the documentary requirements under **ITB** Clause 12 and comply with the eligibility criteria specified in the **BDS**. In the event that any subcontractor is found by the Procuring Entity to be ineligible, the subcontracting of such portion of the Works shall be disallowed.

8.3. The Bidder may identify the subcontractor to whom a portion of the Works will be subcontracted at any stage of the bidding process or during contract implementation. If the Bidder opts to disclose the name of the subcontractor during bid submission, the Bidder shall include the required documents as part of the technical component of its bid.

B. Contents of Bidding Documents

9. Pre-Bid Conference

9.1. (a) If so specified in the **BDS**, a pre-bid conference shall be held at the venue and on the date indicated therein, to clarify and address the Bidders' questions on the technical and financial components of this Project.

(b) The pre-bid conference shall be held at least twelve (12) calendar days before the deadline for the submission of and receipt of bids, but not earlier than seven (7) calendar days from the posting of the Invitation to Bid/Bidding Documents in the PhilGEPS website. If the Procuring Entity determines that, by reason of the method, nature, or complexity of the contract to be bid, or when international participation will be more advantageous to the GoP, a longer period for the preparation of bids is necessary, the pre-bid conference shall be held at least thirty (30) calendar days before the deadline for the submission and receipt of bids, as specified in the **BDS**.

9.2. Bidders are encouraged to attend the pre-bid conference to ensure that they fully understand the Procuring Entity's requirements. Non-attendance of the Bidder will in no way prejudice its bid; however, the Bidder is expected to know the changes and/or amendments to the Bidding Documents as recorded in the minutes of the pre-bid conference and the Supplemental/Bid Bulletin. The minutes of the pre-bid conference shall be recorded and prepared not later than five (5) calendar days after the pre-bid conference. The minutes shall be

made available to prospective bidders not later than five (5) days upon written request.

9.3. Decisions of the BAC amending any provision of the bidding documents shall be issued in writing through a Supplemental/Bid Bulletin at least seven (7) calendar days before the deadline for the submission and receipt of bids.

10. Clarification and Amendment of Bidding Documents

10.1. Prospective bidders may request for clarification(s) on and/or interpretation of any part of the Bidding Documents. Such a request must be in writing and submitted to the Procuring Entity at the address indicated in the **BDS** at least ten (10) calendar days before the deadline set for the submission and receipt of Bids.

10.2. The BAC shall respond to the said request by issuing a Supplemental/Bid Bulletin, to be made available to all those who have properly secured the Bidding Documents, at least seven (7) calendar days before the deadline for the submission and receipt of Bids.

10.3. Supplemental/Bid Bulletins may also be issued upon the Procuring Entity's initiative for purposes of clarifying or modifying any provision of the Bidding Documents not later than seven (7) calendar days before the deadline for the submission and receipt of Bids. Any modification to the Bidding Documents shall be identified as an amendment.

10.4. Any Supplemental/Bid Bulletin issued by the BAC shall also be posted in the PhilGEPS and the website of the Procuring Entity concerned, if available, and at any conspicuous place in the premises of the Procuring Entity concerned. It shall be the responsibility of all Bidders who have properly secured the Bidding Documents to inquire and secure Supplemental/Bid Bulletins that may be issued by the BAC. However, Bidders who have submitted bids before the issuance of the Supplemental/Bid Bulletin must be informed and allowed to modify or withdraw their bids in accordance with **ITB** Clause 23.

C. Preparation of Bids

11. Language of Bids

The eligibility requirements or statements, the bids, and all other documents to be submitted to the BAC must be in English. If the eligibility requirements or statements, the bids, and all other documents submitted to the BAC are in foreign language other than English, it must be accompanied by a translation of the documents in English. The documents shall be translated by the relevant foreign government agency, the foreign government agency authorized to translate documents, or a registered translator in the foreign bidder's country; and shall be authenticated by the appropriate Philippine foreign service establishment/post or the equivalent office having jurisdiction over the foreign bidder's affairs in the Philippines. The English translation shall govern, for purposes of interpretation of the bid.

12. Documents Comprising the Bid: Eligibility and Technical Components

12.1 Unless otherwise indicated in the **BDS**, the first envelope shall contain the following eligibility and technical documents:

(a) Eligibility Documents –

Class "A" Documents

(i) PhilGEPS Certificate of Registration and Membership in accordance with Section 8.5.2 of the IRR, except for foreign bidders participating in the procurement by a Philippine Foreign Service Office or Post, which shall submit their eligibility documents under Section 23.1 of the IRR, provided, that the winning bidder shall register with the PhilGEPS in accordance with Section 37.1.4 of the IRR;

(ii) Statement of all its ongoing government and private contracts, including contracts awarded but not yet started, if any, whether similar or not similar in nature and complexity to the contract to be bid; and

Statement of the Bidder's SLCC similar to the contract to be bid, in accordance with ITB Clause 5.4.

The two statements required shall indicate for each contract the following:

(ii.1) name of the contract;

(ii.2) date of the contract;

(ii.3) contract duration;

(ii.4) owner's name and address;

(ii.5) nature of work;

(ii.6) contractor's role (whether sole contractor, subcontractor, or partner in a JV) and percentage of participation;

(ii.7) total contract value at award;

(ii.8) date of completion or estimated completion time;

(ii.9) total contract value at completion, if applicable;

(ii.10) percentages of planned and actual accomplishments, if applicable; and

(ii.11) value of outstanding works, if applicable.

The statement of the Bidder's SLCC shall be supported by the Notice of Award and/or Notice to Proceed, Project Owner's Certificate of Final Acceptance issued by the Owner other than the Contractor or the Constructors Performance Evaluation System (CPES) Final Rating, which must be at least satisfactory. In case of contracts with the private sector, an equivalent document shall be submitted;

(iii) Unless otherwise provided in the **BDS**, a valid special PCAB License in case of joint ventures, and registration for the type and cost of the contract for this Project; and

(iv) NFCC computation in accordance with ITB Clause 5.5.

Class "B" Documents

(v) If applicable, Joint Venture Agreement (JVA) in accordance with RA 4566.

(b) Technical Documents –

(i) Bid security in accordance with **ITB** Clause 18. If the Bidder opts to submit the bid security in the form of:

(i.1) a bank draft/guarantee or an irrevocable letter of credit issued by a foreign bank, it shall be accompanied by a confirmation from a Universal or Commercial Bank; or

(i.2) a surety bond accompanied by a certification coming from the Insurance Commission that the surety or insurance company is authorized to issue such instruments.

(ii) Project Requirements, which shall include the following:

(ii.1) Organizational chart for the contract to be bid;

(ii.2) List of contractor's personnel (*e.g.*, Project Manager, Project Engineers, Materials Engineers, and Foremen), to be assigned to the contract to be bid, with their complete qualification and experience data. These personnel must meet the required minimum years of experience set in the **BDS**; and

(ii.3) List of contractor's major equipment units, which are owned, leased, and/or under purchase agreements, supported by proof of ownership, certification of availability of equipment from the equipment lessor/vendor for the duration of the project, as the case

may be, which must meet the minimum requirements for the contract set in the **BDS**; and

(iii) Sworn statement in accordance with Section 25.3 of the IRR of RA 9184 and using the form prescribed in Section IX. Bidding Forms.

13. Documents Comprising the Bid: Financial Component

13.1. Unless otherwise stated in the **BDS**, the financial component of the bid shall contain the following:

(a) Financial Bid Form, which includes bid prices and the bill of quantities, in accordance with **ITB** Clauses 15.1 and 15.3, and

(b) Any other document related to the financial component of the bid as stated in the **BDS**

13.2. (a) Unless otherwise stated in the **BDS**, all Bids that exceed the ABC shall not be accepted.

(b) Unless otherwise indicated in the **BDS**, for foreign-funded procurement, a ceiling may be applied to bid prices provided the following conditions are met:

(i) Bidding Documents are obtainable free of charge on a freely accessible website. If payment of Bidding Documents is required by the procuring entity, payment could be made upon the submission of bids

(ii) The procuring entity has procedures in place to ensure that the ABC is based on recent estimates made by the engineer or the responsible unit of the procuring entity and that the estimates are based on adequate detailed engineering (in the case of infrastructure projects) and reflect the quality, supervision and risk and inflationary factors, as well as prevailing market prices, associated with the types of works or goods to be procured.

(iii) The procuring entity has trained cost estimators on estimating prices and analyzing bid variances. In the case of infrastructure projects, the procuring entity must also have trained quantity surveyors.

(iv) The procuring entity has established a system to monitor and report bid prices relative to ABC and engineer's/procuring entity's estimate.

(v) The procuring entity has established a monitoring and evaluation system for contract implementation to provide a feedback on actual total costs of goods and works.

14. Alternative Bids

14.1. Alternative Bids shall be rejected. For this purpose, alternative bid is an offer made by a Bidder in addition or as a substitute to its original bid which may be included as part of its original bid or submitted separately therewith for purposes of bidding. A bid with options is considered an alternative bid regardless of whether said bid proposal is contained in a single envelope or submitted in two (2) or more separate bid envelopes.

14.2. Bidders shall submit offers that comply with the requirements of the Bidding Documents, including the basic technical design as indicated in the drawings and specifications. Unless there is a value engineering clause in the **BDS**, alternative bids shall not be accepted.

14.3. Each Bidder shall submit only one Bid, either individually or as a partner in a JV. A Bidder who submits or participates in more than one bid (other than as a subcontractor if a subcontractor is permitted to participate in more than one bid) will cause all the proposals with the Bidder's participation to be disqualified. This shall be without prejudice to any applicable criminal, civil and administrative penalties that may be imposed upon the persons and entities concerned.

15. Bid Prices

15.1. The contract shall be for the whole Works, as described in **ITB** Clause 1.1, based on the priced Bill of Quantities submitted by the Bidder.

15.2. The Bidder shall fill in rates and prices for all items of the Works described in the Bill of Quantities. Bids not addressing or providing all of the required items in the Bidding Documents including, where applicable, Bill of Quantities, shall be considered non-responsive and, thus, automatically disqualified. In this regard, where a required item is provided, but no price is indicated, the same shall be considered as non-responsive, but specifying a zero (0) or a dash (-) for the said item would mean that it is being offered for free to the Government, except those required by law or regulations to be provided for.

15.3. All duties, taxes, and other levies payable by the Contractor under the Contract, or for any other cause, prior to the deadline for submission of bids, shall be included in the rates, prices, and total bid price submitted by the Bidder.

15.4. All bid prices for the given scope of work in the contract as awarded shall be considered as fixed prices, and therefore not subject to price escalation during contract implementation, except under extraordinary circumstances as specified in GCC Clause 48. Upon the recommendation of the Procuring Entity, price escalation may be allowed in extraordinary circumstances as may be determined by the National Economic and Development Authority in accordance with the Civil Code of the Philippines, and upon approval by the GPPB. Furthermore, in cases where the cost of the awarded contract is affected by any applicable new laws, ordinances, regulations, or other acts of

the GoP, promulgated after the date of bid opening, a contract price adjustment shall be made or appropriate relief shall be applied on a no loss-no gain basis.

16. Bid Currencies

16.1. All bid prices shall be quoted in Philippine Pesos unless otherwise provided in the **BDS**. However, for purposes of bid evaluation, bids denominated in foreign currencies shall be converted to Philippine currency based on the exchange rate prevailing on the day of the Bid Opening.

16.2. If so allowed in accordance with **ITB** Clause 16.1. the Procuring Entity for purposes of bid evaluation and comparing the bid prices will convert the amounts in various currencies in which the bid price is expressed to Philippine Pesos at the exchange rate as published in the *Bangko Sentral ng Pilipinas* (BSP) reference rate bulletin on the day of the bid opening.

16.3. Unless otherwise specified in the **BDS**, payment of the contract price shall be made in Philippine Pesos.

17. Bid Validity

17.1. Bids shall remain valid for the period specified in the **BDS** which shall not exceed one hundred twenty (120) calendar days from the date of the opening of bids.

17.2. In exceptional circumstances, prior to the expiration of the bid validity period, the Procuring Entity may request Bidders to extend the period of validity of their bids. The request and the responses shall be made in writing. The bid security described in **ITB** Clause 18 should also be extended corresponding to the extension of the bid validity period at the least. A Bidder may refuse the request without forfeiting its bid security, but his bid shall no longer be considered for further evaluation and award. A Bidder granting the request shall not be required or permitted to modify its bid.

18. Bid Security

18.1. The Bidder shall submit a Bid Securing Declaration or any form of Bid Security in an amount stated in the **BDS**, which shall be not less than the percentage of the ABC in accordance with the following schedule:

Form of Bid Security	Amount of Bid Security (Not less than the Percentage of the ABC)
(a) Cash or cashier's/manager's check issued by a Universal or Commercial Bank. *For biddings conducted by LGUs, the cashier's/manager's check may be issued by other*	Two percent (2%)

	banks certified by the BSP as authorized to issue such financial instrument.	
(b)	Bank draft/guarantee or irrevocable letter of credit issued by a Universal or Commercial Bank: Provided, however, that it shall be confirmed or authenticated by a Universal or Commercial Bank, if issued by a foreign bank. *For biddings conducted by LGUs, the Bank Draft/ Guarantee, or irrevocable letter of credit may be issued by other banks certified by the BSP as authorized to issue such financial instrument.*	
(c)	Surety bond callable upon demand issued by a surety or insurance company duly certified by the Insurance Commission as authorized to issue such security; and/or	Five percent (5%)

The Bid Securing Declaration mentioned above is an undertaking which states, among others, that the Bidder shall enter into contract with the procuring entity and furnish the performance security required under ITB Clause 32.2, within ten (10) calendar days from receipt of the Notice of Award, and commits to pay the corresponding amount as fine, and be suspended for a period of time from being qualified to participate in any government procurement activity in the event it violates any of the conditions stated therein as provided in the guidelines issued by the GPPB.

18.2. The bid security should be valid for the period specified in the **BDS**. Any bid not accompanied by an acceptable bid security shall be rejected by the Procuring Entity as non-responsive.

18.3. No bid securities shall be returned to Bidders after the opening of bids and before contract signing, except to those that failed or declared as post-disqualified, upon submission of a written waiver of their right to file a request for reconsideration and/or protest, or lapse of the reglementary period without having filed a request for reconsideration or protest. Without prejudice on its forfeiture, Bid Securities shall be returned only after the Bidder with the Lowest Calculated Responsive Bid (LCRB) has signed the contract and furnished the Performance Security, but in no case later than the expiration of the Bid Security validity period indicated in **ITB** Clause 18.2.

18.4. Upon signing and execution of the contract, pursuant to **ITB** Clause 31, and the posting of the performance security, pursuant to **ITB** Clause 32, the successful Bidder's Bid Security will be discharged, but in no case later than the Bid Security validity period as indicated in **ITB** Clause 18.2.

18.5. The bid security may be forfeited:

(a) if a Bidder:

(i) withdraws its bid during the period of bid validity specified in **ITB** Clause 17;

(ii) does not accept the correction of errors pursuant to **ITB** Clause 27.3(b);

(iii) has a finding against the veracity of the required documents submitted in accordance with ITB Clause 28.2;

(iv) submission of eligibility requirements containing false information or falsified documents;

(v) submission of bids that contain false information or falsified documents, or the concealment of such information in the bids in order to influence the outcome of eligibility screening or any other stage of the public bidding;

(vi) allowing the use of one's name, or using the name of another for purposes of public bidding;

(vii) withdrawal of a bid, or refusal to accept an award, or enter into contract with the Government without justifiable cause, after the Bidder had been adjudged as having submitted the LCRB;

(viii) refusal or failure to post the required performance security within the prescribed time;

(ix) refusal to clarify or validate in writing its bid during post-qualification within a period of seven (7) calendar days from receipt of the request for clarification;

(x) any documented attempt by a Bidder to unduly influence the outcome of the bidding in his favor;

(xi) failure of the potential joint venture partners to enter into the joint venture after the bid is declared successful; or

(xii) all other acts that tend to defeat the purpose of the competitive bidding, such as habitually withdrawing from bidding, submitting late Bids or patently insufficient bid, for at least three (3) times within a year, except for valid reasons.

(b) if the successful Bidder:

(i) fails to sign the contract in accordance with **ITB** Clause 31;

(ii) fails to furnish performance security in accordance with **ITB** Clause 32.

19. Format and Signing of Bids

19.1 Bidders shall submit their bids through their duly authorized representative using the appropriate forms provided in Section IX. Bidding Forms on or before the deadline specified in the **ITB** Clause 21 in two (2) separate sealed bid envelopes, and which shall be submitted simultaneously. The first shall contain the technical component of the bid, including the eligibility requirements under **ITB** Clause 12.1, and the second shall contain the financial component of the bid. This shall also be observed for each lot in the case of lot procurement.

19.2 Forms as mentioned in **ITB** Clause 19.1 must be completed without any alterations to their format, and no substitute form shall be accepted. All blank spaces shall be filled in with the information requested.

19.3 The Bidder shall prepare and submit an original of the first and second envelopes as described in **ITB** Clauses 12 and 13. In addition, the Bidder shall submit copies of the first and second envelopes. In the event of any discrepancy between the original and the copies, the original shall prevail.

19.4 Each and every page of the Bid Form, including the Bill of Quantities, under Section IX hereof, shall be signed by the duly authorized representative/s of the Bidder. Failure to do so shall be a ground for the rejection of the bid.

19.5 Any interlineations, erasures, or overwriting shall be valid only if they are signed or initialed by the duly authorized representative/s of the Bidder.

20. Sealing and Marking of Bids

20.1. Bidders shall enclose their original eligibility and technical documents described in **ITB** Clause 12, in one sealed envelope marked "ORIGINAL - TECHNICAL COMPONENT," and the original of their financial component in another sealed envelope marked "ORIGINAL - FINANCIAL COMPONENT," sealing them all in an outer envelope marked "ORIGINAL BID."

20.2. Each copy of the first and second envelopes shall be similarly sealed duly marking the inner envelopes as "COPY NO. ___ - TECHNICAL COMPONENT" and "COPY NO. ___ – FINANCIAL COMPONENT" and the outer envelope as "COPY NO. ___," respectively. These envelopes containing the original and the copies shall then be enclosed in one single envelope.

20.3. The original and the number of copies of the bid as indicated in the **BDS** shall be typed or written in ink and shall be signed by the Bidder or its duly authorized representative/s.

20.4. All envelopes shall:

(a) contain the name of the contract to be bid in capital letters;

(b) bear the name and address of the Bidder in capital letters;

(c) be addressed to the Procuring Entity's BAC in accordance with **ITB** Clause 20.1;

(d) bear the specific identification of this bidding process indicated in the **ITB** Clause 1.2; and

(e) bear a warning "DO NOT OPEN BEFORE..." the date and time for the opening of bids, in accordance with **ITB** Clause 21.

20.5. Bid envelopes that are not properly sealed and marked, as required in the bidding documents, shall not be rejected, but the Bidder or its duly authorized representative shall acknowledge such condition of the bid as submitted. The BAC or the Procuring Entity shall assume no responsibility for the misplacement of the contents of the improperly sealed or marked bid, or for its premature opening.

D. Submission and Opening of Bids

21. Deadline for Submission of Bids

Bids must be received by the Procuring Entity's BAC at the address and on or before the date and time indicated in the **BDS**.

22. Late Bids

Any bid submitted after the deadline for submission and receipt of bids prescribed by the Procuring Entity, pursuant to **ITB** Clause 21, shall be declared "Late" and shall not be accepted by the Procuring Entity. The BAC shall record in the minutes of Bid Submission and Opening, the Bidder's name, its representative and the time the late bid was submitted.

23. Modification and Withdrawal of Bids

23.1 The Bidder may modify its bid after it has been submitted; provided that the modification is received by the Procuring Entity prior to the deadline prescribed for submission and receipt of bids. The Bidder shall not be allowed to retrieve its original bid, but shall be allowed to submit another bid equally sealed and properly identified in accordance with Clause 20, linked to its original bid marked as "TECHNICAL MODIFICATION" or "FINANCIAL MODIFICATION" and stamped "received" by the BAC. Bid modifications received after the applicable deadline shall not be considered and shall be returned to the Bidder unopened.

23.2. A Bidder may, through a Letter of Withdrawal, withdraw its bid after it has been submitted, for valid and justifiable reason; provided that the Letter of

Withdrawal is received by the Procuring Entity prior to the deadline prescribed for submission and receipt of bids. The Letter of Withdrawal must be executed by the authorized representative of the Bidder identified in the Omnibus Sworn Statement, a copy of which should be attached to the letter.

23.3. Bids requested to be withdrawn in accordance with **ITB** Clause 23.1 shall be returned unopened to the Bidders. A Bidder, who has acquired the bidding documents may also express its intention not to participate in the bidding through a letter which should reach and be stamped by the BAC before the deadline for submission and receipt of bids. A Bidder that withdraws its bid shall not be permitted to submit another bid, directly or indirectly, for the same contract.

23.4. No bid may be modified after the deadline for submission of bids. No bid may be withdrawn in the interval between the deadline for submission of bids and the expiration of the period of bid validity specified by the Bidder on the Financial Bid Form. Withdrawal of a bid during this interval shall result in the forfeiture of the Bidder's bid security, pursuant to **ITB** Clause 18.5, and the imposition of administrative, civil, and criminal sanctions as prescribed by RA 9184 and its IRR.

24. Opening and Preliminary Examination of Bids

24.1. The BAC shall open the Bids in public, immediately after the deadline for the submission and receipt of bids in public, as specified in the **BDS**. In case the Bids cannot be opened as scheduled due to justifiable reasons, the BAC shall take custody of the Bids submitted and reschedule the opening of Bids on the next working day or at the soonest possible time through the issuance of a Notice of Postponement to be posted in the PhilGEPS website and the website of the Procuring Entity concerned.

24.2. Unless otherwise specified in the BDS, the BAC shall open the first bid envelopes and determine each Bidder's compliance with the documents prescribed in ITB Clause 12, using a non-discretionary "pass/fail" criterion. If a Bidder submits the required document, it shall be rated "passed" for that particular requirement. In this regard, bids that fail to include any requirement or are incomplete or patently insufficient shall be considered as "failed". Otherwise, the BAC shall rate the said first bid envelope as "passed".

24.3. Unless otherwise specified in the **BDS**, immediately after determining compliance with the requirements in the first envelope, the BAC shall forthwith open the second bid envelope of each remaining eligible Bidder whose first bid envelope was rated "passed." The second envelope of each complying Bidder shall be opened within the same day. In case one or more of the requirements in the second envelope of a particular bid is missing, incomplete or patently insufficient, and/or if the submitted total bid price exceeds the ABC unless otherwise provided in **ITB** Clause 13.2, the BAC shall rate the bid concerned as "failed." Only bids that are determined to contain all the bid requirements for both components shall be rated "passed" and shall immediately be considered for evaluation and comparison.

24.4. Letters of Withdrawal shall be read out and recorded during bid opening, and the envelope containing the corresponding withdrawn bid shall be returned to the Bidder unopened.

24.5. All members of the BAC who are present during bid opening shall initial every page of the original copies of all bids received and opened.

24.6. In the case of an eligible foreign bidder as described in **ITB** Clause 5, the following Class "A" Documents may be substituted with the appropriate equivalent documents, if any, issued by the country of the foreign bidder concerned, which shall likewise be uploaded and maintained in the PhilGEPS in accordance with Section 8.5.2 of the IRR.:

a) Registration certificate from the Securities and Exchange Commission (SEC), Department of Trade and Industry (DTI) for sole proprietorship, or CDA for cooperatives;

b) Mayor's/Business permit issued by the local government where the principal place of business of the Bidder is located; and

c) Audited Financial Statements showing, among others, the prospective Bidder's total and current assets and liabilities stamped "received" by the Bureau of Internal Revenue or its duly accredited and authorized institutions, for the preceding calendar year which should not be earlier than two years from the date of bid submission.

24.7. Each partner of a joint venture agreement shall likewise submit the document required in **ITB** Clause 12.1(a)(i). Submission of documents required under **ITB** Clauses 12.1(a)(ii) to 12.1(a)(iv) by any of the joint venture partners constitutes compliance.

24.8. The Procuring Entity shall prepare the minutes of the proceedings of the bid opening that shall include, as a minimum: (a) names of Bidders, their bid price (per lot, if applicable, and/or including discount, if any), bid security, findings of preliminary examination, and whether there is a withdrawal or modification; and (b) attendance sheet. The BAC members shall sign the abstract of bids as read.

24.8. The Bidders or their duly authorized representatives may attend the opening of bids. The BAC shall ensure the integrity, security, and confidentiality of all submitted bids. The Abstract of Bids as read and the minutes of the Bid Opening shall be made available to the public upon written request and payment of a specified fee to recover cost of materials.

24.9 To ensure transparency and accurate representation of the bid submission, the BAC Secretariat shall notify in writing all Bidders whose bids it has received through its PhilGEPS-registered physical address or official e-mail address. The notice shall be issued within seven (7) calendar days from the date of the bid opening.

E. Evaluation and Comparison of Bids

25. Process to be Confidential

25.1. Members of the BAC, including its staff and personnel, as well as its Secretariat and TWG, are prohibited from making or accepting any kind of communication with any Bidder regarding the evaluation of their bids until the issuance of the Notice of Award, unless otherwise allowed in the case of **ITB** Clause 26.

25.2. Any effort by a Bidder to influence the Procuring Entity in the Procuring Entity's decision in respect of bid evaluation, bid comparison or contract award will result in the rejection of the Bidder's bid.

26. Clarification of Bids

To assist in the evaluation, comparison and post-qualification of the bids, the Procuring Entity may ask in writing any Bidder for a clarification of its bid. All responses to requests for clarification shall be in writing. Any clarification submitted by a Bidder in respect to its bid and that is not in response to a request by the Procuring Entity shall not be considered

27. Detailed Evaluation and Comparison of Bids

27.1. The Procuring Entity will undertake the detailed evaluation and comparison of Bids which have passed the opening and preliminary examination of Bids, pursuant to **ITB** Clause 24, in order to determine the Lowest Calculated Bid.

27.2. The Lowest Calculated Bid shall be determined in two steps:

(a) The detailed evaluation of the financial component of the bids, to establish the correct calculated prices of the bids; and

(b) The ranking of the total bid prices as so calculated from the lowest to highest. The bid with the lowest price shall be identified as the Lowest Calculated Bid.

27.3. The Procuring Entity's BAC shall immediately conduct a detailed evaluation of all bids rated "passed," using non-discretionary "pass/fail" criterion. The BAC shall consider the following in the evaluation of bids.

(a) Completeness of the bid. Unless the **BDS** allows partial bids, bids not addressing or providing all of the required items in the Schedule of Requirements including, where applicable, bill of quantities, shall be considered non-responsive and, thus, automatically disqualified. In this regard, where a required item is provided, but no price is indicated, the same shall be considered as non-responsive, but specifying a zero (0) or a dash (-) for the said item would mean that it is being offered for free to the Procuring Entity, except those required by law or regulations to be provided for; and

(b) Arithmetical corrections. Consider computational errors and omissions to enable proper comparison of all eligible bids. It may also consider bid modifications. Any adjustment shall be calculated in monetary terms to determine the calculated prices.

27.4. Based on the detailed evaluation of bids, those that comply with the above-mentioned requirements shall be ranked in the ascending order of their total calculated bid prices, as evaluated and corrected for computational errors, discounts and other modifications, to identify the Lowest Calculated Bid. Total calculated bid prices, as evaluated and corrected for computational errors, discounts and other modifications, which exceed the ABC shall not be considered, unless otherwise indicated in the **BDS**.

27.5. The Procuring Entity's evaluation of bids shall be based on the bid price quoted in the Bid Form, which includes the Bill of Quantities.

27.6. Bids shall be evaluated on an equal footing to ensure fair competition. For this purpose, all Bidders shall be required to include in their bids the cost of all taxes, such as, but not limited to, value added tax (VAT), income tax, local taxes, and other fiscal levies and duties which shall be itemized in the bid form and reflected in the detailed estimates. Such bids, including said taxes, shall be the basis for bid evaluation and comparison.

27.7. If so indicated pursuant to **ITB** Clause 1.2, Bids are being invited for individual lots or for any combination thereof, provided that all Bids and combinations of Bids shall be received by the same deadline and opened and evaluated simultaneously so as to determine the bid or combination of bids offering the lowest calculated cost to the Procuring Entity. Bid prices quoted shall correspond to all of the requirements specified for each lot. Bid Security as required by **ITB** Clause 18 shall be submitted for each contract (lot) separately. The basis for evaluation of lots is specified in **BDS** Clause 27.3.

28. Post Qualification

28.1. The BAC shall determine to its satisfaction whether the Bidder that is evaluated as having submitted the Lowest Calculated Bid complies with and is responsive to all the requirements and conditions specified in **ITB** Clauses 5, 12, and 13.

28.2. Within a non-extendible period of five (5) calendar days from receipt by the Bidder of the notice from the BAC that it submitted the Lowest Calculated Bid, the Bidder shall submit its latest income and business tax returns filed and paid through the BIR Electronic Filing and Payment System (eFPS) and other appropriate licenses and permits required by law and stated in the **BDS**.

Failure to submit any of the post-qualification requirements on time, or a finding against the veracity thereof, shall disqualify the Bidder for award. Provided in the event that a finding against the veracity of any of the documents submitted is made, it shall cause the forfeiture of the bid security in accordance with Section 69 of the IRR of RA 9184.

28.3. The determination shall be based upon an examination of the documentary evidence of the Bidder's qualifications submitted pursuant to **ITB** Clauses 12 and 13, as well as other information as the Procuring Entity deems necessary and appropriate, using a non-discretionary "pass/fail" criterion, which shall be completed within a period of twelve (12) calendar days.

28.4. If the BAC determines that the Bidder with the Lowest Calculated Bid passes all the criteria for post-qualification, it shall declare the said bid as the LCRB, and recommend to the HoPE the award of contract to the said Bidder at its submitted price or its calculated bid price, whichever is lower, subject to **ITB** Clause 30.3.

28.5. A negative determination shall result in rejection of the Bidder's bid, in which event the Procuring Entity shall proceed to the next Lowest Calculated Bid, with a fresh period to make a similar determination of that Bidder's capabilities to perform satisfactorily. If the second Bidder, however, fails the post qualification, the procedure for post qualification shall be repeated for the Bidder with the next Lowest Calculated Bid, and so on until the LCRB is determined for recommendation of contract award.

28.6. Within a period not exceeding fifteen (15) calendar days from the determination by the BAC of the LCRB and the recommendation to award the contract, the HoPE or his duly authorized representative shall approve or disapprove the said recommendation.

28.7. In the event of disapproval, which shall be based on valid, reasonable, and justifiable grounds as provided for under Section 41 of the IRR of RA 9184, the HoPE shall notify the BAC and the Bidder in writing of such decision and the grounds for it. When applicable, the BAC shall conduct a post-qualification of the Bidder with the next Lowest Calculated Bid. A request for reconsideration may be filed by the Bidder with the HoPE in accordance with Section 37.1.3 of the IRR of RA 9184.

29. Reservation Clause

29.1. Notwithstanding the eligibility or post-qualification of a Bidder, the Procuring Entity concerned reserves the right to review its qualifications at any stage of the procurement process if it has reasonable grounds to believe that a misrepresentation has been made by the said Bidder, or that there has been a change in the Bidder's capability to undertake the project from the time it submitted its eligibility requirements. Should such review uncover any misrepresentation made in the eligibility and bidding requirements, statements or documents, or any changes in the situation of the Bidder which will affect its capability to undertake the project so that it fails the preset eligibility or bid evaluation criteria, the Procuring Entity shall consider the said Bidder as ineligible and shall disqualify it from submitting a bid or from obtaining an award or contract.

29.2. Based on the following grounds, the Procuring Entity reserves the right to reject any and all Bids, declare a Failure of Bidding at any time prior to the contract award, or not to award the contract, without thereby incurring any

liability, and make no assurance that a contract shall be entered into as a result of the bidding:

(a) If there is *prima facie* evidence of collusion between appropriate public officers or employees of the Procuring Entity, or between the BAC and any of the Bidders, or if the collusion is between or among the Bidders themselves, or between a Bidder and a third party, including any act which restricts, suppresses or nullifies or tends to restrict, suppress or nullify competition;

(b) If the Procuring Entity's BAC is found to have failed in following the prescribed bidding procedures; or

(c) For any justifiable and reasonable ground where the award of the contract will not redound to the benefit of the GOP as follows:

(i) If the physical and economic conditions have significantly changed so as to render the project no longer economically, financially or technically feasible as determined by the HoPE;

(ii) If the project is no longer necessary as determined by the HoPE; and

(iii) If the source of funds for the project has been withheld or reduced through no fault of the Procuring Entity.

29.3 In addition, the Procuring Entity may likewise declare a failure of bidding when:

(a) No bids are received:

(b) All prospective Bidders are declared ineligible;

(c) All bids fail to comply with all the bid requirements, fail post-qualification; or

(d) The Bidder with the LCRB refuses, without justifiable cause, to accept the award of contract, and no award is made in accordance with Section 40 of the IRR of RA 9184.

F. Award of Contract

30. Contract Award

30.1. Subject to **ITB** Clause 28, the HoPE or its duly authorized representative shall award the contract to the Bidder whose bid has been determined to be the LCRB.

30.2. Prior to the expiration of the period of bid validity, the Procuring Entity shall notify the successful Bidder in writing that its bid has been accepted, through a Notice of Award duly received by the Bidder or its representative personally or by registered mail or electronically, receipt of which must be confirmed in

writing within two (2) days by the Bidder with the LCRB and submitted personally or sent by registered mail or electronically to the Procuring Entity.

30.3. Notwithstanding the issuance of the Notice of Award, award of contract shall be subject to the following conditions:

(a) Submission of the following documents within ten (10) calendar days from receipt of the Notice of Award:

(i) In the case of procurement by a Philippine Foreign Service Office or Post, the PhilGEPS Registration Number of the winning foreign Bidder; or

(ii) Valid PCAB license and registration for the type and cost of the contract to be bid for foreign bidders when the Treaty or International or Executive Agreement expressly allows submission of the PCAB license and registration for the type and cost of the contract to be bid as a pre-condition to the Award;

(b) Posting of the performance security in accordance with **ITB** Clause 32;

(c) Signing of the contract as provided in **ITB** Clause 31; and

(d) Approval by higher authority, if required, as provided in Section 37.3 of the IRR of RA 9184.

31. Signing of the Contract

31.1. At the same time as the Procuring Entity notifies the successful Bidder that its bid has been accepted, the Procuring Entity shall send the Contract Form to the Bidder, which Contract has been provided in the Bidding Documents, incorporating therein all agreements between the parties.

31.2. Within ten (10) calendar days from receipt of the Notice of Award, the successful Bidder shall post the required performance security, sign and date the contract and return it to the Procuring Entity.

31.3. The Procuring Entity shall enter into contract with the successful Bidder within the same ten (10) calendar day period provided that all the documentary requirements are complied with.

31.4. The following documents shall form part of the contract:

(a) Contract Agreement;

(b) Bidding Documents;

(c) Winning Bidder's bid, including the Technical and Financial Proposals, and all other documents/statements submitted (*e.g.*, Bidder's response to request for clarifications on the bid), including

corrections to the bid, if any, resulting from the Procuring Entity's bid evaluation;

(d) Performance Security;

(e) Notice of Award of Contract; and

(f) Other contract documents that may be required by existing laws and/or specified in the **BDS**.

32. Performance Security

32.1. To guarantee the faithful performance by the winning Bidder of its obligations under the contract, it shall post a performance security within a maximum period of ten (10) calendar days from the receipt of the Notice of Award from the Procuring Entity and in no case later than the signing of the contract.

32.2. The Performance Security shall be denominated in Philippine Pesos and posted in favor of the Procuring Entity in an amount not less than the percentage of the total contract price in accordance with the following schedule:

Form of Performance Security	Amount of Performance Security (Not less than the Percentage of the Total Contract Price)
(a) Cash or cashier's/manager's check issued by a Universal or Commercial Bank. *For biddings conducted by the LGUs, the Cashier's/Manager's Check may be issued by other banks certified by the BSP as authorized to issue such financial instrument.*	Ten percent (10%)
(b) Bank draft/guarantee or irrevocable letter of credit issued by a Universal or Commercial Bank: Provided, however, that it shall be confirmed or authenticated by a Universal or Commercial Bank, if issued by a foreign bank. *For biddings conducted by the LGUs, Bank Draft/Guarantee, or Irrevocable Letter of Credit may be issued by other banks certified by the BSP as authorized to issue such*	

financial instrument.	
(c) Surety bond callable upon demand issued by a surety or insurance company duly certified by the Insurance Commission as authorized to issue such security.	Thirty percent (30%)

32.3. Failure of the successful Bidder to comply with the above-mentioned requirement shall constitute sufficient ground for the annulment of the award and forfeiture of the bid security, in which event the Procuring Entity shall have a fresh period to initiate and complete the post qualification of the second Lowest Calculated Bid. The procedure shall be repeated until LCRB is identified and selected for recommendation of contract award. However if no Bidder passed post-qualification, the BAC shall declare the bidding a failure and conduct a re-bidding with re-advertisement, if necessary.

33. Notice to Proceed

Within seven (7) calendar days from the date of approval of the Contract by the appropriate government approving authority, the Procuring Entity shall issue the Notice to Proceed (NTP) together with a copy or copies of the approved contract to the successful Bidder. All notices called for by the terms of the contract shall be effective only at the time of receipt thereof by the successful Bidder.

34. Protest Mechanism

Decision of the procuring entity at any stage of the procurement process may be questioned in accordance with Sections 55 of the IRR of RA 9184.

Section III. Bid Data Sheet

Bid Data Sheet

ITB Clause	
1.1	The Procuring Entity is the **Department of Budget and Management**. The name of the Contract is **Renovation of the DBM Arcache Building** The identification number of the Contract is DBM-2017-33.
2	The Funding Source is: The Government of the Philippines (GOP) through the Multi-year Obligational Authority No. MYOA-BMB-C-17-0102130 in the amount of **One Hundred Forty Million Five Hundred Thousand Pesos (P140,500,000.00)** The name of the Project is **Renovation of the DBM Arcache Building**
3.1	No further instructions.
5.1	No further instructions.
5.2	Bidding is restricted to eligible bidders as defined in ITB Clause 5.1.
5.4	The Bidder must have completed, within the period specified in the Invitation to Bid and **ITB** Clause 12.1(a)(ii). a single contract that is similar to this Project, equivalent to at least fifty percent (50%) of the ABC. Bidders shall include in their bids. 1. A photocopy of Single Largest Completed Contract or Purchase Order; 2. Notice of Award and/or Notice to Proceed 3. Project Owner's Certificate of Final Acceptance issued by the Owner other than the Contractor or the Constructors Performance Evaluation System (CPES) Final Rating, which must be at least satisfactory. In case of contracts with the private sector. an equivalent document shall be submitted. Similar contract shall refer to the construction of a multi-storey building.
8.1	Subcontracting is allowed. However, the contractor shall undertake not less than 50% of the contracted works with its own resources. Additionally, the bidder should provide a list of their subcontractors, following the prescribed from attached in Section IX.
8.2	Not Applicable.

9.1	The Procuring Entity will hold a Pre-bid Conference for this Project on December 14. 2017. 10:00 a.m., at the BAC Conference Room. Ground Floor, DBM Building III, General Solano St., San Miguel, Manila.
10.1	The Procuring Entity's address is: Department of Budget and Management DBM Bldg. III, General Solano St. San Miguel. Manila procurement@dbm.gov.ph/aescalona@dbm.gov.ph
10.4	No further instructions.
12.1	Valid PCAB License shall be submitted as part of the Class A Legal Documents. PCAB Classifications: Principal Classification: General Building Category. A Registration Particulars: Kind of Project: Building Respective Size Range (Minimum Requirement): Medium B
12.1(a)(iii)	The bidder's SLCC similar to the contract to be bid should have been completed within five (5) years prior to the deadline for the submission and receipt of bids.
12.1(a)(iii)	No further instructions.
12.1(b)(ii 2)	The minimum number of contractor's key personnel to be assigned and their respective required minimum years of experience to the Contract must be supported by their respective resumes and photocopy of valid Professional Regulation Commission (PRC) license is as follows: Key Personnel — Relevant Experience Project Manager — 5 years Project Engineer — 5 years Resident Engineer — 5 years Architect — 5 years Structural Engineer — 5 years

	Sanitary Engineer 5 years Electrical Engineer 5 years Electronics Communications Engineer 5 years Mechanical Engineer 5 years Materials Engineer 5 years See sample forms under Section IX. Bidding Forms.
12.1(b)(ii.3)	The minimum major equipment requirements are the following:

Equipment	Capacity Requirement		Number of Units
Backhoe	Bucket Capacity	0.4 cubic meter	1 unit
	Track Type	Crawler, Steel	
Dump Truck	Torque	380 N-m / 1,300 - 1,700 rpm	1 unit
	Payload	3,500kg	
Mobile Crane	No Minimum Requirement		1 unit
Plate Compactor	No Minimum Requirement		2 units
Comcrete Vibrator	No Minimum Requirement		2 units
Bagger Mixer	No Minimum Requirement		2 units
Welding Machine	No Minimum Requirement		2 units
Power Trowel	No Minimum Requirement		1 units
Bore Piling Machine	Engine Rated Power/Speed	119KW/2200rpm	1 unit
	Rotary Drive Max Output Torque	100KN.m	

	Rotary Drive Drill Speed	0-70r/min	
	Rotary Drive Spin off Speed	70r/min	
	Max Drilling Diameter	1200mm	
	Max Drilling Depth	32m	
Transit Mixer	Mixer Volume	8/9/10/12cbm Concrete Mixer Truck	1 Unit
	Hydraulic Driving System	Eaton, Sauer or Bonfiglioli	
	Water Supply	450L Tank with Reinforced Pipe	
Concrete Pump	Machining Process	Hydraulic	1 Unit
	Type	Concrete Pump	
	Productivity	90m³/h	

The list of contractor's equipment must be supported by ownership, lease and/or purchase agreements. For lease agreements, such proof must include a certification of availability of equipment from the lessor for the duration of the Project.

See sample forms under Section IX. Bidding Forms.

13.1	No additional Requirements.
13.1(b)	This shall include all of the following documents: 1) Bid prices in the Bill of Quantities; 2) Detailed estimates, including a summary sheet indicating the unit prices of construction materials, labor rates, and equipment rentals used in coming up with the Bid; and 3) Cash flow by quarter or payment schedule.

13.2	The ABC is **One Hundred Forty Million Five Hundred Thousand Pesos (P140,500,000.00).** Any bid with a financial component exceeding this amount shall not be accepted.
14.2	No further instructions.
15.4	No further instruction.
16.1	The bid prices shall be quoted in Philippine Pesos.
16.3	No further instructions.
17.1	Bids will be valid until April 27, 2018.
18.1	The bid security shall be in the form of a Bid Securing Declaration or any of the following forms and amounts: 1. The amount of not less than P2,810,000.00, if bid security is in cash, cashier's/manager's check, bank draft/guarantee or irrevocable letter of credit; 2. The amount of not less than P7,025,000.00, if bid security is in Surety Bond.
18.2	The bid security shall be valid until April 27, 2018.
20.3	Each Bidder shall submit one (1) original and two (2) duplicate copies of the first and second components of its bid.
21	The address for submission of bids is at the BAC Conference Room, Ground Floor, DBM Building III, General Solano St., San Miguel. Manila. The deadline for the submission of bids is on December 28, 2017, 9:00 a.m. Late bids shall not be accepted.
24.1	The place of bid opening is at the BAC Conference Room, Ground Floor, DBM Building III, General Solano St.. San Miguel. Manila. The date and time of the submission of bids is on December 28. 2017, 9:00 a.m.
24.2	No further instructions.
24.3	No further instructions.
27.3	Partial bid is not allowed. The infrastructure project is packaged in a single lot and the lot shall not be divided into sub-lots for the purpose of bidding, evaluation, and contract award.
27.4	No further instructions.

28.2	The following shall be submitted in addition to those specified under Section 28.2 of the GCC. Latest Income and Business Tax Returns. filed and paid through the Electronic Filing and Payments System (EFPS), consisting of the following: - 2016 Income Tax Return with proof of payment; and -VAT Returns (Form 2550M and 2550Q) or Percentage Tax Returns (2551M) with proof of payment covering the months from June to November 2017.
31.4(f)	The following documents shall be submitted by the winning bidder within ten (10) calendar days from receipt of the Notice of Award (NOA): 1. Construction schedule and S-curve 2. Manpower schedule 3. Construction methods 4. Equipment utilization schedule 5. Construction safety, sanitation and health program approved by DOLE 6. PERT/CPM Items 1, 2, and 6 of the foregoing documents are subject to approval of the DBM's duly authorized representative upon recommendation of UP.

Section IV. General Conditions of Contract

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1. Definitions

For purposes of this Clause, boldface type is used to identify defined terms.

1.1. The **Arbiter** is the person appointed jointly by the Procuring Entity and the Contractor to resolve disputes in the first instance, as provided for in **GCC** Clause 21.

1.2. **Bill of Quantities** refers to a list of the specific items of the Work and their corresponding unit prices, lump sums, and/or provisional sums.

1.3. The **Completion Date** is the date of completion of the Works as certified by the Procuring Entity's Representative, in accordance with **GCC** Clause 49.

1.4. The **Contract** is the contract between the Procuring Entity and the Contractor to execute, complete, and maintain the Works.

1.5 The **Contract Effectivity Date** is the date of signing of the Contract. However, the contractor shall commence execution of the Works on the Start Date as defined in GCC Clause 1.28.

1.6 The **Contract Price** is the price stated in the Notice of Award and thereafter to be paid by the Procuring Entity to the Contractor for the execution of the Works in accordance with this Contract

1.7 **Contract Time Extension** is the allowable period for the Contractor to complete the Works in addition to the original Completion Date stated in this Contract.

1.8 The **Contractor** is the juridical entity whose proposal has been accepted by the Procuring Entity and to whom the Contract to execute the Work was awarded.

1.9 The **Contractor's Bid** is the signed offer or proposal submitted by the Contractor to the Procuring Entity in response to the Bidding Documents.

1.10 **Days** are calendar days; months are calendar months.

1.11 **Dayworks** are varied work inputs subject to payment on a time basis for the Contractor's employees and Equipment, in addition to payments for associated Materials and Plant.

1.12 A **Defect** is any part of the Works not completed in accordance with the Contract.

1.13 The **Defects Liability Certificate** is the certificate issued by Procuring Entity's Representative upon correction of defects by the Contractor.

1.14 The **Defects Liability Period** is the one year period between contract completion and final acceptance within which the Contractor assumes the responsibility to undertake the repair of any damage to the Works at his own expense.

1.15 **Drawings** are graphical presentations of the Works. They include all supplementary details, shop drawings, calculations, and other information provided or approved for the execution of this Contract.

1.16 **Equipment** refers to all facilities, supplies, appliances, materials or things required for the execution and completion of the Work provided by the Contractor and which shall not form or are not intended to form part of the Permanent Works.

1.17 The **Intended Completion Date** refers to the date specified in the **SCC** when the Contractor is expected to have completed the Works. The Intended Completion Date may be revised only by the Procuring Entity's Representative by issuing an extension of time or an acceleration order.

1.18 **Materials** are all supplies, including consumables, used by the Contractor for incorporation in the Works.

1.19 The **Notice to Proceed** is a written notice issued by the Procuring Entity or the Procuring Entity's Representative to the Contractor requiring the latter to begin the commencement of the work not later than a specified or determinable date.

1.20 **Permanent Works** are all permanent structures and all other project features and facilities required to be constructed and completed in accordance with this Contract which shall be delivered to the Procuring Entity and which shall remain at the Site after the removal of all Temporary Works.

1.21 **Plant** refers to the machinery, apparatus, and the like intended to form an integral part of the Permanent Works.

1.22 The **Procuring Entity** is the party who employs the Contractor to carry out the Works stated in the **SCC**.

1.23 The **Procuring Entity's Representative** refers to the Head of the Procuring Entity or his duly authorized representative, identified in the **SCC**, who shall be responsible for supervising the execution of the Works and administering this Contract.

1.24 The **Site** is the place provided by the Procuring Entity where the Works shall be executed and any other place or places which may be designated in the **SCC**, or notified to the Contractor by the Procuring Entity's Representative as forming part of the Site.

1.25 **Site Investigation Reports** are those that were included in the Bidding Documents and are factual and interpretative reports about the surface and subsurface conditions at the Site.

1.26 **Slippage** is a delay in work execution occurring when actual accomplishment falls below the target as measured by the difference between the scheduled and actual accomplishment of the Work by the Contractor as established from the work schedule. This is actually described as a percentage of the whole Works.

1.27 **Specifications** means the description of Works to be done and the qualities of materials to be used, the equipment to be installed and the mode of construction.

1.28 The **Start Date**, as specified in the **SCC**, is the date when the Contractor is obliged to commence execution of the Works. It does not necessarily coincide with any of the Site Possession Dates.

1.29 A **Subcontractor** is any person or organization to whom a part of the Works has been subcontracted by the Contractor, as allowed by the Procuring Entity, but not any assignee of such person.

1.30 **Temporary Works** are works designed, constructed, installed, and removed by the Contractor that are needed for construction or installation of the Permanent Works.

1.31 **Work(s)** refer to the Permanent Works and Temporary Works to be executed by the Contractor in accordance with this Contract, including (i) the furnishing of all labor, materials, equipment and others incidental, necessary or convenient to the complete execution of the Works: (ii) the passing of any tests before acceptance by the Procuring Entity's Representative; (iii) and the carrying out of all duties and obligations of the Contractor imposed by this Contract as described in the **SCC.**

2. Interpretation

2.1. In interpreting the Conditions of Contract, singular also means plural, male also means female or neuter, and the other way around. Headings have no significance. Words have their normal meaning under the language of this Contract unless specifically defined. The Procuring Entity's Representative will provide instructions clarifying queries about the Conditions of Contract.

2.2. If sectional completion is specified in the **SCC**, references in the Conditions of Contract to the Works, the Completion Date, and the Intended Completion Date apply to any Section of the Works (other than references to the Completion Date and Intended Completion Date for the whole of the Works).

2.3. The documents forming this Contract shall be interpreted in the following order of priority:

a) Contract Agreement;

b) Bid Data Sheet;

c) Instructions to Bidders;

d) Addenda to the Bidding Documents:

e) Special Conditions of Contract;

f) General Conditions of Contract;

g) Specifications;

h) Bill of Quantities; and

i) Drawings.

3. Governing Language and Law

3.1. This Contract has been executed in the English language, which shall be the binding and controlling language for all matters relating to the meaning or interpretation of this Contract. All correspondence and other documents pertaining to this Contract which are exchanged by the parties shall be written in English.

3.2. This Contract shall be interpreted in accordance with the laws of the Republic of the Philippines.

4. Communications

Communications between parties that are referred to in the Conditions shall be effective only when in writing. A notice shall be effective only when it is received by the concerned party.

5. Possession of Site

5.1. On the date specified in the SCC, the Procuring Entity shall grant the Contractor possession of so much of the Site as may be required to enable it to proceed with the execution of the Works. If the Contractor suffers delay or incurs cost from failure on the part of the Procuring Entity to give possession in accordance with the terms of this clause, the Procuring Entity's Representative shall give the Contractor a Contract Time Extension and certify such sum as fair to cover the cost incurred, which sum shall be paid by Procuring Entity.

5.2. If possession of a portion is not given by the date stated in the SCC Clause 5.1, the Procuring Entity will be deemed to have delayed the start of the relevant activities. The resulting adjustments in contract time to address such delay shall be in accordance with **GCC** Clause 47.

5.3. The Contractor shall bear all costs and charges for special or temporary right-of-way required by it in connection with access to the Site. The Contractor shall also provide at his own cost any additional facilities outside the Site required by it for purposes of the Works.

5.4. The Contractor shall allow the Procuring Entity's Representative and any person authorized by the Procuring Entity's Representative access to the Site and to any place where work in connection with this Contract is being carried out or is intended to be carried out.

6. The Contractor's Obligations

6.1. The Contractor shall carry out the Works properly and in accordance with this Contract. The Contractor shall provide all supervision, labor, Materials, Plant and Contractor's Equipment, which may be required. All Materials and Plant on Site shall be deemed to be the property of the Procuring Entity.

6.2 The Contractor shall commence execution of the Works on the Start Date and shall carry out the Works in accordance with the Program of Work submitted by the Contractor, as updated with the approval of the Procuring Entity's Representative, and complete them by the Intended Completion Date.

6.3 The Contractor shall be responsible for the safety of all activities on the Site.

6.4. The Contractor shall carry out all instructions of the Procuring Entity's Representative that comply with the applicable laws where the Site is located.

6.5. The Contractor shall employ the key personnel named in the Schedule of Key Personnel, as referred to in the **SCC**, to carry out the supervision of the Works. The Procuring Entity will approve any proposed replacement of key personnel only if their relevant qualifications and abilities are equal to or better than those of the personnel listed in the Schedule.

6.6. If the Procuring Entity's Representative asks the Contractor to remove a member of the Contractor's staff or work force, for justifiable cause, the Contractor shall ensure that the person leaves the Site within seven (7) days and has no further connection with the Work in this Contract.

6.7. During Contract implementation, the Contractor and his subcontractors shall abide at all times by all labor laws, including child labor related enactments, and other relevant rules.

6.8. The Contractor shall submit to the Procuring Entity for consent the name and particulars of the person authorized to receive instructions on behalf of the Contractor.

6.9. The Contractor shall cooperate and share the Site with other contractors, public authorities, utilities, and the Procuring Entity between the dates given in the schedule of other contractors particularly when they shall require access to the Site. The Contractor shall also provide facilities and services for them during this period. The Procuring Entity may modify the schedule of other contractors, and shall notify the Contractor of any such modification thereto.

6.10. Should anything of historical or other interest or of significant value be unexpectedly discovered on the Site, it shall be the property of the Procuring Entity. The Contractor shall notify the Procuring Entity's Representative of such discoveries and carry out the Procuring Entity's Representative's instructions in dealing with them.

7. Performance Security

7.1. Within ten (10) calendar days from receipt of the Notice of Award from the Procuring Entity but in no case later than the signing of the contract by both

parties. the Contractor shall furnish the performance security in any of the forms prescribed in **ITB** Clause 32.2.

7.2. The performance security posted in favor of the Procuring Entity shall be forfeited in the event it is established that the Contractor is in default in any of its obligations under the Contract.

7.3. The performance security shall remain valid until issuance by the Procuring Entity of the Certificate of Final Acceptance.

7.4. The performance security may be released by the Procuring Entity and returned to the Contractor after the issuance of the Certificate of Final Acceptance subject to the following conditions:

(a) There are no pending claims against the Contractor or the surety company filed by the Procuring Entity;

(b) The Contractor has no pending claims for labor and materials filed against it; and

(c) Other terms specified in the **SCC**.

7.5. The Contractor shall post an additional performance security following the amount and form specified in **ITB** Clause 32.2 to cover any cumulative increase of more than ten percent (10%) over the original value of the contract as a result of amendments to order or change orders, extra work orders and supplemental agreements, as the case may be. The Contractor shall cause the extension of the validity of the performance security to cover approved contract time extensions.

7.6. In case of a reduction in the contract value or for partially completed Works under the contract which are usable and accepted by the Procuring Entity the use of which, in the judgment of the implementing agency or the Procuring Entity. will not affect the structural integrity of the entire project. the Procuring Entity shall allow a proportional reduction in the original performance security, provided that any such reduction is more than ten percent (10%) and that the aggregate of such reductions is not more than fifty percent (50%) of the original performance security.

7.7. Unless otherwise indicated in the **SCC**, the Contractor, by entering into the Contract with the Procuring Entity, acknowledges the right of the Procuring Entity to institute action pursuant to Act 3688 against any subcontractor be they an individual, firm. partnership, corporation, or association supplying the Contractor with labor, materials and/or equipment for the performance of this Contract

8. Subcontracting

8.1. Unless otherwise indicated in the **SCC**, the Contractor cannot subcontract Works more than the percentage specified in **BDS** Clause 8.1.

8.2. Subcontracting of any portion of the Works does not relieve the Contractor of any liability or obligation under this Contract. The Contractor will be responsible for the acts, defaults, and negligence of any subcontractor, its agents, servants or workmen as fully as if these were the Contractor's own acts, defaults, or negligence, or those of its agents, servants or workmen.

8.3. If subcontracting is allowed. The contractor may identify its subcontractor during contract implementation stage. Subcontractors disclosed and identified during the bidding may be changed during the implementation of this Contract. In either case, subcontractors must submit the documentary requirements under ITB Clause 12 and comply with the eligibility criteria specified in the **BDS**. In the event that any subcontractor is found by any Procuring Entity to be eligible, the subcontracting of such portion of the Works shall be disallowed.

9. Liquidated Damages

9.1. The Contractor shall pay liquidated damages to the Procuring Entity for each day that the Completion Date is later than the Intended Completion Date. The applicable liquidated damages is at least one-tenth (1/10) of a percent of the cost of the unperformed portion for every day of delay. The total amount of liquidated damages shall not exceed ten percent (10%) of the amount of the contract. The Procuring Entity may deduct liquidated damages from payments due to the Contractor. Payment of liquidated damages shall not affect the Contractor's liabilities. Once the cumulative amount of liquidated damages reaches ten percent (10%) of the amount of this Contract. the Procuring Entity may rescind or terminate this Contract, without prejudice to other courses of action and remedies available under the circumstances.

9.2. If the Intended Completion Date is extended after liquidated damages have been paid, the Engineer of the Procuring Entity shall correct any overpayment of liquidated damages by the Contractor by adjusting the next payment certificate.

10. Site Investigation Reports

The Contractor, in preparing the Bid, shall rely on any Site Investigation Reports referred to in the **SCC** supplemented by any information obtained by the Contractor.

11. The Procuring Entity, Licenses and Permits

The Procuring Entity shall, if requested by the Contractor, assist him in applying for permits, licenses or approvals, which are required for the Works.

12. Contractor's Risk and Warranty Security

12.1. The Contractor shall assume full responsibility for the Works from the time project construction commenced up to final acceptance by the Procuring Entity and shall be held responsible for any damage or destruction of the Works except those occasioned by *force majeure*. The Contractor shall be fully responsible for the safety, protection, security, and convenience of his

personnel, third parties, and the public at large, as well as the Works, Equipment, installation, and the like to be affected by his construction work.

12.2. The defects liability period for infrastructure projects shall be one year from contract completion up to final acceptance by the Procuring Entity. During this period, the Contractor shall undertake the repair works, at his own expense, of any damage to the Works on account of the use of materials of inferior quality within ninety (90) days from the time the HoPE has issued an order to undertake repair. In case of failure or refusal to comply with this mandate, the Procuring Entity shall undertake such repair works and shall be entitled to full reimbursement of expenses incurred therein upon demand.

12.3. Unless otherwise indicated in the **SCC**, in case the Contractor fails to comply with the preceding paragraph, the Procuring Entity shall forfeit its performance security, subject its property(ies) to attachment or garnishment proceedings, and perpetually disqualify it from participating in any public bidding. All payables of the GoP in his favor shall be offset to recover the costs.

12.4. After final acceptance of the Works by the Procuring Entity, the Contractor shall be held responsible for "Structural Defects," *i.e.*, major faults/flaws/deficiencies in one or more key structural elements of the project which may lead to structural failure of the completed elements or structure, or "Structural Failures," *i.e.*, where one or more key structural elements in an infrastructure facility fails or collapses, thereby rendering the facility or part thereof incapable of withstanding the design loads, and/or endangering the safety of the users or the general public:

(a) Contractor – Where Structural Defects/Failures arise due to faults attributable to improper construction, use of inferior quality/substandard materials, and any violation of the contract plans and specifications, the contractor shall be held liable;

(b) Consultants – Where Structural Defects/Failures arise due to faulty and/or inadequate design and specifications as well as construction supervision, then the consultant who prepared the design or undertook construction supervision for the project shall be held liable,

(c) Procuring Entity's Representatives/Project Manager/Construction Managers and Supervisors – The project owner's representative(s), project manager, construction manager, and supervisor(s) shall be held liable in cases where the Structural Defects/Failures are due to his/their willful intervention in altering the designs and other specifications; negligence or omission in not approving or acting on proposed changes to noted defects or deficiencies in the design and/or specifications; and the use of substandard construction materials in the project;

(d) Third Parties - Third Parties shall be held liable in cases where Structural Defects/Failures are caused by work undertaken by them such as leaking pipes, diggings or excavations, underground cables and electrical wires, underground tunnel, mining shaft and the like, in

which case the applicable warranty to such structure should be levied to third parties for their construction or restoration works.

(e) Users. - In cases where Structural Defects/Failures are due to abuse/misuse by the end user of the constructed facility and/or non-compliance by a user with the technical design limits and/or intended purpose of the same, then the user concerned shall be held liable.

12.5. The warranty against Structural Defects/Failures, except those occasioned on force majeure, shall cover the period specified in the **SCC** reckoned from the date of issuance of the Certificate of Final Acceptance by the Procuring Entity.

12.6. The Contractor shall be required to put up a warranty security in the form of cash, bank guarantee, letter of credit, GSIS or surety bond callable on demand, in accordance with the following schedule:

Form of Warranty	Amount of Warranty Security Not less than the Percentage (%) of Total Contract Price
(a) Cash or letter of credit issued by Universal or Commercial bank: provided, however, that the letter of credit shall be confirmed or authenticated by a Universal or Commercial bank, if issued by a foreign bank	Five Percent (5%)
(b) Bank guarantee confirmed by Universal or Commercial bank: provided, however, that the letter of credit shall be confirmed or authenticated by a Universal or Commercial bank, if issued by a foreign bank	Ten Percent (10%)
(c) Surety bond callable upon demand issued by GSIS or any surety or insurance company duly certified by the Insurance Commission	Thirty Percent (30%)

12.7 The warranty security shall be stated in Philippine Pesos and shall remain effective for one year from the date of issuance of the Certificate of Final Acceptance by the Procuring Entity, and returned only after the lapse of said one year period.

12.8. In case of structural defects/failure occurring during the applicable warranty period provided in **GCC** Clause 12.5, the Procuring Entity shall undertake the necessary restoration or reconstruction works and shall be entitled to full reimbursement by the parties found to be liable for expenses incurred therein upon demand, without prejudice to the filing of appropriate administrative, civil, and/or criminal charges against the responsible persons as well as the forfeiture of the warranty security posted in favor of the Procuring Entity.

13. Liability of the Contractor

Subject to additional provisions, if any, set forth in the SCC, the Contractor's liability under this Contract shall be as provided by the laws of the Republic of the Philippines.

14. Procuring Entity's Risk

14.1. From the Start Date until the Certificate of Final Acceptance has been issued, the following are risks of the Procuring Entity:

(a) The risk of personal injury, death, or loss of or damage to property (excluding the Works, Plant, Materials, and Equipment), which are due to:

(i) any type of use or occupation of the Site authorized by the Procuring Entity after the official acceptance of the works; or

(ii) negligence, breach of statutory duty, or interference with any legal right by the Procuring Entity or by any person employed by or contracted to him except the Contractor.

(b) The risk of damage to the Works, Plant, Materials, and Equipment to the extent that it is due to a fault of the Procuring Entity or in the Procuring Entity's design, or due to war or radioactive contamination directly affecting the country where the Works are to be executed.

15. Insurance

15.1. The Contractor shall, under his name and at his own expense, obtain and maintain, for the duration of this Contract, the following insurance coverage:

(a) Contractor's All Risk Insurance;

(b) Transportation to the project Site of Equipment, Machinery, and Supplies owned by the Contractor;

(c) Personal injury or death of Contractor's employees; and

(d) Comprehensive insurance for third party liability to Contractor's direct or indirect act or omission causing damage to third persons.

15.2. The Contractor shall provide evidence to the Procuring Entity's Representative that the insurances required under this Contract have been effected and shall, within a reasonable time, provide copies of the insurance policies to the Procuring Entity's Representative. Such evidence and such policies shall be provided to the Procuring Entity's through the Procuring Entity's Representative.

15.3. The Contractor shall notify the insurers of changes in the nature, extent, or program for the execution of the Works and ensure the adequacy of the insurances at all times in accordance with the terms of this Contract and shall

produce to the Procuring Entity's Representative the insurance policies in force including the receipts for payment of the current premiums.

The above insurance policies shall be obtained from any reputable insurance company approved by the Procuring Entity's Representative.

15.4. If the Contractor fails to obtain and keep in force the insurances referred to herein or any other insurance which he may be required to obtain under the terms of this Contract, the Procuring Entity may obtain and keep in force any such insurances and pay such premiums as may be necessary for the purpose. From time to time, the Procuring Entity may deduct the amount it shall pay for said premiums including twenty five percent (25%) therein from any monies due, or which may become due. to the Contractor, without prejudice to the Procuring Entity exercising its right to impose other sanctions against the Contractor pursuant to the provisions of this Contract.

15.5. In the event the Contractor fails to observe the above safeguards. the Procuring Entity may, at the Contractor's expense, take whatever measure is deemed necessary for its protection and that of the Contractor's personnel and third parties, and/or order the interruption of dangerous Works. In addition, the Procuring Entity may refuse to make the payments under GCC Clause 40 until the Contractor complies with this Clause.

15.6. The Contractor shall immediately replace the insurance policy obtained as required in this Contract, without need of the Procuring Entity's demand, with a new policy issued by a new insurance company acceptable to the Procuring Entity for any of the following grounds:

(a) The issuer of the insurance policy to be replaced has:

(i) become bankrupt;

(ii) been placed under receivership or under a management committee;

(iii) been sued for suspension of payment; or

(iv) been suspended by the Insurance Commission and its license to engage in business or its authority to issue insurance policies cancelled; or

(v) Where reasonable grounds exist that the insurer may not be able, fully and promptly, to fulfill its obligation under the insurance policy.

16. Termination for Default of Contractor

16.1. The Procuring Entity shall terminate this Contract for default when any of the following conditions attend its implementation:

(i) Due to the Contractor's fault and while the project is on-going. it has incurred negative slippage of fifteen percent (15%) or more in

accordance with Presidential Decree 1870, regardless of whether or not previous warnings and notices have been issued for the Contractor to improve his performance;

(ii) Due to its own fault and after this Contract time has expired, the Contractor incurs delay in the completion of the Work after this Contract has expired; or

(iii) The Contractor:

(i) abandons the contract Works, refuses or fails to comply with a valid instruction of the Procuring Entity or fails to proceed expeditiously and without delay despite a written notice by the Procuring Entity;

(ii) does not actually have on the project Site the minimum essential equipment listed on the bid necessary to prosecute the Works in accordance with the approved Program of Work and equipment deployment schedule as required for the project;

(iii) does not execute the Works in accordance with this Contract or persistently or flagrantly neglects to carry out its obligations under this Contract:

(iv) neglects or refuses to remove materials or to perform a new Work that has been rejected as defective or unsuitable; or

(v) sub-lets any part of this Contract without approval by the Procuring Entity.

16.2 All materials on the Site, Plant, Works, including Equipment purchased and funded under the Contract shall be deemed to be the property of the Procuring Entity if this Contract is rescinded because of the Contractor's default.

17. Termination for Default of Procuring Entity

The Contractor may terminate this Contract with the Procuring Entity if the works are completely stopped for a continuous period of at least sixty (60) calendar days through no fault of its own, due to any of the following reasons:

(a) Failure of the Procuring Entity to deliver, within a reasonable time, supplies, materials, right-of-way, or other items it is obligated to furnish under the terms of this Contract; or

(b) The prosecution of the Work is disrupted by the adverse peace and order situation, as certified by the Armed Forces of the Philippines Provincial Commander and approved by the Secretary of National Defense.

18. Termination for Other Causes

18.1. The Procuring Entity may terminate this Contract, in whole or in part, at any time for its convenience. The HoPE may terminate this Contract for the

convenience of the Procuring Entity if he has determined the existence of conditions that make Project Implementation economically, financially or technically impractical and/or unnecessary, such as, but not limited to, fortuitous event(s) or changes in law and National Government policies.

18.2. The Procuring Entity or the Contractor may terminate this Contract if the other party causes a fundamental breach of this Contract.

18.3. Fundamental breaches of Contract shall include, but shall not be limited to, the following:

(a) The Contractor stops work for twenty eight (28) days when no stoppage of work is shown on the current Program of Work and the stoppage has not been authorized by the Procuring Entity's Representative;

(b) The Procuring Entity's Representative instructs the Contractor to delay the progress of the Works, and the instruction is not withdrawn within twenty eight (28) days;

(c) The Procuring Entity shall terminate this Contract if the Contractor is declared bankrupt or insolvent as determined with finality by a court of competent jurisdiction. In this event, termination will be without compensation to the Contractor, provided that such termination will not prejudice or affect any right of action or remedy which has accrued or will accrue thereafter to the Procuring Entity and/or the Contractor. In the case of the Contractor's insolvency, any Contractor's Equipment which the Procuring Entity instructs in the notice is to be used until the completion of the Works;

(d) A payment certified by the Procuring Entity's Representative is not paid by the Procuring Entity to the Contractor within eighty four (84) days from the date of the Procuring Entity's Representative's certificate;

(e) The Procuring Entity's Representative gives Notice that failure to correct a particular Defect is a fundamental breach of Contract and the Contractor fails to correct it within a reasonable period of time determined by the Procuring Entity's Representative;

(f) The Contractor does not maintain a Security, which is required;

(g) The Contractor has delayed the completion of the Works by the number of days for which the maximum amount of liquidated damages can be paid, as defined in the **GCC** Clause 9; and

(h) In case it is determined prima facie by the Procuring Entity that the Contractor has engaged, before or during the implementation of the contract, in unlawful deeds and behaviors relative to contract acquisition and implementation, such as, but not limited to, the following:

(i) corrupt, fraudulent, collusive, coercive, and obstructive practices as defined in **ITB** Clause 3.1(a), unless otherwise specified in the SCC;

(ii) drawing up or using forged documents;

(iii) using adulterated materials, means or methods, or engaging in production contrary to rules of science or the trade; and

(iv) any other act analogous to the foregoing.

18.4. The Funding Source or the Procuring Entity, as appropriate, will seek to impose the maximum civil, administrative and/or criminal penalties available under the applicable law on individuals and organizations deemed to be involved with corrupt, fraudulent, or coercive practices.

18.5. When persons from either party to this Contract gives notice of a fundamental breach to the Procuring Entity's Representative in order to terminate the existing contract for a cause other than those listed under **GCC** Clause 18.3, the Procuring Entity's Representative shall decide whether the breach is fundamental or not.

18.6. If this Contract is terminated, the Contractor shall stop work immediately, make the Site safe and secure, and leave the Site as soon as reasonably possible

19. Procedures for Termination of Contracts

19.1. The following provisions shall govern the procedures for the termination of this Contract:

(a) Upon receipt of a written report of acts or causes which may constitute ground(s) for termination as aforementioned, or upon its own initiative, the Procuring Entity shall, within a period of seven (7) calendar days, verify the existence of such ground(s) and cause the execution of a Verified Report, with all relevant evidence attached,

(b) Upon recommendation by the Procuring Entity, the HoPE shall terminate this Contract only by a written notice to the Contractor conveying the termination of this Contract. The notice shall state:

(i) that this Contract is being terminated for any of the ground(s) afore-mentioned, and a statement of the acts that constitute the ground(s) constituting the same;

(ii) the extent of termination, whether in whole or in part;

(iii) an instruction to the Contractor to show cause as to why this Contract should not be terminated; and

(iv) special instructions of the Procuring Entity, if any.

The Notice to Terminate shall be accompanied by a copy of the Verified Report:

(c) Within a period of seven (7) calendar days from receipt of the Notice of Termination, the Contractor shall submit to the HoPE a verified position paper stating why the contract should not be terminated. If the Contractor fails to show cause after the lapse of the seven (7) day period, either by inaction or by default, the HoPE shall issue an order terminating the contract;

(d) The Procuring Entity may, at anytime before receipt of the Contractor's verified position paper described in item (c) above withdraw the Notice to Terminate if it is determined that certain items or works subject of the notice had been completed, delivered, or performed before the Contractor's receipt of the notice,

(e) Within a non-extendible period of ten (10) calendar days from receipt of the verified position paper, the HoPE shall decide whether or not to terminate this Contract. It shall serve a written notice to the Contractor of its decision and, unless otherwise provided in the said notice, this Contract is deemed terminated from receipt of the Contractor of the notice of decision. The termination shall only be based on the ground(s) stated in the Notice to Terminate; and

(f) The HoPE may create a Contract Termination Review Committee (CTRC) to assist him in the discharge of this function. All decisions recommended by the CTRC shall be subject to the approval of the HoPE.

19.2. Pursuant to Section 69(f) of RA 9184 and without prejudice to the imposition of additional administrative sanctions as the internal rules of the agency may provide and/or further criminal prosecution as provided by applicable laws, the procuring entity shall impose on contractors after the termination of the contract the penalty of suspension for one (1) year for the first offense, suspension for two (2) years for the second offense from participating in the public bidding process, for violations committed during the contract implementation stage, which include but not limited to the following:

(a) Failure of the contractor, due solely to his fault or negligence, to mobilize and start work or performance within the specified period in the Notice to Proceed ("NTP");

(b) Failure by the contractor to fully and faithfully comply with its contractual obligations without valid cause, or failure by the contractor to comply with any written lawful instruction of the procuring entity or its representative(s) pursuant to the implementation of the contract. For the procurement of infrastructure projects or consultancy contracts, lawful instructions include but are not limited *to* the following:

(i) Employment of competent technical personnel, competent engineers and/or work supervisors;

(ii) Provision of warning signs and barricades in accordance with approved plans and specifications and contract provisions;

(iii) Stockpiling in proper places of all materials and removal from the project site of waste and excess materials, including broken pavement and excavated debris in accordance with approved plans and specifications and contract provisions;

(iv) Deployment of committed equipment, facilities, support staff and manpower; and

(v) Renewal of the effectivity dates of the performance security after its expiration during the course of contract implementation.

(c) Assignment and subcontracting of the contract or any part thereof or substitution of key personnel named in the proposal without prior written approval by the procuring entity.

(d) Poor performance by the contractor or unsatisfactory quality and/or progress of work arising from his fault or negligence as reflected in the Constructor's Performance Evaluation System ("CPES") rating sheet. In the absence of the CPES rating sheet, the existing performance monitoring system of the procuring entity shall be applied. Any of the following acts by the Contractor shall be construed as poor performance:

(i) Negative slippage of 15% and above within the critical path of the project due entirely to the fault or negligence of the contractor; and

(ii) Quality of materials and workmanship not complying with the approved specifications arising from the contractor's fault or negligence.

(e) Willful or deliberate abandonment or non-performance of the project or contract by the contractor resulting to substantial breach thereof without lawful and/or just cause.

In addition to the penalty of suspension, the performance security posted by the contractor shall also be forfeited.

20. Force Majeure, Release From Performance

20.1. For purposes of this Contract the terms "*force majeure*" and "fortuitous event" may be used interchangeably. In this regard, a fortuitous event or *force majeure* shall be interpreted to mean an event which the Contractor could not have foreseen, or which though foreseen, was inevitable. It shall not include ordinary unfavorable weather conditions; and any other cause the effects of which could have been avoided with the exercise of reasonable diligence by the Contractor.

20.2. If this Contract is discontinued by an outbreak of war or by any other event entirely outside the control of either the Procuring Entity or the Contractor, the Procuring Entity's Representative shall certify that this Contract has been discontinued. The Contractor shall make the Site safe and stop work as quickly as possible after receiving this certificate and shall be paid for all works carried out before receiving it and for any Work carried out afterwards to which a commitment was made.

20.3. If the event continues for a period of eighty four (84) days, either party may then give notice of termination, which shall take effect twenty eight (28) days after the giving of the notice.

20.4. After termination, the Contractor shall be entitled to payment of the unpaid balance of the value of the Works executed and of the materials and Plant reasonably delivered to the Site, adjusted by the following:

(a) any sum to which the Contractor is entitled under **GCC** Clause 28;

(b) the cost of his suspension and demobilization;

(c) any sum to which the Procuring Entity is entitled.

20.5. The net balance due shall be paid or repaid within a reasonable time period from the time of the notice of termination.

21. Resolution of Disputes

21.1. If any dispute or difference of any kind whatsoever shall arise between the parties in connection with the implementation of the contract covered by the Act and this IRR, the parties shall make every effort to resolve amicably such dispute or difference by mutual consultation.

21.2. If the Contractor believes that a decision taken by the Procuring Entity's Representative was either outside the authority given to the Procuring Entity's Representative by this Contract or that the decision was wrongly taken, the decision shall be referred to the Arbiter indicated in the **SCC** within fourteen (14) days of the notification of the Procuring Entity's Representative's decision.

21.3. Any and all disputes arising from the implementation of this Contract covered by the R.A. 9184 and its IRR shall be submitted to arbitration in the Philippines according to the provisions of Republic Act No. 876, otherwise known as the " Arbitration Law" and Republic Act 9285, otherwise known as the "Alternative Dispute Resolution Act of 2004": *Provided, however*, That, disputes that are within the competence of the Construction Industry Arbitration Commission to resolve shall be referred thereto. The process of arbitration shall be incorporated as a provision in this Contract that will be executed pursuant to the provisions of the Act and its IRR; *Provided, further*, That, by mutual agreement, the parties may agree in writing to resort to other alternative modes of dispute resolution.

22. Suspension of Loan, Credit, Grant, or Appropriation

In the event that the Funding Source suspends the Loan, Credit, Grant, or Appropriation to the Procuring Entity, from which part of the payments to the Contractor are being made:

(a) The Procuring Entity is obligated to notify the Contractor of such suspension within seven (7) days of having received the suspension notice.

(b) If the Contractor has not received sums due it for work already done within forty five (45) days from the time the Contractor's claim for payment has been certified by the Procuring Entity's Representative, the Contractor may immediately issue a suspension of work notice in accordance with **GCC** Clause 45.2.

23. Procuring Entity's Representative's Decisions

23.1. Except where otherwise specifically stated, the Procuring Entity's Representative will decide contractual matters between the Procuring Entity and the Contractor in the role representing the Procuring Entity.

23.2. The Procuring Entity's Representative may delegate any of his duties and responsibilities to other people, except to the Arbiter, after notifying the Contractor, and may cancel any delegation after notifying the Contractor.

24. Approval of Drawings and Temporary Works by the Procuring Entity's Representative

24.1. All Drawings prepared by the Contractor for the execution of the Temporary Works, are subject to prior approval by the Procuring Entity's Representative before its use.

24.2. The Contractor shall be responsible for design of Temporary Works.

24.3. The Procuring Entity's Representative's approval shall not alter the Contractor's responsibility for design of the Temporary Works.

24.4. The Contractor shall obtain approval of third parties to the design of the Temporary Works, when required by the Procuring Entity.

25. Acceleration and Delays Ordered by the Procuring Entity's Representative

25.1. When the Procuring Entity wants the Contractor to finish before the Intended Completion Date, the Procuring Entity's Representative will obtain priced proposals for achieving the necessary acceleration from the Contractor. If the Procuring Entity accepts these proposals, the Intended Completion Date will be adjusted accordingly and confirmed by both the Procuring Entity and the Contractor.

25.2. If the Contractor's Financial Proposals for an acceleration are accepted by the Procuring Entity, they are incorporated in the Contract Price and treated as a Variation.

26. Extension of the Intended Completion Date

26.1 The Procuring Entity's Representative shall extend the Intended Completion Date if a Variation is issued which makes it impossible for the Intended Completion Date to be achieved by the Contractor without taking steps to accelerate the remaining work, which would cause the Contractor to incur additional costs. No payment shall be made for any event which may warrant the extension of the Intended Completion Date.

26.2. The Procuring Entity's Representative shall decide whether and by how much to extend the Intended Completion Date within twenty one (21) days of the Contractor asking the Procuring Entity's Representative for a decision thereto after fully submitting all supporting information. If the Contractor has failed to give early warning of a delay or has failed to cooperate in dealing with a delay, the delay by this failure shall not be considered in assessing the new Intended Completion Date.

27. Right to Vary

27.1. The Procuring Entity's Representative with the prior approval of the Procuring Entity may instruct Variations, up to a maximum cumulative amount of ten percent (10%) of the original contract cost.

27.2. Variations shall be valued as follows:

(a) At a lump sum price agreed between the parties;

(b) where appropriate, at rates in this Contract;

(c) in the absence of appropriate rates, the rates in this Contract shall be used as the basis for valuation; or failing which

(d) at appropriate new rates, equal to or lower than current industry rates and to be agreed upon by both parties and approved by the HoPE.

28. Contractor's Right to Claim

If the Contractor incurs cost as a result of any of the events under **GCC** Clause 13, the Contractor shall be entitled to the amount of such cost. If as a result of any of the said events, it is necessary to change the Works, this shall be dealt with as a Variation.

29. Dayworks

29.1. Subject to **GCC** Clause 43 on Variation Order, and if applicable as indicated in the **SCC**, the Dayworks rates in the Contractor's bid shall be used for small additional amounts of work only when the Procuring Entity's Representative

has given written instructions in advance for additional work to be paid for in that way.

29.2. All work to be paid for as Dayworks shall be recorded by the Contractor on forms approved by the Procuring Entity's Representative. Each completed form shall be verified and signed by the Procuring Entity's Representative within two days of the work being done.

29.3. The Contractor shall be paid for Dayworks subject to obtaining signed Dayworks forms.

30. Early Warning

30.1. The Contractor shall warn the Procuring Entity's Representative at the earliest opportunity of specific likely future events or circumstances that may adversely affect the quality of the work, increase the Contract Price, or delay the execution of the Works. The Procuring Entity's Representative may require the Contractor to provide an estimate of the expected effect of the future event or circumstance on the Contract Price and Completion Date. The estimate shall be provided by the Contractor as soon as reasonably possible.

30.2. The Contractor shall cooperate with the Procuring Entity's Representative in making and considering proposals for how the effect of such an event or circumstance can be avoided or reduced by anyone involved in the work and in carrying out any resulting instruction of the Procuring Entity's Representative.

31. Program of Work

31.1. Within the time stated in the **SCC**, the Contractor shall submit to the Procuring Entity's Representative for approval a Program of Work showing the general methods, arrangements, order, and timing for all the activities in the Works

31.2. An update of the Program of Work shall show the actual progress achieved on each activity and the effect of the progress achieved on the timing of the remaining work, including any changes to the sequence of the activities.

31.3. The Contractor shall submit to the Procuring Entity's Representative for approval an updated Program of Work at intervals no longer than the period stated in the **SCC**. If the Contractor does not submit an updated Program of Work within this period, the Procuring Entity's Representative may withhold the amount stated in the **SCC** from the next payment certificate and continue to withhold this amount until the next payment after the date on which the overdue Program of Work has been submitted.

31.4. The Procuring Entity's Representative's approval of the Program of Work shall not alter the Contractor's obligations. The Contractor may revise the Program of Work and submit it to the Procuring Entity's Representative again at any time A revised Program of Work shall show the effect of any approved Variations.

31.5. When the Program of Work is updated, the Contractor shall provide the Procuring Entity's Representative with an updated cash flow forecast. The cash flow forecast shall include different currencies, as defined in the Contract, converted as necessary using the Contract exchange rates.

31.6. All Variations shall be included in updated Program of Work produced by the Contractor.

32. Management Conferences

32.1. Either the Procuring Entity's Representative or the Contractor may require the other to attend a Management Conference. The Management Conference shall review the plans for remaining work and deal with matters raised in accordance with the early warning procedure.

32.2. The Procuring Entity's Representative shall record the business of Management Conferences and provide copies of the record to those attending the Conference and to the Procuring Entity. The responsibility of the parties for actions to be taken shall be decided by the Procuring Entity's Representative either at the Management Conference or after the Management Conference and stated in writing to all who attended the Conference.

33. Bill of Quantities

33.1. The Bill of Quantities shall contain items of work for the construction, installation, testing, and commissioning of work to be done by the Contractor.

33.2. The Bill of Quantities is used to calculate the Contract Price. The Contractor is paid for the quantity of the work done at the rate in the Bill of Quantities for each item.

33.3. If the final quantity of any work done differs from the quantity in the Bill of Quantities for the particular item and is not more than twenty five percent (25%) of the original quantity, provided the aggregate changes for all items do not exceed ten percent (10%) of the Contract price, the Procuring Entity's Representative shall make the necessary adjustments to allow for the changes subject to applicable laws, rules, and regulations.

33.4. If requested by the Procuring Entity's Representative, the Contractor shall provide the Procuring Entity's Representative with a detailed cost breakdown of any rate in the Bill of Quantities.

34. Instructions, Inspections and Audits

34.1. The Procuring Entity's personnel shall at all reasonable times during construction of the Work be entitled to examine, inspect, measure and test the materials and workmanship, and to check the progress of the construction.

34.2. If the Procuring Entity's Representative instructs the Contractor to carry out a test not specified in the Specification to check whether any work has a defect

and the test shows that it does, the Contractor shall pay for the test and any samples. If there is no defect, the test shall be a Compensation Event.

34.3. The Contractor shall permit the Funding Source named in the **SCC** to inspect the Contractor's accounts and records relating to the performance of the Contractor and to have them audited by auditors appointed by the Funding Source, if so required by the Funding Source.

35. Identifying Defects

The Procuring Entity's Representative shall check the Contractor's work and notify the Contractor of any defects that are found. Such checking shall not affect the Contractor's responsibilities. The Procuring Entity's Representative may instruct the Contractor to search uncover defects and test any work that the Procuring Entity's Representative considers below standards and defective.

36. Cost of Repairs

Loss or damage to the Works or Materials to be incorporated in the Works between the Start Date and the end of the Defects Liability Periods shall be remedied by the Contractor at the Contractor's cost if the loss or damage arises from the Contractor's acts or omissions.

37. Correction of Defects

37.1. The Procuring Entity's Representative shall give notice to the Contractor of any defects before the end of the Defects Liability Period, which is One (1) year from project completion up to final acceptance by the Procuring Entity's Representative.

37.2. Every time notice of a defect is given, the Contractor shall correct the notified defect within the length of time specified in the Procuring Entity's Representative's notice.

37.3. The Contractor shall correct the defects which he notices himself before the end of the Defects Liability Period.

37.4. The Procuring Entity shall certify that all defects have been corrected. If the Procuring Entity considers that correction of a defect is not essential, he can request the Contractor to submit a quotation for the corresponding reduction in the Contract Price. If the Procuring Entity accepts the quotation, the corresponding change in the SCC is a Variation.

38. Uncorrected Defects

38.1. The Procuring Entity shall give the Contractor at least fourteen (14) days notice of his intention to use a third party to correct a Defect. If the Contractor does not correct the Defect himself within the period, the Procuring Entity may have the Defect corrected by the third party. The cost of the correction will be deducted from the Contract Price.

38.2. The use of a third party to correct defects that are uncorrected by the Contractor will in no way relieve the Contractor of its liabilities and warranties under the Contract.

39. Advance Payment

39.1. The Procuring Entity shall, upon a written request of the contractor which shall be submitted as a contract document, make an advance payment to the contractor in an amount not exceeding fifteen percent (15%) of the total contract price, to be made in lump sum or, at the most two, installments according to a schedule specified in the **SCC**.

39.2. The advance payment shall be made only upon the submission to and acceptance by the Procuring Entity of an irrevocable standby letter of credit of equivalent value from a commercial bank, a bank guarantee or a surety bond callable upon demand, issued by a surety or insurance company duly licensed by the Insurance Commission and confirmed by the Procuring Entity.

39.3. The advance payment shall be repaid by the Contractor by an amount equal to the percentage of the total contract price used for the advance payment.

39.4. The contractor may reduce his standby letter of credit or guarantee instrument by the amounts refunded by the Monthly Certificates in the advance payment.

39.5. The Procuring Entity will provide an Advance Payment on the Contract Price as stipulated in the Conditions of Contract, subject to the maximum amount stated in **SCC** Clause 39.1.

40. Progress Payments

40.1. The Contractor may submit a request for payment for Work accomplished. Such request for payment shall be verified and certified by the Procuring Entity's Representative/Project Engineer. Except as otherwise stipulated in the **SCC**, materials and equipment delivered on the site but not completely put in place shall not be included for payment.

40.2. The Procuring Entity shall deduct the following from the certified gross amounts to be paid to the contractor as progress payment:

(a) Cumulative value of the work previously certified and paid for.

(b) Portion of the advance payment to be recouped for the month.

(c) Retention money in accordance with the condition of contract.

(d) Amount to cover third party liabilities.

(e) Amount to cover uncorrected discovered defects in the works.

40.3. Payments shall be adjusted by deducting therefrom the amounts for advance payments and retention. The Procuring Entity shall pay the Contractor the amounts certified by the Procuring Entity's Representative within twenty eight

(28) days from the date each certificate was issued. No payment of interest for delayed payments and adjustments shall be made by the Procuring Entity

40.4. The first progress payment may be paid by the Procuring Entity to the Contractor provided that at least twenty percent (20%) of the work has been accomplished as certified by the Procuring Entity's Representative.

40.5. Items of the Works for which a price of "0" (zero) has been entered will not be paid for by the Procuring Entity and shall be deemed covered by other rates and prices in the Contract.

41. Payment Certificates

41.1. The Contractor shall submit to the Procuring Entity's Representative monthly statements of the estimated value of the work executed less the cumulative amount certified previously.

41.2. The Procuring Entity's Representative shall check the Contractor's monthly statement and certify the amount to be paid to the Contractor.

41.3. The value of Work executed shall:

(a) be determined by the Procuring Entity's Representative;

(b) comprise the value of the quantities of the items in the Bill of Quantities completed; and

(c) include the valuations of approved variations.

41.4. The Procuring Entity's Representative may exclude any item certified in a previous certificate or reduce the proportion of any item previously certified in any certificate in the light of later information.

42. Retention

42.1. The Procuring Entity shall retain from each payment due to the Contractor an amount equal to a percentage thereof using the rate as specified in GCC Sub-Clause 42.2.

42.2. Progress payments are subject to retention of ten percent (10%), referred to as the "retention money." Such retention shall be based on the total amount due to the Contractor prior to any deduction and shall be retained from every progress payment until fifty percent (50%) of the value of Works, as determined by the Procuring Entity, are completed. If, after fifty percent (50%) completion, the Work is satisfactorily done and on schedule, no additional retention shall be made; otherwise, the ten percent (10%) retention shall again be imposed using the rate specified therefor.

42.3. The total "retention money" shall be due for release upon final acceptance of the Works. The Contractor may, however, request the substitution of the retention money for each progress billing with irrevocable standby letters of credit from a commercial bank, bank guarantees or surety bonds callable on

demand, of amounts equivalent to the retention money substituted for and acceptable to the Procuring Entity, provided that the project is on schedule and is satisfactorily undertaken Otherwise, the ten (10%) percent retention shall be made. Said irrevocable standby letters of credit, bank guarantees and/or surety bonds, to be posted in favor of the Government shall be valid for a duration to be determined by the concerned implementing office/agency or Procuring Entity and will answer for the purpose for which the ten (10%) percent retention is intended, *i.e.*, to cover uncorrected discovered defects and third party liabilities.

42.4. On completion of the whole Works, the Contractor may substitute retention money with an "on demand" Bank guarantee in a form acceptable to the Procuring Entity.

43. Variation Orders

43.1. Variation Orders may be issued by the Procuring Entity to cover any increase/decrease in quantities, including the introduction of new work items that are not included in the original contract or reclassification of work items that are either due to change of plans, design or alignment to suit actual field conditions resulting in disparity between the preconstruction plans used for purposes of bidding and the "as staked plans" or construction drawings prepared after a joint survey by the Contractor and the Procuring Entity after award of the contract, provided that the cumulative amount of the Variation Order does not exceed ten percent (10%) of the original project cost. The addition/deletion of Works should be within the general scope of the project as bid and awarded. The scope of works shall not be reduced so as to accommodate a positive Variation Order A Variation Order may either be in the form of a Change Order or Extra Work Order.

43.2. A Change Order may be issued by the Procuring Entity to cover any increase/decrease in quantities of original Work items in the contract.

43.3. An Extra Work Order may be issued by the Procuring Entity to cover the introduction of new work necessary for the completion, improvement or protection of the project which were not included as items of Work in the original contract, such as, where there are subsurface or latent physical conditions at the site differing materially from those indicated in the contract, or where there are duly unknown physical conditions at the site of an unusual nature differing materially from those ordinarily encountered and generally recognized as inherent in the Work or character provided for in the contract.

43.4. Any cumulative Variation Order beyond ten percent (10%) shall be subject of another contract to be bid out if the works are separable from the original contract. In exceptional cases where it is urgently necessary to complete the original scope of work, the HoPE may authorize a positive Variation Order go beyond ten percent (10%) but not more than twenty percent (20%) of the original contract price, subject to the guidelines to be determined by the GPPB: *Provided, however,* That appropriate sanctions shall be imposed on the designer, consultant or official responsible for the original detailed

engineering design which failed to consider the Variation Order beyond ten percent (10%).

43.5. In claiming for any Variation Order, the Contractor shall, within seven (7) calendar days after such work has been commenced or after the circumstances leading to such condition(s) leading to the extra cost, and within twenty-eight (28) calendar days deliver a written communication giving full and detailed particulars of any extra cost in order that it may be investigated at that time. Failure to provide either of such notices in the time stipulated shall constitute a waiver by the contractor for any claim. The preparation and submission of Variation Orders are as follows:

(a) If the Procuring Entity's representative/Project Engineer believes that a Change Order or Extra Work Order should be issued, he shall prepare the proposed Order accompanied with the notices submitted by the Contractor, the plans therefore, his computations as to the quantities of the additional works involved per item indicating the specific stations where such works are needed, the date of his inspections and investigations thereon, and the log book thereof, and a detailed estimate of the unit cost of such items of work, together with his justifications for the need of such Change Order or Extra Work Order, and shall submit the same to the HoPE for approval.

(b) The HoPE or his duly authorized representative, upon receipt of the proposed Change Order or Extra Work Order shall immediately instruct the appropriate technical staff or office of the Procuring Entity to conduct an on-the-spot investigation to verify the need for the Work to be prosecuted and to review the proposed plan, and prices of the work involved.

(c) The technical staff or appropriate office of the Procuring Entity shall submit a report of their findings and recommendations, together with the supporting documents, to the Head of Procuring Entity or his duly authorized representative for consideration.

(d) The HoPE or his duly authorized representative, acting upon the recommendation of the technical staff or appropriate office, shall approve the Change Order or Extra Work Order after being satisfied that the same is justified, necessary, and in order.

(e) The timeframe for the processing of Variation Orders from the preparation up to the approval by the Procuring Entity concerned shall not exceed thirty (30) calendar days.

44. Contract Completion

Once the project reaches an accomplishment of ninety five (95%) of the total contract amount, the Procuring Entity may create an inspectorate team to make preliminary inspection and submit a punch-list to the Contractor in preparation for the final turnover of the project. Said punch-list will contain, among others, the remaining Works, Work deficiencies for necessary corrections, and the specific duration/time to

fully complete the project considering the approved remaining contract time. This, however, shall not preclude the claim of the Procuring Entity for liquidated damages

45. Suspension of Work

45.1. The Procuring Entity shall have the authority to suspend the work wholly or partly by written order for such period as may be deemed necessary, due to *force majeure* or any fortuitous events or for failure on the part of the Contractor to correct bad conditions which are unsafe for workers or for the general public, to carry out valid orders given by the Procuring Entity or to perform any provisions of the contract, or due to adjustment of plans to suit field conditions as found necessary during construction. The Contractor shall immediately comply with such order to suspend the work wholly or partly.

45.2. The Contractor or its duly authorized representative shall have the right to suspend work operation on any or all projects/activities along the critical path of activities after fifteen (15) calendar days from date of receipt of written notice from the Contractor to the district engineer/regional director/consultant or equivalent official, as the case may be, due to the following:

(a) There exist right-of-way problems which prohibit the Contractor from performing work in accordance with the approved construction schedule.

(b) Requisite construction plans which must be owner-furnished are not issued to the contractor precluding any work called for by such plans.

(c) Peace and order conditions make it extremely dangerous, if not possible, to work. However, this condition must be certified in writing by the Philippine National Police (PNP) station which has responsibility over the affected area and confirmed by the Department of Interior and Local Government (DILG) Regional Director.

(d) There is failure on the part of the Procuring Entity to deliver government-furnished materials and equipment as stipulated in the contract.

(e) Delay in the payment of Contractor's claim for progress billing beyond forty-five (45) calendar days from the time the Contractor's claim has been certified to by the procuring entity's authorized representative that the documents are complete unless there are justifiable reasons thereof which shall be communicated in writing to the Contractor.

45.3. In case of total suspension, or suspension of activities along the critical path, which is not due to any fault of the Contractor, the elapsed time between the effectivity of the order suspending operation and the order to resume work shall be allowed the Contractor by adjusting the contract time accordingly.

46. Payment on Termination

46.1. If the Contract is terminated because of a fundamental breach of Contract by the Contractor, the Procuring Entity's Representative shall issue a certificate for the value of the work done and Materials ordered less advance payments received up to the date of the issue of the certificate and less the percentage to apply to the value of the work not completed, as indicated in the SCC. Additional Liquidated Damages shall not apply. If the total amount due to the Procuring Entity exceeds any payment due to the Contractor, the difference shall be a debt payable to the Procuring Entity.

46.2. If the Contract is terminated for the Procuring Entity's convenience or because of a fundamental breach of Contract by the Procuring Entity, the Procuring Entity's Representative shall issue a certificate for the value of the work done, Materials ordered, the reasonable cost of removal of Equipment, repatriation of the Contractor's personnel employed solely on the Works, and the Contractor's costs of protecting and securing the Works, and less advance payments received up to the date of the certificate.

46.3. The net balance due shall be paid or repaid within twenty eight (28) days from the notice of termination.

46.4. If the Contractor has terminated the Contract under GCC Clauses 17 or 18, the Procuring Entity shall promptly return the Performance Security to the Contractor.

47. Extension of Contract Time

47.1. Should the amount of additional work of any kind or other special circumstances of any kind whatsoever occur such as to fairly entitle the contractor to an extension of contract time, the Procuring Entity shall determine the amount of such extension; provided that the Procuring Entity is not bound to take into account any claim for an extension of time unless the Contractor has, prior to the expiration of the contract time and within thirty (30) calendar days after such work has been commenced or after the circumstances leading to such claim have arisen, delivered to the Procuring Entity notices in order that it could have investigated them at that time. Failure to provide such notice shall constitute a waiver by the Contractor of any claim Upon receipt of full and detailed particulars, the Procuring Entity shall examine the facts and extent of the delay and shall extend the contract time completing the contract work when, in the Procuring Entity's opinion, the findings of facts justify an extension.

47.2. No extension of contract time shall be granted the Contractor due to (a) ordinary unfavorable weather conditions and (b) inexcusable failure or negligence of Contractor to provide the required equipment, supplies or materials.

47.3. Extension of contract time may be granted only when the affected activities fall within the critical path of the PERT/CPM network

47.4. No extension of contract time shall be granted when the reason given to support the request for extension was already considered in the determination

of the original contract time during the conduct of detailed engineering and in the preparation of the contract documents as agreed upon by the parties before contract perfection.

47.5. Extension of contract time shall be granted for rainy/unworkable days considered unfavorable for the prosecution of the works at the site, based on the actual conditions obtained at the site, in excess of the number of rainy/unworkable days pre-determined by the Procuring Entity in relation to the original contract time during the conduct of detailed engineering and in the preparation of the contract documents as agreed upon by the parties before contract perfection, and/or for equivalent period of delay due to major calamities such as exceptionally destructive typhoons, floods and earthquakes, and epidemics, and for causes such as non-delivery on time of materials, working drawings, or written information to be furnished by the Procuring Entity, non-acquisition of permit to enter private properties or non-execution of deed of sale or donation within the right-of-way resulting in complete paralyzation of construction activities, and other meritorious causes as determined by the Procuring Entity's Representative and approved by the HoPE. Shortage of construction materials, general labor strikes, and peace and order problems that disrupt construction operations through no fault of the Contractor may be considered as additional grounds for extension of contract time provided they are publicly felt and certified by appropriate government agencies such as DTI, DOLE, DILG, and DND, among others. The written consent of bondsmen must be attached to any request of the Contractor for extension of contract time and submitted to the Procuring Entity for consideration and the validity of the Performance Security shall be correspondingly extended.

48. Price Adjustment

Except for extraordinary circumstances as determined by NEDA and approved by the GPPB, no price escalation shall be allowed. Nevertheless, in cases where the cost of the awarded contract is affected by any applicable new laws, ordinances, regulations, or other acts of the GoP, promulgated after the date of bid opening, a contract price adjustment shall be made or appropriate relief shall be applied on a no loss-no gain basis.

49. Completion

The Contractor shall request the Procuring Entity's Representative to issue a certificate of Completion of the Works, and the Procuring Entity's Representative will do so upon deciding that the work is completed.

50. Taking Over

The Procuring Entity shall take over the Site and the Works within seven (7) days from the date the Procuring Entity's Representative issues a certificate of Completion.

51. Operating and Maintenance Manuals

51.1. If "as built" Drawings and/or operating and maintenance manuals are required, the Contractor shall supply them by the dates stated in the **SCC**.

51.2. If the Contractor does not supply the Drawings and/or manuals by the dates stated in the **SCC**, or they do not receive the Procuring Entity's Representative's approval, the Procuring Entity's Representative shall withhold the amount stated in the **SCC** from payments due to the Contractor

Section V. Special Conditions of Contract

Special Conditions of Contract

GCC Clause	
1.17	The Intended Completion Date is Two Hundred Forty calendar days from the start date indicated in GCC Clause 1.28. *NOTE: The contract duration shall be reckoned from the start date and not from contract effectivity date.*
1.22	The Procuring Entity is the Department of Budget and Management (DBM) with address at General Solano St., San Miguel, Manila.
1.23	The Procuring Entity's Representative is: Director Ryan S. Lita Administrative Service (AS) Department of Budget and Management
1.24	The **Site** is located at Arcache Building, General Solano St. cor. Nepomuceno St., San Miguel, Manila.
1.28	The Start Date shall be seven (7) calendar days from the date of receipt of the Notice to Proceed.
1.31	The Works consist of: Part I. Design Phase: Not Applicable Part II. Construction Phase: 1. General Requirements: a. Permit to Construct (PTC) b. Permits (Building permit, Electrical Permit, Sanitary Permit, mechanical Permit, Zoning Permit, Fire Permit, etc.) c. Project Billboard 2. Temporary Facilities and Facilities for the Engineer 3. Demolition Works 4. Earth Works 5. Structural Works

	6. Architectural Works 7. Site and Landscape Architectural Works 8. Sanitary/Plumbing Works 9. Electrical Works 10. Electrical Auxiliaries Works 11. Mechanical Works – Elevator, VAC 12. Fire Protection Works 13. Architectural Interior Design Works
2.2	Completion of the Works is within Eight (8) Months beginning seven (7) calendar days from receipt of the Notice to Proceed.
5.1	The Procuring Entity shall give possession of so much of the Site to the Contractor after a pre-construction meeting between the authorized representatives of UP, the DBM and the Contractor.
6.5	The Contractor shall employ the following **Key Personnel:** *[List key personnel by name and designation]* ***NOTE: The names of the Key Personnel and their designation shall be filled out by winning contractor prior to contract signing.***
7.4(c)	No further instructions.
7.7	No further instructions.
8.1	No further instructions.
10	The site investigation reports are: 1. Soil Foundation Investigation Report 2. Location and Invert Elevations of Existing Utilities
12.3	No further instructions.
12.5	Fifteen (15) years. Warranty: The Contractor shall submit a one (1) year Warranty Certificate upon turn-over of the Project. Any defects in workmanship and/or materials which developed within the one (1) year warranty period shall be corrected at no additional cost to the DBM.
13	If applicable, all partners to the joint venture shall be jointly and

	severally liable to the Procuring Entity.
18.3(h)(i)	No further instructions.
21.2	The Arbiter is: Construction Industry Authority of the Philippines 2/F &5/F, Executive Center Bldg. 369 Gil Puyat Ave., cor. Makati Ave., Makati City Tel. Nos.: (+632) 895-4424 / 895-6826 Fax No.: (+632) 897-9336 E-Mail: **ciapdti@yahoo.com**
29.1	No dayworks are applicable to the contract.
31.1	The Contractor shall submit the Program of Work to the Procuring Entity's Representative within ten (10) calendar days from receipt of the Notice of Award.
31.3	The period between Program of Work updates is thirty (30) days. The amount to be withheld for late submission of an updated Program of Work is 1/50 of 1% of contract value
34.3	The Funding Source is the Government of the Philippines.
39.1	The amount of the advance payment is fifteen percent (15%) of the Contract Value and can be availed of upon the submission and receipt of a request for the release of the advance payment after the issuance of the Notice to Proceed (NTP) and posting of an irrevocable letter of credit in favor of the procuring entity.
40.1	Request for payment for Work Accomplished shall be in accordance with the Program of Work.
49	The Certificate of Acceptance shall be issued by the DBM and OVPD/ODPI after the one-year defects and failures, if any, shall have been repaired by the Contractor to the satisfaction of the DBM and OVPD/ODPI. This Certificate shall be issued after the submission of an Acceptance Report by the Inspectorate Team and the warranty certificate of the Contractor. However, the contractor will still be held responsible for structural defects and/or failure of the completed project. The warranty period shall be 2 to 15 years from the final acceptance. Likewise the warranty bond shall be renewed until the end of the warranty period. Non-renewal of the warranty shall be a ground for suspension and/or blacklisting of

	the contractor.
51.1	The date by which "as built" drawings are required is ten (10) calendar days after issuance of final acceptance.
51.2	The amount to be withheld for failing to produce "as built" drawings and/or operating and maintenance manuals by the date required is 1/50 of 1% of contract value.

Section VI. Specifications

SECTION 01000
EXPLANATION TO THE SPECIFICATIONS

INTRODUCTION

The Drawings and Specifications are complementary to each other. Drawings are graphic means of showing work to be done. They are particularly suited to showing where materials are located. Thus, drawings exist essentially to show dimension, location and placement. Not all works, however, can be presented in the drawings. Generalized works are usually statement form and hence. the contractor is required to read the specifications carefully.

Specifications, on the other hand. are used to describe the materials. construction techniques, samples, shop drawings, guarantees and other contract requirements. Together. the drawings and the specifications are used to inform the contractor. In cases where the specified brand carries with it the manufacturer's specifications, the manufacturer's specifications shall hold precedence over these specifications.

The Specifications are of the abbreviated type and include incomplete sentences. The selection of the sentence depends on the underlying principles of Specifications:

A. That the Technical Specifications are only one part of the Contract Documents.
B. That the Contract is between the Owner and the General Contractor and
C. That the General Contractor is the only party responsible for completing the work in accordance with the Contract Documents.

Therefore:

A. Only the General Contractor is referred to in the Specifications so as not to violate the intent of the contract and so as not to undermine the proper chain of command.
B. Any reference to Specialty Trade Contractors in the technical Specifications is made only in so far as selection of Specialty Trade Contractors is made through bidding. Once the Specialty Trade Contractors are selected and assigned to the General Contractor, the General Contractor assumes all the responsibilities for the execution of the whole project in accordance with the Contract Documents. Therefore. in the contract between the Owner and the General Contractor, the Specialty Trade Contractor is not referred to. In all contract Documents, the word "Contractor" means the General Contractor.
C. The brand names specified are intended to assure the level of quality needed for the project. This does not mean however that the brands specified are exclusive. The Contractor shall prove by laboratory tests and certificates that substitute materials are of the equivalent quality and the Contractor shall secure the Architect's approval prior to use of such substitutes.

D. The omission of the phrase "The Contractor shall" is intentional because the whole Specifications is directed to the Contractor. Omitted words or phrases shall be supplied by inference in the same manner as they are when a "note" occurs on the drawings.
E. Where "as shown", "as indicated", "as detailed" or words of similar import are used, it shall be understood that reference to the drawings accompanying the Specifications is made unless otherwise stated.
F. Where "as directed", "as required", "as permitted", "as authorized", "as approved, accepted" or words of similar import as used, it shall be understood that the direction, requirements, permission, authorization, approval or acceptance of the Architect is intended unless otherwise stated.
G. As used herein, "provided" shall be understood to mean "provided complete in place," that is, "furnished and installed".
H. Most sentences are in the imperative mood. This style is especially suited for instructions covering installation of products and equipment.

Example:
"Measure concrete materials such that the proportions can be accurately controlled and easily checked at any time during work."
"Pipes in trenches shall be laid true to line and grade on a stable or suitably prepared foundation…"
"Maintain ground cover by watering"

The verb is the first word of the sentence clearly defining the action to be performed. This style is readily understandable and concise.

CLARIFICATIONS

All reference to any particular brand, material, equipment, or systems in the specifications, drawings, and bid documents is indicative of the type and quality of what is required. However, **any equal material** or equipment or system can be used if approved by UP.

SECTION 01010
SUMMARY OF WORK

GENERAL

1.01 DESCRIPTION OF THE PROJECT

Complete all works for the **RENOVATION OF THE DBM ARCACHE BUILDING**, including supply of all materials, equipment, and systems, as well as performance of all necessary labor and processes, in accordance with the plans, specifications, the Philippine Bidding Documents, the Terms of Reference and other related contract documents.

1.02 PERMITS, LICENSES AND TAXES

A. Secure and pay all permits, fees, licenses, taxes, etc necessary for the execution of the general construction works.

B. Prepare a monthly progress report which shall include an overall progress chart based on actual physical accomplishment of construction work and a progress chart based on actual value of accomplished construction work, among others.

1.03 MOBILIZATION & TEMPORARY FACILITIES

A. Mobilization of all necessary personnel, labor, tools, facilities, and equipment to commence work on the project.

B. Construction, proper maintenance, and ordering of Temporary Facilities like field offices, field conference rooms, storage structures such as warehouses or bodega, materials storage yard, worker housing, proper sanitation facilities, health and safety facilities, among others. See Section 01400 for details.

C. Secure all existing equipment, materials, structures, and facilities for re-use with proper inventory. Provision of security and safety measures for the protection of the general public during construction work.

D. Take all necessary measures to protect all existing facilities, site development, and equipment from damage, loss and dirt. Contractor is responsible for the restoration of all existing equipment, materials, structures, and facilities damaged or otherwise affected during construction work.

1.05 DEMOBILIZATION AND CLEANING

A. Demobilize, dismantle and remove all temporary facilities, including all workmen's houses, construction equipment, tools, personnel and debris out of the project site and premises.

B. Cleaning of the building and site to a spic and span state, ready for use.

2.00 SCOPE OF WORK

PRE-DEVELOPMENT WORKS

DEMOLITION

DEMOLITION

1. Demolition and hauling out of debris as indicated in the Demolition Plans.

RETENTION / PROTECTION / TEMPORARY SUPPORT & ENCLOSURE

1. Protection of all affected structures around the building

CUTTING AND FILLING OF NATURAL GRADE AS NEEDED

OTHER WORKS AS NECESSARY

PROPOSED WORKS

SITE DEVELOPMENT

CONSTRUCTION OF SITE UTILITIES

(see MEPF Plans, Details, & Specifications)

1. Construction of Site Drainage
2. Construction of Site Electrical System
3. Construction of Site Water Distribution System
4. Construction of Site Sewer System
5. Construction of Site Fire Protection System
6. Other Works

STRUCTURAL

(see Structural Plans. Details. & Specifications)

1. Construction of Deep Foundation System
2. Construction of Slab on Fill
3. Construction of Structural Framing System
4. Construction of Roofing System
5. Construction of Elevator Structure
6. Other Works

ARCHITECTURAL/INTERIOR DESIGN

(see Architectural Plans, Details, & Specifications)

1. Construction of all spaces at the ground floor according to architectural and interior design plans and specifications provided
2. Construction of all spaces at the mezzanine floor according to architectural and interior design plans and specifications provided
3. Construction of all spaces at the second floor according to architectural and interior design plans and specifications provided
4. Construction of all spaces at the third floor according to architectural and interior design plans and specifications provided
5. Construction of roof and roof deck according to architectural and interior design plans and specifications provided
6. Construction of Entrance Canopy

7. Construction of Walls (Exterior walls, Interior walls, Curtain walls, etc.)
8. Construction of Doors and Windows
9. Construction of Stairs
10. Architectural Finishes
11. Other Works as necessary

MEPF

(see MEPF Plans, Details, & Specifications)

1 Plumbing, Sanitary, and Drainage Systems
2 Electrical and Electrical Auxiliaries Systems
3 Mechanical Systems
4 Fire Protection System

Other Works

Section 01020
SUMMARY OF MATERIALS AND FINISHES

1.00 GENERAL REQUIREMENTS

1.01 RELATED SECTIONS
All applicable provisions of the different divisions of the Specifications for each work trade shall apply for all items cited in this Summary.

1.02 INFERRED ITEMS AND WORK
Materials and workmanship deemed necessary to complete the works but NOT specifically mentioned in the Specifications, Working Drawings, or in the other Contract Documents, shall be supplied and installed by the Contractor without extra cost to the Owner. Such materials shall be of the highest quality available, and installed or applied in a workmanlike manner at prescribed or appropriate locations

1.03 SPECIFICS
Materials specifically mentioned in this Summary shall be installed following efficient and sound engineering and construction practice, and especially as per manufacturer's application for installation specifications which shall govern all works alluded to in these Specifications.

1.04 ON-SITE ITEMS

Materials and finishes for onsite improvements and facilities as listed below are part of the scope of work and shall be supplied and installed by the Contractor without extra cost to the Owner.

A. Installation of engineered and drainage fills for building and landscaped areas where specified.

B. Construction of:

1. Concrete driveways, walks, ramps, steps, posts, and miscellaneous slabs;

2. Concrete splash slabs, steel or hard plastic gratings;

3. Below grade utility structures such as septic vaults, cisterns, handholes, and manholes;

4. Above-grade utility structures such as electrical poles, concrete pedestals, and the like;

5. Exterior utility lines, raceway system, fixtures, breakers, switches, buzzers, controls including fittings and accessories as required by the specialty trades under plumbing, electrical and communication works.

6. Pumps, tanks and other necessary equipment and facilities.

1.05 OFF-SITE ITEMS

Offsite improvements shall generally be under the responsibility of the Owner and not included in the Contract, with the exception of the following which shall be part of the Contractor's Work:

A. Concreting of entry slabs. This work shall neatly make connections to the existing roads or curbs, if any, and shall incorporate necessary utility ways under such as required. Access road drainage system and other existing utility lines must be kept in working condition.

B. Installation of concrete drainage pipes to neatly receive connections from the storm drainage system of the site to access road and/or to existing drainage system.

C. Permanent connections to the local utility lines for electrical, water, drainage, sewer and telephone lines including equipment, facilities, materials, fees, and/or work which utility companies or authorities may require of the applicant Owner, such as electrical transformers, electric poles, service laterals and drops, etc. by their respective Specialty Contractors.

1.06 OWNER SUPPLIED ITEMS

Owner supplied finishing accessories, furnishing and fixtures such as wall clocks, picture frames, movable furniture etc., shall be installed by the Contractor at no cost to the Owner.

2.00 <u>SITEWORK</u>

2.01 02160: EXCAVATION SUPPORT SYSTEM

A. SHORING AND BRACING SYSTEMS

Types of shoring and bracing systems include, but are not limited to the following:

1. Steel H-section (soldier) piles
2. Timber lagging
3. Steel sheet piles

2.02 02200: EARTHWORK

A. FILL MATERIALS

1. General Fill for structures and under spread footings, pavers, or concrete slabs on grade shall conform to the general requirement for soil materials

above and shall be classified as GW, GM, GP, SW, SM by the ASTM 2487 and conform to the following.

a) Liquid Limit – shall not exceed 25% when tested in accordance with ASTM 423.

b) Plasticity Index – shall not exceed 12% when tested in accordance with ASTM 424.

c) Under Buildings, no more than 25% by weight shall be finer than No. 200 sieve when tested in accordance with ASTM D 1140.

2. Granular Fill shall conform to the general requirements for soil material above and shall be clean, crushed stone or gravel conforming to ASTM C 33, size 67 and with a sand equivalent of not less than 50% when tested in accordance with ASTM D 2419.

3. Backfill material behind walls shall consist of free-draining granular fills, sized in particular to provide a filter media around subsoil drainage system.

4. Drainage Fill: Fill material shall clean, well graded, free draining sand conforming to ASTM C 33 for Fine Aggregate.

5. Borrow: If additional material is required for fill in excess of that obtained by excavation at the site, obtain same from sources acceptable to the Owner's Engineer. All arrangement for obtaining borrow from off-site shall be the responsibility of the Contractor and all cost thereof shall be borne by the Contractor. Acceptable borrow will consist of suitable material for fills as herein before specified. Representative of each type of borrow materials considered suitable shall be delivered to the Testing Laboratory and tested prior to placement. Any borrow material not meeting the standard herein specified, or considered unsuitable by the Owner's Engineer will be rejected at the site.

B. BATTERBOARDS: Second class, pest free lumber assembled and rendered secure for proper delineation of building lines and grades.

2.03 02282: TERMITE PROOFING

Product and application by Owner-accredited termite and pest control contractor.

A. TERMITE PROOFING: Termiticide Concentrate or approved equal; with enhanced aromatic solvent with low odor. Dilution rating: 1 liter Termiticide Concentrate to 50 liters water. There shall be no disturbance of treated soil between application of poison and pouring concrete.

2.04 02520: CONCRETE CURBS, GUTTER, AND PAVED WALKS

A. CEMENT: shall be as per ASTM Standard Specifications for Portland Cement (ASTM C-150: latest revision) for Type 1 Portland Cement.

B. CONCRETE AGGREGATES

1. Aggregates shall be well-graded, clean, hard particles or gravel or crushed rock conforming to the STANDARD SPECIFICATION FOR CONCRETE AGGREGATES (ASTM Designation C-33: latest revision).

2. SAND: shall be coarse sand free from injurious materials such as shells or earth or organic materials. Sand from salt water is not allowed.

C. WATER: shall be clean and free from injurious amounts of oils, acids, alkali, organic materials or other deleterious substances.

D. FORMS. shall be either wood or steel.

E. CONTROLLED STRENGTH OF CONCRETE: Concrete shall develop a minimum of 28-day cylinder strength of 21 Mpa (3,000 PSI).

2.05 02700: SITE DRAINAGE

A. DRAINAGE PIPE:

1. POLYVINYL CHLORIDE PIPES AND FITTINGS. 200 mm (8") and below in diameter. Equivalent to ASTM D2729 Specifications. Rigid (uPVC) pipe and drainage pattern fittings or approved equal conforming to ASTM D2564.

2. Reinforced concrete pipes fittings 250 mm (10") and bigger: Centrifugally cast or vibrated T & G conforming to ASTM C7659 T.

B. JOINING MATERIAL: PVC cement for PVC pipes. One part cement to two parts sand for RC Pipes.

C. BUILDING STORM DRAIN CONNECTION TO MAIN: PVC wye branch and clean out, use junction boxes.

D. AREA DRAIN CATCH BASIN: Loadbearing 4.8 Mpa (700 PSI) concrete hollow blocks (CHB) or reinforced concrete with cover as shown on the drawings.

E. CATCH BASINS OF JUNCTION BOXES: Loadbearing 4.8 Mpa (700 PSI) concrete hollow blocks (CHB) or reinforced concrete as indicated in the drawings, with solid reinforced concrete cover.

3.00 <u>CONCRETE</u>

3.01 03100: CONCRETE FORM WORKS

A. FORMS:

1. TYPE OF FORMS: Use phenolic boards for exposed and unexposed concrete works.

2. SCAFFOLDS: Use metal scaffolding whenever necessary. Wood nor coco lumber are not allowed. Form work, shoring, temporary bracing, staging, construction of temporary facilities, and any other measures needed to support the structural elements or provide shelter from debris during construction shall be the responsibility of the builder.

3.02 03200: CONCRETE STEEL REINFORCEMENT

A. STEEL BARS: Use locally manufactured deformed billet-steel bars conforming to Philippine standard, Intermediate Grade of 275.8 Mpa (Fy = 40,000 psi) for bars 12mm diameter or smaller, and High Strength Grade of 415 Mpa (Fy = 60,000 psi) for bars 16mm diameter and larger. Use standard-sized deformed steel conforming to ASTM A615 / PNS 49 standards, for concrete and masonry reinforcements. Upgrade to next bigger size if specified standard sizes are unavailable.

B. TIE WIRES: Use Ga.16 Galvanized Iron (G.I.) tie wires at joints or laps of placed reinforcements.

3.03 03300: CAST IN PLACE CONCRETE

A. GENERAL:

Concrete shall be composed of Portland cement, fine and coarse aggregates, water and admixture as specified, all thoroughly mixed and brought to the proper consistency, uniformity and temperature for final placement. Strength requirements shall be:

1) 21 MPa (4000 psi) for footings, retaining walls, footing tie beams, cistern and suspended slabs.
2) 21 MPa (4000 psi) for columns, girders, beams;
3) 17.2 MPa (2500 psi) for slabs-on-grade, partitions, walks, & other non-structural members;

B. CEMENT:

Cement shall be Portland cement, conforming to the Standard Specifications for Portland cement (ASTM Designation C-150 latest revision) for type 1 Portland cement. Use only one brand of cement throughout.

C. FINE AGGREGATES:

Fine aggregates shall consist of natural sand, manufactured sand, or a combination thereof. If the fine aggregate shall be a combination of separately processed sizes, or if batching shall result in a combination of natural and manufactured sand, the different components shall be batched separately.

Fine aggregates shall consist of hard, tough, durable, uncoated particles. The specified percentages of fines in the sand may be obtained either by the processing of natural sand or by the production of a suitably graded manufactured sand. The shape of the particles shall be generally rounded or cubical and reasonably free from flat or elongated pieces. The use of beach sand shall be prohibited. The fine aggregate shall conform to the following specific requirements:

Sieve Designation		
Standard (MM)	U S. Standard. Square Mesh	Cumulated Percentage by Weight Passing
9 5	3/8	100
4.75	No 4	95-100
2.36	No. 8	-
1.18	No 16	45-80
0.60	No 30	-
0.30	No 50	10-30
-	No 100	2-10

In addition to the grading limits shown above, the fine aggregates, as delivered to the mixer shall have a fineness modulus of not less than 2.3 nor more than 3.0 and during normal operations, the grading of the fine aggregate shall be controlled so that the fineness modulus of at least nine (9) of ten (10) test samples of the fine aggregate as delivered to the mixer shall not vary more than 0.20 from the average fineness modulus of all samples tested during the preceding 30-day period. The fineness modulus can be determined by dividing by 100 the sum of the cumulated percentages retained on U.S. Standard Sieves Nos. 4, 8, 16, 30, 50 and 100. At the option of the Contractor, fine aggregates may be separated into two or more sizes or classification, but the resulting combined sand shall be of uniformed grading within the limits specified above. It can be generally assumed that fine blending sand maybe required to meet the above grading.

D. COARSE AGGREGATES:

Coarse agreement shall consist of gravel, crushed gravel or rock, or a combination thereof. The coarse aggregate as delivered to the batching plant shall have a uniform and stable moisture content. The approval of deposits shall not be construed as constituting the approval of all the materials taken from the deposits and the Contractor shall be held responsible for the specified quality of all such materials used in the work. Coarse aggregate shall consist of hard, tough, durable, clean and uncoated particles. All foreign materials and dust shall be removed by adequate processing. The particle shape of one of the smallest size of crushed coarse aggregate shall be generally rounded or cubical, and the coarse aggregate shall be reasonably free from flat and elongated particles. A thin, flat and elongated particle can be defined as a particle having a maximum dimension greater than five times the minimum dimension. The coarse aggregate shall be well graded from fine to coarse. It shall be separated into size groups.

The grading of the aggregate within the separated size groups as delivered to the mixer.shall be.as follows:

Sieve Sizes			
Standard (MM)	U S Std Sq Mesh	Percent by Weight Sizes 1-1/2"	Passing Individual 3/4"size
50.00	2"	-	100
37.50	1-1/2"	-	90-100
25 00	1"	100	20-55
19 00	3/4"	90-100	0-15
9 50	3/8"	20-55	0-5
4 75	No 4	0-10	-

- Use 19mm (3/4) coarse aggregate for slabs-on-grade. columns, beams, suspended slabs, tie beams.
- Use 38 mm (1 ½") coarse aggregate for footings

E. WATER:

Water shall be clean and free from injurious amounts of oils, acids, alkalis, salts and organic materials. or other substances that may be deleterious to concrete or steel.

F. ADMIXTURES: shall be subject to prior approval by the Engineer. The admixtures shall be capable of maintaining essentially the same composition and performance throughout the work.

1. Plasticizing admixtures shall be free from chlorides and shall conform to ASTM C494. The admixtures shall be used in concrete mixtures in accordance with the manufacturer's instructions.
2. Air-entraining admixtures –to improve workability or durability of concrete mixes.
3. Accelerators – Use in the amounts as recommended by the manufacturer, with the approval of the Architect.
4. Water Reducing Retarders – Use in the amounts as recommended by the manufacturer, with the approval of the Architect.
5. Integral Waterproofing Compound - for whole Mezzanine and Roof Deck slab. Use one kilo pack per forty kilo bag of Portland cement.
6. Calcium chloride is not allowed. Secure approval of the Engineer prior to using of any other additive.

G. EPOXY BONDING COMPOUND:

1. ASTM C881. 2-component materials suitable for use on dry or damp surfaces; Material type, grade and class to suit project requirements. For bonding new to old concrete. repair of cracks, bonding grout.

NOTE:

PLACEMENT DRAWINGS: Shop drawings of each reinforcing steel detail and placement drawings shall be submitted for approval in accordance with the requirements of the General Conditions. Any material fabricated before final approval of the shop drawings will be done at Contractor's risk, but no material shall be placed until shop drawings have final approval. /shop drawings shall be in accordance with the "Manual of Standard Practice for Detailing Reinforced Concrete Structures" (ACI 315).

3.01 03400: ARCHITECTURAL PRE-CAST CONCRETE

A. MOLD MATERIALS: Metal, plastic or wood that is non-reactive with concrete and will produce required finish surface.

B. REINFORCING MATERIALS:

1. Reinforcing bars: ASTM A 615M, Grade 400 deformed.

2. Steel-Welded Wire Fabric: ASTM A 185, plain, cold drawn.

C. CONCRETE MATERIALS:

1. Portland Cement: ASTM C 150, Type 1. Use only one brand, type, and color of cement from the same mill throughout Project.

2. Normal-Weight Aggregates: ASTM C 33, with coarse aggregates meeting Class 5S and MNL-117 requirements.

a) Face-Mix Coarse Aggregates: Selected, hard, and durable, free of materials that reacts with cement or causes staining. Uniformly graded.

b) Face-Mix Fine Aggregates: Selected, natural or manufactured sand of the same material as coarse aggregate, unless otherwise acceptable to the Architect.

3. Coloring Agent: C 979, synthetic, mineral oxide pigments or colored water-reducing admixtures, color-stable, non-fading, resistant to lime and other alkalis.

4. Water: potable; free from deleterious material that may affect color stability, setting, of strength of concrete.

5. Air-entraining Admixture: ASTM C 260, certified by manufacturer to be compatible with other required admixtures.

6. Water-Reducing Admixture: ASTM C 494, Type A.

7. Retarding Admixture. ASTM C 494, Type B.

D CONNECTION MATERIALS:

1. Steel Shapes and Plates: ASTM A 36M.

2. Malleable Iron Castings: ASTM A 47M

3. Carbon Steel Plates: ASTM A 283M.

4. Carbon-Steel Bolts and Studs: ASTM F 568, Property Class 4.6; carbon-steel, hex-head bolts and studs; carbon-steel nuts; and flat, unhardened steel washers.

5. Welded Headed Studs: AWS D1.1, Type B headed studs, cold-finished carbon-steel bars.

6 Deformed-Steel Wire Bar Anchors: ASTM A 496.

7. Welding Electrodes: Comply with AWS standards.

8. Accessories: Provide clips, hangers, plastic shims, and other accessories required to install architectural pre-cast concrete units.

E. BEARING PADS: Elastomeric pads; AASHTO M 251, plain, vulcanized, 100 percent polychloroprene (neoprene) elastomer, molded to size or cut from a molded sheet, 50 to 70 shore A durometer, minimum tensile strength 15.5 Mpa (2250 psi) per ASTM D 412.

F. GROUT MATERIALS: Cement Grout; Portland Cement, ASTM C 150, Type 1 and clean, natural sand, ASTM C 404. Mix at ratio of 1 part cement to 2-1/2 parts sand, by volume, with minimum water required for placement and hydration.

G. CONCRETE MIXES:

1. Normal-Weight Concrete Face and Back-Up Mixes: Proportion mixes by either laboratory trial batch or field test data methods according to ACI 211.1, using materials to be used on the Project, to provide normal weight concrete with the following properties:

a) Compressive Strength (28-day): 20.7 Mpa (3000 psi).

b) Maximum Water-Cement Ratio at Point of Placement: 0.40.

2. Lightweight Concrete Back-Up Mixes: Proportion mixes by either laboratory trial batch or field test data methods according to ACI 211.2, using materials to be used on the Project, to provide lightweight concrete with the following properties:

a) Compressive Strength (28-day): 34.5 Mpa (5000 psi).

b) Unit Weight: Calculated equilibrium unit weight of 1842 kg/cum (115 lb/cuft), plus or minus 48 kg/cum (3lb/cuft), according to ASTMC 567.

4.00 MASONRY

4.01 04100: MORTAR

A. PORTLAND CEMENT: Use only one brand of cement throughout. Portland cement shall conform to the Standard Specifications for Portland cement (ASTM Designation C-150 latest revision) for type 1 Portland cement.

B. SAND: ASTM C 35 – 67. clean, washed river sand, strong, free from organic and other deleterious materials. Sand from salt water or lahar is not allowed.

C. WATER: Fit for drinking, free from injurious amount of oil, acids, alkali, organic materials and other deleterious substances.

D. CONCRETE MORTAR COMPRESSIVE STRENGTH: (fc) = 13.8 Mpa (2000 psi).

E. ADHESIVE MORTAR: Use Tile Adhesive or approved equal for laying vitrified ceramic tiles on concrete. For tile installation on existing tiles, granolithic floors, marble, plywood, gypsum and fiber cement boards and other non-concrete materials and substrates use Tile Adhesive Heavy-Duty or approved equal.

F. GROUT: Use Tile Grout pre-mixed dry wall filler for floor and wall tile joints either glazed or semi-glazed tiles. Masonry concrete grout compressive strength (fc') = 13.8 Mpa (2000 psi). For tile works. Apply Tile Grout Sealer or approved equal if necessary.

G PLASTER BOND: Apply on all wall areas prior to plastering.

H. MORTAR TOPPING & PLASTER REINFORCING FIBER: For plaster works thicker than 25mm (1") and for mortar topping over membrane waterproofing for roof decks and balconies

4.02 04200: UNIT MASONRY

A. CONCRETE HOLLOW BLOCKS (CHB).

1. Use 150 mm x 200 mm x 400 mm (6" x 8" x 16") and 100 mm x 200 mm x 400 mm (4" x 8" x 16") Non-Load Bearing Concrete Hollow Block Units of standard manufacture, machine vibrated with even texture and well defined edges, steam-cured, conforming to PNS16 Type 1, Class A, with a minimum compressive strength of 2.5 MPa (350 psi) for building exterior and interior walls and septic tank retaining wall around open court and wherever else specified.

   Note: For exterior and interior walls, use 6" CHB from floor to bottom of slab or bottom of beam, with 10mm dia. reinforcing bars at 600 mm o.c. bothways. Anchor to floor by embedding vertical bars 75mm deep into the floor slab. Anchor to slab or beam by providing 10mm dia. dowels. Provide stiffener columns and beams as required in the general notes. PLAIN CEMENT PLASTER – PAINTED FINISH.

B. REINFORCING BARS. Masonry reinforcing steel yield strength (fy) =228 Mpa (33,000 psi), Grade 33 bars, conforming to ASTM Specifications A615 / PNS 49 of sizes shown in Plans. Use standard sizes; upgrade to next bigger size if specified standard sizes are unavailable.

C. TIE WIRES: Gauge 16 Galvanized Iron (G.I.) tie wires.

5.00 METALS

5.01 05100: STRUCTURAL STEEL

Owner/Architect – approved manufacturer/sub–contractor. Conform all materials and workmanship to the requirements of the American Institute of Steel Construction "Specifications for Design, Fabrication and Erection of Structural Steel for Buildings" as amended to date or as may be specifically modified by the drawings or by these Specifications.

A. PLATES, SHEETS AND CONNECTORS: Conform to ASTM Designation A36 with specified yield point of 248 MPa (36,000 psi). From mild steel sheets or plates with standard thickness, size, shape and design as indicated in the plans. For miscellaneous stiffener, bearing anchorage and connector plates or straps. Upgrade to next higher / bigger size and thickness if specified sizes & thicknesses are unavailable.

B. STANDARD SOLID SECTION: Conform to ASTM A36 with specified yield point of 248 MPA (36000 psi). Mild steel angles, flat bars, square bars, channels, U and other sections. For structural steel trusses, purlins, building eaves framing, overhead anchorage of roll-up doors, grill works, miscellaneous fabricated mounting brackets, straps, dowels, frames and connectors. Upgrade to next higher/bigger size and thickness if specified sizes and thickness are unavailable.

C. HIGH STRENGTH BOLTS, NUTS AND WASHERS: Conform bolts to the Specification for High Strength Bolts ASTM A325, Type 1. See structural connection details for location of bearing-type and friction-type bolts.

D. ANCHOR BOLTS: A36.

E. WELDING ELECTRODES: Conform welding electrodes to AWS D1.1:2000 Structural Welding Code – Steel, E-60XX for structural welding.

F. GROUT: Conform non-shrink grout to ASTM C827. Grout shall be non-metallic. Use cementitious free flowing non-shrink grout, or approved equal. Apply using manufacturer's standards strictly.

G. STRUCTURAL STEEL PRIMER PAINT: Epoxy zinc chromate primer except as otherwise recommended by the manufacturer of the coating for all structural steel surfaces.

5.02 05200: MISCELLANEOUS METALS.

A. STANDARD SOLID SECTION: Conform to ASTM 611 with specified yield point of 228 Mpa (33,000 psi). Mild steel flat bars, square bars, overhead anchorage of roll-up doors, grill work, miscellaneous fabricated mounting brackets, straps, dowels, frames and connectors. Upgrade to next higher / bigger size and thickness if specified sizes & thickness are unavailable.

B. BRACING RODS: Standard structural grade steel rods with turnbuckles whenever required ex. for roof framing.

C. PAINTING: Use only approved brand of epoxy zinc chromate paint and linseed oil for all architectural steel components only. For field painting, use only approved brand of enamel paint.

D. STAINLESS STEEL: Pipes, tubes, square bars, and other sections; installed with guarantee. Provide shop drawings for approval by the Architect before fabrication /installation.

1. Roof Gutter: 1.2 mm (gauge 18) thick, Stainless Steel Sheets, Type 304 bent to design shape To be approved by Architect before installation
2. RC Precast Anchors: 10mm Stainless Steel Plain Bars
3. Ramp and Stair Railing; 50 mm round, Gauge 40, Type 304, with ordinary steel balusters, secured by welding to dowels, epoxy enamel painted. Present shop drawings for the approval of the Architect.
4. Grab bars for toilets (where applicable) 50 mm round, Gauge 40, Type 304

Note: Upgrade to next bigger size if specified standard sizes are unavailable.

F. GALVANIZED IRON:

1. Yard Hose Bibbs: G.I. Pipes: schedule 40, painted with Epoxy Enamel Paint.
2. Hangers: Gauge 10 G.I. wire hanger.

G. BRASS NOSING: 3 mm thk. X 38 mm wide brass nosing for every stair tread and for every change in floor elevation, unless otherwise indicated or any approved equivalent by Architect.

H. FASTENINGS: Commercial types, except where special types are shown or required. Fastenings for all exterior work shall be non-ferrous, unless otherwise shown. Fastening for stainless steel and aluminum and other interior work, where exposed shall match the fastened metal.

6.00 WOOD AND PLASTICS

6.01 06100: ROUGH CARPENTRY

Note: For K.D. Tanguile, plywood inner sides and for cut ends of Apitong joints, nailers, and framings, supplementary termite and rot treatment to be applied by Owner-approved termite and pest control company, with guarantee. Effect butt joint appearance for all T and cross intersections of exposed frames. When stronger joints are required, introduce half-laps, dowelling or mortise and tenon but still effect a simple butt joint at the exposed surface.

A. LUMBER:

1. Tanguile: Kiln-dried, factory treated with pressure impregnated Wolman preservative or approved equal, S4S, sound, hard and free from defects lumber. Max. moisture content 12% for lumber with thickness 1" or less: 16% max. moisture content for all others. For framing of countries, closets and cabinets.

2. Yakal: generally for all plates, corbels, struts and other components of wood-based structures requiring wood which is strong, not resistant and/or capable of holding on firmly to driven nails or other connectors. For cabinet base wood blocks or as specifically called for in the drawings.

B. HARDWARE AND FASTENERS: use metal nails, screws, bolts, plates, straps, miscellaneous fasteners or anchorage concealed or countersunk whenever called for, with size, shape and type to ensure a rigid connection for laminated items and at cabinet framing joints.

6.02 06200: FINISH CARPENTRY

Lumber:

A. GUIJO: quarter-sawn, sound and free from imperfections impairing its strength and finish. Kiln-dried (max. moisture content: 12%), with the same shade and color for assemblies or sets of assemblies, warp-free, treated, S4S and fine sanded lumber. For louver slats of doors and edgings, when required

B. PLYWOOD: vacuum treated with Solignum, or approved equal.

1. Weatherproof Marine Plywood 6 mm (1/4") thick. For backing of mirrors and for flush doors as indicated in drawings.

2. 6 mm (1/4") thick class A, Tanguile plywood. For woodworks needing such material.

C. MEDIUM DENSITY FIBERBOARD (MDF): 19mm (3/4"). For free span shelves, and for miscellaneous components of cabinets and closet housing; for all doors and exposed and unexposed sides of closets and kitchen cabinets, and 12.5 mm (1/2") thick for visual display boards.

D. FIBER CEMENT BOARD: Use 4.5mm thick for backing of mirrors; 6mm thick for wall boards; and 9mm thick for fascia boards; 1200 mm x 2400 mm. ficem board. Install as per manufacturer's instructions.

E. MOULDINGS AND TRIMS: For baseboards, use 100mm height, turn-up continuous vinyl baseboard or approved equal. Provide baseboards for all walls (even if not designated in the plans), except for walls finished with tiles, stone and aluminum cladding.

F. HARDWARE AND FASTENERS: Use metal nails, screws, plates, straps, miscellaneous fasteners or anchorage; concealed or countersunk whenever called for, with size, shape and type to ensure a rigid connection for laminated items.

G. ASSEMBLY MATERIALS: Approved water-resistant glue, and nails, screws and bolts of appropriate type, shape and size for all types of joints.

H. TRADEMARK: Each separate lumber piece or assembly is required to bear an official mark of the millworks supplier.

7.00 THERMAL AND MOISTURE PROTECTION

7.01 07100: WATERPROOFING AND DAMPPROOFING

Apply with surface preparation, methods application and density as per manufacturer's specifications. To be installed only by authorized Applicator with guarantee.

A. INTEGRAL WATERPROOFING COMPOUND: Underlay waterproofing membrane. Water-sealed integral concrete waterproofing; for entire slab of both Mezzanine and Roof Deck.

B. FLUID APPLIED WATERPROOFING. Synthetic rubber. cold-vulcanized, liquid applied waterproofing membrane. Apply 1mm thick following manufacturer's specifications; for positive application on elevator pit, suspended toilets, concrete gutter and plant boxes, with 38mm conc. topping, to be installed only by authorized Applicator or by the Architect's approved applicator Whenever necessary, apply for negative application on basement walls, retaining walls and elevator pit.

C. EXPOSED TYPE LIQUID MEMBRANE WATERPROOFING: single pack liquid rubber compound for concrete ledges and firewall.

D. EPOXY SYSTEM WATERPROOFING: Fabric-reinforced, Hi-Built, food-grade, epoxy-based lining for slabs and walls of cistern.

E. DAMP-PROOFING: vapor barrier, one layer at six mils (0.006) thick. For slabs on fill at the building interior. Provide 300 mm overlapping.

7.02 WATERSTOP

For all concrete joints on wall and floor construction below grade.

7.03 PROTECTION BOARD:

4.5mm (3/16") thick Fiber cement board for basement walls on positive applied membrane waterproofing to be applied by experience applicator or as approved by the Architect.

7.04 07210: BUILDING AND ROOFING INSULATION

A. For concrete roof deck: Use 25mm thk x 1.5 pcf density extruded polystyrene board covered with 50mm concrete topping, or approved equal. Installation by manufacturer and Architect approved installer with guarantee.

B. METAL ROOFING INSULATION: 25mm thick glass wool/fiberglass thermal barrier with 2 sided aluminum foil insulation or approved equal. For all metal roofing, installed directly under C-purlins.

1. Roofing Insulation
2. G I. Strap Liner
3. G.I. Tie Wire
4. G.I. Screw

7.06 07610: ROOFING SYSTEM

A. Metal Sheet Roofing & Accessories:

TWIN HI-RIB Pre-painted long span G.I. roofing sheets or approved equal. Off-White or any DBM approved equal in color. For roofing as indicated in the schematic plans.

Base metal type: Cold rolled steel tempered to 275 MPa (40,000 psi).

Thickness: Ga. 25 (0.50mm) Effective Coverage: 950 mm

Anti-rust Coating: 55% Alum, 43.4% zinc & 1.6% silicon

Coating Standards: AZ 125 (125 gm/m^2); ASTM A-792\

Top Coat 18-20 Microns Regular Polyester with Epoxy Primer

Back Coat: 8 Microns Epoxy Primer

B. Ridge rolls and vent, flashings, cappings, trims and mouldings. 0.50 mm thick base metal thickness. (215 g/m^2 zinc coating) pre-painted zinc coated fromplain sheets, pre-formed with matching shape and fitting provisions for Metal Sheet Roofing.

C. Roof Gutters and Metal End Fascia at eaves and gable: 1.2 mm (Gauge 18) thick, Stainless Steel Sheets, Type 304 bent to design shape as shown in Plans.

D. Fasteners and Fixation: Use corrosion-resistant nails, anti-UV treated washer-caps. corrosion-resistant hook bolt connectors in areas as recommended by. manufacturer and approved by Architect. Paint all exposed fixation and fastening devices with the same color as roof.

E. Concealed Clips: Concealed clips shall be designed to meet the wind uplift requirements. Clips will provide for thermal expansion and contraction and will not abrade the panel against the clips. substrate or fasteners. Clips shall be stainless steel or galvanized steel for steel applications.

F. Strainer: Use Brass Dome Strainers for gutters. METMA or approved equal.

G. Salt Spray Test: A sample of the sheets shall withstand a salt spray test for a minimum of 1000 hours in accordance with ASTM B 117, including the scribe requirement in the test. Immediately, upon removal of the panel from the test, the coating shall receive a rating of 10. no blistering, as determined by ASTM D 714; and a rating of 7, 1/16-inch failure at scribe as determined by ASTM D 1654.

7.07 07880: SPRAYED ON FIREPROOFING:

CEMENTITIOUS FIREPROOFING SYSTEM conforming to UL 263/ ASTM E 119 to be applied to all structural steel. with fire rating of 2-hours for structural beams and girder, 3-hours for columns. Apply with surface preparation, method of application and density as per manufacturer's specifications. Installation by Architect approved manufacturer or supplier with guarantee.

7.09 07900: JOINT SEALANTS

A. Silicon Sealant: Use as a general purpose, neutral cure sealant. Contractor must guarantee water tightness of all joints even during strong winds. Use also as sealant for acoustic-treated walls in between classrooms.

B Co-Polymer Clear Sealant: For roofs, awnings, roof flashings, skylights, gutters and downspouts.

C. Solvent-Based Synthetic Rubber Contact Type Adhesive: For bonding wood. plastic laminate, concrete. steel aluminum and hardwood, rubber and glass.

D. Acrylic Latex Gap Sealant: For use between windows or door frames and walls, along skirting boards, around cornices, between countertops and splashboard. In corner or between the wall and ceiling or where shrinkage or movement causes rigid fillers to crack.

E. Acid Cure Silicon: For use on non-porous surfaces such as glass. ceramics and porcelain.

8.00 DOORS AND WINDOWS

8.01 08100: METAL DOORS AND WINDOWS

A. METAL DOORS: See Schedule of Doors and Windows.

1. 08120: ALUMINUM DOORS: Use extruded aluminum 6063-T5 alloy for aluminum door frame sections. Use steel-strengthened aluminum; 44mm x 100mm x 2.388 mm thick minimum dimensions or able to withstand a Design Wind Velocity of 250 km/h at project site. Complete with all components and hardware, glazing and all its accessories Powder-coated finish; color for approval of the Architect.

   a) For glass entrances: Clear Glass: ASTM C 1048, Kind FT (fully tempered). Condition A (uncoated surfaces), Type 1 (transparent), Class 1 (clear) requirements. Provide products that have been tested for surface and edge compression according to ASTM C 1048 and for impact strength according to CPSC 16 CFR, Part 1201 for Category II materials. Complete with all components and hardware. In locations as indicated in the plans and schedule of doors.

2. 08100: STEEL DOORS AND FRAMES, STEEL DOOR HEAD AND JAMBS:

   a) STEEL JAMBS AND HEADER: 1.4mm (gauge 16) thick x 50mm x 100mm single rabbet and 1.4 mm (gauge 16) thick x 50mm x 150mm double rabbet; fabricated cold-rolled steel; epoxy paint finish.

   b) STEEL DOOR TYPES: Use manufacturer's standard details.

      1) Plain, full flush design, 44mm panel thickness, lightweight, minimum 1.0 mm (gauge 20) thick galvanized aluminum - high carbon steel sheet faces with honeycomb chemically treated core, lockformed edge. Complete with stainless steel flag-type hinges and locksets. Provide optional accessories when required.

      2) For louvered Doors and Louvers: as shown in the plans/ Schedule of Doors.

      3) For steel doors with glass: use 6mm thick wired glass on aluminum snap on frame and as shown in the plans.

      4) Fire Doors: UL 10/C, positive pressure test on side gaskets, full flush design, 44mm panel thickness, heavyweight, minimum 1.2 mm (gauge 18) thick galvanized aluminum - high carbon steel sheet faces with honeycomb chemically treated core, lockformed edge. Complete with panic device and all other U.L. listed hardware.

B. METAL WINDOWS: Provide and install all windows with complete locksets, hinges and accessories. See Schedule of Windows.

1. 08520: GLAZED ALUMINUM FIXED, CASEMENT AND AWNING WINDOWS: Use extruded aluminum 6063-T5 alloy for aluminum window frame sections. Use steel-strengthened aluminum for exterior windows, 44mm x 100mm x 2.388mm thick minimum dimensions or able to withstand a Design Wind Velocity of 250 km/h at project site. Use in locations as shown in the schematic drawings. Powder-coated finish; color for approval of the Architect.

2. ALUMINUM JALOUSIE WINDOWS: Use extruded aluminum 6063-T5 alloy for aluminum window frame sections. Use approved flat 10mm THK float glass for window louvers. Powder-coated finish; color for approval of the Architect.

3. STORM RESISTANT FIXED STEEL LOUVER: For Generator Room, use 1.4 mm (gauge 16) thick G.I. jamb, header and mid frames and 1.2mm (gauge 18) thick G.I. louver blades as per manufacturer's standards and details.

8.02 081416: WOOD DOORS

A. WOOD FLUSH DOORS See Schedule of Doors.

1. MOLDED WOOD DOORS: Wood machine laminate on Tanguile kiln dried wood jambs: Laminate Finish. For areas indicated in the plans.

8.03 08700: HARDWARE

A. ALUMINUM DOOR AND WINDOW HARDWARE: Install all glass doors and storefronts and glazed aluminum windows, complete with all components and hardware. See Main Specifications. For main door handle: use Pull Handle Stainless Steel, 350 mm, or approved equal.

B. DOOR LOCKS AND LOCKSETS: U.S. original. Note: Provide 4 pcs Master Keys for all cylindrical locksets and deadbolt locking device.

1. Locksets:

a) Keyed Lever type or approved equal. Entrance Lock, (satin chromium finish), U.S. original, or approved equal. Turn-button locking in inside knob; requires use of key at all times until button is manually restored to unlock position.

b) Lever type or approved equal. Privacy Lock, (satin chromium finish), U.S. original, or approved equal. Push button locking in inside knob. Can be opened from outside by screwdriver or similar tool or by turning inside knob.

2. Deadbolts: One Side Keyed Deadbolt or approved equal. Deadbolt Lock. (satin chromium finish), U.S. original. heavy duty, or approved equal. Deadbolt thrown or retracted by key from outside or by inside turn unit. Bolt automatically deadlocks when fully thrown.

3. Keyless Lockset: see Schedule of Doors

C. HINGES:

1. Spartan or Yank (USA made) or approved equal: 88.5mm x 88.5 mm (3-1/2" x 3-1/2") plain bearing, stainless steel, loose pin or fixed pin, button tip. four (4) pieces per door panel for steel doors where specified.

2. Gravity Pivot Hinge: Stanley or Hager Brand Gravity Pivot Hinge, or approved equal. 2 pieces, plain bearing, for all toilets stall doors.

D. SLIDING DOOR HARDWARE:

1. Hanger and Roller: Centor or approved equal complete with rollers, hangers and brackets, sized according to door weight capacity.

2. Sliding Door Deadbolt: U.S. made, single keyhole, lever type, chrome finish.

3. Flushbolt: 150mm, recessed type, chromium finish. Install at bottom at reveal of all active leaf.

E. DOOR CLOSERS: 40 kg. max. door weight, satin chrome finish. For all doors.

F. PANIC DEVICE and all UL listed Hardware: integrated into Fire Doors.

G. DOOR STOP / DOOR HOLDER: chrome finish, floor / wall mounting. Attached securely to floor / wall to prevent door knob from hitting the wall. For all doors.

H. DOOR PULLS: 203mm x 408mm (8" x 16") Push Plate, 152mm x 405mm (6" x 16") Pull Plate, Stainless Steel. For doors requiring the hardware.

I DOOR SILENCERS: Rubber, 3 sets per door. installed at jamb side. For all doors.

J. CABINET ACCESSORIES:

1. Pulls: satin chrome finish. For all cabinet, lockers and drawers.

2. Self Closing Hinges: For all cabinet and locker doors

3. Drawer Runners: Use extended design mechanism where necessary. For all drawers.

4. Cabinet and Drawer LocksSatin chrome finish. For all cabinet doors and drawers.

K. FLUSH BOLTS. Lever action manual flush bolts, satin chrome finish. For all double-leaf doors. Install at top and bottom at reveal of all active leaf.

L. PADLOCK: heavy duty, solid brass, general purpose padlock.

M. FIRE EXTINGUISHER CABINET LOCK: chrome finish for all fire extinguisher cabinets.

8.04 08800: GLAZING (See Schedule of Doors and Windows)

A. CLEAR FLOAT GLASS: Heat-Treated Float Glass, ASTM C 1048, Kind FT (fully tempered), Type 1 (transparent). Provide products of thickness indicated that have been tested for surface and edge compression according to ASTM C 1048 and for impact strength according to CSPC 16 CFR, Part 1201 for Category II materials. Complete with all components and hardware. For all exterior Aluminum Doors; must be able to withstand a Design Wind Velocity of 250 km/h at project site and has low emissivity.

B. CLEAR FLOAT GLASS: 6mm (1/4 inch) thick Heat-Treated Float Glass, tempered. For all exterior and interior aluminum fixed windows. For all exterior Aluminum Windows; must be able to withstand a Design Wind Velocity of 250 km/h at project site and has low emissivity.

C. CLEAR FLOAT GLASS: 3 mm (1/8 inch) thick. For all fire extinguisher cabinets.

E. MIRRORS: 6 mm (1/4") thick plate glass mirror, distortion-free with felt paper on 12 mm (1/2") thick Weatherproof Marine Plywood backing installed on satin-finish anodized aluminum frame. For all changing rooms, 1M x 1.80 M (full length); for all toilets, 1M x 1.20M (half length).

F. BULK COMPOUND FOR GLASS INSTALLATIONS:

1. Mastics – Elastic compounds and non-skinning compound.
2. Putties – Wood sash putty, metal sash putty.
3. Sealants – one component, two components.

G. PREFORMED SEALANTS:

1. Synthetic Polymer – base sealants – resilient or non-resilient type.
2. Pre-formed gaskets – compression type, structural type.

H. CAULKING: Dow Corning 790 Silicone Building Sealant or approved equal. For all joint gaps between aluminum frames and concrete.

I. GLASS BLOCKS: Mulia glass blocks, Wave Design, or approved equal; 190mm x 190mm x 80mm clear, "waved" pattern.

9.00 FINISHES

9.01 09200: PLASTER

A. PLAIN CEMENT PLASTER FINISH: Consisting of the scratch and finish coats, wood trowel finish, both consisting of one (1) part Portland cement and two (2) parts of clean, washed sand, measured by volume. For all interior and exterior wall surfaces where plastering is essential to complete the work.

B. CEMENTITIOUS THIN PLASTERING MORTAR: For all concrete and CHB walls, exterior and interior, Skimcoat White or approved equal on wood trowel cement plaster finish.

C. STEEL TROWEL FINISH: Provide score joints whenever required. For curbs, catch basins, septic tank.

D. SMOOTH RUBBED FINISH: For all exposed undersides of suspended floor RC slabs and beams and when required by the Architect. Use phenolic forms to attain smooth surface at exposed areas.

E. TOOLED JOINT BROOM FINISH: Surface preparation shall be broomed cement plaster finish with tooled mortar joints. Score joints shall be 25 mm plain all around, grooved, clean, plumb and true to line. All joints shall be spaced as directed by the Architect.

F. PLASTERING GUIDE SYSTEM: Use for interior and exterior grooves, drip moulds, construction joints, all concrete corners of columns and walls and surface wall plastering.

9.02 09260: GYPSUM BOARD / FIBER CEMENT BOARD ASSEMBLIES

GYPSUM DRYWALL PARTITION SYSTEM:

A. GYPSUM WALL BOARDS: 12 mm thick x 1200 mm x 2400 mm gypsum board, standard type, tapered edge (T.E.), both sides. Build up to bottom of slab/beam to avoid flanking transmission of sound. Seal all joints by using appropriate gypsum joining plaster and cotton tape as per manufacturer's instructions. For interior partitions as indicated in the plans. Submit mock-up on site before installation. Test for noise control in mock-up room before final construction. Use moisture proof gypsum boards whenever necessary.

B. ACOUSTICALLY TREATED GYPSUM WALL BOARDS: 12 mm thick x 1200 mm x 2400 mm gypsum board, standard type, tapered edge (T.E.), both sides. Build up to bottom of slab/beam to avoid flanking transmission of sound. Seal all joints by using appropriate gypsum joining plaster and cotton tape as per manufacturer's instructions. Provide 50 mm thick rock-wool in between the leaves to cover the whole wall area. Provide acoustic sealants at top of floor slab and bottom of slab/beam connections to ensure an STC 45 rating. For interior partitions of Training Room 1 and Project Management War Rooms 1 and 2; as indicated in the plans. Submit mock-up on site before installation. Test

for noise control in mock-up room before final construction. Use moisture proof gypsum boards whenever necessary.

C. LIGHT METAL FRAMES FOR WALL ASSEMBLIES:

1. For all Drywalls. Use 50mm x 100 mm x 2.0mm thick metal studs at 0.60 M on center and 50mm x 100mm x 2.0mm thick Metal tracks; and, noggins, knurling stiffeners, side assemblies, bullnoses, corner beads, utility holes and others to complete.

GYPSUM CEILING SYSTEM:

A. GYPSUM CEILING BOARDS: 12mm thick x 1200mmx 2400mm gypsum board, standard type, tapered edge (T.E.). On Light Gauge Metal Frame. Install as per manufacturer's instructions. Fixings shall be rust-proof screws or nails. Ceiling design for approval of the Architect. Use moisture-resistant type for toilets and other wet areas.

B. LIGHT METAL FRAMES FOR CEILING ASSEMBLIES:

1. For all Gypsum Ceiling Boards and Fiber Cement Board Ceiling. Metal Ceiling Assembly. Use 19mm x 50mm x 0.6mm thick G.I furring channel and 0.6 mm thick J-type-wall angle with 12mm x 38mm x 1.0mm thick G.I. carrying channel. 6mm diameter treaded hanger rod, suspension clips, rod joiners, steel angles, furring clips, fastening devices and others to complete. Submit mock-up on site, with ceiling boards, before installation.

9.03 METAL CEILING SYSTEMS

A. Metal Spandrel Ceiling:

Pre-painted long span G.I. ceiling sheets or approved equal. Combination of Off-White and Light Brown, wood grain or any DBM and Architect approved equal in color. For ceiling system of roof eaves; on light gauge metal frame on structural steel framing system; complete with hangers, plates, wall angles, carrying channels, bracings, to withstand wind velocity of 250 km/h. Consult manufacturer/supplier for proper installation procedures.

Base metal type: Cold rolled steel tempered to 275 MPa (40,000 psi).

Thickness: 0.60 Effective Coverage: 950 mm

Anti-rust Coating: 55% Alum, 43.4% zinc & 1.6% silicon

Coating Standards: AZ 125 (125 gm/m^2); ASTM A-792

Top Coat: 18-20 Microns Regular Polyester with Epoxy Primer

Back Coat: 8 Microns Epoxy Primer

7Cappings, trims and mouldings: 0.60 mm thick base metal thickness, (215 g/m^2 zinc coating) pre-painted zinc coated from plain sheets, pre-formed with matching shape and fitting provisions for Metal Sheet Ceiling Systems.

9.05 09300: TILES AND SHEETS

A. POLISHED HOMOGENOUS PORCELAIN FLOOR TILES: non-skid, non-porous, polished, 600mm x 600mm x 10mm thick as shown in the drawings; only in colors assigned in particular areas by the Architect. For ground floor main lobby area. Provide one (1) box containing 20 pcs. of each tile type for DBM's stock upon Final Acceptance.

B. POLISHED HOMOGENOUS PORCELAIN WALL TILES: non-porous, polished, 1200mm x 600mm x 10mm thick as shown in the drawings; only in colors assigned in particular areas by the Architect. For Reception Area accent wall; as indicated in the plans. Provide one (1) box containing 20 pcs. of each tile type for DBM's stock upon Final Acceptance.

C. HOMOGENOUS CONCRETE PAVER TILES, non-skid, 200mm X 200mm X 12mm thick; colors to be chosen and approved by the Architect. For exterior walkways.

D. HOMOGENEOUS ROLLED VINYL SHEETS: 2mm thick x 2M x 20M, Class A; varied colors as per Architects Design, with welded joints on self-levelling grout, or approved equal. As indicated in the plans.

E HOMOGENEOUS VINYL TILES: 2mm thick, Class A; varied colors as per Architects Design, with welded joints on self-levelling grout, or approved equal. As indicated in the plans.

F. HOMOGENOUS GRANITE TILES: non-skid, non-porous, only in colors assigned in particular areas by the Architect. For all toilets. Provide one (1) box containing 20 pcs. of each tile type for DBM's stock upon Final Acceptance.

1. 600mm x 600mm x 10mm thick Floor Tiles –non-skid in colors assigned to particular area by Architect.

2. 300mm x 600mm x 10mm thick Wall Tiles –Use matte, in colors assigned to particular area by Architect.

Finish shall be clean, plumb and true to line. Avoid odd-size tiles. Serojos should be more than half the tile size. Provide one (1) box containing 20 pcs. of each tile type for University's stock upon Final Acceptance.

G. HOMOGENOUS GRANITE COUNTERTOPS: non-porous, only in colors assigned in particular areas by the Architect. For all kitchen, pantry and lavatory countertops. Provide one (1) box containing 20 pcs. of each tile type for DBM's stock upon Final Acceptance.

H. Epoxy or Polyurethane floor paint for storage, genset and pump rooms.

I. ADHESIVE, GROUT AND SEALANT: Use Tile Grout, Grout and Sealant color coordinated as approved by the DBM and the Architect.

J. TILE TRIM: Use plastic tile trim to cover all exposed tile joints; color-coordinated as required.

9.07 PAINTING

Use Pacific Paint (BOYSEN) Philippines, Inc., Davies Paints or approved equal (One brand all throughout). All exposed finish hardware, lighting fixtures and accessories, plumbing fixtures and accessories, glass surfaces and the like shall be adequately protected against stains from paint and other painting materials prior to painting works. All other surfaces which would be endangered by stains or paint marks should be taped and covered with craft paper or equal. Acquire low-VOC paints for interior paint finishes.

A. EXTERIOR:

1. BOYSEN Wallguard Latex Finish or approved equal; for all concrete/masonry exterior surfaces, fascia and all exterior FCB fascia; for all front sides of concrete parapets, concrete ledges and projections.

   After waterproofing:

Surface Preparation:	Bostik Mortafix Skimcoat White or Boysen Skimcoat, or approved equal on wood trowel cement plaster finish.
1st Coat:	BOYSEN Acrytex Primer #1705 or approved equal
2nd and 3rd Coats:	BOYSEN Wallguard Latex Semi-Gloss Finish #5715 or approved equal.

B. INTERIOR:

1. BOYSEN Permacoat Semi-Gloss Latex #715 or approved equal.

   - For all interior concrete, masonry; column surfaces of Lobbies and Corridors for wall areas of all other rooms; for beams, girders, all ceilings including bottom of slabs; for exposed walls; for maintenance offices, deck roofs and all other miscellaneous concrete areas unless otherwise specified.

Surface Preparation:	Bostik Mortafix Skimcoat White or Boysen Skimcoat, or approved equal on wood trowel cement plaster finish.
1st Coat	BOYSEN Permacoat Latex #701 White or approved equal. Cover minor cracks and surface imperfections with Skimcoat

2nd and 3rd Coats:	BOYSEN Permacoat Semi-gloss Latex #715 or approved equal. Tint to get the required color with BOYSEN Latex Colors.

- For FCB/Gypsum Walls

1st Coat	BOYSEN Permacoat Latex #701 White or approved equal. Cover minor cracks and surface imperfections with Skimcoat.
2nd and 3rd Coats:	BOYSEN Permacoat Semi-gloss Latex #715 or approved equal. Tint to get the required color with BOYSEN Latex Colors.

Note: Provide painted baseboards, latex as required, 100mm wide, for all stair walls without PVC baseboards and all other wall surfaces, even if not indicated in elevations/sections.

2. BOYSEN Xyladecor or approved equal; for exterior and interior wood surfaces.

1st Coat:	BOYSEN Xyladecor Colorless or approved equal.
Thinner:	BOYSEN Paint and Varnish Remover #141 or approved equal.

3. BOYSEN Acqua Epoxy or approved equal; for all steel, concrete surfaces or where applicable.

Surface Preparation: For Concrete Surfaces: Bostik Mortafix Skimcoat White or Boysen Skimcoat, or approved equal on wood trowel cement plaster finish.

1st Coat:	BOYSEN Epoxy Primer White #2200 or approved equal
2nd & 3rd Coats:	BOYSEN Acqua Epoxy or approved equal.
Thinner:	BOYSEN Epoxy Reducer #55 or approved equal

C. METAL SURFACES:

1. BOYSEN EPOXY ENAMEL, or approved equal; for ferrous surfaces such as all structural steel surfaces, steel grille, steel louvers, steel and roof framing and other exposed steel surfaces unless otherwise specified.

Surface Preparation:	BOYSEN Metal Etching Solution #71 or approved equal
1st Coat:	BOYSEN Epoxy Red Primer #2277or
	BOYSEN Epoxy Primer Gray #2230 or approved equal
2nd and 3rd Coats:	BOYSEN Epoxy Enamel or approved equal. Tint to get the required color.

2. BOYSEN AUTOMOTIVE LACQUER #1300 or approved equal, for Steel Doors and Frames, Steel Plate Supports and Steel louvers.

Surface Preparation:	BOYSEN Lacquer Spot Putty # 306 or approved equal.
1st Coat:	BOYSEN Lacquer Primer-Surfacer # 305 or approved equal
2nd Coat:	BOYSEN Lacquer Spot Putty # 306, or approved equal, as required
3rd Coat:	BOYSEN Lacquer Primer-Surfacer # 305, or approved equal, on puttied areas.
Topcoat:	BOYSEN Automotive Lacquer # 1300 or approved equal, in required coats

10.00 SPECIALTIES

10.01 10200: INTERIOR SPECIALTIES

A. TOILET PARTITIONS: Phenolic boards toilet doors and partitions complete with all nylon fittings Submit sample for approval of the University and the Architect.

B. OPERABLE PARTITIONS: STC 40-45. Design and color for approval of the DBM or the Architect.

10.02 10400: IDENTIFYING DEVICES

A. FIRE EXIT SIGNS: White acrylic letters and green acrylic background: 2 Hours duration: complete with 1 X 8 W LED lamp and Sealed Maintenance-Free Nickel Cadmium Battery. For all fire exit doors.

B. ROOM NUMBERS: Black acrylic letter and white frosted acrylic background. Fabricated from plastic materials with standard size and dimensions. Submit sample for approval of the University and the Architect.

For Room I.D. Acrylic Lettering, 1 Set Each per room And others as necessary	a) Acrylic Letters Ht of letter = 60mm Ht of Background = 100mm
For Acrylic Graphic Signages: 1 set each per PWD/Public Toilets/Shower Rooms; complete directional signage and other signage as needed	b) Acrylic Graphic Signage Accessibility Standard Design and Sizes (BP344, or other acceptable standards)

10.04 10800: TOILET ACCESSORIES.

A. TOILET PAPER HOLDER: Vitreous china, one (1) beside every water closet in private toilets, white color.

B. SOAP HOLDER: Vitreous china, white color, one (1) set for each lavatory in private toilets.

C. LIQUID SOAP DISPENSER: Piston and spout-type soap dispenser. One (1) set for each public toilet.

D. STAINLESS STEEL GRAB RAIL: 38 mm (1-1/2") diameter. at toilets for the disabled.

E. MIRRORS – 6 mm (1/4") thick plate glass mirror, distortion-free with felt paper on 12 mm (1/2") thick Weatherproof Marine Plywood backing installed on satin-finish anodized aluminum frame. Refer to the plans for mirror sizes and location.

F. AUTOMATIC COLD AIR HAND DRYER: One (1) unit each for each public toilet. Submit sample for approval of the University and the Architect.

11.00 EQUIPMENT

NOTE: Refer to MEPF Plans for all mechanical and electrical equipment. Refer to Section 15.00 and 16.00.

13.00 SPECIAL CONSTRUCTION

13.01 13600: SOLAR ENERGY EQUIPMENT

14.00 CONVEYING SYSTEMS

1. Passenger Elevators:

a)	Series	: Machine Room - Less
b)	Model	: P11
c)	No. of Units	: One (1)
d)	No. of Persons	: 11
e)	Rated Speed	: 1.0 m/sec
f)	Rated Capacity	: 825 kgs.
f)	No. of Stops/Openings	: 3
g)	Control System	: VVVF inverter control and Data Network with multiple microprocessor modules
h)	Operation System	: One-car Selective Collective
i)	Car Design	: CN – 11S standard car ceiling
		: Indirect Lighting through milky-white plastic cover
		: Electric blower with plastic grille
		: Pattern-printed steel sheet walls and doors
		: Inclined type in stainless steel hairline front return panel with integrated entrance column
		: Vinyl resin kick plate
		: Homogeneous granite tile floor
		: Extruded hard aluminum sill
j)	Display	: Type CBM-A110 Car Operating Panel
		: Type PIM-A110 Hall Position Indicator (for one car)

NOTES:

1. Supply and install the Hoist Beams, Separator Beams, Machine Room Cinder Concrete Duct Topping, Pit Ladder.
2. Supply, install and wire all elevator breakers to MDP, complete and ready for use.
3. Pay for elevator permit and permit to operate for one year after turn-over; supply and install electrical wiring within the elevator system to devices for operations, safety and security, etc.; test and commission.

15.00 MECHANICAL / SANITARY

15.01 15325: FIRE SPRINKLER SYSTEM:

NOTE: Refer to Main Specifications Section 15325 SPRINKLER SYSTEM, AUTOMATIC, WET TYPE

A. SPRINKLER HEADS: Recessed, upright, pendent, vertical sidewall, horizontal sidewall type, as required, 12mm dia. and/or 13.5mm dia. orifice, 12mm dia. and/or 19mm dia. pipe threads, rated at 68 degrees Centigrade, 93 degrees C, and/or 121 degrees C., tested and listed by UL and/or FM.

1. For suspended ceiling: use escutcheon plates, of the same finish as the textures of the ceiling boards.

2 For slab ceiling: Sprinkler shall be 93 degrees C with very extra-large orifice glass bulb upright type, brass finish with a K-factor of 14.5.

B. PIPES: shall be new, steel, schedule 40, SUPREME or U.S. brand, black, designed for 175 psi working pressure, conforming to ASTM A 120 or A53.

C. FITTINGS:

1. Screwed fittings: malleable iron, 300 lbs. and 150 lbs. class, black, ANSI B16.3. VICTAULIC brand for mechanical tee and elbow, or UL/FM.

2. Flanged fittings: steel, short body, 150, black, ANSI B16.1.

3. Weld fittings: steel, standard weight, black, ANSI B16.25, ASTM A234, ANSI B16.5 or ANSI B16.11.

D. GASKETS: full face 1/8" minimum thickness red sheet rubber. Flange bolts and heavy semi-finished hexagon head nuts, cadmium plated. ANSI B18.2.

E. OUTSIDE SCREW AND YOKE (O.S.&Y.) GATE VALVES: flanged, iron body, bronze mounted, 175 psi working pressure, with handwheel turning counterclockwise to open.

F CHECK VALVE: flanged, swing type, iron body bronze seat ring and disc ring, and 175 psi working pressure rating.

G. FIRE DEPARTMENT CONNECTIONS: 1-1/2" x 2-1/2" x 4" Siamese connection, brass body, brass chain and plugs, and brass escutcheon, lettered "AUTOMATIC SPRINKLER" for sprinkler system, and/or "STANDPIPE" for standpipe system. Inlet threading shall be same as municipal fire department connection, shall be tested and listed by UL and/or FM and be 175 psi rating.

H. VALVE FOR MAIN RISER DRAIN: angle type or globe type, bronze body, screwed 175 psi pressure rating, 2'size, and a renewable composition soft disc.

I. VALVE FOR AUXILIARY DRAIN AND INSPECTOR'S TEST CONNECTION: globe type, bronze body, screwed 175 psi pressure rating, 1" size, and a renewable composition disc.

J. RETARD-TYPE ELECTRIC FLOW ALARM SWITCH: Provide alarm bell as required.

K. INTERIOR BELL OR HORN: 24 VDC, horn or bell, tested and listed by UL and/or FM.

L. FLOW SWITCH: vane type. 24 VDC tested and listed by UL and/or FM.

M. VALVES FOR FIRE DEPARTMENT VALVE STATION (DRY STANDPIPE): angle type, 2-1/2" female iron pipe threads by 2-1/2" male NST hose threads, chromium plated with chromium plated cap and chain. Valve hose threads shall be same as the Municipal fire department, tested and listed by UL and/or FM with pressure ratings of 175 psi.

N. VALVES FOR FIRE HOSE STATIONS: angle type, pressure restricting, 1-1/2" female iron pipe threads, rough brass x male NST threads, polished brass, chromium plated, tested and listed by UL and/or FM

O. FIRE HOSE CABINET: recessed, 16 gauge steel body, ANOLOK finish aluminum door trim, to fit a 100 feet hose pin rack and a fire extinguisher, with full panel glass door. Cabinet finish shall be baked white enamel inside with "Fire Red" coat outside. Cabinet may be locally made of approved quality

P. PIN RACK FOR FIRE HOSE STATION CABINET: semi-automatic type, baked red enamel finish, designed for 100 feet of 1-1/2" hose, and furnished with 1-1/2" chrome plated brass rack nipple.

Q. FIRE HOSE FOR FIRE HOSE STATION: 100 feet of 1-1/2" cotton single jacket, rubber lined hose with wax and gum treatment. Hose couplings shall be 1-1/2" chrome plated, male-female National Standard hose threads. Fire hose and couplings shall be approved by UL and/or FM. Provide 1-1/2" spanner to each fire hose cabinet (FHC).

R. NOZZLE FOR FIRE HOSE STATION: 1-1/2" adjustable, capable of complete shut-off, solid straight stream or any degree of solid conical fog, chrome plated. Threads shall be hose threads. Nozzle shall be approved by UL and/or FM.

S. ABC DRY POWDER CHEMICAL: multi-purpose type portable fire extinguisher UL Listed and Factory Mutual Approved. Furnish and install one (1) each – 4.5 Kgs. (10Lbs.) Capacity to each fire hose cabinet.

T. PUMPS:

1. Fire Pump Vertical Type: Refer to Fire Protection (FP) Plans. "PEERLESS BRAND" (U.S.A) or approved equal; Multi-Stage Vertical Turbine Centrifugal Fire Pump, UL Listed & FM Approved, Suitable for 500 gpm at 100 psi, Six (6) stages. Complete with standard components: threaded & coupled OLS column, 6x6x12G cast iron surface discharge head assembly, cast iron with bronze impeller bowl assembly, basket strainer. Coupled to Vertical Hollow Shaft, WP1, 40Hp, 230Volts, 3Phase, 60 Hz, 1750Rpm Motor 1.15 Service Factor , UL Listed; complete with ff. standard accessories; Pilot Operated Relief Valve, Enclosed Type Overflow Cone, Butt Weld, Flow Meter, Discharge Pressure Gauge, Automatic Air Release Valve and "FIRETOL" or approved equal Fire Pump Controller.

2. Jockey Pump Vertical Type: Refer to Fire Protection Plans. "GRUNDFOS . BRAND" or approved equal. Vertical Multi-Stage, Submersible Pump. in stainless steel (AISI 304) bowl, impeller and shaft, built-in non return valve, capable to deliver 50 gpm at 110 psi TDH, couple to submersible, 7.5hp, 230 vlots, 3phase, 60hz, 3500rpm, with cable guard and lead wire. With "FIRETOL" (U.S.A) or approved equal Jockey pump Controller.

NOTES:

1. Install all fire and jockey pumps and their respective accessories, complete and ready for use, wire all fire and jockey pumps up to their respective breakers; test and commission.
2. Install and wire all pump breakers to MDP and all FACPs to float switches, complete and ready for use, test and commission.

15.02 15400: PLUMBING SYSTEMS

A. PIPES AND FITTINGS:

1. COLD WATER LINES: Main risers and branches; Polypropylene Pipe; PN16.
2. SEWER AND WASTE PIPES:
   a) Main Lines and Stacks: CAST IRON PIPES.
   b) Branches Only: POLYVINYL CHLORIDE PIPES AND FITTINGS. Equivalent to ASTM D2729 Specifications. By Emerald, Atlanta, or approved equal. Rigid (uPVC) pipe and drainage pattern fittings or approved equal conforming to ASTM D2564.
   c) Vent Pipes: POLYVINYL CHLORIDE PIPES AND FITTINGS. Conforms to ASTM D2729 Specifications. By Emerald. Atlanta, or approved equal.
3. STORM DRAINAGE SYSTEMS:
   a) Downspouts: POLYVINYL CHLORIDE PIPES AND FITTINGS. Conforms to ASTM D2729 Specifications. By Emerald, Atlanta, or approved equal.
   b) POLYVINYL CHLORIDE PIPES AND FITTINGS. 200 mm (8") and below in diameter. Equivalent to ASTM D2729 Specifications. By Emerald, Atlanta, or approved equal Rigid (uPVC) pipe and drainage pattern fittings or approved equal conforming to ASTM D2564.
   c) Storm Drainage: CONCRETE PIPES: Sizes as required. conforming to Class IV.1, reinforced for 250 mm Φ (10") and larger.

4. AIR-CON DRAIN: POLYVINYL CHLORIDE PIPES AND FITTINGS.
   Equivalent to Series 1000, Class 35, with Elastomeric Closed Cell Insulation.

B. VALVES:

1. Valves: ASTM B-61 & 62, ASTM A-197, For gate valves and check valves. cast brass, sizes as required in the drawings.

2. Gate valves and check valves for hydro-pneumatic pumps piping shall be tested at 150 psi for a period of 2 hours. As required for rehabilitation of existing pump.

3. Rubber Seated Check valves for hydro-pneumatic pumps, use swing check valve. As required for rehab of existing pump.

Size	2" diameter
Fits Flanges	
Pressure Class	150 ANSI
Pressure Ratings	275 psi
Temperature Range	Resilient vitron rubber seat 446 degrees F
Fluid	Water
Standard Materials	Valve Body -- Cast Iron ASTM A-48
	Valve Trim – Stainless Steel ASTM 304

C. TRAPS AND CLEANOUTS:

1. Cleanout plugs for PVC pipes shall Emerald, Atlanta, or approved equal; cast brass ferrule with countersunk tap screw cover.

2. Underground traps except P-traps on floor drains shall be provided with removable cleanouts. Cleanout and cleanout access cover for cast iron pipes shall be Metma, Zum, or approved equal as indicated below:

APPLICATION	TYPE	PRODUCT NO.
Concealed Drainage Lines	Horizontal Cleanouts with Access Covers	Z14405
Exposed Drainage Lines	Horizontal and Vertical Cleanouts	Z1440
Finished Floor Area	Floor Level Access Cleanouts Tile Floors	Z14256 Z140010
Finished Walls	With Round Plate Access Covers	Z14401

D. DRAINS: ASA, METMA, as indicated or approved equal.

1. Roof Gutter - M-319-16, ASA or equal
2. Floor/Shower - M-210, ASA or equal
3. Deck - M-319-36, ASA or equal
4. Canopy - M-319-34, ASA or equal
5. Trench Drain - M-319-34, ASA or equal
6. Cleanout - M-240, ASA or equal

E. FAUCETS: See Section 15450 Plumbing Fixtures.

F. HOSE BIBBS:

1. Hose Bibbs: Chrome plated faucet for toilets and shall be size 20 mm hose thread connection. For other faucet with bronze body. use brass, made of male inlet threads, hexagon shoulder and three quarter inch hose connections.

G. PIPE SLEEVES:

1. Wrought iron or steel pipe schedule 40 for sleeves in walls and partitions.
2. Steel pipe schedule 40 for sleeves in concrete beams or concrete fireproofing.
3. Galvanized steel pipe schedule 40 for sleeves through floors.
4. Steel pipe sleeves in footings shall be not less than four inches larger in diameter than the pipe to be installed.

H. CATCH BASINS/JUNCTION BOXES: 140 kg/cm^2 RC with C.I. grating cover M-452 E In-site and pre-cast reinforced slabs. with concrete hollow block walls, details as shown in the drawings. For drain terminals discharge. and generally at all intersecting points of pipes.

I. OVERFLOW DRAIN: 50 mm dia G.I. pipe with polished brass hub adaptor or approved equal

J. JOINTING:

Flanged Joint Gasket – Garlock or approved equal

Screwed Joints – U.S. Federal Specifications GG-P-251or approved equal

PVC Pipes and Fittings –PVC cement or as per Manufacturer's recommendations.

Dissimilar Pipes – Adopter fittings shall be used.

Concrete Drain Pipe – Cement mortar

K. HORIZONTAL IN-LINE FILTER PUMPS: Refer to Mechanical (M) and/or Plumbing (P) Plans.

L. CONSTANT PRESSURE PUMPS: Refer to Plumbing (P) Plans.

M. SEWAGE TREATMENT PLANT (STP): Supply of materials. equipments, tools, labor and engineering supervision and managements for Sewage Treatment Plant (STP) in accordance and compliance with Laguna Lake Development Authority (LLDA).

Number of Occupancy: 150 persons per day
Type of Waste: Domestic
Process: ABR-ISF with Ultra-Filtration
150 x 12 = 1800Gal x 4 = 7200 liter/7 cu.m.

LIST OF EQUIPMENTS:

1. END SUCTION CENTRIFUGAL PUMP: HORIZONTAL End Suction Centrifugal Pump complete with pressure gauge, relief valve, check valve. Driven by 1.5 HP TYPE 220 volts, 1 phase, 60 Hz electric motor.

   Quantity: 4 units
   Operation: 2 units in Alternate Operation set at filled interval
   2 units for Raw Water Tank and Holding Tank
   Location: STP area

2. END SUCTION CENTRIFUGAL PUMP: HORIZONTAL End Suction Centrifugal Pump complete with pressure gauge, relief valve, check valve,. Driven by 1.0 HP TYPE 220 volts, 1 phase, 60 Hz electric motor.

   Quantity: 2 units
   Operation: 2 units in Alternate Operation set at filled interval
   1 unit for Settling Tank
   Location: STP area

3. SEWAGE PUMP (TRANSFER PUMP): Submersible non-clog sewage pump Constructed with PA resin casing & impeller & stainless steel shaft. Driven by 220 volts, 3 phase, 60 Hz, Insulation class E submersible induction motor.

   Rating: 0.28 m^3/min. x 9m TDH x 1.0kW, 3Ø, 230V 60Hz
   Bore: 50mmØ Discharge Min
   Origin: Japan
   Quantity: 2 units
   Operation: HOA Alternate Parallel complete with Liquid Level Sensor
   Location: ABR Sewage Pit

4. Activated Silica "Silectc™"

   Disinfection Media.
   Rating: 88m^3/day capacity
   Operation: Non-current
   Type: 25mm Flange Connection
   Location: Sump Pit

5. Multi-Cyclone

   Rating: 4-10m^3/hr capacity
   Operation: Non-current
   Type: 25mm Flange Connection

Location: Sump Pit

Construction of Concrete Septic Tank 4 chambers, wall thickness RC wall. Refer to structural design.

Digestive Chamber (1 unit): 1.5m (W) x 2.5m(L) x 2.0m(D)
Leaching Chamber (3 units): 1.5m(W) x 1.2m(L) x 2 0m(D)

Each chamber with stainless steel cover Ga.18 600mm x 600mm opening manholes.

NOTES:

1. Supply and install water service entrance meter and connection, all pumps and all tanks and their respective accessories, including steel supports and anchors, and wire all pumps up to their respective breakers; and pumps up to tank level controllers & float switches; test and commission.
2. Supply, install and wire all pump breakers to MDP test and commission, ready for use.
3. Construct Pump House, all cisterns, tanks, etc. ready for use

15.03 15450: PLUMBING FIXTURES

Note: Verify roughing in dimensions and installation procedures from manufacturer before proceeding with final set of pipe inlets and mounting hardware.

PLUMBING FIXTURES All plumbing fixtures and accessories with approval from the Architect.

A. WATER CLOSET: HCG, EARTH Institutional Model No. C4332FV, flush valve, low consumption 4.5lpf, round front water closet, innoglaze finish, with seat and cover, or approved equal; for all toilets. Use SLOAN "Royal" Flush Valve or approved equal; supply pipe assembly and all other fittings to complete. One (1) set for each public/ PWD toilet water closet stall. White color. Use HCG One Piece Dual Flush High Efficiency water closet or approved equal for all private toilets.

B. OVER-THE-COUNTER LAVATORY. HCG Countertop Lavatory Model No. L363S, or approved equal; innoglaze finish, white color. Model No L3811 EVERGLADES Single Lever Ceramic Disc Faucet, or approved equal, chrome, with angle valve, steel braided flexible hose, strainer, P-trap, and all other fittings to complete.

C. WALL-HUNG LAVATORY: Wall-Hung Lavatory innoglaze finish, white color. Use Model No. L3811 EVERGLADES Single Lever Ceramic Disc Faucet, or approved equal; chrome, with angle valve, steel braided flexible hose, strainer, P-trap, and all other fittings to complete.

D. URINAL: HCG, KOHOUTEK Institutional Model No. U 28, or approved equal: innoglaze finish, wall-hung, and spreader (UF629) for all urinals. Fittings shall be Push Valve Model No UF627, or approved equal: with vacuum breaker, brass outlet flange with mounting bolts and gaskets, wall bracket with screws and all other fittings to complete White color.

E. SHOWER HEADS & VALVES: HANSGROHE rain shower heads & valves or app equal.

F. KITCHEN SINK: Stainless Steel, Hwaco Deluxe Model, or approved equal; double drain bowl for kitchen and pantry. Provide DELTA or CASCADE or approved equal; chrome finish single lever kitchen faucet with P-trap, angle valves, strainers and all other fittings, or approved equal to complete.

G. FLOOR DRAINS: METMA, M-200-D MAB, or approved equal; Stainless Steel, 100mm x 100mm (4" x 4"). For all floor drains and slop sinks.

H. GREASE TRAPS: Stainless steel or HDPE; by Weida Philippines Inc. or approved equal; for all Kitchen sinks.

15.04 15500: VENTILATION AND AIR-CONDITIONING SYSTEMS (Refer to Mechanical Plans)

A. EQUIPMENT:

1. FANS: Provide exhaust fans on all restroom, storage area, server room, pantry, etc. where extra ventilation will be needed and as indicated in the plans. Provide ceiling fans in circulation areas such as the lobby, hallway, etc. Use propeller type, vane axial, centrifugal scroll and/or inline fans.

2. AIR CONDITIONERS:

   a) Inverter Split Type: Ceiling suspended or wall mounted type will be installed in the office areas, and conference rooms, etc. Each unit should have a remote control. Outdoor unit should be complete with propeller fans, condenser, mounting bracket, rubber pad, etc. All type 230V / 1PH / 60 Hz. ***Carrier, Daikin, Mitsubishi Electric*** or approved equal.

3. MOTORS: Motors shall conform to NEMA standard Continuous duty 1.15 service factor, 60 Hz frequency and with enclosure of either Open, Drip Proof encapsulated (ODP) or totally Enclosed Fan Cooled (TEFC) as specified.

NOTES:

1. Supply and install concrete foundation, steel supports and anchor bolts for all VAC equipment; install and wire all VAC equipment up to their respective breakers; supply and install A/C drain lines terminating up to ledge and FCU

drains for air conditioning

2. Supply, install and wire all VAC breakers to MDP, complete, test and commission, ready for use..

3. Supply and install all ledge drains and FCU drains, hidden from view, for all types of air conditioning units.

16.00 ELECTRICAL

16.01 16100: BASIC ELECTRICAL MATERIALS AND METHODS:

A. WIRES AND CABLES: Phelps Dodge or approved equal. No conductor shall be less than 3.5 mm^2 in size unless otherwise specified.

B. CONDUITS: As indicated in the Electrical (E) Plans.

1. Rigid steel conduits (RSC): shall be hot dipped galvanized, standard weight pipes made of mild stel smooth circular bore. It shall be in standard length of 3.05 meters including coupling, reamed and threaded on each end; Maruchi or approved equal.

2. Intermediate Metallic Conduit (IMC):Maruchi, Matsushita or approved equal.

3. Non-Metallic Conduit (PVC): CS40 smooth wall non-metallic conduit conforming to Philippine National Standards No. 14 for PVC Pipes. Conduit shall be in standard length of 3.05 meters including coupling; Emerald, Neltex, Moldex, Atlanta, Crown or approved equal.

C. OUTLET BOXES AND FITTINGS: Use GFCI outlets around swimming pools and all other wet areas and as needed/ required by the Architect.

1. Convenience Outlets: National or approved equal, Cream color, 220V, with amperage as required. For general building interior use.

2. Weatherproof Outlets: National or approved equal, double device plate with cover receptacle, heavy duty. For outlets inside pump room and other exterior-located outlets, as indicated in the plans.

3. Boxes: Metal utility boxes Ga. 16, sizes and shapes as required.

D. SWITCHES, PANELBOARDS AND CIRCUIT BREAKERS:

1. Switches: National, Jimbo, Meikoshia or approved equal, with amperage as required. Suited to location and intended purpose. Approved type by Architect.

2. Circuit Breakers: Manufactured by Mitsubishi, Fuji-Haya, Schneider, or approved equal, GA 16 bolt-on type, pre-painted, surface mounted, with latch lock.

3. Magnetic Starter: Schneider or approved equal with NEMA casing, surface mounted with latch lock.

4. Metal Enclosures and Cabinets: Fuji-Haya, Allied, Macropower, Schneider Electricor approved equal.

5. Emergency: Furnish and install automatic transfer switch (ATS) with number of poles, amperage, voltage, and withstand current ratings needed by the building. Each automatic transfer shall consists of an inherently double throw power transfer switch unit and a microprocessor controller, interconnected to provide complete automatic operation. All transfer switches and control panels shall be the product of the same manufacturer.

E. HANGERS AND SUPPORTS:

1. For all suspended conduits: Angle bars with 12mm dia. hangers at 1-m intervals. Prime and finish-painted. Joints of conduits on a staggered position. Submit shop drawings for approval.

16.02 16410: ELECTRICAL SERVICE SYSTEM

A. TRANSFORMERS, TRANSFORMER CABLES AND POSTS:

All components shall be supplied and installed by others upon representation by the Contractor and full payment by the Owner.

NOTES:

1. The Contractor shall secure all permits and install all equipment necessary for electrification
2. Furnish all works; duct banks and concrete mounting base and all other works in preparation for installation of transformers.
3. MERALCO shall supply and set in place transformers & HV switch gears; wire and terminate at high voltage side; test and commission; to be paid for by the DBM, upon representation by the Contractor.
4. Wire and terminate transformers at low-voltage side; test and commission; ready for use. .

B. GENERATOR: Refer to Electrical (E) Plans.

NOTES:

1. Supply, set and phase generator including vibro isolators and anchors; supply and install all accessories, exhaust system, mufflers, day tanks, etc., ready for use, connect control wiring to ATS; test and commission.
2. Supply and connect ATS to EMDP & MDP; assist in test and commission.

3. Supply and install Concrete Mounting Base and Stub-out for Exhaust of Generator.

4. Construct complete Generator House ready for use.

16.03 16420: ELECTRICAL DISTRIBUTION SYSTEM:

A. LIGHTING FIXTURES AND ACCESSORIES: Luminaire must be UL-listed for wet locations and wiring cavity must be field accessible for service or repair needs. Samples of lighting fixtures, complete with lamps and accessories, shall be submitted for approval by the University and Architect prior to fabrication and purchase.

1. LED FLUORESCENT LUMINAIRES: The luminaire shall have a heavy-duty cast aluminum housing with impact and heat resistant glass tubes. Consider using 1x1200mm surface mounted or recessed fixtures. Use preferred power suitable for the location or approved by the DBM

2. LED DOWNLIGHTS:

   a) Consider using 75mm diam. x L230mm recessed downlight. Housing made of aluminum alloy material, electrostatic coating, and compact design. Warm white or neutral white color temperature. Use preferred power suitable for the location or approved by the Architect.

   b) For mood lighting (where applicable): Consider using single lamp 160mm dia. x L221mm or 210mm dia. x L245mm ceiling or pendant mounted, complete with single lamp, or approved equal. Pure white or warm white color temperature. Use preferred power suitable for the location or approved by the Architect.

3. LED WALL SCONCES AND/OR COLUMN LIGHTS

   a) For columns at gallery: consider using glass and stainless steel wall luminaires, general diffusing. Submit sample for approval by the Architect.

   b) For columns and walls outside the building: consider all possible requirements needed/required, general diffusing. Submit sample for approval by the Architect.

4. LED FLOOD LIGHTS AND/OR HIGH BAY LIGHTS:

   a) Where required: consider using floodlight fixture. Body and frame finished in a special optical design giving high performance light control. Optical assembly is hermetically sealed providing IP65. Housing must be die cast aluminum electrostatically sprayed with a polyester powder paint finish, following anti-corrosion priming and oven cured at minimum of 180°C.

5. LED SPOTLIGHTS:

   a) For accent lighting as directed by the Architect. Housing made of aluminum alloy. Concise tube-type appearance. With wide angle adjustment for horizontal and vertical. Submit sample for approval by the Architect.

6. LED STRIP LIGHTS: Rope light, inserted into recess in concrete surface. Water Proof IP68.

7. EMERGENCY LIGHTS: consider using twin lamp self-contained emergency lighting luminaire with 2 x 3.5 Watt LED lights and sealed maintenance-free lead acid battery emergency time is greater than 6 hours.

8. EXIT LIGHTS/ SIGNS- EXIT SIGN, complete with 3.5W LED Lamp and Ni-Cad Battery for 2 hrs. duration.

9. GARDEN LIGHTS- located on exterior areas and should be weatherproofed. Submit sample for approval by the Architect.

Note: Luminaires of other brands as approved by the DBM and the Architect are acceptable. Lamps and electronic ballasts as approved by Architect, are acceptable. Submit sample for approval prior to purchase.

B. COMMUNICATION SYSTEM:

1. TELEPHONE SYSTEM

   1. PHELPS DODGE or approved equal, wire No 22 conductor telephone jacketed wire, in PVC conduits. Locate wire terminal box plate with jack as shown in the plans.

   b) Telephone equipment - Owner Supplied

2. PUBLIC ADDRESS: The voice alarm system shall be the integrated solution for BGM (Background Music) and EVAC (Emergency Voice Alarm). The voice alarm system shall be designed for public address and emergency evacuation. Communication System shall provide clear announcements during public addressing and one-way voice communication during and emergency and can provide BGM where required. Consider using Aiphone, Panasonic or approved equal, with Integrated Security. The system shall be capable of fulfilling the following requirements:

i. Clear, un-distorted announcements to selected areas during public addressing;

ii. Clear, un-distorted paging to all zones; either individually or collectively. Selection of groups of zones shall be programmable from time to time; and

iii. Background music to selected areas when the other functions are not selected.

C. WI-FI and LAN SYSTEMS

1. INTERNET WITH WIFI: Provide and install conduits, wiring, router, hubs and all materials needed/required. The system shall cover all locations especially sensitive areas in all public and private rooms and system must be fully operational.

2. LAN SYSTEM: Provide and install conduits, wiring, hubs, devices and all materials and accessories needed/required for a complete LAN System. The system shall cover all locations especially sensitive areas in all public and private rooms and system must be fully operational. See Electrical Auxiliary Plans.

D. GROUNDING & LIGHTNING PROTECTION SYSTEM: Supply and Install. See Electrical Auxiliary Plans.

16.04 16721: FIRE PROTECTION SYSTEM (See Fire Protection Plans)

A. FIRE ALARM SYSTEM: The system shall be complete in all ways. It shall include all mechanical and electrical installation, all conduits, boxes, wires, detection and control equipment and other materials needed/required for the fire alarm system. All devices, components and equipment shall be the products of the same manufacturer. All devices, components and equipment shall be new, standard products of the manufacturer's latest design and suitable to perform the functions intended. All devices and equipment shall be UL listed and/or FM approved/ Locks for all cabinets shall be keyed alike. Use ***Ademco***, Simplex, National, Apollo, Edwards, Cooper or approve equal for the fire alarm devices and detectors and connect to Building Fire Alarm Control Panel to make the system fully operational. Complete, test and commission, ready for use.

Note: All reference to any particular brand, material, equipment, or systems in the specification, drawings, and bid documents is indicative of the type and quality of what is required. It is essential that the bidder/contractor costs, supplies and use the materials as specified in these Summary. However, any equal material or equipment or system will be considered if deemed fit and if approved by the DBM and the Architect.

SECTION 01100
ITEMS FOR SUBMISSION BY THE CONTRACTOR

ITEMS FOR SUBMISSION BY THE CONTRACTOR FOR THE ARCHITECT'S APPROVAL PRIOR TO ORDER, PURCHASE, WORK OR MANUFACTURE

The following section is a listing of materials and construction documents for the Architect's appreciation to ensure that design objectives for the intended class of construction are met. It is designed to avoid waste such as when the Contractor installs specific materials or systems which are not acceptable for the project.

1.00 SAMPLES

DIVISION 2 SITEWORKS

1 All specified sizes and types of stone pavers	1 piece each
2. Plants	1 piece each
3. Ground Covers	1 square area
4. Topsoil and Soil Amendment	1 bag
5 Fertilizers and Mulches	1 bag

DIVISION 3 CONCRETE

• Cement	1 bag
• Aggregates	1 bag
• Others (if required by Architect / Owner)	1 unit each

DIVISION 4 MASONRY

• All specified sizes and types of unit masonry	1 piece each
• All specified sizes and types of exterior stone cladding	1 piece each
• Others (if required by Architect / Owner)	1 unit each

DIVISION 5 METALS

• All specified sizes of structural steel sections	1000 mm length
• All specified sizes of steel reinforcements per bulk delivery	1000 mm length
• Steel decking (if needed)	300 mm length
• All aluminum & stainless steel sections	150 mm length
• Brass nosing section (if needed)	150 mm length
• Others (if required by Architect / Owner)	1 unit each

DIVISION 6 WOOD AND PLASTICS

• Yakal and Tanguile with preservative	300 mm length
• Hardware and Fasteners	1 piece each

• Laminated MDF	Sample swatches for all types and colors
Others (if required by Architect / Owner)	1 unit each

DIVISION 7 THERMAL AND MOISTURE PROTECTION

• All waterproofing & dampproofing products	300 mm x 300 mm swatch
• Waterstop	100mm length
• Roofing sheets and accessories	1 piece each
• Joint sealants	1 tube each
• All insulation products	300 mm x 300 mm piece
• Others (if required by Architect / Owner)	1 unit each

DIVISION 8 DOORS & WINDOWS

• All corner sections of aluminum doors, jambs and hardware	1 unit each
• All aluminum door and window panels complete with operating mechanisms, locksets and all other hardware	1 panel each
• All glass panes & glazing compounds	1 panel each
• Aluminum and Steel Storm Resistant Fixed Louver	1 panel each
• All finishing hardware: locksets, hinges, door stopper/holder, closer, chain lock, eye, deadlock, cabinet & drawer pulls, locks, butt hinges and aluminum door hardware	1 piece each
• Others (if required by Architect / Owner)	1 unit each

DIVISION 9 FINISHES

• All plaster types	1 panel mock-up
• Fiber cement board	1 panel each
• Gypsum board	1 panel each
• All colors of vitrified ceramic tiles	1 piece each
• All colors of homogeneous tiles	1 piece each
• Acoustic boards	1 panel each
• All specified sizes and types of stones	1 piece each
• All colors of multilayer sports vinyl	1 piece each
• All colors of carpet tiles	1 piece each
• All paints and lacquers	Sample swatches for all types and colors (300mmx300mm)

Others (if required by Architect / Owner)	1 unit each

DIVISION 10 SPECIALTIES

• Visual Display Boards	1 panel each
• Interior Specialties	1 panel each
• Identifying Device Letter Size	1 piece each
• All toilet accessories	1 piece each
• Others (if required by Architect / Owner)	1 unit each

DIVISION 11 EQUIPMENT

DIVISION 12 FURNISHINGS

DIVISION 15 MECHANICAL / SANITARY

• All plumbing pipes, fittings, and accessories	1 of each type
• All fire alarm system components and accessories	1 of each type
• All exhaust fans	1 unit each
• All valves	1 unit each
• Sprinkler heads	1 unit each
• Others (if required by Architect / Owner)	1 unit each

DIVISION 16 ELECTRICAL

• All conduits, fittings, wires, cables and accessories	1 of each type
• All junction box, pull box and accessories	1 of each type
• All lighting fixtures, switches and convenience outlets	1 complete set each
• All fire alarm wiring devices	1 of each type
• Others (if required by Architect / Owner)	1 unit each

2.00 MOCK-UPS

NOTE: All mock-ups are for Architect's approval before final installation.

1. Stone pavers on sand bed
2. Stainless steel railing assembly
3. Aluminum horizontal devices assembly
4. All waterproofing materials in place
5. All types of wall board assemblies
6. All types of ceiling board assemblies
7. All types of wall and floor tile and stone finish
8. All paint finishes
9. All types of display boards
10. All types of modular work cubicles
11. Toilet Partitions for one toilet complete with hardware

12. Cement and Natural Stone Paving showing setting bed, joint sizes, laying patterns, colors, textures, one unit area per plan
13. Natural Stone Exterior Wall Finish showing waterproofing, joint sizes, laying patterns, colors, textures, 0.50 x 1.00m area
14. All door and window fenestration rabbets
15. Others (if required by Architect / Owner)

3.00 TECHNICAL CATALOGUES AND BROCHURES

1. Roofing System
2. Fire alarm system
3. Fire Extinguisher
4. Electrical panel distribution
5. Exhaust & Ventilating fans
6. Electric Elevator
7. Pumps
8. Others (if required by the Architect / Owner)

4.00 DETAILED SHOP DRAWINGS

1. All structural steel framing joints and steel decking
2. Roofing Installation
3. Structural steel trusses, frames, its connection system and sequence of erection
4. All door, window panels including all operating devices, locksets and other hardware
5. Aluminum and Stainless Steel Sections, Framing, and Cladding
6. Waterproofing and Insulation installation methods
7. Installation method and details of building I.D. letters
8. Complete Natural Stone Finish installation method with waterproofing and stainless metal anchors
9. All architectural pre-cast units
10. Others (if required by the Architect / Owner)

5.00 LABORATORY TEST CERTIFICATES

1. Structural Steel strength
2. Reinforcing Steel strength
3. Welding tests
4. Concrete (bases on batch mix for specified phases of pouring works)
   Concrete mix design
   Concrete test results
5. Compaction tests on fill materials
6. Fireproofing tests
7. Waterproofing tests

8. Leak test for all plumbing and water pipes
9. Analysis of imported topsoil
10. Others (if required by the Architect / Owner)

6.00 GUARANTEES / WARRANTIES

Submittals for Environmental Performance

1. Termite Poisoning
2. Wood treatment
3. All Waterproofing Materials
4. Roofing System
5. Aluminum Doors and Windows
6. Pumps
7. Fire alarm systems and fire extinguishers
8. Fire doors
9. All trees, palms, shrubs, ground covers, lawns (when needed)
10. Furniture and Systems Furniture
11. Others (if required by Architect / Owner)

SECTION 01200
SHOP DRAWINGS

1.00 DETAIL DRAWINGS AND INSTRUCTIONS

1.01 SUPPLEMENTARY DRAWINGS AND INSTRUCTIONS

The drawings referred to in these Specifications may be further supplemented by additional detail drawings and instructions essential to the proper interpretation of the Drawings and the proper execution of the work. The Architect shall furnish with reasonable promptness such additional detail Drawings and Instructions. All such additional detail drawings and instructions shall be consistent with the Contract Documents, true developments thereof, and reasonably inferable therefrom. All such additional drawings and instructions are to be considered of equal force as those which originally accompany the Specifications. The work shall be executed in conformity with such detail drawings and instructions, and the Contractor shall do no work without proper drawings and instructions.

1.02 SCHEDULE FOR SUBMISSION OF DETAIL AND SHOP DRAWINGS

The Contractor and the Architect. if either one so requests, shall jointly prepare a schedule, subject to change from time to time in accordance with the progress of the work, fixing the dates at which the various detail drawings will be required, and the Architect shall furnish them in accordance with that schedule. Under like conditions, a schedule shall be prepared, fixing the dates for submission of the shop drawings, in preparation for the manufacture and installation of materials and for the completion of the various parts of the work.

2.00 SHOP DRAWINGS

2.01 CONDITIONS IN THE PREPARATION OF SHOP DRAWINGS

The Contractor shall prepare at his own expense and submit with such promptness as to cause no delay in his own work or in that of any other contractor doing work on the same building, two (2) copies of all shop or setting drawings, templates, patterns and models, as well as schedule required for the work of various trades, and the Architect shall pass upon them with reasonable promptness, making desired corrections. The Contractor shall make any corrections required by the Architect. file with him two (2) corrected copies and furnish such other copies as may be needed.

2.02 CHECKING DRAWINGS OF SUB-CONTRACTORS

Before submitting shop drawings for approval, the Contractor shall check drawings of all sub-Contractors for accuracy. He shall see that all work contiguous with and having bearing on work indicated on shop drawings is accurately and distinctly illustrated and that work shown is in conformity with Contract requirements.

2.03 IDENTIFICATION

Shop drawings shall be numbered consecutively and represent:

A. All working and erection dimensions.
B. Arrangements and sectional views.
C. Necessary details, including complete information for making connections with other work, kinds of materials and finishes.

Shop drawings shall be dated and contain (a) name of project (b) descriptive names of equipment, materials and classified item numbers, (c) location at which materials or equipment are to installed in work.

2.04 LETTER OF TRANSMITTAL

Submission of Shop Drawings shall be accompanied by a Letter of Transmittal in duplicate. containing name of project, Contractor's name, number of drawings. titles, and other pertinent data.

2.05 CORRECTIONS, CHANGES AND VARIATIONS

The Contractor shall submit three (3) sets of prints of shop drawings to the Architect for approval. Satisfactory shop drawings will be so identified by the Architect, dated. and one copy there of returned to the Contractor should shop drawings be disapproved by the Architect. one set of such drawings will be returned to the Contractor with necessary corrections and changes to be made as indicated.

A. The Contractor shall make required corrections and changes and re-submit shop drawings, in duplicate until the Architect's approval is obtained.
B. Upon receipt of approval, the Contractor shall insert date of approval on tracings and promptly furnish the Architect with three additional prints of approved drawings.
C. No work called for by shop drawings shall be executed until the Architect's approval is given.
D. If shop drawings show variations from Contract requirements because of standard shop practice or other reasons, the Contractor shall make mention of such variations in his letter of submittal.

2.06 RESPONSIBILITY FOR ACCURACY

Approval of shop drawings will be general. It shall not relieve the Contractor of the responsibility for accuracy of such drawings, nor for proper fitting and construction of work, nor for furnishing of materials or work required by the Contractor and not indicated on shop drawings. The Architect's approval of such drawings or schedule shall not relieve the Contractor from responsibility for deviations from Drawings or Specifications, unless he has in writing, called the Architect's attention to such deviation at the time of submission and secure his written approval, nor shall it relieve him from responsibility for errors of any sort in shop drawings or schedules.

SECTION 01300
FIELD ENGINEERING

1.00 GENERAL

1.01 SERVICES OF LICENSED SURVEYOR

The Contractor shall pay for the services of a licensed Surveyor to confirm and certify the location of column centers, piers, walls. pits, trenches, pipe work, culvert work, utility lines and work of similar nature required by the Contract.

A. The Contractor shall furnish certification from a licensed Surveyor that all portions of work are located in accordance with Contract requirements and at elevations required thereby.

B. The Surveyor shall promptly verify and certify to lines and levels of any portion or subdivision of work at any time it may be deemed necessary by the Architect. Any deviation from the Drawings shall be certified to the Architect within 24 hours of discovery of same

1.02 SURVEYOR REQUISITES

The Surveyor selected for the purpose of undertaking the work involved in this project shall be subject to the Architect's approval. He shall not be a regular employee of the Contractor, nor shall he have any interest in the Contract. He shall be employed by the Contractor in laying out the work, it being intended that the Surveyor shall present an independent and disinterested verification of the project's layout.

1.03 CERTIFICATION BY SURVEYOR

A final certification shall be submitted upon completion of work, or upon completion of each major segment of the work, or as required by the Architect, and before final certificate, and there shall be included a map. plot. note or the like necessary in the opinion of the Architect to constitute a full and complete report.

SECTION 01400
CONSTRUCTION FACILITIES

1.00 USE OF PREMISES

1.00 LIMITATIONS FOR USE

The Contractor shall confine his apparatus, the storage of materials, and the operations of his workmen to limits indicated by the law, ordinances, permits, or directions of the Owner and/or the Architect and shall not unreasonably encumber the premises with his materials.

2.00 SAFEGUARD FOR STRUCTURE

The Contractor shall not load or permit any part of the structure to be loaded with weight that will endanger its safety.

The Contractor shall enforce the Architect's instructions regarding signs, advertisements, fires and smoking.

2.00 TEMPORARY STRUCTURE AND FACILITIES

2.01 TEMPORARY OFFICE AND CONTRACTOR'S BUILDING

The Contractor shall at all times provide and maintain adequate weather tight temporary office with water, light, telephone, and toilet facilities for the use of the Architect, Construction Manager, Resident Engineers, Inspectors and sub-contractors. This office shall be provided with wooden floor raised above the ground, windows, doors and locks, tables, closet, blackboard, tackboard, benches and racks for drawings. One enclosed private room shall be apportioned for the exclusive use of three Owner's representatives. Field Office equipment and furniture shall be turned over to Owner upon completion of the project.

2.02 TEMPORARY HOUSING FOR WORKERS

The temporary buildings for housing men, or the erection of tents or other forms of protection will be permitted only at such places as the Owner or Architect shall designate; and the sanitary condition of the grounds in or about such structures shall at all times be maintained in a manner satisfactory to the Owner and the Architect.

Nobody shall be allowed to sleep or cook within the building line of the project under construction.

2.03 TEMPORARY SANITARY FACILITIES AND FIRST AID STATION

The Contractor shall provide, construct and maintain for the duration of the contract, ample sanitary toilet accommodation and other necessary conveniences including water connections for the use of personnel and laborers on the work, properly secluded from public observation, in such manner and at such points as shall be approved by the Architect, and their use shall be strictly enforced. He shall keep places clean and free from flies; remove all connections and appliances connected therewith prior to the completion of the contract, and leave the premises perfectly clean.

2.04 TEMPORARY BARRICADES AND GUARD LIGHTS

The Contractor shall furnish and put up all temporary barricades (at the boundaries of the construction site, as designated by the Owner or Architect) and guard lights necessary for the protection, proper prosecution and completion of work. The guard lights at the top of the falsework tower, barricades, railing, etc., shall be provided and maintained by the Contractor throughout the duration of the project. The Contractor shall ensure that all workers will be limited to stay within the barricaded enclosure so as not to disturb the activities of the university.

2.05 TEMPORARY WATER, POWER AND TELEPHONE FACILITIES

The Contractor shall make all necessary arrangements with the OWNER or local utility companies in order that temporary facilities for water, power, and telephone are sufficiently provided till the completion of the work. All expenses incurred in connection therewith shall be paid by the Contractor.

2.06 TEMPORARY SIGNS

No signs or advertisements will be allowed to be displayed without the Architect's approval. The Contractor may erect one painted sign as approved by the Architect, giving names and addresses of the Architect, Contractor, and various sub-contractors. The Architect shall approve the size, color, lettering, and sign location.

2.07 TEMPORARY ROADWAYS

The Contractor shall construct and properly maintain temporary driveways within and adjacent to the site in order to provide proper access to the building. Temporary driveways shall adequately sustain loads to be carried on them and be so constructed as not to endanger existing or newly installed underground structures.

2.08 TEMPORARY STAIRS, LADDERS, RAMPS, RUNWAYS

The Contractor shall furnish and maintain all equipment such as temporary stairs, ladders, ramps, scaffolds, runways, derricks, chutes, and the like, as required for proper execution of work by all trades. All such apparatus, equipment, and the construction shall meet all requirements of Labor Law and other local laws applicable thereto.

2.09 TEMPORARY ENCLOSURES

The Contractor shall provide temporary weather tight enclosures for all exterior openings as soon as walls and roof are built so as to protect all work from weather. All exterior doors shall be equipped with self-closing hardware and padlocks. All exterior windows shall be provided with temporary sash frames securely fastened in place but removable when required. Such sash frames shall be covered in an approved manner.

2.10 TEMPORARY OR TRIAL USAGE

Temporary or trial usage by the Owner of any mechanical device, machinery, apparatus, equipment, or any work or materials supplied under Contract before final completion and written acceptance by the Architect shall not be construed as evidence of Architect's acceptance of the same.

The Owner shall have the privilege of such temporary or trial usage, for such reasonable length of time as the Architect shall deem to be proper. No claim for damage shall be made by the Contractor for injury to, or breaking of any parts of such work which may be caused by weakness or inaccuracy of structural parts or by defective material or workmanship.

If the Contractor so elects, he may, at his expense, place persons satisfactory to the Architect to make such trial usage.

2.10.1 REMOVAL OF TEMPORARY STRUCTURES

The Contractor shall remove all temporary work from premises, erected by him and shall clean the premises as a condition for completing the work and before acceptance of work by the Owner.

3.00 PROTECTION OF WORK AND OWNER'S PROPERTY

3.01 SAFEGUARD MEASURES

The Contractor shall put up and continuously maintain adequate protection of all his work from damage and shall protect the Owner's property, as well as all materials furnished and delivered to him by the Owner. He shall make good any such damage, injury or loss, except such as may be caused by agents or employees of the Owner, or due to causes considered as Act of God.

A. The Contractor shall provide reliable and competent watchmen to guard the site and premises, from commencement of operations until building is fully operational. Provide all doorways with locks under control of the Contractor, who shall lock doors at the close of each day's work. In the event that the Architect at any time deems watchmen service inadequate or incompetent the contractor shall increase or change the watchmen personnel to the Architect's satisfaction.
B. Smoking on premises shall be prohibited except in areas designated by the Owner or the Architect. Fires shall not be built on premises except by express consent of the Architect.
C. The Contractor shall provide and maintain barrels of water and fire buckets on premises for fire protection. Such equipment shall not be used for any other purpose.
D. The Contractor shall provide and maintain in good working order an adequate number of fire extinguishers.

3.02 OLD MATERIALS

All old materials of value found by the Contractor upon the work shall be carefully stored in an area designated by Owner or the Architect; and the Contractor shall be responsible for the same until final acceptance of the work.

3.03 TREES AND OTHER PLANTS

Existing trees, plants, shrubs, etc., which are to remain shall be boxed or otherwise protected from damage. No trees within site or located outside building lines shall be cut or removed without specific approval from the Owner and the Architect.

A. All trees and other plants that need to be transplanted elsewhere within fifty (50) meters from the building lines shall be done by the Contractor at his own expense in accordance with instructions from the Architect or from the authorities concerned.
B. Undue damage of trees, plants, shrubs, streets, sidewalks, etc., resulting from or in connection with the construction work shall be made good and or replaced by the Contractor at his own expense to the satisfaction of the Owner and the Architect.

3.04 DRAINAGE

If it is necessary in the prosecution of the work to interrupt or obstruct the natural flow of rivers or streams, the drainage of the surface, or flow of artificial drains, the Contractor shall provide for the same during the progress of the work in such a way that no damage shall result to either public or private interests. For any neglect to provide for other natural or artificial drainage which he may have interrupted, he shall solely be held liable for all damages which may result therefrom during the progress of the work.

4.00 PROTECTION OF ADJACENT PROPERTY AND EXISTING UTILITIES

4.01 CONTRACTOR'S SOLE RESPONSIBILITY

The Contractor shall adequately protect adjacent property as provided by law and the Contract Documents. The construction, building or work, in addition to any neighboring property or building which may be jeopardized in any manner, must be thoroughly an substantially braced against winds, floods, setting, falling, of like similar occurrences, and when necessary, covered and protected from sun and rain at the Contractor's expense. The Contractor shall solely be liable and pay for all damages occasioned in any manner by his acts or neglect, or of his agents, employees, or workmen.

4.02 EXISTING UTILITIES

Existing utilities, if damaged due to negligence or fault of the Contractor, shall be repaired by the Contractor at his expense.

5.00 PROTECTION OF LIFE, WORK AND PROPERTY DURING AN EMERGENCY

5.01 AUTHORIZATION TO CONTRACTOR

In an emergency affecting the safety of life or of the work or of adjoining property, the Contractor, without special instruction or authorization from the Owner or Architect, is hereby permitted to act, at his discretion, to prevent such threatened loss or injury and he shall so act, without appeal, if so instructed or authorized. Any compensation claimed by the Contractor on amount of emergency work, shall be determined by agreement or arbitration.

SECTION 01500
MATERIALS AND EQUIPMENT

1.00 GENERAL

Notwithstanding anything herein specified or provided that may be construed to the contrary, all materials and equipment must conform to all laws, ordinances, regulations and building codes now or hereafter may be in force and applicable during the period of construction, and the Contractor shall obtain the necessary permits and pay the required fees therefore to the proper authorities. The Contractor shall bear any and damages by reason of any delay in the work arising from his failure to comply with the provisions of this clause. Provided, however, that should any revision or amendments to such laws, ordinances, regulations and codes made during the construction period affect the cost or time or completion of the contract, a corresponding adjustment shall be made.

2.00 MATERIALS, FIXTURES, APPLIANCES, AND FITTINGS FURNISHED BY THE CONTRACTOR

2.01 MANUFACTURERS AND DEALERS

Names of proposed manufacturers, material men, and dealers who are to furnish materials, fixtures, appliances or other fittings shall be submitted to the Architect for approval as early as possible, to avoid proper investigation and checking.

A. No manufacturer will be approved for any materials to be furnished under this Contract unless he shall be of good reputation, shall have a plant of ample capacity and adequate quality control, and shall have successfully produced similar products.
B. All transactions from manufacturers, or sub-contractors, shall be through the Contractor.
C. In asking for prices on materials, the Contractor shall provide manufacturer or dealer with complete information from Specifications and Drawings, and shall inform manufacturers or dealer of all pertinent contract requirements.
D. The manufacturer or dealer shall have the materials, equipment, fixtures, appliances or other fitting supplied by him properly coded or identified in accordance with existing standards for same to indicate class grade or quality.

2.02 SAMPLE OF MATERIALS

The Contractor shall furnish for approval, with such promptness as to cause no delay in work, samples as specified or required. Work shall be in accordance with approved samples.

A. Unless otherwise specified, three samples shall be submitted. and of adequate size to show quality, type, color, range, finish, and texture of material.
B. Each sample shall be labeled, bearing material name and quality, the Contractor's name, date, project name, and other pertinent data
C. Where specifications require manufacturer's printed installation directions, such directions shall accompany samples submitted for approval.
D. A letter of transmittal in triplicate from the Contractor requesting approval shall accompany all set of samples.
E. Transportation charges to the Architect's office must be prepaid on all samples forwarded
F. Materials shall not be ordered until approval is received in writing from the Architect. All materials shall be furnished substantially equal in every respect to approved samples.

2.03 TRADE NAME MATERIALS AND SUBSTITUTES

A. Whenever item or class of material is specified exclusively by trade name, by manufacturer's name or by catalogue reference, only such item shall be used except as provided for in paragraph (b) hereof.
B. No substitution shall be made for any material, article, or process required under contract unless approved in writing by the Architect.
C Materials and articles installed or used without such approval shall be at the risk of subsequent rejections.
D. Samples of materials for use in reinforced concrete work such as steel bars, cement, and aggregates and their certificates of origin are to be approved by the Architect.

2.04 TESTING SAMPLES OF MATERIALS

The Contractor shall submit to the Architect as many samples as may be required for testing. Testing of all samples shall comply with the Specifications and government standards and shall be performed by a competent entity or testing laboratory approved by the Architect. All costs for shipment, delivery, handling, and testing of samples are to be paid by the Contractor.

2.05 QUALITY OF MATERIALS

Unless otherwise specified, all materials shall be new. The quality of materials shall be of the best grade of their respective kinds for the purpose. The work shall be

performed in the best and most acceptable in manner in strict accordance with the requirements of the Drawings and Specifications.

The decision of the Architect as to quality and quantity of work and materials shall be final and precedent to the Contractor's right to receive any money hereunder.

2.06 STORAGE AND STOCKPILING MATERIALS

A. The Contractor shall allot suitable space to sub-contractors for storage of their materials and for erection of their sheds and tool houses.
B. All cement, lime and other materials affected by moisture shall be stored on platforms and protected from weather. Materials shall be so stored as to insure the preservation of their quality and fitness for the work. Stored materials shall be located so as to facilitate prompt inspection.
C. Should it be necessary at any time to move materials, sheds, or storage platforms, the Contractor shall do so at his own expense.

2.07 DEFECTIVE MATERIALS

All materials not conforming to the requirements of these Specifications shall be considered as defective. No defective materials, the defects of which have been subsequently corrected, shall be used until approval has been given. Upon failure on the part of the Contractor to comply forthwith with any order of the Architect made pursuant to the provisions of this article, the Architect shall have the authority to remove and replace defective materials and to deduct this cost of removal and replacement from any money due or to become due the Contractor.

A. The apparent silence of the Specifications, Drawings, Special Provisions and Supplementary Specifications, as to any detail or description concerning any point shall be regarded as meaning that only the best general practice is to prevail and that only materials and workmanship of first-class quality are to be used.
B. Failure and neglect on the part of the Architect, or any of his agents to condemn or reject bad or inferior materials shall not be construed to imply and acceptance of the materials if said bad or inferior materials are discovered at any time prior to the final acceptance of the work by the Owner and the release of the Contractor.

2.08 IMPORTED MATERIALS, FIXTURE AND EQUIPMENT

The Contractor shall take cognizance of the time element of the Contract. He shall make early arrangements for the purchase and delivery of all specified imported materials, fixtures, appliances and equipment in order to avoid delay in the completion of the Work.

No extension of time or substitution of materials shall be allowed due to negligence or inadvertence of the Contractor.

3.00 ITEMS FURNISHED BY THE OWNER

Materials. equipment, fixtures, appliances and fittings specifically indicated shall be furnished by the Owner in accordance with a schedule of delivery agreed between the Owner and the Contractor. The fact that the Owner is to furnish material is conclusive evidence of its acceptability for the purpose intended, and the Contractor may continue to use it until otherwise directed. If the Contractor discovers any defect in material furnished by the Owner, he shall notify the Architect. The Contractor shall be responsible for material loss or damage after receipt of any material, fixture. appliances or fitting unless same has been installed and accepted for safekeeping by the Owner or his representative.

4.00 ROYALTIES AND PATENTS

The Contractor shall pay all royalties and license fees on all patented materials and processes furnished by him. He shall defend all suits and claims corresponding thereto for infringement of any patent rights and shall save the Owner harmless from loss on account thereof.

5.00 MANUFACTURER'S DIRECTIONS

All manufactured articles materials, equipment, appliance and fittings shall be applied. installed. connected, erected, used, cleaned. and conditioned, in accordance with manufacturer's printed directions, unless herein specified to the contrary. Where reference is made to manufacturer's directions, the Contractor shall submit specified number of copies of such directions of the Architect.

SECTION 01750
WARRANTIES AND BONDS

1.00 CONTRACTOR'S INSURANCE AND BONDS

1.01 CONTRACTOR'S LIABILITY INSURANCE

The Contractor shall secure and maintain such insurance from an insurance company approved by the Owner as will protect himself, his sub-contractors, and the Owner from claims of bodily injury, death or property damage which may arise from operations under this Contract. The Contractor shall not commence work under this Contract until he has obtained all insurance required under this section and shall have filed the certificate of insurance or the certified copy of the insurance policy with the Owner. Such insurance policy shall contain a clause providing that it shall not be canceled by the insurance company without ten (10) days written notice to the Owner of intention to cancel. The amounts of such insurance shall be as agreed upon.

1.02 CONTRACTOR'S FIRE INSURANCE

In addition to such Fire Insurance as the Contractor elects to carry for his work protection, he shall secure and maintain in the name of the Owner policies upon such structures and materials and in such amount as shall be designated. These policies shall be secured from a company which is satisfactory to the Owner and delivered to the Owner

1.03 CONTRACTOR'S PERFORMANCE BOND AND PAYMENT BOND

The Contractor, prior to signing the Contract, shall furnish a Performance and Payment Bond equal to 10% of the Contract amount for the faithful performance of his work and to cover payments and obligations arising from his Contract. Such bonds shall be in the forms of sureties as approved by the Owner. Such bonds shall remain in effect until replaced by the Contractor's Guarantee Bond.

1.04 CONTRACTOR'S GUARANTEE BOND

The Performance and Payment Bond will be released by the Owner after the expiration of two (2) months from the final acceptance of the work and only after the Contractor has furnished the Owner, a Guarantee Bond in the amount of 30% of the Total Contract Cost. The Guarantee Bond shall be for a period of one (1) year commencing from the date of acceptance as a guarantee that all materials and workmanship installed under Contract are of good quality.

1.05 . CONTRACTOR'S GUARANTY-WARRANTY

A. The Contractor shall, in case of work performed by his sub-contractors and where guarantees are required, secure warranties from said sub-contractors and deliver copies of same to the Owner upon completion of work.

B. The Contractor shall and thereby warrants all work performed by him directly and for which guarantee are required.

C. The Contractor shall and thereby warrants and/or guarantees for a period of one year, or for longer periods where so provided in Specifications, as evidenced by date of final certificate issued by the Architect, all materials and workmanship installed under Contract to be of good quality in every respect and to remain so for period described herein.

D. Should any defects develop in aforesaid work, within the specified period due to faults in material and/or workmanship, the Contractor thereby agrees to make all repairs and do all necessary work to correct defective work to the Architect's satisfaction. Such repairs and corrective works shall be done without cost to the Owner and at entire cost and expenses of the Contractor within five (5) days written notice to the Contractor by the Owner.

E. In case the Contractor fails to do the work so ordered, the Owner may have the work done and charge the cost thereof against monies retained as provided for in the Agreement and, if said retained monies shall be insufficient to pay such cost, or if no money is available, the Contractor and his sureties agree to pay to the Owner the cost of such work.

F. All the foregoing are without prejudice to the right of the Owner under the New Civil Code and other laws now or hereafter that may be applicable.

SECTION 02100
SITE PREPARATION

1.00 GENERAL

1.01 SCOPE

A. Furnish all materials, labor, equipment, plant, tools required to complete:
   - Demolition of existing structures
   - removable of salvage materials
   - clearing of shrubs
   - disposal of resulting trash, waste, timber stumps, and other vegetation.

B. Do not cut down any trees without the approval of the Architect and the Owner. Secure permit from proper authorities in the transfer and cutting of trees. See drawings for coverage of work involved

1.02 EXAMINATION OF SITE

Visit the site of the work and examine the premises to fully understand all existing conditions relative to the work. No increase of cost or extension of performance time will be considered for failure to verify and know actual site conditions.

1.03 PERMITS

Secure and pay for all necessary permits needed for the work.

1.04 PROTECTION

Provide adequate measures to protect workmen and passers-by in the areas. Protect adjacent properties and existing facilities on site, persons, shrubs, trees, lawns, structures and utilities therein against harm or damage. Provide surface drainage in a manner to avoid creating nuisance to adjacent areas during the period of construction.

2.00 PRODUCTS

2.01 DISPOSAL OF MATERIALS

A. All salvageable materials shall remain the property of the Owner. Hauling and stacking of salvaged material within a 300 meter radius to Owner's specified storage shall be for the account of the Contractor. However, upon Owner's

written instructions, salvageable materials may be disposed of by the Contractor at the Contractor's expense.

B. All debris and other materials resulting from clearing and grubbing work shall be immediately removed from the premises and dumped at sites provided by the Contractor in manner approved by the Architect.

3.00 EXECUTION

3.01 DEMOLITION

A. Demolish and remove from existing structures and other obstructions within the building area as indicated in the Plans.
B. Where existing concrete on ground is to be demolished, remove all existing concrete and other obstructions to a depth of 610 mm (24") below grade
C. Cap all existing utility lines. Consult Owner before commencing work.

3.02 CLEARING AND GRUBBING

A. Do not uproot or cut down trees unless specifically shown in the plans or as directed by the Architect and/or Owner. Secure permit to cut when necessary.
B. Protect trees indicated in the plans as "to be retained and protected."
C. Cut down trees in manner to avoid damage to trees to be preserved, prevent injury to structures or minimize danger to traffic.
D. Remove tree stumps and roots. Holes left behind shall be filled with suitable material and compacted in accordance with item Section 02200 EARTHWORK.
E. Grub up or clear undergrowth, bushes, vegetation rubbish and all objectionable and dispose in accordance with item 2.01 of this Section.

3.03 REPAIRS:

A. Repair damage done to existing on-site facilities or to property of any person or persons off the premises by reason of the required work for demolition, clearing and grubbing. All expenses arising from the above scope of work shall be at the expense of the Contractor.

SECTION 02110
SITE CLEARING

1.00 GENERAL

1.01 SCOPE

A. Protection of existing trees to remain
B. Removal of trees and other vegetation
C. Topsoil stripping
D. Clearing and grubbing
E. Removing above-grade improvements
F. Removing below-grade improvements

1.02 PROJECT CONDITIONS

A. Traffic: Conduct site-clearing operations to ensure minimum interference with roads, streets, walks, and other adjacent occupied or used facilities. Do not close or obstruct streets, walks, or other occupied or used facilities without permission from authorities having jurisdiction.

B. Protection of Existing Improvements. Provide protections necessary to prevent damage to existing improvements indicated to remain in place.

1. Protect improvements on adjoining properties and on Owner's property.
2. Restore damaged improvements to their original condition, as acceptable to property owners.

C. Protection of Existing Trees and Vegetation: Protect existingProtect existing trees and other vegetation to remain in place against unnecessary cutting, breaking or skinning of roots, skinning or bruising of bark, smothering of trees by stockpiling construction materials or excavated materials within drip line, excess foot or vehicular traffic, or parking of vehicles within drip line. Provide temporary guards to protect trees and vegetation to be left standing.

1. Water trees and other vegetation to remain within limits of contract work as required to maintain their health during course of construction operations.
2. Provide protection for roots over 1-1/2 inch in diameter that are cut during construction operations. Coat cut faces with an emulsified asphalt or other acceptable coating formulated to use on damaged plant tissues. Temporarily cover exposed roots with wet burlap to prevent roots from drying out: cover with earth as soon as possible.

3. Repair or replace trees and vegetation that are damaged by construction operations in a manner acceptable to Architect/Engineer. Employ a licensed arborist to repair damage to trees and shrubs.

1.03 PROJECT CONDITIONS

A. General: Indicated locations are approximate; determine exact locations before commencing Work.

B. Arrange and pay for disconnecting, removing, capping, and plugging utility services. Notify affected utility companies in advance and obtain approval before starting this Work.

C. Place markers to indicate location of disconnected services. Identify service lines and capping locations on provided documents.

2.00 PRODUCTS

2.01 MATERIALS

A. Provide temporary or permanent materials as required for the proper execution of the work of this Section.

3.00 EXECUTION

3.01 SITE CLEARING

A. General: Remove trees, shrubs, grass, and other vegetation, improvements, or obstructions, as required, to permit installation of new construction. Remove similar items elsewhere on site or premises as specifically indicated. Removal includes digging out and off-site disposal of stumps and roots.

1. Cut minor roots and branches of trees indicated to remain in a clean and careful manner where such roots and branches obstruct installation of new construction.

B. Topsoil: Topsoil is defined as friable clay loam surface soil found in a depth of not less than 4 inches. Satisfactory topsoil is reasonably free of subsoil, clay lumps, stones, and other objects over 1 inch in size, and without weeds, roots, and other objectionable material.

1. Strip topsoil to whatever depths encountered in a manner to prevent intermingling with underlying subsoil or other objectionable material. Remove heavy growths of grass from areas before stripping.

a. Where existing trees are to remain, leave existing topsoil in place within drip lines to prevent damage to root system.

2. Stockpile topsoil in storage piles in areas as directed. Construct storage piles to provide free drainage of surface water. Cover storage piles, if required, to prevent wind erosion.

3. Dispose of unsuitable or excess topsoil as specified for disposal of waste material.

3.02 EXISTING TREES AND VEGETATION

A. Protect existing trees indicated to remain in place against cutting, breaking or skinning of roots, skinning and bruising of bark, smothering of trees by stockpiling building materials or excavated materials within drip line, excess foot or vehicular traffic, or parking of vehicle within drip line. Provide temporary fences, barricades or guards at dripline to protect trees. Trees within limits of contract work shall be watered as required by the Architect.
B. When it is necessary to cut tree roots to provide room for new construction, cleanly saw tree roots over 1-1/2 inches diameter. Cover exposed roots with wet burlap to prevent roots from drying out.
C. Where trees or shrubbery designated to remain or those in areas outside the area indicated to be cleared and grubbed are damaged in the course of the Work, repair damage to or replace damaged existing trees and shrubbery to the Architect's satisfaction.

3.03 EXISTING STRUCTURES AND PROPERTY

A. Obtain permission from the Architect prior to removing signs, posts, catch basin frames and grates, and manhole frames and covers not indicated on the Contract Drawings for removal.
B. Protect existing structures and facilities not to be removed.
C. Store salvaged items in an orderly manner as directed by the Architect.
D. Protect existing survey monuments

3.04 DISPOSAL OF WASTE MATERIALS

A. Burning on Owner's Property: Burning is not permitted on Owner's property.

B. Removal from Owner's Property: Remove waste materials and unsuitable or excess topsoil from Owner's property.

SECTION 02160
EXCAVATION SUPPORT SYSTEMS

1.00 GENERAL

1.01 SCOPE

Furnish all materials, labor, equipment, plant, tools required to support excavation against loss of ground or caving embankments.

1.02 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.03 SUMMARY

A. This Section includes, but is not limited to, the following:

1. Shoring and bracing necessary to protect existing buildings, streets, walkways, utilities, and other improvements and excavation against loss of ground or caving embankments.
2. Maintenance of shoring and bracing.
3. Removal of shoring and bracing, as required.

B. Types of shoring and bracing systems include, but are not limited to, the following:

1. Steel H-section (soldier) piles.
2. Timber lagging.
3. Steel sheet piles.

1.04 SUBMITTALS

A. General. Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.

B. Layout drawings for excavation support system and other data prepared by, or under the supervision of, a qualified professional engineer. System design and calculations must be acceptable to local authorities having jurisdiction.

1.05 QUALITY ASSURANCE

A. Engineer Qualifications: A professional engineer legally authorized to practice in jurisdiction where Project is located, and experienced in providing successful engineering services for excavation support systems similar in extent required for this Project.

B. Supervision: Engage and assign supervision of excavation support system to a qualified professional engineer foundation consultant.

1. Submit name of engaged consultant and qualifying technical experience.

C. Regulations: Comply with codes and ordinances of governing authorities having jurisdiction.

1.06 JOB CONDITIONS

A. Before starting work, verify governing dimensions and elevations. Verify condition of adjoining properties. Take photographs to record any existing settlement or cracking of structures, pavements, and other improvements. Prepare a list of such damages, verified by dated photographs, and signed by Contractor and others conducting investigation.

B. Survey adjacent structures and improvements, employing qualified professional engineer, establishing exact elevations at fixed points to act as benchmarks. Clearly identify benchmarks and record existing elevations.

C. During excavation, resurvey benchmarks weekly, maintaining accurate log of surveyed elevations for comparison with original elevations. Promptly notify Architect if changes in elevations occur or if cracks, sags, or other damage is evident.

1.07 EXISTING UTILITIES

A. Protect existing active sewer, water, gas, electricity and other utility services and structures.

B. Notify municipal agencies and service utility companies having jurisdiction. Comply with requirements of governing authorities and agencies for protection, relocation, removal, and discontinuing of services.

2.00 PRODUCTS

2.01 MATERIALS

A. General. Provide adequate shoring and bracing materials which will support loads imposed. Materials need not be new, but should be in serviceable condition.

B. Structural Steel: ASTM A 36 (ASTM A 36M).

C. Steel Sheet Piles: ASTM A 328 (ASTM A 328M).

D. Timber Lagging: Any species, rough-cut, mixed hardwood, nominal 3 inches (75 mm) thick, unless otherwise indicated.

3.00 EXECUTION

3.01 SHORING

A. Wherever shoring is required, locate the system to clear permanent construction and to permit forming and finishing of concrete surfaces. Provide shoring system adequately anchored and braced to resist earth and hydrostatic pressures.

B. Shoring systems retaining earth on which the support or stability of existing structures is dependent must be left in place at completion of work.

3.02 BRACING

A. Locate bracing to clear columns, floor framing construction, and other permanent work. If necessary to move a brace, install new bracing prior to removal of original brace.

B. Do not place bracing where it will be cast into or included in permanent concrete work, except as otherwise acceptable to Architect.

C. Install internal bracing, if required, to prevent spreading or distortion of braced frames.

D. Maintain bracing until structural elements are supported by other bracing or until permanent construction is able to withstand lateral earth and hydrostatic pressures.

E. Remove sheeting, shoring, and bracing in stages to avoid disturbance to underlying soils and damage to structures, pavements, facilities, and utilities.

F. Repair or replace, as acceptable to Architect, adjacent work damaged or displaced through installation or removal of shoring and bracing work.

SECTION 02200
EARTHWORK

1.00 GENERAL

1.01 SCOPE

A. Furnish all materials, labor, equipment, plant, tools required to complete:
- Stripping
- Site grading
- Excavation
- Trenching
- Earthfilling and Backfilling
- Compaction
- Dewatering

B. See drawings for location and extent of work required.

1.02 VERIFICATION OF EXISTING CONDITIONS

A. Verify and examine the site of work to familiarize with the character of materials to be encountered and all other existing conditions affecting the work.

1.03 PROTECTION

A. Provide adequate protection measures to protect materials, men and adjoining property.

B. Provide shoring, sheeting and bracing to prevent caving, erosion or gullying of sides or excavation.

C. Provide for surface drainage during the period of construction in such manner as to avoid creating a nuisance to adjacent areas. Keep all excavation free of water at all times.

2.00 PRODUCTS

See Section 01020 Summary of Materials and Finishes.

3.00 EXECUTION

3.01 STRIPPING

A. Strip top soil only in areas required as shown in the plans or as directed by the University. Remove top soil to depths indicated or as required by the Architect but in no case less than 150 mm (6") in depth, prior to start of regular excavation or backfilling work.

B. Stockpile the removed top soil separate from other excavated materials in locations designated by the Architect. Spread and compact with a light roller in areas indicated in the plans or where directed by the Architect.

3.02 SITE GRADING

A. Cut or fill and machine grade the site area. Deposit material in horizontal layers not exceeding 200 mm (8") in depth and compact in accordance with method A of ASTM D 1557- 66T. Rough grade elevations and levels shall be approximately 150 mm (6") below the bottom of slabs on grade, 250 mm (10") below paving finish grades and 100 mm (4") below finish grades in areas to be lawn sodded or landscaped.

3.03 STAKES AND BATTER BOARDS

A. Stake out building accurately and establish grades.

B. Batter boards and reference marks shall be erected at locations where they will not be disturbed during the construction.

C. Construct two permanent bench marks of previously known elevations near the site of construction.

3.04 EXCAVATION

A. Excavate to the dimensions and elevations indicated on the Drawings. Carry excavation to depths directed by the Architect. Should unsuitable bearing be encountered at elevations indicated, contract price shall be adjusted according to the unit price agreed upon by the Owner and the Contractor.

B. Excavation carried to a greater depth or size indicated or required through error. shall be corrected by filling such additional depth or size with class "D" concrete at Contractor's expense.

C. Bottom of excavation shall be level, free from loose material and brought to indicated or required levels in undisturbed earth or in compacted fill.

D. Excavate with proper allowance made for floor slabs, from erection. shoring, drain tile. waterproofing, masonry and adequate space for inspection of foundations.

3.05 DEWATERING

A. Control grading around building so that ground is pitched to prevent water from running into excavated areas of buildings or damaging other structures.

B Pump water out of excavated areas throughout the construction period. Water shall not be conducted into adjacent developed property.

3.06 TRENCHING FOR SUB-DRAINAGE

A. Excavate trenches for underground utility systems and drain lines. Grade and tamp to provide firm bed trenches for drain lines.

B. When rock is encountered, excavate to a depth of 150 mm (6") below the bottom elevation of the pipe and fill with sand and gravel or crushed stones thoroughly compacted before laying pipe.

3.07 EARTHFILLING AND BACKFILLING

A. Prior to earthfilling/backfilling around structures, remove all forms, trash and debris. Use only approved earthfill/backfill material and place symmetrically on all sides in layers, moistened in accordance with Item 3.08 of this Section.
B. Earthfill/Backfill around structures only after the concrete has attained sufficient strength to resist lateral pressure resulting from the earthfill/backfill

3.08 SOIL COMPACTION

Filling material to be used inside the building shall be placed in loose layers not exceeding 200 mm (8") thick. Each layer shall be moisture conditioned as necessary and compacted in accordance to AASHO methods in the following schedule:

a) For vehicular traffic areas (parking and driveways ----- 95% maximum dry density (mdd).
b) For areas inside Buildings and pumphouse structures and outside up to 2.00 M away from line of exterior wall of buildings and in hard landscaped areas---------- 95% mdd.
c) For pedestrian areas -------- 95 % mdd.
d) For areas designated for future expansion --------- 95% mdd.
e) Non vehicular traffic areas (open/ green areas) ------- 90% mdd.

3.09 DISPOSAL OF EXCAVATED MATERIAL

Surplus material resulting from all earthwork operations not required or unsuitable for fill or backfill shall be disposed of by the Contractor at his expense in areas off the site provided by the Contractor.

4.00 SOIL BEARING CAPACITY

4.01 UNCONFIRMED CONDITIONS

If during excavation, conditions discovered at the site do not conform to the findings of the "SOIL INVESTIGATIONS REPORT" submitted by the Soils Engineer, the Contractor shall immediately notify the Architect or his representative, in writing, of such conditions.

4.02 SOILS/STRUCTURAL ENGINEERS

The Soils Engineer and the Structural Engineer shall visit the site and make the changes in foundation design, as necessary. Any changes in the foundation design and drawings shall be treated as EXTRA WORK covered under Article 23 of the GENERAL CONDITIONS of the Contract.

4.03 WRITTEN NOTICE TO PROCEED

The Contractor may proceed with excavation work but foundation forms and reinforcement shall not be installed until after the receipt of written notice to proceed from the Architect.

4.04 FOOTINGS

No footings shall rest on fill.

SECTION 02230
SITE CLEARING AND DEMOLITION

1.1 GENERAL

1.2 SCOPE

A. Section Includes:

1. Protecting existing vegetation to remain.
2. Removing existing vegetation.
3. Clearing and grubbing.
4. Stripping and stockpiling topsoil.
5. Removing above- and below-grade site improvements. including but not limited to: Asphalt and concrete paving; retaining walls; and light pole bases.
6. Disconnecting, capping or sealing. and removing site utilities.

B. Related Sections:

1. Division 1 Section "Construction Waste Management".
2. Division 1 Section "Temporary Facilities and Controls" for temporary utility services. construction and support facilities. security and protection facilities.
3. Division 1 Section "Execution Requirements" for field engineering and surveying.
4. Division 2 Section "Soil Erosion" for temporary erosion and sedimentation control procedures.
5. Division 2 Section "Earthwork" satisfactory use of soil material.

1.3 DEFINITIONS

A. Subsoil: All soil beneath the topsoil layer of the soil profile, and typified by the lack of organic matter and soil organisms.

B. Surface Soil: Soil that is present at the top layer of the existing soil profile at the Project site. In undisturbed areas, the surface soil is typically topsoil; but in disturbed areas such as urban environments, the surface soil can be subsoil.

C. Topsoil: Top layer of the soil profile consisting of existing native surface topsoil or existing in place surface soil and is the zone where plant roots grow. Its appearance is generally friable. pervious, and black or a darker shade of brown, gray, or red than underlying subsoil; reasonably free of subsoil, clay

lumps, gravel, and other objects more than 50mm (2 inches) in diameter; and free of subsoil and weeds, roots, toxic materials, or other non-soil materials..

D. Vegetation: Trees, shrubs, groundcovers, grass, and other plants

E. Demolition (demolish): Means the complete wrecking of buildings or site features with little or no regard for salvaging materials or construction items for reuse, except as desired by the Owner for the project site.

F. Selective Demolition: Means the demolition of specific portions of an existing site improvement together with subsequent removal of resulting debris.

G. Protection (protect): Means to provide for the prevention of injury to persons and site features, including or site improvements, subsurface utilities, finishes, and mechanical/electrical systems.

1.4 MATERIAL OWNERSHIP

A. Except for stripped topsoil and other materials indicated to be stockpiled, recycled or otherwise remain Owner's property, cleared materials shall become Contractor's property and shall be removed from Project site.

1.5 SUBMITTALS

A. Existing Conditions. Documentation of existing on-site and adjacent off-site materials and improvements to remain that establishes preconstruction conditions that might be misconstrued as damage caused by site clearing and demolition.

1. Use sufficiently detailed photographs or videotape.
2. Include plans and notations to indicate specific wounds and damage conditions of each tree or other plants designated to remain.

B. Record Drawings: Identifying and accurately showing locations of capped utilities and other subsurface structural, electrical, and mechanical conditions.

1.6 QUALITY ASSURANCE

A. Pre-installation Conference: Conduct conference at Project site.

1.7 PROJECT CONDITIONS

A. Explosives: Use of explosives will not be permitted.

B. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during site-clearing operations.

1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction.
2. Provide alternate routes around closed or obstructed traffic ways if required by Owner or authorities having jurisdiction.
3. Ensure safe passage of persons around area of demolition and erect temporary passageways as required by authorities having jurisdiction.
4. Conduct operations to prevent damage to adjacent structures and injury to pedestrians.

C. Improvements on Adjoining Property: Authority for performing site clearing and demolition indicated on property adjoining Owner's property will be obtained by Owner before award of Contract.

1. Do not proceed with work on adjoining property until directed by Architect.

D. Utility Locator Service: Notify DBM for area where Project is located before site clearing.

E. Do not commence site-clearing operations until temporary erosion- and sedimentation control and plant-protection measures are in place.

F. The following practices are prohibited within protection zones:

1. Storage of construction materials, debris, or excavated material.
2. Parking vehicles or equipment.
3. Foot traffic.
4. Erection of sheds or structures.
5. Impoundment of water.
6. Excavation or other digging unless otherwise indicated
7. Attachment of signs to or wrapping materials around trees or plants unless otherwise indicated.

G. Do not direct vehicle or equipment exhaust towards protection zones.

H. Prohibit heat sources, flames, ignition sources, and smoking within or near protection zones.

I. Soil Stripping, Handling, and Stockpiling: Perform only when the topsoil is dry or slightly moist.

J. Damages: Promptly repair damages caused to adjacent facilities by demolition operations.

K. Utility Services: Maintain existing utilities indicated to stay in service and protect against damage during demolition operations. Located and identify existing utilities entering site Expose utilities using hand-tools; confirm depth, direction, and of each respective utility. Do not interrupt existing utilitiesserving occupied facilities. Cooperate with owner and utility companies in keeping services and facilities in operation. Restore all damaged utilities to the satisfaction of the utility owner. Disconnecting and sealing indicated utilities before starting demolition is part of this work.

2.1 PRODUCTS

2.2 MATERIALS

A. Satisfactory Soil Material: Requirements for satisfactory soil material are specified in Division 2 Section "Earthwork."

1. Obtain approved borrow soil material off-site when satisfactory soil material is not available on-site.

3.1 EXECUTION

3.2 PREPARATION

A. Protect and maintain benchmarks and survey control points from disturbance during construction.

B. Locate and clearly identify trees, shrubs, and other vegetation to remain. Wrap a 25mm (1-inch) blue vinyl tie tape flag around each tree trunk at 1370 mm (54 inches) above the ground.

C. Protect existing site improvements to remain from damage during construction.

1. Restore damaged improvements to their original condition, as acceptable to Owner.

3.3 TREE AND PLANT PROTECTION

A. General: Protect trees and plants remaining on-site according to requirements shown or indicated.

B. Repair or replace trees, shrubs, and other vegetation indicated to remain or be relocated that are damaged by construction operations, in a manner approved by Architect.

3.4 EXISTING UTILITIES

A. Arrange for disconnecting and sealing indicated utilities that serve existing s tructures before site clearing.

1. Verify that utilities have been disconnected and capped before proceeding with site clearing.

B. Locate and coordinate with drawings, identify, disconnect, and seal or cap utilities indicated to be removed.

1. Arrange with utility companies to shut off indicated utilities.
2. Owner will arrange to shut off indicated utilities when requested by Contractor.

C. Locate, identify, and disconnect utilities indicated to be abandoned in place.

D. Interrupting Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:

1. Notify owner not less than 5-days in advance of proposed utility interruptions.
2. Do not proceed with utility interruptions without Architect's written permission.

E. Excavate for and remove underground utilities indicated to be removed.

3.5 CLEARING AND GRUBBING

A. Remove obstructions, trees, shrubs, and other vegetation to permit installation of new construction.

1. Do not remove trees, shrubs, and other vegetation indicated to remain.
2. Grind down stumps and remove roots, obstructions, and debris to a depth of 760 mm (18 inches) below exposed sub grade.
3. Use only hand methods for grubbing within protection zones.
4. Chip removed tree branches and dispose of off-site.

B. Fill depressions caused by clearing and grubbing operations with satisfactory soil material unless further excavation or earthwork is indicated.

1. Place fill material in horizontal layers not exceeding a loose depth of 8 inches, and compact each layer to a density equal to adjacent original ground.

3.6 TOPSOIL STRIPPING

A. Remove all plant material and grass before stripping topsoil.

B. Strip topsoil to depth of 150mm (6 inches) in a manner to prevent intermingling with underlying subsoil or other waste materials.

1. Remove subsoil and nonsoil materials from topsoil, including clay lumps, gravel, and other objects more than 50mm (2 inches) in diameter; trash, debris, weeds, roots, and other waste materials.

C. Stockpile topsoil away from edge of excavations without intermixing with subsoil. Grade and shape stockpiles to drain surface water. Cover to prevent windblown dust and erosion by water.

1. Limit height of topsoil stockpiles to 1830mm (72 inches).
2. Do not stockpile topsoil within protection zones.

3 Dispose of surplus topsoil. Surplus topsoil is that which exceeds quantity to be stockpiled or reused.
4. Stockpile surplus topsoil to allow for re-spreading deeper topsoil

3.7 SITE IMPROVEMENTS

A. Remove existing above- and below-grade improvements as indicated and necessary to facilitate new construction.

B. Remove slabs, paving, curbs, gutters, and aggregate base as indicated.

1. Unless existing full-depth joints coincide with line of demolition, neatly saw- cut along line of existing pavement to remain before removing adjacent existing pavement. Saw-cut faces vertically. Break- up and remove concrete slabs and masonry in small sections.
2. Paint cut ends of steel reinforcement in concrete to remain with two coats of antirust coating, following coating manufacturer's written instructions. Keep paint off surfaces that will remain exposed.

C. Pollution Control: Use water sprinkling, temporary enclosures, and other methods to limit dust and dirt rising and scattering in the air. Comply with governing regulations pertaining to environmental protection.

D. Do not use water when it may create hazardous or objectionable conditions such as ice, flooding, and pollution.

E Clean adjacent structures and improvements of dust, dirt, and debris caused by demolition operations. Return adjacent areas to condition existing prior to start of work.

3.8 DISPOSAL OF SURPLUS AND WASTE MATERIALS

A. Remove surplus soil material, unsuitable topsoil, obstructions, demolished materials, and waste materials including trash and debris, and legally dispose of them off Owner's property.

B. Separate recyclable materials produced during site clearing from other non-recyclable materials. Store or stockpile without intermixing with other materials and transport them to recycling facilities. Do not interfere with other Project work.

C. Recycled Materials: Separate and recycle waste materials including but not limited to concrete and asphalt paving. Monitor and provide documentation confirming amount of recycled material (by weight or volume) diverted from the landfill compared to the overall amount of material not diverted. Coordinate documentation to comply with the Waste Management Plan.

SECTION 02240
DEWATERING

1.1 GENERAL

1.2 SCOPE

A. Section includes construction dewatering to be used if ground water is discovered on site. The geotechnical report did not indicate any ground water in any borings completed within the building foot print If ground water is discovered on-site, it will be necessary to have water tested for possible contamination.

B. Related Sections:

1. Division 2 Section "Earthwork" for excavating, backfilling, site grading, and for site utilities.

1.3 RELATED DOCUMENTS

A Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.4 PERFORMANCE REQUIREMENTS

A Dewatering Performance: Design, furnish, install, test, operate, monitor, and maintain dewatering system of sufficient scope, size, and capacity to control hydrostatic pressures and to lower, control, remove, and dispose of ground water and permit excavation and construction to proceed on dry, stable subgrades.

1. Continuously monitor and maintain dewatering operations to ensure erosion control, stability of excavations and constructed slopes, that excavation does not flood, and that damage to subgrades and permanent structures is prevented.

2. Prevent surface water from entering excavations by grading, dikes, or other means.

3. Accomplish dewatering without damaging existing buildings, structures, and site improvements adjacent to excavation.

4. Remove dewatering system when no longer required for construction.

1.5 SUBMITTALS

A. Delegated-Design Submittal: For dewatering system indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

B. Qualification Data: For qualified Installer and professional engineer.

C. Field quality-control reports.

D. Other Informational Submittals:

1.6 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer that has specialized in design of dewatering systems and dewatering work.

B. Regulatory Requirements: Comply with governing EPA notification regulations before beginning dewatering. Comply with hauling and disposal regulations of authorities having jurisdiction.

C. Preinstallation Conference: Conduct conference at Project site.

1. Review methods and procedures related to dewatering including, but not limited to, the following:

   a. Inspection and discussion of condition of site to be dewatered including coordination with temporary erosion control measures and temporary controls and protections.

   b. Geotechnical report.

   c. Proposed site clearing and excavations.

   d. Existing utilities and subsurface conditions.

   e. Coordination for interruption, shutoff, capping, and continuation of utility services.

   f. Construction schedule. Verify availability of Installer's personnel, equipment, and facilities needed to make progress and avoid delays.

   g. Testing and monitoring of dewatering system.

   h. Testing of ground water to determine contamination.

1.7 PROJECT CONDITIONS

A. Project-Site Information: A geotechnical report has been prepared for this

Project and is available for information only. The opinions expressed in this report are those of geotechnical engineer and represent interpretations of subsoil conditions, tests, and results of analyses conducted by geotechnical engineer. Owner will not be responsible for interpretations or conclusions drawn from this data.

1. If ground water is disturbed on-site in the course of the work, then the contractor must have the water tested to determine if any contamination exists. If contaminated ground water is discovered, additional dewatering operations would be needed. The contractor shall obtain testing services to determine extend of contamination and appropriate remediation strategies. All test reports must be turned over to the owner.
2. The geotechnical report was used in the preparation of construction drawings.

2.00 PRODUCTS (Not Used)

3.1 EXECUTION

3.2 PREPARATION

A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by dewatering operations.

1. Prevent surface water and subsurface or ground water from entering excavations, from ponding on prepared subgrades, and from flooding site and surrounding area.

2. Protect subgrades and foundation soils from softening and damage by rain or water accumulation.

B. Install dewatering system to ensure minimum interference with roads, streets, walks, streams, and other adjacent occupied and used facilities.

1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction. Provide alternate routes around closed or obstructed traffic ways if required by authorities having jurisdiction.

C. Provide temporary grading to facilitate dewatering and control of surface water.

D. Monitor dewatering systems continuously.

E Promptly repair damages to adjacent facilities caused by dewatering.

F Protect and maintain temporary erosion and sedimentation controls, which are specified in Division 1 Section "Temporary Facilities and Controls" during dewatering operations.

3.3 INSTALLATION

A. Install dewatering system utilizing wells, well points, or similar methods complete with pump equipment, standby power and pumps, filter material gradation, valves, appurtenances, water disposal, and surface-water controls.

1. Space well points or wells at intervals required to provide sufficient dewatering.

2. Use filters or other means to prevent pumping of fine sands or silts from the subsurface.

B. Before excavating below ground-water level, place system into operation to lower water to specified levels. Operate system continuously until drains, sewers, and structures have been constructed and fill materials have been placed or until dewatering is no longer required.

C. Provide an adequate system to lower and control ground water to permit excavation, construction of structures, and placement of fill materials on dry subgrades. Install sufficient dewatering equipment to drain water-bearing strata above and below bottom of foundations, drains, sewers, and other excavations.

1. Do not permit open-sump pumping that leads to loss of fines, soil piping, subgrade softening, and slope instability.

D. Reduce hydrostatic head in water-bearing strata below subgrade elevations of foundations, drains, sewers, and other excavations.

1. Maintain piezometric water level a minimum of 24 inches below surface of excavation.

E. Dispose of water removed by dewatering in a manner that avoids

endangering public health, property, and portions of work under construction or completed. Dispose of water and sediment in a manner that avoids inconvenience to others. Provide sumps, sedimentation tanks, and other flow-control devices as required by authorities having jurisdiction.

F Provide standby equipment on site, installed and available for immediate operation, to maintain dewatering on continuous basis if any part of system becomes inadequate or fails. If dewatering requirements are not satisfied due to inadequacy or failure of dewatering system, restore damaged structures and foundation soils at no additional expense to Owner.

1 Remove dewatering system from Project site on completion of dewatering.
Plug or fill well holes with sand or cut off and cap wells a minimum of 910mm (36 inches) below overlying construction.

G. Damages: Promptly repair damages to adjacent facilities caused by dewatering operations.

3.4 FIELD QUALITY CONTROL

A. Observation Wells. Provide, take measurements, and maintain at least the minimum number of observation wells or piezometers indicated; additional observation wells may be required by authorities having jurisdiction.

1. Observe and record daily elevation of ground water and piezo metric water levels in observation wells.
2. Repair or replace, within 24 hours, observation wells that become inactive, damaged, or destroyed. In areas where observation wells are not functioning properly, suspend construction activities until reliable observations can be made. Add or remove water from observation-well risers to demonstrate that observation wells are functioning properly.
3. Fill observation wells, remove piezometers, and fill holes when dewatering is completed.

B. Provide continual observation to ensure that subsurface soils are not being removed by the dewatering operation.

SECTION 02280
TERMITE PROOFING

1.00 GENERAL

1.01 SCOPE

The Contractor shall hire the services of an approved or accredited pesticide company to furnish all labor, materials, equipment, plant, tools, and services to complete the termite proofing work hereinafter described.

1.02 EXAMINATION OF SITE

Visit the site of the work and examine the premises to fully understand all existing conditions relative to the work involved. Prior to soil stripping, excavation or filling, all termite mounds within the area should be demolished, removed and treated. No increase of cost or extension of performance time will be considered for failure to verify and know actual site conditions.

2.00 PRODUCTS

See Section 01020 Summary of Materials and Finishes

3.00 EXECUTION

3.01 CONTRACTOR LICENSE AND CERTIFICATION REQUIREMENT

A. The pesticide company should have a valid license from the Fertilizer and Pesticide Authority of the Department of Agriculture.
B. All pesticides shall be applied by or under the direct supervision of a certified pesticide applicator.

3.02 ENVIRONMENTAL AND SAFETY CONDITIONS

A. Formulation, treatment, storage and disposal of pesticides shall be in accordance with label directions. Water for formulation shall be drawn only from site/s designated by the Architect, and the filling hose shall be fitted with a backflow preventer meeting local plumbing codes and standards. The filling operation shall be under the direct and continuous observation of the Construction Manager to assure that overflow is prevented.

3.03 APPLICATION

A. Termite Control

Application of solution shall be done by means of power sprayers fitted with flow meters for accurate monitoring of actual quantity used. At the time of soil treatment application, the soil shall be preferably in a friable condition with low moisture content to allow uniform distribution of the treatment solution throughout the soil. Do not allow pesticide during or immediately following heavy rains, or when conditions will cause runoff and create an environmental hazard Cover treated area with waterproof sheeting if concrete is not poured on the same day as the soil treatment. Take precautions to prevent disturbance of pesticide barrier. Before the placement of structural components, re-treat where soil or fill is disturbed after treatment. Apply pesticide prior to placement of gravel base, vapor barrier or waterproof membrane.

1. Slab on Grade Construction: Establish a horizontal pesticide barrier over areas intended for covering by floors, porches, attached entryways, garages, carports and terraces. Apply treatment solution with a low pressure coarse spray at the rate of four (4) liters per square meter. Apply at the rate of seven (7) liters solution per square meter if the gravel fill is washed gravel or other coarse material. Establish a continuous chemical barrier in the voids of hollow block foundation or voids of masonry. Apply treatment at the rate of seven (7) liters per three (3) linear meters. Make pesticide band at least 150 mm wide with the pesticide evenly distributed throughout. Treat buildings constructed with basement slabs in the same manner.
2. Crawl Space Construction: Establish a vertical pesticide barrier inside of foundation walls, both sides of interior partition walls, around piers, plumbing and roddings and utility conduits Apply treatment solution by rodding or rodding and trenching the fill at the rate of fifteen (15) liters solution per three (3) linear meters, and 300 mm deep from grade to bottom of foundation. Treat both sides of foundation and around all piers and pipes. Make treated barrier of fill at least 150 mm wide with the pesticide evenly distributed throughout.
3. Dry pipes and Conduits: Establish pesticide barrier on various dry pipes and conduits such as electrical service entrance, raceways, pipe chase, vents. Use powder type termiticide by injecting it inside the pipe.
4. Termite Mounds: Demolish and treat all termite mounds within the property found after construction.

3.04 ARCHITECT'S APPROVAL

The Contractor shall submit to the Architect for approval, a copy of the pest control company's proposal and chemical application, method/procedure including the description of the equipment to be used before the start of work.

3.05 INSPECTION AND TEST

Sampling shall be done only in the presence of the Construction Manager.

Amount of sample to be taken: Chlorpyrifos Termiticide Solution or approved equal and Pentachlorophenol (from Original container) 50 cc each.

3.06 CONTRACTOR'S GUARANTEE

Upon completion of work, and as a condition for final acceptance, the Contractor shall submit to the Owner a written guarantee from the pesticide company which shall provide that:

A. The soil poisoning treatment shall prevent subterranean termites from attacking the building and its contents for a period of not less than five (5) years.
B. The contractor shall thereby warrant all works in pest control; that all materials and workmanship applied under the contract are of good quality in every respect and will remain as such for not less than five (5) years.
C. Should there be termite infestation within a one (1) year period, the Contractor thereby agrees to do all necessary repairs on the damaged portions of the building caused by termite infestation to the satisfaction of the Owner and at the Contractor's expense. Re-treatment shall also be done by the Contractor after completion of the repairs and at his expense. Such repairs and corrective works shall be done within five days after a written notice from the Owner has been received by the Contractor.
D. Should there be infestation within the one (1) year period up until the five (5) year guarantee, the pesticide company agrees to do all the necessary repairs at their expense. The pesticide company shall conduct annual inspection of the building and the surroundings to check any infestation during the guarantee period. Notice shall be given by the pesticide company to the Owner in case there is presence of termites in the surroundings.

SECTION 02500
ROADS AND PARKING

1.00 GENERAL

1.01 SCOPE

A. Furnish all materials, labor, equipment, plant and tools required to complete
   - driveways
   - roadways
   - parking

B. See drawings for location and extent of work.

C. Related works specified elsewhere. See Division 3 CONCRETE

1.02 PROTECTION

Protect all materials from dirt and all injurious substances that may affect the strength of concrete and cement.

2.00 PRODUCTS

2.01 MATERIALS

Refer to Section 01020 Summary of Materials and Finishes.

3.00 EXECUTION

3.01 SUBGRADE PREPARATION

A. Prior to commencing the preparation of the subgrade complete all installations of sub-drainage lines, manholes and catch basins and all other utilities underneath the subgrade, including their fully compacted backfill.

B. Compact all materials immediately below subgrade level on embankment to a depth of 150 mm (6"), or to such greater depth as may be specified, in accordance to the requirements of AASHTO T-180 Method D.

3.02 BASE COURSE

A. Placing and Spreading of Base Course: The sub-base and/or base material shall be placed in loose layers not exceeding 200 mm. (8 "), moisture conditioned as necessary and compacted to a minimum of 95% of its maximum dry density.

B. Rolling Base Course:

1. Immediately following spreading, compact materials to the full by rolling with a 3 wheeled or tandem roller weighting at least 8 tons or with a multiple wheeled rubber tired roller loaded as directed to give satisfactory compaction.
2. Progress rolling gradually from the sides to the center, parallel with the centerline of the road and it shall continue until compaction is satisfactory to the Engineer.
3. After rolling all the base course materials blade or smoothen the surface. Blade and roll alternately as required or directed to maintain a smooth, even surface.
4. Machine tamp base course materials along curbs, headers or walls and at all places not accessible to the rollers.
5. Sprinkle all layers of base course materials with water during rolling, tamping and blading.

C. Spreading of Choker Aggregate:
1. After final rolling of base course aggregates, evenly spread choker aggregates over the surface until the voids are filled to within approximately 10 mm of the surface, and if possible, the surface shall be broomed with push brooms or diagonal brooms. Continue to spread, broom and roll until a smooth surface is obtained.

3.03 CONCRETE PAVEMENT

A. See DIVISION 3 CONCRETE for concrete proportions and consistency, form works, methods of placing concrete, compaction, finishing and curing concrete.

B. JOINTS:
1. WEAKENED PLANE JOINTS
With the use of a power driven saw, cut a groove in the pavement, at locations shown in the Plans, to a minimum depth of 50 mm. and a maximum width of 5 mm within 24 hours after the concrete was placed.
2. TRANSVERSE EXPANSION JOINTS
Use pre-moulded expansion joint fillers for transverse expansion joints as detailed and shown in the Plans or as directed by the Engineer.

C. SURFACE FINISHING
Finish the pavement surface to the required roughness by passing over the concrete a drag of one or two burlap cloths or by other approved means.

D. CURING AND PROTECTION

Immediately after the finishing operations, exposed concrete surfaces shall be cured by one of the following methods as the Contractor may elect.

1. Mat Method. The entire exposed surface shall be covered with two or more layers of burlap. Mats shall overlap each other at least 150 mm (6"). The mat shall be thoroughly wetted with water prior to placing on concrete surface and shall be kept continuously in a saturated condition and in intimate contact with concrete for not less than 7 days
2. Impervious Sheeting Method. The entire exposed surface shall be wetted with a fine spray of water and then covered with impervious sheeting material. Sheets shall be laid directly on the concrete surface with the light-colored side up and overlapped 300 mm (12") when a continuous sheet is not used. The curing medium shall not be less than 450 mm (18") wider than the concrete surface to be cured, and shall be securely weighted down by heavy wood planks, or by placing a bank of moist earth along edges, and laps in the sheets. Sheets shall be satisfactory repaired or replaced if torn or otherwise damaged. The curing medium shall remain on the concrete surface to be cured for not less than 7 days.
3. Membrane-Curing Method: The entire exposed surface shall be covered with a membrane-forming curing compound. Where type 1 curing compound is used, the concrete surface shall be shaded from the direct rays of the sun for a period of 3 days immediately after spraying. Curing compound shall be applied in two coats by hand-operated pressure sprayers at a coverage of approximately 200 square feet per gallon for both coats. The second coat shall be applied in a direction approximately at right angles to the direction of application of the first coat. The compound shall form a uniform, continuous, coherent film that will not check, crack, or peel and shall be free from pinholes or other imperfections. Apply an additional coat to all surfaces showing discontinuity, pinholes or other defects. Concrete surfaces that are subjected to heavy rainfall within 3 hours after curing compound has been applied shall be resprayed by the above method and at the above coverage at no additional cost to the Owner. Expansion-joint openings shall be sealed at the top by inserting moistened paper or fiber rope or covering with strips of waterproof paper prior to application of the curing compound, in a manner to prevent the curing compound entering the joint. Concrete surfaces to which membrane-curing compounds have been applied shall be adequately protected for 7 days from pedestrian and vehicular traffic and from any other action that might disrupt the continuity of the membrane. Any area covered with curing compound and damaged by subsequent construction operations within the 7-day curing period shall be resprayed as specified above at no additional expense to the Owner.

E. OPENING TO TRAFFIC

Preclude any or all kinds of traffic over the concrete pavement for a period of 10 days or longer if the Engineer deems it necessary to extend this time.

Maintain satisfactory barricades to exclude all traffic on the pavement. Repair of damage to the pavement due to traffic is at the expense of the Contractor.

SECTION 02515
UNIT PAVERS

1.0 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.02 SUMMARY

A. This Section includes the following:
   1. Stone pavers set in aggregate setting bed.

B. Related Sections: The following Sections contain requirements that relate to this Section:
   2. Section 02200 Earthwork: for compacted subgrade and subbase course.
   3. Section 03300 Cast-in-Place: for concrete base course.

1.03 SUBMITTALS

A. General: Submit each item in this Article according to the Conditions of the Contract and Section 01100 Items for Submission by the Contractor.

B. Product data for each type of paver.

C. Samples for initial selection in the form of manufacturer's color charts consisting of actual units or sections of units showing the full range of colors, textures, and patterns available for each type of unit paver indicated.

D. 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.

1.04 QUALITY ASSURANCE

A. Installer Qualifications: Engage an experienced Installer who has completed unit paver installations similar in material, design, and extent to that indicated for this Project and with a record of successful in-service performance.

B. Single-Source Responsibility: Obtain each color, type, and variety of unit pavers, joint materials, and setting materials from a single source with resources to provide products and materials of consistent quality in appearance and physical properties without delaying the Work.

C. Mockup: Prior to installing unit pavers, construct mockups for each form and pattern of unit pavers required to verify selections made under sample submittals and to demonstrate aesthetic effects as well as qualities of materials and execution. Build mockups to comply with the following requirements, using materials indicated for final unit of Work, including same base construction, special features for expansion joints, and contiguous work as indicated.

1. Locate mockups on-site in the location and of the size indicated or, if not indicated, as directed by Landscape Architect.
2. Notify Landscape Architect one week in advance of the dates and times when mockups will be constructed.
3. Demonstrate the proposed range of aesthetic effects and workmanship.
4. Obtain Landscape Architect's acceptance of mockups before start of final unit of Work
5. Retain and maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
   a) When directed, demolish and remove mockups from Project site.
   b) Accepted mockups in an undisturbed condition at the time of Substantial Completion may become part of the completed Work.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Protect unit pavers and aggregate during storage and construction against soilage or contamination from earth and other materials.

1. Wrap pavers in plastic or use other packaging materials that will prevent rust marks from steel strapping.

B. Protect grout and mortar materials from deterioration by moisture and temperature. Store in a dry location or in waterproof containers. Keep containers tightly closed.

2.0 PRODUCTS

Refer to Section 01020 Summary of Materials and Finishes.

3.0 EXECUTION

3.01 EXAMINATION

A Examine surfaces indicated to receive paving, with Installer present, for compliance with requirements for installation tolerances and other conditions

affecting performance of unit pavers. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Vacuum clean concrete substrates to remove dirt, dust, debris, and loose particles.
B. Remove substances from concrete substrates that could impair mortar bond, including curing and sealing compounds, form oil, and laitance.
C. Proof-roll prepared subgrade surface to check for unstable areas and areas requiring additional compaction. Do not proceed with installation of unit pavers until deficient subgrades have been corrected and are ready to receive subbase for unit pavers.

3.03 INSTALLATION, GENERAL

A. Do not use unit pavers with chips, cracks, voids, discolorations, and other defects that might be visible or cause staining in finished work.
B. Mix pavers from several pallets or cubes as they are placed to produce uniform blend of colors and textures.
C. Cut unit pavers with motor-driven masonry saw equipment to provide clean, sharp, unchipped edges. Cut units to provide pattern indicated and to fit adjoining work neatly. Use full units without cutting where possible. Hammer cutting is not acceptable.
    1. For concrete pavers, a block splitter may be used.
D. Joint Pattern: As indicated.
E. Tolerances: Do not exceed 1/32-inch (0.8-mm) unit-to-unit offset from flush (lippage) nor 1/8 inch in 10 feet (3 mm in 3 m) from level, or indicated slope, for finished surface of paving.
F. Provide edge restraints as indicated. Install edge restraints prior to placing unit pavers.
    1. Install job-built concrete edge restraints to comply with requirements of Division 3 Section "Cast-in-Place Concrete."
    2. Where pavers set in mortar bed are indicated as edge restraints for pavers set in aggregate setting bed, install pavers set in mortar first. Cut off mortar setting bed at a steep angle so that it will not interfere with aggregate setting bed.

3.04 AGGREGATE SETTING-BED PAVER APPLICATIONS

A. Compact soil subgrade uniformly to at least 95 percent of ASTM D 1557 laboratory density.
B. Place aggregate base and subbase in thicknesses indicated. Compact by tamping with plate vibrator and screed to depth required to allow setting of pavers.

C. Place graded aggregate for subbase and base over compacted subgrade. Provide compacted thickness of base and subbase indicated. Compact subbase and base to 100 percent of ASTM D 1557 maximum laboratory density.

D. Place sand for leveling course and screed to a thickness of 1 to 1-1/2 inches (25 to 38 mm), taking care that moisture content remains constant and density is loose and constant until pavers are set and compacted.

E. Treat leveling base with soil sterilizer to prohibit growth of grass and weeds.

F. Set pavers with a minimum joint width of 1/16 inch (1.5 mm) and a maximum of 1/8 inch (3 mm), being careful not to disturb leveling base. If pavers have spacer bars, place pavers hand tight against spacer bars. Use string lines to keep straight lines. Fill gaps between units that exceed 3/8 inch (10 mm) with pieces cut to fit from full-size unit pavers.

G. Vibrate pavers into leveling course with a low-amplitude plate vibrator capable of a 3500- to 5000-lbf (16- to 22-kN) compaction force at 80 to 90 Hz. Perform at least 3 passes across paving with vibrator. Vibrate under the following conditions:

   1. After edge pavers are installed and there is a completed surface or before surface is exposed to rain.
   2. Before ending each day's work, fully compact installed concrete pavers within 36 inches (900 mm) of the laying face. Cover the open layers with nonstaining plastic sheets overlapped 48 inches (1200 mm) on each side of the laying face to protect it from rain.

H. Spread dry sand and fill joints immediately after vibrating pavers into leveling course. Vibrate pavers and add sand until joints are completely filled, then remove excess sand. Leave a slight surplus of sand on the surface for joint filling.

I. Do not allow traffic on installed pavers until sand has been vibrated into joints.

J. Repeat joint-filling process 30 days later.

3.05 REPAIR, POINTING, CLEANING, AND PROTECTION

A. Remove and replace unit pavers that are loose, chipped, broken, stained, or otherwise damaged or if units do not match adjoining units as intended. Provide new units to match adjoining units and install in same manner as original units, with same joint treatment to eliminate evidence of replacement.

B. Pointing: During tooling of joints, enlarge voids or holes and completely fill with mortar or grout. Point-up joints at sealant joints to provide a neat, uniform appearance, properly prepared for application of sealant.

C. Cleaning: Remove excess grout from exposed paver surfaces; wash and scrub clean.

   1. Remove protective coating as recommended by protective coating manufacturer and acceptable to brick and grout manufacturer. Trap and remove coating to prevent it from clogging drains.

D Provide final protection and maintain conditions in a manner acceptable to Installer that ensures that unit paver work is without damage or deterioration at the time of Substantial Completion.

SECTION 02520
CONCRETE CURBS, GUTTER AND PAVED WALKS

1.00 GENERAL

1.01 SCOPE

A. Furnish all materials, labor, equipment, plant and tools required to complete
   - concrete curbs
   - gutters
   - paved walks and other concrete pavements

B. See drawings for location and extent of work.

C. Related works specified elsewhere. See Division 3 CONCRETE

1.02 PROTECTION

Protect all materials from dirt and all injurious substances that may affect the strength of concrete and cement.

2.00 PRODUCTS

2.01 MATERIALS

See Section 01020 Summary of Materials and Finishes.

3.00 EXECUTION

3.01 SUBGRADE PREPARATION

A. Prior to commencing the preparation of the subgrade complete all installations of sub-drainage lines, manholes and catch basins and all other utilities underneath the subgrade, including their fully compacted backfill.

B. Compact all materials immediately below subgrade level on embankment to a depth of 150 mm (6"), or to such greater depth as may be specified, in accordance to the requirements of AASHTO T-180 Method D.

3.02 BASE COURSE

A. Placing and Spreading of Base Course: The sub-base and/or base material shall be placed in loose layers not exceeding 200 mm. (8 "), moisture conditioned as necessary and compacted to a minimum of 90% of its maximum dry density.

B. Rolling Base Course:
   1. Immediately following spreading, compact materials to the full by rolling with a 3 wheeled or tandem roller weighting at least 8 tons or with a multiple wheeled rubber tired roller loaded as directed to give satisfactory compaction.

2. Progress rolling gradually from the sides to the center, parallel with the centerline of the road and it shall continue until compaction is satisfactory to the Engineer.
3. After rolling all the base course materials blade or smoothen the surface. Blade and roll alternately as required or directed to maintain a smooth, even surface.
4. Machine tamp base course materials along curbs, headers or walls and at all places not accessible to the rollers.
5. Sprinkle all layers of base course materials with water during rolling, tamping and blading.

C. Spreading of Choker Aggregate:

1. After final rolling of base course aggregates, evenly spread choker aggregates over the surface until the voids are filled to within approximately 1 cm. of the surface, and if possible, the surface shall be broomed with push brooms or diagonal brooms. Continue to spread, broom and roll until a smooth surface is obtained.

3.03 CONCRETE PAVEMENT

A. See DIVISION 3 CONCRETE for concrete proportions and consistency, form works, methods of placing concrete, compaction, finishing and curing concrete

B. JOINTS:

1. WEAKENED PLANE JOINTS
   With the use of a power driven saw, cut a groove in the pavement, at locations shown in the Plans, to a minimum depth of 50 mm. and a maximum width of 5 mm. within 24 hours after the concrete was placed.
2. TRANSVERSE EXPANSION JOINTS
   Use pre-molded expansion joint fillers for transverse expansion joints as detailed and shown in the Plans.

C. SURFACE FINISHING

Finish the pavement surface to the required roughness by passing over the concrete a drag of one or two burlap cloths or by other approved means.

D. CURING AND PROTECTION

Immediately after the finishing operations, exposed concrete surfaces shall be cured by one of the following methods as the Contractor may elect.

1. Mat Method. The entire exposed surface shall be covered with two or more layers of burlap. Mats shall overlap each other at least 6 inches. The mat shall be thoroughly wetted with water prior to placing on concrete surface

and shall be kept continuously in a saturated condition and in intimate contact with concrete for not less than 7 days.

2. Impervious Sheeting Method. The entire exposed surface shall be wetted with a fine spray of water and then covered with impervious sheeting material. Sheets shall be laid directly on the concrete surface with the light-colored side up and overlapped 300 mm when a continuous sheet is not used. The curing medium shall not be less than 450 mm wider than the concrete surface to be cured, and shall be securely weighted down by heavy wood planks, or by placing a bank of moist earth along edges, and laps in the sheets. Sheets shall be satisfactory repaired or replaced if torn or otherwise damaged. The curing medium shall remain on the concrete surface to be cured for not less than 7 days
3. Membrane-Curing Method: The entire exposed surface shall be covered with a membrane-forming curing compound. Where type 1 curing compound is used. the concrete surface shall be shaded from the direct rays of the sun for a period of 3 days immediately after spraying. Curing compound shall be applied in two coats by hand-operated pressure sprayers at a coverage of approximately 200 square feet per gallon for both coats. The second coat shall be applied in a direction approximately at right angles to the direction of application of the first coat. The compound shall form a uniform, continuous, coherent film that will not check, crack, or peel and shall be free from pinholes or other imperfections. Apply an additional coat to all surfaces showing discontinuity, pinholes or other defects. Concrete surfaces that are subjected to heavy rainfall within 3 hours after curing compound has been applied shall be resprayed by the above method and at the above coverage at no additional cost to the Owner. Expansion-joint openings shall be sealed at the top by inserting moistened paper or fiber rope or covering with strips of waterproof paper prior to application of the curing compound, in a manner to prevent the curing compound entering the joint. Concrete surfaces to which membrane-curing compounds have been applied shall be adequately protected for 7 days from pedestrian and vehicular traffic and from any other action that might disrupt the continuity of the membrane. Any area covered with curing compound and damaged by subsequent construction operations within the 7-day curing period shall be resprayed as specified above at no additional expense to the Owner.

E. OPENING TO TRAFFIC

Preclude any or all kinds of traffic over the concrete pavement for a period of 10 days or longer if the Engineer deems it necessary to extend this time. Maintain satisfactory barricades to exclude all traffic on the pavement. Repair of damage to the pavement due to traffic is at the expense of the Contractor

SECTION 02700
SITE DRAINAGE

1.00 GENERAL

1.01 SCOPE

Furnish all materials, labor, equipment, plant, tools required to complete the storm drainage system external to the building.

1.02 PROTECTION

Protect materials from loss, injury or defacement. Lost or damaged materials shall be replaced by the Contractor at his own expense.

2.00 PRODUCTS

See Section 01020 Summary of Materials and Finishes.

3.00 EXECUTION

3.01 EXCAVATION

A. Excavate trenches for all underground pipe lines to require depths, slope and grades.
B. Rest pipes on well-tamped solid bedding along its entire length.
C. Lay water and sewer pipes in separate trenches.
D. See SECTION 02200: EARTHWORK, ITEM 3.06

3.02 BACKFILLING

A. Pipe lines shall be tested by Contractor and by Owner's representative prior to backfilling.
B. Clean and free all excavation from trash and debris.
C. Backfill shall consist of same material excavated or other approved materials. Free backfill of debris and big stones. Place backfill in horizontal layers not exceeding 300 mm (12") or as indicated or directed.
D. Carefully place and tamp backfill under and around pipe barrel in such manner so as not to disturb pipe line and joints.
E. Properly moisten each backfill layer and compact by hand or machine to an optimum density that will present excessive settlement and shrinkage.

SECTION 03100
CONCRETE FORMWORK

1.00 GENERAL

1.01 SCOPE

A. Furnish all materials. labor. equipment . plant , tools, required to complete.
   - all cast in place concrete form work.

B. All work shall be done in accordance with the minimum requirements of the AMERICAN CONCRETE INSTITUTE CODE FOR REINFORCED CONCRETE ACI 381 except as modified herein.

C. Refer to the General Conditions for all pertinent provisions.

1.02 SUBMITTALS

Shop drawings of formwork when required by the Architect shall be submitted for approval before fabrication and erection of such formwork.

1.03 APPROVAL

A. All form materials are subject to approval before fabrication of formworks.

1.04 CLEANING AND OILING OF FORMS

A. Before placing the concrete, clean the contact surfaces of the forms of encrustation of mortar, grout, or other foreign material, and coat with standard form oil that can effectively prevent sticking and staining of the concrete surfaces.

1.05 PROTECTION

A. Provide adequately braced forms that will produce correctly aligned concrete, able to meet the specific weights and side pressure of newly placed concrete.

B. Choose form fittings that are adequate to the purpose.

C. Exercise care in the choice of surface forms and form fittings that will be in contact with concrete.

2.00 PRODUCTS

Refer to Section 01020 Summary of Materials and Finishes.

3.00 EXECUTION

3.01 PREPARATION

A. Check all forms to conform to the shape. lines and dimensions of members as called for in the plans.

B. Check all formwork for plumbness and correct alignment.

C. Provide openings in column forms for cleaning and inspection preferably at lowest points of pour lifts.

D. Provide camber for cantilever and long spans or as indicated in construction notes.

E. Coat all forms with Nox-crete form oil before reinforcement is placed. Remove all surplus oil on form surfaces.

3.02 FORM AND SHORING

A. Removal

1. Remove forms only upon approval of the Engineer in such manner that will prevent damage to the concrete and at such time as to insure the complete safety of the structure. In no case shall the supporting forms and shorings be removed until the members have attained sufficient strength to support their weight and load thereon.
2. Exercise due care while stripping forms and protect corners subsequently against chipping or other damage by approved means.
3. Any repairs of surface imperfections shall be formed at once and curing shall be started as soon as the surface is sufficiently hard to permit it without further damage.
4. The results of suitable control tests shall be used as evidence that the concrete has attained sufficient strength to permit removal of shorings and supporting forms. Cylinders required for control tests shall be made in addition to those required by this Specification.
5. The minimum time period for removal of forms shall govern where it exceeds the minimum specified curing period. Where the formwork for one element supports the framework for another element, the greater time period shall apply to both elements. Forms shall not be removed before the expiration of the minimum time specified below

Element		*Time Period (Days Min.)*
Walls, columns, sides of beams and girders, and slabs on grade		1
Pan joist forms (side only):		
30 inches wide more or less		3
Over 30 inches wide		4
Where design live load is:	less than dead load	greater than dead load
For Arch center :	14	7
Joist, beam, or girder soffits:		
Under 10 feet	7	4
10 feet to 20 feet	14	7
Over 20 feet	21	14
For one way floor slabs when clear span between structural supports		
Under 10 feet	4	3
10 feet to 20 feet	7	4
Over 20 feet	10	7

3.03 SUPPORT

Sufficient shoring members to support dead loads plus construction loads on beams and slabs shall be provided for a period of eight (8) days in addition to the seven (7) days specified thereto. The time for removal of forms for structures not included thereto shall be as directed by the Engineer. Concrete work shall be protected from damage during construction.

3.04 TOLERANCE LIMITS

A. Set and maintain concrete forms so as to insure completed work within the following tolerance limits.

1. Variation from the plumb
   a. In the lines and surfaced of columns, piers, walls and rises:
      In 3.00 m (10')……6 mm (1/4")
      In any storey or 6 00 m (20') max……10 mm (3/8")
   b. For exposed corner columns, control joints, grooves and other conspicuous lines:
      In any way 6 00 m (20') max……6 mm (1/4")
      In 12.00 m (40') or more……10 mm (3/8")

2. Variation from the level or from the grades indicated on the drawings:

   a. In floors (below removal of forms), ceiling beams, soffits and rises.
      In 3.00 m (10')……6 mm (1/4")
      In any way or 6.00 m (20') max……10 mm (3/8")
      In 12.00 m (40') or more……10 mm (3/8")
   b For exposed lintels, sills, parapets. horizontal grooves and other conspicuous lines:
      In any way of 6.00 m (20') max ……6 mm (1/4")
      In 12.00 m (40') or more. ……10 mm (3/8")

3. Variation of the linear building lines from the established position in plan and related position columns. walls and partitions:
   In any way or 6.00 m (20') max……6 mm (1/4")
   In 12.00 m (40') or more……25 mm (1")
4. Variation in the sizes and location of sleeves, floor openings and in thickness of slabs and wall.
   Openings……6 mm (1/4")
5. Variation in cross-sectional dimensions of columns and beams and in thickness of slabs and walls:
   Minus……6 mm (1/4")
   Plus……12 mm (1/2")
6. Footings
   a. Variation of dimensions in Plan

Minus.....12 mm (1/2")
Plus.....50 mm (2")
(applies to concrete only and not to reinforcing bars and dowels).

b. Misplacements of eccentricity. 5% of specified thickness.

7. Variation in steps:

a. In a flight of steps:

Rise.....3 mm (1/8")
Tread. .....6 mm (1/4")

b. In consecutive steps:

Rise.....2 mm (1/16")
Tread.... .....3 mm (1/8")

SECTION 03200
CONCRETE REINFORCEMENT

1.00 GENERAL

1.01 SCOPE

A. Furnish all materials, labor, equipment, plant, tools, required to complete:
- steel reinforcing bars
- welded wire fabric
- bar supports and dowels
- reinforcement accessories, including all wire ties, chairs, spacers, supports, and other necessary devices.

B. All pertinent provisions of the General Conditions form part of this section.

1.02 SUBMITTALS

Shop drawings of each reinforcing steel detail and placement drawings shall be submitted for approval in accordance with the requirements of the GENERAL CONDITIONS. Any material fabricated before final approval of the shop drawings will be done at Contractor's risk, but no material shall be placed until shop drawings have final approval. Shop drawings shall be in accordance with the "Manual of Standard Practice for Detailing Reinforced Concrete Structures" (ACI 315).

1.03 PROTECTION AND STORAGE

Protect steel reinforcement adequately from rusting. Store reinforcing steel on supports, above ground / floor level. Store undercover. Keep covered with tarpaulins, if required, due to a delay in use.

1.04 TESTING

Tests shall conform to ASTM Designations of specified materials. Samples for testing shall be provided by the Contractor without additional costs to the Owner. Expenses for testing shall be borne by the Contractor. Copies of the results shall be furnished to the Owner and the Architect promptly.

1.05 MEASUREMENT AND PAYMENT

For deduction or addition in the contract sum due to deletion or extra work involved, the steel reinforcement shall be measured by weight either in kilograms or in tons. The Contractor shall be paid based on the steel weight as per unit prices submitted on the proposal form. Steel bars that are not installed shall not be paid by the Owner.

2.00 PRODUCTS

Refer to Section 01020 Summary of Materials and Finishes.

3.00 EXECUTION

3.01 PREPARATION

A. Before placing reinforcement and before pouring of concrete, remove all loose rust, mill scale, oil, or other adhering materials which tend to reduce or destroy bond between concrete and reinforcement

B. Cutting and Bending:
   1. Reinforcing steel shall be accurately cut and bent in accordance with the approved detailed reinforcement drawings.
   2. Reinforcing steel shall not be straightened or re-bent in a manner that will injure the material. Bars with kinks or with bends not shown on the approved detailed reinforcement drawings or with cracks or splits on the bends shall not be used.
   3. All bars shall be bent cold. Bends for stirrups and ties shall be made around pins with a diameter of at least twice the thickness of the bars; for bars 25 mm (1") and smaller, six (6) times the thickness; for larger bars, eight (8) times the thickness.
   4. If Contractor elects to have reinforcing steel cut and bent off the Site, he shall provide, maintain and operate a small cutting and bending shop on the Site and maintain a representative stock of steel.
   5. This provision is to take care of minor revisions and additions in an expeditious manner.

3.02 PLACING REINFORCEMENT

A. Metal Reinforcement
   1. Reinforcing steel shall be accurately placed in accordance with approved detailed reinforcement drawings and shall be adequately secured against displacement by using specified tie wires or approved clips at all intersections. Refer to the Engineer in case of doubt in placing of steel.
   2. Reinforcing bars shall be accurately placed and adequately secured with concrete metal wires, metal chair spacer ties or other accessories.
   3. Wire mesh reinforcement where shown in slabs shall be secured in position by spacer bars and chairs. Spacer bars shall be lapped not less than 125 mm (5"). In slabs on ground, pre-cast concrete blocks may be substituted for chairs.

4. Reinforcing steel shall be supported by concrete or metal supports, spacers, or metal hangers, except at surfaces exposed to the ground or to the ground or to the weather, where supports shall be concrete.
5. Wooden support and wooden spreaders shall not be used. At surfaces where an attractive appearance is paramount, the support shall be of a type which shall not cause subsequent staining or marring of the exposed surface.
6. After it has been installed, reinforcing steel shall be inspected by the Engineer for compliance with requirements as to size, shape, length, splicing, position and number.

B. Bar Spacing

Spacing of bars shall be done in accordance with the ACI-Building Code or as follows:

1. Clear distance between parallel bars shall be one and one-half (1-1/2) times the diameter of the bars.
2. Clear distance shall not be less than 1-1/3 times the maximum size of aggregates, nor less than 25 mm (1").
3. Where bars are used in two or more layers, the bars in the upper layers shall be placed directly above those in the lower layers at a clear distance of not less than 25 mm (1").

3.03 OFFSET AND SPLICE IN REINFORCEMENT

A. Splices

1. Generally, avoid splices in slabs, beams and girders at points of maximum stress.

   Splices may be allowed only upon written approval of splice details by the Architect / Engineer or as shown or noted in the Plans.
2. Splice in adjacent bars shall be staggered a minimum distance of forty (40) bar diameters.

B. Offsets

Where changes in cross section of columns occur, longitudinal bars shall be offset in a region where lateral support is afforded. Where offset, the slope of the included portion shall not be more than one on six (1:6) and in case of tied columns, the ties shall be spaced 75 mm (3") on center for a distance of 300 mm (1') below and above the point of offset.

SECTION 03300
CAST-IN-PLACE CONCRETE

1.00 GENERAL

1.01 SCOPE

A. Furnish all materials, labor, equipment, plant, tools, required to complete:
- proportioning
- mixing
- placement
- curing and
- finishing of concrete

B. All pertinent provisions of the General Conditions form part of this Section.

1.02 REFERENCE STANDARDS

The latest edition of following standards shall form part of this specification:

A. ACI American Concrete Institute
B. 211.01- 85 Standard Practice for Selecting Proportions for Normal and Heavyweight Concrete
C. 301 - 84(R88)Concrete, Structural for Building
D. 309R-87 Standard Practice for Consolidation of Concrete
E. 318 – 86 Building Code Requirements for Reinforced Concrete
F. AASHTO American Association of State Highway and Transport Officials
G. M173-84 Concrete Joint Sealer, Hot-Poured Elastic Type Performed Expansion Joint Filler for Concrete
H. ASTM American Society for Testing and Materials
I. C33-86 Concrete Aggregates
J. C31-88 Standard Practice for Making, Curing Concrete Test Specimen in the Field
K. C39-86 Compressive Strength of Cylindrical Concrete Specimen
L. C42-87 Obtaining and Testing Drilled Cores and Sawed Beams of Concrete
M. C94-86 Standard Specification for Ready-Mixed Concrete
N. C143-78 Standard Test Method for Slump of Portland Cement Concrete
O. C150-86 Portland Cement, Specification for
P. C309-81 Liquid-Membrane Forming Compounds for Curing Concrete
Q. C494-86 Chemical Admixtures

1.03 REQUIREMENTS

Full coordination shall be given other trades to install embedded items. Provisions shall be made for setting items not placed in the forms. Before concrete is placed

embedded items shall have been inspected, and test for concrete aggregates and other materials shall have been done.

1.04 PROTECTION & STORAGE

A. Cement :
   1. Store cement in bags in suitable dry, water tight, properly ventilated weatherproof structure;
   2. Elevate floors above the ground to sufficiently prevent the absorption of moisture.
   3. Stock bags close together to reduce circulation of air but shall not be stocked against walls.
   4. Storage shall permit easy access for inspection and identification of each shipment.
   5. Cement that has been in storage for so long that there may be doubt of each quality shall be tested by standard mortar test to determine its suitability for use, and shall not be used without approval of the Engineer.

B. Aggregates :
   1. Store in a manner as to prevent the inclusion of foreign matter.
   2. Aggregates of different sizes shall be stored in separate piles
   3. Maintain storage piles in a manner that will afford good drainage.
   4. Stock piles of coarse aggregate shall be built in horizontal layers not exceeding 1200 mm in depth to avoid segregation. Should the coarse aggregate become segregated, it shall be remixed to conform to the grading requirements given hereinbefore.

C. Admixtures – store to prevent deterioration or intrusion of foreign matters.

1.02 SUBMITTALS

A. Concrete Mix Design

B. Samples
   Submit samples of cement and aggregates proposed for exposed architectural concrete work for approval, giving names, sources and descriptions of the material.

C. Reports
   Submit 5 copies of mix design and test results.

D. Notification
   Submit schedule of pours and location at least 7 days prior to date of pouring for approval.

1.04 MEASUREMENT AND PAYMENT

For deduction or addition on the contract sum due to deletion or extra work involved, measure cast-in-place concrete in cubic meter and base payment on the actual poured volume using the unit prices on the proposal form.

1.05 DESIGN STRENGTH OF CONCRETE

All strengths of concrete shall be as indicated on the Structural Design Criteria / Construction Notes.

2.00 PRODUCTS

2.01 MATERIALS

Refer to Section 01020 Summary of Materials and Finishes.

2.02 CONCRETE PROPORTIONS AND CONSISTENCY

A. Cement and Aggregate
Make proportions so as to produce a concrete mixture which will work readily into corners and angles of the forms and around reinforcement with the method of placing materials to avoid segregation of accumulation of excess free water on the surface.

B. Measurement
1. Measure concrete materials such that the proportions can be accurately controlled and easily checked at any time during work.
2. Conform to measurement of materials for ready mixed concrete to STANDARD SPECIFICATIONS FOR READY MIXED CONCRETE. ASTM Designation C-94, where applicable.
3. Never exceed the water content by 6 U.S gallons per bag of cement for all portions in the structure. Allow job mix adjustment of water content only on permission of the Architect / Engineer provided that cement is also added to keep the original water-cement ratio of the design mix. Limit slumps to the following.

SLUMP TEST VALUES

PORTION OF STRUCTURE	SLUMP (inches)
Column, Beams, Girders, Slabs	3-6
Foundation Elements, Bedded Slabs and Cantilevered Beams and Slabs	2-5
Pavement	2-3

C. Proportions
The proportions of all materials in concrete shall be subject to the approval of the Engineer. The Contractor shall employ on his own expense an approved testing

laboratory which shall design the mixed proportions in accordance with ACI 211.01-85. The adequacy of this mix shall be verified by a test on a minimum of 6 cylinders; 3 tested at 7 days, 3 at 28 days, in accordance with ASTM C39. These mixes shall be proved by preliminary tests 30 days before concreting and shall show a 28-day strength of 15 percent higher than the ultimate required. No substitution shall be made in the materials or mix with additional tests to show that the quality of concrete is satisfactory. If, at any time during the construction, the concrete resulting from the approved mix design proves to be unsatisfactory for any reason such as too much water, lack of sufficient plasticity to prevent segregation . honeycomb, etc., or insufficient strength, the contractor shall notify the Testing Laboratory and the Engineer. The laboratory shall modify the design, subject to the approval of the Engineer until a satisfactory concrete is obtained.

2.03 MIXING CONCRETE

A. Site Mixed Concrete

B. All concrete shall be machine mixed for at least 1 1/2 minutes after all materials including water are in the mixing drum. The time elapse between the introduction of the mixing water to the cement and aggregates and placing of the concrete in final position shall not exceed 45 minutes.

C. Placing of material in mixer shall be done in such a way that the first batch of concrete materials in the mixer shall contain sufficient excess of cement, sand and water to coat the inside of the drum without reducing the cement content of the mixed to discharged. The tampering of concrete, that is, placing additional cement, aggregate or water during mixing period shall not be permitted.

D. Let the mixer be of an approved size and type which will ensure a uniform distribution of material throughout the mass. Equip it with a DEVICE FOR ACCURATELY MEASURING, TIMING AND CONTROLLING THE AMOUNT OF MIXING WATER IN EACH BATCH and operate in accordance with the manufacturer's recommendations.

E. No hand mixing shall be allowed except in case of emergency such as mixer breakdown during pouring operations and shall stop at the first allowed construction joint

F. Re-tempering of concrete shall not be permitted. The Contractor shall mix only such quantities that are required for immediate use and mixture which has developed setting shall not be used. Concrete which has been partially hardened shall not be re-tempered.

G. Ready-Mixed Concrete

1. Ready-mixed concrete, when used shall be batched, mixed, and delivered from a plant approved by the Engineer and shall be in strict accordance with the requirements set forth in ASTM C-94.
2. The rate of delivery of the mixed concrete shall be such that the interval between placing of successive batches shall not exceed thirty (30) minutes. The elapsed time between the introduction of water to the cement and aggregate and completion of discharge shall not exceed one (1) hour or not more than 1 1/2 hours if a retarder is used. It should be kept constantly agitated during the transit period. Delivery tickets shall not exceed one (1) hour and contains the weight of sand, gravel and amount of cement and water added. The Contractor shall keep legible copies available for examination of the Engineer

3.00 EXECUTION

3.01 PREPARATIONS

A. Inspect and clean all forms and check all installations before placing concrete.
B. Wet surfaces thoroughly and grout before placing concrete.
C. Clean all laitance from previous pouring and possibly expose aggregates before renewing pouring.

3.02 CONCRETE PLACING

A. Concrete shall be placed only after all formworks, installations of materials to be embedded and preparation of surface involved in the placing have been inspected and approved by the Engineer. The Contractor shall provide equipment and shall employ methods which will minimize separation of aggregates from concrete mix.
B. Water shall be removed from excavation before concrete is deposited. Any flow of water shall be diverted through proper side drains to a pump or be removed by other approved methods to avoid washing over freshly deposited concrete. Hardened concrete, debris and foreign materials shall be removed from interior of forms and from inner surfaces of mixing and conveying equipment. Reinforcements shall be secured in position, inspected and approved before pouring concrete. Runaways shallbe provided for wheeled concrete handling equipment, such equipment shall not be wheeled over reinforcements nor shall runaways be supported on reinforcements.
C. Concrete shall be handled from the place of final deposit as rapidly as practicable by methods which shall prevent the segregation or loss of the ingredients. It shall be deposited in the forms in approximately uniform horizontal layers and as nearly as practicable in its final position to avoid rehandling.
D. Conveying or handling of concrete by the use of long; inclined chutes or pipes or more than three (3) meters shall not be permitted. Dumping of concrete into

buggies buckets or wheelbarrows with a free fall or more than one (1) meter shall not be permitted. When placing operations would involve dropping the concrete more than 1 1/2 meters, it shall deposited through sheet metal or other approved conveyor. As for practicability, the conveyor shall be kept full of concrete during placing and their lower ends shall be kept buried in the newly-placed concrete. After the initial set of concrete, the forms shall not be jarred and no strain shall be placed on the ends of the reinforcing bar which are being projected.

E. Concrete in columns shall be placed in one continuous operation. Concrete in girders, beam and slabs in superstructures shall be poured in a monolithic and continues manner. No construction joint shall be allowed on any part of the structure without the approval of the Engineer.

F Consolidation: Consolidate all concrete in accordance with provisions of ACI 309R-87. Consolidate all layers of concrete greater than four inches in depth with high frequency, internal, mechanical vibrating equipment, supplemented by hand spading and tamping. Consolidate concrete slabs 4 inches or less in depth by wood tampers, spading and settling with a heavy leveling straight edge. Operator vibrators with vibratory element submerged in the concrete with a minimum frequency of not less than 6000 impulses per minute when submerged. Insert and withdraw vibrators approximately 18 inches apart. Penetrate the previously lift with the vibrator when more than one lift is required. Place concrete in 18-inch maximum vertical lifts. Limit duration of vibration to time necessary to produce satisfactory consolidation without causing segregation of aggregates. Provide adequate number of units and power source at all times. Maintain spare units to ensure adequacy. If in the opinion of the Engineer, the equipment being used is not adequate to accomplish proper consolidation, the Engineer may order delay in proper placement of concrete until such equipment is available for use at the location of placement of concrete.

3.03 FLOOR FINISHES

Floor finishes shall be noted carefully by the Contractor. Prepare slabs suitable in surface and elevation to receive finishes. Consult Division 9 Finishes and its application.

3.04 CONCRETE JOINTS

a) Construction Joint

Construction joints shall be provided where indicated in the Drawings or as directed by the Engineer. Joints not indicated on drawings shall be so made and locate as not to impair the strength of the structures. When a construction joint is to be made, the surface of the hardened concrete shall be thoroughly cleaned and all laitance removed. In addition, the joint shall be thoroughly wetted and sloshed with a coat of neat cement grout immediately prior to placing of new concrete.

b) Expansion and Contraction Joints

a) Expansion and contraction joints shall be provided where indicated and shall be in accordance with details.

c) Preformed Strips

Preformed strips shall be placed before the adjoining concrete of a joint is poured. The joint sealer shall be applied after concrete on both sides of the joint have been poured and after the joint lines have been trued.

3.05 PROTECTION AND CURING CONCRETE

A. General.

Concrete surfaces exposed to conditions causing premature drying shall be protected as soon as possible with canvas. straw. burlap, sand or other satisfactory materials and kept moist; or if the surfaces are not covered they shall be kept moist by flushing or sprinkling, as directed by the Engineer. All concrete shall be moist cured for a period of not less than seven consecutive days after placing by an approved method or combination of methods applicable to local conditions.

B. Moist Curing

The surface of the concrete shall be kept continuously wet with water for a period of seven (7) days, by spraying or covering with burlap or other approved material thoroughly saturated with water or keeping the covering wet by spraying or intermittent hosing. Water for curing shall be generally clean and free from any element which might cause objectionable staining or discoloration of the concrete.

3.06 REPAIR OF CONCRETE

A. Correct all imperfections on concrete surfaces to produce concrete and concrete surfaces that conform to the requirements of this Section.

B. Unless otherwise approved by the Engineer, repair of imperfections in formed concrete shall be completed after 24 hours of removal of forms.

C Large bulges and abrupt irregularities shall be removed by bushing, hammering and grinding.

D. Honeycombed or otherwise defective area shall be cut out to solid concrete but to depth of not less than 25 mm. The edges of the cut shall be perpendicular to the surface of the concrete.

E. All imperfections on formed surfaces shall be repaired by patching with cement mortar:

   i. Use white cement in the concrete to provide a finish color matching the surrounding concrete, except that for exposed surfaces.

   ii. Saturate the area to be patched and at least 150 mm adjacent thereto with water before placing the mortar.

   iii. Mix the mortar approximately one hour before placing and remix occasionally during this period with a trowel without adding water.

iv. Then brush a grout of cement and water, mixed to the consistency of paint, onto the surface to which the mortar is to be bonded. Compact the mortar into place and screed slightly higher than the surface.

v. Finish patches on exposed surfaces to match the adjoining surfaces, after they have set for an hour or more. Cure patches as specified for the concrete.

d) Use mortar filling placed under impact of mortar gun as drypack filling for holes too shallow for concrete filling and these holes should be no deeper than the far side of the reinforcement nearest the surface.

e) Concrete filling shall be used for holes extending entirely through the concrete for holes which are greater in area then 1,000 square centimeters and deeper than 10 centimeters and for holes in reinforced concrete which are greater in area than 500 square centimeters and which extend beyond reinforcement..

f) Filling shall be bonded tightly to the surfaces of the holes and shall be sound and free from shrinkage, cracks and drumy areas, after the fillings have been cured and dried

g) Exposed surfaces shall utilize plywood forms, and after the removal of forms, shall not be plastered, unless otherwise directed by the Engineer.

h) All joint marks of the formwork shall be reworked to a smooth surface to match adjacent areas and to present a neat appearance.

i) All materials, procedures and operations used in the repair of concrete shall be as directed by the Architect / Engineer.

j) The cost of all materials, labor and equipment used in the repair of all materials shall be borne by the Contractor.

3.07 TEST OF CONCRETE

A. Concrete Samples and Testing

The Contractor shall be required to make test on concrete samples taken from actual pouring of concrete on site under the Supervision of the Engineer. Throughout the period the concrete is being poured into the forms and while spading operation are being done, sets of test samples in cylinder shall be taken from fresh concrete from the forms.

The Contractor shall employ, at his own expense, an approved testing laboratory which shall make the following test and immediately submit five copies of test reports to the Engineer. The following test shall be made each 10 cu.m. of concrete or fraction thereof, but not less than one (1) set of tests, shall be made from any one batch of concrete and all three (3) tests shall be made from the same batch.

1. Compression Tests:

The Contractor shall furnish six (6) standard 150 x 300 mm cylindrical mould and place on the fresh concrete inside the cylinder in three separate equal layers rodded separately with 16mm diameter rod 25 strokes, with the tamping end rounded to a hemispherical tip of the same diameter. Level the surface with trowel and label the samples identifying the proportion of concrete, date taken and place taken. These samples are to be cured in the same manner as to the concrete in the construction cured.

a) Test one cylinder at the age of seven (7) days, and one cylinder at the age of twenty eight (28) days. in accordance with ASTM C31 and C39. Keep one cylinder in reserve for a fifty six day test, if the twenty eight day test does not meet the requirements.
b) The Contractor shall make additional cylindrical sample as required or as directed by the Engineer, to check strength of concrete in the construction.

2. Slump Tests.

a) To determine the consistency of workable fluidity of freshly-mixed concrete in the field, the Contractor shall keep all times a slump cone at the site. At least two slump test shall be made and the sample of concrete from which test specimens are made shall be representative of the entire batch and shall conform with the procedures as specified in ASTM C143-78.
b) Place freshly-mixed concrete in the slump cone 100 x 200 mm x 300 mm in equal layers. Rod each layer with 25 strokes of the tamping rod 16 mm diameter with the tamping end rounded to a hemispherical tip of the same diameter. Level the mould and lift at once. Measure the slump action immediately by getting the difference in height between the height of the mould and the top of the slumped concrete.
c) The slump for vibrated concrete shall be 50 mm minimum and 100 mm maximum provided that the required strength of concrete is obtained.

3. Test Reports:

a) The testing laboratory shall submit four copies of its test cylinder reports which are to include as far as applicable, the following items: Location of pour in the structure, concrete design, mix number, concrete design strength. type and manufacturer of cement, amount of any admixture used, slump tests, date of sampling, cylinder application number. days cured in the field. days cured in the laboratory, age at time of testing, crushing stress. type of failure, who made the samples, who shipped the samples to the laboratory and whether concrete strength meets the specifications.

4. Additional Tests:

a) If, in the opinion of the Engineer, based on cylinder strengths below specifications requirements or visual defects, concrete of poor quality has been placed, additional test shall be made as directed by the Engineer and at the expense of the Contractor. Test may be compression test on cored cylinder. ASTM C42, and /or load tests as outlined in ACI 318, Sec. 202, or as directed.

3.08 FAILURE OF TEST SAMPLES

i. In any case of failure to meet specified strength, the Contractor may, at his expense, obtain concrete core samples from the poured concrete and have their compressive strength determined by a competent testing authority which shall be taken as a conclusive evidence of its strength and integrity, provided the curing will not impair the safety of the structure and can be satisfactorily replaced.
ii. To determine adequacy of the structure, the Owner shall have the option to order load tests on parts of the structure where concrete strength tests are below 80% of those specified. These tests are to be done in accordance to ACI 318-89 recommendations and the cost are to be borne by the Contractor.
iii. Demolition and concrete replacement, if recommended by the Engineer shall be borne by the Contractor.

3.09 LIQUIDATED DAMAGES FOR FAILURE TO MEET CONCRETE REQUIREMENTS

For strength to concrete obtained on molded or drilled test specimen less than those required on Article 3.06, the Contractor shall pay to the Owner as liquidated damages, and not as a penalty or forfeiture. The following are the percentages of the proposed unit prices per cubic meter for the quantity of concrete directly and indirectly affected by the failure to meet strength requirements regardless of whether or not analyses of test results show that the concrete in place can still safely carry the design loads:

A. For concrete less than one hundred percent (100%) but greater than ninety-two percent (92%) of specified strength, payment of thirty percent (30%) of the cost per cubic meter of concrete.
B. For concrete equal to or less than ninety-two (92%) but greater than eighty-five percent (85%) of the specified strengths, payment of sixty-five percent (65%) of the cost per cubic meter of concrete.
C. For concrete equal or less than eighty-five percent (85%) of the specified strengths, removal of the concrete deposited and its replacement at the expense of the Contractor.

3.10 INSPECTION

Concrete shall be proportioned, mixed and placed only in the presence of the Architect / Engineer. The Architect / Engineer shall be notified in advance to provide ample time for inspection of reinforcing steel bars before any mixing and placing of concrete is commenced.

SECTION 03400
ARCHITECTURAL PRECAST CONCRETE

1.00 GENERAL

1.01 SCOPE

A. Furnish all materials. labor. equipment, plant, tools, required to complete all architectural pre-cast mouldings. units, etc.

B. See drawings for location and extent of work required.

1.02 SUBMITTALS

A. Shop Drawings- Submit shop drawings showing mounting details for the approval of the Architect/Engineer.

B. Samples- Submit sample of each type for the approval of the Architect/Engineer.

1.03 DELIVERY, HANDLING AND STORAGE

Handle, store and protect precast items both in transit and on jobsite to avoid chipping, breaking or contact with soil. Materials shall not be delivered unduly long before it is required for the proper conduct of work.

1.04 QUALITY CONTROL

A. Ensure that the preceeding work is clean and ready to receive units.

B. Check reinforcing steel dowels for straightness, proper alignment, spacing, size and length.

C. Observe field proportioning of mortar. Visually check aggregate to determine uniformity of grading, cleanliness and moisture.

D. Reject damaged materials and ensure good quality materials to be installed.

E. Ensure that the joints are full of mortar and kept light during work.

F. Check plumbness of units installed.

G. Keep complete record of inspection.

2.00 PRODUCTS

2.01 MATERIALS

Refer to Section 01020 Summary of Materials and Finishes.

2.02 CONCRETE MIXES

A. Normal-Weight Concrete Face and Back-Up Mixes: Proportion mixes by either laboratory trial batch or field test data methods according to ACI 211.1, using materials to be used on the Project, to provide normal-weight concrete with the following properties:

1. Compressive Strength (28-Day): 20.7 Mpa (3000 psi).
2. Maximum Water-Cement Ratio at Point of Placement: 0.40.

2.03 MOLDS

A. Accurately construct molds, mortar tight, of sufficient strength to withstand pressures due to concrete-placing operations and temperature changes.

B Maintain molds to provide completed architectural precast concrete units of shapes, lines, and dimensions indicated, within fabrication tolerances specified.

2.04 FABRICATION

A. Accurately position cast-in anchors, inserts, plates, angles, and other anchorage hardware for attachment of loose hardware and secure in place during precasting operations. Locate anchorage hardware where it does not affect the position of the main reinforcement or the placing of concrete.

B. Discard architectural precast concrete units that are warped, cracked, broken, spalled, stained, or otherwise defective unless repairs are permitted by Architect and meet requirements

3.00 EXECUTION

3.01 PREPARATION

Clean laitance, dust, dirt, organic or other foreign materials from concrete surface upon which reinforced masonry is to be placed. Use sand blasting, if necessary to remove laitance from pores.

3.02 INSTALLATION

A Install clips, hangers, and other accessories required for connecting architectural precast concrete units to supporting members and back-up materials.

B. Mortar joints- Spread all bed joints with mortar to the full thickness of the face. Avoid fins of mortar that protrude into cells to be grouted.

C. Install architectural precast concrete units plumb, level, and in alignment. Provide temporary supports and bracing as required to maintain position, stability, and alignment as units are being permanently connected.

3.03 CLEANING

A. Clean exposed surfaces of architectural precast concrete units after erection to remove weld marks, other markings, dirt, and stains.

1. Wash and rinse according to architectural precast concrete fabricator's recommendations. Protect other work from staining or damage due to cleaning operations.
2. Do not use cleaning materials or processes that could change the appearance of exposed architectural precast concrete finishes.

SECTION 04100
MORTAR

1.00 GENERAL

1.01 SCOPE

A. Furnish all materials, labor, equipment, plant, tools, required to complete
- plaster
- masonry work and
- patching mortar

as shown in the drawings and specified in the Summary of Materials and Finishes herewith.

B. Unless otherwise indicated on drawings or specified herein, all materials or work under the division shall be subject to the provisions under Division 3 CONCRETE

2.00 PRODUCTS

2.10 MATERIALS

Refer to Section 01020 Summary of Materials and Finishes.

2.02 MIXES

Cement Mortar:
1 part Portland Cement
2 parts sand, but not more than 1 part Portland Cement, 3 parts sand.
For plaster works thicker than 25 mm (1"), use plaster mix with FIBRIN – 23 as per manufacturer's specifications.

3.00 EXECUTION

3.01 INSTALLATION

A. Application of Cement Plaster

1. Scratch Coat: Apply with sufficient force and material to form full keys or bond. Cross scratch as soon as scratch coat has attained initial set and apply brown coat as soon as practicable.

2. Brown Coat: Scratch or broom for bond of finish coat and allow to set hard. Keep brown coat moist until finish coat is applied.
3. Finish Coat: Bring to true. even surfaces with rods and trowel smooth, leaving finished surface free from tool marks and blemishes. Keep cement plaster moist for at least 3 days and protect against rapid drying until cured.

B. Application of masonry mortar

Lay all concrete hollow blocks with 10 mm (3/8") horizontal and vertical mortar joints.

C. Application of patching mortar

1. Provide the same mixture of gray and white cement for patching mortar and used to fill holes and imperfections, but should be richer mixture and the cement and sand proportions should be the same as those used in the concrete.
2. Never steel trowel patches. but finish with wood or cork floats.
3. Allowing the mixed patching mortar to stand for an hour or two before using it, reduces the amount of shrinkage. but never add water in remixing it.
4. No cement dusting is allowed to hasten any phase of surface for floors and wall finishing.

SECTION 04420
EXTERIOR STONE CLADDING

1.00 GENERAL

1.01 SCOPE

A. Furnish all materials, labor, equipment, plant, tools required to complete:
   - All Stone Exterior Wall Cladding

B. See drawings and details for location.

1.02 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

2.00 PRODUCTS

Refer to Section 01020 Summary of Finishes and Materials.

3.00 EXECUTION

3.01 EXAMINATION

A. Examine surfaces to receive stone flooring finishes and conditions under which finish will be installed for compliance with requirements for installation tolerances and other conditions affecting performance of stone paving and flooring.

3.02 PREPARATION

A. Vacuum clean concrete substrates to remove dirt, dust, debris, and loose particles.

B. Remove substances from concrete substrates that could impair mortar bond, including curing and sealing compounds, form oil, and laitance.

C. Clean stone surfaces that have become dirty or stained by removing soil, stains, and foreign materials before setting. Clean stone by thoroughly scrubbing with fiber brushes and then drenching with clear water. Use only mild cleaning compounds that contain no caustic or harsh materials or abrasives.

3.03 INSTALLATION, GENERAL

A. Execute stone paving and flooring installation by skilled mechanics and employ skilled stone fitters at the site to do necessary field cutting as stone is set.

B. Set stone to comply with Drawings and Shop Drawings. Match for color and pattern by using units numbered in sequence as indicated on Shop Drawings. Waterproof wall base before installing stones.

C. Scribe and field-cut stone as necessary to fit at obstructions. Produce tight and neat joints.

D. Provide the necessary stainless-steel anchors to fix the stone slab finish permanently on walls.

SECTION 05100
STRUCTURAL STEEL FRAMING

1.00 GENERAL

1.01 SCOPE

A. Furnish all materials, labor, equipment, plant, tools, required to complete fabrication and erection of all structural steel and miscellaneous steel items complete, as shown and/or as specified including:
   - Furnishing of anchor bolts for structural steel columns and responsibility for their correct locations, provide templates;
   - Brackets and miscellaneous iron connections, shop-connected to structural members;
   - Beam Penetrations as indicated in the drawings;
   - Installing and removing temporary guys, shores, scaffolding and bracing required for steel erection.

B. Where so indicated on the plans, structural members shall be joined by welding. The welds shall be of size and type indicated and shall be made by competent operators.

1.02 RESPONSIBILITY

A. Contractor shall be responsible for the accurate location of all steel work including all items used to attach materials to other parts of the work.

B. Contractor shall see to it that any and all items of work which are to be built into the works of other trades are installed at the proper time.

C. Contractor shall notify the Architect / Engineer if the steel work shall be fabricated in a shop other than the site, so that arrangements can be made together with the Project Representative in the inspection of the delivered materials and in the fabrication of the steel work.

D. Where specified steel sizes and thicknesses are found unavailable in market, all affected items shall be upgraded to next higher level of size and thickness.

1.03 REFERENCES, CODES AND STANDARDS

A. Specifications for the Design, Fabrication and Erection of Structural Steel for Buildings of the American Institute of Steel Construction (AISC), latest edition.

B. Code of Standard Practice for SteelBuildings and Bridges, of AISC, latest edition.

C. Code for Welding in Building Construction, D1.1 of the American Welding Society (AWS).

D. Specifications for Structural Joints using ASTM A 325 or A490 Bolts by the Research Council of Riveted and Bolted Structural Joints.

1.04 QUALIFICATIONS

A. Welding procedures, welders, welding operations and tackers shall be qualified in accord with the AWS Code.

1.05 SUBMITTALS

A. Shop Drawings
   1. In accordance with the requirements of the General Conditions, furnish complete detailed fabrication and erection shop drawings including details of all connections for review and approval of the Engineer.
   2. The Engineer will review and approve all shop drawings. Re-submit if any corrections are required.

B. Proof of Compliance: Submit the following in three (3) copies for review by Testing Laboratory and Architect.
   1. Certified reports of tensile properties and bend tests for steel shapes, bar, and plates.
   2. Certificates of conformance for structural steel tubing.
   3. Affidavit (in duplicate) that structural steel having a yield strength greater than 36 ksi conforms to requirements of Drawings and Specifications.

1.06 DELIVERY, STORAGE AND HANDLING

A. Shipping statements shall be delivered in the jobsite. The Project Representative and the Engineer shall inspect the materials per delivery and may request additional tests on the materials delivered, if in their opinion, there is reasonable doubt as to the materials specification. The fabrication and delivery of the fabricated structural steel should conform with the approved schedule of erection and items such as anchor bolts, anchorage and others that have to be placed in concrete which shall be in jobsite before such concrete structural member will be poured. Erection marks shall be painted on structural steel members and fabricated sections. Small structural members such as rivets, bolts, nuts, washers, etc, should be shipped and kept in properly marked suitable container.

B. Structural steel members which are stored at the site or a staging area shall be above ground on platforms, skids, or other supports. Store fasteners and welding electrodes in a weathertight and dryplace until ready for use. Store packaged materials in their original containers.

2.00 PRODUCTS

A.. MATERIALS: Refer to Section 01020 Summary and Finishes.

B. FABRICATION:

1. Fabricate structural steel within tolerances specified under Codes and Standards referenced in paragraph 1.03.
2. Fabricate and assemble structural steel in the shop to the greatest extent possible. Do shearing carefully and accurately using machine equipment where possible.
3. Connections shall be welded or bolted as indicated. Shop connections not otherwise shown shall be welded. Eccentric connections are not permitted unless shown in detail on shop drawings.
4. Surfaces required to be milled or planned are indicated on the drawings.
5. Provide bearing plates for members bearing on footings, piers and walls.
6. Drift pins may be used for assembling parts provided metal is not distorted or holes enlarged. Holes requiring enlargement to admit bolts shall be reamed. Misaligned holes will subject members to rejection.
7. Shop Cleaning:
   a) Cleaning: Thoroughly clean loose mill scale, rust, dirt, grease and other foreign matter from structural steel shapes.
8. Shop Painting. Shop paint structural steel work which will be exposed in the finish work and other fabrications exposed to weather. Coordinate the use of primer paint on the steel with architectural drawings and fire ratings.
   a) Surface Preparation: After inspection and before shipping, clean steel work to be painted. Remove loose rust, loose mill scale, and spatter slag or flux deposits. Clean steel in accordance with Steel Structures Painting Council (SSPC) SP-2, SP-3. or SP-7.Remove oil and grease deposits by solvent.
   b) Painting: Immediately after surface preparation, apply structural steel primer paint in accordance with manufacturer's instructions and at a rate to provide uniform dry film thickness on 1.5 mils. Use painting methods which will result in full coverage of joints, corners, edges, and exposed surfaces.

3.00 EXECUTION

3.01 CONDITION OF SURFACES

A. Before starting work, verify locations and elevations of bearings and anchor bolts. Immediately report inaccuracies. Work under this Section shall include responsibility for accurate bearing of steel and correct location of anchorage.

3.02 ERECTION

A. General - The Contractor shall use special care in unloading, handling and erecting the steel to avoid bending, twisting or otherwise distorting the steel members. The erector shall handle the materials in such a way as to minimize the damage to the shop coat of paint The Contractor shall plan and execute the erection in such a way so that the close fit and neat appearance of the joints and the structure, as a whole will not be impaired. If temporary braces or erection slips are employed, care shall be taken to avoid any unsightliness upon removal. Tack welds shall be ground smooth and holes shall be filled with weld metal or body solder and smoothed by grinding or filing. The Contractor shall submit to the Architect or Engineer the sequence of erection for approval.

B. Erect items of structural steel in accord with applicable provisions of Reference Standard 1.03.

C. Erection Tolerances:

1. Structural Steel work erection tolerances shall be in accord with "AISC Specification for the Design, Fabrication and Erection of Structural Steel for Buildings" and "AISC Code of Standard Practice for SteelBuildings and Bridges".
2. Let all structural members of single rolled shape and built-up members fabricated by riveting or welding, unless otherwise specified, be straight within the tolerances allowed by ASTM Specification.
3. Never let compression members deviate from straightness by more than 1/100 of the axial length between points which are to be laterally supported.
4. Let completed members be free from twists, bends and open joints. Sharp kinks or bends shall be the cause of rejection of materials

D. Field connections shall be welded or bolted as indicated.

E. Temporary Bracing: Introduce wherever necessary to provide for loads to which structure is subjected including erection equipment and its operation. Leave in place until no longer required for safety. Make proper provisions for construction loads, piles of materials, equipment, etc., carried by structural frame during erection.

F. Alignment: No riveting, permanent bolting or permanent welding shall be done until the structure has stiffened with the resulting stresses and properly aligned.

3.03 WELDING TECHNIQUE

A. Perform welding in accord with appropriate Section of Reference Standards.

B. Conform the technique of welding employed, the appearance and quality of welds made, the methods used in correcting defective work to the requirements of the Standard Code for Welding in Building Construction of the American Welding Society.

C. Make surfaces to be welded free from loose scale, slag, rust grease, paint and any other foregoing material except that mill scale which withstands vigorous wire brushing remain Any shop paint on surface adjacent to joints to be field welded shall be wire brushed, to reduce the paint film to a minimum.

D. Prepare edges by gas-cutting, whenever practicable, cut by a mechanically guided torch.

E. Let gas cut edges which will be subjected to substantial stress or which are to have weldmetal deposited on them be free from gouges. Remove by grinding any gouges that remain from cutting.

F. Shape all re-entrant corners notch free to a radius of at least 12 mm (1/2")

G. Bring the fit of joints at contact surfaces which are not completely sealed by welds, close enough to exclude water after painting.

H. Align all abutting parts to be welded carefully. Correct misalignments greater than 3 mm (1/8") and in making the correction, never draw parts into a slope sharper than two (2) degrees (7/16 inch in 12 inches).

I. Position the work for flat welding whenever practicable.

J. In assembling and joining parts of structure or of built-up members, avoid needless distortion and minimize shrinkage stresses. Where it is impossible to avoid high residual stresses in the closing welds of a rigid assembly, make closing welds in compression elements.

K. In the fabrication of cover plated beams and built-up members, make all shop splices in each component part before such component part is welded to other parts of the member.

L. Backing strips may be removed by gouging or gas cutting after welding is completed, provided no injury is done to the base metal and weld metal. Weld metal surface is left flush or slightly convex with full throat thickness.

M. Terminate butt welds at the ends of a joint in a manner that will ensure soundness. Where possible, do by the use of extension bars or run-off plates. Remove extension bars or run-off plates upon completion of the weld. Make the ends of the weld smooth and flushed with abutting parts.

N. Undercut and overcut should be avoided.

3.04 BOLTING

A. As erection progresses, bolt up work to take care of dead loads, construction live loads, lateral forces and erection stresses. Tighten all bolts to a bolt tension not less than the proof load given in the applicable ASTM Specification for the type of the bolt used.

B. Unless otherwise noted, erection bolts used in welded construction may be either tightened securely and left in place or removed and the holes filled with plug welds.

C. Make high strength bolted connections in accord with Reference Standard for "high-type" connections with threads excluded from shear plane for bearing-type connections.

D. Contact surface with "slip critical (friction) type" connections shall be free of oil, paint, lacquer, or other coatings.

E. Tighten nuts using Direct Tension Indicators. Minimum bolttension as per Reference Standard for each bolt type and size used. Use beveled washers to

compensate for parallelism when outer face of bolted parts has a slope greater than 1:20 with respect to a plane normal to the bolt axis.

F. Let completed member be free from twist, bends and open joints. Sharp or bends shall be the cause of rejection of materials.

G. When bolts have been completely tightened, mark with identifying symbol.

3.05 FIELD PAINTING

A. For convenience, all steel works shall receive final painting on the ground before erection on a higher level. Connections made on the field by bolting or welding shall receive another coat of enamel paint.

B. All steel work connections shall be free from loose mill scale, rust, weld slag and other foreign matter.

C. After erection, all unpainted areas including any marred or damaged surfaces shall receive one coat of same rust inhibitive paint as used in the shop painting.

3.06 QUALITY CONTROL, TESTS AND INSPECTIONS

A. Testing Laboratory: A qualified testing laboratory, meeting requirements of ASTM E 329 shall be approved by the Design Structural Engineer. Testing and Inspection shall be as required by Drawings as well as these Specifications. Inspection of welding shall be in accordance with the provisions of Section 6 of the Standard Code for Welding in Building Construction of the American Welding Society. All tests are charged to the contractor.

B. Tests for structural steel shall be made and reports furnished by Testing Laboratory in accord with the following requirements:

1. Mill Tests and Inspection of Structural Steel:

   a) Test of Mill Order A36: Where steel, ordered from mill, cut to lengths, is identified by heat or melt numbers and is accompanied by mill analysis test reports, material shall be used without further local tests, provided an affidavit is given that materials conform with requirements. In case of controversy, tension and bend tests of materials, either locally or at the mill, as required for local stock is mandatory.

   b) Test of Unidentified Steel: In the event that structural steel cannot be identified by heat or melt numbers and is accompanied by mill analysis and test reports, such stock may be used, provided one (1) tension and one (1) bend test is made for each 50 tons or fractional part. of stock as may be used in the work. Complete four-sided surface inspection may be required for materials. Each piece of high-strength local stock steel shall be tested and stamped.

   c) Test Specimens shall be taken under direction of Testing Laboratory and shall be machined by the Contractor, at his expense, to dimensions as required by related applicable Standard ASTM Specification.

2. Tests of Welding and Bolting: Testing Laboratory shall inspect shop and field welding and inspect high tensile bolting. Testing Laboratory shall certify in writing, upon completion of work, that welding and high tensile bolting has been performed in accord with Drawings and Specifications and applicable Reference standards in 1.03.
3. Inspection of High Tensile Bolts: Testing Laboratory shall check bolt tightness on 100% of bolts.
4. Continuous Inspection of Welds: Testing Laboratory shall inspect welded connections of column to column, column to girder, or girder to girder by ultrasonic or other approved non-destructive tests.
   a) Ultrasonic testing shall be performed by a specially trained, qualified technician, who shall operate equipment, examine welds and maintain a record of welds examined, defects found and disposition of each defect. Defective welds shall be repaired and costs of retesting defective welds shall be borne by the Contractor.
   b) Welds requiring ultrasonic testing shall be tested at the rate of 100%.
   c) When ultrasonic indication arising from the weld root can be interpreted as either a weld defect or backing strip, backing strip shall be removed at expense of Contractor, and if no root defect is visible, weld shall be retested. If no defect is indicated on this retest and no significant amount of base and weld metal have been removed, joint needs no further repair or welding. If a defect is indicated, it shall be repaired at no expense to Owner.
   d) Questionable root indications that prove not to be defective shall not count against welder to increase test rates.
   e) Ultrasonic instrumentation shall be calibrated by a qualified technician to evaluate quality of welds in accord with AWS D1.1, Appendix C.
   f) Other methods of inspection, for example, x-ray, gamma ray, magnetic particle, or dye penetrant, may be used on welds if deemed necessary by Testing Laboratory with cooperation of Contractor.
5. Ultrasonic Material Inspection:
   a) All column materials within 1 foot (6 inches either side) of a direct butt-weld for girder flange connections is to be ultrasonically tested for laminations in accord with ASTM designation A578-Level II.
   b) Material in designated location shall be tested for laminations by ultrasonic means prior to fabrication, with written reports submitted to Architect.
   c) Detection of Laminations: Rejectable defect discovered by ultrasonic means are defined as follows. Using suitable calibrated ultrasonic equipment, any recordable discontinuity causing complete loss of back-reflection and which cannot be encompassed within a 3-inch diameter circle is unacceptable (Level II Standard of Acceptance). Should such flaws be detected, they may be repaired by welding, subject to Engineer's review.

d) All full penetration groove welds, all partial penetration groove welds and all electro slag welds shall be subjected to ultrasonic testing.

3.07 IDENTIFICATION

A. Mark to identify the ASTM Specifications of steel for main components.
B. Identify such steel in completed members or assemblies by painting the designation of the piece over any shop coat of paint, prior to shipment from fabricators plant.

SECTION 05200
MISCELLANEOUS METALS

1.00 GENERAL

1.01 SCOPE

A. Furnish all materials, labor, equipment, plant, tools, required to complete all stainless steel works for roof flashing, window grilles, stone anchors, stair and ramp railing and others, as required

10.2 MEASUREMENTS AND COORDINATION

Obtain measurements for all work required to be accurately fitted at the job and not from the drawings. The Contractor will be responsible for the accuracy of all such measurements and the precise fitting and assembly of the finish products Coordinate the work with that of all other trades to prevent interference. Verify conditions at the job before fabrication.

2.00 PRODUCTS

Refer to Section 01020 Summary of Materials and Finishes.

3.00 EXECUTION

3.01 WORKMANSHIP

A. Make all works well formed to shape and size shown and assemble as detailed. Methods of fabrication and assembly however, unless otherwise specifically stated, shall be of first quality craftsmanship and at the discretion of the Contractors whose responsibility shall be to guarantee satisfactory performance as herein specified.

B. Cut, shear and punch to produce clean, true lines and surfaces with burrs removed.

C. Weld or bolt connections as indicated. Use countersunk screws recessed work where possible. Make all details of assembly strong with sufficient stiffness. Form joint exposed to weather in a manner to exclude water.

D. Provide all work with proper clearances. Fabricate and install in a manner to provide for expansion and contraction but will insure rigidity and provide close fitting of sections.

E. Fabricate and install as directed by the Manufacturer.

F. Provide a protective clear coating which is resistant to alkaline, mortar and plaster to be applied to aluminum sections after fabrication.

3.02 PROTECTION

Protect all finished work until turnover to the Owner.

SECTION 06100
ROUGH CARPENTRY

1.00 GENERAL

1.01 SCOPE

A. Furnish all materials, labor, equipment, plant, tools, required to complete:
   - Wooden framing
   - Related rough carpentry work

B. Include in the works, nailing strips, scaffoldings, plates, straps, joists, hangers, rods, dowels, hardware, fasteners and other miscellaneous iron and steel items pertinent to rough carpentry work.

1.02 STORAGE AND PROTECTION

A. Stack framing lumber to insure against deformation and maintain proper ventilation.

B. Protect lumber from elements.

C. Lumber in contact with concrete or masonry shall be coated with two (2) coats of asphalt applied hot.

D. Temporary Protection
   1. Provide and maintain temporary protection of the work as required to safeguard completed or partially completed work during the progress of the construction.
   2. Provide all the necessary rough stairs, ladders, runways for convenient access to all parts of the building until other permanent facilities are in place.

2.00 PRODUCTS

2.01 LUMBER

A. Moisture Content -- Not to exceed 18 percent.

B. Grade and Trade Mark -- Required on each piece of lumber. All lumber, excluding scaffoldings, to be pressure treated, conforming to 67% stress grade lumber in accordance to the requirements of the Philippine National Building Code, latest edition.

C. For K. D. Tanguile plywood inner sides, and cut ends of Apitong framings, supplementary termite and rot treatment to be applied by Owner accredited termite and pest control company.

D. Refer to the Section 01020 Summary of Materials and Finishes.

2.02 SUBSTITUTION OF LUMBER

Any lumber equally good for the purpose intended may be substituted for kinds specified, provided, however, the substitution needs to be authorized in writing by the Architect.

2.03 ROUGH HARDWARE AND METAL FASTENERS

Plates, straps, nails, spikes, bolts, joists, hangers, rods, dowels, fasteners and miscellaneous iron and steel items shall be of sizes and types to rigidly secure members in place.

3.00 EXECUTION

3.01 INSTALLATION

A. Fit carefully mortise and tenon joints of all framing including tongues and grooves of sheathings. Anchor all frames coming in contact with concrete, unless otherwise specified by means of 20 D nails, spaced not more than 200 mm. (8") apart all around the contact surfaces. Plane and dress side of frame that will receive the wall boards of sidings.

B. Wood nailers shall be in accordance with detail drawings. Where not indicated on the drawings or mentioned herein, nailing strips shall be 25 mm. x 50 mm. (1" x 2") spaced at 400 mm. (16") on center both ways. Fasten securely by expansion bolts or other approved device at every 600 mm. (2') on center.

C. Make all exposed nails countersunk. Do scribbling, mitering and joining accurately and neatly to conform to details.

D. Effect butt joint appearance for all T and cross intersections or exposed frames. When stronger joints are required, introduce half-laps, doweling or tenon and mortise but still effect simple joints at the exposed surface.

SECTION 06200
FINISH CARPENTRY

1.00 GENERAL

1.01 SCOPE

A. Furnish all materials, labor, equipment, plant, tools, required to complete
   - Wood framing, trims and mouldings
   - Wood panel boards

   and related finish carpentry work as indicated on the drawings and/or specified herein.

B. Coordinate work with all other related trades.

1.02 HANDLING, STORAGE AND PROTECTION

A. Millwork
   1. Protect millwork against dampness during and after delivery.
   2. Do not bring interior finish, including doors, inside building until plaster is thoroughly dry.
   3. Protect all finished woodwork from injury after it has been set in place until the completion and final acceptance of the work.

B. Medium Density Fiberboard, Gypsum Board and Fiber Cement Board.
   Stack boards flat on a smooth level surface. Timber blocks may be used as support if it ensures optimum performance. Store sheets under cover and keep dry prior to fixing. If sheets should become wet, allow to dry thoroughly before fixing is commenced.

2.00 PRODUCTS

Refer to Section 01020 Summary of Materials and Finishes.

3.00 EXECUTION

3.01 WORKMANSHIP

A. Make all wood finish and millwork true to details, clean and sharply defined.
B. Set panels to allow for free movement in case of swelling or shrinkage.
C. Conceal means of fastening various parts together.

3.02 FINISH

A. Mill, fabricate and erect interior finish as indicated on the drawings. Machine sand at the mill and manual smooth at the job.
B. Separate with 6 mm (1/4") stone-cut joints all interior trim set against with fine finishing nails, screws or glue where required.
C. Make mill mouldings perfectly smooth on exposed surfaces and true to profile.
D. Make joints tight and in a manner to conceal shrinkage. Secure trims with fine finishing nails, screws or glue where required.
E. Set nails for putty stopping.
F. Make window and door trim simple length
G. Miter mouldings at corner. cope and angles.

3.03 WOOD SHELVING

A. Each shelf shall be supported on a continuous wood cleat at walls.
B. Secure cleats to masonry walls by expansion bolt or approved fastening device.

3.04 CABINETS AND LOCKERS

A. Fabricate cabinets and closets in accordance with details.
B. Use sound kiln-dried lumber or medium density fiberboard.
C. Erect cabinets straight. level and plumb and securely anchor in place.

3.05 ASSEMBLY MATERIALS

A. Approved water-resistant wood glue
B. Liquid Nails or approved equal.
C. Nails, screws and bolts of appropriate type, shape and size for all types of joints.

3.06 FASTENERS FOR FIBER CEMENT BOARD

A. Fasteners: Use galvanized wire nails 25 mm (1") long for fixing to timber frames. Deutsher "Teks" screws may also be used with self-embedded head, No. 8 * 25 mm (1").

3.07 HARDWARE

A. Accurately fit and install all required finish hardware items.
B. If surface-applied hardware is fitted and applied before painting, remove all such items, except butts and reinstall after painting is completed
C. Finish Hardware: See Summary of Materials and Finishes.

SECTION 07100
WATERPROOFING and DAMPPROOFING

1.00 GENERAL

1.01 SCOPE

A. Furnish all materials, labor, equipment, plant, tools, required to complete:
   - Protection of all exterior finishes
   - Water-sealing of exterior wall surfaces/ firewalls
   - Waterproofing of roof decks, underground walls and slab, concrete gutters, suspended toilets, cisterns and others
   - Water-sealing of expansion joints
   - Damp-proofing of slabs on fill.

B. See drawings and details for location and extent of requirements.

1.02 SUBMITTALS

A. Samples - Submit to Architect samples of materials to be used clearly labeled as to brand name and manufacturer's name to secure approval.

B. Manufacturer's Instructions - Submit to the Architect the manufacturer's complete printed instructions for the application of the material.

C. Warranties - Upon completion, submit to the Architect written warranty that the waterproofing is effective for a period of five years

1.03 ALTERNATES

No substitution of materials shall be made unless authorized in writing by the Architect prior to starting the work of waterproofing.

2.00 PRODUCTS

Refer to Section 01020 Summary of Materials and Finishes.

3.00 EXECUTION

3.01 GENERAL

1. Waterproofing:
2. Deliver waterproofing materials to the site in original sealed containers or packages bearing the manufacturer's name and brand designation, specification number, type and class.

3. Store and protect waterproofing materials from damage, weather, moisture and extreme temperature with extraordinary care.
4. Clean, free from holes and imperfections, smooth and dry all surfaces to receive waterproofing materials. The Contractor shall perform the necessary surface preparation according to the manufacturer's specifications. Immediately before application of waterproofing, clean surfaces and secure approval. No application of waterproofing is permitted in wet weather.
4. All work under this section shall be performed only by a qualified Contractor trained and approved by the manufacturer. Apply all waterproofing strictly in accordance with manufacturer's specifications.

B. Damp-proofing of slabs on fill and basement slabs:

1. Prior to placing the concrete, the hard core should be compacted to smooth, even surface, eliminating all sharp projections or irregularities which may puncture the moisture barrier.
2. Cover the entire area with a layer of damp-proofing film, extending past the perimeter of the slab and turning up against walls for the depth of the concrete.
3. Overlapping of sides and ends: 150 mm (6") minimum.
5.

3.02 TESTING

Flood test all applicable waterproofed areas prior to acceptance of job. Plug all drains, build temporary dams at openings so that water will be 250 mm (1") deep at the high point of the waterproofed area Maintain the water for at least 24 hours. Remedy at once any evidence of leaking.

3.03 GUARANTEE

The Contractor shall guarantee all waterproofing work to be free from defects in materials and in workmanship and free of leaks for a period of five (5) years from the date of final acceptance. Any defect shall be repaired at the Contractor's expense.

3.04 CURING

Where curing of waterproofing is required, cure strictly in accordance to the Manufacturer's specifications. Allow foot traffic only after complete curing.

3.05 TOPPING

Where topping over waterproofing is required, the Contractor shall provide the topping to the thickness indicated in the drawings.

SECTION 07210
BUILDING AND ROOFING INSULATION

1.00 GENERAL

1.01 SCOPE

A. Furnish all materials, labor, equipment, plant, tools, required to complete works as indicates in Plans.
B. See drawings for location and extent of work required.

1.02 SUBMITTALS

A. Samples - Submit to the Architect samples of materials to be used and secure approval prior to installation.
B. Manufacturer's Instructions - Submit to the Architect the manufacturer's complete printed instructions for the installation of the material.

1.03 PRODUCT HANDLING AND PROTECTION

A. Supply and deliver insulation material in its finished form.
B. Store at a place properly protected from rain and sunlight. Extended outdoor exposure is not recommended.
C. The insulation material shall not be in contact with wet concrete
D. All works shall be performed only by qualified contractor.

2.00 PRODUCTS

2.01 MATERIALS

Refer to Section 01020 Summary of Materials and Finishes.

3.00 EXECUTION

A. Install insulation in dry state.
B. Where cutting of material is necessary, use sharp knife and straight edge.
C. Fit tight around all roof protrusions. Fill the gaps with offcuts to avoid heat leakages.
D. Side and end laps shall be 50 mm (2") to 100 mm (4") and adhered by rugby contact adhesive.
E. Install insulation before roofing is fixed.
F. Any accidental punctures and damages shall be repaired and sealed with aluminum tapes.

SECTION 07400
SHEET METAL ROOFING

1.00 GENERAL

1.01 SCOPE

A. Furnish all materials, labor, equipment, plant, tools, required to complete:
   - fitting and installation of ribbed metal roofing, flashing components, strap and rivet units
   - application of supplementary materials to make the roof unit watertight and leak-proof.

B. See drawings and details for sizes and location of work required.

1.02 SUBMITTALS

Submit to the Architect shop drawings and samples of materials to be used and secure approval prior to installation.

1.03 BRANDING

Each sheet shall be branded with the name or trademark of the manufacturer.

2.00 PRODUCTS

See Section 01020 Summary of Materials and Finishes.

3.00 EXECUTION

3.01 GENERAL

A. Lay down the ribbed roofing sheet starting from the end opposite the prevailing wind.
B. Lay and install the first sheet with the turned down edge towards the outside of the area covered.
C. Overlay the next sheet in such a manner that the exposed edge is turned down and the covered edge is turned up.
D. Fix the strap according to indications shown in the manufacturer's catalogue.
E. Fasten the roofing sheets to the steel purlins by means of straps riveted to roofing sheets and strapped around purlins.
F. Side lap fasteners shall be done by rivets and washers spaced from 300 mm (12") to 457 mm (18") on centers.

3.02 RIDGE ROLLS

Minimum lap of ridge roll shall be 300 mm (12") over roofing sheets. Rivet ridge to roofing sheets at top of every fourth corrugation in addition to rivets engaging top line of straps.

3.03 FLASHING & COUNTER FLASHING

A. Provide flashing and counterflashing at all critical points where water may seep through.
B. Where corrugations run parallel to the walls, corrugate one wing of the flashing sheet to match corrugation of roof sheet while other wing shall go up against the walls and counter flash.

3.04 FASCIA

See drawings as to the details of the fascia.

SECTION 07810
PLASTIC UNIT SKYLIGHT

1.00 GENERAL

1.01 SCOPE

Furnish all materials. labor. equipment, plant, tools, required to complete:

- plastic unit skylights and their accessories.

1.02 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.03 SUMMARY

A. This Section includes plastic unit skylights.
B. Related Sections:
   1. Division 5 Section "Structural Metal Framing" for roof framing.
   2. Division 7 Section "Roof Accessories" for curbs, roof hatches, and smoke vents.
C. Refer to roofing system Sections for roofing accessories to be built into the roofing system to accommodate Work of this Section.

1.04 SUBMITTALS

A. General: Submit the following according to the Conditions of Contract and Division 1 Specification Sections.
B. Product data for each type of skylight specified, including details of construction relative to materials, dimensions of individual components, profiles, finishes, and glazing light transmission and thermal characteristics.
C. Shop drawings showing fabrication and installation of skylights, including plans, elevations, sections, details of components, and attachments to other units of Work.
D. Samples for initial selection purposes in the form of manufacturer's color charts showing a full range of colors available for each type of skylight glazing, retainer, frame, and curb indicated.
E. Samples for verification purposes in full-size units or a representative section of each type of skylight indicated for each color, texture, shape, and sizes specified.

1.05 SYSTEM DESCRIPTION

A. General: Provide Thermoplastic roofing system that has the following capabilities based on testing manufacturer's standard units in assemblies similar to those indicated for this Project.

B. Fire-Test-Response Characteristics: Provide plastic sheets identical to those tested for the following fire-test-response characteristics, per ASTM test method indicated below, by UL or other testing and inspecting agencies acceptable to authorities having jurisdiction. Identify plastic sheets with appropriate markings of applicable testing and inspecting organization.

1. Self-Ignition Temperature: 650 deg F (343 deg C) or greater when tested per ASTM D 1929 on plastic sheets in the thickness intended for use.
2. Smoke density of 75 or less when tested per ASTM D 2843 on plastic sheets in the thickness intended for use.
3. Relative-Burning Characteristics: As follows, when tested per ASTM D 635:
   a. Polycarbonate: Burning extent of 1 inch (25 mm) or less when tested on plastic glazing indicated below with a nominal thickness of 0.060 inch (1.5 mm) or the thickness intended for use.

C. Wind Loads: Provide Thermoplastic roofing system, including anchorage, capable of withstanding wind-load design pressures calculated according to requirements of authorities having jurisdiction over the area.

1.06 QUALITY ASSURANCE

A. Professional Engineer Qualifications: Hire a professional engineer who is legally qualified to practice in the jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of Thermoplastic roofing that are similar to those indicated for this Project in material, design, and extent.

B. Installer Qualifications: Engage an experienced installer to assume engineering responsibility and perform work of this Section who has specialized in Thermoplastic roofing systems similar to those required for this Project, who is acceptable to manufacturer and who can submit a currently dated License Certificate which shall verify the installer's qualifications to properly install Thermoplastic roofing sheets and accessories and shall commit the manufacturer to the acceptance of the installer as a co-signer under a joint responsibility agreement.

1. Engineering Responsibility: Prepare design data for Thermoplastic roofing systems, including signed and sealed shop drawings, based on testing and

engineering analysis of manufacturer's standard units in assemblies similar to those indicated for this Project.

C. Source Limitations: Obtain each type of Thermoplastic roofing sheets and accessories from one source and by a single manufacturer.

D. Product Options: Information on Drawings and in Specifications establishes requirements for system's aesthetic effects and performance characteristics. Aesthetic effects are indicated by dimensions, arrangements, alignment, and profiles of components and assemblies as they relate to sight lines and relationships to one another and to adjoining construction. Performance characteristics are indicated by criteria subject to verification by one or more methods including preconstruction testing, field testing, or in-service performance.

E. Preconstruction Testing: Comply with the following requirements:
   1. Preconstruction Testing Service: Engage a qualified independent testing agency to perform the preconstruction testing indicated.

F Mockups: Prior to installing Thermoplastic roofing systems, construct mockups for each form of construction and finish required to verify selections made under Sample submittals and to demonstrate aesthetic effects as well as qualities of materials and execution. Build mockups to comply with the following requirements, using materials indicated for Work.
   1. Locate mockups on-site in the location and of the size indicated or, if not indicated, as directed by Architect
   2. Notify Architect 7 days in advance of the dates and times when mockups will be constructed.
   3. Demonstrate the proposed range of aesthetic effects and workmanship.
   4. Obtain Architect's approval of mockups before start of Work.
   5. Retain and maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
      a. When directed, demolish and remove mockups from Project site.
      b. Approved mockups in an undisturbed condition at the time of Substantial Completion may become part of the completed Work.

G. Pre-installation Conference: Conduct conference at Project site prior to installation of Thermoplastic roofing sheets.

1.07 WARRANTY

A. General: Warranties specified in this Section shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract

Documents and shall be in addition to and run concurrent with other warranties made by the Contractor under requirements of the Contract Documents.

B. Plastic Warranty: Provide written warranty signed by manufacturer agreeing to repair or replace work that has or develops defects in the plastic. "Defects" is defined as abnormal aging or deterioration.
   1. Warranty Period for Thermoplastic: 5 years from date of Substantial Completion against breakage.

C. Finish Warranty: Provide written warranty signed by manufacturer agreeing to repair or replace work with finish defects. "Defects" is defined as peeling, chipping, chalking, fading, abnormal aging or deterioration, and failure to perform as required. Failures include, but are not limited to, the following:
   1. Structural failures including, but not limited to, excessive deflection.
   2. Air infiltration and water penetration.
   3. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
   4. Failure of operating components to function normally.
   5. Plastic breakage, wearing, tearing.

Warranty Period: 2 years from date of Substantial Completion.

2.00 PRODUCTS

2.01 MATERIALS

Refer to the Section 01020 Summary of Materials and Finishes

3.00 EXECUTION

3.01 INSTALLATION

A. General: Comply with manufacturer's instructions and recommendations. Coordinate with installation of roof deck and other substrates to receive skylight units. Coordinate with installation of vapor barriers, roof insulation, roofing, and flashing as required to assure that each element of the work performs properly and that combined elements are waterproof and weathertight. Anchor units securely to supporting structural substrates, adequate to withstand lateral and thermal stresses as well as inward and outward loading pressures.
   a. Prepare sash. Clean sash surface and prime if necessary. Rabbet should be free of burrs.
   b. Prepare Thermoplastic sheets. After measuring sash opening carefully, determine recommended edge engagement and expansion allowance. Cut sheet to exact size required. Edges should be clean and free of notches.

c. Glaze Themorplastic sheets. Sealants and tapes with sufficient extensibility to accommodate thermal expansion and contraction without loss of adhesion to either frame or sheet must be use.

B. Isolation: Where metal surfaces of units are to be installed in contact with incompatible metal or corrosive substrates, including wood, apply bituminous coating on concealed metal surfaces, or provide another permanent separation.

C. Flange Seals: Except as otherwise indicated, set flanges of accessory units in a thick bed of roofing cement to form a seal.

D. Cap Flashing: Where cap flashing is required as component of the skylight, install to provide an adequate waterproof overlap with roofing or roof flashing (as counterflashing). Seal with thick bead of mastic sealant, except where overlap is indicated to be left open for ventilation.

E. Operational Units: Test-operate units with operable components. Clean and lubricate joints and hardware. Adjust for proper operation.

3.02 CLEANING AND PROTECTION

A. Remove glazing compound and masking paper by applying naphtha (VM&P) or kerosene with a soft cloth, followed immediately with a thorough soap and water cleaning. DO NOT USE GASOLINE. Adherence to regular and proper cleaning procedures is recommended to preserve appearance.

B. Wash Thermoplastic sheets with a mild soap or detergent (e.g. Joy Dishwashing Liquid) and lukewarm water, using a clean sponge or a soft cloth. Rinse well with clean water. Dry thoroughly with a chamois or moist cellulose sponge to prevent water spots. Do not scrub or use brushes on the sheets; their coating is UV-resistant, not mar-resistant.

C. Remove fresh paint splashes, grease and smeared glazing compounds before drying by rubbing lightly with a good grade of VM&P naphtha or isopropyl alcohol. Afterward, a warm final wash should be made, using a mild soap or detergent solution and ending with a thorough rinsing with clean water.

D. Minimize scratches and minor abrasions by using a mild automobile polish. Test selected product on a sample of a Thermoplastic sheet and follow manufacturer's instructions.

SECTION 07880
SPRAYED ON FIREPROOFING

1.00 GENERAL

1.01 SCOPE

A. Furnish all materials, labor, equipment, plant, tools, required to complete: Sprayed-on fireproofing of all structural steel surfaces as per the specified fire rating.

1.02 SUMMARY

A. This Section includes the following:
   1. Concealed sprayed-on fireproofing.
   2. Exposed sprayed-on fireproofing.

B. Related Sections: The following Sections contain requirements that relate to this Section:
   1. Division 3 Section "Cast-In-Place Concrete" for concrete fireproofing.
   2 Division 4 Section "Unit Masonry" for masonry fireproofing.
   3. Division 5 Section "Structural Steel" for surface conditions specified for structural steel receiving sprayed-on fireproofing.
   4. The following Division 9 Sections for gypsum-board-based fireproofing:
      a. "Gypsum Drywall."
   5. Division 9 Section "Painting" for field priming structural steel prior to applying sprayed-on fireproofing.

1.03 DEFINITIONS

A. Concealed sprayed-on fireproofing refers to applications where sprayed-on materials are applied to surfaces that are concealed from view behind other construction when the Work is completed.

1.04 SUBMITTALS

A. Product data for each sprayed-on fireproofing product indicated.
   1. Certification by manufacturers that products supplied comply with local regulations controlling use of volatile organic compounds (VOCs).

B. Shop drawings in form of structural framing plans indicating the following:
   1. Where and what kinds of surface preparations are required before applying fireproofing.
   2. Extent of sprayed-on fireproofing for each different construction and fire-resistance rating including the following:

a. Applicable fire-resistive design designations of inspecting and testing agency acceptable to authorities having jurisdiction.
b. Minimum thicknesses needed to achieve required fire-resistance ratings of structural components and assemblies.
c. Designation of restrained and unrestrained conditions based on definitions in ASTM E 119, Appendix X3 as determined by a qualified professional engineer.

3. Treatment of fireproofing after its application.

C. Test reports for sprayed-on fireproofing from a qualified independent testing agency employed and paid by Contractor or manufacturer. Provide reports indicating that physical properties of proposed sprayed-on fireproofing products comply with specified requirements based on comprehensive testing of current product formulations according to the following requirements:

1. Qualified independent testing agency does testing on laboratory specimens that it witnessed during preparation and conditioning Include in test reports a full description of preparation and conditioning of laboratory test specimens.

a. Test reports without the above information are not acceptable.

D. Product certificates from fireproofing manufacturers that each sprayed-on fireproofing product indicated for Project complies with specified requirements including those for fire-test-response characteristics and compatibility with adhesives, primers, and other surface coatings on substrates indicated to receive fireproofing.

E. Qualification data for firms and persons specified in "Quality Assurance" article to demonstrate their capabilities and experience. Include list of completed projects with project names, addresses, names of Architects and Owners, and other information specified.

1.05 QUALITY ASSURANCE

A. Fire-Test-Response Characteristics: Provide sprayed-on fireproofing products identical to those used in assemblies tested for the following fire-test-response characteristics, per test method indicated below, by UL or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify packages (bags) containing fireproofing with appropriate classification markings of applicable testing and inspecting agency.

1. Fire-Resistance Ratings: As indicated by reference to fire-resistive designs listed in UL "Fire Resistance Directory," or in the comparable publication of another testing and inspecting agency acceptable to authorities having jurisdiction, for fire-resistive assemblies where sprayed-on fireproofing serves as direct-applied protection, tested per ASTM E 119.

2. Surface-Burning Characteristics: As indicated for each sprayed-on fireproofing product required, tested per ASTM E 84.

B. Installer Qualifications: Engage an experienced Installer certified, licensed, or otherwise qualified by the sprayed-on fireproofing manufacturer as having the necessary experience, staff, and training to install manufacturer's products per specified requirements. A manufacturer's willingness to sell its sprayed-on fireproofing products to the Contractor or to an Installer engaged by the Contractor does not in itself confer qualification on the buyer.

C. Single-Source Responsibility: Obtain sprayed-on fireproofing materials from a single manufacturer for each different product required.

D. Testing Agency Qualifications: To qualify for acceptance, an independent testing agency hired by Contractor or manufacturer to test sprayed-on fireproofing products must demonstrate to Architect's satisfaction, based on evaluation of agency-submitted criteria conforming to ASTM E 699, that it has the experience and capability to conduct satisfactorily the testing indicated.

E. Engineer Qualifications: A professional engineer legally authorized to practice in jurisdiction where Project is located and experienced in providing structural engineering services of the kind indicated that have resulted in the installation of structural systems similar to this Project in material, design, and extent with a record of successful in-service performance.

F. Provide fireproofing products containing no detectable asbestos as determined according to the method specified in 40 CFR Part 763, Subpart F, Appendix A, Section 1, Polarized Light Microscopy.

G. Field-Constructed Mockups: Prior to installing sprayed-on fireproofing, apply each product specified for exposed applications to demonstrate both aesthetic effects and qualities of materials and execution. Build mockups to comply with the following requirements, using materials indicated for final unit of Work.

1. Locate mockups on site in location or, if not indicated, directed by Architect.
2. Extent of Mockups: Approximately 100 sq. ft. (9 sq. m) of surface for each product indicated.
3. Notify Architect one week in advance of the dates and times when mockups will be erected.
4. Demonstrate the proposed range of aesthetic effects and workmanship.
5. Obtain Architect's acceptance of mockups before start of final unit of Work.
6. Retain and maintain mockups during construction in undisturbed condition as a standard for judging completed unit of Work.
   a. Accepted mockups in undisturbed condition at time of Substantial Completion may become part of completed unit of Work.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to Project site in original, unopened packages with intact and legible manufacturers' labels identifying product and manufacturer; date of

manufacture; shelf life, if applicable; and fire-resistance ratings applicable to Project.

B. Use materials with limited shelf life within period indicated. Remove from Project site and discard any materials whose shelf life has expired.

C. Store sprayed-on fireproofing materials inside, under cover, above ground, so they are kept dry until ready for use. Remove from Project site and discard any materials that have deteriorated.

1.07 PROJECT CONDITIONS

A. Environmental Conditions: Do not install sprayed-on fireproofing when ambient or substrate temperatures are 40 deg F (4 deg C) and falling, unless temporary protection and heat is provided to maintain temperatures at or above this level for 24 hours before, during, and for 24 hours after applying sprayed-on fireproofing.

B. Ventilation Ventilate sprayed-on fireproofing by natural means or, where this is inadequate, forced-air circulation during and after application until fireproofing dries thoroughly.

1.08 SEQUENCING

A. Sequence and coordinate application of sprayed-on fireproofing with other related work specified in other Sections to comply with the following requirements:

1. Provide temporary enclosures to prevent deterioration of sprayed-on fireproofing for interior applications due to exposure to unfavorable environmental conditions.

2. Avoid unnecessary exposure of sprayed-on fireproofing to abrasion and other damage likely to occur during construction operations subsequent to its application.

3. Do not apply fireproofing to metal roof decking substrates until roofing has been completed: prohibit roof traffic during application and drying of fireproofing.

4. Do not begin applying fireproofing until clips, hangers, supports, sleeves, and other items penetrating fireproofing are in place.

5. Defer installing ducts, piping, and other items that would interfere with applying fireproofing until fireproofing is installed.

6. Do not install enclosing or concealing construction until after fireproofing has been applied, inspected, tested, and corrections have been made to any defective fireproofing.

1.09 WARRANTY

A General: The warranty specified in this Article shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and shall be in addition to and run concurrent with other warranties made by the Contractor under requirements of the Contract Documents.

B. Warranty: Submit a written warranty, executed by Contractor and cosigned by Installer, agreeing to repair or replace sprayed-on fireproofing that has failed within the specified warranty period. Failures include but are not limited to the following:

1. Cracking, flaking, eroding in excess of specified requirements, peeling, and delaminating of sprayed-on fireproofing from substrates due to defective materials and workmanship within the specified warranty period.

2. Not covered under the warranty are failures attributable to damage by occupants and Owner's maintenance personnel, exposure to environmental conditions other than those investigated and approved during fire-response testing, and to other causes not reasonably foreseeable under conditions of normal use.

C. Warranty Period: 2 years from date of Substantial Completion

2.00 PRODUCTS

2.01 CONCEALED SPRAYED-ON FIREPROOFING MATERIALS

Refer to Section 01020 Summary of Materials and Finishes. Follow strictly product specifications of fireproofing material of choice.

3.00 EXECUTION

3.01 EXAMINATION

A. Examine substrates with Installer present to determine if they are in satisfactory condition to receive sprayed-on fireproofing. A substrate is in satisfactory condition if it complies with the following:

1. Substrates comply with requirements in the Section where the substrate and related materials and construction are specified.

2. Substrates are free of oil, grease, rolling compounds, incompatible primers, loose mill scale, dirt, or other foreign substances capable of impairing bond of fireproofing with substrate under conditions of normal use or fire exposure.

3. Objects penetrating fireproofing, including clips, hangers, support sleeves, and similar items, are securely attached to substrates.

4. Substrates are not obstructed by ducts, piping, equipment, and other suspended construction that will interfere with applying the fireproofing.

B. Conduct tests according to sprayed-on fireproofing manufacturer's recommendations to verify that substrates are free of oil, rolling compounds, and other substances capable of interfering with bond where there is any doubt as to their presence.

C. Do not proceed with installation of fireproofing until unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Clean substrates of substances that could impair bond of fireproofing, including oil, grease, rolling compounds, incompatible primers, and loose mill scale.

B. Prime substrates where recommended by fireproofing manufacturer, except where compatible shop primer has been applied and is in satisfactory condition to receive fireproofing.

C. Cover other work subject to damage from fall-out or overspray of fireproofing materials during application. Provide temporary enclosure as required to confine spraying operations, protect the environment, and ensure maintaining adequate ambient conditions for temperature and ventilation.

3.03 INSTALLATION, GENERAL

A. Comply with fireproofing manufacturer's instructions for mixing materials, application procedures, and types of equipment used to convey and spray on fireproofing materials; as applicable to the particular conditions of installation and as required to achieve fire-resistance ratings indicated.

B. Apply sprayed-on fireproofing that is identical to products tested as specified in Part 1 under "Test Reports" in "Submittals" article, with respect to rate of application, use of sealers, topcoats, tamping, troweling, water overspray, or other materials and procedures affecting test results.

C. Install metal lath, as required, to comply with fire-resistance ratings and recommendations of fireproofing manufacturer for conditions of exposure and intended use. Securely attach lath to substrate in position required for support and reinforcement of fireproofing. Use anchorage devices of type recommended by fireproofing manufacturer. Attach lathing accessories where indicated or required.

D. Extend fireproofing in full thickness over entire area of each substrate to be protected. Unless otherwise recommended by fireproofing manufacturer, install body of fireproof covering in a single course.

E. Apply fireproofing materials by sprayed-on method to maximum extent possible. Following the spraying operation in each area, complete the coverage by trowel application or other placement method recommended by manufacturer.

3.04 INSTALLING CONCEALED FIREPROOFING

A. Apply concealed fireproofing in thicknesses and densities indicated but not less than those required to achieve fire-resistance ratings designated for each condition and comply with requirements for thickness specified in Part 2 "Concealed Fireproofing" article.

3.05 FIELD QUALITY CONTROL

A. Testing Agency: A qualified independent testing agency employed and paid by Owner will perform field quality-control testing.

B. Extent and Testing Methodology: Testing of completed fireproofing will take place in successive stages in areas of extent described below; do not proceed with fireproofing of next area until test results for previously completed fireproofing show compliance with requirements.

1. Extent of Each Test Area: Each bay of floor area.

2. Within each area, testing agency will randomly select one structural member of each type (primary beam, secondary beam, joist, truss, steel deck, and column) and test fireproofing as follows:

a. For cohesion and adhesion per ASTM E 736.

b. For thickness per ASTM E 605.

c Lower flanges and webs of beams, column webs, column flanges, and floor deck for density per ASTM E 605 or Appendix A "Alternate Method for Density Determination" of AWCI Technical Manual 12-A.

d. When testing discovers fireproofing not in compliance with requirements, testing agency will perform additional random testing to determine extent of noncompliance.

C. Testing agency will report test results promptly and in writing to Contractor and Architect.

D. Remove and replace fireproofing where test results indicate that it does not comply with specified requirements for cohesion and adhesion or for density or both.

E. Apply additional fireproofing per manufacturer's directions where test results indicate that the thickness does not comply with specified requirements.

F. Additional Testing: Where fireproofing is removed and replaced or repaired, additional testing will be performed to determine compliance with specified requirements.

3.07 CLEANING, REPAIR, AND PROTECTION

A. Cleaning: Immediately after completing spraying operations in each containable area of Project, remove material over-spray and fall-out from surfaces of other construction and clean exposed surfaces to remove evidence of soiling.

B. Cure exposed cementitious fireproofing materials according to fireproofing manufacturer's recommendations to prevent premature drying.

C. Protect fireproofing, according to advice of fireproofing manufacturer and Installer, from damage resulting from construction operations or other causes so that fireproofing will be without damage or deterioration at time of Substantial Completion.

D. Coordinate installation of fireproofing with other construction to minimize the need to cut or remove fireproofing. As installation of other construction proceeds, inspect fireproofing and patch any areas where fireproofing was removed or damaged.

E. Repair or replace work that has not been successfully protected.

SECTION 07900
JOINT SEALANTS

1.00 GENERAL

1.01 SCOPE

Furnish all materials, labor, equipment, plant, tools, required to complete:

- application of caulks and sealants for panel joints, expansion joints, construction joints, glazing of doors and windows, acoustic control and others.

1.02 SUBMITTALS

A. Samples
Submit to the Architect sample of materials to be used and secure approval.

B. Manufacturer's Instructions
Submit to the Architect the manufacturer's complete printed instructions for the application of the material.

1.04 PRODUCT HANDLING

A. Materials shall be delivered to the site in the original sealed containers or packages bearing manufacturer's name and brand specification.
B. Materials stored on jobsite shall be protected from weather moisture and extreme temperature with extra ordinary care.

1.05 PROJECT CONDITION

Temperature and relative humidity conditions for a period before, during and after application shall be as recommended by the manufacturer. If rain occurs, allow surfaces to dry before proceeding with the applications.

2.00 PRODUCTS

2.01 MATERIALS

Refer to the Summary of Materials and Finishes.

3.00 EXECUTION

3.01 SURFACE PREPARATION

A. Surface to be bonded should be free of oil, grease and dust. Scrub off soap residue with water, then clean with solvent. Surface must be completely clean and dry. Any trace of old sealant should be removed.
B. Concrete should be fully cured.
C. Wood surfaces should be lightly sanded and free from dust.
D. Metal must be free of corrosion, mill scale, oil tar or peeling paint.
E. Iron and steel surfaces should be painted to protect against rusting.

3.02 APPLICATION

A. Apply sealant evenly in a continuous, steady flow pushing sealant ahead of nozzle to achieve a filled, void-free joint.
B. Do not apply too thick. A thin bead of sealant will accommodate more joint movement than a thick bead. Ideally, sealant depth should be no more than 12 mm and no less than 6 mm. Use backing material to reduce depth.
C. If necessary, widen joints by cutting sides or removing rigid filler. Wider joints accommodate more movement than narrow joints.
D. Use masking tape for neat appearance. Remove soon after smoothing before sealant cures.
E. Smooth with spatula for heat appearance, and to force sealant into joints and ensure proper contact onto sides of joint.
F. Clean up spills before sealant cures with suitable solvent-soaked cloth.
G. Remove cured sealant by scraping or wire brushing.
H. Read product instructions carefully and follow them to the letter.

SECTION 08100
METAL DOORS AND WINDOWS

1.00 GENERAL

1.01 SCOPE

A. Furnish all materials, labor, equipment, plant, tools, required to complete:
   - Metal Doors and Windows
   - Metal Jambs and Frames
   - Operable Wall Partition

B. See drawings and schedules for size, details and location of required work.

1.02 SHOP DRAWINGS AND SAMPLES

A. Submit shop drawings and secure Architect's approval prior to placement of order.

B. Submit sample corner sections, hinges, tracks, handles and all other accessories.

C. Submit sample of one full size unit, complete assembly, with all accessories, prior to fabrication of steel windows.

2.00 PRODUCTS

2.01 MATERIALS

Refer to Section 01020 Summary of Materials and Finishes.

3.00 EXECUTION

3.01 METAL DOORS

A. Fabrication
   1. Factory prefabricate all frames in accordance to the designs and dimensions indicated in the drawings.
   2. Flush type doors shall be 45 mm (1-3/4") thick. Reinforced doors form steel sections extending full height of doors and spaced not over 200 mm (8") o.c vertically.
   3. Tops and bottoms of doors shall have continuous stiffener channels welded to side plates.
   4. Insulate hollow flush doors with fiberboard or cork to deaden metallic sound. Edges at top sides shall be reinforced and finished flush.

B. Installation

1. Set and anchor frames as shown in details and in approved shop drawings.
2. Set frames plumb and square and brace where necessary to prevent distortion.
3. Provide continuous vinyl weather-strip, vertically at meeting stiles on pairs and concealed top and bottom rails for all exterior doors. Entrances shall be constructed so that gaps will not occur between pivot stiles and door jambs when doors are locked or operational to prevent heat and air transmission and entrance of water and insects.
4. Protective Coating: Clean all surfaces and apply a protective coating of clear, water-white methacrylate-type lacquer, resistant to alkaline mortar and plaster immediately after fabrication and may not be removed even after completion of installation.
5. Wedge clear of masonry all frames set in prepared openings 3/16 to 1/4 inch to allow for caulking.
6. Install hardware to fit details as shown in the drawings and as per manufacturer's specifications. Supply all necessary templates and instructions required.

C. Adjustments
1. Adjust all frames and attach all hardware before glazing.
2. Secure all windows and doors to be watertight and all hardware operating free and easy.

3.02 ALUMINUM DOORS AND WINDOWS

A. Fabrication
1. Factory prefabricate all frames in accordance to the designs and dimensions indicated in the drawings.
2 Extruded aluminum swing doors shall be mortised and reinforced corner construction, assembled with 9.525mm dia. steel tension rods for maximum strength.
3. Use RPC 12030/12031 Door Stile, 12033 Door Bottom Rail, 12032 Top Rail

B. Installation
1. Set and anchor frames as shown in details and in approved shop drawings
2. Set frames plumb and square and brace where necessary to prevent distortion.
3. Provide continuous vinyl weather-strip, vertically at meeting stiles on pairs and concealed top and bottom rails for all exterior doors. Entrances shall be constructed so that gaps will not occur between pivot stiles and door jambs when doors are locked or operational to prevent heat and air transmission and entrance of water and insects.

4. Protective Coating: Clean all surfaces and apply a protective coating of clear, water-white methacrylate-type lacquer, resistant to alkaline mortar and plaster immediately after fabrication and may not be removed even after completion of installation.
5. Wedge clear of masonry all frames set in prepared openings 3/16 to 1/4 inch to allow for caulking.
6. Install hardware to fit details as shown in the drawings and as per manufacturer's specifications. Supply all necessary templates and instructions required.

C. Adjustments
1. Adjust all frames and attach all hardware before glazing.
2. Secure all windows and doors to be watertight and all hardware operating free and easy.

3.03 OPERABLE WALL PARTITION

A. Fabrication
1. Factory prefabricate everything including finish in accordance to the designs and dimensions indicated in the drawings. All material specifications will be provided for by the manufacturer.

B. Installation
Installation will be handled by the manufacturer.

3.04 ADJUSTING AND CLEANING

A. Final Adjustments: Check and readjust operating hardware items just prior to final inspection. Leave work in complete and proper operating condition. Remove and replace defective work, including doors or frames that are warped, bowed, or otherwise unacceptable.
B. Prime Coat Touchup: Immediately after erection, sand smooth any rusted or damaged areas of prime coat and apply touchup of compatible air-drying primer.
C. Factory Finish Touchup: Immediately after erection, sand to feather-edge minor scratched, chipped, or damaged areas and apply touchup of compatible air-drying paint. Minor finish imperfections may be repaired provided finish matches new work finish and is acceptable to Architect; otherwise remove and replace.

SECTION 08520
ALUMINUM WINDOWS

1.00 GENERAL

1.01 SCOPE

A. Furnish and install all materials and equipment and perform labor required to install completely and ready for use all types of Aluminum Windows, hardware and all accessories.

1.02 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.03 SUMMARY

A. This Section includes Architectural Grade aluminum windows of the performance class indicated. Window types required include the following:

Awning windows
Fixed windows
Casement windows

B. Related Section: Division 8 Section "Glazed Aluminum Curtain Walls" contains requirements that relate to this Section.

1.04 DEFINITIONS

A. Combination Windows: Where 2 different types of operating sash or ventilators are included in the same window unit and share a common frame, the unit is considered a "combination window."

B. Dual windows are double-hung, horizontal-sliding, and fixed-type units with both a prime and a secondary window combined in a single composite unit. The prime window element protects the building from climatic elements. The secondary window is used for energy conservation and acoustical control.

C. Hinged emergency-access/egress windows are side-hinged units that swing out to provide emergency exit.

D. Performance class number, included as part of the window designation system, is the actual design pressure in pounds force per square foot (pascals) used to determine structural test pressure and water test pressure.
   1. Structural test pressure, wind load test, is equivalent to 150 percent of the design pressure.
   2. Water-leakage-resistance test pressure is equivalent to 20 percent of the design pressure with 8 lbf/sq. ft. (383 Pa) as a minimum for Architectural Grade windows.

1.05 PERFORMANCE REQUIREMENTS

A. General: Provide aluminum windows engineered, fabricated, and installed to withstand normal thermal movement, wind loading, and impact loading without failure, as demonstrated by testing manufacturer's standard window assemblies representing types, grades, classes, and sizes required for Project according to test methods indicated.

B. Test Criteria: Testing shall be performed by a qualified independent testing agency based on the following criteria:
   1. Design wind velocity at Project site is 155 mi./h (250 km/h).
   2. Test Procedures: Test window units according to ASTM E 283 for air infiltration, ASTM E 331 for water penetration, and ASTM E 330 for uniform load deflection and structural performance.

C. Performance Requirements: Testing shall demonstrate compliance with requirements indicated in AAMA 101 for air infiltration, water penetration, and structural performance for type, grade, and performance class of window units required. Where required design pressure exceeds the minimum for the specified window grade, comply with requirements of AAMA 101, Section 3, "Optional Performance Classes," for higher than minimum performance class.
   1. Air-Infiltration Rate for Operating Units: Not more than 0.37 cfm/ft. (2.06 cu. m/h per m) of operable sash joint for an inward test pressure of 6.24 lbf/sq. ft. (299 Pa).
   2. Air-Infiltration Rate for Fixed Windows: Not more than 0.15 cfm/ft. (2.74 cu. m/h per m) of area for an inward test pressure of 6.24 lbf/sq. ft. (299 Pa).
   3. Water Penetration: No water penetration as defined in the test method at an inward test pressure of 20 percent of the design pressure.
   4. Uniform Load Deflection: No deflection in excess of 1/175 of any member's span during the imposed load, for a positive (inward) and negative (outward) test pressure of 60 lbf/sq. ft. (2873 Pa).
   5. Thermal Movements: Provide window units that allow thermal movement resulting from the following maximum change (range) in ambient temperature when engineering, fabricating, and installing aluminum windows to prevent buckling, opening of joints, and overstressing of

components, connections, and other detrimental effects. Base engineering calculation on actual surface temperatures of materials due to solar heat gain and nighttime sky heat loss.

a. Temperature Change (Range). 20 deg C, ambient; 80 deg C, material surfaces.

D. Window Wall Tests: Provide window units included as part of the aluminum curtain wall system that comply with performance requirements of Division 8 Section "Glazed Aluminum Curtain Walls."

1.06 SUBMITTALS

A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.

B. Product Data for each type of window required, including the following.
   1. Construction details and fabrication methods.
   2. Profiles and dimensions of individual components.
   3. Data on hardware, accessories, and finishes.
   4. Recommendations for maintaining and cleaning exterior surfaces.

C. Shop Drawings showing fabrication and installation of each type of window required including information not fully detailed in manufacturer's standard Product Data and the following:
   1. Layout and installation details, including anchors.
   2. Elevations at 1/4 inch = 1 foot (1:50) scale and typical window unit elevations at 3/4 inch = 1 foot (1:20) scale.
   3. Full-size section details of typical composite members, including reinforcement and stiffeners.
   4. Location of weep holes.
   5. Panning details.
   6. Hardware, including operators.
   7. Window cleaning provisions.
   8. Glazing details.
   9. Accessories.

D. Samples for initial color selection on 12-inch- (300-mm-) long sections of window members. Where finishes involve normal color variations, include Sample sets showing the full range of variations expected.

E. Samples for Verification: The Architect reserves the right to require additional samples that show fabrication techniques, workmanship, and design of hardware and accessories.

F. Test reports from a qualified independent testing agency indicating that each type, grade, and size of window unit complies with performance requirements indicated based on comprehensive testing of current window units within the last 5 years. Test results based on use of down-sized test units will not be accepted.

1.07 QUALITY ASSURANCE

A. Installer Qualifications: Engage an experienced Installer who has completed installation of aluminum windows similar in material, design, and extent to those required for this Project and with a record of successful in-service performance.

B. Testing Agency Qualifications: To qualify for approval, an independent testing agency must demonstrate to Architect's satisfaction, based on evaluation of agency-submitted criteria conforming to ASTM E 699, that it has the experience and capability to satisfactorily conduct the testing indicated without delaying the Work.

C. Single-Source Responsibility: Obtain aluminum windows from one source and by a single manufacturer.

D. Mockups: Prior to installing aluminum windows, construct mockups for each form of construction and finish required to verify selections made under Sample submittals and to demonstrate aesthetic effects as well as qualities of materials and execution. Build mockups to comply with the following requirements, using materials indicated for final unit of Work.
   1. Locate mockups on-site in the location and of the size indicated or, if not indicated, as directed by Architect.
   2. Notify Architect one week in advance of the dates and times when mockups will be constructed.
   3. Demonstrate the proposed range of aesthetic effects and workmanship.
   4. Obtain Architect's approval of mockups before start of final unit of Work.
   5. Retain and maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
      a. When directed, demolish and remove mockups from Project site.
      b. Approved mockups in an undisturbed condition at the time of Substantial Completion may become part of the completed Work.

E. Product Options: The Drawings indicate sizes, profiles, dimensional requirements, and aesthetic effects of aluminum windows and are based on the specific window types and models indicated. Other aluminum window manufacturers whose products have equal performance characteristics may be

considered provided deviations in size, profile, and dimensions are minor and do not alter the aesthetic effect. Refer to Division 1 Section "Substitutions.".

1.08 PROJECT CONDITIONS

A. Field Measurements: Check window openings by field measurements before fabrication and show recorded measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
   1. Where field measurements cannot be made without delaying the Work, guarantee opening dimensions and proceed with fabricating aluminum windows without field measurements. Coordinate wall construction to ensure that actual opening dimensions correspond to guaranteed dimensions.

1.09 WARRANTY

A. General Warranty: The special warranty specified in this Article shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by the Contractor under requirements of the Contract Documents.

B. Special Warranty: Submit a written warranty signed by aluminum window manufacturer agreeing to repair or replace window components that fail in materials or workmanship within the specified warranty period. Failures include, but are not limited to, the following:
   1. Structural failures including excessive deflection, water leakage, air infiltration, or condensation.
   2. Faulty operation of sash and hardware.
   3. Deterioration of metals, metal finishes, and other materials beyond normal weathering.

C. Warranty Period: 3 years after date of Substantial Completion.

D. Warranty Period for Metal Finishes and Glass: 5 years after date of Substantial Completion.

2.00 PRODUCTS

2.01 MATERIALS

Refer to Section 01020 Summary of Materials and Finishes.

3.00 EXECUTION

3.01 INSPECTION

A. Inspect openings before installation. Verify that rough or masonry opening is correct and sill plate is level. Masonry surfaces shall be visibly dry and free of excess mortar, sand, and other construction debris.

3.02 INSTALLATION

A. Comply with manufacturer's specifications and recommendations for installing window units, hardware, operators, and other components of the Work.

B. Set window units plumb, level, and true to line, without warp or rack of frames or sash. Provide proper support and anchor securely in place.
   1. Separate aluminum and other corrodible surfaces from sources of corrosion or electrolytic action at points of contact with other materials by complying with requirements specified under "Dissimilar Materials" Paragraph in appendix to AAMA 101.

C. Set sill members and other members in a bed of sealant or with joint fillers or gaskets, as shown on Shop Drawings, to provide weathertight construction. Refer to Division 7 Section "Joint Sealants" for compounds, fillers, and gaskets to be installed concurrently with window units. Coordinate installation with wall flashings and other components of the Work.

3.03 FIELD QUALITY CONTROL

A. Conduct on-site tests for air and water infiltration with window manufacturer's representative present. The Architect will select units to be tested. Tests not meeting specified requirements and units having similar deficiencies shall be corrected at no cost to the Owner. Testing shall be performed by a qualified independent testing agency selected by the Architect.
   1. Air-Infiltration Tests: Conduct tests according to requirements of ASTM E 783. Allowable infiltration shall not exceed 1.5 times the amount indicated.
   2. Water-Resistance Tests: Conduct tests according to requirements of ASTM E 1105. No water leakage is permitted.

3.04 ADJUSTING

A. Adjust operating sash and hardware to provide a tight fit at contact points and at weatherstripping for smooth operation and a weathertight closure.

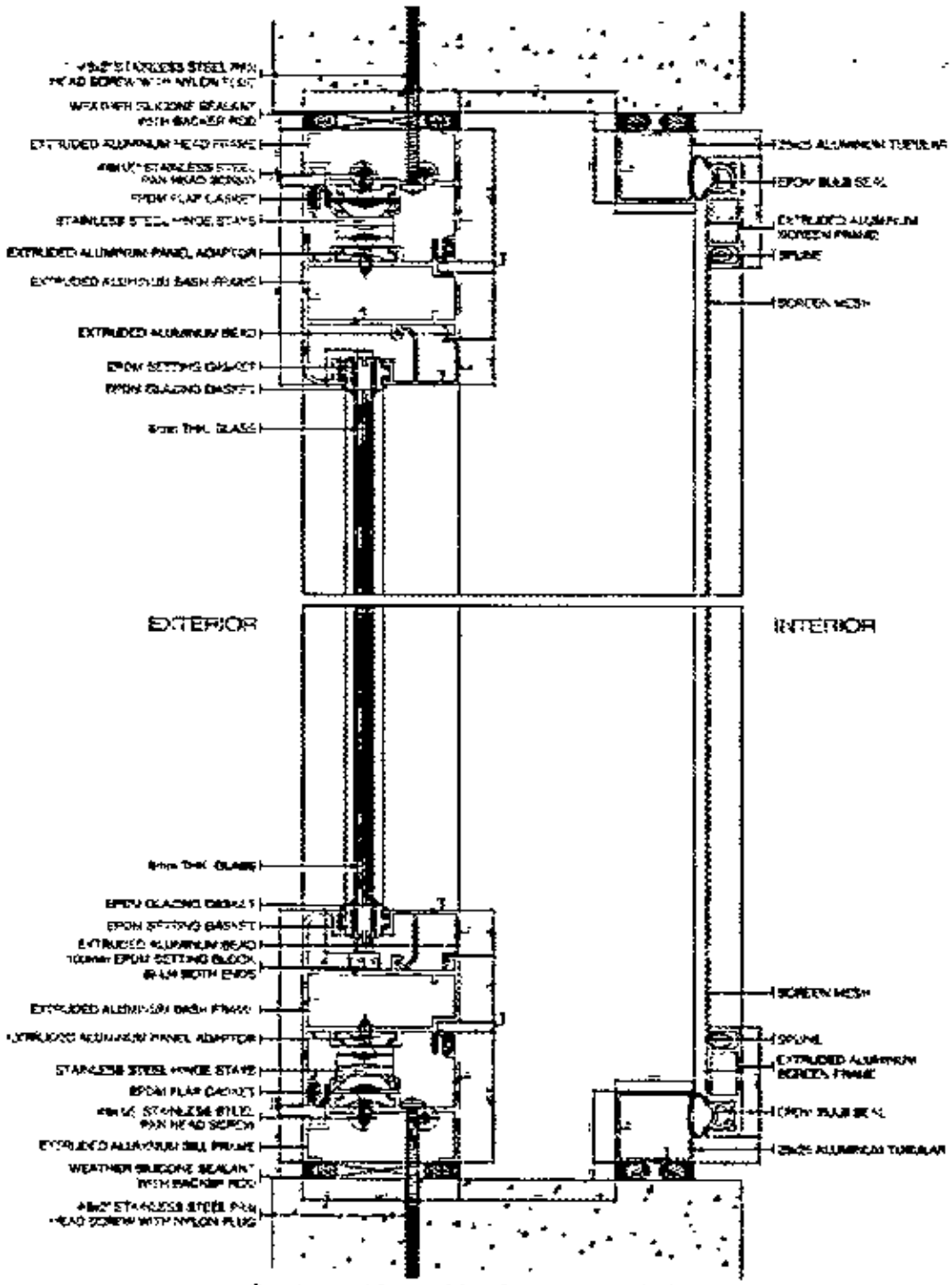
3.05 CLEANING

A. Clean aluminum surfaces promptly after installing windows. Exercise care to avoid damage to protective coatings and finishes. Remove excess glazing and sealant compounds, dirt, and other substances. Lubricate hardware and other moving parts.

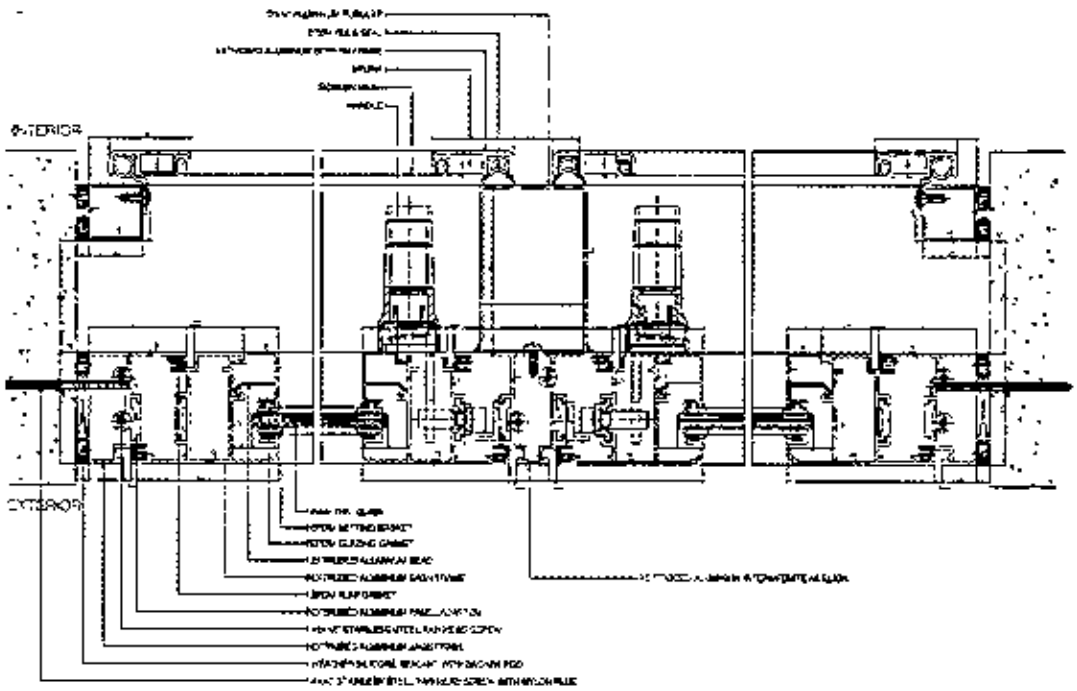
3.06 PROTECTION

A. Provide final protection and maintain conditions, in a manner acceptable to aluminum window manufacturer, that ensure window units are without damage or deterioration at the time of Substantial Completion.

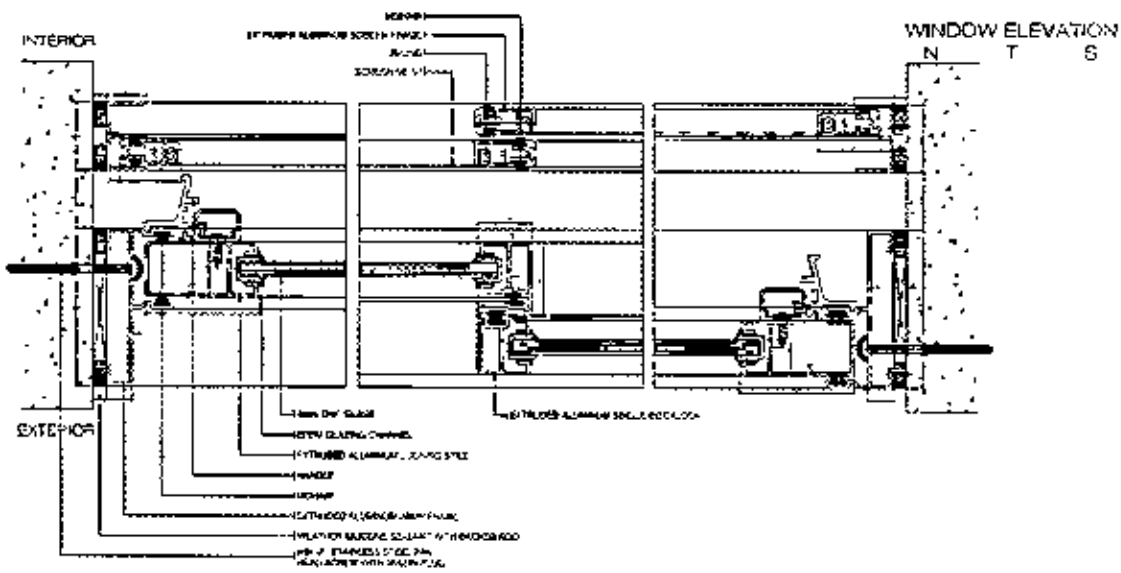
NOTE. THE SECTIONS ON THE FOLLOWING PAGES ARE INDICATIVE SECTIONS AND DO NOT NECESSARILY SHOW THE DESIGN NOR THE DIMENSIONS OF THE ALUMINUM SECTIONS REQUIRED IN THESE SPECIFICATIONS.



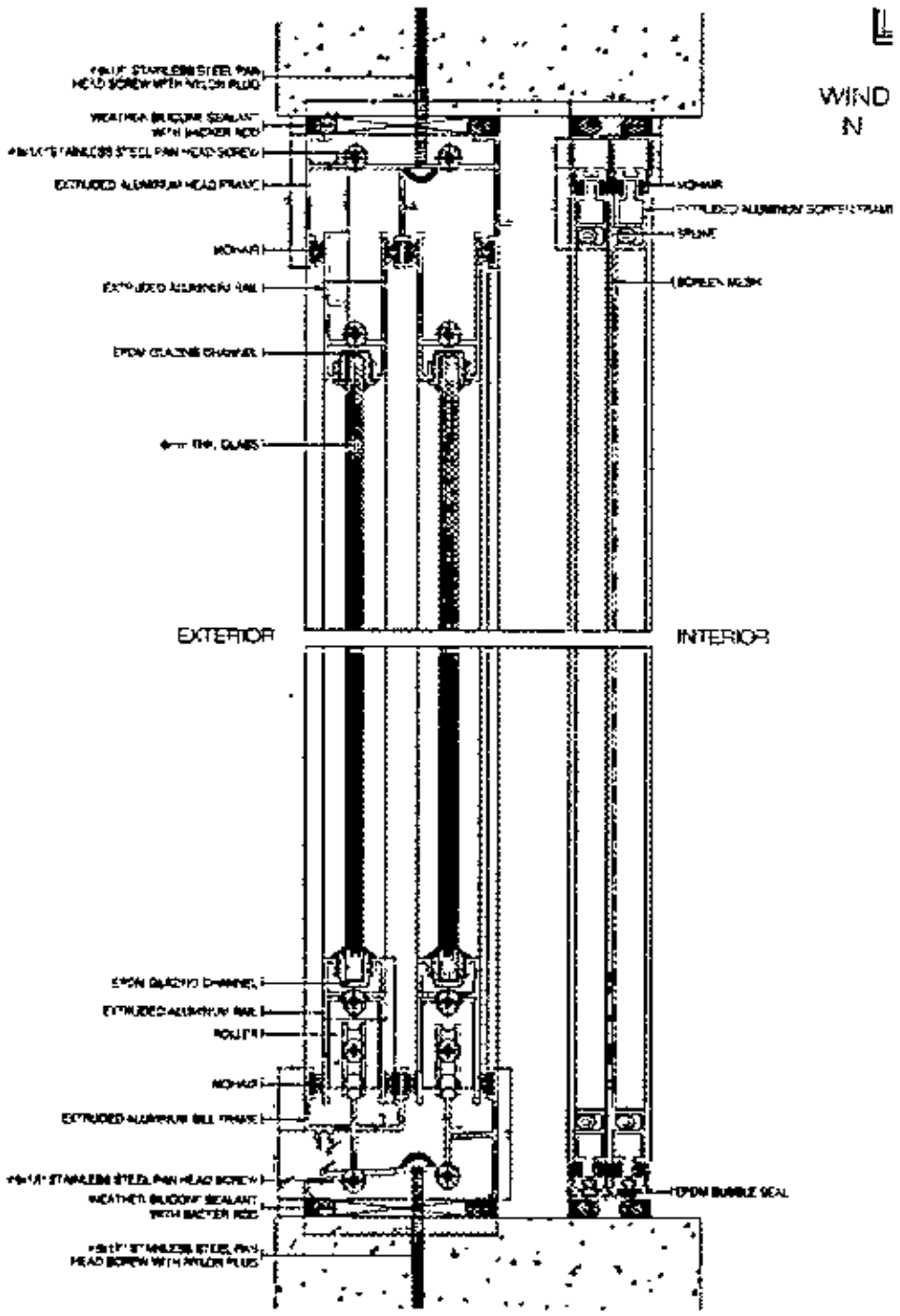
Section cut from side of casement window



Section cut from top of casement window



Section cut from top of sliding window



Section cut from side of sliding window

SECTION 08700
HARDWARE

1.00 GENERAL

1.01 SCOPE

A. Furnish and install all materials and equipment and perform labor required to fully equip in the most satisfactory conditions all:
   - Finish hardware for doors, and windows and
   - other operating members

B. Include nails, spikes, bolts, long screws, etc.

C. Furnish and fit in place all:
   Hardware not herein specifically mentioned but necessary to leave the work complete. All such hardware should there be any, shall conform in every respect to the balance of the hardware herein specified.

1.02 SUBMITTALS

Submit samples of locksets, hinges, door pulls, door stops, door closers, door lock chains, door eyes and other finish hardware and accessories for Architect's approval.

2.00 PRODUCTS

Refer to Section 01020 Summary of Materials and Finishes.

3.00 EXECUTION

3.01 INSTALLATION

A. All hardware shall be installed in strict accordance with the manufacturer's directions.

B. All work shall be installed plumb and true and secured with proper fastenings so as to make all work rigid and firm.

C. After installation, all finishing hardware shall operate and function smoothly and efficiently in strict accord with their respective expected operating performance.

D. All work which is to receive hardware shall be inspected and any defect must first be rectified before installing finishing hardware.

E. Exposed items of hardware: After hardware has been properly fitted, all exposed items such as knobs, plates, pulls, locks, etc. shall be removed until final coat of finish has been applied, and then hardware installed.

F. Door Knobs. Lock and Latch Strikes:

1. All locks, latch strikes and strike boxes be installed in door. frames at the same height from the floor.
2. Door knobs shall be located so that the center of the knobs is 965 mm (38") from the finished floor or as directed by the Architect.
3. All lock turn to be non-ferrous metal. All lock mechanisms to be free of dye cast material.
4. All locks are to be interchangeable and reversible without any alterations to the door.
5. The face of each lock to be beveled 3 mm (1/8") in 50 mm (2") to conform to the level of the door.
6. Roses to hold firmly in place without use of wood screws. Knobs to be securely fastened to spindles without the use of set screws.
7. All cylinders must be removable and interchangeable with the aid of the key, but without requiring the lock to be removed from the door.
8. Key locks are to have automatic deadlocking latch to prevent forcing back of the bolt. All locks to have box strikes. Lips of strikes not to project beyond jamb trim.

3.02 PROTECTION

A. Hardware which might be damaged by the construction work shall be protected during the progress of the building work and uncovered upon completion.

B. Protection must be provided at all times including during painting operation.

3.03 CLEANING

A. Upon completion of the work, all hardware shall be cleaned and polished and left in perfect operating condition.

B. Any hardware that may have been damaged either on its finish or more shall be replaced.

SECTION 08800
GLAZING

1.00 GENERAL

1.01 SCOPE

A. Furnish all materials, labor, equipment, plant, tools required to complete
   - All glass and glazing works free from imperfection, water marks.

B. See drawings for size, location and details.

1.02 SUBMITTALS

A. Submit samples of glass panels with factory labels for Architect's approval.

B. Submit samples of glazing compound

1.03 LABELS

Label each glass panel and do not remove from glass panel until final cleaning and after inspection and approval.

1.04 DELIVERY AND STORAGE

Deliver only as required and store in a safe location as directed. Unpack only when ready for use.

1.05 PROTECTION

A. Protect all glass from damage, breakage, staining, etching, differential ageing, abrasion, scratches, and impact during construction and until final acceptance of the contract work. Replace unless satisfactory corrective measures can be made at the job without removing the damaged glass, as directed by the Architect.

B. Glazed openings shall be identified with a colorful flag, festoon, or tape suspended near, but not in contact with the glass. Tapes or banners may be attached to the sash at head, jambs or site with a non-staining adhesive or by any convenient, mechanical means. Do not mark or coat glass partially or completely with "X", "S" or other symbols with soap, wax cleaning powders or other materials.

C. Lost and damaged materials shall be replaced by the Contractor at his own expense.

2.00 PRODUCTS

Refer to Section 01020 Summary of Materials and Finishes.

3.00 EXECUTION

3.01 GLAZING

A. Prevent glass from all contact with metal or any hard or sharp materials by use of resilient shims placed at quarter points.
B. Use resilient sealants.
C. Use stops in sizes permitting a "good grip" on the glass.
D. Install glass only in openings that are rigid, plumb and square.
E. Allow sufficient clearance at edges of glass to compensate for its expansion or for some settlement of the building. Clearance should be 6 mm (1/4") from edge to frame and 3 mm (1/8") for face.
F. Removal of putty or glazing compound smears from glass shall be performed by the glazing contractor during the materials normal work life. Failure to do so may result in damage to the glass.

SECTION 09200
PLASTER

1.00 GENERAL

1.01 SCOPE

A. Furnish all materials, labor, equipment, plant, tools, required to complete
   - all plain cement plaster finish.

B. See drawings for details and location of work required.

1.02 RELATED DOCUMENTS

A. See Division 4 Section "Mortar" for description of Materials.

2.00 PRODUCT

Refer to Section 01020 Summary of Materials and Finishes.

3.00 EXECUTION

3.01 PLAIN CEMENT PLASTER FINISH

A. Provide all walls indicated with three coats of cement plaster (scratch coat, brown coat and finish coat). Mix each coat in the proportion of one part Portland cement to three parts and by volume.

B. Apply the scratch coat with sufficient material and pressure to ensure a good bond and then scratch to a rough surface. Provide a thickness of 10 mm (3/8") for the scratch coat. Dampen with water before applying brown coat

C. Apply brown coat one day after applying scratch coat with a thickness of 10 mm (3/8") and level to a flat even surface. When stiff enough, trowel with a wooden float and cross hatch or broom lightly and evenly to secure a good mechanical bond for the finish coat. Wet the surface and keep from drying out for at least three (3) days.

D. Apply finish coat seven (7) days after the application of the brown coat. Provide thickness of 3 mm (1/8"). Keep the finish coat damp but not saturated for a period of seven days.

SECTION 09260
GYPSUM BOARD ASSEMBLIES

1.00 GENERAL

1.01 SCOPE

A. Furnish all materials, labor, equipment, plant, tools, required to complete
- Gypsum board assemblies attached to steel framing.
- Fiber Cement board assemblies attached to steel framing.

B. See drawings for details and location of work required.

1.02 RELATED DOCUMENTS

A. Division 7 Section "Sprayed-on Fireproofing" for fireproofing structural steel members concealed behind gypsum board assemblies.

1.03 SUBMITTALS

A. Shop Drawings showing locations, fabrication, and installation of control and expansion joints including plans, sections, details of components, and attachments to other units of Work.
B. Product certificates signed by manufacturers of gypsum board assembly components certifying that their products comply with specified requirements.

1.03 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in original packages, containers, or bundles bearing brand name and identification of manufacturer or supplier.

B. Store materials inside under cover and keep them dry and protected against damage from weather, direct sunlight, surface contamination, corrosion, construction traffic, and other causes. Neatly stack gypsum panels flat to prevent sagging.

2.00 PRODUCT

Refer to Section 01020 Summary of Materials and Finishes.

3.00 EXECUTION

3.1 EXAMINATION

A. Examine substrates to which gypsum board assemblies attach or abut. installed hollow metal frames, cast-in-anchors, and structural framing, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of assemblies specified in this Section. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 APPLYING AND FINISHING GYPSUM BOARD, GENERAL

A. Gypsum Board Application and Finishing Standards: Install and finish gypsum panels to comply with ASTM C 840, GA-214 and GA-216.
B. Install ceiling board panels across framing to minimize the number of abutting end joints and to avoid abutting end joints in the central area of each ceiling. Stagger abutting end joints of adjacent panels not less than one framing member.
C Install gypsum panels with face side out. Do not install imperfect, damaged, or damp panels. Butt panels together for a light contact at edges and ends with not more than 1/16 inch (1.5 mm) of open space between panels. Do not force into place.
D. Locate both edge or end joints over supports, except in ceiling applications where intermediate supports or gypsum board back-blocking is provided behind end joints. Do not place tapered edges against cut edges or ends. Stagger vertical joints on opposite sides of partitions. Avoid joints other than control joints at corners of framed openings where possible.
E. Attach gypsum panels to steel studs so leading edge or end of each panel is attached to open (unsupported) edges of stud flanges first.
F. Attach gypsum panels to framing provided at openings and cutouts.
H. Space fasteners in gypsum panels according to referenced gypsum board application and finishing standard and manufacturer's recommendations.
I Space screws a maximum of 12 inches (304.8 mm) o.c. for vertical applications.
J. Space fasteners in panels that are tile substrates a maximum of 8 inches (203 2 mm)
o.c.

SECTION 09300
TILE

1.00 GENERAL

1.01 SCOPE

A. Furnish all materials, labor, equipment, plant, tools required to complete:
   - all types of tile works.

1.02 SAMPLES

Submit samples of floor and wall tiles including all required beads and moldings.

2.00 PRODUCTS

Refer to Section 01020 Summary of Materials and Finishes.

3.00 EXECUTION

3.01 APPLICATION OF SCRATCH COAT

A. Thoroughly dampen, but not saturate, surfaces of masonry or concrete walls before applying the scratch coat. Make surface areas appear slightly damp. Allow no free water on the surface.
B. On masonry, first apply a thin coat with great pressure, then bring it out sufficiently to compensate for the major irregularities on the masonry surfaces to a thickness of not less than 6 mm (1/4") at any point.
C. Evenly rake scratch coats, but not dash coats, to provide good mechanical key for subsequent coats before the mortar has fully hardened.
D. On surfaces not sufficiently rough to provide good mechanical key, dash on the first coat with a whisk broom or fiber brush using a strong whipping motion. Do not trowel or otherwise disturb mortar applied by dashing until it is hardened.

3.02 FLOOR TILE INSTALLATION ON MORTAR BED

A. Before spreading the setting bed, establish lines of borders and center the fieldwork in both directions to permit the pattern to be laid with a minimum of cut tiles.
B. Clean concrete sub-floor then moisten but not soak. Afterwards, sprinkle dry cement over the surfaces and spread the mortar on the setting bed.

C. Mix mortar one (1) part Portland cement to three (3) parts sand. Tamp to ensure good bond over the entire area and screed to provide a smooth level bed at proper height and slope.
D. Pitch floor to drains as required.
E. After setting bed has set sufficiently to be worked over, sprinkle dry cement over and lay tiles.
F. Keep tile joints parallel and straight over the entire area by using straight edges.
G. Tamp the tile solidly into the bed, using wood blocks of size to ensure solid bedding free from depression.
H. Lay tiles from center lines outward and make adjustments at walls.

3.03 WALL TILE INSTALLATION ON MORTAR BED

A. Before application of mortar bed, dampen the surface of the scratch coat evenly to obtain uniform section.
B. Use temporary or spot grounds to control the thickness of the mortar bed. Fill out the mortar bed even with the grounds and rod it to a true plane.
C. Apply the mortar bed over an area no greater than can be covered with tile while the coat is still plastic.
D. Allow no single application of mortar to be 19 mm (3/4") thick.
E. Completely immerse wall tile in clean water and soak it at least 1/2 hour. After removal, stack tile on edge long enough to drain off excess water. Re-soak and drain individual tiles that dry along edges. Allow no free moisture to remain on the back of tile during setting.
F. Apply a bond coat 1/32 to 1/16 inch thick to the plastic setting bed or to the back of each sheet or tile.
G. Press tile firmly into the bed and beat into place within one (1) hour.
H. Lay tile fields in rectangular block areas not exceeding 600 mm by 600 mm (24" by 24"). Cut the setting bed through its entire depth along the edges of each block area after placement and before subsequent blocks are installed.
I. Within 1 hour after installation of tile, remove strings from string-set tile and wet the faces of face-mounted tile and remove the paper and glue. Avoid using excess water. Adjust any tile that is out of alignment.

3.04 GROUTING

A. After tile, brick, or marble slab has sufficiently set, force a maximum of grout into joints by trowel, brush or finger application.
B. Before grout sets, strike or tool the joints of cushion-edge tiles to the depth of the cushion.
C. Fill all joints of square-edged tile flush with the surface of the tile. Fill all gaps or sips.
D. During grouting, clean all excess grout off with clean burlap, other clothes or sponges.

3.05 CLEANING

Sponge and wash tile thoroughly with clear water after the grout has stiffened. Then clean by rubbing with damp cloths or sponges and polish clean with dry cloth.

SECTION 09600
STONE

1.00 GENERAL

1.01 SCOPE

A. Furnish all materials, labor, equipment, plant, tools required to complete.
   - all homogeneous Granite Stone slab finish
   - all Quartz countertop finish
   - all Cobblestone finish

B. See drawings and details for location.

1.02 RELATED DOCUMENTS

A Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

2.00 PRODUCTS

Refer to Section 01020 Summary of Finishes and Materials.

3.00 EXECUTION

3.01 EXAMINATION

A. Examine surfaces to receive stone flooring finishes and conditions under which finish will be installed for compliance with requirements for installation tolerances and other conditions affecting performance of stone paving and flooring.

3.02 PREPARATION

A. Vacuum clean concrete substrates to remove dirt, dust, debris, and loose particles.

B. Remove substances from concrete substrates that could impair mortar bond, including curing and sealing compounds, form oil, and laitance.

C. Clean stone surfaces that have become dirty or stained by removing soil, stains, and foreign materials before setting. Clean stone by thoroughly scrubbing with fiber brushes and then drenching with clear water. Use only mild cleaning compounds that contain no caustic or harsh materials or abrasives.

3.03 INSTALLATION, GENERAL

A. Execute stone paving and flooring installation by skilled mechanics and employ skilled stone fitters at the site to do necessary field cutting as stone is set.

B. Set stone to comply with Drawings and Shop Drawings. Match for color and pattern by using units numbered in sequence as indicated on Shop Drawings.
C. Scribe and field-cut stone as necessary to fit at obstructions. Produce tight and neat joints.
D. Provide the necessary non-rust anchors to fix the stone slab finish permanently on walls.

SECTION 09650
RESILIENT FLOORING

1.00 GENERAL

1.01 SCOPE

A. Furnish all materials, labor, equipment, tools required to complete:
- Homogeneous vinyl tile works.

1.02 SAMPLES

Submit samples of homogeneous vinyl sheets/tiles.

2.00 PRODUCTS

- Refer to Section 01020 Summary of Materials and Finishes.

3.00 STORAGE AND HANDLING

Store rolls on clean, flat, and solid surfaces in a controlled environment. Do not store outside. Place 6'6" (2 m.) wide rolls in an upright position. Do not lay flat or stack rolls on top of each other. Handle all materials carefully and safely.

4.00 SUBFLOOR PREPARATION

The General Contractor will supply a smooth, flat concrete finish ready to receive the new resilient sheet flooring.

The concrete subfloor will be cured for a minimum of at least thirty (30) days The slab will have a tolerance of 3/16" (4.5mm) in a 10' (3.05 m) radius.

Prepare substrate as per ASTM F710 "Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring".

The concrete floor temperature will have to be maintained at a minimum of 65°F (18°C) for 48 hours prior. during. and 48 hours after the installation.

4.01 MOISTURE TESTING

The concrete slab. new or old, should be tested for moisture rates by a recognized engineering firm.

- "Standard Test Method for Measuring Moisture Evaporation Rate of Concrete Subfloor Using Anhydrous Calcium Chloride"

- and/or "Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using In-Situ Probes".

A. Before proceeding with any work, inspect the subfloor surface and report in writing to the Project Manager and the General Contractor any visible defects on the surface such as cracks, bumps, rough areas or variations in evenness.

B. Check the subfloor for grease, oil, paint, marker, spills, dust or any contamination that may adversely affect the adhesion of the flooring. Clean the subfloor according to the existing conditions.

C. Prohibit circulation of other trades in the installation area.

D. Sanding of the subfloor will be mandatory in many cases; especially in areas where the subfloor has been contaminated with foreign products. It may be necessary to scarify or bead-blast concrete surface to remove existing adhesives, paint, curing agents, concrete sealers or other surface applied materials.

E. The General Contractor shall patch and repair all cracks, voids and other imperfections of concrete with high strength Portland cement based patching compounds approved by the manufacturer. Do not use gypsum based patching materials.

F. After completion of sanding, patching and leveling, vacuum or sweep entire surface of concrete to remove loose dust and dirt before starting the installation of material.

5.00 INSTALLATION INSTRUCTIONS

5.01 FLOORING INSPECTION

Inspect all materials carefully to verify that correct colors, lot number, patterns, quality and quantities have been shipped as ordered. Do not install, cut, or fit any material that has visible defects. Material that may have minor edge damage or distortion should be trimmed and removed prior to installation of the sheets.

A contractor that installs material with visible defects or damage without prior consent of the Architect deems the product acceptable for installation and therefore accepts full responsibility for said material.

5.02 DRY LAY OF SHEETGOODS

A. Installation temperature shall be at least 65°F (18°C) maintained for 48 hours prior to during and 48 hours after installation.

B. Mark the center starting line.

C. Unroll the first length of material along this chalk line and then work progressively outward. leaving a 1/4" (4mm) gap between the sheets to allow the material to relax for at least 16-24 hours.

D. Seaming should be kept to a minimum and avoid cross seams as much as possible. Place seams in areas exposed to the least amount of traffic.

E. Before applying the adhesive. bring the loose sheets close together leaving a gap of 1/32" (1mm).

F. The 1/32" (1 mm) gap is the space needed for the electric groover. This gap has to be constant in width.

5.03 ACRYLIC ADHESIVE INSTALLATION METHOD

Acrylic Adhesive or approved equal.

- Follow the guidelines indicated on the pail of adhesive.

A. Recommended trowel size:
   - For Porous Substrates - 1/16" x 1/16" x 1/16" (1.6 mm x 1.6 mm x 1.6 mm) square notch covering 125 - 185 sq. ft. per US gallon (3.06 - 4.53 m2 per liter).
   - For Nonporous Substrates – 1/32" x 1/16" x 1/32" (0.8 mm x 1.6 mm x 0.8 mm) 'U' notch. covering 185 - 245 sq ft. per US gallon (4.53 - 6.0 m2 per liter).

B. Lay flooring back to apply adhesive: Roll back or fold back methods described below.
   - Roll back: To reduce the risk of bubbles, the roll back method is the most recommended. By keeping the roll tight and maintaining a constant pressure while unrolling into the adhesive, the risk for bubbles will be minimal. With the roll back method. do not pre-cut material as if to be the final trim. Leave material 2"-3" (5-7 cm) longer for trimming after placement.
   - Fold back: Care must be taken to not flap flooring back to prevent trapping excess air.

     Note: Fold back and roll back methods are preferred to the fold lengthwise method (as used for rolls of carpet). However, some areas will dictate the fold lengthwise method.

C. Starting from the center line and working outward, fold back the sheets (width) halfway and apply the adhesive to the subfloor.

D. To ensure uniform adhesion of the entire surface, only spread a workable amount of adhesive at one time.

E. Maintain a uniform spread rate. Replace trowel (or trowel blade) with every pail used.

F. SMOOTH ADHESIVE RIDGES WITH A PAINT ROLLER

- Immediately after troweling the adhesive onto the concrete use a medium napped paint roller saturated with adhesive to flatten out visible trowel marks and even out the adhesive. A double arm roller frame is recommended to ensure an even coat of adhesive.

G. Once the adhesive is applied, fold back or roll back the flooring into the still wet adhesive for 4''-6'' (10-15 cm). This will ease the foldback or roll back of the second half and it will help avoid an overlap of the glueline. Should this method not followed, the glueline mark will telegraph through the flooring.

H. The use of walking boards is advised to protect from adhesive displacement during installation

I. "Open time" of the adhesive is dependent upon porosity of the substrate, temperature, and humidity. It is important that the installers familiarize themselves with the adhesive before starting the installations. Insufficient open time for acrylic adhesive will cause bubbling. A too long open time will result in poor adhesive transfer.

J While installing, always work to have complete sheets glued at the end of the day.

Note: Use a 14'' to 16'' cork board or a piece of 2'' x 4'' wrapped with carpet to remove air bubbles.

K. Once flooring is placed into the adhesive, immediately roll thoroughly with a 3 sectional 100-lbs (45 kg) steel roller in both directions. Move roller slowly to expel trapped air and assure complete adhesive transfer to the flooring.

L. Continue laying sheets by keeping the edges spaced 1/32" (1 mm), trimming each side with a straight edge or scribing. The goal is to produce a uniformly 1/32" (1 mm) spaced seam for welding.

M. During the installation, always double check the flooring for bubbles with the lights on and off.

WARNING: Avoid adhesive displacement by prohibiting traffic for a period of 48 hours and 72 hours for rolling loads.

5.04 POLYURETHANE ADHESIVE METHOD (For areas with heavy rolling loads exceeding 175lbs)

Use a recommended adhesive, or approved equal.

- Follow the guidelines indicated on the pail of adhesive.
- Mix polyurethane adhesive part A and part B as recommended by the adhesive manufacturer. Recommended trowel size is 1/32" x 1/16" x 1/32" (0.8 mm x 1.6 mm x 0.8 mm) 'U' notch, covering 185 - 245 sq. ft. per US gallon (4.53 - 6.0 m2 per liter).

A. Lay flooring back to apply adhesive: Roll back or fold back methods described below.

- Roll back: To reduce the risk of bubbles, the roll back method is the most recommended. By keeping the roll tight and maintaining a constant pressure while unrolling into the adhesive, the risk for bubbles will be minimal. With the roll back method, do not pre-cut material as if to be the final trim. Leave material 2"-3" (5-7 cm) longer for trimming after placement.
- Fold back: Care must be taken to not flap flooring back to prevent trapping excess air.

B. Starting from the center line and working outward, fold the sheets back halfway and apply the adhesive to the subfloor.

   Note: Fold back and roll back methods are preferred to the fold lengthwise method. Some areas will dictate the fold lengthwise method.

C. To ensure uniform adhesion of the entire surface, only spread a workable amount of adhesive at one time.

D. Maintain a uniform spread rate. Replace trowel (or trowel blade) with every pail used.

E. There is no 'open time' with this type of adhesive, therefore once the adhesive is applied, immediately install the flooring into the wet adhesive.

F. While installing, always work to have complete sheets glued at the end of the day.

G. To reduce the risk of bubbles, the roll back method is the most recommended.

H. By keeping the roll tight and maintaining a constant pressure while unrolling into the adhesive, the risk for bubbles will be minimal.

I. The fold back method is acceptable, but care must be taken to not flap it back too quickly.

   Note: ON KNEELING/WALKING BOARDS Use a 14'' to 16'' (35-40cm) cork board or a piece of 2'' x 4'' (10cm x 20cm) wrapped with carpet to remove air bubbles.

J. Once flooring is placed into the adhesive, immediately roll thoroughly with a 3 sectional 100-lbs (45 kg) steel roller in both directions.

K. Continue laying sheets by keeping the edges spaced 1/32" (1 mm), trimming each side with a straight edge or scribing. The goal is to produce a uniformly 1/32" (1 mm) spaced seam for welding.

L. During the installation, always double check the flooring for bubbles with portable or fixed lighting.

   WARNING:

   - Avoid adhesive displacement by prohibiting traffic for a period of 48 hours and 72 hours for rolling loads.
   - The use of walking boards is mandatory to protect from adhesive displacement during and after installation.

6.00 HEAT WELDING

Refer to ASTM F1516 "Standard Practice for Sealing Seams of Resilient Flooring by the Heat Weld Method".

6.01 ROUTING

Rout 2/3 of the total thickness of the homogeneous flooring.

A. Groove only 16-24 hours after the installation.

B. Use an electric routing machine for major installation such as Leister, JANSER or equal, approved by manufacturer.

C. The use of a straight edge and hand groover, with care, will provide good results for smaller installations. Maintain a uniform width and depth of groove for a uniform welded seam.

6.02 MANUAL WELD

Note: Always practice on a scrap piece of material first to assure proper temperature and speed. This should be done every day there is welding to do on the job site. Doing so will prevent failures.

A. This must be done with a heat welding gun with variable temperature control and speed weld nozzle by Leister or equal, approved by manufacturer.

B. Nozzle size is 5mm as the Leister Speed Tip #105433 model.

C. Keep tip perpendicular to the flooring to ensure a uniform weld.

D. Always keep the tip clean.

Notes: For both installation types, do not heat weld resilient flooring for a minimum of 24 hours after the material has been placed into the adhesive.

7.00 TRIMMING WELDED ROD

Note: Trimming is done once the welding rod and material have completely cooled.

A. Trimming must be done in two passes.

B. Use trimming tools sharpened in the middle only, such as the Mozart trimmer.

C. This type of trimmer will not damage the flooring when used properly.

D. The first trim has to be done with the thickness guide.

E. The second trim has to be done with the trimmer only.

F. Always verify the trimmed weld to ensure that the welding rod is bonded properly and is flush with the top wear layer.

8.00 FLASH COVING

Note: for better results while flash coving, the walls finish has to be properly done, down to the ground. There should not be any voids at the bottom of the wall. Trimming must be done in two passes.

A Metal capping is preferred to vinyl cap.

B. Miter all corners cleanly.

C. Outside corners should be cut and shaped from a solid piece of aluminum cap.

D. Affix cove stick to the floor and wall.

E. The flooring material can be either pattern scribed or cut in by hand.

F. Outside corners are formed using the "butterfly" method.

G. Inside corners are typically cut at a 45° angle on the wall.

H. Corners and straight walls are adhered with a good quality acrylic adhesive or a good quality solvent free contact cement.

I. On dusty walls, it will often be necessary to apply two coats.

J. Coat wall entirely and overlap past the cove stick and onto the substrate approximately 1"-2" (2-5 cm).

K. While installing the outside corners, it may be necessary to heat in order to shape the material.

9.00 ONCE THE INSTALLATION IS COMPLETE

A. Do a visual inspection of the project.

B Verify every welded seam.

C. Repair every imperfection before leaving the project.

D. Make sure that every vertical obstacle such as doorframes is well trimmed and sealed with a silicone sealer or an equivalent product.

SECTION 09900
PAINTING

1.00 GENERAL

1.01 SCOPE

A. Furnish all materials, labor, equipment, plant, tools required to complete:
   - all painting and varnishing works

B. See drawings for location, quantity and extent of surfaces to receive paint and varnish.

1.02 WORK IN OTHER SECTIONS

The Painting Contractor shall examine the drawings and specifications for the section being painted and for painting work in other sections for possible conflict in work.

The Painting Contractor shall also examine all the surfaces to be finished under the contract and see that the work of other trades has been left or installed in satisfactory condition to receive the paint, stain, or specified finish.

1.03 PROTECTION OF WORK

The Painting Contractor shall protect his work and the work of other contractors against damage or injury caused by paint application.

1.04 WORKMANSHIP

A. The paint shall be applied only by skilled painters to the method specified so as to form a film of uniform thickness, free from sags, runs, crawls, or other defects.

B. For painted work, each succeeding coat shall differ slightly in color or tint from that of the preceding coat.

C. The Painting Contractor shall include in his work all final clean-up of paint spots on the floor, glass and finish hardware.

1.05 MATERIALS STORAGE

A. All materials shall be provided to the job site in clean, sealed, original containers with all labels and other markings intact. Materials will be stored in the area designated and all storage areas will be kept neat, clean and locked.

B. A room or rooms in the premises shall be assigned for the storage of painting tools and materials. Protect the floor with drop cloths or building paper. Place cloth and cotton waste in covered metal containers, or destroy them at the end of each work day.

C. All painting materials shall be received and mixed in an assigned room to avoid pilferage and maintain quality control. All necessary precautions shall be taken to prevent fire by complying with all applicable local Fire Prevention and Safety Ordinances.

1.06 COLORS

A. All colors are to be selected or approved by the Architect or his authorized representative and actual color chips shall be supplied to the Contractor for matching.

B. All undercoats shall be tinted to approximate the finish coat color.

1.07 SUBMITTALS

TEST PANELS: Prepare sample panels of selected color or shade on 300 mm by 300 mm (12" by 12") plywood panels for approval by the Architect. Colors may not be the manufacturer's standard color. Special color shall be provided as required.

1.08 FIRE PREVENTION

Every precaution will be taken by the Contractor to prevent fires. At the end of each day's work, all oily rags, empty containers and combustible material will be removed from the premises. Seal all paint and varnish containers with remaining content and store outside the construction site.

2.00 PRODUCT

2.01 MATERIALS

Refer to Section 01020 Summary of Finishes and Materials.

2.02 SURFACE PREPARATION

A. Masonry (new surface)

1) All areas to be painted must be dry and free of dirt, grease, oil, dust, loose grit or mortar and other contaminants.
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) Apply one coat Concrete Primer & Sealer.
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.

B. Masonry (old surface)

1) Remove scaling, flaking, blistering and peeling off paint either with the use of paint remover, wire brushing, or scraping.
2) For chalking old paint, use Masonry Surface Conditioner as primer.
3) 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.

C. Wood (new surface)

1) All areas to be painted must be dry and free of dirt, dust, grease, oil and other foreign matter.
2) Sand surface until wood is smooth to touch and no slivers or rough edges remain.
3) Dust off completely, then wipe with clean rag.
4) Apply one coat of Interior Primer & Sealer or Exterior Wood Primer.
5) Fill nail holes, cracks, dents and damaged areas with Plastic Wood Dough or Glazing Putty.

D. Metal (new surface)

1) Remove dust, dirt, grease, oil, wax, loose scales and other contaminants by wiping with rag soaked in lacquer thinner or naphtha.
2) Sand, wire brush or scrape all rusty metal exposed to the weather for some time.
3) Treat surface with Rust Converter. Let stand overnight, then wipe off white residue with clean rag soaked in lacquer thinner of naphtha.
4) Apply one coat Red oxide or Red Lead or Zinc Chromate Primer. Let dry overnight before finishing with one or two coats of recommended topcoat.

3.00 EXECUTION

3.01 APPLICATION

A. Employ only experienced, skilled craftsmen and apply as per manufacturer's written specifications.

B. Paint shall be applied by a brush, roller or spray in accordance with the manufacturer's directions. All materials when brushed, shall be evenly flowed on with brush best suited for the type of material being applied. When using roller, the covers shall be carpet, velvet back or high pile sheep wool best suited for materials and texture specified by the Architect. Sprayed paint shall be uniformly applied with suitable equipment.

C. Exposed surfaces shall mean all areas visible when all permanent or built in fixtures, etc., are in place in all areas specified or scheduled to be painted. Painted surfaces in back of movable equipment and furniture. Paint all inside metal and plastered surfaces visible through the above specified equipment covers.

D. Access panels, electrical panels, louvers, exposed conduits, primed outlet covers, primed wall and ceiling plates and other primed items they occur unless otherwise specified in Painting Schedule Paint the back sides of access panels, removable or hinged covers and the like.

E. Do not apply exterior paint in damp, rainy weather. Do not apply interior paint when in the Architect's opinion, satisfactory results cannot be obtained due to high humidity and excessive temperature. However, failures of the Architect to notify the Contractor shall not relieve the Contractor of responsibility to produce satisfactory results.

3.02 PROTECTION

A. Protect or remove all exposed finished hardware, lighting fixtures and accessories, plumbing fixtures and accessories, glasses and the like so that these are not stained during painting operations. Re-install them after completion of works.

B. Tape and cover with craft paper or equal all other surfaces which would be endangered by stains or paint marks.

C. Repair any damage done. Refinish any work made necessary by defective workmanship for material or carelessness of other crafts.

3.03 WORKMANSHIP IN GENERAL

A. Mix paint with proper consistency. Apply paints evenly and brush efficiently to minimize brush marks.

B. Stir paint thoroughly to keep pigment in even suspension when paint is being applied.

C. Except as otherwise directed by the Architect, apply paints in three coats (priming, body and finish). Allow each coat to dry thoroughly before the succeeding coat is applied. In general, unless otherwise instructed by the Architect, provide not less than 48 hours as the time between the applications of succeeding coats. Let the Architect or his representative inspect and approve each coat before the succeeding coat is applied.

D. If surfaces are not fully covered or cannot be satisfactorily finished in the number of coats specified, apply subsequent coats to attain the desired evenness of paint without extra cost to the Owner.

E. Touch up knots, pitch steaks, sappy spots, etc. where finish calls for interior paints or enamel. For exteriors, use any approved sealer.

F. Sand smooth woodwork to be finished with enamel or varnish. Use fine sand paper between coats of enamel or vanish applied to wood or metal to produce an even smooth surface.

G. Do not paint exterior while surface is damp or during rainy or damp weather.

H. Do necessary puttying of nail holes, cracks, etc. after the prime had been applied. Bring putty flush with adjoining surface in a neat, workmanlike manner.

I. Tint undercoats of paint or enamel to same or approximate shade of final coat.

J. Protect to remove hardware, hardware accessories, plates, lighting fixtures and other similar items during the painting operation and re-install them after completion of work.

3.04 VARNISHING

A. Sand thoroughly all woodwork surfaces to be varnished. Fill carefully all cracks, nail holes and other defects with first-quality colored or white putty tinted to match the desired finish.

B. For open-grain woods like Tangule etc., reduce the prominence of the course grain by applying first quality pastewood filler with consistency reduced for brush application and tinted to match the desired finish. Allow this filler to set sell and remove excess by wiping across grain. Allow overnight drying or as per required by manufacturer Remove all remaining surplus by wiping the wood

C. Allow stains and varnishes to dry for 48 hours between coats and sand lightly between coats with no. 00 sand paper or finer. Clean and dust before applying the next coat.

3.03 CLEANING

Protect the work and adjacent work and materials at all times by a suitable covering or by other methods. Upon completion of the work, remove paint and

varnish spots from the floor, glass and finish hardware. Remove all surplus materials, scaffolding, etc. so as to leave the premises in perfect condition, acceptable to the Owner.

SECTION 10100
VISUAL DISPLAY BOARDS

1.00 GENERAL

1.01 SCOPE

A. Furnish all materials, labor, equipment, plant, tools required to complete all:
- whiteboards
- glass boards
- bulletin boards

B. See drawings and details for design and locations of works required.

2.00 PRODUCTS

Refer to Section 01020 Summary of Materials and Finishes.

3.00 EXECUTION

3.02 FABRICATION

a. Fabricate / assemble all specialty items with quality conforming to furniture class.
b. Use countersunk hardware and connectors at surfaces which are visible.
c. Render all assemblies rigid, secure, true to line and plane.
d. Implement all butt joints with precision by using appropriate tools and equipment, and such that only a neat straight hairline is visible at such joints.

3.02 INSTALLATION

For wall mounted assemblies, use sufficient and appropriate mounting hardware and connections which are concealed. Mount assemblies plumb, straight, level and at prescribed heights.

SECTION 10200
INTERIOR SPECIALTIES

1.00 GENERAL

1.01 SCOPE

A. Furnish all materials, labor, equipment, plant, tools required to complete all:
- Toilet partitions
- Operable partitions

B. See schematic drawings for size and locations of works required.

2.00 PRODUCTS

Refer to Section 01020 Summary of Materials and Finishes.

3.00 EXECUTION

3.02 FABRICATION

Factory prefabricate everything including finish in accordance to the specifications and dimensions indicated in the schematic drawings and bid documents. All material specifications will be provided for by the manufacturer.

3.02 INSTALLATION

Installation will be handled by the manufacturer.

SECTION 10400
IDENTIFYING DEVICES

1.00 GENERAL

1.01 SCOPE

Furnish all materials, labor, equipment, plant, tools required for the installation of

- building identification letters

1.02 SAMPLE AND SHOP DRAWINGS

Submit samples for approval of the Architect. For the building identification, full size lettering layout and installation method shall be submitted to the Architect for approval before start of work. Make available half full size patters for the Owner, upon request.

2.00 PRODUCTS

2.01 MATERIALS

Refer to Section 01020 Summary of Materials and Finishes.

3.00 EXECUTION

3.01 WORKMANSHIP

Execute in high quality workmanship comparable with artworks.

3.02 INSTALLATION

Install in a secure and permanent manner at prescribed heights and/or layout. For the building identification, float letters away from the back wall with the use of cantilevered brass dowels behind each letter. For back walls with irregular surface, provide dowels with different lengths such that the letter faces are true to place. Embed dowels into the back wall by drilling appropriate sized holes at accurate points. Do not mutilate the back wall. After the dowels are positioned, fill with expanding grout, or other approved fillers and retouch flush to the back wall surface.

SECTION 10800
TOILET AND BATH ACCESSORIES

1.00 GENERAL

1.01 SCOPE

A. Furnish all materials, labor, equipment, plant, tools, required to complete all toilet and bath accessories

B. See drawings and details for sizes and locations of work required.

2.00 PRODUCTS

2.01 MATERIALS

Refer to Section 01020 Summary of Materials and Finishes.

3.00 EXECUTION

Furnish and install all toilet accessories true to line, plane and lever, in accordance to manufacturer's specifications.

SECTION 14210
ELECTRIC ELEVATORS

1.00 GENERAL

1.01 SCOPE

Furnish all materials, labor, equipment, plant, tools, required to complete and make ready for
electric passenger and hospital elevators.

1.02 RELATED DOCUMENTS

Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.03 SUMMARY

A. This Section includes the following:
   1. Electric traction passenger elevators.
   2. Electric traction hospital elevators.

B. Related Sections: The following Sections contain requirements that relate to this Section:

   1. Division 3 Section "Cast-in-Place Concrete" for setting sleeves, inserts, and anchoring devices in concrete.
   2. Division 4 Section "Unit Masonry" for setting sleeves, inserts, and anchoring devices in masonry
   3. Division 5 Section "Structural Steel" for attachment plates, angle brackets, and other preparation of structural steel for fastening guide-rail brackets.
   4. Division 5 Section "Metal Fabrications" for attachment plates, angle brackets, divider beams, and other steel framing for supporting guide-rail brackets.
   5. Division 5 Section "Structural Steel" for hot-rolled steel subsills and entrance frames that are a part of steel frame.
   6. Division 5 Section "Metal Fabrications" for hot-rolled steel subsills and entrance frames.
   7. Division 5 Section "Metal Fabrications" for pit ladders.
   8. Division 5 Section "Ornamental Metalwork" for combination hall push-button stations.
   9. Division 9 Section "Painting" for field painting of hoistway entrances.
   10. Division 9 Sections for finish flooring in elevator cars.

11. Division 15 Sections for ventilating hoistways and machine rooms.
12. Division 16 Sections for electrical service to elevators, including fused disconnect switches, standby power source, and transfer switch.
13. Division 16 Sections for security card access equipment used to restrict elevator use.

C. Allowances: Provide finished elevator cars under the elevator car allowances specified in Division 1 Section "Allowances." Allowances include furnishing and installing wall, floor, and ceiling finishes; car doors; light fixtures; and handrails. Allowances also include cutouts, trim, and other provisions for installing elevator signal equipment in cars.

1.04 DEFINITIONS

A. Electric Traction Elevators: Elevators in which cars are hoisted by wire ropes using electrically driven traction sheaves and are defined to include driving machines; cars; hoistway doors; guide rails; guide-rail brackets; roping; buffers; counterweights; signals; control systems; electrical wiring within elevator system; and devices for operations, safety, security, required performance at rated speed and capacity, and for complete elevator installation.

1. Counterweight displacement switches, seismic switch, and other elevator safety equipment required by the "Code" for seismic risk zone 2 or greater are included.

B. Defective Elevator Work. Operation or control system failures; performances below specified ratings; excessive wear; unusual deterioration or aging of materials or finishes; unsafe conditions; the need for excessive maintenance; abnormal noise or vibration; and similar unusual, unexpected, and unsatisfactory conditions.

1.05 SUBMITTALS

A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.

B. Product Data for each elevator including capacities, sizes, performances, operations, safety features, finishes, and similar information.

C Shop Drawings for each elevator showing plans, elevations, sections, and large-scale details indicating service at each landing, machine room layout, coordination with building structure, and relationships with other construction. Indicate variations from specified requirements, maximum dynamic and static loads

imposed on building structure at points of support, and locations of equipment and signals. Include maximum and average power demands.

D. Samples of exposed finishes for car, hoistway doors, and signal equipment; 3-inch (75-mm) square samples of sheet materials; and 4-inch (100-mm) lengths of running trim members.

E. Maintenance manuals for each different electric traction elevator, including operation and maintenance instructions, parts listing with sources indicated, recommended parts inventory listing, emergency instructions, and similar information. Include all diagnostic and repair information available to manufacturer's and Installer's maintenance personnel. Submit for Owner's information at project closeout as specified in Division 1.

F. Inspection and acceptance certificates and operating permits as required by governing authorities for normal, unrestricted elevator use.

1.06 QUALITY ASSURANCE

A. Installer Qualifications: Engage the elevator manufacturer or an experienced Installer approved by the elevator manufacturer who has completed elevator installations similar in material, design, and extent to that indicated for this Project and with a record of successful in-service performance.

B. Regulatory Requirements: In addition to local governing regulations, comply with the applicable provisions of the following:

1. ASME A17.1, "Safety Code for Elevators and Escalators," referred to as the "Code."

1.07 WARRANTY

A. General Warranty: The elevator warranty specified in this Article shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by the Contractor under requirements of the Contract Documents.

B. Standard Elevator Warranty: Submit a written warranty signed by manufacturer agreeing to repair, restore, or replace defective elevator work within the specified warranty period.

1. Warranty Period: 12 months from date of Substantial Completion.

1.08 MAINTENANCE SERVICE

A. Initial Maintenance Service. Beginning at Substantial Completion, provide 12 months' full maintenance service by skilled, competent employees of the elevator Installer. Include monthly preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper elevator operation at rated speed and capacity. Use parts and supplies as used in the manufacture and installation of original equipment.

1. Perform maintenance, including emergency callback service, during normal working hours.
2. Include 24-hour-per-day, 7-day-per-week emergency callback service.

   a. Response Time: 2 hours or less.

B. Continuing Maintenance Service: Provide a continuing maintenance proposal from Installer to Owner, in the form of a standard yearly (or other period) maintenance agreement, starting on date initial maintenance service is concluded. State services, obligations, conditions, and terms for agreement period and for future renewal options.

C. Continuing Maintenance Service: Provide a continuing maintenance proposal from Installer to Owner, in the form and with terms, conditions, and obligations set forth in "Draft of Elevator Maintenance Agreement" at end of this Section, starting on date initial maintenance service is concluded.

2.00 PRODUCTS

2.01 MATERIALS AND COMPONENTS

Refer to Section 01020 Summary of Materials and Finishes. Include all items and systems comprising the standard features of the Elevator Model of choice.

3.00 EXECUTION

3.01 EXAMINATION

A. Examine elevator areas, with Installer present, for compliance with requirements, installation tolerances, and other conditions affecting performance of elevator work. Examine hoistways, hoistway openings, pits, and machine rooms, as constructed; verify critical dimensions; and examine supporting structure and other conditions under which elevator work is to be

installed. Do not proceed with installation until unsatisfactory conditions have been corrected.

1. For the record, prepare a written report, endorsed by the Installer, listing dimensional discrepancies and conditions detrimental to the performance of elevator work.

3.02 INSTALLATION

A. Comply with manufacturer's instructions and recommendations.

B. Welded Construction: Provide welded connections for installing elevator work where bolted connections are not required for subsequent removal or for normal operation, adjustment, inspection, maintenance, and replacement of worn parts. Comply with AWS standards for workmanship and for qualifications of welding operators.

C. Coordination: Coordinate elevator work with work of other trades for proper time and sequence to avoid construction delays. Use established benchmarks, lines, and levels to ensure dimensional coordination of the Work.

D. Sound Isolation: Mount rotating and vibrating equipment on vibration-isolating mounts designed to effectively prevent transmission of vibrations to structure and thereby, eliminate sources of structure-borne noise from elevator system.

E. Lubricate operating parts of systems, including ropes, as recommended by manufacturers.

F. Alignment: Coordinate installation of hoistway entrances with installation of elevator guide rails for accurate alignment of entrances with cars. Where possible, delay final adjustment of sills and doors until car is operable in shaft. Reduce clearances to minimum, safe, workable dimension at each landing.

G. Leveling Tolerance: 1/8 inch (3 mm), up or down, regardless of load and direction of travel.

H. Set sills flush with finished floor surface at landings. Fill space under sills solidly with nonshrink, nonmetallic grout.

3.03 FIELD QUALITY CONTROL

A. Acceptance Testing: Upon nominal completion of elevator installation and before permitting use (either temporary or permanent) of elevators, perform

acceptance tests as required and recommended by the "Code" and governing regulations and agencies.

B. Operating Test: Load elevators to rated capacity and operate continuously for 30 minutes over full travel distance, stopping at each level and proceeding immediately to the next. Record temperature rise of elevator machines during 30-minute test period. Record failure of elevators to perform as required.

1. Perform operating test specified above on one elevator of each type, capacity, speed, and travel distance.

C. Advise Owner, Architect, and authorities having jurisdiction in advance of dates and times tests are to be performed on elevators.

3.04 DEMONSTRATION

A. Instruct Owner's personnel in proper use, operation, and daily maintenance of elevators. Review emergency provisions, including emergency access and procedures to be followed at time of failure in operation and other building emergencies. Train Owner's personnel in procedures to follow in identifying sources of operational failures or malfunctions. Confer with Owner on requirements for a complete elevator maintenance program.

B. Make a final check of each elevator operation with Owner's personnel present and just prior to date of Substantial Completion. Determine that operation systems and devices are functioning properly.

3.05 PROTECTION

A. Temporary Use: Do not use elevators for construction purposes unless cars are provided with temporary enclosures, either within finished cars or in place of finished cars, to protect finishes from damage.

1. Provide full maintenance service by skilled, competent employees of the elevator Installer for elevators used for construction purposes. Include preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper elevator operation at rated speed and capacity. Use parts and supplies as used in the manufacture and installation of original equipment.
2. Provide protective coverings, barriers, devices, signs, or other procedures to protect elevators. If, despite such protection, elevators become damaged, engage elevator Installer to restore damaged work so that no evidence remains of correction work. Return items that cannot be refinished in the

field to the shop, make required repairs and refinish entire unit, or provide new units as required.

B. Provide final protection and maintain conditions, in a manner acceptable to elevator manufacturer and Installer, that ensure elevators are without damage or deterioration at the time of Substantial Completion.

SECTION 15050
BASIC MECHANICAL MATERIALS AND METHODS

1.1 GENERAL

1.2 DESCRIPTION OF WORK

A This Section includes the following:
1. Piping materials and installation instructions common to most piping systems.
2. Transition fittings.
3. Dielectric fittings.
4. Mechanical sleeve seals.
5. Sleeves.
6. Escutcheons.
7. Grout.
8. Mechanical demolition.
9. Equipment installation requirements common to equipment sections.
10 Painting and finishing.
11. Concrete bases.
12. Supports and anchorages.

1.3 DEFINITIONS

A. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe and duct shafts, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawlspaces, and tunnels.

B. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.

C. Exposed, Exterior Installations: Exposed to view outdoors or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.

D. Concealed, Interior Installations. Concealed from view and protected from physical contact by building occupants. Examples include above ceilings and in duct shafts

E. Concealed, Exterior Installations: Concealed from view and protected from weather conditions and physical contact by building occupants but subject to outdoor ambient temperatures. Examples include installations within unheated shelters.

F. The following are industry abbreviations for plastic materials:
1. ABS: Acrylonitrile-butadiene-styrene plastic.

2. CPVC: Chlorinated polyvinyl chloride plastic.
3. PVC: Polyvinyl chloride plastic.

G The following are industry abbreviations for rubber materials:
1. EPDM: Ethylene-propylene-diene monomer rubber.
2. NBR: Acrylonitrile-butadiene rubber.

1.4 SUBMITTALS

A. Product Data: For the following:
1. Transition fittings.
2. Dielectric fittings.
3. Mechanical sleeve seals.
4. Escutcheons.

B Welding certificates.

1.5 CONTRACTOR QUALIFICATIONS

A. Qualified mechanical contractor must have been in business for minimum 20 consecutive years.

B. Qualified mechanical contractor must have successfully completed a minimum 5 similar projects. Submit project name, description, size, and owner references for 5 projects of similar size and complexity. Similar projects must include Biosafety Lab level 3 and variable volume laboratory control components.

1.6 QUALITY ASSURANCE

A. Steel Support Welding: Qualify processes and operators according to AWS D1.1, "Structural Welding Code--Steel."

B Steel Pipe Welding: Qualify processes and operators according to ASME Boiler and Pressure Vessel Code: Section IX, "Welding and Brazing Qualifications."
1. Comply with provisions in ASME B31 Series, "Code for Pressure Piping."
2. Certify that each welder has passed AWS qualification tests for welding processes involved and that certification is current.

C. Electrical Characteristics for Mechanical Equipment: Equipment of higher electrical characteristics may be furnished provided such proposed equipment is approved in writing and connecting electrical services, circuit breakers, and conduit sizes are appropriately modified. If minimum energy ratings or efficiencies are specified, equipment shall comply with requirements.

1.7 GENERAL REQUIREMENTS

A. Work under Division 15 shall include furnishing of all labor, materials, equipment, and services necessary for and reasonably incidental to the proper completion of all plumbing, fire protection, and HVAC work as shown on the drawings and herein specified.

B. Drawings shall not be scaled. Refer to architectural and structural drawings for building construction and dimensions and to room finish schedule on architectural drawings for material, finish and construction method of walls, floor and ceiling in order to insure proper rough-in and installation of work.

C. Work Included:

1. Include all labor, accessories, tools, equipment and material required to completely execute installation of the entire heating, ventilating and air conditioning, plumbing and fire protection systems as shown on the drawings and as specified. Work shall include but not be limited to the furnishing, unloading, handling distribution, setting, supporting and installation of all components required for the mechanical systems.

D Interpretation of Contract Documents:

1. Except where modified by a specific notation to the contrary, it shall be understood that the indication and/or description of any item, in the drawings or specifications or both, carries with it the instruction to furnish and install the item, regardless of whether or not this instruction is explicitly stated as part of the indication or description.
2. It shall be understood that the specifications and drawings are complimentary and are to be taken together for a complete interpretation of the work.
3. No exclusions from, or limitations in, the language used in the drawings or specifications shall be interpreted as meaning that the appurtenances or accessories necessary to complete any required system or item of equipment are to be omitted.
4. The drawings of necessity utilize symbols and schematic diagrams to indicate various items of work. Neither of these have any dimensional significance nor do they delineate every item required for the intended installations. The work shall be installed in accordance with the diagrammatic intent expressed on the drawings, and in conformity with the dimensions indicated on final architectural and structural working drawings and on equipment shop drawings.
5. No interpretation shall be made from the limitations of symbols and diagrams that any elements necessary for complete work are excluded.
6. Certain details appear on the drawings, which are specific with

regard to the dimensioning and positioning of the work. These details are intended only for the purpose of establishing general feasibility. They do not obviate field coordination for the intended work. Information as to the general construction shall be derived from structural and architectural drawings and specifications only.

7. The use of words in the singular shall not be considered as limiting Where other indications denote that more than one item is referred to.
8. Drawings are diagrammatic. They are not intended to be absolutely precise; nor are they intended to show every offset, every fitting, and every component. The purpose of the drawings is to represent a systems concept, and to indicate the main components of the systems with the approximate geometrical relationships. Based on the systems concept, this contractor shall provide all other components and materials necessary to make the systems fully complete and operational
9. If the required material, installation, or work can be interpreted differently from drawing to drawing, or between drawings and specifications; provide that material, installation, or work which is of the higher standard.

E. Standards and Codes:

1. Work shall be installed to conform with any law, regulation, code, ordinance, ruling or Fire Underwriters requirement applicable to this class of work.
2. All installations for construction purposes shall conform with the Department of
   Labor "Safety and Health Regulations for Construction".
3. All equipment with electrical components shall bear the UL label.
4. Mechanical systems including ductwork, air handling systems, utilities piping, and plumbing systems shall be designed, furnished, and installed in compliance with the latest edition of applicable codes and standards of the following organizations or as referenced here:
   a. National Mechanical Code of the Philippines
   b. National Fire Code of the Philippines
   c. National Building Code of the Philippines

1.8 COORDINATION

A. Arrange for pipe spaces, chases, slots, and openings in building structure during progress of construction, to allow for mechanical installations.

B. Coordinate installation of required supporting devices and set sleeves in

poured-in-place concrete and other structural components as they are constructed.

C. Coordinate requirements for access panels and doors for mechanical items requiring access that are concealed behind finished surfaces. Access panels and doors are specified in Division 8 Section "Access Doors and Frames."

D. HVAC, Plumbing, Fire Protection, and Electrical drawings are diagrammatic. They indicate the general arrangements of mechanical and electrical systems and other work. They do not show every offset required nor do they show the exact routings and locations needed to coordinate with structure and other trades.

E. Layout the work to prevent conflict with work of other trades and to coordinate the work. Systems shall generally be run in a rectilinear fashion.

F. The sprinkler piping will generally be run at the lowest elevation possible in the ceiling. Pipes will be run so the piping system is drainable.

G. Storm drain piping and sanitary waste piping, in which the grade must be maintained, shall have the first priority. Ducts and pipes shall be offset to avoid them.

H Service piping shall generally be run below ductwork so that they will be accessible for service and modification. The pipes will be offset as required to avoid interfering with access panels, dampers, etc.

I. Ducts will have second priority. Pipes will be offset as required to avoid them.

J. Where pipes of different trades conflict, such as domestic water vs. chilled water, the smaller pipe shall be offset.

1.9 COORDINATION DRAWINGS

A. Prepare coordination drawings to a scale of 1/4" = 1' - 0" or larger, detailing major elements, components, and systems of mechanical equipment and materials in relationship with other systems, installations, and building components. Indicate locations where space is limited for installation and access and where sequencing and coordination of installations are of importance to the efficient flow of the Work, including (but not necessarily limited to) the following:

B. Indicate the proposed locations of piping, ductwork, equipment, and materials.

Include the following:

1. Clearances for installing and maintaining insulation.
   - a Clearances for servicing and maintaining equipment, including tube removal, filter removal, and space for

equipment disassembly required for periodic maintenance.

b. Equipment connections and support details.
c. Roof curbs and openings.
d. Exterior wall and foundation penetrations.
e. Shaft and chase details.
f. Fire-rated wall and floor penetrations.
g. Complete air distribution including ductwork, terminal air boxes, air distribution devices, dampers, etc.
h. Hot water, chilled water, condenser water, make-up water, and gas piping; including valves, coils, meters, gauges, etc.
i. Fire sprinkler and standpipe system.
j. Roof drains and associated piping, sanitary waste and vent piping, domestic hot and cold water piping, any compressed air or gas piping.
k. Electrical cable-trays
l. All equipment and devices requiring electrical power. Show horsepower or KW, volts, phase, and amps.
m. Access doors and panels.
n. Sizes and location of required concrete pads and bases.
o Valve stem movement.

2. Indicate scheduling, sequencing, movement, and positioning of large equipment into the building during construction.
3. Prepare floor plans, elevations, and details to indicate penetrations in floors, walls, roofs, and ceilings and their relationship to other penetrations and installations.
4 Prepare reflected ceiling plans to coordinate and integrate installations, air outlets and inlets, light fixtures, access panels, communication systems components, sprinklers, and other ceiling-mounted items.
5. Furnish dimensioned setting location drawings, templates, instructions for installation of anchorages, such as concrete inserts, expansion joints, anchor bolts, pipe sleeves, and miscellaneous items having integral anchors, which are to be embedded in concrete, precast concrete, or masonry construction. Drawings will be coordinated amongst all pertinent prime and subcontractors prior to review and approval by General Contractor. A copy of the approved coordinated drawings shall be sent to the Architect for record purposes.
6. Furnish catalog information, factory assembly drawings and field installation drawings as required for a complete explanation and description of all items of equipment.

C. The drawings provided indicate a layout suitable for all the disciplines. To verify this, and to allow the flexibility in construction layout, the mechanical contractor will generate detailed,

multidiscipline drawings, working with all other disciplines.

1. The coordination drawings shall be submitted in CAD format.
   a. The drawings shall be in 3D
   b. The coordination drawing electronic files shall be suitable for use (directly or by data-import) by AutoCAD MEP 2014.
   c. The contractor shall submit a test file of one section of coordination drawing. representing an area of the building approximately 500- 1,000 SF and containing a representation of actual components for all the major systems, for approval of the electronic format and data standards. This must be approved prior to submittal of the full coordination drawings.
2. Each system shall be drawn on a separate layer. with different colors and line thicknesses. The format shall strictly follow the National CAD standards, latest edition, and shall clearly distinguish between:
   a. HVAC Equipment, including all devices scheduled.
   b. HVAC Ductwork: including supply, return, general exhaust, dust system exhaust, & BSL exhaust
   c. HVAC piping, including chilled water supply, chilled water return. heating water supply heating water return, condenser water supply, condenser water return, potable water makeup
   d. Plumbing piping, including potable. potable hot water, and sanitary piping
   e. Sprinklers & sprinkle piping,
   f. Electrical: including light fixtures, electrical cable trays.
3. The coordination drawings shall include clear and distinct indications of all access spaces required (I.E.: maintenance clearances. electrical code mandated clearances. etc.).
   a. Prior to submission, the coordination drawings shall be reviewed and approved by the following manufacturer's representatives who shall provide certification that all proper clearances have been met, and access panels/doors needed are shown, so that the representative will be able to provide warrantees for the equipment. The following equipment shall be so reviewed and approved.
      1) Chillers
      2) Boilers
      3) Cooling Towers
      4) Pumps
      5) AHUs

6) EFs
7) Lab Fans
8) Terminal Boxes
9) Lab Air Valves

1.10 PROTECTION OF EQUIPMENT

A. Protect all materials and equipment from damage during storage at the site and throughout the construction period.

B Protection from damage from rain, dirt, sun and ground water shall be accomplished by storing the equipment on elevated supports and covering them on all sides with protective rigid or flexible water proof coverings securely fastened. This includes ductwork as well as all stored materials.

C. Piping shall be protected by storing it on elevated supports and capping the ends with suitable material to prevent dirt accumulation in the piping.

1.11 CONTIGUOUS WORK:

A. If any part of the Contractor's work is dependent for its proper execution or for its subsequent efficiency or appearance on the character or conditions of contiguous work not executed by him, this contractor shall examine and measure such contiguous work and report to the Architect in writing any imperfection therein, or conditions that render it unsuitable for the reception of this work. Should the contractor proceed without making such written report, he shall be held to have accepted such work and the existing conditions and he shall be responsible provided prior approval of any substitute item is obtained from the Architect/Engineer. Therefore, in sections of the drawings or specifications where the words "or equal" or "or approved equal" follow a list of manufacturers, contractor may submit requests for substitutes on the specified item in accordance with the procedure specified in the General Conditions to the Contract.

1. In all cases the contractor shall be completely responsible for changes in dimension of other than first named manufacturer equipment, electrical changes, etc. required for proper function and final performance. Item shall comply with all requirements herein set forth and as required to perform as designed.

1.12 CERTIFICATE OF INSPECTION AND APPROVAL

A. Upon completion of work. furnish to the Owner certificates of inspection or approval from the authorities having jurisdiction if certificates of inspection or approval are required by law or

regulation.

1.13 PROJECT CLOSEOUT:

A. Maintenance Manuals:

1. At the end of construction, furnish to the Architect three (3) bound and indexed sets of maintenance and operating instructions, parts lists, electrical wiring diagrams, balance data, and manufacturer's literature sufficient for operation and complete maintenance of all equipment by the Owner. Approved submittals and shop drawings may be included in the Maintenance Manuals instead of being separately furnished, if desired.
2. It is intended that the documentation provided in maintenance manuals, along with as- built drawings, shall be complete and detailed enough to permit and facilitate troubleshooting, engineering analysis, and design work for future changes, without extensive field investigations and testing. Manuals shall be prepared so as to explain system operation and equipment to those not acquainted with the job.
3. Manuals shall be durably bound and clearly identified on the front cover (and on the spine of thick volumes). Identification shall include the building or project name, applicable trade (such as HVAC, Plumbing, Fire Protection, etc.), approximate date of completion (month and year), and contractor's name.
4. Manuals shall be organized into well-defined and easy to locate sections, with index tabs or separators to divide the sections. A complete table of contents shall be provided at the front indicating the section or page number for each system, subsystem, or supplier/manufacturer.
5. Manuals shall include complete information and diagrams on all controls, indicators, sensors, and signal sources. Control diagrams are to show the locations of components and major equipment by room number or other identification when room numbers are not applicable. Locations of out-of-sight components, such as duct-mounted sensors, flow switches, etc. should be clearly indicated. Control diagrams must include identification of components by make and model number, operating ranges, recommended set points, reset schedules, and other job-specific data useful for troubleshooting, calibration and maintenance. Complete narrative descriptions of operating sequences of control systems and subsystems shall be included on the prints adjacent to the corresponding schematics. Catalog data and cuts shall be clearly marked to indicate model numbers, sizes, capacities,

operating points, and other characteristics of each item used. This should include accessories or special features provided. Where various sizes or variations of a series or model are used, documents should clearly show which are used where. Where quantities are appropriate, schedule of usage should be provided. Maintenance literature shall include complete information for identifying and ordering replacement parts, such as illustrated parts breakdowns.

6. Maintenance manuals must include complete balance data on all systems.

B. Instructions to Owner:

1. Contractor shall conduct a maintenance and operational instruction session for the Owner. Where highly technical or complex equipment is supplied, such as chillers and control systems, manufacturer's representatives, controls subcontractors, and other appropriate personnel who are particularly qualified, shall conduct training sessions pertaining to their equipment, or systems. Such training shall be scheduled with the Owner in advance.

C. Spare Filters

1. A complete set of filters shall be provided and installed prior to Test and Balance. An additional set of filters shall be provided and installed at final completion. An additional set of filters shall be delivered to the Owner's representative in sealed packages with factory certification documents and tracking bar code. Temporary filters shall be used to keep the system clean whenever the HVAC system is used for temporary heating and cooling. New temporary filters shall be provided and installed when existing temporary filters become loaded with dust and/or debris

D. Warranties:

1. This Contractor warrants the mechanical systems to be free of defects in materials and workmanship for a period of one year after date of final payment. The effective dates of this warranty apply to all components of the mechanical systems regardless of any equipment manufacturer's warranties, which may expire at an earlier date. Any system malfunctions, or any previously undiscovered non-compliance with the plans and specifications, during the warranty period shall be repaired at no cost to the Owner.

2. Deliver to Owner all warranties, guarantees, etc. and obtain written receipts.

1.12 PRODUCTS

1.13 MANUFACTURERS

A. In other Part 2 articles where subparagraph titles below introduce lists, the following requirements apply for product selection:
   1. Available Manufacturers: Subject to compliance with specified requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the manufacturers specified.

B. Substitution of Specified Materials.
   1. Throughout the drawings and specifications, equipment and systems have been selected and are referenced by name, manufacturer, model number, etc. These references are not intended to limit competition and in most cases materials and methods of construction equal to that specified with be accepted provided prior approval of any substitute item is obtained from the Architect/Engineer. Therefore, in sections of the drawings or specifications where the words "or equal" or "or approved equal" follow a list of manufacturers, contractor may submit requests for substitutes on the specified item in accordance with the procedure specified in the General Conditions to the Contract.
   2. In all cases the contractor shall be completely responsible for changes in dimension of other than first named manufacturer equipment, electrical changes, etc. required for proper function and final performance. Item shall comply with all requirements herein set forth and as required to perform as designed.

C. Equipment and materials installed under this contract shall be new and without blemish or defect. Defective materials or equipment installed but not approved by the Architect or Engineer at the time of final inspection, shall be replaced with new before final acceptance by the Owner

D. Each major component of equipment shall have the manufacturer's name, address, model number, and rating on a plate securely affixed in a conspicuous place. The nameplate of a distributing agent will not be acceptable. ASME Code Ratings, UL label, or other data, which is die-stamped into the surface of the equipment, shall be stamped in a location easily visible.

1.14 PIPE, TUBE, AND FITTINGS

A. Refer to individual Division 15 piping Sections for pipe, tube, and fitting materials and joining methods.

B. Pipe Threads: ASME B1.20.1 for factory-threaded pipe and pipe fittings.

1.15 . JOINING MATERIALS

A. Refer to individual Division 15 piping Sections for special joining materials not listed below.

B. Pipe-Flange Gasket Materials: Suitable for chemical and thermal conditions of piping system contents.

1. ASME B16.21, nonmetallic, flat, asbestos-free, 1/8-inch maximum thickness unless thickness or specific material is indicated.
   a Full-Face Type: For flat-face, Class 125, cast-iron and cast-bronze flanges.
   b. Narrow-Face Type: For raised-face, Class 250, cast-iron and steel flanges.
2. AWWA C110, rubber, flat face, 1/8 inch thick, unless otherwise indicated; and full-face or ring type, unless otherwise indicated.

C. Flange Bolts and Nuts: ASME B18.2.1, carbon steel, unless otherwise indicated.

D. Plastic, Pipe-Flange Gasket, Bolts, and Nuts: Type and material recommended by piping system manufacturer, unless otherwise indicated.

E. Solder Filler Metals: ASTM B 32, lead-free alloys. Include water-flushable flux according to ASTM B 813.

F. Equipment and materials installed under this contract shall be new and without blemish or defect. Defective materials or equipment installed but not approved by the Architect or Engineer at the time of final inspection, shall be replaced with new before final acceptance by the Owner.

G Each major component of equipment shall have the manufacturer's name, address, model number and rating on a plate securely affixed in a conspicuous place. The nameplate of a distributing agent will not be acceptable. ASME Code Ratings, UL label, or other data, which is die-stamped into the surface of the equipment, shall be stamped in a location easily visible.

1.16 PIPE, TUBE, AND FITTINGS

A. Refer to individual Division 15 piping Sections for pipe, tube, and fitting materials and joining methods.

B. Pipe Threads: ASME B1.20.1 for factory-threaded pipe and pipe fittings.

1.17 JOINING MATERIALS

A. Refer to individual Division 15 piping Sections for special joining materials not listed below.

B. Pipe-Flange Gasket Materials: Suitable for chemical and thermal conditions of piping system contents.

1. ASME B16.21, nonmetallic, flat, asbestos-free. 1/8-inch maximum thickness unless thickness or specific material is indicated.
   a. Full-Face Type: For flat-face, Class 125, cast-iron and cast-bronze flanges.
   b. Narrow-Face Type: For raised-face. Class 250. cast-iron and steel flanges.
2. AWWA C110, rubber. flat face. 1/8 inch thick, unless otherwise indicated; and full-face or ring type, unless otherwise indicated.

C. Flange Bolts and Nuts: ASME B18.2.1. carbon steel. unless otherwise indicated.

D. Plastic, Pipe-Flange Gasket, Bolts, and Nuts: Type and material recommended by piping system manufacturer, unless otherwise indicated.

E. Solder Filler Metals: ASTM B 32, lead-free alloys. Include water-flushable flux according to ASTM B 813.

F. Dielectric Couplings: Galvanized-steel coupling with inert and noncorrosive, thermoplastic lining; threaded ends; and 300-psig minimum working pressure at 225 deg F.

G. Dielectric Nipples: Electroplated steel nipple with inert and noncorrosive, thermoplastic lining; plain, threaded, or grooved ends: and 300-psig minimum working pressure at 225 deg F.

1.18 MECHANICAL SLEEVE SEALS

A. Description: Modular sealing element unit, designed for field assembly, to fill annular space between pipe and sleeve.

1. Sealing Elements: EPDM interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
2. Pressure Plates: Plastic. Include two for each sealing element
3. Connecting Bolts and Nuts: Stainless steel of length required to secure pressure plates to sealing elements. Include one for each sealing element.

1.19 SLEEVES

A. Galvanized-Steel Sheet: 0.0239-inch minimum thickness; round tube closed with welded longitudinal joint.

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

C. Stack Sleeve Fittings: Manufactured, cast-iron sleeve with integral

clamping flange.

Include clamping ring and bolts and nuts for membrane flashing.

1. Underdeck Clamp: Clamping ring with set screws.

1.20 ESCUTCHEONS

A. Description: Manufactured wall and ceiling escutcheons and floor plates, with an ID to closely fit around pipe, tube, and insulation of insulated piping and an OD that completely covers opening.

B. One-Piece. Deep-Pattern Type: Deep-drawn, box-shaped brass with polished chrome-plated finish.

C. One-Piece, Cast-Brass Type: With set screw.
   1. Finish: Polished chrome-plated.

D. Split-Casting. Cast-Brass Type: With concealed hinge and set screw.
   1. Finish: Polished chrome-plated.

E. One-Piece, Stamped-Steel Type: With set screw or spring clips and chrome-plated finish.

F. Split-Plate, Stamped-Steel Type: With hinge, set screw, and chrome-plated finish.

1.21 GROUT

A. Description: ASTM C 1107, Grade B, non-shrink and nonmetallic, dry hydraulic-cement grout.
   1. Characteristics: Post-hardening, volume-adjusting, non-staining, noncorrosive, nongaseous, and recommended for interior and exterior applications
   2. Design Mix. 5000-psi, 28-day compressive strength.
   3. Packaging: Premixed and factory packaged.

3.1 EXECUTION

3.2 PIPING SYSTEMS - COMMON REQUIREMENTS

A Install piping according to the following requirements and Division 15 Sections specifying piping systems.

B Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.

C. Install piping in concealed locations, unless otherwise indicated and

except in equipment rooms and service areas.

D. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

E. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.

F. Install piping to permit valve servicing.

G. Install piping at indicated slopes, or to allow positive drainage.

H. Install piping free of sags and bends.

I. Install fittings for changes in direction and branch connections.

J. Install piping to allow application of insulation.

K. Select system components with pressure rating equal to or greater than system operating pressure.

L. Install escutcheons for penetrations of walls, ceilings, and floors according to the following.

1. New Piping:

a. Piping with Fitting or Sleeve Protruding from Wall: One-piece, deep-pattern type.

b. Insulated Piping: One-piece, stamped-steel type with spring clips.

c. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One-piece, cast-brass type with polished chrome-plated finish.

d. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One-piece, stamped-steel type.

e. Bare Piping at Ceiling Penetrations in Finished Spaces: One-piece or split-casting, cast-brass type with polished chrome-plated finish.

f. Bare Piping at Ceiling Penetrations in Finished Spaces: Split-plate, stamped-steel type with concealed hinge and set screw.

M. Install sleeves for pipes passing through concrete and masonry walls and concrete floor and roof slabs.

N. Install sleeves for pipes passing through concrete and masonry walls, gypsum-board partitions, and concrete floor and roof slabs.

1. Cut sleeves to length for mounting flush with both surfaces

a. Exception: Extend sleeves installed in floors of mechanical equipment areas or other wet areas 2 inches above finished floor level. Extend cast-iron sleeve fittings below floor slab as required to secure clamping ring if ring is specified.

2. Install sleeves in new walls and slabs as new walls and slabs are constructed.

3. Install sleeves that are large enough to provide 1/4-inch annular

clear space between sleeve and pipe or pipe insulation. Use the following sleeve materials:

a. Steel Pipe Sleeves: For pipes smaller than NPS 6.

b. Steel Sheet Sleeves: For pipes NPS 6 and larger, penetrating gypsum- board partitions.

c. Stack Sleeve Fittings: For pipes penetrating floors with membrane waterproofing. Secure flashing between clamping flanges. Install section of cast-iron soil pipe to extend sleeve to 2 inches above finished floor level. Refer to Division 7 Section "Sheet Metal Flashing and Trim" for flashing.

1) Seal space outside of sleeve fittings with grout.

4. Except for underground wall penetrations, seal annular space between sleeve and pipe or pipe insulation, using joint sealants appropriate for size, depth, and location of joint. Refer to Division 7 Section "Joint Sealants" for materials and installation.

O Aboveground, Exterior-Wall Pipe Penetrations: Seal penetrations using sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.

1. Install steel pipe for sleeves smaller than 6 inches in diameter.

2. Mechanical Sleeve Seal Installation: Select type and number of sealing elements required for pipe material and size. Position pipe in center of sleeve. Assemble mechanical sleeve seals and install in annular space between pipe and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

P. Underground, Exterior-Wall Pipe Penetrations: Install cast-iron "wall pipes" for sleeves Seal pipe penetrations using mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.

1 Mechanical Sleeve Seal Installation: Select type and number of sealing elements required for pipe material and size. Position pipe in center of sleeve. Assemble mechanical sleeve seals and install in annular space between pipe and sleeve Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

Q. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestop materials. Refer to Division 7 Section "Through-Penetration Firestop Systems" for materials.

R. Verify final equipment locations for roughing-in.

S. Refer to equipment specifications in other Sections of these Specifications for roughing-in requirements.

3.3 PIPING JOINT CONSTRUCTION

A. Join pipe and fittings according to the following requirements and Division 15 Sections specifying piping systems.

B Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.

C Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.

D. Soldered Joints: Apply ASTM B 813, water-flushable flux, unless otherwise indicated, to tube end. Construct joints according to ASTM B 828 or CDA's "Copper Tube Handbook," using lead- free solder alloy complying with ASTM B 32.

E. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," "Pipe and Tube" Chapter. using copper-phosphorus brazing filler metal complying with AWS A5.8.

F. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:

1. Apply appropriate tape or thread compound to external pipe threads unless dry seal threading is specified.
2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.

G Welded Joints: Construct joints according to AWS D10.12. using qualified processes and welding operators according to Part 1 "Quality Assurance" Article.

H. Flanged Joints: Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Use suitable lubricants on bolt threads.

I Plastic Piping Solvent-Cement Joints: Clean and dry joining surfaces. Join pipe and fittings according to the following:

1. Comply with ASTM F 402 for safe-handling practice of cleaners, primers, and solvent cements.
2. ABS Piping: Join according to ASTM D 2235 and ASTM D 2661 Appendixes.
3. CPVC Piping: Join according to ASTM D 2846/D 2846M Appendix.
4. PVC Pressure Piping: Join schedule number ASTM D 1785, PVC pipe and PVC socket fittings according to ASTM D 2672. Join other-than-schedule- number PVC pipe and socket

fittings according to ASTM D 2855.

5. PVC Nonpressure Piping: Join according to ASTM D 2855.
6. PVC to ABS Nonpressure Transition Fittings: Join according to ASTM D 3138 Appendix. J. Plastic Pressure Piping Gasketed Joints: Join according to ASTM D 3139.

K. Plastic Nonpressure Piping Gasketed Joints: Join according to ASTM D 3212.

3.4 PIPING CONNECTIONS

A. Make connections according to the following, unless otherwise indicated:
   1. Install unions, in piping NPS 2 and smaller, adjacent to each valve and at final connection to each piece of equipment.
   2. Install flanges, in piping NPS 2-1/2 and larger, adjacent to flanged valves and at final connection to each piece of equipment.
   3. Wet Piping Systems: Install dielectric coupling and nipple fittings to connect piping materials of dissimilar metals.

3.5 EQUIPMENT INSTALLATION - COMMON REQUIREMENTS

A. Install equipment to allow maximum possible headroom unless specific mounting heights are not indicated.

B. Install equipment level and plumb, parallel and perpendicular to other building systems and components in exposed interior spaces, unless otherwise indicated.

C. Install mechanical equipment to facilitate service, maintenance, and repair or replacement of components. Connect equipment for ease of disconnecting, with minimum interference to other installations. Extend grease fittings to accessible locations.

D. Install equipment to allow right of way for piping installed at required slope.

3.6 PAINTING

A. Painting of mechanical systems, equipment, and components is specified in Division 9 Section "Painting (Professional Line Products)."

B. Damage and Touchup: Repair marred and damaged factory-painted finishes with materials and procedures to match original factory finish.

3.7 CONCRETE BASES

A. Concrete Bases: Anchor equipment to concrete base according to equipment manufacturer's written instructions and according to [illegible] seismic codes at Project.

1. Construct concrete bases of dimensions indicated, but not less than 6 inches larger in both directions than supported unit.
2. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch centers around the full perimeter of the base.
3. Install epoxy-coated anchor bolts for supported equipment that extend through concrete base, and anchor into structural concrete floor.
4. Place and secure anchorage devices. Use supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
5. Install anchor bolts to elevations required for proper attachment to supported equipment.
6. Install anchor bolts according to anchor-bolt manufacturer's written instructions.
7. Use 3000-psi, 28-day compressive-strength concrete and reinforcement as specified in Division 3 Section "Cast-in-Place Concrete."

3.8 ERECTION OF METAL SUPPORTS AND ANCHORAGES

A. Refer to Division 5 Section "Metal Fabrications" for structural steel.
B. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor mechanical materials and equipment.
C. Field Welding: Comply with AWS D1.1.

3.9 GROUTING

A. Mix and install grout for mechanical equipment base bearing surfaces, pump and other equipment base plates, and anchors.
B. Clean surfaces that will come into contact with grout.
C. Provide forms as required for placement of grout.
D. Avoid air entrapment during placement of grout.
E. Place grout, completely filling equipment bases.
F. Place grout on concrete bases and provide smooth bearing surface for equipment.
G. Place grout around anchors.
H. Cure placed grout.

SECTION 15083
IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT

1.1 GENERAL

1.2 SCOPE OF WORK

A. Section Includes:
   1. Equipment labels.
   2. Equipment Markers
   3. Warning signs and labels.
   4. Pipe labels.
   5 Stencils.
   6. Valve tags.
   7. Warning tags.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.
B. Samples: For color. letter style, and graphic representation required for each identification material and device.
C. Equipment Label Schedule: Include a listing of all equipment to be labeled with the proposed content for each label.
D. Valve numbering scheme.
E. Valve Schedules: For each piping system to include in maintenance manuals.

1.4 COORDINATION

A. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.
B. Coordinate installation of identifying devices with locations of access panels and doors.
C. Install identifying devices before installing acoustical ceilings and similar concealment.

2.1 PRODUCTS

2.2 EQUIPMENT LABELS

A. Metal Labels for Equipment:
   1. Material and Thickness: Aluminum. 0.032-inch, anodized aluminum or stainless steel, 0.032-inch minimum thickness, and having predrilled or stamped holes for attachment hardware
   2. Minimum Label Size: Length and width vary for required label

content, but not less than 2-1/2 by 3/4 inch.

3. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.
4. Fasteners: Stainless-steel rivets or self-tapping screws.
5. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.
6. Label Content: Include equipment's Drawing designation or unique equipment number. Drawing numbers where equipment is indicated (plans, details, and schedules), plus the Specification Section number and title where equipment is specified.
   a. Data:
      1) Manufacturer, product name, model number, and serial number.
      2) Capacity, operating and power characteristics, and essential data.
      3) Labels of tested compliances.
   b. Location: Accessible and visible.
   c. Fasteners: As required to mount on equipment.

B. Plastic Markers for Equipment:
1. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/8 inch thick, and having predrilled holes for attachment hardware.
2. Letter Color: White.
3. Background Color: Red.
4. Maximum Temperature: Able to withstand temperatures up to 160 deg F.
5. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.
6. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.
7. Fasteners: Stainless-steel rivets or self-tapping screws
8. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.
9. Label Content: Include equipment's Drawing designation or unique equipment number, Drawing numbers where equipment is indicated (plans, details, and schedules), plus the

Specification Section number and title where equipment is specified.

10 Data:

a. Name and plan number.

b. Equipment service.

c Design capacity.

d. Other design parameters such as pressure drop, entering and leaving conditions, and speed.

C. Equipment Label Schedule: For each item of equipment to be labeled, on 8-1/2-by- 11-inch bond paper. Tabulate equipment identification number and identify Drawing numbers where equipment is indicated (plans, details, and schedules), plus the Specification Section number and title where equipment is specified. Equipment schedule shall be included in operation and maintenance data.

2.3 WARNING SIGNS AND LABELS

A. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/8 inch thick, and having predrilled holes for attachment hardware.

B Letter Color: Black.

C. Background Color: Yellow.

D. Maximum Temperature: Able to withstand temperatures up to 160 deg F.

E Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.

F Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.

G. Fasteners: Stainless-steel rivets or self-tapping screws.

H. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

I. Label Content: Include caution and warning information, plus emergency notification instructions.

2.4 PIPE LABELS

A. General Requirements for Manufactured Pipe Labels: Preprinted, color-coded, with lettering indicating service, and showing flow direction.

B. Pretensioned Pipe Labels: Precoiled, semi rigid plastic formed to partially cover circumference of pipe and to attach to pipe without fasteners or adhesive.

C. Pipe Label Contents: Include identification of piping service using same designations or abbreviations as used on Drawings, pipe size, and an arrow indicating flow direction.

1 Flow-Direction Arrows: Integral with piping system service lettering to accommodate both directions, or as separate unit on each pipe label to indicate flow direction.

2 Lettering Size: At least 1-1/2 inches high.

2.5 STENCILS

A. Stencils: Prepared with letter sizes according to ASME A13.1 for piping; and minimum letter height of 3/4 inch for access panel and door labels, equipment labels, and similar operational instructions.

1. Stencil Material: Metal or fiberboard.
2. Stencil Paint: Exterior, gloss, alkyd enamel black, unless otherwise indicated. Paint may be in pressurized spray-can form.
3. Identification Paint: Exterior, alkyd enamel in colors according to ASME A13.1, unless otherwise indicated.

B. Pipe Stencil Contents: Include identification of piping service using same designations or abbreviations as used on Drawings, pipe size, and an arrow indicating flow direction.

1 Flow-Direction Arrows: Integral with piping system service lettering to accommodate both directions, or as separate unit on each pipe label to indicate flow direction.

2. Lettering Size: At least 3/4 inches high.

2.6 VALVE TAGS

A. Valve Tags: Stamped or engraved with 1/4-inch letters for piping system abbreviation and 1/2-inch numbers.

1. Tag Material: Brass, 0.032-inch minimum thickness, and having predrilled or stamped holes for attachment hardware.
2. Fasteners: Brass wire-link or beaded chain; or S-hook.

B. Valve Schedules: For each piping system, on 8-1/2-by-11-inch bond paper. Tabulate valve number, piping system, system abbreviation (as shown on valve tag), location of valve (room or space), normal-operating position (open, closed, or modulating), and variations for identification. Mark valves for emergency shutoff and similar special uses.

1. Valve-tag schedule shall be included in operation and maintenance data.

2.7 WARNING TAGS

A Warning Tags: Preprinted or partially preprinted, accident-prevention tags, of plasticized card stock with matte finish suitable for writing.

1. Size: Approximately 4 by 7 inches.
2. Fasteners: Brass grommet and wire.
3. Nomenclature: Large-size primary caption such as "DANGER," "CAUTION," or "DO NOT OPERATE."
4. Color: Yellow background with black lettering.

3.1 EXECUTION

3.2 PREPARATION

A Clean piping and equipment surfaces of substances that could impair bond of identification devices, including dirt, oil, grease, release agents, and incompatible primers, paints, and encapsulates.

3.3 EQUIPMENT LABEL INSTALLATION

A. Install or permanently fasten labels on each major item of mechanical equipment.

B. Locate equipment labels where accessible and visible.

3.4 PIPE LABEL INSTALLATION

A. Stenciled Pipe Label Option: Stenciled labels may be provided instead of manufactured pipe labels, at Installer's option. Install stenciled pipe labels with painted, color-coded bands or rectangles, complying with ASME A13 1, on each piping system.

1. Identification Paint: Use for contrasting background.
2. Stencil Paint: Use for pipe marking.

B Locate pipe labels where piping is exposed or above accessible ceilings in finished spaces, machine rooms; accessible maintenance spaces such as shafts, tunnels, and plenums: and exterior exposed locations as follows:

1. Near each valve and control device.
2. Near each branch connection, excluding short takeoffs for fixtures and terminal units. Where flow pattern is not obvious, mark each pipe at branch.
3. Near penetrations through walls, floors, ceilings, and

inaccessible enclosures.

4. At access doors, manholes, and similar access points that permit view of concealed piping.
5. Near major equipment items and other points of origination and termination.
6. Spaced at maximum intervals of 50 feet along each run Reduce intervals to 25 feet in areas of congested piping and equipment.

C. Pipe Label Color Schedule:
1. Compressed-Air Piping:
   a. Background Color: Blue.
   b. Letter Color: White.
2. Vacuum Piping:
   a. Background Color: Yellow.
   b. Letter Color: Black.
3. Domestic Water Piping:
   a. Background Color: Green
   b. Letter Color: White.
4. Sanitary Waste and Storm Drainage Piping:
   a. Background Color: Green.
   b. Letter Color: Black.

3.5 VALVE-TAG INSTALLATION

A. Install tags on valves and control devices in piping systems, except check valves; valves within factory-fabricated equipment units; shutoff valves; faucets; convenience and lawn-watering hose connections; and similar roughing-in connections of end-use fixtures and units List tagged valves in a valve schedule.

B. Valve-Tag Application Schedule: Tag valves according to size, shape, and color scheme and with captions similar to those indicated in the following subparagraphs:
1. Valve-Tag Size and Shape:
   a. Cold Water: 1-1/2 inches, round.
   b. Hot Water: 1-1/2 inches, round.
   c. Compressed Air 1-1/2 inches, round.
   d. Vacuum: 1-1/2 inches, round.
2. Valve-Tag Color:
   a. Cold Water: Natural.
   b Hot Water: Natural.
   c. Low-Pressure Compressed Air: Natural.
   d High-Pressure Compressed Air: Natural.
3. Letter Color:
   a. Cold Water: Black.

b. Hot Water Black.
c. Compressed Air: Black.
d. Vacuum: Black.

3.6 WARNING-TAG INSTALLATION

A. Write required message on, and attach warning tags to. equipment and other
items where required

SECTION 15325
SPRINKLER SYSTEM, AUTOMATIC, WET TYPE

1.00 GENERAL

1.01 Applicable provisions of the "General Conditions" govern work under this section.

2.00 QUALIFICATIONS OF CONTRACTORS

2.01 The contractor for the protection installation shall be a qualified Fire Protection Contractor, regularly engaged in the installation of automatic fire sprinkler systems and other fire protection equipment. and must have at least one (1) sprinkler installation approved by the Philippines Insurance Rating Associations (PIRA). Companies or corporation whose personnel have supervised an approved sprinkler plan and subsequently approved by PIRA or by the Fire Departments are also qualified.

3.00 SCOPE OF WORK

3.01 This specification includes the furnishing of all labor, materials. equipment and services necessary or incidental to the complete installation. testing adjusting and placing into service of the several systems of fire protection, all as shown on the drawing and as herein after specified. Drawing and specification 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 fire protection system.

3.02 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 may be 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.

3.03 Work included in this specification shall consist of. but is not necessarily limited to the following items;

1. Arrange for, obtain and bear the cost of necessary permits, bonds and fees for the automatic sprinkler work.

2. All permits fees, private or government shall be paid by the contractor.

3. Furnish and install sprinkler system to the entire building where shown on the drawings. System to include all pipes, hangers, sway braces, sprinkler heads, control valves, drains alarms, water flow switches and control valve monitor switches. The fire pumps, drives, jockey pumps and controllers, pumps standard accessories shall be supplied and installed by the Sprinkler Contractor.

4. Fire hose cabinets, pressure reducing valves and hose accessories, including connection pipe and fittings to the sprinkler system.

5. Alarm check valves, complete with set of trimmings, retarding chamber, water motor alarm gong, alarm pressure switches, water flow switches and monitor switches. The Sprinkler Contractor shall coordinate and interface the required electrical wiring connection for the water flow and monitor switches to the building fire alarm system.

6. Furnish and install a system of dry standpipe complete with valves and fire department connection. Contractor to provide as shown in the plans by – pass valve with pipe and fitting to connect the wet sprinkler pipe riser with the dry standpipe riser.

7. Furnish and install fire departments connection for the sprinkler system.

8. Furnish and install inspector's test connection pipe, nozzles, and valves on the farthest point of each floor, located where shown on the drawings.

9. Furnish and install water flow alarm switches, and monitor tamper switches to floor control valves. The sprinkler contractor shall furnish and install the wiring connection of the water flow and monitor switches to the sprinkler supervisory control panel with the Electrical Contractor. The supervisory control panel shall be interface to the Building fire alarm panel and BMS system at the Ground floor by the Electrical Contractor.

10. Do the testing of all piping works and necessary cleaning of the fire protection works. These include also testing of the fire department pipeline and drain pipe, and water flow alarms.

11. Fire extinguishers as shown in the plans shall be supplied and installed by the contractor. Overt and above those specified, the Owner of the building and/or the Tenants shall supply the requirements of the Fire Department.

12. All opening through which fire may spread from one floor to the other, .such holes through floor or walls for the pipe shall be .sealed with fire resistant materials.

13. Chipping and plastering works necessary for the area covered in the installation of automatic sprinkler system.

14. Furnish the shop drawing and certificates of inspection.

15. Periodically remove from the jobsite all rubbish and debris resulting from the fire protection work.

16. Furnish and install portable foam – water hose station with the necessary AFFF foam liquid concentrate. foam nozzles for the protection of the combustible diesel fuel for the Genset equipment located at the Mechanical Electrical rooms.

17. Furnish and install two units of 22.7 Kgs. (50Lbs.) Class C Carbon Dioxide portable fire extinguisher near the transformer vaults, genset and main Electrical rooms.

18. Miscellaneous items as hereinafter specified .

4.00 SITE CONDITIONS

4.01 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 no out of any misunderstanding on his part on this conditions shall be entertained.

The Contractor shall be responsible for the proper coordination with other trade Contractors.

5.00 STANDARDS, CODES AND REGULATIONS

5.01 The applicable current standards for the fire protection system shall be the National Fire Protection Association (NFPA), NFPA-13, NFPA-10, NFPA-20, NFPA-14 Philippine Fire Code- P.D. 1185, the PSME Code and all other applicable codes and ordinances.

6.00 SUBMITTAL (SHOP) DRAWINGS AND DATA

6.01. Before commencing any work or providing any materials at the jobsite for this project the Fire Protection Contractor shall submit to the Architect, for approval four (4) copies of catalog cuts and descriptive matter regarding materials and equipment which he intends to furnish and install. Shop drawing and data shall be submitted specifically for, but not limited to the following items: Sprinkler heads, valves, pipes, pipe hangers, hose valve and accessories, fire hose cabinets, mechanical grooved coupling (flexible pipe connectors), pressure reducing valve, pipe riser support and sleeves, portable fire extinguishers, and foam equipment, and the sprinkler monitoring control panel.

6.02 The Fire Protection Contractor shall not proceed with the installation of the work until he has received the Architects approval on his shop drawings.

6.03 The Architect's approval of shop drawing, catalogue cuts, etc., shall not relieve the Fire Protection Contractor of the responsibility for any errors or omissions which may exist in the items submitted nor shall it relieve him from the responsibility for deviation from the contract drawing and specifications. The stamped approval of the shop drawing, catalogue cuts, etc., shall not be construed as a complete check but will indicate only that the general design and method of construction is satisfactory.

6.04 In the event additional clarifying details are required by inspection authorities, details shall be prepared and approval of same secured by the Fire Protection Contractor at his expense.

7.00 CONDUCT OF WORK

7.01 The Fire Protection shall employ on the job at all times a competent superintendent Licensed Professional Mechanical engineer who shall be responsible for the progress and execution of the work. Workmanship shall be of high quality, conforming to the standard practice as stipulated by NFPA, ASTM, ASA and PSME recommendations by skilled workmen during regular working hours.

8.00 SELECTION OF MATERIALS AND EQUIPMENT

8.01 All materials and equipment furnished under this section (15500) shall be new, manufactured in the United States, and approved by Underwriter's Laboratories, Inc. (UL), Factory Mutual (FM), and American Water Works Association (AWWA) where applicable.

8.02 The proposal submitted shall include all materials and equipment as specified or shown on the drawings.

9.00 AUTOMATIC SPRINKLER AND STANDPIPE SYSTEM

9.01 Pipe shall be new, designed for 175 psi working pressure, conforming to ASTM specification manufactured in the United States or approved equal local pipes and have the manufacturer's name or brand along with the applicable ASTM standard, marked on each length of pipe. The local manufactured pipe branch "Supreme Pipe" are acceptable brand with proper schedule and wall thickness.

9.02 Pipe shall be steel, schedule 40, black and in accordance with the specifications ASTM A120 or A53. Pipe that shall be grooved by the use of cut grooving machine shall be schedule 80. Pipe that shall be grooved by roll grooving machine shall be schedule 40.

9.03 Schedule 40 black steel pipes shall be joints by screwed joints in accordance with specifications ANSI B2.1 up to 65mm. and flanged, victaulic type or screwed connections for 75mm. and up. Pipe fittings to be used with schedule 80 pipe shall be rated 300 lbs. class if there are any.

9.04 Sprinkler piping that is exposed to the weather or used in a corrosive atmosphere shall be painted with protective coating. Sprinkler piping in the building shall be painted with two coats of enamel primer and two coats of Fire Red color enamel paint.

9.05 All ASTM A53 and ASTM A120 sprinkler pipe must be hydrostatically tested at the mill per the ASTM Standard.

9.06 Screwed fittings shall be malleable iron, 300 lbs. and 150 lbs. class, black and in accordance with ANSI B16.3. 'Victaulic" brand mechanical tee and elbow UL/FM fitting can also be used.

9.07 Flanged fitting shall be steel, short body, 1560. black and in accordance with ANSI B16.1. Gaskets shall be full face of 1/8" minimum thickness red sheet rubber. Flange bolts and heavy semi-finished hexagon head nuts, cadmium plated, having dimension in accordance with ANSI B18.2.

9.08 Weld fitting shall be steel, standard weight, black and in accordance with ANSI B16.25, ASTM A234, ANSI B16.5 or ANSI B16.11.

9.09 Outside screw and yoke (O.S. & Y) gate valves shall be flanged, iron body, bronze mounted, 175 psi working pressure, with handwheel turning

counterclockwise to open. Valve shall be tested and listed and by UL and/or FM.

9.10 Check valve shall be flanged, swing type, iron body bronze seat ring and disc ring, and 175 psi working pressure rating. Valve shall be tested and listed by UL and/or FM.

9.11 Check valve shall be butterfly wafer style, iron body, rubber seal, and 175 psi pressure rating. Valve shall be tested and listed by UL and/or FM.

9.12 Fire department connections shall be 2-1/2" x 2-1/2" x 4" Siamese connection, brass body, brass chain and plugs, and brass escutcheon, lettered "AUTOMATIC SPRINKLER" for sprinkler system, and/or "STANDPIPE" for standpipe system. Inlet threading shall be National Standard, same as municipal fire department connection shall tested and listed by UL and/or FM and 175 psi rating.

9.13 Valve for main riser drain shall be angle type or globe type, bronze body screwed 175 psi pressure rating, 2" size, and a renewable composition soft disc

9.14 Valve for auxiliary drain and inspector's test connection shall be globe type, bronze body, screwed 175 psi pressure rating, 1" size, and a renewable composition disc.

9.15 At each location where called for on plans or where required by the Fire Department, provide an approved retard-type electric flow alarm switch. Provide alarm bell as required. Flow alarm switch shall have extra set of contacts for extension by others to central alarm panel.

9.16 Interior bell or horn shall be 24 VDC. Horn or bell shall be tested and listed by UL and/or FM.

9.17 Flow switch shall be vane type, 24 VDC. Flow switch shall be tested and listed by UL and/or FM.

9.18 O.S. & Y. gate valve supervisory switch shall be 24 VDC. Supervisory switch shall be tested and listed by UL and/or FM.

9.19 Valves for fire department valve station (Dry Standpipe) shall be angle type, 2-1/2" female iron pipe threads by 2-1/2" male NST hose threads, chromium plated with chromium plated cap and chain. Valve hose threads shall be National Standard same as Municipal fire department. Valve shall be tested and listed by UL and/or FM with pressure rating of 175 psi.

9.20 Valve for fire hose stations shall be angle type, pressure restricting, 1-1/2" female iron pipe threads, rough brass x male NST threads, polished brass, chromium plated. Valve shall be tested and listed by UL and/or FM.

9.21 Cabinet for fire hose station shall be recessed, 16 gauge steel body, ANOLOK finish aluminum door trim. Cabinet shall be designed to fit a 100 feet hose pin rack and a fire extinguisher. Door shall be full panel glass. Cabinet finish shall be baked white enamel inside with "Fire Red" coat outside. Cabinet may be locally made of approved quality.

9.22 Pin rack hose for fire hose station cabinet shall be semi-automatic type, baked red enamel finish, designed for 100 feet of 1-1/2" hose, and furnished with 1-1/2" chrome plated brass rack nipple.

9.23 Fire hose for fire hose station shall be 100 feet 1-1/2" cotton single jacket, rubber lined hose with wax and gum treatment. Hose coupling shall be 1-1/2" chrome plated, male-female National Standard hose threads. Fire hose and couplings shall be approved by UL and/or FM.

9.24 Nozzle for fire hose station shall be 1-1/2" adjustable, capable of complete shut-off, solid straight stream or any degree of solid conical fog, chrome plated. Threads shall be National Standard hose threads. Nozzle shall be approved by UL and/or FM.

9.25 Provide 1-1/2" spanner to each fire hose cabinet (FHC).

9.26 Furnish and install one each – 4.5Kgs. (10Lbs.) Capacity ABC Dry powder chemical, multi purpose type potable fire extinguisher UL Listed and Factory Mutual Approved, to each fire hose cabinet.

10.00 IDENTIFICATION SIGNS AND CHART

10.01 The drain, alarm test valves, etc., shall have standard identification signs, painted fire red with white lettering. The sign shall be attached to the valve in a conspicuous position.

11.00 SPRINKLER HEADS

11.01 Sprinkler heads shall be recessed, upright, pendent, vertical sidewall, horizontal sidewall type as required, 12mm. dia. and/or 13.5mm. dia. Orifice. 12mm. dia. And/or 19mm. dia. pipe threads, rated at 68 degrees Centigrade, 93 degrees C, and/or 121 degrees C. Sprinklers in areas with suspended ceiling the escutcheon plates shall be of the same finish as the textures of the ceiling

boards. Sprinkler shall be 93 degrees Centigrade at the Parking areas with very extra large orifice glass bulb upright type, brass finish and a K-factor of 14.5. Sprinkler shall be 68 degrees Centigrade at the theater with very extra large orifice glass bulb recessed type, chrome finish with a K-factor of 14.5. Sprinklers shall be tested and listed by UL and/or FM.

11.02 Furnish to the owner a steel enameled box housing for the space heads and a sprinkler wrench as shown on the plans.

12.00 HOOD FIRE EXTINGUISHING SYSTEM

12.01 Exhaust hood, duct, and cooking appliance fire extinguishing system shall be UL and FM approved for main kitchen. The details of the hood and cooking appliances shall be furnished by the Tenant later on.

Approved Manufacturer: - Range Guard by ASCOA, Cardox, Kiddie, Ansul

13.00 FIRE PUMP

The fire pumps shall be supplied and to be installed by the Sprinkler Contractor and the specification are as follows:

13.01 Fire Pump Assembly: Furnish and install Underwriter's Laboratories Inc. (U.L.) approved fire pumps as shown on plans, complete with motors, motor starters, controls, fitting and other appurtenances and accessories necessary to complete the equipment installation in each respect.

Pumps shall be located and connected as shown in the drawings. Complete installation shall be in accordance with the requirements and meeting with the approval of NFPA 20, Philippine Rating Bureau (PRB) and of the Fire Department.

The fire pump to be installed at the Basement 1 Floor level of the building shall be as follows:

13.02 Fire Pumps:
Refer to the plans and Section 01020 Summary of Materials and Finishes.

13.03 Jockey Pumps:
Refer to the plans and Section 01020 Summary of Materials and Finishes.

13.04 Drives: For the jockey pumps, the motor horsepower rating shall be in accordance with the manufacturer's requirements The motor shall be of such

capacity that 115% of the full load ampere rating shall not exceed at any condition of pump load.

13.05 Control Equipment: The fire pump motor control equipment shall be completely assembled, wired and tested at the factory and shall be specifically designed for fire pump purpose. Control equipment of the combined manual and automatic primary resistance or Wye-Delta type reduced voltage starter with all components enclosed in one or more approved drip-tight enclosures, and shall incorporate the following:

1. Disconnect Switch – externally operable quick break type.

2. Circuit Breaker – time delay type with trips in all phases set or 300% of the motor full – load current.

3. Motor Starter – Primary resistance, reduced voltage type capable of being energized automatically through the pressure switch or manually by means of an external handle

4. Running Period Timer – set to keep motor in operation when started automatically for a minimum period of one (1) minute for each 10 HP motor rating but not to exceed seven (7) minutes.

5 Entire unit shall withstand the full available short current as given by the serving Meralco Company.

6. Pilot Lamp – to indicate circuit breaker closed and power available.

7. Ammeter test link and voltmeter test studs.

8. Alarm panel with visible and audible alarm 120 Volts independent source of power to indicate circuit breaker open on power failure.

9. Manual Selection Station – a two – position station shall be provided on the enclosure marked 'AUTO' and 'NON-AUTO'.

10. Means shall be provide on the controller to operate an alarm signal continuously while the pump is running.

11. Detailed operating instructions shall be provide on a plate mounted securely on the front of the enclosure.

12. Pressure Recorders.

All of the above equipment must be manufactured in accordance with pamphlet and requirements of the National Fire Protection Association #20 and installed as per their recommendations.

13.06 Jockey pump control shall included a combined manual and automatic reduced voltage type motor starter for the pump, fusible disconnect switch, hand- off automatic selector switch, control voltage transformer and pressure regulator having a range of 0 to 250 lbs. Control shall be furnished under this Section for installation and writing under Section "Electrical Works".

13.07 Jockey pump, drivers, controls and necessary attachments, specified herein, shall be purchased under a unit contract from the fire pump manufacturer, or his representative, stipulating compliance with these specifications. Fire pump shall be laboratory tested by the pump manufacturer with certified performance test curves furnished to the Engineer and the insurance authorities at the time of the field acceptance test. Upon award of contract, the manufacturer shall furnish the required number of pump unit dimension prints, control cubicle dimension prints, and schematic wiring diagram, all contained in an indexed booklet for the Engineer's approval.

13.08 The pump manufacturer shall provide the services of a qualified Engineer to advise the Contractor on the proper installation of equipment, make necessary mechanical adjustments and align fire pump flexible coupling. Pump manufacturer shall pay the test fees, shall arrange and conduct final field acceptance test, and provide all required test equipment.

14.00 AUTOMATIC SPRINKLER SYSTEM AND STANDPIPE SYSTEM

14.01 The interior surfaces of all piping and equipment shall be clean and free of all dirt, loose scale, rust, and other foreign materials before installation. Piping shall be painted with coats of red lead enamel paint and two coats of enamel fire red color paint

14.02 Pipe ends shall be reamed to remove all burns, and pipe sections shall be cleaned inside to remove all chips and foreign material prior to making up joints. Approved joint compound shall be applied to the threads of the pipe and not in the fitting when making up joint. Pipe shall not extend into the waterway of the fitting.

14.03 Sprinkler heads installed where they may be exposed or subjected to mechanical damage shall be furnished complete with head guards

14.04 When welding pipe on jobsite, the fire hazard of the welding process shall be suitable safeguards. Weld in place of pipe and fittings shall not be allowed at the jobsite Only shop weld fabrication will be permitted with factory made fittings. Mitered weld will not be permitted. Intersection of feedmain and crossmain pipe shall be provided with flanged or victaulic type fittings.

14.05 Pipe passing through the building walls and floors above grade shall be provided with sleeves of standard weight galvanized steel pipe, and shall be I stalled prior to concreting works of the Civil Contractor. The annular spaces between pipe and sleeves shall be packed tight insulated fire resistive materials. Provide chrome plated escutcheon plates large enough to cover the pipe sleeves. Sleeves shall be sized as follows:

1"	pipe	-	2"	ID Sleeve
1-1/4"	pipe	-	2"	ID Sleeve
1-1/2"	pipe	-	2-1/2"	ID Sleeve
2"	pipe	-	3"	ID Sleeve
2-1/2"	pipe	-	4"	ID Sleeve
3"	pipe	-	5"	ID Sleeve
4"	pipe	-	6"	ID Sleeve
6"	pipe	-	8"	ID Sleeve
8"	pipe	-	10"	ID Sleeve

15.00 PIPE SUPPORTS

15.01 All piping shall be supported by means of hangers of approved quality, capable of supporting load. Sizing, spacing and installation shall be in accordance with National Fire Protection Association Standard No. 13, "Sprinkler System", except as otherwise shown on drawing or specified herein.

15 02 The fire protection Contractor shall furnish and install the required sprinkler pipe seismic sway bracing for the risers, feedmain pipe and crossmain pipe all in accordance with the tables and figures shown on NFPA – 13 requirements for the protection of the piping against breakage due to seismic earthquake movement.

15.03 No cutting, drilling, welding or burning of any structural steel members shall be allowed. Power driven studs and welding studs shall not be allowed.

15.04 All bolts and threaded rods shall be used with double nut and washer wherever a single unsecured nut could work loose and allow either threaded rod supported piping to drop.

16.00 .HOOD FIRE EXTINGUISHING SYSTEM

16.01 System shall be installed in accordance with the latest edition of the applicable standard of National Fire Protection Association, manufacturer's manual and all applicable codes.

16.02 Contractor shall visit the jobsite, take all field measurements and verify all conditions affecting the work.

16.03 Contractor shall obtain and pay for any permits specifically required for the fire extinguishing installation.

17.00 FOAM FIRE PROTECTION FOR COMBUSTIBLE LIQUID OF GENSET

17.01 Provide portable foam fire hose station near the location of the comestible fuel tanks of the proposed Generator equipment, as indicated in the plans. The Fire Hose station shall be fire hose reel type, wall mounted swinging semi-automatic with 40mm. x 15meters Fire hose NST threads. and with Foam-water Nozzle "National Foam RP-6" brand or equally approved by the Fire Protection Engineer.The hose reel shall be covered with a red vinyl painted with white sign 'FIRE HOSE KEEP CLEAR' lettering. The required foam liquid AFFF concentrates in 5 – gallons cans shall also be provided by the Contractor as per plans.

17.02 Provide two (2) units of 50 Kgs. Capacity Carbon Dioxide portable type fire extinguishers on wheels at the Electrical – Mechanical Rooms.

On other Electrical Rooms at the Upper floor levels shall be provide with 10 Lbs. capacity Carbon Dioxide portable fire extinguishers.

18.00 TESTS AND INSPECTION

18.01 The Fire Protection Contractor shall conduct and bear the costs of all necessary tests of the fire protection work, furnishing all labor, power and equipment. All piping shall be tested with water and test witnessed by representatives of the Architect/Engineer and the Owner.

18.02 The fire protection piping shall be tested under a hydrostatic pressure of not less than 200 lbs. PSIG, for a duration of not less than two (2) hours or at 50 lbs. per square inch in excess of the maximum static pressure when the maximum pressure is in excess of 150 lbs. per sq. in.

18.03 The piping subjected to the hydrostatic test shall be filled with water and thoroughly checked for the elimination of all air. The control valves shall be closed during pressure testing. All joints shall be proven tight or acceptable by the test. Defective work or materials shall be corrected or replaced in an approved manner. If necessary, piping shall be dismantled and reassembled with the used of new pipe or fitting as no caulking or make-shift method of temporary repair of defective work will be permitted. Test shall be repeated until the particular line or system receives the approval of the representatives of the Architect/Engineer.

18.04 Acceptance of the automatic work shall be based upon the inspection and tests of the complete installation by representatives of the local Fire Department, Architect, Engineer, PIRA, and the Owner.

SECTION 15400
PLUMBING SYSTEMS

1.00 GENERAL

1.01 DESCRIPTION

A. Applicable provisions of "General Conditions" govern work under this section.

B. All fittings, connections and piping embedded in concrete shall be subject to inspection by the Architect and/or his representative before covering and/or completion.

C. The Contractor shall provide all items, articles, materials, operation or methods listed, mentioned or scheduled on the drawings and/or herein, including all labor, materials, equipment, plant, tools, and other incidentals necessary and required for their completion.

D. The contract drawings and specifications are complementary to each other, and any labor or materials called for by either, whether or not called for by both, if necessary, for the successful operation of any of the particular type of equipment furnished and installed will be without additional cost to the owner.

E. All dimensional locations of fixtures, drains, riser and pipe chase shall be verified on the architectural drawings and manufacturer's catalogue.

F. In cases where there are conflicts between the drawings and the specifications, the contractor shall within three (3) days, inform the Engineer of such conflicts.

G. It is not intended that the drawings shall show every pipe, fitting, valve and appliance. All such items whether specifically mentioned or not, or indicated on the drawings shall be furnished and installed, if necessary, to complete the system in accordance with the best practice of the plumbing trade and to the satisfaction of the Engineer and the Owner.

H. The Contractor is required to refer to all architectural, structural, mechanical and electrical plans and specifications, and shall investigate all possible interferences and conditions affecting his work.

I. Electrical systems are not included in this division, but the Contractor will provide all facilities and make provisions for the installation of the work as construction progresses.

1.02 SCOPE OF WORK

Work included under this section of the specifications consists in furnishing all labor, tools and equipment, appliances and materials necessary for complete installation, testing and operation of the plumbing system in accordance with the contract.

A. Roof, Lower ground floor to roof deck storm drainage system and connection to the point of discharge as shown in the plans to be verified at the jobsite.

B. Sanitary drainage system of the building and connection to the point of discharge as shown in the plans to be verified at the jobsite.
C. Soil, waste and vent piping system within the building.
D. Cold and Hot water distribution system and supply pipes to the equipment, fixtures and hose bibbs inclusive of all valves, fittings, and other accessories to complete the system.
E. Aircon drainage system
F. Installation of all plumbing fixtures, trims and accessories.
G. Furnish and installation of pumps, valves and other accessories necessary for complete operation of the system.
H Payments for all permit incidental to the completion of the project.
I. The contractor shall provide all necessary shop drawings and as-built plans in reproducible forms including 4 sets of white prints.
J. Disinfection and testing of building water distribution system .
K. All other works described in other sections of this document necessary for the completion of this contract.

1.03 OTHER WORKS

The following work or materials in conjunction with the work to be done or installed.

A. Civil Works
   1. Pumping, shoring, general excavations and backfill.
   2. Painting, except as required by the Plumbing Code and these specifications.
   3. Underground and elevated water tanks.
   4. Septic vaults and balancing dilution tank.
   5. Leaching field construction.
B. Electrical
   1. Electrical supply to equipment inclusive of circuit breakers.
   2. Wiring from pump motors to controllers and from controllers to the circuit breakers shall be provided and installed by the Contractor under the supervision of the pump supplier.
C. General
   1. Water needed for construction shall be metered or prorated by Contractors.
   2. Temporary toilet facilities.

1.04 SUBMITTALS

A. Within fifteen (15) days after award of contract, the Contractor shall submit for the Engineers approval four (4) copies of all complete list of manufacturer name of all materials he proposes to use.
B. After approval of the above list and before purchase of any equipment or materials, the Contractor shall submit to the Engineer for approval four (4) complete sets of detailed information consisting of manufacturer's bulletins, shop drawings and part list of the materials to be provided under this contract.

C. The Contractor shall assume the cost of and the entire responsibility of any change in the work as shown in the contract drawings which may be occasioned by approval of materials other than those specified.

1.05 APPLICABLE CODE AND STANDARDS

A. All plumbing works to be done and sizes of pipes to be used shall be in accordance with the National Plumbing Code and the Plumbing Code of the Philippines.

B. The Contractor shall verify the above paragraphs with each section of the specifications and coordinate his work so that the General Contractor will understand clearly the intent of the work to be done.

2.00 PRODUCTS

2.01 DESCRIPTION OF MATERIALS

All materials to be used shall conform to the standards specified. All classes listed are not necessarily required for this project. Of classes listed, only those specifically called for under sections of this Division or shown shall be provided. Use of materials shall further be governed by other requirements imposed on other sections of this specification. Materials shall be subject to test necessary to ascertain their fitness if the Engineer so requires.

2.02 ALTERNATE MATERIALS

Use of any material not specified in these specifications may be allowed, provided such alternate has been approved by the Engineer, and provided further that a test, if required, shall be done by an approved agency in accordance with the generally accepted standards.

2.03 IDENTIFICATION OF MATERIALS

Each length of pipe, fittings, traps, fixtures and devices used in the plumbing system shall have cast, stamped or indelibly marked on it the manufacturer's trademark or name, the weight, type and classes of products when so required by the standards mentioned.

All materials and equipment mentioned in this specification, including all incidental items not specifically indicated but required to complete the contract shall be new and free from defects. If damaged during the course of construction, it shall be repaired or replaced as directed by the Project Representative at no additional cost to the Owner.

2.04 STANDARD SPECIFICATION FOR MATERIALS AND EQUIPMENT

Refer to Section 01020 Summary of Materials and Finishes.

2.05 PIPE SLEEVES

A. Pipe sleeves shall be installed and properly secured in place at all points where pipes pass through masonry or concrete, except unframed floors on earth.

B. Pipe sleeves shall be of sufficient diameter to provide approximately one-quarter inch clearance around the pipe or insulation.

C. Pipes sleeves in walls and partitions shall be of wrought iron or steel pipe schedule 40. Pipe sleeves in concrete beams or concrete fireproofing shall be steel pipe schedule 40.

D. Pipe sleeves thru floors shall be galvanized steel pipe schedule 40. Sleeve in floor shall extend not less than one inch and not more than two inches above and the space around the pipe shall be packed with fiberglass insulation UL/FM listed materials.

E. Pipe sleeves in footings shall be or steel pipe and shall be not less than four inches larger in diameter than the pipe to be installed.

F. Flashing sleeves shall be installed where pipe pass through waterproofing membrane. The sleeves shall be provided with an integral flashing flange or clamping device to which a flashing shield shall be of sixteen ounce, soft sheet copper, shall extend not less than eight inches from the sleeves and flashing flanges and should be thoroughly mopped into the membrane.

G. All pipe penetration sleeves shall be galvanized Schedule 40 steel pipe with anchor plate or collar for waterproofed exterior or interior concrete walls shall be caulked with oakum and sealed with epoxy.

2.06 SEISMIC BRACES, PIPE HANGERS AND SUPPORTS

A. Horizontal Runs of Pipes:

1. Horizontal runs of pipe shall be hung with adjustable wrought iron or malleable iron pipe hangers spaced not over 10 feet apart
2. Trapeze hangers may be used in lieu of separate hangers on pipes running parallel to and close to each other.
3. Chains, straps, perforated turnbuckles or other approved means of adjustment, except that turnbuckles may be omitted for hangers on soil or waste pipes from individual toilet rooms to maintain stacks when space does not permit their use.
4. Inserts shall be of cast steel and shall be of type to receive a machine bolt or nut after installation. Inserts shall be permitted adjustment of the bolt in one horizontal direction and shall be installed before the concrete is poured.
5. Vertical runs of pipe shall be supported by wrought iron clamps or collar at every floor and provided with double sway braces between floors.
6. Chromium plated pipe shall have a clearance of not less than three-quarter inch nor more than one inch when run on the face of marble or plaster, and the pipe shall be supported where required by cast brass supports finished to match the pipes.
7. Provide sway braces or clamps at every 10 feet for lines running along beams and at every beam for lines running across beams.

8. Water pipes screwed or flanged shall be supported at every 10' intervals and provided with sway braces at every 40' maximum.
9. Other pipes shall be supported in accordance with their manufacturer's requirement.

B. For Vertical Pipes

For vertical risers and down feed gravity supply pipes: Vertical risers shall be supported with clamps over the sleeve at every floor and provided with double sway braces between floors as shown in the drawings.

To determine the weight of pipes, size of hanger rods and spacing of supports, use the following schedule.

PIPE (in.)	WEIGHT PER FT. FOOT	MIN HANGER ROD SIZE (in.)	ALLOW. LOADS (Pounds)	MAX. HANGER SPACING WATER & WASTE		
				Copper Type M (Ft)	Steel Sch. 40	Cast Iron Std
1/2	1	1/4	240	6	6	-
3/4	1 4	1/4	240	6	8	-
1	2 1	1/4	240	6	8	-
1 1/4	2 9	3/8	610	6	10	-
1 1/2	3 6	3/8	610	6	10	-
2	5 2	3/8	610	10	10	5
2 1/2	7 9	1/2	1130	10	10	5
3	10.8	1/2	1130	10	10	5
4	16 50	1/2	1130	10	10	5
5	23 50	5/8	1810	10	10	5
6	31 60	5/8	1810	10	10	5
8	50 50	5/8	1810	10	10	5
10	77 00	3/4	2710	10	10	5
12	102.36	7/8	3770	10	10	5

Note: Weight on Column 2 are for pipes full of water

2.07 SCHEDULE OF CONNECTIONS TO STRUCTURAL CONCRETE SUPPORTINGMEMBERS

Rod Size For Pipes (in.)	No. of Anchors to Concrete	Sice of Expansion Anchor to Concrete (in.)	Load Max. in Tension	Insert Concrete Cast-in-Place	Machine Bolts
1/2	1	5/8	400	3/8	3/8
5/8	1	3/4	550	1/2	3/8
3/4	2	1/2	900	1/2	3/8
3/4	2	5/8	1300	1/2	1/2
7/8	2	3/4	1800	5/8	1/2
7/8	4	5/8	2600	2 1/2	5/8
7/8	4	3/4	3700	2 5/8	5/8

2.08 FLOOR, WALLS, AND CEILINGS

A. Where uncovered exposed pipes pass through floors, finished walls or ceilings, they shall be fitted with chromium plated cast brass plates or chromium plated pipe or steel plates on ferrous pipes.

B. Plates shall be large enough to completely close the hole around the pipes and shall be octagonal or round with the least dimension not less than one and one-half inches larger than the diameter of the pipe. Plates shall be well secured.

2.09 CONSTANT PRESSURE HYDRO-PNEUMATIC PUMPS

Refer to Section 01020 Summary of Materials and Finishes.

3.00 EXECUTION

3.01 PIPING INSTALLATION :

A. General: Piping shall be installed as shown on the drawings, as recommended by the manufacturer and as directed during installation, straight and direct as possible, forming right angles or parallel lines with building walls and other pipes. and neatly spaced. Erect pipe risers plumb and true, parallel with walls and other pipes neatly spaced.

1. All piping shall be properly supported or suspended on stands, clamps, hangers. or equivalent of approved design. Supports shall be installed in such a manner to permit pipe free expansion and contraction while minimizing vibration.
2. Do not install pipes in a manner which interferes with other pipes, ducts, conduits, equipment and adjacent structures of the building.
3. The arrangement, positions and connections of pipes, fixtures, drains, valves and the like, indicated on the drawings shall be followed as closely as possible The right is reserved by the Project Representative to change locations and elevations to accommodate conditions which may arise during the progress of the work, prior to installation, without additional compensation for such changes.
4. The responsibility for accurately laying out the work and coordination of installation with other contracts rests with this contractor. Any field layout interferences that occur shall be reported immediately to the Project Representative.
5. All pipes shall be cut accurately to measurements and shall be worked into place without springing or forcing. Changes in pipe sizes shall be made with reducing fittings.
6. Roughing-in for pipes and fixtures shall be carried along with the building construction. Correctly located openings of proper sizes shall be provided where required in the walls and floors for the passage of pipes. All items to be embedded in concrete shall be thoroughly cleaned and free from all rust, scale and paint and shall be in-place before concrete pouring.
7. Stainless steel angular bars for trench grating support shall be properly anchored and installed in place before concrete pouring.

8. Pipes shall not pass through columns, footings, beam of ribs, except where noted on the drawings.

B. COLD WATER SYSTEM

1. The piping shall be extended to all fixtures, outlets, and equipment from the gate valves installed in the branch near the riser.
2. All pipings above ground shall be run parallel with the lines of the building unless otherwise shown in the plans.
3. No water pipings shall be buried in floors unless specifically indicated on the drawings or approved by the Engineer.
4. All service pipes, valves and fittings shall be kept at sufficient distance from other work to permit finished covering not less than one-half inch from such work or from finished covering on the different service.
5. Changes in pipes shall be made with reducing fittings.
6. No valve shall be installed with its stem below the horizontal. All valves shall be gate valves unless otherwise specified or noted on the drawings.
7. Unions shall be concealed in walls, ceilings and partitions, except where they are enclosed in a metal frame box and cover.
8. All cold water lines shall be tested at 150 psi for a period of two (2) hours before covering.

C. THREADED PIPE JOINTS

1. All pipes shall be reamed before threading. All screw joints shall be made with graphite and oil or with an approved graphite compound applied to male threads only. Threads shall be full out, and not more than three threads on the pipe shall remain exposed.
2. Caulking of threaded joints to stop or prevent leaks will not be permitted. Use 3M pipe thread sealant or equivalent on all G.I. or steel pipes screwed on threaded joints.

D. SOIL AND WASTE PIPING SYSTEMS

1. Fittings: All changes in pipe sizes on soil, waste and drain lines shall be made with reducing fittings.
2. All changes in direction shall be made by the appropriate use of forty-five degrees wyes or long sweep bends, except that sanitary tees may be used on vertical stacks and short quarter bends or elbows may be used in soil and waste lines where the change in direction of flow is from the horizontal to the vertical and on the discharge from the water closet.
3. No trap which depends for its seal on the action of movable parts shall be used, full S-traps, bell traps and crown vented traps are prohibited.

E. VENT SYSTEM

1. All main vertical soil and waste stacks shall be extended full size to and above the roof line to act as vents, except where otherwise specifically indicated.

2. Vent pipes in roof spaces shall be run as close as possible to underside of roof with horizontal piping pitched down to stacks without forming traps. Vertical vent pipes may be connected into one main vent riser above the highest vented fixtures.
3. Where an end or circuit vent pipe from any fixtures or line of fixtures is connected to a vent line serving other fixtures, the connections shall be at least four feet (4') above the floor on which the fixtures are located to prevent the use of vent line as waste.
4. Horizontal waste receiving the discharge from two or more fixtures shall be provided with end vents unless separate venting of fixtures is noted.
5. All vents embedded in concrete shall be G.I. pipes, schedule 40
6. All fixtures shall be individually vented.

F. PIPING GRADES AND SLOPES:
1. Keep all horizontal runs of piping, except where concealed in partitions, as high as possible and close to the wall.
2. Piping shall be properly graded or pitched to insure easy circulation, drainage and prevent water hammer and noise. Slopes as follows unless otherwise indicated.
3. Cold water shall pitch, up in the direction of flow at 1 inch in 60 feet horizontal run.
4. Maintain a minimum of 1 percent for all sanitary soil and wastes lines, and a minimum of 1/2 percent for storm drainage lines.

3.02 CLEANING AND PAINTING

A. All Exposed Metal Surfaces
1. All exposed metal surfaces shall be rid of grease, dirt or other foreign materials.
2. Chrome or nickel plated pipings, fittings and trimmings shall be polished upon completion.
3. All equipment, fixtures, valves and fittings shall be cleaned of grease and sludge which may have accumulated. Any stoppage or discoloration, or other damage to parts of the building, its finish or furnishings due to the system shall be repaired by the Contractor.

B. Painting
1. All exterior surfaces of pipings to be installed in or through concrete floor fill or tile floors, and underground shall be painted in accordance with Architect's specifications.
2. Pipe hanger supports and all other iron works in concealed spaces shall be thoroughly cleaned and painted in accordance with Architect's specifications.

3.03 UNION CONNECTIONS

A. Slip joints shall be permitted only in trap seals or on the inlet side of the traps.

B. Tuckers or hub drainage fittings shall be used for making union connections wherever practicable in connection with dry vents. Use of screws and (except fitting bushed in the sand).

3.04 PLUMBING SYSTEM TEST

A. The entire system of drains, waste and vent piping inside the building shall be tested. Water test shall be in accordance with the Plumbing Code. Every portion of the system shall be tested to a hydrostatic pressure equivalent to at least 10-foot head water. After filling, water supply shall be shut-off and allowed to stand 1/2 hour under test, during which time there shall be no drop greater than 4".

B. Upon completion of the roughing-in and before setting fixtures, the entire cold water piping system shall be tested at 150 psi for a period of two hours before covering at every floor.

C. Where a portion of the water piping system is to be concealed before completion, this portion shall be tested in a manner similar to that described for the system.

D. The Contractor shall furnish and pay for all devices, materials, etc., labor and power required in connection with all tests All tests shall be made in the presence and satisfaction of the Sanitary Engineer, Plumbing and other City Inspectors, and other public utilities having jurisdiction.

E. Defects disclosed by the test shall be repaired or if required by the Engineer or his representative, defective work shall be replaced without extra charge to the Owner. Test shall be repeated as directed until all works are proven satisfactory.

F. The Contractor shall also be responsible for the other trades that may be damaged or destroyed by the tests or the repair or replacement of his own work and shall restore the damage to its original condition without extra cost to the Owner.

G. The Contractor shall notify the Engineer, Plumbing Inspector and others having jurisdiction at least a week in advance of making the required tests so arrangements can be made for their presence to witness the test.

H. All repairs to pipings shall be made with new materials at the expense of the Contractor.

3.05 GUARANTEE FOR PLUMBING SYSTEM

The Plumbing Contractor shall furnish to the Owner a written guarantee covering the satisfactory operations of the plumbing installation in all its parts for a period of one (1) year after the date of acceptance. During this period, the Plumbing Contractor shall repair or replace any defective work and pay for any repair or replacement cost.

3.06 WARRANTY FOR EQUIPMENT

A. Pumps if furnished by the Contractor in any section of the specifications shall be guaranteed against defective design, materials and workmanship for a period of one (1) year from the date of final acceptance.

B. Upon receipt of a written complaint and during the period of the guarantee, all defective parts shall be replaced by the Contractor at his own expense.

3.07 COLOR CODING FOR PIPES

COLD WATER PIPES	Green with White Band at 1.00 o.c.
HOT WATER PIPES	Red with White Band at 1 00 o c
SEWAGE PIPES	Black with Red Bank
VENT PIPES	Green
STORM SEWER PIPES	Black with Green Band

3.08 DISINFECTION

A. The entire water system shall be thoroughly flushed and disinfected with chlorine before it is placed in service.

B. Chlorine shall be liquid chlorine or hypochlorite (HTH) and shall be introduced into the water lines in a manner approved by the Sanitary Engineer.

C. Chlorine dosage shall be to provide no less than 50 parts per million (or mg/l) of available chlorine and allowed to stand for 24 hours, after which the system shall be flushed with potable water until the residual chlorine content is about 0.2 parts per million. All valves in the system shall be opened and closed several times during the chlorinating period.

D. The interior of elevated water tank shall be thoroughly washed and swabbed with chlorine or hypochlorite solution containing 200 parts per million (mg/l) available chlorine and allowed to stand for at least 16 hours, after which the tank shall be flushed with potable water before placing in service.
Before washing and swabbing with chlorine solution, the tank shall be thoroughly cleaned of all debris, dirt or dust to the satisfaction of the Engineer.

E. The Contractor shall furnish and pay for all devices, chlorine materials, labor and power required for disinfection purposes. Disinfection shall be made in the presence of the Sanitary Engineer.

3.09 UNDERGROUND DRAINAGE SYSTEM

A. EXCAVATING

1. Trenches for all underground pipelines shall be excavated to the required depths and grades.
2. Bell holes shall be provided so that pipe will rest on well tamped solid ground for its entire length. (For concrete pipe, use Bell & Spigot)
3. Where rock is encountered, excavation shall extend to a depth six inches below the pipe bottom and before pipe is laid, the space between the bottom of pipe or other approved filling materials.

B. PIPE LAYING

Pipes in trenches shall be laid true to line and grade on a stable or suitably prepared foundation, each section of the pipe being bedded and bottom of the trench shaped to fit the lowest quadrant of the pipe circumference.

C. BACKFILLING

1. After pipe lines have been tested, inspected and approved by the Engineer, and prior to backfilling, all forms and bracings shall be removed and the excavation shall be cleaned from trash and debris.
2. Materials for backfilling shall consist of approved materials and shall be free of debris or big rocks.
3. Backfill shall be placed in horizontal layers, properly moistened and compacted to an optimum density that will prevent excessive settlement and shrinkage.

SECTION 15444

DOMESTIC WATER PUMPS

1.1 GENERAL

1.2 DESCRIPTION

A. This Section includes all-bronze and bronze-fitted centrifugal pumps for domestic cold- and hot-water circulation- close-coupled, horizontally mounted, in-line

B Related Sections include the following:

1. Division 15 Section "Packaged Booster Pumps" for booster systems.

1.3 SUBMITTALS

A. Product Data: For each type and size of domestic water pump specified. Include certified performance curves with operating points plotted on curves; and rated capacities of selected models, furnished specialties, and accessories.

B. Shop Drawings: Diagram power, signal, and control wiring.

C Operation and Maintenance Data: For domestic water pumps to include in emergency, operation, and maintenance manuals.

1.4 QUALITY ASSURANCE

A. Product Options: Drawings indicate size, profiles, and dimensional requirements of domestic water pumps and are based on the specific system indicated.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

C. UL Compliance: Comply with UL 778 for motor-operated water pumps.

2.1 PRODUCTS

2.2 CLOSE-COUPLED, HORIZONTALLY MOUNTED, IN-LINE CENTRIFUGAL PUMPS

A. Description: Factory-assembled and -tested, overhung impeller, single-stage, close-coupled, horizontally mounted, in-line centrifugal pumps designed for installation with pump and motor shafts mounted horizontally.

1. Pump Construction: All bronze. Casing: Radially split, cast iron,

with threaded companion-flange connections for pumps with NPS 2 pipe connections and flanged connections for pumps with NPS 2-1/2 pipe connections. Impeller: ASTM B 584, cast bronze; statically and dynamically balanced, closed, and keyed to shaft. Shaft and Shaft Sleeve: Steel shaft, with copper-alloy shaft sleeve. Seal: Mechanical, with carbon-steel rotating ring, stainless-steel spring, ceramic seat, and rubber bellows and gasket. Include water slinger on shaft between motor and seal. Bearings: Oil- lubricated; bronze-journal or ball type. Shaft Coupling: Rigid type.

2.3 **CONTROLS**

A. Thermostats: Electric: adjustable for control of hot-water circulation pump Type: Water-immersion sensor, for installation in hot-water circulation piping. Range: 65 to 200 deg F. Operation of Pump: On or off. Transformer: Provide if required. Power Requirement: 24 V, ac. Settings: Start pump at 110 deg F and stop pump at 120 deg F.

2.4 **FLEXIBLE CONNECTORS**

A. Description: Corrugated, bronze inner tubing covered with bronze wire braid. Include copper- tube ends or bronze flanged ends, braze-welded to tubing. Include 125-psig minimum working- pressure rating and ends matching pump connections.

3.1 **EXECUTION**

3.2 **EXAMINATION**

A. Examine roughing-in of domestic-water-piping system to verify actual locations of connections before pump installation.

3.3 **PUMP INSTALLATION**

A. Install pumps with access for periodic maintenance including removal of motors, impellers, couplings, and accessories.

B. Independently support pumps and piping so weight of piping is not supported by pumps and weight of pumps is not supported by piping.

C. Install close-coupled, horizontally mounted, in-line centrifugal pumps with motor and pump shafts horizontal.

D Install continuous-thread hanger rods and elastomeric hangers of sufficient size to support pump weight. Fabricate brackets or supports as required. Hanger and support materials are specified in Division 15 Section "Hangers and Supports " Suspend vertically mounted, in-line centrifugal pumps independent of piping. Install pumps with motor and

pump shafts vertical. Use continuous-thread hanger rods and elastomeric hangers of sufficient size to support pump weight. Hanger. and support materials are specified in Division 15 Section "Hangers and Supports."

3.4 CONTROL INSTALLATION

Install immersion-type thermostats in hot-water return piping. Install timers.

3.5 CONNECTIONS

A. Piping installation requirements are specified in other Division 15 Sections.
   Drawings indicate general arrangement of piping, fittings. and specialties.
B. Install piping adjacent to pumps to allow service and maintenance.
C. Connect domestic water piping to pumps. Install suction and discharge piping equal to or greater than size of pump nozzles. Refer to Division 15 Section "Domestic Water Piping."
D. Ground equipment according to Division 16 Section "Grounding and Bonding." E.
   3 Connect wiring according to Division 16 Section "Conductors and Cables."
F. Connect thermostats and timers to pumps that they control.
G. Interlock pump with water heater burner and time delay relay.

3.6 START-UP AND DEMONSTRATION

A. Engage a factory-authorized service representative to coordinate with CxA and train Owner's maintenance personnel to adjust, operate. and maintain controls and pumps. Refer to Division 1 Section "Closeout Procedures."

SECTION 15446
PACKAGED BOOSTER PUMPS

1.1 GENERAL

1.2 DESCRIPTION

A. Section Includes:
   1. Multiplex, variable-speed booster pumps.
B. Related Sections:
   1. Division 15 Section "Domestic Water Pumps" for domestic-water circulation pumps.

1.3 DEFINITIONS

A. VFC: Variable-frequency controller(s).

1.4 SUBMITTALS

A. Per Section 01330.

1.5 QUALITY ASSURANCE

A. Electrical Components. Devices, and Accessories: Listed and labeled as defined in NFPA 70. by a qualified testing agency. and marked for intended location and application.
B. ASME Compliance: Comply with ASME B31.9 for piping.
C. UL Compliance for Packaged Pumping Systems.
D. Booster pumps shall be listed and labeled as packaged pumping systems by testing agency acceptable to authorities having jurisdiction.

2.1 PRODUCTS

2.2 MULTIPLEX, VARIABLE-SPEED BOOSTER PUMPS

A. Description: Factory-assembled and -tested, fluid-handling system for domestic water, with pumps, piping, valves, specialties. and controls, and mounted on base.
B Pumps: Type: End suction as defined in plans for end-suction, close-coupled, single-stage, overhung-impeller, centrifugal pump. Casing: Radially split; cast iron. Impeller: Closed, ASTM B 584 cast bronze; statically and dynamically balanced and keyed to shaft. Shaft and Shaft Sleeve: Steel shaft, with copper-alloy shaft sleeve and deflector. Seal: Mechanical. Mounted vertically.
C. Motors: Single speed, with grease-lubricated or pre-greased,

permanently shielded, ball-type bearings. Select motors that will not overload through full range of pump performance curve.

D. Piping: Copper tube and copper fittings.

E. Dielectric Fittings: With insulating material isolating joined dissimilar metals.

F. Control Panel: Factory installed and connected as an integral part of booster pump; automatic for multiple-pump, variable-speed operation, with load control and protection functions.

1. Control Logic: Solid-state system with transducers, programmable microprocessor, VFC, and other devices in controller. Install VFC for pump motors larger than 25 hp in separate panel, same type as motor control panel enclosure.
2. Motor Controller: NEMA ICS 2, variable-frequency, solid-state type.

G. Building Automation System Interface: Provide auxiliary contacts for interface to building automation system. Building automation systems are specified in Division 15 Section "HVAC Instrumentation and Controls." Include the following:

2.3 STEEL, PRECHARGED, POTABLE-WATER STORAGE TANKS

A. Steel, Pre-charged. Bladder, Water Storage Tanks: Description: Steel, vertical, pressured-rated tank with cylindrical sidewalls and with air- charging valve and air pre-charge. Tank Size: 150 to 160 gallons. Operation: Factory-installed, replaceable butyl-rubber bladder.

B. Construction: ASME code Section VIII constructed and labeled, steel, constructed with nontoxic welded joints. for 125-psig working pressure @ 240 deg F maximum temperature.

C. Tappings: Factory-fabricated steel, welded to tank before testing and labeling.

D. Specialties and Accessories: tappings in tank, Pressure gage, Charging valve.

E. Vertical Tank Supports: Factory-fabricated steel legs or steel skirt, welded to tank before testing and labeling.

F. Tank Interior Finish: Materials and thicknesses complying with NSF 61 barrier materials for potable-water tank linings. Extend finish into and through tank fittings and outlets. Coating: Epoxy resin.

G Exterior Coating: Manufacturer's standard enamel paint.

2.4 MOTORS

A. Comply with NEMA designation, temperature rating, service factor, and enclosure type for motors. Motors shall be high efficiency and inverter duty. Motor Sizes: Minimum size as

indicated. If not indicated, large enough so driven load will not require motor to operate in service factor range above 1.0.
Controllers, Electrical Devices, and Wiring: Comply with requirements for electrical devices and connections specified in NFPA 70.

3.1 EXECUTION

3.2 EXAMINATION

A. Examine roughing-in for booster pumps to verify actual locations of piping connections before booster-pump installation.

3.3 INSTALLATION AND CONNECTIONS

A. Equipment Mounting: Install booster pumps on concrete base using elastomeric pads. Comply with requirements for concrete base specified in Division 3 Section "Cast-in-Place Concrete."
B. Support connected domestic-water piping so weight of piping is not supported by booster pumps.
C. Connect domestic-water piping to booster pumps. Install suction and discharge pipe equal to or greater than size of system suction and discharge headers.

3.4 IDENTIFICATION

A. Identify system components. Comply with requirements for identification specified in Division 15 Section "Identification for Plumbing Piping and Equipment."

3.1 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections.
B. Perform tests and inspections. Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.
C. Tests and Inspections:
   1. Perform visual and mechanical inspection.
   2. Leak Test: After installation, charge booster pump and test for leaks Repair leaks and retest until no leaks exist.
   3. Operational Test: After electrical circuitry has been energized, start booster pumps to confirm proper motor rotation and booster-pump operation.
   4. Test and adjust controls and safeties. Replace damaged and

malfunctioning controls and equipment.

D. Prepare test and inspection reports.

3.2 STARTUP SERVICE

A. Engage a factory-authorized service representative to perform startup service confirm witnessing by CxA and Owner's representatives. Complete installation and startup checks according to manufacturer's written instructions.

3.3 ADJUSTING

A. Adjust booster pumps to function smoothly, and lubricate as recommended by manufacturer. Adjust pressure set points.

B. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting booster pump to suit actual occupied conditions. Provide up to two visits to Project during other-than-normal occupancy hours for this purpose.

3.4 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain booster pumps.

SECTION 15450
PLUMBING FIXTURES AND TRIMS

1.00 GENERAL

1.01 DESCRIPTION OF WORK

A. Work Included: Install complete sanitary plumbing fixtures, trims and supply fittings, traps, valves, and supports in accordance with the contract documents.
B. Furnish and install adaptors, couplings and devices required for complete connections of all sanitary plumbing fixtures and trims other than those supplied by the owner.
C. All fixtures shall be completely new, free from defects, function efficiently and shall be cleaned, with trims polished and ready for use before acceptance.
D. All plumbing fixtures and equipment shall be installed free and open in a manner to provide easy access for cleaning and shall be furnished with all brackets, cleats, plates and anchors required to support the fixtures and equipment rigidly in place.

2.00 PRODUCTS

2.01 MATERIALS

A. General for all sanitary plumbing fixtures unless otherwise specified.
   1. Vitreous Ware: Fired vitreous china ware of the best quality, non-absorbent and burned so that the whole mass is thoroughly fused and vitrified, producing a material white in color, which when fractured shall show a homogenous mass, close-grained and free from pores. Glazed finish thoroughly fused and united to the body, without discoloration, chips, or flaws, and free from craze. Warped or otherwise imperfect fixtures shall not be accepted.
   2. Fixtures: Free from imperfections, true as to line, angles, curves, and color, smooth, watertight and quiet in operation. See Summary of Materials and Finishes.
   3. Location, Type, Color and Finishes: See architectural drawings.
   4. The Plumbing Contractor shall be responsible for the supply of the fixture fittings (or trims) which are not provided with the fixture, but required for a complete installation. All fixtures shall be carefully checked to determine the items which must be provided to complete the installation.

2.02 SCHEDULE OF FIXTURES

Refer to Section 01020 SUMMARY OF MATERIALS AND FINISHES.

3.00 EXECUTION

3.01 FIXTURE INSTALLATION

A. Support all fixtures securely in a neat workman like manner on approved carriers or supports. The method of support for each fixture shall be approved type manufacturer's standard, except where fixture designations on the drawings indicate modifications.

B. Floor mounted water closets shall be installed in accordance with the manufacturer requirement with standard lead caulked cast bronze adaptor flange, wax gasket and hold down bolts with nuts, washers and bolt head cover on closet flange. Bolt head exposed cover shall match the color finish of the closet.

C. Lavatories shall be supported on concealed chair carriers similar to Smith products, single or double as required, with block base foot support bolted to floor, and adjustable sleeve for arm adjustment, steel pipe upright and adjustable alignment truss. Concealed arms shall be provided with leveling screws and locking device and shall be designed to receive threaded escutcheons. Slab type lavatories (wall mounted) shall be furnished with extra-heavy, cast brass chrome plated threaded escutcheon between the fixture and the wall. The escutcheon shall be screwed on the adjustable sleeve or arm. Countertop lavatories shall be built and anchored into architectural vanity countertops including trims as means of support.

D. Counter-type sinks shall be installed with manufacturer's standard concealed carrier or supports and otherwise supported by countertops as indicated on the drawings.

E. Install all fixtures level and flush with finish floors and partitions.

F. Drawings indicate fixtures layout dimensions. All rough-in dimensions shall be based on final finished dimensions. Deviations from the drawings due to actual site condition shall be approved by the Project Representative.

G. All fixtures shall be provided with individual shut-off valves for cold water supplies so that any fixture may be separately controlled without affecting other fixtures supplied with the same distribution line.

H. Fixture fittings, trims, faucets, traps. water supply pipes and waste pipes that are exposed to view in finished spaces shall be painted with one coat of red lead primer and two finish coats of enamel paint, the color to be designated by the Architect unless otherwise specified.

I. Every plumbing fixture or equipment requiring connections to the sanitary drainage system shall be equipped with a trap.

J. Each trap shall be placed as near the fixture as possible. No fixture shall be double-trapped.

3.02 TESTING AND CLEANING

A. The Project Representative or his authorized representatives shall conduct field inspection of all completed or partially completed installed plumbing fixtures prior to scheduled testing.

B. All plumbing fixtures shall be properly protected from use and drainage during the construction period. At the end of the work and prior to approval, the fixtures shall be cleaned as per manufacturer's recommendations, to the satisfaction of the Architect.

C. After installation of any or all the plumbing fixtures of the building, same shall be kept clean and in working order, but shall not be used by anyone until the building has been formally turned over to and accepted by the Owner.

D. Water running test shall be conducted for all fixtures in the presence of the Project Representative of his authorized representatives, in order to insure soundness, leakage-free and quiet operation.

SECTION 15500
VENTILATION & AIR CONDITIONING SYSTEMS

1.00 GENERAL

1.01 GENERAL DESCRIPTION

The work to be done under this Divisions of the specification consists of the fabrication, complete in all details, of the Mechanical Works at the subject premises, and all work and materials incidental to the proper completion of the installation, except those portion of the work which are expressly stated as to be done by others. All works shall be in accordance with the governing Codes, etc. which, later shall then govern. The requirements with regard to materials and appliances necessary for the complete installation of the work specified herein and indicated on the drawings.

1.02 DRAWINGS AND SPECIFICATIONS

A. The contract drawing and specification are complementary to each other and any labor or materials called for by either. Whether or not called for by both, if necessary for the successful operation of any of the particular type of equipment shall be furnished and installed without additional cost to the Owner.

B. All dimensional location of piping, equipment. risers and pipes chase shall be verified on the architectural drawing and manufacturer's cataloque.

1.03 INTENT

It is not intended that the drawing shall show every pipe, fitting, valve and equipment. All such items whether specifically mentioned or not, or indicated on the drawing. shall be furnished and instated if necessary to complete the system in accordance with the best practice of the air conditioning and ventilation trade and to the satisfaction of the Architect, the Engineer and the Owner.

1.04 SITE INVESTIGATION

The Contractor is required to visit the site and to ascertain for himself the local conditions and facilities that may affect his work. He will be deemed to have done this before preparing his proposal and any subsequent claims on the ground of inadequate or inaccurate information will not be entertained.

1.05 SHOP DRAWING

The Contractor shall submit to the Architect and the Engineer, for approval, four (4) copies of all shop drawing of details & connections not shown on the drawing or deviation thereof but required for the work. The Contractor shall certify that the drawing has been checked for dimensions, materials, creation details and that they confirm to the intent of the drawing and specification.

1.06 RECORD DRAWINGS

A. The Contract shall during the progress of work, keeps a record of the actual installation from that shown on the contract drawing.

B. Upon completion of work, the Contract shall submit four (4) copies of the as-built drawing indicating the works as actually and finally installed.

1.07 GUARANTEE

The Contractor shall guarantee that the fire protection system is free from all defective workmanship and materials and will remain so for a period of one (1) year from date of acceptance of the work. Any defect, appearing within the before said period shall be remained by the Contraction at his own expense.

1.08 PERMITS

The Contractor shall be responsible for securing all the required construction and operation permits and pays all the necessary fees thereof. Copies of all the permits. together with certificate of inspection shall be submitted to the Owner.

1.09 CODES AND STANDARDS

The work under this contract is to be installed with reference to the latest requirement of the following.

A. PHILIPPINE NATIONAL BUILDING CODE
B AMERICAN SOCIETY OF HEATING, REFRIGERATING AND AIR CONTIONING ENGINEERS (ASHRAE)
C. AMERICAN REFRIGERATION INSTITUTE (ARI)
D. AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)
E. AMERICAN NATIONAL STANDARD INSTITUTE (ANSI)
F. AIR MOVING AND CONDITIONING CONTRACTORS NATIONAL ASSOCIATION INC. (SMANA)
F. SHEET METAL AND AIR CONDITIONING CONTRACTORS NATIONAL ASSOCIATION INC. (SMACNA)
G. NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)
H. UNDERWRITTERS LABORATORIES (UL)
J. NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

1.10 SUBMITTALS

The Contractors shall submit all the necessary documents such as materials catalogue, samples, shop drawing. manufacturer's standard installation instruction, operation and maintenance manuals, equipment warranty, and all other documents as may be required.

2.00 MATERIALS

2.01 QUALITY ASSURANCE

All materials to be used shall be new and shall conform to their reference codes and standards. Use of materials shall further be governed by other requirements, imposed on other section of these Specification Materials shall be subject to the necessary tests to ascertain their fitness if so required.

2.02 ALTERNATE MATERIALS

Use of any materials. not specified in these specifications may be allowed provided that such alternate has been approved by the Architect and Engineer and provided further that a test. if required, shall be done by an approved agency in accordance with generally accepted standards.

2.03 IDENTIFICATION OF MATERIALS

Each length of pipe. fitting, equipment and device used in the a card vent system shall have cast. stamped or indelibly marked on it the manufacturers trademark or name, the weight, type and classes of product when so required by the standard mentioned above.

2.04 DUCTWORKS

Materials – Zinc coated steel "commercial" quality complying with ASTM A93

A. Minimum gage – be duct dimension, refer to longer size of rectangular duct for low pressure ductworks.

Duct Dimension (mm)			US Standard Gage
UP	to	300	26
350	to	750	24
800	to	1350	22
1400	to	2100	20
Over	to	2100	18

B. Duct shall be essentially airtight
Cross break ducts 450 mm and large
Duct elbow shall have center line radius no less than 1 ½ times the maximum duct dimension in plane of turn.

C. Duct support – (all dimension in mm unless noted otherwise)

Duct Dimension	Duct Support	Support Spacing
Up to 600	25x25x3 angle And 10 dia rod 38x3 flat	2.4 M.O.C. Maximum
650 to 1050	38x38x3 angle and 10 dia rod 50x6 flat	1.8 M.O.C. Maximum
1100 to 1450	50x50x6 angle and 12 dia rod	1 8 M.O.C. Maximum

	Over 1500	50x6 flat 50x50x6 angle and 12 dia rod 65x6 flat	1.2 M O.C. Maximum

D. Volume damper – Provide split or opposed blade volume damper as required for air balancing. Materials shall be 2 gage heavier than connecting duct work.

E. Fire damper – Provide fusible link type fine damper (74 C) where required. Material shall be 2 gauge heavier than connecting ductwork.

F. Access door – Provide access door as indicated or as required for proper maintenance.

2.05 FLEXIBLE CONNECTOR

A. Material – Heavy duty canvass cloth
B Install on all intake and discharge sides of air moving equipment
C. Maximum length – 150 mm
D. Provide necessary angles, bolts, clips, flanges and other fastening for securing connection to duct and equipment.

2.06 REGISTERS/GRILLES

A. Designation – SAR, RAR, FAR, EAR. SAG, RAG, FAG, EAG.
B. Material – Gage 22, G 1 sheet
C. Model – Similar to "Tuttle and bailey"
D. Size and capacity – As shown on drawing
E. Accessories – Volume damper (For Registers)

2.07 DUCT INSULATION

A. Material – Rigid fiberglass with average thermal conductivity not to exceed 0 036W/M-C at mean temperature of '24C complete with aluminum vapor barrier.
B. Density – 48Kg/Cu. M
C. Adhesive – Rugby adhesive
D. Thickness – 25mm thick
E. Metal cladding – Gage 26 G 1 sheet
F. Corner Bidding – Gaga 24 6.1 sheet continuous
G. Application – Supply and return ductwork

2.08 PIPE INSULATION

A. Material – Premoulded closed cell elastomerie
B. Thickness – 25 mm
C. Finish – PVC plastics
D. Metal cladding – Gage 26 G.1 sheets
E. Application – Refrigerant and A/C drain piping

2.09 COPPER PIPING

A. Type – Copper pipe, seamless hand drawn, ASTM-B-88
B. Minimum wall thickness – Type L
C. Joints – Solered type
D. Fitting – Wrought copper ANSI B. 16
E. Valves – Bronze body with soldered ends
F Solder type – Silver 15AG-80, CU-5P
G. Application – Refrigerant piping

2.10 UNPLASTICIZED POLYVINYL CHLORIDE (uPVC)

A. Type – uPVC Blue
B. Minimum wall thickness – Class 150 or Series 600
C. Joints - Slip-on type
D. Fitting – uPVC with the same wall thickness as the pipes
E. Valves – uPVC, 860 KPA class
F. Pipe sealant – PVC cement
G. Application – drain piping

2.11 PIPING IDENTIFICATION

A. Identify all piping with color-coding
B. Apply painting only after all pipes insulation and finishes are complete
C. Paints – Two (2) coats of primer paint plus one (1) coat of luminous/reflective enamel paints
D. Color code – ASHRAP standard subject to print approval of the Engineer and Architect
E. Provide directional arrow at a minimum distance of 5-M interval
F. Chart – Provide chart of color code listed above in frame and mounted under suitable plastic. Chart shall be mounted in mechanical room or as instructed.

2.12 PIPE SUPPORT

A. Pipe support shall be fabricated with flat bar, round bar, and angular bar of appropriate size.
B. Anchorage of pipe support on concrete slab or beam shall be expansion shields or it shall be directly fastened to structural steel member as shown on details or as required
C. All hangers and support shall be painted with one (1) coat of primer paint and two (2) coats of finishing enamel paint.

2.13 PRESSURE GAGE

A. Type : Dial type 90 mm
B. Accuracy : Within 1% of scale range

C. Ranges : Select range so that the normal operating pressure is indicated half way of the dial gage

D. Calibration : Kg/cm2 or psi

2.14 PIPE AND DUCT SLEEVES

A. Pipe sleeve shall be black iron pipe, schedule 40

B. Duct sleeve shall be galvanized iron steel sheet one (1) gage thicker than the passing duct.

C. Sleeve shall have a minimum clearance of 25 mm around the pipe / duct insulation, if any, and caulked with oakum and mastic sealant.

D. All pipe sleeves for extension wall shall be with water stop collar.

2.15 EQUIPMENT FOUNDATION

A Equipment foundation shall basically consist of steel angle, channel, reinforced concrete pads and foundation required by the equipment. Submit shop drawing as required.

B. Size, type and bearing capacity shall be designed by the Contractor in accordance with the equipment manufacturer's standard.

C. All metal parts shall be pointed with one (1) coat of primer paint and two (2) coats of finishing enamel paint.

2.16 ELECTRICAL WIRING

A. Power wiring of all equipment shall be provided by the Contractor from the circuit breaker or junction box installed by the electrical contractor to the equipment.

B. All control wiring shall be the sole responsibility of the Contractor.

C. Conduit shall be IMC or EMT, UL listed, unless otherwise noted and must be sized in-accordance with the equipment load and manufacturer's standard.

D Wires shall be THW, unless otherwise noted and must be sized in accordance with the equipment load and manufacturer's standard.

3.00 EQUIPMENT

3.01 QUALITY ASSURANCE

All equipment to be used shall be new and shall conform to the reference codes and standards. The manufacturer shall provide representatives for start-up supervision.

3.02 OPERATION, INSTRUCTION & MAINTENANCE MANUAL

The manufacturer shall provide (4) copies of operation & maintenance manuals, including spare parts to the Owner

3.03 FANS

A. Fans shall be statically and dynamically balanced conforming to AMCA standard Casing can either be metal, fiberglass or PVC.. that suit the environmental condition.
B. Type of fans shall be either propeller, vane axial, centrifugal scroll or inline as specified in the equipment schedule. All fans shall generally below noise, low speed unless other wise noted.
C. Accessories such as gravity shutter. vibration isolators and belt guards shall be included as standard items.

3.04 VRV AND/OR VRF AIR CONDITIONER

A. VRV and/or VRF air conditioner shall be inverter-type and consists of air grading unit and air cooled condensing unit using refrigerant R-22. Unit shall be designed for 35°C DB ambient air temperature.
B. Air handling unit shall consist of evaporator fan, coil and filter sections.
C Air-cooled condensing unit shall consist to compress condenser fans and coil section.
D. Unit shall be standard protect of a reputable manufacturer and ready for field installation interconnection with refrigerant piping and electrical wiring.
E. expansion valve. sight glass, filter driven and solenoid valves shall be included in the unit.

3.05 MOTOR

Motors shall conform to NEMA standard Continuous duty 1.15 service factor, 60 Hz frequency and with enclosure of either Open. Drip Proof encapsulated (ODP) or totally Enclosed Fan Cooled (TEFC) as specified.

3.06 MOTOR CONTROLLER

A. Motor controller shall be combination circuit breaker and magnetic starter. NEMA IA enclosure as required.
B. Starter shall be across the line for motors 7.5 KW or smaller and reduced voltage for 12KW and bigger Provide one (1) overload relay with heater each phase and auxiliary contact as may be required.
C. Circuit breaker shall be molded case breaker complete with thermal magnetic trip and external operating handle.
D. All motor controllers shall be provided with auxiliary contacts for integration to Building Automation System.

4.00 INSTALLATION

4.01 WORKMANSHIP

A. The work throughout shall be executed in the best and most thorough jointly interpret the meaning of the drawing and specifications and shall have the power to reject any work and materials which in their judgement are not in full accordance therewith.

B. The contractor shall assume unit responsibility and shall provide the services of a qualified Engineer to supervise the complete installation of.equipment and system and who shall be available for conducting the final acceptance tests.

C. All equipment shall be installed in accordance with the manufacturer's standard. Certificate of compliance by the manufacturer's representative shall be submitted to the Owner

4.02 AIR DISTRIBUTION SYSTEM

A. In general, locate ducts as required to clear structure, lights, doors and other devices.

B. Allow sufficient space around ducts for installing, covering and servicing all equipment.

C. Locate all duetwork requiring adjustment, inspection or servicing for convenient access with respect to finished structure.

D. Provide metal sleeves where ducts pass though floors, wall or ceilling. Opening shall be airtight and/or light proof

E. Connections between dissimilar metals – provide non-conducting gaskets, washers, ferrules or flexible connector.

F. Install all fabricated ducted in strict accordance with manufacturer's recommendations, including reference to joints, end connections and vapor seal.

G. All ductwork shall be cleaned and left free of loose insulation and construction debris.

H. Provide access doors on all ductwork that require servicing of dampers.

I. Locate all diffusers, registers and louvers in coordination with architectural drawings.

J. All ductwork shall be sealed to less than 1% leakage by volume at 1255 mm SPWG for one (1) hour.

K. All insulated duetwork passing through building exterior or subject to weather shall be provide with metal cladding.

L. Duct support shall be spaced to avoid sagging. Horizontal and vertical ducts shall be spaced in accordance with SMACNA standards.

M. Provide auxiliary structure steel members as maybe required for required for proper support of the ductworks.

4.03 PIPING SYSTEM

A In General

Parallel to building liners and other piping

Install essentially as shown. Modify as required to clear building structure and opening, lights, ducts and other devices.

B. Provide adequate spacing to permit installing insulation, servicing valves and specialties and replacing section of pipe.

C Pipe grade – install piping to permit drainage of oil back to compressor.

D. Flexibility – allow thermal expansion by providing expansion loops or bends where shown and where ever required

E Provide pipe sleeves for all piping passing through building structure.

F. All insulated piping passing through building exterior or subject to weather shall be provide with metal cladding.

G Horizontal and vertical pipe shall be spaced to avoid sagging and misalignment of piping Hanger shall be adjustable to permit drainage or sloping of pipes.

H. Provide isolation of pipe and hanger of different materials.

I. Trapeze hangers may be used in lieu of separate hangers on pipe running parallel to and close to each other.

J Provide auxiliary structure steel member as may be required for proper support of piping.

K. Provide trap where indicated or required by equipment manufacturer.

L Size refrigerant pipes and condensate drain pipes in accordance with equipment manufacturer standard.

4.04 SUPPORT, SLEEVES AND HANGERS

A Fixture support

All fixture and equipment shall be supported and fastened in a safe and satisfactory manner

B Pipes sleeves

Pipe sleeves shall be installed and properly secured in place at all points where pipes pass through masonry or concrete, except unframed on earth.

C Pipe hangers, supports and inserts

Horizontal runs of pipe shall be hung with adjustable pipe hangers spaced not over 3.0 M apart.

Trapeze hangers may be used in lieu of separate hangers in pipes running parallel to and close to each other.

Insert shall be securely anchored and the anchor shall be properly slushed with mortar. Inserts shall be completely concrete when the fixtures are installed. Vertical pipe riser shall be supported at every floor unless additional supports are required.

Provide isolation for pipe and hanger of different materials.

Provide auxiliary structure steel member required for supporting and anchoring of pipes and accessories.

4.05 SURFACE PREPARATION AND PAINTING

A Surface Preparation

All exposed metal surface shall be rid of grease oil or other foreign materials.

All equipment, pipes, valves and fitting shall be cleaned of grease and sludge which may have accumulated. Any discoloration or other damage to the parts of the building its finish of furnishing due the mechanical system shall be required by the Contractor.

B Painting

All exterior surface of piping to be installed in or through concrete floor, fill or tiled floors and underground shall be given one (1) coat of acid resisting paint having a bituminous base.

Pipe hanger support and other iron works in concealed spaces shall be thoroughly cleaned and painted

All exposed piping shall be painted with two (2) coats of primer paint and one (1) coat of enamel finished paints after cleaning and freed of rust. Direction markers shall be spaced no more than 5.0 M apart Color code shall be as follows or as required.

Refrigerant	Black

Paints bands of 50 mm width at 1.5-M interval for all piping concealed inside ceiling will be acceptable.

5.00 TESTING AND BALANCING

5.01 AIR DISTRIBUTION SYSTEM

A. Clean permanent type filters and replace disposable filters with clean media
B. Check operation of al l automatic damper to ensure proper setting and operation.
C. Check and ensure cleanliness off ducts coil and equipment
D. Measure supply air volume by using the duct traverse method taking a minimum of three (3) reading Seal duct access holes with metal snap –in pluge. The use of duct tapes to seal access holes will not be permitted.
E Adjust balancing dampers for required main and branch ducts air quantities.
F. Adjust registers, grilles and diffusers air volume to within 10% of individual requirement specified, and also adjust to minimize draft in all areas.
G. The total air delivery from a fan system shall be obtained by adjustment of the fan speed. The drive motor of each fan not be loaded greater than the corrected full load amperage rating of the motor involve.
H. Check air volume on all air distribution equipment and make adjustment such that the capacity corresponds to the specified values.
I. All ducts works shall be tested in accordance with SMACNA standard.
J. Record all information measured.

5.02 REFRIGERANT SYSTEM

A. Leak test – Upon completion of the equipment, test all factory and field installed refrigerant piping using nitrogen gas at pressure as prescribe by ASTRAE standard or as per manufacturer's standard.
B Evacuation and charging – After pressure test, evacuate the system using a vacuum pump and charge the system in accordance with the equipment manufacturer's standard.
C Start-up and initial operation test shall be conducted in the presence of equipment manufacturer's authorized representative.

5.03 BALANCING DATA

A. Report shall consist of the following data:

Project Name

Date / Time

Contractor

Out condition (DB/WB)

Design and actual readings of all capacity, pressure drop, RPM, velocity, pressure, flow rate, temperature and electrical data.

Physical sizes and actual location of all equipment and devices

B. Prior to actual testing and balancing, the Contractor shall submit to the Engineer and Architect the proposed agenda of the testing and balancing methods and instruments to be used for approval.

C. Unless otherwise required, all data so be measured must have at least three (3) readings.

SECTION 16050
BASIC ELECTRICAL MATERIALS AND METHODS

1.00 GENERAL

1.01 GENERAL DESCRIPTION

All electrical works for this project shall be governed by the provisions of the latest edition of the Philippine Electrical Code, rules and regulations of Local Authorities that have jurisdiction over the project and policies of electric and communication utility companies in the locality.

The plans and specifications are complementary, and what is called for in one shall be taken as called for in both.

The General Conditions and Provisions of the Civil Works Contract not in conflict with the plans and specifications form part of this section of the specifications.

1.02 SITE VISIT

The Contractor is advised to visit the site to ascertain for himself the prevailing local conditions there at and to check the existing line facilities of local power and communication companies. Also, to investigate other pertinent things that may affect his work. It shall be presumed that he had done this before preparing his proposal and no subsequent claim on the ground of inadequate or inaccurate information will be entertained.

1.03 SCOPE OF WORK OF THE CONTRACTOR

The work of the Contractor includes supervision, labor, equipment and materials, and to perform all electrical operations in connection with the electrical system shown on the plans, and their tests and inspection complete and in accordance with these specifications and plans and subject to the terms and conditions of the contract. Any equipment, materials, or works not shown on the plans but mentioned in the specifications, or vice-versa, shall be furnished and installed by the Contractor.

The following are the scope of work of the Contractor:

A. Furnish and install transformers at locations indicated in the plans. Provide concrete base mounting pads.
B. Furnish and install power service entrance including related concreting and civil works, such as excavation / backfilling and concrete encasement.
C. Furnish and install a complete roughing-in and wiring systems for lighting and power including feeders, branch circuits and taps.

D. Furnish and install all lighting fixtures, wiring devices and necessary wiring gutters and boxes.
E. Furnish and install motor wiring inclusive from overcurrent device to motor terminals except those specified to be done by other trades.
F. Furnish and install wiring and conduits for pump and electronic control motors of mini-irrigation system inclusive from overcurrent device to motor terminals except those specified to be done by other trades.
G. Furnish and install service entrance PVC conduit for incoming telephone service including related concreting and civil works.
H. Furnish and install complete telephone and public address/paging systems, wiring, outlets, telephone terminal cabinets, terminal blocks, wiring accessories, devices and all terminations.
I. Furnish and install a complete fire alarm system including wiring, control panel, alarm stations, bell stations, smoke detectors and heat detectors.
J. Furnish and install panelboards and enclosed circuit breakers as required.
K. Complete testing of all electrical and auxiliary systems.
L. Painting of all panelboards and enclosures.
M. Application of electric power service including preparation of all necessary plans, forms and related documents, payment of government fees and charges and coordination with power and other authorities or persons involved in the procedures.
N. Preparation of as-built plans and drawings.
O. Furnish and install a complete grounding system
P. If anything has been omitted of any item of works or materials, usually furnished, which are necessary for the completion of the electrical works as outlined herein before, then such items shall be and are hereby included in this division of the work.

1.04 EXCAVATION AND BACKFILL

The Contractor shall be responsible for excavation to layout his electrical conduit. Excavation shall be such as to provide a uniform bearing for the conduit and shall be filled with gravel to grade.

1.05 CUTTING AND PATCHING

The Contractor shall furnish sketches to the General Contractor showing the location and sizes of all openings, chases, sleeves and inserts. He shall be responsible for the cost of cutting and patching where any electrical items were not installed, incorrectly sized or located. No structural members shall be cut without the consent and proper direction from the Architect. All patching shall be performed in a neat and workmanlike manner acceptable to the Architect.

1.06 SUBCONTRACTING

The Contractor shall not subcontract the whole or any part of the work without the written consent of the Owner. The Contractor shall be responsible for any work carried out by any subcontractor as if he himself were undertaking the job.

1.07 WORKMANSHIP

The Contractor shall execute all works in a neat and workmanlike manner and shall do all necessary works whether or not it is clearly specified in the plans and these specifications. All works shall be done in accordance with the best practices employed in modern electrical installations.

The Contractor shall employ only competent and efficient workmen and shall, upon written request of the Architect, discharge or otherwise remove from work any employee who, in the opinion of the Architect, is careless, incompetent, an obstruction to the progress of the work, acts contrary to instructions or conducts himself improperly.

1.08 STANDARD OF MATERIALS

All materials shall be new and must conform to the technical specifications. They shall be standard products of reputable manufacturers and shall bear its name.

All materials shall be subject to the approval of the Architect. This approval shall not relieve the Contractor of the responsibility of inspecting such materials for defects and non-conformance with the specifications.

Where the technical specifications or the drawings give the name of the manufacturer and/or catalog number of a material, it is given as guide as to the size, strength, quality or class of the material desired and shall be interpreted to mean that the item or another fully equal is suitable for the service intended. Substitution shall be subject to prior written approval of the Architect.

The apparent silence of the specifications and drawings as to any detail or apparent omission from them of a detailed description concerning any material shall be regarded to mean that only materials of first class quality shall be used.

1.09 REMOVAL OF DEFECTIVE OR UNAUTHORIZED WORK

Any defective work due to poor workmanship, defective materials, damaged through carelessness or any other cause, found to exist prior to acceptance of or final payment for the work shall be removed immediately and replaced by work and material which shall conform to these specifications or, otherwise, remedied in an acceptable manner.

This clause shall have effect regardless of the fact that the work may have been done within the full knowledge of the Architect.

All materials not conforming to the requirements of the technical specifications shall be considered as defective.

No defective materials, the defect of which has been subsequently corrected, shall be used unless approval has been given by the Architect.

1.10 CONFORMITY WITH PLANS AND ALLOWABLE DEVIATIONS

These specifications and drawings indicate the general layout of the system and the Contractor shall be responsible for the proper installation of the system without substantial alterations or modifications. Whenever departures from the specifications and the drawings become inevitable due to field condition of exigencies of construction, details of proposed departures shall be submitted without delay to the Architect for approval.

1.11 COORDINATION WITH OTHER CONTRACTORS

The Contractor shall familiarize himself with the specifications and drawings of the Civil Works and those works of the specialty trades to avoid conflict with their work. Whenever conflict with the works of other trades are identified or pinpointed, this should be brought to the attention of the Architect immediately for proper disposition and coordination to arrive at the best solution.

1.12 INJURY TO PERSONS OR DAMAGE TO PROPERTY

The Contractor shall be responsible for all injuries to persons and damage to property caused by his work or by his workmen and shall be liable for any claim against the Owner on account of such injury and/or damage. Likewise, he shall be liable to damages and loss of Owner's property caused by inclement weather or theft due to his defective work, negligence or carelessness of his men. Should the Contractor cause damage to the works of any other contractor, he should settle the matter between them and free the Owner from any claim on account of such damage.

1.13 SUSPENSION OR DELAYS

The Contractor shall not suspend or fail to make progress in his work without justifiable cause. In the event of continuous delay or suspension of the work still persists despite a written complaint, at the Owner shall have the right to take over the

work and all materials in the site and take the necessary steps to have the work completed by others.

1.14 INSPECTION AND TEST

The Architect, or his representative, shall be allowed access to all parts of the work at all times and shall be furnished information and assistance by the Contractor to conduct a detailed inspection test. The cost of such inspection and test shall be borne by the Contractor.

The Contractor shall conduct the following tests, where applicable, on all electrical conductors and equipment installed in the presence of the Owner or his duly authorized representative.

A. ground resistance test
B. insulation resistance test
C. continuity test
D. voltage level test
E. phase relationship

The Contractor shall also check circuit connection at panelboards, and see to it that all single phase circuits are connected at panelboards, and see to it that all single phase circuits are connected to phase as shown in the load schedule.

All reports must be formal, typewritten and signed with the signatory properly identified.

All defects found during the tests shall be repaired immediately by the Contractor.

All tools, equipment and instruments needed to conduct the tests shall be on the account of the Contractor.

1.15 CLEANING UP

During the progress of the entire work, the Contractor shall keep clean the premises at all times by removing all dirt, debris, rubbish and waste materials caused by him in the performance of his work. He shall remove all tools, scaffoldings and surplus materials after completion and acceptance of the work.

1.16 LEAVING THE SITE

The Contractor shall not withdraw from the site until the whole electrical system is complete and in operating condition and ready for use by the Owner.

1.17 GUARANTEE

The Contractor shall leave the entire electrical work in proper working condition. He shall replace any defective work or materials furnished and installed by him without charge for labor and materials except those caused by ordinary wear and tear within one year from the date of acceptance of the project by the Owner or Architect.

1.18 PERMITS AND DUES

The Contractor shall secure all necessary permits at his own expense and pay all corresponding government fees and taxes.

The Contractor shall include in his work, without extra cost to the Owner or Architect, drawings (in addition to contract drawings and documents) and associated paper works as required by the electric and telephone companies and government authorities.

1.19 SHOP DRAWINGS

The Contractor shall submit five (5) copies of shop drawings to the Architect for approval within thirty (30) days after the award of the contract.

Shop drawings or brochures for all major electrical equipment, including service entrance equipment, lighting fixtures, panelboards, switches, wiring devices and plates and equipment of auxiliary systems shall be submitted for approval. All equipment shall be a standard product of an established manufacturer whether the manufacturer's name is specified or not.

The Contractor shall be able to submit sample fixtures when requested by the Owner or Architect. All materials and equipment installed without prior approval of the Architect shall be at the risk of subsequent rejection.

1.20 AS-BUILT DRAWINGS

The Contractor shall record all deviations made from approved construction plans during the progress of electrical construction and shall reflect the actual layout in the as-built plans. Upon completion of the project, the Contractor shall submit to the Architect two (2) complete sets of as-built plans signed and sealed by the Contractor's Professional Electrical Engineer. One (1) set of original tracing reproducible copy shall be submitted to the Owner.

1.21 INSPECTION AND CERTIFICATES

Upon completion of the entire installation, the approval of the Architect and Owner shall be secured. The Contractor shall obtain, at his own expense, a Certificate of

Electrical Inspection from the government authorities having jurisdiction over the project and submit same to the Architect prior to final payment.

1.22 EQUIVALENTS

When materials or equipment are mentioned by name, they shall form the basis of the contract. If the name is not mentioned, the Contractor may, thru written request, recommend an equivalent subject to the approval of the Architect. Substitution of specified materials, if allowed or approved by the Architect, will credit the Owner of any savings so obtained from the difference in cost.

1.24 DETAILED BREAKDOWN OF ESTIMATE

The Contractor shall submit a detailed estimate on each listed electrical system along with the bid proposal.

2.00 PRODUCTS

2.01 GENERAL

Where specifications of any type of material or equipment are in question, such materials shall conform to the standard specifications set by the following:

A. U.S. UNDERWRITERS LABORATORIES
B. U.S. NATIONAL BOARD OF FIRE UNDERWRITERS
C. NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION
D. INSULATED POWER CABLE
E. AMERICAN STANDARDS ASSOCIATION
F. BUREAU OF STANDARDS, DEPARTMENT OF TRADE
G. PHILIPPINE NATIONAL STANDARDS

2.02 TRANSFORMER

Refer to Section 01020 Summary of Materials and Finishes and the Electrical (E) Plans.

2.03 CONDUITS

A. Rigid steel conduits (RSC): shall be hot dipped galvanized, standard weight pipes made of mild steel smooth circular bore. It shall be in standard length of 3.05 meters including coupling, reamed and threaded on each end.
B. Intermediate Metallic Conduit (IMC).
C. Non-metallic conduit (PVC). CS40 smooth wall non-metallic conduit conforming to Philippine National Standards No. 14 for PVC Pipes. Conduit shall be in standard length of 3.05 meters including coupling.

2.04 SWITCHES, PANELBOARDS AND CIRCUIT BREAKERS

A. Circuit Breakers
   Molded case circuit breakers shall be Japan-made. No bracing on handles of single pole breakers shall be allowed in lieu of two- or three-pole types.
B. Metal Enclosures and Cabinets
   Panelboard enclosures, telephone cabinets, bus bar gutters, pull boxes, and wire gutters for feeders shall be locally fabricated by reputable manufacturers.
C. Safety Switches:
   1. All safety switches shall be rated as shown in the plans and shall be fusible type unless noted otherwise.
   2. All safety switches rated at 60A and above shall be spring assisted.

2.05 WIRES AND CABLES

Wires and cables shall be insulated for 600 volts. Feeders, sub-feeders and branch circuit wires and cables shall be soft drawn copper, annealed and of 98% conductivity, type THWN.

All joints or splices for No. 8 or larger shall be made with a double indent mechanical compression connector. Branch circuit splices shall be soldered. A soldered joint shall be carefully soldered without use of acid. After the conductors have been made mechanically and electrically secured, the entire joint shall be covered with rubber and plastic tapes to make the insulation of the joint or splice equal to the original insulation of the conductor.

2.06 LIGHTING FIXTURES

For lighting fixtures, lamps and accessories, refer to Section 01020 Summary of Materials and Finishes.

2.07 WIRING DEVICES

The following wiring devices are for small appliances, receptacles and switches to control lights only. For other specific loads they shall be described accordingly.

A. Duplex convenience outlet, grounding type, 10A, 250V.
B. Single-pole switch with mounting strap and device plate cover, 15A, 300V.
C. Two single-pole switch with mounting strap and device plate cover, 15A, 300V.
D. Three single-pole switch with mounting strap and device plate cover, 15A, 300V.
E. Three-way switch with mounting strap and device plate cover, 15A, 300V.
F. Special purpose outlet shall be as specified in the plans

2.08 AUXILIARY SYSTEMS

All systems shall be as per plans.

A. Fire systems shall be as per plans.

2.09 OTHERS

All other materials not mentioned herewith shall be one approved for the location and intended use and the best of its kind.

2.10 OPERATION AND MAINTENANCE

1. The Contractor shall furnish operation and maintenance manuals for each electrical and auxiliary systems and for each piece of equipment. Four (4) copies of the complete manual bound in hardback binders or an approved equivalent shall be provided to the Owner. One copy shall be provided to the Architect's office for future reference. The following identification shall be inscribed on the cover: the words "OPERATING AND MAINTENANCE MANUAL", the name and location of the project and the name of the Contractor. The manual shall include the names, address and the telephone numbers of each subcontractor supplying the equipment and systems, and of their local representatives. The manual shall have a table of contents with the tab sheets placed before instructions covering the subject. The instruction sheets shall be legible with large sheets of drawings folded in.
2. The manual shall include, but not limited to the following; a system layout showing circuits, devices and controls; wiring and control diagrams with data to explain detailed description of the function of each principal component of the system, the procedure for operating; shutdown instructions; installation instructions; maintenance instructions: test procedures; performance data; and parts list.
3. The parts list for equipment shall indicate the sources of supply, recommended spare parts, and life service organization which is reasonably convenient to the building site. The manual shall be complete in all respects for all equipment, controls and accessories provided.

3.00 EXECUTION

3.01 SERVICES

Power and telephone service entrances shall be in PVC pipes installed underground, in concrete encasement, from their designated tapping points to the building being served. Specifications for this type of installation as indicated in the site development plans shall be applied.

A. Secondary service voltage from transformer shall be: 380Y/ 220volts, 3-phase, 4-wires, 60 Hz

3.02 WIRING METHODS

A. Conduit runs for lighting, power and auxiliary branch layouts shall be in PVC pipes.
B. Exposed conduit runs which are subject to physical injury shall be in RSC pipes.
C. Underground conduit runs shall be in PVC pipes encased in concrete.

3.03 GROUNDING

The following shall be grounded in accordance with the drawings and the requirements of the Philippine Electrical Code.

A. Metal enclosures of panelboards and circuit breakers, wire gutters, pull boxes, junction boxes and utility boxes.
B. Non-current carrying metal parts of lighting fixtures, devices and motors.
C. Provide a continuous and effective equipment grounding system.

3.04 DISTRIBUTION FEEDERS

Feeder conductors and raceways shall be installed as shown on the plans and no changes in size shall be made without written consent from the Architect and Engineer. Feeder conductors shall be continuous without splices to its destination panelboards, circuit breakers and wire gutters.

3.05 BRANCH CIRCUITS

The plans indicate the general installation of all circuit wiring and outlets. Branch circuit raceways shall follow the line of shortest distance between connection points as practicable and in so far as the building condition would allow. However, exposed feeders and circuit raceways shall be installed following the building line. No wires of different circuits shall be inserted in one conduit. Where homerun for light and branch circuits exceeds thirty (30) meters, the next larger conductor size shall be used.

3.06 PANELBOARDS

Panelboards shall be fabricated from gauge no. 16 black iron (B.I.) sheet with epoxy primer and baked enamel paint finish. Doors shall be hinged with Allen screw lock from the top to bottom. Front covers shall have a stainless push-to-open lock. Dead front covers shall only be removed after the front cover has been detached.

3.07 WIRE GUTTERS AND PULLBOXES

Common pull boxes and wire gutters shall be fabricated from gauge no. 16 B.I. sheet with epoxy primer and baked enamel paint finish. Cover shall have twist lock on corners and centers of edge.

3.08 OUTLET, SWITCH AND SPLICE BOXES

Power, lighting and auxiliary outlet boxes shall be fabricated from gauge no. 16 standard pressed steel or cast metal coated with red lead primer before installation.

3.09 RACEWAY SYSTEM

1. Conduit raceways and tubing shall not have more than four quarter bends in any continuous run. Where more than four (4) 90-degree bends become necessary, a pull box shall be installed to reduce the four (4) quarter bends into halves. Exposed conduits shall be run parallel with or perpendicular to the building line. Exposed conduits shall be secured in place by means of approved supports, hangers or fastenings. Conduit supports shall be fastened to walls by means of bolts with expansion sleeves. The use of wood or lead plugs is not permitted. All conduit ends shall be firmly attached to cabinets or boxes by means of locknuts and bushings. Field bends shall not be allowed for rigid steel conduits larger than 20mm diameter. Threadless couplings and connectors used with the tubing shall be of concrete-tight type. No tubing smaller than 15mm diameter shall be used.
2. Exposed conduits shall be treated with red lead primer and finished with gray color paint. All field cut threads shall be painted with white lead.

SECTION 16160
GROUNDING AND BONDING

1.1 GENERAL

1.2 SCOPE OF WORK

A. This Section includes methods and materials for grounding systems and equipment.
   1. Underground distribution grounding
   2. Common ground bonding.

B. Type of electrical grounding and bonding work specified in this section includes the following: Solidly grounded.

C. Applications of electrical grounding and bonding work in this section includes the following:
   1. Building Steel
   2. Underground copper water piping.
   3. Electrical power systems.
   4. Grounding rods.
   5. Separately derived systems.
   6. Raceways.
   7. Service equipment.
   8. Enclosures.
   9. Equipment.
   10. Transformers.
   11. Area lighting fixtures.
   12. Distribution transformers.
   13. Switchboard.
   14. Ground Rings.

D. Refer to other Division 16 sections for wires/cables. electrical raceways, boxes and fittings. and wiring devices which are required in conjunction with electrical grounding and bonding work.

1.3 SUBMITTALS

A. Product Data and Plans showing dimensioned as-built locations of grounding features specified in Part 3 "Field Quality Control" Article, including the following:
   1. Test wells
   2. Ground rods.
   3. Ground rings.
   4. Grounding arrangements and connections for separately derived systems.
   5. Grounding for sensitive electronic equipment.

B. Field quality-control test reports.

C. Operation and Maintenance Data: For grounding to include the following in emergency, operation, and maintenance manuals:

1 Instructions for periodic testing and inspection of grounding features at test wells, and grounding connections for separately derived systems. Tests shall be to determine if ground resistance or impedance values remain within specified maximums, and instructions shall recommend corrective action if they do not. Include recommended testing intervals.

D. Operation and Maintenance Data: For grounding to include the following in emergency, operation, and maintenance manuals:

1. Instructions for periodic testing and inspection of grounding features at test wells, and grounding connections for separately derived systems.

   a. Tests shall be to determine if ground resistance or impedance values remain within specified maximums, and instructions shall recommend corrective action if they do not.

   b. Include recommended testing intervals.

1.4 QUALITY ASSURANCE

A. Manufacturer's Qualifications: Install grounding and bonding products of firms regularly engaged in the manufacture of these materials, including stranded cable, grounding rods, and bonding jumpers.

B Electrical Code Compliance: Comply with the applicable State electrical code requirements of the authority having jurisdiction, and NEC as applicable to electrical grounding and bonding, pertaining to systems, circuits and equipment.

C. UL Compliance: Comply with applicable requirements of UL Standards No.'s 467, "Electrical Grounding and Bonding Equipment," and 869, "Electrical Service Equipment," pertaining to grounding and bonding of systems, circuits and equipment. In addition, comply with UL Standard 486A, "Wire Connectors and Soldering Lugs for Use with Copper Conductors."

D IEEE Compliance: Comply with applicable requirements of IEEE Standards 142 and 241 pertaining to electrical grounding.

2.1 PRODUCTS

2.2 MANUFACTURERS

A. Subject to compliance with requirements, manufacturers offering grounding products which may be incorporated in the work include, but are not limited to, the following:
   1. B Line Systems, Inc.
   2. Burndy Corporation.
   3. Crouse Hinds Div.
   4. Cooper Industries.
   5. Electrical Components Div.
   6. Gould Inc.
   7. Ideal Industries, Inc.
   8. O Z/Gedney
   9. Thomas & Betts Corp.
   10. VFC, Inc.
   11. Western Electric Co.

2.3 MATERIALS AND PRODUCTS

A. General: Except as otherwise indicated, provide electrical grounding and bonding systems indicated; with assembly of materials, including, but not limited to, cables/wires, connectors, solderless lug terminals, grounding rods, bonding jumpers, service arresters, and additional accessories needed for a complete installation.

B. Where more than one type component product meets indicated requirements, selection is Contractor's option.

C. Where materials or components are not indicated, provide products which comply with NEC and UL requirements and with established industry standards for those applications indicated. Products include: Conductors, Connectors and Connection Accessories, Grounding electrodes and connection accessories.

2.4 CONDUCTORS

A Insulated Conductors: Solid green insulation with copper wire or cable insulated for 600 V unless otherwise required by applicable Code or authorities having jurisdiction.

B. Bare Copper Conductors:
   1. Solid Conductors: ASTM B 3.
   2. Stranded Conductors: ASTM B 8.
   3. Tinned Conductors: ASTM B 33.
   4. Bonding Cable: 28 kcmil. 14 strands of No. 17 AWG conductor, 1/4 inch in diameter.
   5. Bonding Conductor: No. 4 or No. 6 AWG, stranded conductor.
   6. Bonding Jumper: Copper tape, braided conductors, terminated with copper ferrules: 1-5/8 inches wide and 1/16 inch thick.

7. Tinned Bonding Jumper: Tinned-copper tape, braided conductors, terminated with copper ferrules; 1-5/8 inches wide and 1/16 inch thick

C. Grounding Bus: Rectangular bars of annealed copper. 1/4 by 2 inches high in cross section, unless otherwise indicated; with insulators.

2.5 CONNECTORS

A. Listed and labeled by a nationally recognized testing laboratory acceptable to authorities having jurisdiction for applications in which used, and for specific types, sizes, and combinations of conductors and other items connected.

B. Bolted Connectors for Conductors and Pipes. Copper or copper alloy, bolted pressure- type, with at least two bolts.

1. Pipe Connectors: Clamp type, sized for pipe.

C. Welded Connectors: Exothermic-welding kits of types recommended by kit manufacturer for materials being joined and installation conditions.

2.6 GROUNDING ELECTRODES

A. Ground Rods: Copper-clad steel; 3/4 inch in diameter by 10 feet long.

B. Chemical-Enhanced Grounding Electrodes. Copper tube, straight or L-shaped, charged with nonhazardous electrolytic chemical salts.

1. Termination: Factory-attached No. 4/0 AWG bare conductor at least 1216 mm (48 inches) long.

2. Backfill Material: Electrode manufacturer's recommended material.

2.7 ELECTRICAL GROUNDING CONNECTION ACCESSORIES

A Provide electrical insulating tape, bonding straps, as recommended by accessories manufacturers for type service indicated.

3.1 EXECUTION

3.2 APPLICATIONS

A. Underground Grounding Conductors: Install bare stranded-copper conductor, No. 3/0 AWG minimum.

1. Bury at least 24 inches below grade.

2. Duct-Bank Grounding Conductor: Bury 12 inches above duct bank when indicated as part of duct-bank installation.

B. Isolated Grounding Conductors: Green-colored insulation with continuous yellow stripe. On feeders with isolated ground, identify grounding conductor where visible to normal inspection, with alternating bands of green and yellow tape, with at least three bands of green and two bands of yellow.

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

1. Install bus on insulated spacers 1 inch, minimum, from wall 6 inches above finished floor, unless otherwise indicated.
2. Where indicated on both sides of doorways, route bus up to top of door frame, across top of doorway, down to specified height above floor, and connect to horizontal bus.

D Conductor Terminations and Connections:

1. Pipe and Equipment Grounding Conductor Terminations: Bolted connectors.
2 Underground Connections: Welded connectors, except at test wells and as otherwise indicated.
3 Connections to Ground Rods at Test Wells: Bolted connectors.
4 Connections to Structural Steel: Welded connectors.

3.3 GROUNDING UNDERGROUND DISTRIBUTION SYSTEM COMPONENTS

A. Comply with IEEE C2 grounding requirements.

B. Pad-Mounted Transformers and Switches: Install two ground rods and ground ring around the pad. Ground pad-mounted equipment and noncurrent-carrying metal items associated with substations by connecting them to underground cable and grounding electrodes. Install tinned-copper conductor not less than No. 2 AWG for ground ring and for taps to equipment grounding terminals. Bury ground ring not less than 6 inches from the foundation

3.4 EQUIPMENT GROUNDING

A Install green insulated equipment grounding conductors with all feeders and branch circuits. The raceway system shall not be relied on for ground continuity.

B. Water Heater, Heat-Tracing, and Antifrost Heating Cables: Install a separate insulated equipment grounding conductor to each electric water heater and heat-tracing cable. Bond conductor to heater units, piping, connected equipment, and components.

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

D. Isolated Equipment Enclosure Circuits: For designated equipment supplied

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

E. Signal and Communication Equipment: For telephone, alarm, voice and data, and other communication equipment, provide No. 4 AWG minimum insulated grounding conductor in raceway from grounding electrode system to each service location, terminal cabinet, wiring closet, and central equipment location.

1. Service and Central Equipment Locations and Wiring Closets: Terminate grounding conductor on a 8mm x 50xmm x 610mm (1/4-by-2-by-24-inch) grounding bus, using irreversible connectors.
2. Terminal Cabinets: Terminate grounding conductor on cabinet grounding terminal.

F Metal Poles Supporting Outdoor Lighting Fixtures: Install grounding electrode and a separate insulated equipment grounding conductor in addition to grounding conductor installed with branch-circuit conductors.

G. Boxes with concentric, eccentric or over-sized knockouts shall be provided with bonding bushings and jumpers. The jumper shall be sized per NEC Table 250-122 and lugged to the box.

3.5 INSTALLATION

A. General: Install electrical grounding and bonding systems as indicated, in accordance with manufacturer's instructions and applicable portions of NEC, NECA's "Standard of Installation," and in accordance with recognized industry practices to ensure that products comply with requirements.

B. Install grounding systems as designed and submit certified test report on grounding system.

C. Coordinate with other electrical work as necessary to interface installation of electrical grounding and bonding system work with other work.

1. Where tests show resistance to ground is over 25 ohms, take appropriate action to reduce resistance to 25 ohms, or less, by driving additional ground rods. A copy of the ground resistance test report shall be sent to the Construction Manager's office, to the attention of the "review section".
2. Retest grounding system to demonstrate compliance.
3. Provide written certified testing report indicating resistance to ground

value.

D. Ground electrical service system neutral at service entrance equipment to grounding rod(s), grounded copper water pipe, and foundation building steel.

E. Ground each separately derived system neutral to an effectively grounded copper water pipe.

F. Connect together system neutral, service equipment enclosures, exposed noncurrent carrying metal parts of electrical equipment, metal raceway systems, grounding conductor in raceways and cables, receptacle ground connectors, and cold water systems.

G Provide ground clamps for grounding conductors to underground grounding rods.

H Provide a separate, insulated equipment grounding conductor from each device to ground buses in panelboards. Terminate each end on a grounding lug, bus, or insulated grounding bushing.

I. Provide grounding system per the Drawings and Article 250 of the NEC. Provide green equipment grounding conductor for all electrical raceways.

J. Connect grounding electrode conductors to copper water pipe using a suitable grounding clamp as indicated on the Drawings. Provide conduit grounding hubs and water pipe ground clamps as required.

K. Use minimum #1/0 AWG copper conductor for communications service grounding conductor. Leave 2700 mm (9 feet) of slack conductor at terminal board.

L Provide insulated grounding bushings on all service entrance conduit terminations up to the first overcurrent protection device.

M. Connect grounding electrode conductors to 1 inch diameter, or greater, metallic cold water pipe using a suitably sized ground clamp.

N. Tighten grounding and bonding connectors and terminals, including screws and bolts, in accordance with manufacturer's published torque tightening values for connectors and bolts. Where manufacturer's torquing requirements are not indicated, tighten connections to comply with tightening torque values specified in UL 486A to assure permanent and effective grounding.

O. Apply corrosion resistant finish to field connections, buried metallic grounding and bonding products, and places where factory applied protective coatings have been destroyed, which are subjected to corrosive action.

P. Provide clamp on connectors on clean metal contact surfaces, to ensure

electrical conductivity and circuit integrity.

Q. Transformer housing, cable shields, primary and secondary neutrals shall be connected to a driven copper ground having a maximum resistance of 25 ohms using No. 2 AWG green insulated Type "THW" or "THHN"/"THWN" stranded copper conductor. Primary neutral conductor shall be unbroken to transformer primary neutral bushing, and thereafter grounded as indicated on the Drawings.

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

S. Common Ground Bonding with Lightning Protection System: Comply with NFPA 780 and UL 96 when interconnecting with lightning protection system. Bond electrical power system ground directly to lightning protection system grounding conductor at closest point to electrical service grounding electrode. Use bonding conductor sized same as system grounding electrode conductor, and install in conduit.

T. Ground Rods: Drive rods until tops are 2 inches below finished floor or final grade, unless otherwise indicated.

1. Interconnect ground rods with grounding electrode conductor below grade and as otherwise indicated. Make connections without exposing steel or damaging coating, if any.

U Bonding Straps and Jumpers: Install in locations accessible for inspection and maintenance, except where routed through short lengths of conduit.

1. Bonding to Structure: Bond straps directly to metal structure, provided the building frame is effectively grounded.
2. Bonding to Equipment Mounted on Vibration Isolation Hangers and Supports: Install so vibration is not transmitted to rigidly mounted equipment.
3. Use exothermic-welded connectors for outdoor locations, but if a disconnect-type connection is required, use a bolted clamp.

V. Grounding and Bonding for Piping:

1. Metal Water Service Pipe: Install insulated copper grounding conductors, in conduit, from building's main service equipment, or grounding bus, to main metal water service entrances to building. Connect grounding conductors to main metal water service pipes, using a bolted clamp connector or by bolting a lug-type connector to a pipe flange, using one of the lug bolts of the flange. Where a dielectric main water fitting is installed, connect grounding conductor on street side of fitting. Bond metal grounding conductor conduit or sleeve to conductor at each end.

2. Water Meter Piping: Use braided-type bonding meters. Connect to pipe with a bolted connector
3. Bond each aboveground portion of gas piping system downstream from equipment shutoff valve.

W Bonding Interior Metal Ducts: Bond metal air ducts to equipment grounding conductors of associated fans, blowers, electric heaters, and air cleaners. Install tinned bonding jumper to bond across flexible duct connections to achieve continuity.

X. Grounding for Steel Building Structure: Install a driven ground rod at base of each corner column and at intermediate exterior columns at distances not more than 60 feet apart.

Y. Ground Ring: Install a grounding conductor, electrically connected to each building structure ground rod and to each steel column, extending around the perimeter of building area or item indicated.
1. Install tinned-copper conductor not less than No. 3/0 AWG for ground ring and for taps to building steel
2. Bury ground ring not less than 5 feet from building foundation.

3.6 FIELD QUALITY CONTROL

A. Examination:
1. Examine areas and conditions under which electrical grounding and bonding connections are to be made and notify Engineer in writing of conditions detrimental to proper completion of work.
2. Do not proceed with work until unsatisfactory conditions have been corrected.

B. Perform the following tests and inspections and prepare test reports:
1. After installing grounding system but before permanent electrical circuits have been energized, test for compliance with requirements.
2. Test completed grounding system at each location where a maximum ground- resistance level is specified, at service disconnect enclosure grounding terminal, and at ground test wells. Make tests at ground rods before any conductors are connected.
   a Measure ground resistance not less than two full days after last trace of precipitation and without soil being moistened by any means other than natural drainage or seepage and without chemical treatment or other artificial means of reducing natural ground resistance.
   b. Perform tests by fall-of-potential method according to IEEE 81.
3. Prepare dimensioned drawings locating each test well, ground rod and ground rod assembly, and other grounding electrodes Identify each by letter in alphabetical order, and key to the record of tests and

observations. Include the number of rods driven and their depth at each location, and include observations of weather and other phenomena that may affect test results. Describe measures taken to improve test results.

C. Excessive Ground Resistance: If resistance to ground exceeds specified values, additional ground rods shall be driven to reduce the resistance to that specified. Compliance shall be demonstrated by retesting.

D. A copy of the ground resistance test report shall be sent to the Owner's representative.

SECTION 16162
LIGHTNING PROTECTION

1.1 GENERAL

1.2 SUMMARY

This Section includes lightning protection for buildings.

1.3 DEFINITIONS

A. LPI: Lightning Protection Institute.
B. NRTL: National recognized testing laboratory.

1.4 SUBMITTALS

A. Product Data: For air terminals and mounting accessories.
B Shop Drawings: Detail lightning protection system. including air-terminal locations, conductor routing and connections, and bonding and grounding provisions. Include indications for use of raceway, data on how concealment requirements will be met, and calculations required by NFPA 780 for bonding of grounded and isolated metal bodies.
C. Qualification data for firms and persons specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include data on listing or certification by an NRTL or LPI.
D. Certification, signed by Contractor, that roof adhesive for air terminals is approved by manufacturers of both the terminal assembly and the single-ply membrane roofing material.
E. Field inspection reports indicating compliance with specified requirements.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Engage an experienced installer who is an NRTL or who is certified by LPI as a Master Installer/Designer.

B. Listing and Labeling: As defined in NFPA 780, "Definitions" Article

1.6 COORDINATION

A Coordinate installation of lightning protection with installation of other building systems and components, including electrical wiring, supporting structures and building materials, metal bodies requiring bonding to lightning protection components, and building finishes.
B. charges and coordination with power and telephone companies and other authorities or persons involved in the procedures.
C. Preparation of as-built plans and drawings.
D Furnish and install a complete grounding system.
E. If anything has been omitted of any item of works or materials, usually furnished, which are necessary for the completion of the electrical works

as outlined herein before, then such items shall be and are hereby included in this division of the work.

2.1 PRODUCTS

2.2 GENERAL

Where specifications of any type of material or equipment are in question, such materials shall conform to the standard specifications set by the following:

A. U.S. UNDERWRITERS LABORATORIES
B. U.S. NATIONAL BOARD OF FIRE UNDERWRITERS
C. NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION
D. INSULATED POWER CABLE
E. AMERICAN STANDARDS ASSOCIATION
F. BUREAU OF STANDARDS, DEPARTMENT OF TRADE
G. PHILIPPINE NATIONAL STANDARDS

2.3 LIGHTNING PROTECTION SYSTEM COMPONENTS

A. Comply with UL 96
B. Roof-Mounting Air Terminals: NFPA Class II, copper, solid, unless otherwise indicated.
   1 Single-Membrane, Roof-Mounting Air Terminals: Designed for single-membrane roof materials.
C. Stack-Mounting Air Terminals: Solid copper.
D Ground Rods, Ground Loop Conductors, and Concrete-Encased Electrodes: Comply with Division 16 Section "Grounding and Bonding" and with standards referenced in this Section.
E. Down Lead Conductor: Routed in schedule 40 PVC conduit. (Building steel will not be used for down conductors).

3.1 EXECUTION

3.2 INSTALLATION

A. Install lightning protection components and systems according to UL 96A and applicable requirements of NFPA 780.
B. Install conductors with direct paths from air terminals to ground connections. Avoid sharp bends and narrow loops.
C Conceal the following conductors:
   1. System conductors.
   2. Down conductors.
   3. Interior conductors.
   4. Conductors within normal view from exterior locations at grade within 200 feet of building.
   5. Notify Architect at least 48 hours in advance of inspection

before concealing lightning protection components.

D. Cable Connections: Use approved exothermic-welded connections for all conductor splices and connections between conductors and other components, except those above single-ply membrane roofing.

E. Air Terminals on Single-Ply Membrane Roofing: Comply with adhesive manufacturer's written instructions.

F. Bond extremities of vertical metal bodies exceeding 60 feet in length to lightning protection components.

G. A # 3/0 bare copper ground loop will be installed 30" below grade around the perimeter of the building tied into building steel at intervals not to exceed 50'.

1. Bond ground terminals to ground loop at test wells.
2. Bond grounded metal bodies on building within 12 feet of ground to loop.

3.3 CORROSION PROTECTION

A. Do not combine materials that can form an electrolytic couple that will accelerate corrosion in the presence of moisture unless moisture is permanently excluded from junction of such materials.

B. Use conductors with protective coatings where conditions would cause deterioration or corrosion of conductors.

3.4 FIELD QUALITY CONTROL

A. UL Inspection: Provide inspections as required to obtain a UL Master Label for system

SECTION 16231
PACKAGED ENGINE GENERATOR

1.1 GENERAL

1.2 SCOPE OF WORK

A. Provide all labor, materials, and equipment to furnish and start-up the power generation system in accordance with the contract documents and manufacturer's drawings and installation instructions. These specifications also describe requirements for the design. fabrication, and testing of the power system.

B The power generation system shall include the following:
1. Engine-driven generator set.
2. Control system, cooling system.
3. Fuel supply and storage system.
4. Generator set accessories and Enclosure.

1.3 SYSTEM FUNCTION

A. The generator set shall include the capability of automatically controlling generator set operation. After starting, the unit will attain rated speed and voltage, and accept rated load. Generator set speed shall be controlled by the engine governor, while generator output voltage regulation shall be a function of the generator automatic voltage regulator.

1.4 SYSTEM PERFORMANCE

The power generating system shall conform to the following performance criteria:

A. Rating - Engine brake horsepower shall be sufficient to deliver full rated generator set kW/kVA when operated at rated rpm and equipped with all engine-mounted parasitic and external loads such as radiator fans and power generators.

B. Conditions - The rating shall be based on ISO 3046/1 standard conditions of 100 kPa and 27C
(29.53 in Hg, 81F); BS 5514, DIN 6271. SAE J1349 and API 7B-11C also apply.

C. Fuel - Diesel engines shall be able to deliver rated power when operating on No. 2 diesel fuel having 35 degree API (16C. 60F) specific gravity.

D. Fuel Consumption - Diesel fuel rates shall be based on fuel having a low heating value (LHV) of 42,780 kJ/kg (18,390 Btu/lb) when used at 29C (85F) and weighing 838.9 g/l (7.001 lbs/U.S. gal).

E. Start Time and Load Acceptance - Engines shall start, achieve rated voltage and frequency, and be capable of accepting load within 10 seconds when properly equipped and maintained.

F. Block Load Acceptance - Transient response shall conform to ISO 8528 requirements.

1.5 PERFORMANCE

A. The individual generator set shall exhibit the following performance capability:

1.	At Site Conditions	
2.	Power Capability	1750 EkW Standby
3.	Speed	1800 RPM
4.	Cooling Type mounted	Radiator, Blower fan, engine
5.	Ambient Capability	125.0 Degree F
6.	Sound Level, Exhaust	85 dBA @ 10ft

1.6 RESPONSIBILITY

A. The responsibility for performance to this specification shall not be divided among individual component manufacturers, but must be assumed solely by the primary manufacturer This includes generating system design, manufacture, test, and having a local supplier responsible for service, parts, and warranty for the total system.

1.7 PROTOTYPE TESTS

A. The system manufacturer must be able to certify that engine, generator, controls, and switchgear have been tested as complete systems of representative engineering models (not on equipment sold)

1.8 PRODUCTION TESTS

A. The system manufacturer shall perform post production tests on the generator set supplied. A certified report of these tests shall be available when requested at the time of the generator set order.

1.9 REFERENCES

A. This specification includes applicable considerations of:

1. American Society of Mechanical Engineers (ASME)
2. Association of British Generating Set Manufacturers (ABGSM)
3. British Standards Institution (BS)
4. EEC 89/392 Safety and Health
5. Electrical Generating Systems Association (EGSA)
6. Deutsches Institut fuer Normung (DIN)
7. Institute of Electrical and Electronics Engineers (IEEE)
8. International Electrotechnical Commission (IEC)
9. International Standards Organization (ISO) 9000
10. National Electrical Code (NEC)
11. National Electric Manufacturers Association (NEMA)
12. National Fire Protection Association (NFPA)
13. Occupational Safety and Health Act (OSHA)
14. Society of Automotive Engineers (SAE)
15. United States Military Standards for Generators and Controls(MIL-STD)

1.10 MINIMUM SERVICE AND WARRANTY QUALIFICATIONS

A. The manufacturer shall have a local authorized dealer who can provide factory trained servicemen, the required stock of replacement parts, technical assistance, and warranty administration.

1.11 WARRANTY ADMINISTRATION

A. The manufacturer's authorized dealer shall be capable of administering the manufacturer's and dealer's warranty for all components supplied by the selling dealer (who may or may not be the same as the servicing dealer).

1.12 WARRANTY TERMS

A. The manufacturer's and dealer's extended warranty shall in no event be for a period of less than five (5) years from date of initial start-up of the system and shall include repair parts, labor, reasonable travel expense necessary for repairs at the jobsite, and expendables (lubricating oil, filters, antifreeze, and other service items made unusable by the defect) used during the course of repair. Applicable deductible costs shall be specified in the manufacturer's warranty. Running hours shall not be a limiting factor for the system warranty by either the manufacturer or

servicing dealer. Submittals received without written warranties as specified will be rejected in their entirety.

1.13 PARTS AVAILABILITY

A. The generator set supplier shall have sufficient parts inventory to maintain over the counter availability of at least 90% of any required parts.

1.14 OIL SAMPLING SERVICE

A. The generator set supplier shall provide a scheduled oil sampling service to monitor engine condition on an ongoing basis. The sampling method shall be of the atomic absorption spectrophometry method and be accurate to within a fraction of one part per million for the following elements.
   1. Iron
   2. Chromium
   3. Copper
   4. Aluminum
   5. Silicon
   6. Lead
   7. Water
   8. Fuel
   9. Antifreeze

B. The oil samples shall be analyzed at the generator set supplier's facility by factory trained personnel. Immediate notification of critical results shall be provided to the owner's representative.

1.15 SUMMARY

A. This Section includes packaged engine-generator sets for standby power supply with the following features:
   1. Diesel engine.
   2. Unit-mounted cooling system.
   3. Unit-mounted control and monitoring.
   4. Performance requirements for sensitive loads.
   5. Outdoor enclosure.

1.16 DEFINITIONS

A. Operational Bandwidth: The total variation from the lowest to highest value of a parameter over the range of conditions indicated, expressed as a percentage of the nominal value of the parameter.

B. LP: Liquid petroleum.

1.17 SUBMITTALS

A. Product Data: For each type of packaged engine generator indicated. Include rated capacities, operating characteristics, and furnished specialties and accessories. In addition, include the following:
   1. Thermal damage curve for generator.
   2. Time-current characteristic curves for generator protective device.

B. Shop Drawings: Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
   1. Dimensioned outline plan and elevation drawings of engine-generator set and other components specified.
   2. Design Calculations: Signed and sealed by a qualified professional engineer. Calculate requirements for selecting vibration isolators and seismic restraints and for designing vibration isolation bases.
   3. Vibration Isolation Base Details: Signed and sealed by a qualified professional engineer. Detail fabrication, including anchorages and attachments to structure and to supported equipment. Include base weights.
   4. Wiring Diagrams: Power, signal, and control wiring.

C. Manufacturer Seismic Qualification Certification: Submit certification that day tank, engine- generator set, batteries, battery racks, accessories, and components will withstand seismic forces defined in Division 16 Section "Electrical Supports and Seismic Restraints." Include the following.
   1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
      a. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified."
      b. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified and the unit will be fully operational after the seismic event."
   2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
   3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

D. Qualification Data: For manufacturer.

E. Source quality-control test reports.
   1. Certified summary of prototype-unit test report.

2. Certified Test Reports: For components and accessories that are equivalent, but not identical, to those tested on prototype unit.
3. Certified Summary of Performance Tests: Certify compliance with specified requirement to meet performance criteria for sensitive loads.
4. Report of factory test on units to be shipped for this Project. showing evidence of compliance with specified requirements.
5. Report of sound generation.
6. Report of exhaust emissions showing compliance with applicable regulations.
7. Certified Torsional Vibration Compatibility: Comply with NFPA 110.

F. Field quality-control test reports.

G. Operation and Maintenance Data: For packaged engine generators to include in emergency, operation, and maintenance manuals. In addition to items specified in Division 1 Section "Operation and Maintenance Data," include the following:
   1. List of tools and replacement items recommended to be stored at Project for ready access. Include part and drawing numbers, current unit prices, and source of supply.

H. Warranty: Special warranty specified in this Section.

1.18 QUALITY ASSURANCE

A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of units required for this Project.
   1. Maintenance Proximity: Not more than four hours' normal travel time from Installer's place of business to Project site.
   2. Engineering Responsibility: Preparation of data for vibration isolators and seismic restraints of engine skid mounts, including Shop Drawings, based on testing and engineering analysis of manufacturer's standard units in assemblies similar to those indicated for this Project.

B. Manufacturer Qualifications: A qualified manufacturer. Maintain, within 200 miles of Project site, a service center capable of providing training, parts, and emergency maintenance repairs.

C. Testing Agency Qualifications: An independent agency, with the experience and capability to conduct the testing indicated, that is a member company of the InterNational Electrical Testing Association or is a nationally recognized testing laboratory (NRTL), and that is acceptable to authorities having jurisdiction.
   1. Testing Agency's Field Supervisor: Person currently certified by the International Electrical Testing Association or the National Institute for Certification in Engineering Technologies to supervise on-site testing specified in Part 3.

D. Source Limitations: Obtain packaged generator sets and auxiliary components through one source from a single manufacturer.

E. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

F. Comply with ASME B15.1.

G. Comply with NFPA 37.

H. Comply with NFPA 70.

I. Comply with NFPA 99.

J. Comply with NFPA 110 requirements for Level 1 emergency power supply system.

K. Comply with UL 2200.

L. Engine Exhaust Emissions: Comply with applicable state and local government requirements.

M. Noise Emission: Comply with applicable state and local government requirements for maximum noise level at adjacent property boundaries due to sound emitted by generator set including engine, engine exhaust, engine cooling-air intake and discharge, and other components of installation.

1.19 PROJECT CONDITIONS

A. Interruption of Existing Electrical Service: Do not interrupt electrical service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary electrical service according to requirements indicated:

1. Notify Owner's representative and Architect no fewer than two days in advance of proposed interruption of electrical service.
2. Do not proceed with interruption of electrical service without Owner representative's and Architect's written permission.

B. Environmental Conditions: Engine-generator system shall withstand the following environmental conditions without mechanical or electrical damage or degradation of performance capability:

1. Ambient Temperature: 20 to 40 deg C.
2. Relative Humidity: 0 to 100% percent.
3. Altitude: 4.5 meters (15 feet) above sea level.

C. Unusual Service Conditions: Engine-generator equipment and installation are required to operate under the following conditions:

1. Manila area black-out.
2. Periods of strong wind such as typhoons – wind gust velocity up to 200 kilometers per hour.

1.20 COORDINATION

A. Coordinate size and location of concrete bases for package engine generators. Cast anchor- bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified in Division 3.

B. Coordinate size and location of roof curbs, equipment supports, and roof penetrations for remote radiators. These items are specified in Division 7 Section "Roof Accessories."

1.21 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of packaged engine generators and associated auxiliary components that fail in materials or workmanship within specified warranty period.

1. Warranty Period: Five (5) years from date of final acceptance of the work.

1.22 MAINTENANCE SERVICE

A. Initial Maintenance Service: Beginning at Substantial Completion, provide 12 months' full maintenance by skilled employees of manufacturer's designated service organization. Include quarterly exercising to check for proper starting, load transfer, and running under load. Include routine preventive maintenance as recommended by manufacturer and adjusting as required for proper operation. Provide parts and supplies same as those used in the manufacture and installation of original equipment.

1.23 EXTRA MATERIALS

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

1. Fuses: One for every 10 of each type and rating, but no less than one of each.
2. Indicator Lamps: Two for every six of each type used, but no fewer than two of each.
3. Filters: One set each of lubricating oil, fuel, and combustion-air filters.

2.1 PRODUCTS

2.2 MANUFACTURERS

A. Subject to compliance with requirements, provide as manufactured by:

1. Caterpillar Tractor Co.
2. Covington Diesels.

3. Cummins/Onan Engine Co., Inc.
4. Kohler Co.

2.3 ENGINE GENERATOR SET

A. Factory-assembled and -tested, engine-generator set.

B. Mounting Frame: Maintain alignment of mounted components without depending on concrete foundation; and have lifting attachments.
   1. Rigging Diagram. Inscribed on metal plate permanently attached to mounting frame to indicate location and lifting capacity of each lifting attachment and generator-set center of gravity.

C. Capacities and Characteristics:
   1. Power Output Ratings: Nominal ratings as indicated.
   2. Output Connections. Three-phase, four wire.
   3. Nameplates. For each major system component to identify manufacturer's name and address, and model and serial number of component.

D. Generator-Set Performance:
   1. Steady-State Voltage Operational Bandwidth: 3 percent of rated output voltage from no load to full load.
   2. Transient Voltage Performance: Not more than 20 percent variation for 50 percent step-load increase or decrease. Voltage shall recover and remain within the steady-state operating band within three seconds.
   3. Steady-State Frequency Operational Bandwidth: 0.5 percent of rated frequency from no load to full load.
   4. Steady-State Frequency Stability: When system is operating at any constant load within the rated load, there shall be no random speed variations outside the steady-state operational band and no hunting or surging of speed.
   5. Transient Frequency Performance: Less than 5 percent variation for 50 percent step- load increase or decrease. Frequency shall recover and remain within the steady-state operating band within five seconds.
   6. Output Waveform. At no load, harmonic content measured line to line or line to neutral shall not exceed 5 percent total and 3 percent for single harmonics. Telephone influence factor, determined according to NEMA MG 1, shall not exceed 50 percent.
   7. Sustained Short-Circuit Current: For a 3-phase, bolted short circuit at system output terminals, system shall supply a minimum of 250 percent of rated full-load current for not less than 10 seconds and then clear the fault automatically, without damage to generator system components.
   8. Start Time: Comply with NFPA 110, Type 10, system requirements.

E. Generator-Set Performance for Sensitive Loads:

1. Oversizing generator compared with the rated power output of the engine is permissible to meet specified performance.
   a Nameplate Data for Oversized Generator: Show ratings required by the Contract Documents rather than ratings that would normally be applied to generator size installed.
2. Steady-State Voltage Operational Bandwidth: 1 percent of rated output voltage from no load to full load.
3. Transient Voltage Performance: Not more than 10 percent variation for 50 percent step- load increase or decrease. Voltage shall recover and remain within the steady-state operating band within 0.5 second.
4. Steady-State Frequency Operational Bandwidth: Plus or minus 0.25 percent of rated frequency from no load to full load.
5. Steady-State Frequency Stability: When system is operating at any constant load within the rated load, there shall be no random speed variations outside the steady-state operational band and no hunting or surging of speed.
6. Transient Frequency Performance: Less than 2-Hz variation for 50 percent step-load increase or decrease. Frequency shall recover and remain within the steady-state operating band within three seconds.
7. Output Waveform: At no load, harmonic content measured line to neutral shall not exceed 2 percent total with no slot ripple Telephone influence factor, determined according to NEMA MG 1, shall not exceed 50 percent.
8. Sustained Short-Circuit Current: For a 3-phase, bolted short circuit at system output terminals, system shall supply a minimum of 300 percent of rated full-load current for not less than 10 seconds and then clear the fault automatically, without damage to winding insulation or other generator system components.
9. Excitation System: Performance shall be unaffected by voltage distortion caused by nonlinear load.
   a. Provide permanent magnet excitation for power source to voltage regulator.
10. Start Time: Comply with NFPA 110, Type 10, system requirements.

2.4 ENGINE

A. Engine Equipment:

1. The engine shall be equipped with air filters, fuel filters and pressure gauge, lubricating oil cooler, filters, and pressure gauge,

water pump and temperature gauge, service hour meter, flywheel, and flywheel housing when applicable.

B. Structure/Metallurgy:

1. The design of the basic engine shall provide for maximum structural integrity to extend service life. Materials used in the engine shall incorporate the highest level of proven metallurgical and manufacturing technology. Block shall be of one piece design and cast of high tensile strength iron in the system manufacturer's own foundry. Counter-boring for cylinder liners shall not be permitted. Crankshaft shall be a one piece forging with regrindable wear surfaces hardened through heat treat methods. Cylinder wear surfaces shall be induction hardened over their entire length. Main and rod bearings shall consist of aluminum bonded by copper to a steel backing. The wear surface shall be coated with a lead-tin overlay and the bearing covered by a tin flashing Connecting rods shall be high strength steel with tapered pin bore. Drilled passages to supply oil from rod bearing for piston cooling and lubricating oil will not be permitted. Pistons shall be a lightweight aluminum alloy which is elliptically ground across the skirt and tapered from crown to skirt. High performance engines shall incorporate a two piece articulated piston with forged steel crown and cast aluminum skirt. For medium and high speed engines, compression rings in aluminum bodies shall have integral cast iron ring bands with keystone sectioned top rings. Compression rings in steel piston crowns shall seat in hardened steel grooves. Oil jets shall supply piston cooling and lubricating oil. Valves shall be hard-faced with replaceable inserts.

C. Lubrication System:

1. The lubrication oil pump shall be a positive displacement type that is integral with the engine and gear driven from the engine gear train. The system shall incorporate full flow filtration with bypass valve to continue lubrication in the event of filter clogging. The bypass valve must be integral with the engine filter base or receptacle. Systems where bypass valves are located in the replaceable oil filter are not acceptable. Pistons shall be oil cooled by continuous jet spray to the underside or inside of the crown and piston pin. The filter shall incorporate a self-lubricating, free rotating seal and have a nonmetallic core sufficiently rigid to minimize movement or shifting of the filtration media.

D Diesel Fuel System:

1. The fuel system shall be integral with the engine. It shall consist of fuel filter. transfer pump. injection pumps, lines. and nozzles. The transfer pump shall deliver fuel under low pressure to individual injection pumps - one for each cylinder. The injection pumps shall be driven from the camshaft and simultaneously controlled by a rack and pinion assembly that is hydraulically actuated by signals from the engine governor. The pumps shall be of a variable displacement type to alter the volume of fuel delivered to the spray nozzles according to load demand. The nozzles shall inject fuel directly into the cylinder in the optimum spray pattern for efficient combustion.

E. Fuel Water System Separator

1. A fuel/water separator shall protect the fuel system from water damage.

F. Fuel Cooler

1. Fuel shall be piped from the filter/water separators to the intake of the engine fuel pump. and then to the engine. Excess fuel shall be piped through the fuel cooler and returned to the fuel tank with less than 60 kPa (8.7 PSI) restriction. The fuel cooler shall be capable of exchanging heat rejected at full load with the cooling medium, including 10% reserve to accommodate fouling.

G. Fuel Lines:

1. Flexible fuel lines between engine and fuel supply shall be installed to isolate vibration.

H. Governor-Electronic - Speed Control:

1. Speed droop shall be externally adjustable from 0 (isochronous) to 10% from no load to full rated load. Steady state frequency regulation shall be +/- 0.25 percent. Speed shall be sensed by a magnetic pickup off the engine flywheel ring gear. A provision for remote speed adjustment shall be included. In the event of a DC power loss, the forward acting actuator will move to the minimum fuel position.

I. Fan and Belt Guarding:

1. The fan, fan drive, and fan belts shall be covered with 14 gauge punched steel mesh guarding for personnel protection. The guarding shall conform to IEC 34-5, ISO and OSHA standards.

J. Blower Fan:

1. The radiator cooling fan shall be a blower type driven from the engine. Air shall be drawn from the engine side and exhausted through the radiator core.

K. Inlet Air System:

1. The engine air cleaner shall be engine mounted with dry element requiring replacement no more frequently than 250 operating hours or once each year If external ducting is required, maximum restriction to the combustion air inlet shall be 6.7 kPa (27 in H2O) with air flow of 2988 cfm.

L. Turbo Charging:

1. Turbochargers shall be of the axial turbine type driven by engine exhaust gases and direct - connected to a compressor supplying engine combustion air.

M. After Cooling:

1. Aftercooler core air surfaces shall be coated with a corrosion inhibitor to minimize oxidation.

N. Exhaust System:

1. The engine exhaust system shall be installed to discharge combustion gases quickly and silently with minimum restriction. System including silencer shall be designed for minimum restriction. and in no case shall backpressure exceed 6.7 kPa (27 in H2O).

O. Silencer - Critical:

1. The silencer shall provide extreme noise attenuation for environments with low background noise and slight noise emissions would be objectionable.

P. Jacket Water Heater.

1. Jacket water heaters shall be provided to maintain coolant temperature of 32C (90F) while the engine is idle. Heaters shall accept 208 volt AC single phase power and include thermostatic controls. Hoses to and from the heater shall be industrial quality which exhibit long life in operational environments. Manual shutoff valves shall be incorporated to isolate the heater during servicing. The JWH shall be dual 3 kW heaters for a total of 6 kW.

Q. Batteries:

1. Batteries for starting and control shall be selected and supplied by the generator set manufacturer. They shall be a heavy duty SLI lead acid type with thru-partition connectors, and housed in a hard rubber or polypropylene case with provision for venting. Starting batteries shall be rated 24 volt DC with a minimum of 280 ampere-hour and 2000 CCA. Sizing shall consider specific application requirements of engine oil viscosity, ambient starting temperature, control voltage, overcharging and vibration. Batteries shall be located as close to the starting motor as practical, away from spark sources, in a relatively cool ambient, and permit easy inspection and maintenance. Battery warranty shall be the responsibility of the generator set manufacturer.

R. Alternator.

1. An engine mounted belt driven battery charging alternator shall be installed with an automatic voltage regulator. It shall be suitable for heavy duty applications with a rating of 24 volts, 35 amperes.

S. Fuel: Fuel oil, Grade DF-2.

T. Rated Engine Speed: 1800 rpm.

U. Maximum Piston Speed for Four-Cycle Engines: 2250 fpm.

V. Lubrication System: The following items are mounted on engine or skid:

1. Filter and Strainer: Rated to remove 90 percent of particles 5 micrometers and smaller while passing full flow.
2. Thermostatic Control Valve: Control flow in system to maintain optimum oil temperature. Unit shall be capable of full flow and is designed to be fail-safe.
3. Crankcase Drain: Arranged for complete gravity drainage to an easily removable container with no disassembly and without use

of pumps, siphons, special tools, or appliances.

W. Engine Fuel System:

1. Main Fuel Pump: Mounted on engine. Pump ensures adequate primary fuel flow under starting and load conditions.
2. Relief-Bypass Valve: Automatically regulates pressure in fuel line and returns excess fuel to source.
3. Dual Natural Gas with LP-Gas Backup (Vapor-Withdrawal) System:
   a Carburetor.
   b. Secondary Gas Regulators: One for each fuel type.
   c. Fuel-Shutoff Solenoid Valves: One for each fuel source.
   d Flexible Fuel Connectors: One for each fuel source.

X. Coolant Jacket Heater: Electric-immersion type, factory installed in coolant jacket system. Comply with NFPA 110 requirements for Level 1 equipment for heater capacity.

Y. Governor: Adjustable isochronous, with speed sensing.

Z. Cooling System: Closed loop, liquid cooled, with radiator factory mounted on engine-generator- set mounting frame and integral engine-driven coolant pump

1. Coolant: Solution of 50 percent ethylene-glycol-based antifreeze and 50 percent water, with anticorrosion additives as recommended by engine manufacturer.
2. Size of Radiator: Adequate to contain expansion of total system coolant from cold start to 110 percent load condition.
3. Expansion Tank: Constructed of welded steel plate and rated to withstand maximum closed-loop coolant system pressure for engine used. Equip with gage glass and petcock.
4. Temperature Control: Self-contained, thermostatic-control valve modulates coolant flow automatically to maintain optimum constant coolant temperature as recommended by engine manufacturer.
5. Coolant Hose: Flexible assembly with inside surface of nonporous rubber and outer covering of aging-, ultraviolet-, and abrasion-resistant fabric.
   a Rating: 50-psig (345-kPa) maximum working pressure with coolant at 180 deg F (82 deg C), and noncollapsible under vacuum.
   b. End Fittings: Flanges or steel pipe nipples with clamps to suit piping and equipment connections.

AA. Muffler/Silencer: Critical type, sized as recommended by engine manufacturer and selected with exhaust piping system to not exceed ... engine manufacturer's engine backpressure requirements.

1. Minimum sound attenuation of 25 dB at 500 Hz.
2. Muffler/Silencer shall be located within enclosure.

BB Starting System: 24-V electric, with negative ground.

1. Components: Sized so they will not be damaged during a full engine-cranking cycle with ambient temperature at maximum specified in Part 1 "Project Conditions" Article.

2. Cranking Motor: Heavy-duty unit that automatically engages and releases from engine flywheel without binding.
3. Cranking Cycle: As required by NFPA 110 for system level specified.
4. Battery: Adequate capacity within ambient temperature range specified in Part 1 "Project Conditions" Article to provide specified cranking cycle at least three times without recharging.
5. Battery Cable: Size as recommended by engine manufacturer for cable length indicated. Include required interconnecting conductors and connection accessories.
6. Battery Compartment: Factory fabricated of metal with acid-resistant finish and thermal insulation. Thermostatically controlled heater shall be arranged to maintain battery above 10 deg C regardless of external ambient temperature within range specified in Part 1 "Project Conditions" Article. Include accessories required to support and fasten batteries in place.
7. Battery-Charging Alternator: Factory mounted on engine with solid-state voltage regulation and 35-A minimum continuous rating.
8. Battery Charger: Current-limiting, automatic-equalizing and float-charging type. Unit shall comply with UL 1236 and include the following features:
   a. Operation: Equalizing-charging rate of 10 A shall be initiated automatically after battery has lost charge until an adjustable equalizing voltage is achieved at battery terminals. Unit shall then be automatically switched to a lower float-charging mode and shall continue to operate in that mode until battery is discharged again.
   b. Automatic Temperature Compensation: Adjust float and equalize voltages for variations in ambient temperature from

minus 40 deg C to plus 60 deg C to prevent overcharging at high temperatures and undercharging at low temperatures.

c. Automatic Voltage Regulation: Maintain constant output voltage regardless of input voltage variations up to plus or minus 10 percent.

d. Ammeter and Voltmeter: Flush mounted in door. Meters shall indicate charging rates.

e. Safety Functions: Sense abnormally low battery voltage and close contacts providing low battery voltage indication on control and monitoring panel. Sense high battery voltage and loss of ac input or dc output of battery charger. Either condition shall close contacts that provide a battery-charger malfunction indication at system control and monitoring panel.

f. Enclosure and Mounting: NEMA 250, Type 1, wall-mounted cabinet.

2.5 GENERATOR

A. General:

1. The generators shall be rated for Standby service at 1750 kW, 2187.5 kVA, 0.8 PF, 480/277 V, three phase, 4 wire, 60 Hz, 1800 rpm.
2. The generator shall be capable of withstanding a three phase load of 300% rated current for 10 seconds, and sustaining 150% of continuous load current for 2 minutes with field set for normal rated load excitation It shall exhibit less than 5% waveform deviation at no load.
3. Generator efficiencies shall be calculated according to IEC 34-2 Section 4, with all I2R losses corrected to 115C.

B. Mechanical Design - Single Bearing:

1. The generator housing shall be one piece and mount directly to the engine flywheel housing without bolted adaptors. Engine torque shall be transmitted through flexible steel plates to the generator rotor. The generator ventilating fan shall mount to the engine flywheel and act as a pressure plate to secure the flexible plates. The rotor core shall be constructed of low loss non-orientated steel laminations attached to the core lengths and fitted with low resistance amortisseur bars brazed/welded to plates at both ends of the core. The rotor assembly shall demonstrate 150% overspeed capability at 170C for 2 hours. Rotor dynamic, two plane balance shall not exceed 0.002 inch peak to peak amplitude at operating speed. All rotating

components shall be secured with SAE Grade 8 hardware. C Windings:

2. Windings shall be form wound. Thermal Class 200 magnet wire as described by NEMA Magnet Wire Standard MW 1000, Section MW 35-C, shall be used for rotor and stator windings. The windings shall consist of copper magnet wire coated with an underlay of polyester resins and a superimposed heavy coat of polyamideimide resins. All winding insulation shall be Class H in accordance with BS and IEEE standards. No materials shall be used which support fungus growth, and shall be impervious to oil, dirt and fumes encountered in diesel operating conditions.

D. Operating Environment:

1. The generator shall be designed to operate in a sheltered drip-proof environment
   Generator shall be equipped with 120 volt AC single phase space heaters to minimize condensation while the generator set is idle. The heaters shall be capable of easily mounting in the assembled generator.

E. Excitation:

1. The generator exciter shall be brushless with the circuit consisting of a three-phase armature and a three-phase full wave bridge rectifier mounted on the rotor shaft. Surge suppressors shall be included to protect the rotating diodes from voltage spikes. The permanent magnet excitation system shall derive excitation current from a pilot exciter mounted on the rotor shaft. It shall enable the generator to sustain 300% of rated current for ten seconds during a fault condition.

F. Voltage Regulator:

1. The automatic voltage regulator shall maintain generator output voltage by controlling the current applied to the exciter field of the generator. The regulator shall be a totally solid state design which includes electronic voltage buildup and overcurrent protection It shall incorporate 1:1 volts per Hertz characteristics with the regulated voltage a linear function proportional to frequency over a 30 to 70 Hz range. The regulator shall be suitable for mounting within or external to the generator assembly, and have provision for remote voltage level control, using 16 ga shielded wire. As installed, the voltage regulator shall meet the applicable sections of the following standards:
   a. Canadian Standards Association (CSA)

b. International Electrotechnical Commission (IEC)
c. Institute of Electrical and Electronic Engineers (IEEE)
d. National Electrical Manufacturers Association (NEMA)

G. Voltage Regulator - Digital:

1. The digital voltage regulator shall be microprocessor based with fully programmable operating and protection characteristics. The regulator shall be capable of sensing true RMS in three phases of generator output voltage, or operating in single phase sensing mode. It shall exhibit the following operational characteristics:
   a. Generator output voltage maintained within +/- 0.25% at steady state conditions.
   b. Generator output voltage maintained within +/- 0.25% of rated value for any load variation between no load and full load.
   c. Generator output voltage drift no more than +/-0.25% of rated value at constant temperature.
   d. Generator output voltage drift no more than +/- 0.5% of rated value within a 40 change over ambient temperature range of -40C to 70C.
   e. Response time less than 20 millisecond.
   f. Voltage buildup with generator output as low as 6 volts.
   g. At full throttle engine starting, output voltage overshoot no more than 5% of its rated value, with respect to the volts/Hz curve. Meets ISO 8325-3 class G2 specifications.
   h. Power dissipation 55 W at 15 amps; <100 ma at rest.
   i. Telephone Influence Factor (TIF) of less than 50.
   j. Electronic Interference/Radio Frequency Interference (EMI/RFI) suppressed to MIL STD 461C Part 9 and VDE 875 level N.
   k. Maintain stable voltage control with 20% total harmonic distortion.
   l. The regulator shall include the following features:
   m. Voltage level rheostat to provide generator output voltage adjustment of -10% to
      +10% of nominal. This shall be in addition to a programmable output voltage level of -25% to +10%
   n. Automatic gain adjustment to provide output voltage compensation for changes in load or frequency.
   o. Manual gain adjustment 0 - 10% to provide compensation for line losses between generator output terminals and the load.
   p. Reactive droop adjustment programmable to allow paralleling without interconnect wiring between generators, with 10% minimum droop at full load and 0.8 PF.
2. It shall allow system parameter setup and monitoring, and provide

fault alarm and shutdown information through a keyed LCD display. A PC-based user interface shall be available to allow viewing and modifying operating parameters in a windowed environment. The regulator shall be factory preset but field programmable for: voltage output; voltage, minimum; voltage droop/crosscurrent adjustment; voltage gain (IR compensation); voltage gain, internal; current, output; field current variation; sensing, single or three phase; dual voltage/frequency slopes: slope intersect (knee) frequency; under frequency set point; over/under voltage trip: over/under voltage trip time. Protection shall be provided for the regulator against long term overcurrent conditions. Generator output shall shut off when output is shorted, or excitation current exceeds normal for 15 seconds. The regulator shall not be damaged or result in unsafe operation when subjected to open or shorted input due to sensing loss, or sensing source shorted to ground or adjacent conductor. The regulator shall be capable of operating while mounted within the generator assembly, or 300m (985 ft) from the generator. It shall have provision for remote voltage level control, using 16 ga shielded wire. The regulator module sealed in a waterproof and airtight shock resistant plastic housing and shall withstand:

a. Operating temperatures between -40C to 70C. b. Shock tolerance to 20 g's
c Vibration of 4.5 g's (peak) between frequencies of 18 to 2000
d. Hz in three perpendicular planes, and mechanical shock of 15 g's in all three planes.
e. Salt spray resistant as described by MIL STD-810C, Method 509.1 and ASTM- B117.
f. Pressure sealed to withstand 35 kPa (5 PSI).
g. The regulator shall be manufactured by the manufacturer of the engine-generator set.

H Mounting:

1. The engine and generator shall be assembled to a common base by the engine- generator manufacturer. The generator set base shall be designed and built by the engine-generator manufacturer to resist deflection, maintain alignment, and minimize resonant linear vibration.

I. Isolator - Spring Type:

1. Steel spring isolators shall be installed between the generator set base and the mounting surface. The isolators shall bolt to the base, and have a waffled or ribbed pad on their bottom surface. The pads shall be resistant to heat and age, and impervious to oil, water, antifreeze,

diesel fuel, and cleaning compounds.

J. Controls, Protection, and Monitoring:

1. The controls, protection, and monitoring systems of the generator set and its operation shall be the responsibility of the generator set manufacturer. All subsystem components, interfaces, and logic shall be compatible with engine mounted devices.

2.6 CONTROLS - GENERATOR SET MOUNTED

A. The control panel shall be designed and built by the engine-generator manufacturer. It shall be mounted on the generator set and incorporate 100% solid state microprocessor based control circuitry and digital instrumentation. All electronic control components are to be mounted in sealed, dust tight, watertight, metal housings. Housings which must be opened for service or setup are not acceptable. All output circuits greater than 100mA shall be fuse or circuit breaker protected. The panel shall be labeled with ISO symbols and comply with IEC 144, IP 22, and NEMA 12 for external environmental resistance, and IP 44 and NEMA 12 for resistance of the internal sealed modules. The control panel shall be capable of facing the right, left, or rear and shall be vibration isolated.

B. The panel shall include the following equipment / functions:
   1. Automatic remote start capability with mode of operation selectable from a panel- mounted 4-position switch (Stop, Manual, Automatic, Reset).
   2. Cycle crank with adjustable "crank" and "rest" times.
   3. Adjustable cooldown timer.
   4. Emergency Stop push button requiring manual reset.
   5. Voltage adjustment potentiometer to adjust voltage +10, -25% of rated.
   6. Individual flashing LED's shall be provided.

C. The use of a common alarm or shutdown lamp which depend on a separate display to determine the alarm or fault condition is not acceptable.

D. Separate LED annunciation shall be provided for:
   1. Overspeed (red)
   2. Overcrank (red)
   3. High Coolant temperature (red)
   4. Low Oil pressure (red)
   5. Emergency Stop (red)
   6 Low Coolant Level (red - programmable as alarm or shutdown)

E. NFPA 99 alarm module with common alarm and silence switch shall be

located in the control panel.

F. Panel illumination lights (2) with ON/OFF switch shall be provided on the control panel.

G. Separate digital displays shall be provided for the engine and generator parameters. These displays shall allow the simultaneous display of AC parameters and at least one (selectable) engine parameter to be displayed at the same time. Requirements for these displays are as follows:
   1. Digital display and phase selector switch for generator operational parameters. True RMS sensing of these parameters shall be utilized to minimize distortion due to non- linear loads and ensure accuracy.
   2. AC volts (+/- 0.5% accuracy)
   3 AC amps (+/- 0.5% accuracy)
   4. Hertz (+/- 0.3 Hz accuracy)

H. Digital display for:
   1. Engine RPM (+/- 0.5% accuracy)
   2. DC voltage (+/- 0.5% accuracy)
   3. Oil pressure (+/- 0 5% accuracy)
   4. Coolant temperature (+/- 0.5% accuracy)
   5. Operating hours

I. Diagnostic capability:
   1. Must provide dual level diagnostics identifying both system level and component level.
      The diagnostic codes shall be maintained in a history log specifying the number of occurrences, and second/minute/hr at which they occur.

J. Sensors:
   1. Sensors providing a pulse with modulated output shall be utilized for oil pressure, coolant temperature sensing and shall be protected against a fault to (+/-) battery. The usable output range of the sensor shall be limited to 5% to 95% duty cycle. Output outside the usable range shall be diagnosed as a fault condition and appropriate diagnostic shall be provided. Separate speed sensing signals shall be provided for overspeed protection and electronic governing.

K. Ambient parameters:
   1. Operating: -40C to +70C (-40 F to +158 F) 2.
      Storage: -55 C to +85 C (-67 F to +185 F)
   3. Humidity: 0 to 100% relative humidity

L. Must be impervious to salt spray, fuel, oil and oil additives, coolant, spray cleaners, chlorinated solvents. hydrogen sulfide and methane gas, and dust.

2.7 CIRCUIT BREAKER - GENERATOR SET MOUNTED

A. The main line circuit breakers shall be mounted and connected in a guarded drip-proof enclosures meeting NEMA 1, IP 22 and IEC 144. The circuit breakers shall be 100% rated and sized as indicated on the drawings. Each circuit breaker shall meet or exceed the minimum short circuit rating of the equipment it feeds.

2.8 BACK-UP LIGHTING

A Lighting with battery back-up shall be provided inside the generator housing for maintenance personnel to trouble-shoot if the generator fails to start.

2.9 BATTERY CHARGER

A. A dual rate 10 ampere battery charger shall be provided which shall accept 120 volt AC single phase input to provide 24 volt DC output. It shall be fused on the AC input and DC output, and incorporate current limiting circuitry to avoid the need for a crank disconnect relay. An AC voltage power switch shall be mounted on the face of the charger and shielded from accidental switching. The charger shall include an AC ammeter and voltmeter, a failure malfunction alarm switch, and be housed in a NEMA 1 enclosure suitable for wall mounting.

2.10 RADIATOR

A. The engine cooling system shall be treated by the engine supplier for the inhibition of internal corrosion using Nalcool 2000 rust inhibitor per the manufacturer's formulas for a properly treated cooling system.

2.11 ENCLOSURE

A. Provide a rust resistant weather-protective housing for diesel generator unit made of heavy gauge reinforced steel: mate and match to the unit enclosed, which permits proper cooling and access to both controller and service points.

2.12 WEIGHT

A. The weight of the engine unit consisting of generator set, base and all other specified items including all liquids (i.e., fuel oil, lube oil and cooling solutions) shall be calculated by the engine dealer utilizing manufacturer's data. The base of the unit shall be designed and manufactured as a heavy duty, structural steel construction with four point lifting provisions to support the calculated weight. Details and manufacturer's certification of the base construction shall be included with the drawings submitted for approval as well as all dealer weight

calculations supported by manufacturer's data.

2.13 FUEL TREATMENT

A. Provide fuel treatment that is a detergent, dispersant, biocide, demulsifier, corrosion inhibitor, metal deactivator, polymerization retardant, and pour point reducer. Install at dosage ratio recommended by manufacturer. Additive shall be International Lubrication and Fuel Consultants Inc. #1052, or pre-approved equal.

2.14 TAIL PIPE

A. Each silencer shall be fitted with a 90 degree tail pipe extension (elbow) terminating in a vertical position and, to prevent the entrance of rain water, shall be fitted with a weighted, aluminum rain cap. The exhaust stacks will extend up to above the adjacent Mechanical Room roofline.

2.15 FUEL OIL STORAGE

A. Comply with NFPA 30.

B. Base-Mounted Fuel Oil Tank: Factory installed and piped, complying with UL 142 fuel oil tank. Features include the following:

1. Tank level indicator.
2. Capacity: Fuel for twenty-four (24hours' continuous operation at 100 percent rated power output.
3. Vandal-resistant fill cap.
4. Containment Provisions: Comply with requirements of authorities having jurisdiction.
5. Fuel Oil Tank shall be contained within footprint of Generator.

2.16 CONTROL AND MONITORING

A. Automatic Starting System Sequence of Operation: When mode-selector switch on the control and monitoring panel is in the automatic position, remote-control contacts in one or more separate automatic transfer switches initiate starting and stopping of generator set. When mode-selector switch is switched to the on position, generator set starts. The off position of same switch initiates generator-set shutdown. When generator set is running, specified system or equipment failures or derangements automatically shut down generator set and initiate alarms. Operation of a remote emergency-stop switch also shuts down generator set

B. Manual Starting System Sequence of Operation: Switching on-off switch on

the generator control panel to the on position starts generator set. The off position of same switch initiates generator- set shutdown. When generator set is running, specified system or equipment failures or derangements automatically shut down generator set and initiate alarms. Operation of a remote emergency-stop switch also shuts down generator set.

C. Configuration: Operating and safety indications, protective devices, basic system controls, and engine gages shall be grouped in a common control and monitoring panel mounted on the generator set. Mounting method shall isolate the control panel from generator-set vibration.

D. Configuration: Operating and safety indications, protective devices, basic system controls, and engine gages shall be grouped in a common wall-mounted control and monitoring panel.

E. Configuration: Operating and safety indications, protective devices, basic system controls, engine gages, instrument transformers, generator disconnect switch or circuit breaker, and other indicated components shall be grouped in a combination control and power panel. Control and monitoring section of panel shall be isolated from power sections by steel barriers. Panel features shall include the following:

1. Wall-Mounting Cabinet Construction: Rigid, self-supporting steel unit complying with NEMA ICS 6. Power bus shall be copper. Bus, bus supports, control wiring, and temperature rise shall comply with UL 891.
2. Switchboard Construction: Freestanding unit complying with Division 16 Section "Switchboards."
3. Switchgear Construction: Freestanding unit complying with Division 16 Section "Switchgear."
4. Current and Potential Transformers: Instrument accuracy class.

F. Indicating and Protective Devices and Controls: As required by NFPA 110 for Level 1 system, and the following:

1. AC voltmeter.
2. AC ammeter.
3. AC frequency meter.
4. DC voltmeter (alternator battery charging).
5. Engine-coolant temperature gage.
6. Engine lubricating-oil pressure gage.
7. Running-time meter.
8. Ammeter-voltmeter, phase-selector switch(es).
9. Generator-voltage adjusting rheostat.

10. Fuel tank derangement alarm.
11. Fuel tank high-level shutdown of fuel supply alarm.
12. Generator overload.

G. Indicating and Protective Devices and Controls:

1. AC voltmeter.
2. AC ammeter.
3. AC frequency meter.
4. DC voltmeter (alternator battery charging).
5. Engine-coolant temperature gage.
6. Engine lubricating-oil pressure gage.
7. Running-time meter.
8. Ammeter-voltmeter, phase-selector switch(es).
9. Generator-voltage adjusting rheostat.
10. Start-stop switch.
11. Overspeed shutdown device.
12. Coolant high-temperature shutdown device.
13. Coolant low-level shutdown device.
14. Oil low-pressure shutdown device.
15. Fuel tank derangement alarm.
16. Fuel tank high-level shutdown of fuel supply alarm
17. Generator overload.

H. Supporting Items: Include sensors, transducers, terminals, relays, and other devices and include wiring required to support specified items. Locate sensors and other supporting items on engine or generator, unless otherwise indicated.

I. Connection to Data Link: A separate terminal block, factory wired to Form C dry contacts, for each alarm and status indication is reserved for connections for data-link transmission of indications to remote data terminals. Data system connections to terminals are covered in Division 16 Section "Electrical Power Monitoring and Control."

J Common Remote Audible Alarm: Comply with NFPA 110 requirements for Level 1 systems.

h. Include necessary contacts and terminals in control and monitoring panel.

1. Overcrank shutdown.
2. Coolant low-temperature alarm.
3. Control switch not in auto position.
4. Battery-charger malfunction alarm.
5. Battery low-voltage alarm.

K. Common Remote Audible Alarm: Signal the occurrence of any events listed below without differentiating between event types. Connect so that after an alarm is silenced, clearing of initiating condition will reactivate alarm until silencing switch is reset.
   1. Engine high-temperature shutdown.
   2. Lube-oil, low-pressure shutdown.
   3. Overspeed shutdown.
   4. Remote emergency-stop shutdown.
   5. Engine high-temperature prealarm.
   6. Lube-oil, low-pressure prealarm.
   7. Fuel tank, low-fuel level.
   8. Low coolant level.

L. Remote Alarm Annunciator: Comply with NFPA 99. An LED labeled with proper alarm conditions shall identify each alarm event and a common audible signal shall sound for each alarm condition. Silencing switch in face of panel shall silence signal without altering visual indication. Connect so that after an alarm is silenced, clearing of initiating condition will reactivate alarm until silencing switch is reset. Cabinet and faceplate are surface- or flush- mounting type to suit mounting conditions indicated.

M. Remote Emergency-Stop Switch: Flush; wall mounted, unless otherwise indicated; and labeled. Push button shall be protected from accidental operation.

2.16 GENERATOR OVERCURRENT AND FAULT PROTECTION

A. Generator Circuit Breaker: Molded-case, electronic-trip type; 100 percent rated; complying with UL 489.
   1. Tripping Characteristics: Adjustable long-time and short-time delay and instantaneous.
   2. Trip Settings: Selected to coordinate with generator thermal damage curve.
   3. Shunt Trip: Connected to trip breaker when generator set is shut down by other protective devices.
   4. Mounting: Adjacent to or integrated with control and monitoring panel.

B. Generator Protector: Microprocessor-based unit shall continuously monitor current level in each phase of generator output, integrate generator heating effect over time, and predict when thermal damage of alternator will occur. When signaled by generator protector or other generator-set protective devices, a shunt-trip device in the generator disconnect switch shall open the switch to disconnect the generator

from load circuits. Protector shall perform the following functions:

1. Comply with NEMA MG 1.

2. Drive: Generator shaft shall be directly connected to engine shaft. Exciter shall be rotated integrally with generator rotor.

3. Electrical Insulation: Class H or Class F.

4. Stator-Winding Leads: Brought out to terminal box to permit future reconnection for other voltages if required.

5. Construction shall prevent mechanical, electrical, and thermal damage due to vibration, overspeed up to 125 percent of rating, and heat during operation at 110 percent of rated capacity.

6 Enclosure: Dripproof.

7. Instrument Transformers: Mounted within generator enclosure.

8. Voltage Regulator: Solid-state type, separate from exciter, providing performance as specified.

9 Adjusting rheostat on control and monitoring panel shall provide plus or minus 5 percent adjustment of output-voltage operating band.

10. Strip Heater: Thermostatically controlled unit arranged to maintain stator windings above dew point.

11. Windings: Two-thirds pitch stator winding and fully linked amortisseur winding. K. Subtransient Reactance: 12 percent, maximum.

2.18 OUTDOOR GENERATOR-SET ENCLOSURE

A. Description: Vandal-resistant, weatherproof steel housing, wind resistant up to 100 mph Multiple panels shall be lockable and provide adequate access to components requiring maintenance. Panels shall be removable by one person without tools. Instruments and control shall be mounted within enclosure.

B. Description: Prefabricated or preengineered walk-in enclosure with the following features:

1. Construction: Galvanized-steel, metal-clad, integral structural-steel-framed building erected on concrete foundation.
2. Structural Design and Anchorage: Comply with ASCE 7 for wind loads.
3. Space Heater: Thermostatically controlled and sized to prevent condensation.
4. Louvers: Equipped with bird screen and filter arranged to permit air circulation when engine is not running while excluding exterior dust, birds, and rodents.
5. Hinged Doors. With padlocking provisions.
6. Ventilation: Louvers equipped with bird screen and filter arranged to permit air circulation while excluding exterior dust, birds, and rodents.
7. Thermal Insulation: Manufacturer's standard materials and thickness selected in coordination with space heater to maintain winter interior temperature within operating limits required by engine-generator-set components.
8. Muffler Location: Within enclosure.

C. Engine Cooling Airflow through Enclosure: Maintain temperature rise of system components within required limits when unit operates at 110 percent of rated load for 2 hours with ambient temperature at top of range specified in system service conditions.

1. Louvers: Fixed-engine, cooling-air inlet and discharge. Storm-proof and drainable louvers prevent entry of rain and snow.
2. Automatic Dampers: At engine cooling-air inlet and discharge Dampers shall be closed to reduce enclosure heat loss in cold weather when unit is not operating.

D. Interior Lights with Switch: Factory-wired, vapor proof-type fixtures within housing: arranged to illuminate controls and accessible interior. Arrange for external electrical connection.

1. AC lighting system and connection point for operation when remote source is available.
2. DC lighting system for operation when remote source and generator are both unavailable.

E. Convenience Outlets: Factory wired, GFCI. Arrange for external electrical connection.

F. Panelboard: Single point connection for the enclosure, 100A main, 208/120V, 3-Phase, 4-Wire, 60Hz. This panelboard feed the loads in the

generator enclosure. Minimum 4 – 20 circuit breakers shall be provided for future loads.

2.20 VIBRATION ISOLATION DEVICES

A. Elastomeric Isolator Pads: Oil- and water-resistant elastomer or natural rubber, arranged in single or multiple layers, molded with a nonslip pattern and galvanized-steel baseplates of sufficient stiffness for uniform loading over pad area, and factory cut to sizes that match requirements of supported equipment.
   1. Material: Standard neoprene.
   2. Durometer Rating: 30.
   3. Number of Layers: Two.

B. Restrained Spring Isolators: Freestanding, steel, open-spring isolators with seismic restraint.
   1. Housing: Steel with resilient vertical-limit stops to prevent spring extension due to wind loads or if weight is removed; factory-drilled baseplate bonded to ¼ inch thick, elastomeric isolator pad attached to baseplate underside; and adjustable equipment mounting and leveling bolt that acts as blocking during installation.
   2. Outside Spring Diameter: Not less than 80 percent of compressed height of the spring at rated load.
   3. Minimum Additional Travel: 50 percent of required deflection at rated load.
   4. Lateral Stiffness: More than 80 percent of rated vertical stiffness.
   5. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.

2.21 FINISHES

A. Indoor and Outdoor Enclosures and Components: Manufacturer's standard finish over corrosion-resistant pretreatment and compatible primer.

2.22 SOURCE QUALITY CONTROL

A. Prototype Testing: Factory test engine-generator set using same engine model, constructed of identical or equivalent components and equipped with identical or equivalent accessories.

   1. Tests. Comply with NFPA 110, Level 1 Energy Converters and with IEEE 115.

B. Project-Specific Equipment Tests: Before shipment, factory test engine-generator set and other system components and accessories manufactured

specifically for this Project. Perform tests at rated load and power factor. Include the following tests:

1. Test components and accessories furnished with installed unit that are not identical to those on tested prototype to demonstrate compatibility and reliability
2. Full load run.
3. Maximum power.
4. Voltage regulation.
5. Transient and steady-state governing.
6. Single-step load pickup
7. Safety shutdown.
8. Provide 14 days' advance notice of tests and opportunity for observation of tests by Owner's representative.
9. Report factory test results within 10 days of completion of test.

3.1 EXECUTION

3.2 TESTING

A. Test diesel generator set in accordance with Section 16015 Testing and Placing in Service.
B. Do not proceed with the work until unsatisfactory conditions have been corrected.

3.3 EXAMINATION

A. Examine areas, equipment bases, and conditions, with Installer present, for compliance with requirements for installation and other conditions affecting packaged engine- generator performance.
B. Examine roughing-in of piping systems and electrical connections. Verify actual locations of connections before packaged engine-generator installation
C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.4 INSTALLATION

A. Install packaged engine generator to provide access, without removing connections or accessories, for periodic maintenance.
B. Install packaged engine generator with restrained spring isolators having a minimum deflection of 1 inch on 4 inch high concrete base. Secure sets to anchor bolts installed in concrete bases. Concrete base construction is specified in Division 16 Section "Electrical Supports and Seismic

Restraints."

C. Install Schedule 40, black steel piping with welded joints and connect to engine muffler. Install thimble at wall. Piping shall be same diameter as muffler outlet. Flexible connectors and steel piping materials and installation requirements are specified in Division 15 Section "Hydronic Piping."

1. Install condensate drain piping to muffler drain outlet full size of drain connection with a shutoff valve, stainless-steel flexible connector, and Schedule 40, black steel pipe with welded joints. Flexible connectors and piping materials and installation requirements are specified in Division 15 Section "Hydronic Piping."

D. Electrical Wiring: Install electrical devices furnished by equipment manufacturers but not specified to be factory mounted.

E. Installation of Diesel Engine Driven Generator Sets:

1. Install diesel engine driven generator as indicated, in accordance with the equipment manufacturer's written instructions, and with recognized industry practices, to ensure that engine generator units fulfill requirements. Comply with NFPA 110 and NEMA standards pertaining to installation of engine generator sets and accessories.
2. Coordinate with other work, including raceways, electrical boxes and fittings, fuel tank, piping and accessories, as necessary to interface installation of engine generator equipment work with other work.
3. Tighten connectors and terminals, including screws and bolts, in accordance with equipment manufacturer's published torque tightening values for equipment connectors. Where manufacturer's torquing requirements are not indicated, tighten connectors and terminals to comply with tightening torques specified in UL Stds 486A, B and the National Electrical Code.
4. Install units on vibration isolators in accordance with manufacturer's indicated method of installation.
5. Connect fuel oil piping to fuel tank as indicated, and comply with manufacturer's installation instructions.
6. Align shafts of engine and generator within tolerances recommended by engine generator unit manufacturer.
7. Post-Installation Testing:
   a. Following installation, the following tests shall be performed by the system manufacturer's local dealer representative (s) in the presence of the owner's engineer or designated appointee:

3.5 CONNECTIONS

A. Piping installation requirements are specified in Division 15 Sections. Drawings indicate general arrangement of piping and specialties.

B. Connect fuel, cooling-system, and exhaust-system piping adjacent to packaged engine generator to allow service and maintenance.

C. Connect cooling-system water piping to engine-generator set and with flexible connectors.

D. Connect engine exhaust pipe to engine with flexible connector.

E. Connect fuel piping to engines with a gate valve and union and flexible connector.
   1. Diesel storage tanks, tank accessories, piping, valves, and specialties for fuel systems outside the building are specified in Division 2 Section "Fuel Oil Distribution."
   2. Diesel fuel piping, valves, and specialties inside the building are specified in Division 15 Section "Fuel Oil Piping."
   3. Natural- and LP-gas piping, valves, and specialties for gas distribution outside the building are specified in Division 2 Section "Natural Gas Distribution."
   4. Natural- and LP-gas piping, valves, and specialties for gas piping inside the building are specified in Division 15 Section "Fuel Gas Piping."

F. Ground equipment according to Division 16 Section "Grounding and Bonding." G. Connect wiring according to Division 16 Section "Conductors and Cables."

3.6 IDENTIFICATION

A. Identify system components according to Division 15 Section "Mechanical Identification" and Division 16 Section "Electrical Identification."

3.7 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections. Report results in writing.

B. Perform tests and inspections and prepare test reports.
   1. Manufacturer's Field Service: Engage a factory-authorized service

representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

C. Tests and Inspections:

1. Perform tests recommended by manufacturer and each electrical test and visual and mechanical inspection for "AC Generators and for Emergency Systems" specified in NETA Acceptance Testing Specification. Certify compliance with test parameters.
2. NFPA 110 Acceptance Tests: Perform tests required by NFPA 110 that are additional to those specified here including, but not limited to, single-step full-load pickup test.
3. Battery Tests: Equalize charging of battery cells according to manufacturer's written instructions. Record individual cell voltages.
   a. Measure charging voltage and voltages between available battery terminals for full-charging and float-charging conditions. Check electrolyte level and specific gravity under both conditions.
   b. Test for contact integrity of all connectors. Perform an integrity load test and a capacity load test for the battery.
   c. Verify acceptance of charge for each element of the battery after discharge.
   d. Verify that measurements are within manufacturer's specifications.
4. Battery-Charger Tests: Verify specified rates of charge for both equalizing and float- charging conditions.
5. System Integrity Tests: Methodically verify proper installation, connection, and integrity of each element of engine-generator system before and during system operation. Check for air, exhaust, and fluid leaks.
6. Exhaust-System Back-Pressure Test: Use a manometer with a scale exceeding 40-inch wg (120 kPa). Connect to exhaust line close to engine exhaust manifold.
   i. Verify that back pressure at full-rated load is within manufacturer's written allowable limits for the engine.
7. Exhaust Emissions Test: Comply with applicable government test criteria.
8. Voltage and Frequency Transient Stability Tests: Use recording oscilloscope to measure voltage and frequency transients for 50 and 100 percent step-load increases and decreases, and verify that performance is as specified.
9. Harmonic-Content Tests: Measure harmonic content of output voltage under 25 percent and at 100 percent of rated linear load. Verify that harmonic content is within specified limits.
10. Noise Level Tests: Measure A-weighted level of noise emanating from generator-set installation, including engine exhaust

and cooling-air intake and discharge. at four locations on the property line, and compare measured levels with required values.

11 Prestart Checks:

a. Oil level; water level; sub-base tank fuel level; battery connection and charge condition; engine to control interconnects; engine generator intake/exhaust obstructions.

12. Operation:

a. Load - One-hour operation at 80% of full load rating. Two hours operation at 100% of full load rating. After the first half-hour stabilization period at full load, the following shall be recorded at fifteen minute intervals:

1) Voltage and amperage (3 phase), frequency
2) Fuel pressure, oil pressure and water temperature
3) Exhaust gas temperature at engine exhaust outlet
4) Ambient temperature

b. Proper operation of controls, engine shutdown, and safety devices shall be demonstrated.

c. The manufacturer's representative shall provide inductive load banks and field engineer for the test Building load shall not be used.

D. Coordinate tests with tests for transfer switches and run them concurrently.

E. Test instruments shall have been calibrated within the last 12 months. traceable to standards of NIST, and adequate for making positive observation of test results. Make calibration records available for examination on request.

F. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.

G Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.

H. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

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

J. Retest: Correct deficiencies identified by tests and observations and retest until specified requirements are met.

K. Report results of tests and inspections in writing. Record adjustable relay settings and measured insulation resistances, time delays, and other

values and observations. Attach a label or tag to each tested component indicating satisfactory completion of tests.

L. Infrared Scanning: After Substantial Completion, but not more than 60 days after Final Acceptance, perform an infrared scan of each power wiring termination and each bus connection. Remove all access panels so terminations and connections are accessible to portable scanner.
   1. Follow-up Infrared Scanning: Perform an additional follow-up infrared scan 11 months after date of Substantial Completion.
   2. Instrument: Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.
   3. Record of Infrared Scanning: Prepare a certified report that identifies terminations and connections checked and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

3.8 DEMONSTRATION

A. The system manufacturer's authorized dealer shall provide a complete orientation for the owner's engineering and maintenance personnel. Orientation shall include both classroom and hands-on instruction. Topics covered shall include control operation, schematics, wiring diagrams, meters, indicators, warning lights, shutdown system and routine maintenance.

B. Fuel:
   1. Provide full tanks of diesel fuel, after all testing and startup.

SECTION 16420
ELECTRICAL DISTRIBUTION SYSTEM

A. 1.00 GENERAL REQUIREMENTS

1.01 SCOPE OF WORK

Furnish materials and equipment and perform labor required to complete the following:

- Power distribution system
- Lighting system
- Communication Systems (Public Address & Sound)

Refer to drawings for extent and magnitude of work.

B. 2.00 PRODUCTS

Refer to Section 01020 Summary of Materials and Finishes

C. 3.00 EXECUTION

3.01 POWER SYSTEM

A. Unless otherwise indicated on drawings. do all wiring for power. connections of motors and line switches, motor starters. speed regulators, circuit breakers, compensators or any other appliance or electrical component that may need motors and specific power requirement. Present a representative when the motors are first started by the supplier for testing.

B. Wire control may be 3.5 mm^2, 5.5 mm^2 and 8.0 mm^2 Type "THWN" and color-coded for easy identification. Use PHELPS DODGE, or approved equal.

3.02 LIGHTING SYSTEM

A. Install all wiring in rigid conduit and, in general, conceal them in the structure, except connections to luminous recessed fluorescent troughs, which shall be in flexible steel conduit or ACT cable.

B. Balance lighting conduits at the panels on the 1-phase, 3-wire systems.

3.03 COMMUNICATION SYSTEM

Public address and Sound:

A. Furnish and install conduits, cables for public address and sound system.

B. Install all wiring in rigid conduit.

3.04 INTERNET WITH WI-FI SYSTEMS

Wifi System:

A. Furnish and install conduits, cables, hubs and routers for floors with internet requirements.
B. Install all wiring in rigid conduit.

3.05 CCTV, CABLE, MATV

A. Furnish and install conduits, cables and CCTV units in all ground floor entrance and exit points.
B. Furnish and install conduits, cables for CATV and MATV in areas identified on plans.
C. Install all wiring in rigid conduit.

3.06 FIRE ALARM AND SIGNALLING BELL SYSTEM

A. Install all wiring in rigid conduit and, in general, conceal them in the structure.
B. Install components at terminals as the general location indicated in the plans, and in conformity with the respective specifications for the systems. Confirm the exact placement of components with the Architect prior to implementation and installation.

3.07 LIGHTNING ARRESTER

A. Use bare copper wire, 22mm^2 for line inside, and grounding rod 20 mm diameter x 3.00 meters solid copper embedded in the ground. Install where indicated by Electrical Engineer.
B. Fix the cable securely to the base of the finial and to the solid rod at its base. Drop the cable at the center of the spire avoiding contact with any of the steel reinforcement.

SECTION 16511
INTERIOR LIGHTING

1.1 GENERAL

1.2 SCOPE OF WORK

A This Section includes the following:
1. Interior lighting fixtures, lamps, and ballasts.
2. Emergency lighting units.
3. Exit signs.
4. Lighting fixture supports.
5. Retrofit kits for fluorescent lighting fixtures.

B Related Sections include the following:
1. Division 13 Section "Lighting Controls" for manual or programmable control systems with low-voltage control wiring or data communication circuits.
2. Division 16 Section "Wiring Devices" for manual wall-box dimmers for incandescent lamps.
3. Division 16 Section "Lighting Control Devices" for automatic control of lighting, including time switches, photoelectric relays, occupancy sensors, and multipole lighting relays and contactors.
4. Division 16 Section "Museum Lighting" for theatrical lighting fixtures and their controls.
5. Division 16 Section "Dimming Controls" for architectural dimming systems.

C. Extent, location, and details of interior lighting fixture work are indicated on the Drawings and in the Schedules.

D. Types of interior lighting fixtures in this section include the following:
1. High intensity discharge (HID).
2. Fluorescent.
3. Incandescent.
4. LED
   A.

1.3 DEFINITIONS

A BF: Ballast factor.

B. CRI: Color-rendering index.

C. HID: High-intensity discharge.

D. LER: Luminaire efficacy rating.

E. Luminaire: Complete lighting fixture, including ballast housing

1.4 SUBMITTALS

A. Product Data: For each type of lighting fixture, arranged in order of fixture designation.

B. Include data on features, accessories, finishes, and the following:

1. Physical description of lighting fixture including dimensions.
2. Emergency lighting units including battery and charger.
3. Ballast.
4. Energy-efficiency data.
5. Photometric data, in IESNA format, based on laboratory tests of each lighting fixture type, outfitted with lamps, ballasts, and accessories identical to those indicated for the lighting fixture as applied in this Project.
   a. Photometric data shall be certified by a manufacturer's laboratory with a current accreditation under the National Voluntary Laboratory Accreditation Program (NVLAP) for Energy Efficient Lighting Products.
6. Lighting fixtures.
7. Suspended ceiling components.
8. Structural members to which suspension systems for lighting fixtures will be attached.

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

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

E. Field quality-control test reports.

F. Operation and Maintenance Data: For lighting equipment and fixtures to include in emergency.

G. Manufacturer's Qualifications: Firms regularly engaged in manufacture of interior lighting fixtures of sizes, types and ratings required, whose products are UL listed and/or labeled.

H. Codes and Standards:

1. Electrical Code Compliance: Comply with applicable State code requirements of the installation, and construction of interior building lighting fixtures.
2. NEMA Compliance: Comply with applicable requirements of

NEMA Stds Pub/No.'s LE 1 and LE 2 pertaining to lighting equipment.

3. Third Party Agency Compliance: Provide products which have been listed and/or labeled by a third party agency accredited by the NCBCC to label electrical and mechanical equipment as of August 1, 1991.
4. ANSI Labels: Provide fluorescent lamp ballasts, which comply with ANSI C82.11.

1.5 DELIVERY, STORAGE AND HANDLING

A. Deliver interior ligting fixtures in factory-fabricated containers or wrapping, which properly protect fixtures from damage.

B. Store interior lighting fixtures in original packaging. Store inside well-ventilated area protected from weather, moisture, soiling, extreme temperatures, and humidity, laid flat and blocked off ground.

C. Handle interior lighting fixtures carefully to prevent damage, breaking, and scoring of finishes. Do not install damaged units or components; replace with new.

D Sequencing and Scheduling:

1. Coordinate with other work including wires/cables, electrical boxes and fittings, and raceways, to properly interface installation of interior lighting fixtures with other work.
2. Sequence interior lighting installation with other work to minimize possibility of damage and soiling during remainder of construction.

1.6 QUALITY ASSURANCE

A. Luminaire Photometric Data testing Laboratory Qualifications: Provided by manufacturers' laboratories that are accredited under the National Volunteer Laboratory Accreditation Program for Energy Efficient Lighting Products.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

C. Comply with NFPA 70.

1.7 WARRANTY

A General Warranty

1. Emergency egress lighting and exit lighting units shall be warranted for three years. Battery must have an additional two more years pro-rated warranty. Warranty shall start from the date of project final acceptance. Warranty shall be included in the close out documents.

B. Special Warranty for BALLASTS: Manufacturer's standard form in which ballast manufacturer agrees to repair or replace ballasts that fail in materials or workmanship within specified warranty period.

1. Warranty Period for Electronic Ballasts: Five years from date of final acceptance of the work.

C. Special Warranty for T5 and T8 Fluorescent Lamps: Manufacturer's standard form, made out to Owner and signed by lamp manufacturer agreeing to replace lamps that fail in materials or workmanship, freight on board the nearest shipping point to Project site, within specified warranty period below.

1. Warranty Period for T5 and T8 Fluorescent Lamps: One year from date of final acceptance of the work.

1.8 EXTRA MATERIALS

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

1. Lamps: 10 for every 100 of each type and rating installed. Furnish at least one of each type.
2. Plastic Diffusers and Lenses: 1 for every 100 of each type and rating installed. Furnish at least one of each type.
3. Battery and Charger Data: One for each type of emergency lighting unit.
4. Ballasts: 1 for every 100 of each type and rating installed. Furnish at least one of each type.
5. Globes and Guards: 1 for every 20 of each type and rating installed. Furnish at least one of each type.

2.1 PRODUCTS

2.2 MANUFACTURERS

A. Subject to compliance with requirements, manufacturers offering products which may be incorporated in the work include, but are not limited to those listed below:

B. Interior Fixtures. Refer to Fixture Schedule on drawings.

1. LEDs
2. Fluorescent Ballasts:
3. High Intensity Discharge Ballasts:
4. Lamps:

2.3 LIGHTING FIXTURES

A. General: Provide lighting fixtures, of sizes, types and ratings indicated: complete with, but not limited to, housings, energy efficient ballasts, starters, wiring, poles and standards.

B. Wiring: Provide electrical wiring within fixture suitable for connecting to branch circuit wiring.

C. Lamps:

1. All lamps of a particular type used on this Project shall be by one manufacturer.
2. All lamps of a particular type shall be from one production run.
3. Provide fluorescent lamps of energy saving types and wattages as indicated on the Drawings.
4. Provide HID lamps in types and wattages indicated on the Drawings.
5. Provide incandescent lamps in types and wattages as indicated on the Drawings.

D. Interior Lighting Fixture Types:

1. General: Fixtures must comply with minimum requirements as stated herein.
   B. Review Architectural Drawings and Specifications to verify ceiling types, modules, suspension systems appropriate to installation.
2. Refer to the Fixture Schedule on the Drawings for specific fixture requirements.

E. Examination:

1. Examine areas and conditions under which lighting fixtures are to be installed, and substrate for supporting lighting fixtures.
2. Notify Engineer in writing of conditions detrimental to proper completion of the work.

2.4 LIGHTING FIXTURES AND COMPONENTS, GENERAL REQUIREMENTS

A. Recessed Fixtures: Comply with NEMA LE 4 for ceiling compatibility for recessed fixtures.

B. Incandescent Fixtures: Comply with UL 1598. Where LER is specified, test according to NEMA LE 5A.

C. Fluorescent Fixtures: Comply with UL 1598. Where LER is specified, test according to NEMA LE 5 and NEMA LE 5A as applicable.

D. HID Fixtures: Comply with UL 1598. Where LER is specified, test according to NEMA LE 5B.

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

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

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

H. Reflecting surfaces shall have minimum reflectance as follows, unless otherwise indicated:

1. White Surfaces: 85 percent.
2. Specular Surfaces: 83 percent.
3. Diffusing Specular Surfaces: 75 percent.
4. Laminated Silver Metallized Film: 90 percent.

I. Plastic Diffusers, Covers, and Globes:

1 Acrylic Lighting Diffusers: 100 percent virgin acrylic plastic. High resistance to yellowing and other changes due to aging, exposure to heat, and UV radiation.
   a. Lens Thickness: At least 0.125 inch minimum unless different thickness is indicated.
   b. UV stabilized.
2. Glass: Annealed crystal glass, unless otherwise indicated.

2.5 BALLASTS FOR LINEAR FLUORESCENT LAMPS

A Where disconnecting means is required for the double-ended la disconnect shall be labeled and located next to the room's local s

B. Electronic Ballasts: Comply with ANSI C82.11; programmed start type, unless otherwise indicated, and designed for type and quantity of lamps served. Ballasts shall be designed f full light output unless dimmer or bi-

level control is indicated.

1. Total Harmonic Distortion Rating: Less than 10 percent.
2. Transient Voltage Protection: IEEE 587, Category A or better and shall meet FCC Rules and Regulations, part 18.
3. Operating Frequency: 20 kHz or higher.
4. Lamp Current Crest Factor: 1.7 or less.
5. BF: 0.85 or higher.
6. Power Factor: 0.95 or higher.
7. Ballast case temperature shall not exceed 25 deg C rise over 40 deg C ambient.
8. Input current third harmonics shall not exceed ANSI recommendations (33 percent total harmonic distortion, 27.5 percent of the third triplets).
9. Flicker shall be 15 percent or less with any lamp suitable for the ballast.

C. Electronic Programmed-Start Ballasts for T5 and T5HO Lamps: Comply with ANSI C82.11 the following:

1. Lamp end-of-life detection and shutdown circuit for T5 diameter lamps.
2. Automatic lamp starting after lamp replacement.
3. Sound Rating: A.
4. Total Harmonic Distortion Rating: Less than 20 percent.
5. Transient Voltage Protection: IEEE 587, Category A or better.
6. Operating Frequency: 20 kHz or higher.
7. Lamp Current Crest Factor: 1.7 or less.
8. BF: 0.95 or higher, unless otherwise indicated.
9. Power Factor: 0.95 or higher.

D. Not Used

E. Ballasts for Dimmer-Controlled Lighting Fixtures: Electronic type.

1. Dimming Range: 100 to 5 percent of rated lamp lumens.
2. Ballast Input Watts: Can be reduced to 20 percent of normal.
3. Compatibility: Certified by manufacturer for use with specific dim lamp type indicated.

F. Ballasts for Bi-Level Controlled Lighting Fixtures: Electronic type.

1. Operating Modes: Ballast circuit and leads provide for remote co of the associated lamp between high- and low-level and off.
   a. High-Level Operation: 100 percent of rated lamp lumens.
   b. Low-Level Operation: 30 percent of rated lamp lumens.
2. Ballast shall provide equal current to each lamp in each operating mode.
3. Compatibility: Certified by manufacturer for use with specific bi-

level control lamp type indicated.

2.6 BALLASTS FOR COMPACT-FLUORESCENT LAMPS

A. Description: electronic programmed start type, complying with ANSI C 82.11, designed for type and quantity of lamps indicated. Ballast shall be designed for full light output unless dimmer or bi-level control is indicated:
   1. Lamp end-of-life detection and shutdown circuit.
   2. Automatic lamp starting after lamp replacement.
   3. Sound Rating: A.
   4. Total Harmonic Distortion Rating: Less than 20 percent.
   5. Transient Voltage Protection: IEEE C62.41, Category A or better.
   6. Operating Frequency: 20 kHz or higher.
   7. Lamp Current Crest Factor: 1.7 or less.
   8. BF: 0.95 or higher, unless otherwise indicated.
   9. Power Factor: 0.95 or higher.
   10. Interference: Comply with 47 CFR, Chapter 1, Part 18, Subpart C, for limitations on electromagnetic and radio-frequency interference for non-consumer equipment.
   11. Ballast Case Temperature: 75 deg C, maximum.

B. Ballasts for Dimmer-Controlled Lighting Fixtures: Electronic Type
   1. Dimming Range: 100 to 5 percent of rated lamp lumens.
   2. Ballast Input Watts: Can be reduced to 20 percent of normal.
   3. Compatibility: Certified by manufacturer for use with specific dimmer lamp type indicated.

C. Electronic Ballast for Metal-Halide Lamps: Include the following features unless otherwise indicated:
   1. Lamp end-of-life detection and shutdown circuit.
   2. Sound Rating: A
   3. Total Harmonic Distortion Rating: Less than 15 percent.
   4. Transient Voltage Protection: IEEE C62.41, Category A or better.
   5. Lamp Current Crest Factor: 1.5 or less.
   6. Power Factor: 0.90 or higher.
   7. Interference: Comply with 47 CFR, Chapter 1, Part 18, Subpart C, for limitations on electromagnetic and radio-frequency interference for non-consumer equipment.
   8. Protection: Class P thermal cutout.
   9. Retain subparagraph and associated subparagraphs below for bi-level ballasts.
   10. Bi-Level Dimming Ballast: Ballast circuit and leads provide for remote control of the light output of the associated fixture between high- and low-level and off.

a. High-Level Operation: 100 percent of rated lamp lumens.
b Low-Level Operation: 35 percent of rated lamp lumens.
c Compatibility: Certified by ballast manufacturer for use with specific bi-level control system and lamp type indicated. Certified by lamp manufacturer that ballast operating modes are free from negative effect on lamp life and color- rendering capability.

11. Continuous Dimming Ballast: Dimming range shall be from 100 to 35 percent of rated lamp lumens without flicker.
    a Ballast Input Watts: Reduced to a maximum of 50 percent of normal at lowest dimming setting.
    b. Compatibility: Certified by manufacturer for use with specific dimming control system and lamp type indicated. Certified by lamp manufacturer that ballast operating modes are free from negative effect on lamp life and color-rendering capability.
12. Auxiliary Instant-On Quartz System: Factory-installed feature automatically switches quartz lamp on when fixture is initially energized and when power outages occur. System automatically turns quartz lamp off when HID lamp reaches approximately 60 percent light output.

2.7 EXIT SIGNS

A. Description: Comply with UL 924, for sign colors, visibility, luminance, and lettering size, comply with authorities having jurisdiction. Comply with NEC, NC Building Code, Volume X Energy Code, NFPA-101, and NEMA Standards

B. Internally Lighted Signs:
    1 Lamps for AC Operation: LEDs, 70,000 hours minimum rated lamp life. Maximum LED failure rate shall be 25 % within seven (7) year period, otherwise, if exceeded manufacturer shall replace the complete unit at no charge to the Owner.

2.8 FLUORESCENT LAMPS

A. Low-Mercury Lamps: Comply with EPA's toxicity characteristic leaching procedure test: shall yield less than 0.2 mg of mercury per liter when tested according to NEMA LL 1.

B. T8 programmed start lamps, rated 32 W maximum, nominal length of 1200 mm (48 inches), 2800 initial lumens (minimum), CRI 75 (minimum), color temperature 3500 K, and average rated life 20.0 hours,

unless otherwise indicated

C. T8 programmed start lamps, rated 17 W maximum, nominal length of 600 mm (24 inches), 1300 initial lumens (minimum), CRI 75 (minimum), color temperature 3500 K, and average rated life of 20,000 hours, unless otherwise indicated.

D T5 programmed start lamps, rated 28 W maximum, nominal length of 45.2 inches, 2900 initial lumens (minimum), CRI 85 (minimum), color temperature 3500K, and average ated life of 20,000 hours, unless otherwise indicated.

E T5HO programmed start, high-output lamp inches, 5000 initial lumens (minimum), CRI 85 (minimum), color temperature 3000K, and average average rated life of 20,000 hours, unless otherwise indicated.

F. Compact Fluorescent Lamps: 4-Pin, CRI 80 (minimum), color temperature 3500K, average rated life of 10,000 hours at 3 hours operation per start, unless otherwise in
1. 13 W: T4, double or triple tube, rated 900 initial lumens (minimum).
2. 18 W: T4, double or triple tube, rated 1200 initial lumens (minimum).
3. 26 W, T4, double or triple tube, rated 1800 initial lumens (minimum).
4. 32 W: T4, triple tube, rated 2400 initial lumens (minimum).
5. 42 W: T4, triple tube, rated 3200 initial lumens (minimum).
6. 55 W: T4, triple tube, rated 4300 initial lumens (minimum).

2.9 HID LAMPS

A. High-Pressure Sodium Lamps: ANSI C78.42, CR 21 (minimum) color temperature 1900K and average rated life of 24,000 hours, minimum.

1. Dual-Arc Tube Lamps: Arranged so only one of two arc tubes is lighted at one time an when power is restored after an outage, the cooler arc tube, with lower internal pressure, lights instantly, providing an immediate 8 to 15 percent of normal light output.

B. Metal-Halide Lamps: ANSI C78.1372, with a minimum CRI 65, and color temperature 4000 K

C. Pulse-Start, Metal-Halide Lamps: Minimum CRI 65, and color temperature 4000 K.

2.10 LIGHTING FIXTURE SUPPORT COMPONENTS

A. Comply with Division 16 Section "Electrical Supports and Seismic Restraints" for channel- and angle-iron supports and nonmetallic channel and angle supports.

B. Wires. ASTM A 641/A 641M, Class 3, soft temper, zinc-coated steel, 12 gage.

C. Wires for Humid Spaces: ASTM A 580/A 580M, Composition 302 or 304, annealed stainless steel, 12 gage.

2.11 RETROFIT KITS FOR FLUORESCENT LIGHTING FIXTURES

A. Comply with UL 1598 listing requirements.
   1. Reflector kit: UL 1598, Type I. Suitable for two-to-four-lamp, surface mounted recessed lighting fixtures by improving reflectivity of fixture surfaces.
   2. Ballast and lamp change kit: UL 1598, Type II Suitable for changing existing ballast, lamps, and sockets.

3.00 EXECUTION

3.10 INSTALLATION

A. Lighting fixture: Set level, plumb, and square with ceilings and walls. Install lamps in each fixture.

B Support for Lighting Fixtures in or on Grid-Type Suspended Ceilings:
   1. Where a recessed fluorescent, high intensity, or downlight fixture replaces a section or part of a ceiling tile, fixture is to be supported at the two (2) opposite ends to the steel frame of the building. Supports shall be provided with the same type of wire as used to support the lay-in ceiling track. Attach one end of the wire to one corner of the luminaire and the other end of the building's structural system.
   2. The lay-in luminaire shall then be screwed to the main runners of the ay-in ceiling rack at all four (4) corners using sheet metal screws. For fire rated suspended ceiling, luminaire shall be supported to the building structure. The luminaire shall then be screwed to the main runners of the suspended ceiling track at all four (4) corners using sheet metal screws.

C Suspended Lighting Fixture Support:
   1. Pendants and Rods: Where longer than 48 inches, brace to limit swinging.
   2. Continuous Rows: Use tubing or stem for wiring at one point and tubing or rod for suspension for each unit length of fixture chassis, including one at each end.

D. Air-Handling Lighting Fixtures: Install with dampers closed and ready for adjustment.

E. Adjust aimable lighting fixtures to provide required light intensities.

F. Connect wiring according to Division 16 Section "Conductors and Cables."

G Installation of Interior Lighting Fixtures:

1. Install interior lighting fixtures at locations and heights as indicated, in accordance with fixture manufacturer's written instructions. applicable requirements of NEC, NECA's "Standard of Installation," NEMA standards, and with recognized industry practices to ensure that lighting fixtures fulfill requirements.
2. Provide fixtures and/or fixture outlet boxes with hangers to properly support fixture weight. Submit design of hangers, method of fastening, other than indicated or specified herein, for review by Engineer.
3. Install flush mounted fixtures properly to eliminate light leakage between fixture frame and finished surfaces.
4. Provide plaster frames for recessed fixtures installed in other than suspended grid type acoustical ceiling systems. Brace frames temporarily to prevent distortion during handling.
5. Fasten fixtures securely to indicated structural supports: and ensure that pendant fixtures are plumb and level. Provide individually mounted pendant fixtures longer than two (2') feet with twin stem hangers. Provide stem hanger with ball aligners and provisions for minimum one (1") inch vertical adjustment. Mount continuous rows of fixtures with an additional stem hanger greater than number of fixtures in the row. Provide clips for securing lay-in fixtures in grid ceiling system.
6. Tighten connectors and terminals, including screws and bolts, in accordance with equipment manufacturer's published torque tightening values for equipment connectors. Where manufacturer's torqueing requirements are not indicated, tighten connectors and terminals to comply with tightening torques specified in UL Stds 486A and B, and the National Electrical Code
7. Support surface mounted fixtures greater than two (2') feet in length at one other point in addition to the outlet box fixture stud.
8. Fixtures weighing more than 25 pounds shall be independently supported from the building structure, and shall not rely on ceiling or ceiling structure for support.

9. Surface mounted fluorescent fixtures shall be mounted using 1/4" threaded rod at each end and rods shall be attached to the building structure above the ceiling. Ceiling grid tees shall not be used for supporting surface mounted fixtures.

3.2 FIELD QUALITY CONTROL

A. Test for Emergency Lighting: Interrupt power supply to demonstrate proper operation.
Verify transfer from normal power to battery and retransfer to normal.

B. Prepare a written report of tests, inspections, observations, and verifications indicating and interpreting results. If adjustments are made to lighting system. retest to demonstrate compliance with standards.

C. Replace defective and burned out lamps for a period of one year following the Date of Substantial Completion.

D. At Date of Substantial Completion, replace lamps in interior lighting fixtures which are observed to be noticeably dimmed after Contractor's use and testing, as judged by owner's representative, and architect/engineer of record.

E. Grounding:
1. Provide equipment grounding connections for interior lighting fixtures as indicated specified in Section 16062 Grounding.
2. Tighten connections to comply with tightening torques specified in UL Std 486A to assure permanent and effective grounds.

F. Adjusting and Cleaning:
1. Clean interior lighting fixtures of dirt and construction debris upon completion of installation. Clean fingerprints and smudges from lenses.
2. Protect installed fixtures from damage during remainder of construction period.

G. Demonstration:
1. Upon completion of installation of interior lighting fixtures, and after building circuit been energized, apply electrical energy to demonstrate capability and compliance with requirements.
2. Where possible, correct malfunctioning units at site, then retest to demonstrate compliance; otherwise, remove and replace with new units, and proceed with retesting.

SECTION 16521
EXTERIOR LIGHTING

1.1 GENERAL

1.2 SCOPE OF WORK

A. This Section includes the following:
   1. Exterior luminaires with lamps and ballasts.
   2. Luminaire-mounted photoelectric relays.
   3. Poles and accessories.

B Extent of exterior lighting fixture work is indicated by the Drawings and Schedules.

C. Types of exterior lighting fixtures in this section include the following:
   1. High intensity discharge (HID).
   2. Metal halide.
   3. High pressure sodium.
   4. Fluorescent
   5. LED

D. Related Sections include the following:
   1. Division 16 Section "Interior Lighting" for exterior luminaires normally mounted on exterior surfaces of the building.

1.3 DEFINITIONS

A. CRI: Color-rendering index.

B. HID: High-intensity discharge

C. Luminaire: Complete lighting fixture, including ballast housing if

D. Pole: Luminaire support structure, including tower used for large area illumination.

E. Standard: Same definition as "Pole" above.

1.4 STRUCTURAL ANALYSIS FOR POLE SELECTION

A. Dead Load: Weight of luminaire and its horizontal and vertical supports, lowering devices and supporting structure, applied as stated in AASHTO LTS-4.

B. Wind Load: Pressure of wind on pole and luminaire, calculated and applied as stated in AASHTO LTS-4.
   1. Wind speed for calculating wind load for poles 50 feet (15 meters) or less in height is 110 mph (177 kph).

1.5 SUBMITTALS

A. Product Data: For each luminaire, pole, and support component, arranged in order of lighting unit designation. Include data on features, accessories, finishes, and the following:

1. Physical description of luminaire, including materials, dimensions, effective projected area, and verification of indicated parameters.
2. Details of attaching luminaires and accessories.
3. Details of installation and construction.
4. Luminaire materials.
5. Photometric data based on laboratory tests of each luminaire type, complete with indicated lamps, ballasts, and accessories.
   a. For indicated luminaires, photometric data shall be certified by a qualified independent testing agency. Photometric data for remaining luminaries shall be certified by manufacturer.
6. Photoelectric relays.
7. Ballasts, including energy-efficiency data.
8. Lamps, including life, output, and energy-efficiency data.
9. Materials, dimensions, and finishes of poles.
10. Means of attaching luminaries to supports, and indication that attachment is suitable for components involved.
11. Anchor bolts for poles.

B. Shop drawings
1. Anchor-bolt templates keyed to specific poles and certified by manufacturer.
2. Wiring Diagrams: Power wiring.
3. Pole and Support Component Certificates: Signed by manufacturers of poles, certifying that products are designed for indicated load requirements in AASHTO LTS-4 and that load imposed by luminaire has been included in design.

D. Operation and Maintenance Data: For luminaries and poles to include in emergency operation and maintenance manuals.

E. Warranty: Special warranty specified in this Section.

1.6 QUALITY ASSURANCE

A. Luminaire Photometric Data Testing Laboratory Qualifications. Provided by manufacturers' laboratories that are accredited for evaluating energy efficient lighting products.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable

to authorities having jurisdiction, and marked for intended use.

C. Comply with IEEE C2, "National Electrical Safety Code."

D. Comply with NFPA 70.

E. Manufacturers: Firms regularly engaged in manufacture of exterior building lighting fixtures of types and ratings required.

F. Codes and Standards:
   1. NEC Compliance: Comply with NEC as applicable to installation and construction of exterior building lighting fixtures.
   2. NEMA Compliance: Comply with applicable requirements of NEMA Stds Pub/No.'s FA 1, LE 1 and LE 2 pertaining to lighting equipment.
   3. Third Party Agency Compliance: Provide products which have been listed and/or labeled by a third party agency accredited by the NCBCC to label electrical and mechanical equipment as of August 1, 1991.
   4. ANSI Labels: Provide fluorescent lamp ballasts, which comply with ANSI C82.11.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Package aluminum poles for shipping according to ASTM B 660.

B. Store poles on decay-resistant-treated skids at least 12 inches above grade and vegetation. Support poles to prevent distortion and arrange to provide free air circulation.

C. Handle wood poles so they will not be damaged. Do not use pointed tools that can indent pole surface more than 1/4 inch deep. Do not apply tools to section of pole to be installed below ground line.

D. Retain factory-applied pole wrappings on metal poles until right before pole installation. For poles with nonmetallic finishes, handle with web fabric straps.

E. Handle lighting fixtures carefully to prevent damage, breaking, and scoring. Do not install damaged fixtures or components; replace with new.

F. Store lighting fixtures in clean dry place. Protect from weather, dirt, fumes, water, construction debris, and physical damage.

1.8 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace products that fail in materials or workmanship; that corrode; or that fade, stain, perforate, erode, or chalk due to effects of weather or solar radiation within specified

warranty period. Manufacturer may exclude lightning damage, hail damage, vandalism, abuse, or unauthorized repairs or alterations from special warranty coverage.

1. Warranty Period for Luminaires. One year from date of final acceptance of the work.
2. Warranty Period for Metal Corrosion: One year from date of final acceptance of the work.
3. Warranty Period for Color Retention: One year from date of final acceptance of the work.
4. Warranty Period for Poles: Repair or replace lighting poles and standards that fail in finish, materials, and workmanship within manufacturer's standard warranty period, but not less than one year from date of final acceptance of the work.

1.9 EXTRA MATERIALS

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

1. Lamps: 10 for every 100 of each type and rating installed. Furnish at least two of each type.
2. Glass and Plastic Lenses, Covers, and Other Optical Parts: 10 for every 100 of each type and rating installed. Furnish at least one of each type.
3. Ballasts: 10 for every 100 of each type and rating installed. Furnish at least one of each type.
4. Globes and Guards: 10 for every 100 of each type and rating installed. Furnish at least one of each type.

2.1 PRODUCTS

2.2 MANUFACTURERS

A. In Exterior Lighting Device Schedule where titles below are column or row headings that introduce lists, the following requirements apply to product selection:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

B. Exterior Lighting Fixtures:

1. General: Provide lighting fixtures, of sizes, types and ratings indicated; complete with, but not limited to, housings, energy efficient ballasts, starters and wiring.
2. Wiring: Provide electrical wiring within fixture suitable for connection to branch circuit wiring as follows:
3. NEC Type AF for 120 volts, minimum No. 18 AWG.

4. NEC Type SF-2 for 277 volts, minimum No. 18 AWG.

C. Fluorescent-Lamp Ballasts: Provide low-temperature, high power-factor, low energy fluorescent lamp ballasts, capable of operating lamp types indicated.

D. High-Intensity-Discharge Lamp Ballasts: Provide HID lamp ballasts, capable of operating lamp types with ratings indicated; reactor type, high power-factor, core and coil assembly encapsulated in non-melt resin; install capacitor outside ballast encapsulation for easy field replacement.

E. Provide HID lamp ballasts, which properly mates and matches lamps to electrical supply by providing appropriate voltages and impedances for which lamps are designed. Design ballasts to operate lamp within the lamp manufacturer's specifications.

F. Lamps:
   1. All lamps of a particular type used on this Project shall be by one manufacturer.
   2. All lamps of a particular type shall be from one production run.
   3. Provide fluorescent lamps of energy saving types and wattages as indicated on the Drawings.
   4. Provide HID lamps in types and wattages indicated on the Drawings.
   5. Provide incandescent lamps in types and wattages as indicated on the Drawings.

G. Exterior Lighting Fixture Types:
   1. General: Refer to the Fixture Schedule for types and requirements of exterior lighting fixtures.

H. Execution:
   1. Inspection.
      a. Examine areas and conditions under which lighting fixtures are to be installed, and substrate which will support lighting fixtures.
      b. Do not proceed with work until unsatisfactory conditions have been corrected.

2.3 LUMINAIRES, GENERAL REQUIREMENTS

A. Luminaires shall comply with UL 1598 and be listed and labeled for installation in wet locations by an NRTL acceptable to authorities having jurisdiction.

B. Comply with IESNA RP-8 for parameters of lateral light distribution patterns indicated for luminaires.

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

D. Sheet Metal Components. Corrosion-resistant aluminum, unless otherwise indicated.
   C. Form and support to prevent warping and sagging.

E. Housings: Rigidly formed, weather- and light-tight enclosures that will not warp, sag, or deform in use Provide filter/breather for enclosed luminaires.

F. Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions, and designed to permit relamping without use of tools. Designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during relamping and when secured in operating position. Doors shall be removable for cleaning or replacing lenses. Designed to disconnect ballast when door opens.

G. Exposed Hardware Material: Stainless steel.

H. Plastic Parts: High resistance to yellowing and other changes due to aging, exposure to heat, and UV radiation.

I Light Shields: Metal baffles, factory installed and field adjustable, arranged to block light distribution to indicated portion of normally illuminated area or field.

J. Reflecting surfaces shall have minimum reflectance as follows, unless otherwise indicated:
   1. White Surfaces: 85 percent.
   2. Specular Surfaces: 83 percent.
   3. Diffusing Specular Surfaces: 75 percent.

K Lenses and Refractors Gaskets: Use heat- and aging-resistant resilient gaskets to seal and cushion lenses and refractors in luminaire doors.

L Luminaire Finish: Manufacturer's standard paint applied to factory-assembled and - tested luminaire before shipping. Where indicated, match finish process and color of pole or support materials.

M. Factory-Applied Finish for Steel Luminaires: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
   1 Surface Preparation: Clean surfaces to comply with SSPC-SP 1, "Solvent Cleaning," to remove dirt, oil, grease, and other contaminants that could impair paint bond. Grind welds and polish surfaces to a smooth, even finish. Remove mill scale and rust, if present, from uncoated steel, complying with SSPC-SP 5/NACE

No. 1, "White Metal Blast Cleaning," or SSPC-SP 8, "Pickling."

2. Exterior Surfaces: Manufacturer's standard finish consisting of one or more coats of primer and two finish coats of high-gloss, high-build polyurethane enamel.
   a. Color: As selected from manufacturer's standard catalog of colors.

N Factory-Applied Finish for Aluminum Luminaires: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

1. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.
2. Natural Satin Finish: Provide fine, directional, medium satin polish (AA-M32); buff complying with AA-M20; and seal aluminum surfaces with clear, hard-coat wax.
3. Class I, Clear Anodic Finish: AA-M32C22A41 (Mechanical Finish: medium satin; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class I, clear coating 0.018 mm or thicker) complying with AAMA 611.
4. Class I, Color Anodic Finish: AA-M32C22A42/A44 (Mechanical Finish: medium satin; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class I, integrally colored or electrolytically deposited color coating 0.018 mm or thicker) complying with AAMA 611.
   a. Color: Medium bronze.

2.4 LUMINAIRE-MOUNTED PHOTOELECTRIC RELAYS

A. Comply with UL 773 or UL 773A.

B. Contact Relays: Factory mounted, single throw, designed to fail in the on position, and factory set to turn light unit on at 1.5 to 3 fc and off at 4.5 to 10 fc with 15-second minimum time delay.

1. Relay with locking-type receptacle shall comply with NEMA C136.10.
2. Adjustable window slide for adjusting on-off set points.

2.5 FLUORESCENT BALLASTS AND LAMPS

A. Low-Temperature Ballast Capability: Rated by its manufacturer for reliable starting and operation of indicated lamp(s) at temperatures 0 deg F and higher.

B. Ballast Characteristics:

1 Power Factor: 90 percent, minimum.

2. Total Harmonic Distortion Rating: Less than 10 percent.
3. Electromagnetic Ballasts: Comply with ANSI Class P, automatic-reset thermal protection.
4. Case Temperature for Compact Lamp Ballasts: 65 deg C, maximum.
5. Transient-Voltage Protection: Comply with IEEE C62.41 Category A or better.

C. Low-Temperature Lamp Capability: Rated for reliable starting and operation with ballast provided at temperatures 0 deg F and higher.

D. Fluorescent Lamps: Low-mercury type. Comply with the EPA's toxicity characteristic leaching procedure test; shall yield less than 0.2 mg of mercury per liter when tested according to NEMA LL 1.

2.6 BALLASTS FOR HID LAMPS

A. Comply with ANSI C82.4 and UL 1029 and capable of open-circuit operation without reduction of average lamp life. Include the following features unless otherwise indicated:
1. Ballast Circuit: Constant-wattage autotransformer or
2. Minimum Starting Temperature: Minus 22 deg F.
3. Normal Ambient Operating Temperature: 104 deg F.

B. Auxiliary, Instant-On, Quartz System: Factory-installed feature automatically switches quartz lamp on when fixture is initially energized and when momentary power outages occur. System automatically turns quartz lamp off when HII lamp reaches approximately 60 percent of light output.

C. High-Pressure Sodium Ballasts: Electromagnetic type with solid-state igniter/starter and capable of open-circuit operation without reduction of average lamp life. Igniter/starter shall have an average life in ulsing mode of 10,000 hours at an igniter/starter –case temperature of 90 deg C.
1. Instant- Restrike Device: Integral with ballast, or solid-state potted module, factory installed within fixture and compatible with lamps, ballasts, and mogul sockets up to 150 W.
   a. Restrike range: 105- to 130- V ac.
   b. Maximum Voltage: 250-V peak or 150-V ac RMS.

2.7 HID LAMPS

A. High-Pressure Sodium Lamps: ANSI C78.42, CRI 21 (minimum), color temperature 1900 K, and average rated life of 24,000 hours, minimum.

B. Metal-Halide Lamps: ANSI C78.1372, with a minimum CRI 65, and

color temperature 4000K.

C. Pulse Start, Metal-Halide Lamps: Minimum CRI 65, and color temperature 4000K

2.8 POLES AND SUPPORT COMPONENTS, GENERAL REQUIREMENTS

A. Structural Characteristics: Comply with AASHTO LTS-4.

1. Wind-Load Strength of Poles: Adequate at indicated heights above grade without failure permanent deflection, or whipping in steady winds of speed indicated in Part 1 "Structural Analysis Criteria for Pole Selection" Article, with a gust factor of 1.3.
2. Strength Analysis: For each pole, multiply the actual projects area of luminaires and brackets by a factor of 1.1 to obtain the equivalent projected area to be used in pole selection strength analysis.

B. Luminaire Attachment Provisions. Comply with luminaire manufacturers' mounting requirements. Use stainless-steel fasteners and mounting bolts, unless otherwise indicated.

C. Mountings, Fasteners, and Appurtenances: Corrosion-resistant items compatible with support components.

1. Materials: Shall not cause galvanic action at contact points.
2. Anchor Bolts, Leveling Nuts, Bolt Caps, and Washers: Hot-dip galvanized after fabrication, unless stainless steel items are indicated.
3. Anchor-Bolt Template: Plywood or steel.

D. Concrete Pole Foundations: Cast in place, with anchor bolts to match pole-base flange. Concrete, reinforcement, and formwork are specified in Division 3 Section "Cast-In-Place" concrete.

E. Breakaway Supports: Frangible breakaway supports, tested by an independent agency acceptable to the owner and construction manager, according to AASHTO LTS-4.

F. All metal poles shall be provided with a gasketed handhole in the pole to access branch circuit wiring. Access fasteners shall be vandal-resistant.

2.9 STEEL POLES

A. Poles: Comply with ASTM A 500, Grade B, carbon steel with a minimum yield of 46,000 p1-piece construction up to 40 feet in height with access handhole in pole wall.

1. Shape: Square, straight.

2 Mounting Provisions: Butt flange for bolted mounting on foundation or breakaway support.

B. Steel Mast Arms: Single-arm type, continuously welded to pole attachment plate. Material and finish same as pole.

C. Brackets for Luminaires: detachable, cantilever, without underbrace
   1. Adapter fitting welded to pole and bracket, then bolted together with stainless- steel bolts.
   2. Cross Section: Tapered oval, with straight tubular end section to accommodate luminaire.
   3. Match pole material and finish.

D. Pole-Top Tenons: Fabricated to support luminaire or luminaires and brackets indicated. and securely fasten to pole top.

E. Steps: Fixed steel, with nonslip treads, positioned for 380mm (15-inch) vertical spacing. alternating opposite sides of pole: first step at elevation 3meters (10 fee)t above finished grade.

F. Grounding and Bonding Lugs: Welded 1/2-inch threaded lug. complying with requirements in Division 16 Section "Grounding and Bonding." listed for attaching grounding and bonding conductors of type and size listed in that Section, accessible through handhole.

G Cable Support Grip: Wire-mesh type with rotating attachment eye, sized for diameter of cable and rated for a minimum load equal to weight of supported cable time a 5.0 safety factor.

H Factory-Painted Finish: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
   1. Surface Preparation: Clean surfaces to comply with SSPC-SP 1, "Solvent Cleaning", to remove dirt. oil, grease, and other contaminants that could impair paint bond. Grind welds and polish surfaces to smooth even finish. Remove mill scale and rust, if present, from uncoated steel, complying with SSPC-SP 5/NACE No. 1. "White Metal Blast Cleaning." or SSPC-SP 8, "Pickling "
   2. Interior Surfaces of Pole: One coat of bituminous paint. or otherwise treat for equal corrosion protection.
   3. Exterior Surfaces. Manufacturer's standard finish consisting of one or more coats of primer and two finish coats of high-gloss, high-build polyurethane enamel.
      a Color: Match Arc

2.10 POLE ACCESSORIES

A. Base Covers: Manufacturer' standard metal units, arranged to cover

pole's mounting bolts and nuts. Finish same as pole

3.1 EXECUTION

3.2 INSTALLATION OF EXTERIOR LIGHTING FIXTURES

A. Install exterior lighting fixture at locations and heights as indicated, in accordance with fixture manufacturer's written instructions, applicable requirements of NEC, NECA's "Standards of Installation," NEMA standards, and with recognized industry practices to ensure that lighting fixtures fulfill requirements.

B. Coordinate with other electrical work as appropriate to properly interface installation of exterior lighting fixtures with other work.
   1. Tighten connectors and terminals, including screws and bolts, to comply with tightening torques specified in UL Stds 486A and B.
   2 Fasten fixtures securely to poles, and ensure that poles and fixtures are plumb.

C. Adjusting and Cleaning:
   1. Clean exterior lighting fixtures or dirt and debris upon completion of installation.
   2. Protect installed fixtures from damage during construction period.

3.3 LUMINAIRE INSTALLATION

A. Install lamps in each luminaire.

B. Fasten luminaire to indicate structural supports.
   1. Use fastening methods and materials selected to resist seismic forces defined for the application and approved by the manufacturer.

C. Adjust luminaires that require field adjusting or aiming.

3.4 POLE INSTALLATION

A. Align pole foundations and poles for optimum directional alignment of luminaires and their mounting provisions on the pole.

B. Clearances: Maintain the following minimum horizontal distances of poles from surface and underground features, unless otherwise indicated on Drawings:
   1. Fire hydrants and storm drainage piping: 1524 mm (60 inches)
   2 Water, electric, communication, gas and sewer lines: 3000 mm (10 feet)
   3 Trees: 4600 mm (15 feet)

C. Concrete Pole Foundations: Set anchor bolts according to anchor-bolt

templates furnished by pole manufacturer. Concrete materials, installation. and finishing requirements are specified in Division 3 Section "Cast-in-Place Concrete."

D Foundation-Mounted Poles: Mount pole with leveling nuts. and tighten top nuts to torque level recommended by pole manufacturer.

1. Use anchor bolts and nuts selected to resist seismic forces defined for the application and approved by manufacturer.
2. Grout void between pole base and foundation. Use non-shrink or expanding concrete grout firmly packed to fill space.
3. Install base covers, unless otherwise indicated.
4. Use a short piece of ½ inch diameter pipe to make a drain hole through grout.

   Arrange to drain condensation from interior of pole.

E. Poles and Pole Foundations Set in Concrete Paved Areas: Install poles with minimum of 150 mm (6 inch) wide, unpaved gap between the pole or pole foundation and the edge of adjacent concrete slab. Fill unpaved ring with pea gravel to a level 25 mm (1 inch) below top of concrete slab.

F. Raise and set poles using web fabric slings (not chain or cable).

3.5 BOLLARD LUMINAIRE INSTALLATION

A. Align units for optimum directional alignment of light distribution.

B Install on concrete base with top flush with finished grade or surface at bollard location. Cast conduit into base, and shape base to match shape of bollard base. Finish by troweling and rubbing smooth. Concrete materials, installation, and finishing are specified in Division 3 Section "Cast-in-Place Concrete."

3.6 INSTALLATION OF INDIVIDUAL GROUND-MOUNTING LUMINAIRES

A. Install on concrete base with top flush with finished grade or surface at luminaire location. Cast conduit into base, and finish by troweling and rubbing smooth. Concrete materials, installation. and finishing are specified in Division 3 Section "Cast-in-Place Concrete."

3.7 CORROSION PREVENTION

A. Aluminum: Do not use in contact with earth or concrete. When in direct contact with a dissimilar metal, protect aluminum by insulating fittings or treatment.

B. Steel Conduits: Comply with Division 16 Section "Raceways and

Boxes." In concrete foundations, wrap conduit with 0.010 inch thick, pipe-wrapping plastic tape applied with a 50 percent overlap.

3.8 GROUNDING

A. Ground metal poles and support structures according to Division 16 Section "Grounding and Bonding."
   1. Install grounding electrode for each pole, unless otherwise indicated.
   2. Install grounding conductor pigtail in the base for connecting luminaire to grounding system.

B. Ground nonmetallic poles and support structures according to Division 16 Section "Grounding and Bonding."
   1. Install grounding electrode for each pole.
   2. Install grounding conductor and conductor protector.
   3. Ground metallic components of pole accessories and foundations.

C. Tighten connections to comply with tightening torques specified in UL Std 486A to assure permanent and effective grounds.

D. Provide equipment grounding connections for exterior lighting fixtures as indicated and as specified in Section 16452 Grounding

3.9 FIELD QUALITY CONTROL

A. Inspect each installed fixture for damage. Replace damaged fixtures and components.

B. Illumination Observations: Verify normal operation of lighting units after installing luminaires and energizing circuits with normal power source
   1. Verify operation of photoelectric controls.

C. Illumination Tests:
   1. Measure light intensities at night. Use photometers with calibration referenced to NIST standards. Comply with the following IESNA testing guide(s):
      a. IESNA LM-5, "Photometric Measurements of Area and Sports Lighting."
      b. IESNA LM-50, "Photometric Measurements of Roadway Lighting Installations."
      c. IESNA LM-52, "Photometric Measurements of Roadway Sign Installations."
      d. IESNA LM-64, "Photometric Measurements of Parking Areas."
      e. IESNA LM-72, "Directional Positioning of Photometric Data."

D. Prepare a written report of tests, inspections, observations, and verifications indicating and interpreting results If adjustments are made to lighting system, retest to demonstrate compliance with standards.

E. Upon completion of installation of exterior lighting fixtures, and after building circuitry has been energized, apply electrical energy to demonstrate capability and compliance with requirements

F. Where possible, correct malfunctioning units at site, then retest to demonstrate compliance; otherwise, remove and replace with new units, and proceed with retesting.

G. Replace defective and burned out lamps for a period of one year following the Date of Substantial Completion

H. At the Date of Substantial Completion, replace lamps in exterior lighting fixtures which are observed to be noticeably dimmed after Contractor's use and testing as judged by the Engineer

SECTION 16715
VOICE AND DATA COMMUNICATION CABLING

1.1 GENERAL

1.2 GENERAL DESCRIPTION

All electrical works for voice and data communication cabling for this project shall be governed by the provisions of the latest edition of the Philippine Electrical Code, rules and regulations of Local Authorities that have jurisdiction over the project and policies of electric and communication utility companies in the locality.

1.3 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

A. ELECTRONIC INDUSTRIES ASSOCIATION (EIA)
   1. EIA TSB-67 Transmission Performance Specifications for Field Testing of Unshielded Twisted-Pair Cabling Systems
   2. EIA 310-D Cabinets, Racks, Panels, and Associated Equipment
   3. EIA/TIA TSB-75 Additional Horizontal Cabling Practices for Open Offices
   4. EIA-455-21A FOTP-21 Mating Durability of Fiber Optic Interconnecting Devices
   5. EIA-492AAAA-A 50 Micrometer Core Diameter/125-Micrometer Cladding Diameter Class 1a Graded-Index Multimode Optical Fibers
   6. EIA/TIA-526-7 OFSTP-7 Measurement of Optical Power Loss of Installed Single- Mode Fiber Cable Plant
   7. EIA/TIA-526-14 OFSTP-14 Optical Power Loss Measurements of Installed Multimode Fiber Cable

B. Plant
   1. EIA/TIA-568-C Addendum 1997, Addendum 1998) Commercial Building Telecommunications Wiring Standard
   2. EIA/TIA-569-A Commercial Building Standard for Telecommunications Pathways and Spaces
   3. EIA/TIA-606 Administration Standard for the Telecommunications Infrastructure of Commercial Buildings
   4 EIA/TIA-607 Commercial Building Ground and Bonding Requirements

for Telecommunications

C. INSULATED CABLE ENGINEERS ASSOCIATION (ICEA)
   1. ANSI/ICEA S-80-576 Communication Wire and Cable for Wiring of Premises

D. NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)
   1. NEMA WC 63.1 Telecommunications Cables

E. NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)
   1. NFPA 70 National Electrical Code

F. UNDERWRITERS LABORATORIES INC. (UL)
   1. UL 444 Communications Cables
   2. UL 467 Grounding and Bonding Equipment
   3. UL 497 Safety Protector for Paired Conductor Communication Circuit
   4. UL 514C Nonmetallic Outlet Boxes, Flush-Device Boxes, and Covers
   5. UL 910 Flame-Propagation and Smoke-Density Values for Electrical and Optical- Fiber Cables Used in Spaces Transporting Environmental Air
   6. UL 969 Marking and Labeling Systems
   7. UL 1286 Office Furnishings
   8. UL 1581 Electrical Wires, Cables, and Flexible Cords
   9. UL 1666 Flame Propagation Height of Electrical and Optical-Fiber Cables Installed in Vertical Shafts
   10. UL 1863 Communication Circuit Accessories

1.4 SUMMARY

A. This Section includes the following items for wiring systems used as signal pathways for voice and high-speed data transmission:
   1. Mounting elements.
   2. Unshielded twisted-pair cabling.
   3. Fiber-optic cabling.
   4. Coaxial cable.
   5. Multiuser telecommunications outlet assemblies.
   6. Workstation outlets.
   7. Backboards.
   8. Identification products.

B. Related Sections include the following:
   1. Division 13 Section "Security Access" for data transmission meeting RS-232 and RS-485 cabling associated with system panels

and devices

C. The structured telecommunications cabling and pathway system shall include permanently installed backbone and horizontal cabling, horizontal and backbone pathways, service entrance facilities, work area pathways, telecommunications outlet assemblies, conduit, raceway, and hardware for splicing, terminating, and interconnecting. The horizontal system includes the cabling and pathway between the telecommunications closet and the work area telecommunications outlet. The horizontal system shall be wired in a star topology with the IDF at the center or hub of the star. The backbone cabling and pathway system includes intra building interconnecting cabling, pathway, and terminal hardware to provide connectivity between the MDF's, BDF's, and IDF's. The backbone system shall be wired in a star topology with the MDF at the center or hub of the star

1.5 DEFINITIONS

A. Backbone: A facility (e.g., pathway, cable, or conductors) between telecommunications rooms or floor distribution terminals, the entrance facilities, and the equipment rooms within or between buildings.

B. BICSI: Building Industry Consulting Service International.

C Cross-Connect: A facility enabling the termination of cable elements and their interconnection or cross-connection.

D. EMI: Electromagnetic interference.

E. Horizontal Cabling: Cabling between and including the telecommunications outlet/connector and the horizontal cross-connect. Also the cabling between and including the building automation system outlet or the first mechanical terminations on the horizontal connection point and the horizontal cross-connect.

F. IDC: Insulation displacement connector.

G. LAN: Local area network.

H. RCDD: Registered Communications Distribution Designer.

I RMC. Rigid metallic conduit.

J. UTP: Unshielded twisted pair.

K. Main Distribution Frame (MDF): A physical structure at a central location for terminating permanent backbone cables to interconnect with service provider (SP) equipment at the activity minimum point of

presence. The MDF generally includes vendor specific components to support voice and data circuits, building surge protector assemblies, main cross connect blocks, equipment support frames, and wood backboard (if MDF is wall mounted). Depending upon local site conditions, the MDF and BDF may be identical.

L. Building Distribution Frame (BDF): A structure with terminations for connecting backbone, campus, and horizontal cabling. The BDF generally includes a cross connect, equipment support frame, and wooden backboard or terminal cabinet The BDF shall

M. Intermediate Distribution Frame (IDF): An intermediate termination point for horizontal wiring and cross connections within telecommunications closets or wiring closets.

N. Telecommunications Closet: An enclosed space for telecommunications equipment, terminations, and cross-connect wiring for horizontal cabling.

1.6 SUBMITTALS

A. Product Data: For features, ratings, and performance of each component specified.
   1. For coaxial cable, include the following installation data for each type used:
      a. Nominal OD.
      b Minimum bending radius.
      c. Maximum pulling tension.

B Shop Drawings:
   1. Include dimensioned plan and elevation views of telecommunications equipment rooms, labeling each individual component. Show equipment rack assemblies, method of field assembly, workspace requirements, and access for cable connections.
   2. System Labeling Schedules: Electronic copy of labeling schedules, in software and format selected by Owner.
   3. System Labeling Schedules: Electronic copy of labeling schedules that are part of the cabling and asset identification system of the software.
   4. Cabling Administration Drawings.
   5 Wiring diagrams to show typical wiring schematics including the following:
      a. Workstation outlets, jacks, and jack assemblies.
      b. Patch cords.
      c. Patch panels.
      d Fiber-optic boxes.
      e. Distribution racks.

f. Terminal racks.

C. Manufacturer Seismic Qualification Certification: Submit certification that distribution racks, patch panels, and their components will withstand seismic forces defined in Division 16 Section "Electrical Supports and Seismic Restraints." Include the following:

1. Basis for Certification: Base certification on the maximum number of components capable of being mounted in each rack type. Identify components on which certification is based. Indicate whether withstand certification is based on actual test of assembled components or on calculation.
   a. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified and the unit will be fully operational after the seismic event."
2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity of each rack-mounted component and of each assembled rack type, and locate and describe mounting and anchorage provisions.
3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

D. Qualification Data: For Installer.

E. Source quality-control test reports.

F. Field quality-control test reports

G. Submit the following in accordance with Conditions of Contract and Division 1 specification sections:

1. Shop Drawings
2. Telecommunications drawings
3. Distribution frames
4. Product Data
5. Telecommunications cabling (backbone and horizontal)
6. Patch panels
7. Telecommunications outlet/connector assemblies
8. Equipment support frame
9. Building protector assemblies
10. Connector blocks
11. Protector modules
12. Test Reports
13. Telecommunications cabling testing
14. Factory reel tests for optical fiber cables
15. Certificates

16. Installer qualifications
17. Test plan
18. Operation and Maintenance Data
19. Telecommunications cabling and pathway system Data Package.

H ADDITIONAL SUBMITTAL REQUIREMENTS

1. Telecommunications Drawings & Electronic Files

2. Provide registered communications distribution designer (RCDD) approved drawings complete with wiring diagrams and details required to prove that the distribution system shall properly support connectivity from the telecommunications equipment room to telecommunications work area outlets. Show the entrance facility and layout of cabling and pathway runs, cross connect points, MDF, BDF, IDF, grounding system, terminating block arrangements and type. Drawings shall depict final telecommunications cabling configuration, including location, color coding, gage, pair assignment, polarization, and terminating blocks layout at cross connect points and patch panels after telecommunications cable installation. Provide a plastic laminated schematic of telecommunications cable system showing cabling, BDF's, IDF's, MDF's, and equipment rooms keyed to floor plans by room number. All required design, testing, termination and labeling information is to be provided in electronic format on CD ROM in addition to hard copy format.

3. Distribution Frames

4. Provide shop drawing showing layout of applicable equipment including incoming cable stub or connector blocks, building protector assembly, outgoing cable connector blocks and equipment spaces and racks. Provide all information on CD ROM in electronic format and in hard copy file.

5. Installer Qualifications

6 Prior to installation, submit data of installer's experience and qualifications.
D. Installers shall be a Building Industry Consulting Service International (BICSI) Registered Cabling Installation Technician or have experience which shall include 3 years on projects of similar complexity. Include names and locations of two projects successfully completed using optical fiber and] copper communications cabling systems. Include written certification from users that systems have performed satisfactorily for not less than 18

months. Include specific experience in installing and testing structured telecommunications distribution systems using optical fiber, Category 3 and Category 6 cabling systems.

7. Test Plan

8. Provide a complete and detailed test plan for the telecommunications cabling system including a complete list of test equipment for the UTP and optical fiber components and accessories. Include procedures for certification, validation, and testing.

9. Additions to Operation and Maintenance Manuals

10. In addition to requirements of Data Package 6 for the telecommunications cabling and pathway system, including the requirements of paragraph entitled "Telecommunications Drawings".

1.5 DELIVERY AND STORAGE

A. Provide protection from weather, moisture, dirt, dust, and other contaminants for telecommunications cabling and pathway equipment placed in storage.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: Cabling installer must have on staff personnel certified by BICSI.

1. Layout Responsibility: Preparation of Shop Drawings, Cabling Administration Drawings, and field testing program development by an RCDD.

2. Installation Supervision: Installation shall be under the direct supervision of a Registered Technician, who shall be present at all times when Work of this Section is performed at Project site.

B. Testing Agency Qualifications: An independent agency, with the experience and capability to conduct the testing indicated, that is a nationally recognized testing laboratory (NRTL) as defined by OSHA in 29 CFR 1910.7.

C. Testing Agency's Field Supervisor: Person currently certified by BICSI as an RCDD to supervise field quality-control testing.

D. Source Limitations: Obtain all products except cables through one source from a single manufacturer.

E. Electrical Components, Devices, and Accessories: Listed and labeled as

defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

F. Comply with NFPA 70, "National Electrical Code."

G. Comply with EIA/TIA Standards, latest editions.

2.1 PRODUCTS

2.2 ACTIVE COMPONENTS

A. Active components are not part of the project scope.

2.3 PASSIVE COMPONENTS

A. UL or third party certified. Provide a complete system of telecommunications cabling and pathway components using star topology and support structures, patch panels, connectors, fiber optic cabling, category 6 cabling, racks, pathways, and space complete with conduits, pull wires, wireways, cable trays, terminal boxes, outlets, cables, junction boxes, telephone cabinets, and telecommunications closets. Fixed cables and pathway systems for telecommunications system shall be UL listed or third party independent testing laboratory certified, and shall comply with NFPA 70.

2.4 PATHWAYS (BACKBONE AND HORIZONTAL)

A. EIA/TIA-569-A. Pathway shall be conduit and cable tray (in telecommunication equipment rooms and telecommunications closets only. Provide grounding and bonding as required by EIA/TIA-607. Cable tray wiring shall comply with NFPA 70.

B. Work Area Pathways

C. Comply with EIA/TIA-569-A. System furniture pathways shall comply with UL 1286.

E Horizontal cabling for open offices shall comply with EIA/TIA TSB-75.

2.5 TELECOMMUNICATIONS CABLING

A. Cabling shall be UL listed for the application and shall comply with EIA TBS-67, EIA/TIA- 568-C and NFPA 70. Provide a labeling system for cabling as required by EIA/TIA-606 and UL 969. Cabling manufactured more than 12 months prior to date of installation shall not be used.

B. Backbone Cabling

1. Backbone Copper (telephone)
   a. ANSI/ICEA S-80-576, EIA/TIA-568-C and UL 444..copper backbone cable shall be solid conductor, 24 AWG. 100 ohm. 100 - pair UTP (Unshielded twisted pair), NFPA 70 CMR rated formed into 25 pair binder groups covered with a gray thermoplastic jacket. NFPA 70 type CMP may be substituted for type CMR. Pair twist lengths and frequency per unit length shall be determined by the manufacturer. A minimum of two conductor twists per foot is required. Color coding shall comply with industry standards for 25 pair cables. Cable shall be third party verified to comply with EIA/TIA requirements.

2. Backbone Optical Fiber
   a. EIA-492AAAA-A, UL 1666, optical fiber cable shall be 50/125
   b. 12-fiber multimode and 6-fiber single mode with a NFPA 70 rating of OFNR. NFPA 70 type OFNP may be substituted for type OFNR. The cable jacket shall be orange.
   c. he cable shall provide a maximum attenuation of 3.5 dB/km @ 850 nm and
      F. 1.0 dB/km @ 1300 nm. The bandwidth of the cable shall be 160 MHz-km @ 850 nm and 500 MHz-km @ 1300 nm.

C. Horizontal Cabling

1. Comply with NFPA 70, NEMA WC 63.1, ANSI/ICEA S-80-576, EIA TSB-67 and performance characteristics in EIA/TIA-568-C.
2. Cable length maximum is 90 meters (295 feet) for UTP Level 6 from the horizontal cross-connect
3. To the outlet/connector and 20 feet for patch cords and cross-connect jumpers in the horizontal cross-connect.
4. In establishing limits on horizontal cable lengths, a 33 ft. allowance was made for combined length of patch cables and cables used to connect equipment in the work area and telecommunications closet. All equipment cables should meet or exceed the same performance requirements as the patch cords.
5. The 20 ft. maximum length specified for patch cables does not include additional cable lengths needed to connect to active equipment. For example, if 3m (10 ft.) of cable is used for each work area connection, the 33 ft. total allowance provides for up to 23 ft. of combined length per channel for patch cables and equipment cables in the telecommunications closet.

D. Horizontal Copper

1. UTP (unshielded twisted pair), 100 ohm. Provide for each individually twisted pair, 24 AWG conductors, NFPA 70 CMG

rated, with a blue PVC jacket. NFPA 70 type CMP or CMR may be substituted for type CMG. Individual pairs shall be constructed to contain a minimum two twists per foot per each pair. Overall diameter of four pair cable shall not exceed .25 inches. Ultimate breaking strength shall be minimum 40.82 kg 90 pounds. Four pair cable shall withstand a bend radius of one inch minimum at a temperature of minus 20 degrees C maximum without jacket or insulation cracking. Conductors shall be color coded and polarized in accordance with EIA/TIA-568-C. Horizontal cabling in open offices shall comply with EIA/TIA TSB-75.

2. Category 6 UTP,UL listed and third party verified to comply with EIA/TIA-568-C
   G. Category 6 requirements.
3. Category 3 UTP shall be third party verified to comply with EIA/TIA-568-C Category 3 requirements.

2.6 DISTRIBUTION FRAMES

A. Provide building distribution frames (BDFs), intermediate distribution frames (IDFs), and main distribution frames (MDFs) as shown on design drawings for terminating and cross connecting permanent cabling.

B. Equipment Support Frame

1. EIA 310-D.

C. Racks, floor mounted modular type. 16-gauge steel construction treated to resist corrosion. Provide rack with vertical and horizontal cable management channels, top and bottom cable troughs, grounding lug and a surge protected power strip with 6 duplex 20 amp receptacles. Rack shall be compatible with 19 inches panel mounting. Provide Chatsworth or approved equal.

D. Building Protector Assemblies

1. Self-contained unit providing a field cable stub factory connected to protector socket blocks to terminate and accept protector modules for 200 pairs of outside cable. Building protector assembly shall have connector blocks for connection to interior cabling at full capacity.

E. Protector Modules

1. UL 497, RUS TECM 823, solid state type rated for the application. Provide the number of surge protector modules equal to the number of pairs of exterior cable of the building protector assembly. Provide Panamax or approved equal.

F. Connector Blocks

1. Insulation displacement Type 110 for Category 6 and higher systems. Provide blocks for the number of horizontal and backbone cables terminated on the block plus 25 percent spare.

G. Patch Panels

1. Provide ports for the number of horizontal and backbone cables terminated on the panel plus 25 percent spare. Provide pre-connectorized Optical fiber and copper patch cords for patch panels. Provide patch cords with connectors specified. Patch cords shall meet minimum performance requirements specified in EIA/TIA-568-C for cables and hardware specified.
2. Modular to 110 Block Patch Panel
3. Panels shall be amp and shall comply with EIA/TIA-568-C. Panels shall be third party verified and [shall comply with EIA/TIA category 6 requirements. Panels shall be constructed of .09 inch minimum aluminum and shall be compatible with an EIA 19 inch equipment rack. Panel shall provide 48 non-keyed, RJ-45 ports. wired to T568A standards as required. Patch panels shall terminate the building cabling on 110-style insulation displacement connectors and shall utilize a printed circuit board interface The rear of each panel shall have incoming cable strain-relief and routing guides. Panels shall have each port factory numbered and be equipped with laminated plastic nameplates above each port.
4. Fiber Optic Patch Panel
   a. Panel shall be amp. Provide panel for maintenance and cross-connecting of optical fiber cable. Panel shall be constructed of 0.09 inch minimum aluminum and shall be compatible with a 19 inch equipment rack. Each panel shall provide 24 duplex SC multimode adapters. Adapters shall utilize zirconia ceramic alignment sleeves Provide dust cover for all unused adapters. The rear of each panel shall have a cable management tray a minimum of 8 inches deep with removable cover, incoming cable strain-relief and routing guides Panels shall have each adapter factory numbered and be equipped with laminated plastic nameplates above each adapter.

2.7 TELECOMMUNICATIONS OUTLET BOXES

A. Standard type 4 inches square by 2 1/8 inches deep. Mount flush in finished walls at height indicated or as specified for outlet receptacles. Outlet boxes for wall-mounted telephones shall be 2 by 4 by 2 1/8 inches deep, mounted at height as indicated. Depth of boxes shall be large enough to allow manufacturers' recommended conductor bend

radiuses.

2.8 TELECOMMUNICATIONS OUTLET/CONNECTOR ASSEMBLIES:

A. Outlet/Connector Copper

B. Outlet/connectors shall be amp, and shall comply with FCC Part 68.5, and EIA/TIA-568-C. UTP Outlet/connectors shall be UL 1863 listed, non-keyed, 4-pair, constructed of high impact rated thermoplastic housing and shall be third party verified and CAT 6 requirements. Each jack shall be wired T568A. UTP outlet/connectors shall comply with EIA-455-21A for 500mating cycles.

C. Optical Fiber Adapters

1. Optical fiber adapters shall be amp and shall be suitable for duplex SC style connectors. Adapters shall utilize zirconia ceramic alignment sleeves. Provide dust cover for all adapters.

D. Cover Plates

1. Telecommunications cover plates shall comply with UL 514C, and; oversized design constructed of 302 stainless material. Stenciled lettering for voice and data circuits shall be provided using thermal ink transfer process.

E. Optical Fiber Connectors

1. Connectors shall be amp and shall comply with EIA-455-21A. Optical fiber connectors shall be Type "ST". The connectors shall provide a maximum attenuation of .3 dB @ 1300 nm with less than a 0.2 dB change after 500 mating cycles.

2.9 BACKBOARDS:

A. Provide void-free, fire rated interior grade plywood 19 mm ¾ inch thick [4 by 8 feet] [as indicated]. Backboards shall be painted with a gray, nonconductive fire-resistant overcoat. Do not cover the fire stamp on the backboard.

2.10 GROUNDING AND BONDING PRODUCTS:

A. Comply with UL 467, EIA/TIA-607, and NFPA 70. Components shall be

B. Identified as required by EIA/TIA-606.

2.11 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the

following requirements apply to product selection:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, manufacturers specified.

2. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

I.

2.12 SYSTEM REQUIREMENTS

A. Coordinate the features of materials and equipment so they form an integrated system. Match components and interconnections for optimum future performance.

B. Expansion Capability: Unless otherwise indicated, provide spare fibers and conductor pairs in cables, positions in cross-connect and patch panels, and terminal strips to accommodate 20 percent future increase in the number of workstations shown on Drawings. This expansion requirement does not apply to horizontal cable from workstation outlet to first terminal board.

2.13 MOUNTING ELEMENTS

A. Backboards: 3/4-inch, interior-grade, fire-retardant-treated plywood.

B. Distribution Racks: Freestanding and wall-mounting, modular-steel units designed for telecommunications terminal support and coordinated with dimensions of units to be supported.
   1. Module Dimension: Width compatible with EIA 310 standard 19-inch panel mounting.
   2. Finish: Baked-polyester powder coat.

C. Power Strips: For mounting in the racks, with (21) NEMA 5-20R and (6) L6-20R equivalent to APC zero U 5.7KW 120/208V.:
   1. LED indicator lights for power and protection status.
   2. LED indicator lights for reverse polarity and open outlet ground.
   3. Circuit breaker and thermal fusing. When protection is lost, circuit opens and cannot be reset.
   4. Close-coupled, direct plug-in line cord.
   5. Rocker-type on-off switch, illuminated when in on position.
   6. Peak Single-Impulse Surge Current Rating: 33 kA per phase.
   7. Protection modes shall be line-to-neutral, line-to-ground, and neutral-to-ground. UL 1449 clamping voltage for all 3 modes shall be not more than 330 V.
   8. One RJ11/12C telephone line protector, suitable for modem connection. Maximum clamping voltage 220 peak on pins No. 3 and

No. 4.

D. Floor-Mounting Rack: Steel, freestanding, modular, with vertical and horizontal cable management channels, top and bottom cable troughs, and grounding lug.

E. Cabinets: Steel, freestanding, modular, with removable and lockable side panels, front and rear doors, ventilation openings in rear door and top panel, and the following components:
   1. Provisions for a roof-mounted ventilation fan.
   2. 250-cfm roof-mounted ventilation fan.
   3. Key all locks alike.

2.14 UNSHIELDED TWISTED-PAIR CABLING

A. 100-Ohm UTP: Comply with UL 444.

B. Backbone Copper Cable:
   1. No. 24 AWG, 25 pair.
   2. Category 3
   3. NFPA 70, type CMR complying with UL 1666.
   4. Cable Jacket Color: Gray.

C. Horizontal Copper Cable:
   1. No. 24 AWG, 100 ohm, four pair.
   2. Comply with TIA/EIA-568-C, Category 6
   3. NFPA 70, types CMG and CMP.
   4. Cable Jacket Color: Blue.

D. Cable Connecting Hardware. Comply with TIA/EIA-568-C. IDC type, using modules designed for punch-down caps or tools.
   1 IDC Terminal Block Modules: Integral with connector bodies, including plugs and jacks where indicated.
   2. IDC Connecting Hardware: Consistent throughout Project.
   3. Cross-Connect Panel: Modular array of IDC terminal blocks arranged to terminate building cables and permit interconnection between cables.
   4. Number of Terminals per Field: One for each conductor in assigned cables plus 25 percent spare.

H. Patch Panel: Comply with TIA/EIA-568-C, meeting or exceeding cable performance. Modular panels housing multiple-numbered jack units with IDC-type connectors at each jack for permanent termination of pair groups of installed cables.
   1. Number of Jacks per Field: One for each four-pair conductor group of indicated cables, plus spares and blank positions adequate to satisfy specified expansion criteria.

I. Jacks and Jack Assemblies: Modular, color-coded, RJ-45 receptacle units with integral IDC-type terminals. Use non-keyed jacks for data service.

J. Patch Cords: Factory-made, four-pair cables in 48-inch lengths; terminated with RJ-45 plug at each end. Use non-keyed plugs for data service.

2.15 FIBER-OPTIC CABLING

A. Fiber-Optic Cable: 50/125-micrometer, multimode optical fiber.

B. Building Service Fiber Cable: 24 fibers.
   1. Comply with TIA/EIA-492AAAA, tight buffer.
   2. NFPA 70, Type OFN complying with UL 1666.
   3. Maximum Attenuation: 3 dB/km at 850 nm; 1 dB/km at 1300 nm.
   4. Minimum Modal Bandwidth: 160 MHz-km at 850 nm; 500 MHz-km at 1300 nm.
   5. Cable Jacket Color: Orange.

C. Backbone Fiber Cable: Six fibers.
   1. Comply with TIA/EIA-492AAAA, tight buffer.
   2. NFPA 70, Types OFN and OFNP
   3. Maximum Attenuation: 3 dB/km at 850 nm; 1.0 dB/km at 1300 nm.
   4. Minimum Modal Bandwidth: 160 MHz-km at 850 nm; 500 MHz-km at 1300 nm.
   5. Cable Jacket Color: Orange.

D. Cross-Connect and Patch Panels: Modular panels housing multiple-numbered, duplex cable connectors.
   1. Number of Connectors per Field: One for each fiber of cable or cables assigned to field, plus spares and blank positions adequate to satisfy specified expansion criteria.

E. Patch Cords: Factory-made, dual fiber cables in 36-inch lengths.

F. Cable Connecting Hardware:
   1. Comply with TIA/EIA-568-C.
   2. Quick-connect, simplex- and duplex-Type SC couplers. Insertion loss not more than 0.7 dB.
   3. Type SFF connectors may be used in termination racks, panels, and equipment packages.

2.16 COAXIAL CABLE

A. Cable Characteristics: Broadband type, recommended by cable manufacturer specifically for broadband data transmission applications. Coaxial cable and accessories shall have 75-ohm nominal impedance with a return loss of 20 dB maximum from 7 to 806 MHz, and shall be listed to comply with NFPA 70, Articles 810 and 820.

B. RG-11/U: No. 14 AWG, solid, copper-covered steel conductor; gas-injected, foam-PE insulation. Double shielded with 100 percent aluminum polyester tape and 60 percent aluminum braid. Jacketed with sunlight-resistant black PVC or PE. Suitable for outdoor installations in ambient temperatures ranging from minus 40 to plus 85 deg C; NFPA 70, Type CATV.

C. RG-6/U: No. 16 AWG, solid, copper-covered steel conductor; gas-injected, foam-PE insulation. Double shielded with 100 percent aluminum-foil shield and 60 percent aluminum braid. Jacketed with black PVC or PE. Suitable for indoor installations; NFPA 70, Type CATV or CM

D. Coaxial-Cable Connectors: Type BNC, 75 ohms. Of three-piece construction, consisting of a crimp-type center tit, sleeve, and main body.

2.17 WORKSTATION OUTLETS

A. Jacks: 100-ohm, balanced, twisted-pair connector, four-pair, modular, RJ-45. Comply with TIA/EIA-568-C.

B. Workstation Outlets: Dual jack-connector assemblies mounted in single or multigang faceplate.
   1. Faceplate: High-impact plastic; color as selected by Architect.
   2. Mounting: Flush, unless otherwise indicated.
   3. Legend: Machine-printed, adhesive tape label identifying the circuit

2.18 BACKBOARDS

A. A-C, void-free plywood, 84 inches high and 3/4-inch thick, fire rated.

2.19 GROUNDING AND BONDING

A. Materials: Comply with NFPA 70, TIA/EIA-607, and UL 467

2.20 IDENTIFICATION PRODUCTS

A. Comply with TIA/EIA-606-A and with applicable requirements in Division 16 Section "Electrical Identification."

B. Cable Labels: Self-adhesive vinyl or vinyl-cloth wraparound tape markers, machine printed with alphanumeric cable designations.

C. Computer-based cable management system, with integrated database and graphic capabilities.

   1. Document physical characteristics by recording the network, TIA/EIA details, and connections between equipment and cable.

2. Information shall be presented in database view, schematic plans, or technical drawings. AutoCAD drawing software shall be used as drawing and schematic plans software.
3. System shall interface with the following testing and recording devices:
   a. Direct upload tests from circuit testing instrument into the PC.
   b. Direct download circuit labeling into labeling printer.

2.21 SOURCE QUALITY CONTROL

A. Coaxial Cable: Each cable spool sweep tested at the factory before shipping at frequencies from 5 MHz to 1 GHz. Sweep test shall test frequency response, or attenuation over frequency, of a cable by generating a voltage whose frequency is varied through specified frequency range and graphing the results.

B. Fiber-Optic Cable: Each cable spool tested at factory before shipping at 850 and 1300 nm. Test and inspect all equipment according to BICSI and North Carolina STS 1000 Guidelines.

C. UTP Cable Verification of Performance: Test every cable package or reel at factory to verify that cable complies with TIA/EIA-568-C requirements.

3.1 EXECUTION

3.2 INSTALLATION STANDARDS

A. Comply with BICSI TCI, TIA/EIA-568-C and TIA/EIA-569-A.

3.3 EXAMINATION

A. Examine pathway elements intended for cables.
   1. Verify proposed routes of pathways. Check raceways, cable trays, and other elements for compliance with space allocations, clearances, installation tolerances, hazards to cable installation, and other conditions affecting installation.
   2 Verify that cabling can be installed complying with EMI clearance requirements.

B. Prepare wall penetrations and verify that penetrations of rated fire walls are made using products labeled for type of wall penetrated.
   1. Identify plan to support cables and raceways in suspended ceilings. Verify weight of individual types and sizes of cables. Verify that load capacity of cable support structures is adequate for each pathway.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.4 APPLICATION OF MEDIA

A. Backbone Cable for Data Service: Use fiber-optic cable for runs between equipment rooms and wiring closets and for runs between wiring closets.

B. Backbone Cable for Voice Service: Use UTP Category 3 cable for runs between equipment rooms and wiring closets and for runs between wiring closets.

C. Horizontal Cable for Data Service: Use UTP Category 6 cable for runs between wiring closets and workstation outlets.

D. Horizontal Cable for Voice Service: Use UTP Category 6 cable for runs between wiring closets and workstation outlets.

3.5 INSTALLATION

A Comply with NECA 1.

B. Wiring Method: Install cables in raceway and cable tray except within consoles, cabinets, desks, and counters. Conceal raceway and wiring except in unfinished spaces. Cable trays are specified in Division 16 Section "Cable Trays." Raceways and boxes are specified in Division 16 Section "Raceways and Boxes."

C. Cable Installation:

1. Install exposed cables within Telecom Rooms parallel and perpendicular to surfaces or exposed structural members and follow surface contours where possible.
2. Make splices, taps, and terminations only at indicated outlets, terminals, and cross-connect and patch panels.
3. Pulling Cable: Do not exceed manufacturer's written recommended pulling tensions. Do not install bruised, kinked, scored, deformed, or abraded cable. Do not splice cable between termination, tap, or junction points. Remove and discard cable if damaged during installation and replace it with new cable.
4. Cold-Weather Installation: Bring cable to room temperature before dereeling. Heat lamps shall not be used for heating.
5. Secure and support cables at intervals not exceeding 30 inches and not more than 6 inches from cabinets, boxes, fittings, outlets, racks, frames, and terminals within Telecom Rooms.
6. Install UTP cables using techniques, practices, and methods that are consistent with Category 6 rating of components and that ensure Category 6 performance of completed and linked signal paths, end to end.

a. Do not untwist more than 1/4 inch of Categories 6 cables at connector terminations.

7. Outdoor Coaxial Cable:
   a. Outdoor connections shall be installed in enclosures complying with NEMA 250, Type 4X. Connectors shall be corrosion resistant with properly designed O-rings to keep out moisture.
   b. Attach antenna lead-in cable to support structure at intervals not exceeding 36 inches.

D. Wiring within Wiring Closets and Enclosures:

1. Install plywood backboards on walls of equipment rooms and wiring closets from floor to ceiling.
2. Mount patch panels, terminal strips, and other connecting hardware on backboards, wall-mounted racks, floor-mounted racks, and cabinets as shown on drawings.
3. Group connecting hardware for cables into separate logical fields.
4. Train conductors to terminal points with no excess.
5. Use lacing bars to restrain cables, to prevent straining connections, and to prevent bending cables to smaller radii than minimums recommended by manufacturer.

E. Separation from EMI Sources: Comply with BICSI TDM and TIA/EIA-569-A recommendations for separating unshielded copper voice and data communication cable from potential EMI sources, including electrical power lines and equipment. Comply with the following minimum separation distances from possible sources of EMI:

1. Separation between unshielded power lines or electrical equipment in proximity to open cables or cables in nonmetallic raceways is as follows:
   a Electrical Equipment Rating Less Than 2 kVA: 5 inches.
   b Electrical Equipment Rating between 2 and 5 kVA: 12 inches.
   c. Electrical Equipment Rating More Than 5 kVA: 24 inches.
2. Separation between unshielded power lines or electrical equipment in proximity to cables in grounded metallic raceways is as follows:
   a. Electrical Equipment Rating Less Than 2 kVA: 2-1/2 inches.
   b. Electrical Equipment Rating between 2 and 5 kVA: 6 inches.
   c. Electrical Equipment Rating More Than 5 kVA: 12 inches.
3. Separation between power lines and electrical equipment located in grounded metallic conduits or enclosures in proximity to cables in grounded metallic raceways is as follows:
   a Electrical Equipment Rating Less Than 2 kVA: No requirement.
   b. Electrical Equipment Rating between 2 and 5 kVA: 3 inches.
   c Electrical Equipment Rating More Than 5 kVA: 6 inches.

4. Electrical Motors and Transformers, 5 kVA or HP and Larger: 48 inches.
5. Fluorescent Fixtures: 5 inches.

F. Conduit:
1. Comply with TIA/EIA-569-A for maximum length of conduit and bends between pull points, and for pull-box sizing.
2. Use manufactured conduit sweeps and long-radius ells whenever possible.
3. In telecommunications rooms, position conduit ends adjacent to a corner on backboard (in case of a single piece of plywood) or in the corner of room (where multiple sheets of plywood are installed around perimeter walls of room). Use cable trays to route cables if conduits cannot be located in these positions. Secure conduits to backboard when entering room from overhead. Extend conduits 1 to 3 inches in finished floor.

G Backboards: Install plywood with 84-inch dimension from floor up toward ceiling. Butt adjacent sheets tightly, and form smooth gap-free corners.

H. Telecommunications cabling and pathway systems, including the horizontal and backbone cable, pathway systems, telecommunications outlet/connector assemblies, and associated hardware shall be installed in accordance with EIA/TIA-568-C, EIA/TIA- 569-A, NFPA 70, and UL standards as applicable. Cabling shall be connected in a star topology network. Metal raceway bases, covers, and dividers shall be bonded and grounded in accordance with EIA/TIA-607. Telecommunications cabling and pathways with copper media shall be installed in accordance with the following criteria to avoid potential electromagnetic interference between power and telecommunications equipment. The interference ceiling shall not exceed 3.0 volts per meter measured over the usable bandwidth of the telecommunications cabling Pathways shall be installed in accordance with the following minimum clearance distances of 4 feet from motors, generators, frequency converters, transformers, or uninterruptible power system, 12 in from power conduits and cable systems. 5 inches from fluorescent or high frequency lighting system fixtures.

I. Cabling
Install Category 3 UTP, Category 6 UTP, and optical fiber telecommunications cabling and pathway system as detailed in EIA/TIA-568-CB. Screw terminals shall not be used except where specifically

indicated on plans. Use an approved insulation displacement connection (IDC) tool kit for copper cable terminations. Do not untwist Category 6 UTP cables more than one half inch from the point of termination to maintain cable geometry. Provide service loop on each end of the cable, 10 ft. in the telecommunications closet, [3.3 ft in the work area outlet for optical fiber and] 12 inches for UTP. Do not exceed manufacturers' cable pull tensions for copper and optical fiber cables. Provide a device to monitor cable pull tensions. Do not exceed 25 pounds pull tension for four pair copper cables. Do not chafe or damage outer jacket materials. Use only lubricants approved by cable manufacturer. Do not over cinch cables, or crush cables with staples. For UTP cable bend radii shall not be less than four times the cable diameter.

J. Open Cable

1. Use only where specifically indicated on plans for use in cable trays (in equipment and telecommunications rooms only). Comply with EIA/TIA-568-C. Do not exceed cable pull tensions recommended by the manufacturer.

2. Plenum cable shall be used where open cables are routed through plenum areas. Plenum cables shall comply with flammability plenum requirements of NFPA 70 and shall comply with UL 910.

K. Backbone Cable

1. Optical fiber Backbone Cable. Install backbone optical fiber in indicated pathways. Do not exceed manufacturer's recommended bending radii and pull tension.
2. Prepare cable for pulling by cutting outer jacket 10 inches leaving strength members together and attach to pulling eye.

L. Horizontal Cabling

1. All telecommunications workstation cabling will be installed in minimum 1" conduit homeruns continuous from workstation to cable tray room.

M. Pathway Installations

1. Comply with EIA/TIA-569-A. Conceal conduit under floor slabs and within finished walls, ceilings, and floors. Keep conduit minimum 6 inches away from parallel runs of electrical power equipment, flues, steam, and hot water pipes.
2. Install conduit parallel with or at right angles to ceilings, walls, and structural members where located above accessible ceilings and

where conduit is visible after completion of project. Run conduits in crawl spaces and under floor slabs as if exposed.

3. Install no more than two 90 degree bends for a single horizontal cable run.

N. Conduit Installed Under Floor Slabs

1. Conduits shall be 1" minimum. Conduit shall be located a minimum of 6 inches below the vapor barrier. Seal around conduits at penetrations through vapor barrier.

O. Service Entrance Conduit, Underground

1 PVC Type EPC-40. Underground portion shall be encased in minimum of 3 inches of concrete extending from the building entrance to 5 feet out from the building and shall be a minimum of 24 inches below slab or grade.

P. Cable Tray Installation

1. Install cable tray components in accordance with EIA/TIA-569-A. Only CMP and OFNP type cable shall be installed in a plenum.

Q. Work Area Outlets

1 Terminate UTP cable in accordance with EIA/TIA-568-C and wiring configuration as specified.

R. Telecommunications Closet Termination

1. Install termination hardware required for Category 6 and Optical fiber system. An insulation displacement tool shall be used for terminating copper cable to insulation displacement connectors.

S. Labeling

1. Each work area is labeled with a unique identifying number. A consistent labeling and numbering scheme shall be used. The labeling shall be clearly legible on the outlet face and the termination end. The numbering plan should identify the source and destination of the cable for horizontal runs.
2. A sample numbering plan is: 208A-A1/241B
   a Where 208 is the telecommunications closet room #:
   b "A" is the patch panel identification,
   c. "A1" is the "A" Block and the first position,
   d "241" is the workstation room #,
   e. and "B" is the workspace of the user in room 241.

T. Horizontal cable shall be labeled at the workstation end and the cross-connect end. Backbone cables (whether riser or horizontal) shall have an

identifying number that is labeled at each end Labels shall be the same color on each end. Performance documentation must use the same labeling scheme.

U Color Coding

TERMINATION TYPE	COLOR	COMMENTS
Demarcation Point	Orange	Central Office Terminations
Network Connection Circuits	Green	Network Connections or auxiliary circuits
Common Equipment	Purple	Used for all major switching PBX, host. LANs & data
First level Backbone	White	Main cross-connect to intermediate cross-connect
.	Gray	Intermediate cross-connect to
Station	Blue	Horizontal cable terminations
Interbuilding	Brown	Campus cable terminations
Key Systems	Red	Key Telephone Systems
Miscellaneous	Yellow	Auxiliary maintenance alarms

V. Equipment Support Frames

1. Install in accordance with EIA/TIA-569-A.
2. Racks. floor mounted modular type. Permanently anchor rack to the floor per manufacturer's recommendations.

W. Electrical Penetrations

1. Seal openings around electrical penetrations through fire resistance-rated wall, partitions, floors. or ceiling in accordance with UL Fire-stopping details.

X. Grounding and Bonding

1. In accordance with EIA/TIA-607, and NFPA 70.

3.6 GROUNDING

A. Comply with Division 16 Section "Grounding and Bonding" and with TIA/EIA 607.

B. Grounding Points:

1. Locate grounding terminals in each equipment room, wiring closet,

rack, and cabinet.

2. Telecommunications Grounding Bus bars: Mount on wall of telecommunications entrance facility, equipment room, and closet with standoff insulators.

C. Bonding Conductors:

1. Extend from telecommunications entrance facility to electrical entrance facility and connect to grounding electrode.
2. Where a panelboard for telecommunications is located in same room or space as a grounding bus bar, bond to equipment ground bus of electrical panelboard.
3. Extend from telecommunications entrance facility to grounding bus bars.
4. Extend from grounding bus bars to ground terminals in equipment racks and cabinets.
5. Extend from grounding bus bars to building metal frame within room, or to metal frame external to room but readily accessible.

D. Special Requirements:

1. Bonding conductors shall be insulated copper, No. 6 AWG minimum.
2. Install only in nonmetallic conduit, unless specifically required for protection of conductor. Metallic conduit, if used, shall be RMC. For RMC that exceeds 36 inches in length, conductors shall be bonded at each end of conduit.
3. Bonding conductors shall be installed without splices unless approved by Owner because of special circumstances. Where splices are necessary, they shall be accessible and shall be located in telecommunications spaces. Splices shall be by irreversible compression connectors or by exothermic welding.

3.7 IDENTIFICATION

A. In addition to requirements in this Article, comply with TIA/EIA -606-A and with applicable requirements in Division 16 Section "Electrical Identification"

1. Color-code cross-connect fields. Apply colors to voice and data service backboards, connections, covers, and labels

B. Using cable and asset management software specified in Part 2, develop Cabling Administration Drawings for system identification, testing, and management. Use unique alphanumeric designation for each cable, and label cable, jacks, connectors, and terminals to which it connects with same designation. Use logical and systematic designations for facility's architectural arrangement. At completion, cable and asset management software shall reflect as-built conditions.

C. Use logical and systematic designations for facility's architectural arrangement and nomenclature, and a consistent color-coded identification of individual conductors.

D. Cable and Wire Identification

1. Label each cable within 4 inches of each termination and tap, where it is accessible in a cabinet or junction or outlet box, and elsewhere as indicated.
2. Each wire connected to building-mounted devices is not required to be numbered at device if color of wire is consistent with associated wire connected and numbered within panel or cabinet.
3. Exposed Cables and Cables in Cable Trays and Wire Troughs: Label each cable at intervals not exceeding 15 feet.
4. Label each terminal strip and screw terminal in each cabinet, rack or panel
   a. All wiring conductors connected to terminal strips shall be individually numbered, and each cable or wiring group being extended from a panel or cabinet to a building-mounted device shall be identified with name and number of particular device as shown.
   b. Label each unit and field within distribution racks and frames
5. Within Connector Fields in Equipment Rooms and Wiring Closets: Label each connector and each discrete unit of cable-terminating and connecting hardware. Where similar jacks and plugs are used for both voice and data communication cabling, use a different color for jacks and plugs of each service.
6. At Workstations: Attach label to device plate.

E. Cable Schedule: Post in prominent location in each equipment room and wiring closet. Incoming and outgoing cables and their designations, origins, and destinations. Protect rigid frame and clear plastic cover. Furnish an electronic copy of final comprehensive schedules for Project.

F. Cabling Administration Drawings: Show building floor plans with cable administration- point labeling. Identify labeling convention and show labels for telecommunications closets, backbone pathways and cables, entrance pathways and cables, terminal hardware and positions, horizontal cables, work areas and workstation terminal positions, grounding buses and pathways, and equipment grounding conductors. Follow convention of TIA/EIA-606-A. Furnish electronic record of all drawings, in software and format selected by Owner.

3.8 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing and inspecting agency to

perform field tests and inspections and prepare test reports.

B. Category 6 UTP Cabling tests:

1. Test instruments shall meet or exceed applicable requirements in TIA/EIA-568-C. Perform tests with a tester that complies with performance requirements in Annex I, complying with measurement accuracy specified in Annex H. Use only test cords and adapters that are qualified by test equipment manufacturer for channel or link test configuration.
2. Visually inspect cable placement, cable termination, grounding and bonding, equipment and patch cords, and labeling of all components.
3. Wire-map test that reports open circuits, short circuits, crossed pairs, reversed pairs, spl pairs, and improper terminations.
4. Channel and permanent link tests for cable lengths, insertion loss, near-end crosstalk loss, power sum near-end crosstalk loss, equal-level far-end crosstalk loss, power sum equal-level far-end crosstalk, return loss, propagation delay, and delay skew. Performance shall comply with minimum criteria in TIA/EIA-568-C.

C. Fiber-Optic Cable Tests:

1. Test instruments shall meet or exceed applicable requirements in TIA/EIA-568-C. Use only test cords and adapters that are qualified by test equipment manufacturer for channel or link test configuration.
2. Visually inspect cable placement, cable termination, grounding and bonding, equipment and patch cords, and labeling of all components.
3. Link End-to-End Attenuation Tests:
   a. Horizontal and multimode backbone link measurements: Test at 850 or 1300 nm in 1 direction according to TIA/EIA-526-14-A, Method B, One Reference Jumper.
   b. Attenuation test results for horizontal links shall be less than 2.0dB. Attenuation test results shall be less than that calculated according to equation in TIA/EIA-568-C.

D. Data for each measurement shall be documented. Data for submittals shall be printed in a summary report that is formatted similar to Table 10.1 in BICSI TDM, or transferred from the instrument to the computer, saved as text files, and printed and submitted.

E. Remove and replace cabling where test results indicate that they do not comply with specified requirements.

F. Retest and inspect cabling to determine compliance of replaced or additional work with specified requirements.

3.9 DEMONSTRATION

A. Train Owner's maintenance personnel in cable-plant management

operations, including changing signal pathways for different workstations, rerouting signals in failed cables, and keeping records of cabling assignments with revisions when extending wiring to establish new workstation outlets. Refer to Division 1 Section "Demonstration and Training".

3.10 TESTING

A. Telecommunications Cabling Testing

B. UTP Testing

C. All cable pairs must be tested for the following conditions:
   1. Polarity
   2. Reversal of pairs
   3. Wire transpositions
   4. Continuity
   5. Opens
   6. Shorts
   7. AC and DC foreign voltages
   8. Level 5 NEXT End to End from Faceplte through 110 connecting block and/or patch panel and jumper.
   9. TIA/EIA-568-C wiring discrepancies

D. All test data will be documented and provided to the using agency at the time of acceptance.

E. Fiber Optic Testing

3.11 SYSTEM TESTING

A. Upon completion of the passive optical cable system, the system must be tested to ensure compliance with the design and link loss specifications. The single most important test is end-to-end attenuation test that measures the optical power loss between cable termination points. The attenuation of a system at one wavelength is not necessarily related to the attenuation at the other, except for the short links such as horizontal cabling. The best way to verify the cabling meets the loss limit is to measure each segment between patch panels. Because of the stress and bending that cables undergo during installation, measurement of the attenuation of each link with connectors in place is required after installation.

B. The tests include:

   1. Power meter tests – For building risers, power meter tests are

required. Disregard optical time-domain reflectometer (OTDR) testing runs for less than 2 kilometers testing of end-to-end attenuation on each fiber span at both operational; wavelengths.

2. 850/1300 nm (nanometers) wavelength for multimode fiber
3. 1310 nm wavelength for single mode fiber

C Testing in one direction is required. Test results should be retained for inclusion into the documentation package.

D. Optical Time Domain Reflectometer (OTDR) Signature Traces of each terminated fiber should be recorded at 850 nm and 1310nm for fiber continuity purposed. OTDR testing is mandatory for runs longer than 2 kilometers.

E. A Final Report should be compiled that records system configuration, fiber labels, cable routes and "as built" details. Loss measurement and OTDR traces should be included.

F Inspection

1. Visually inspect cabling jacket materials for UL or third party certification markings.

J Visually inspect UTP and optical fiber jacket materials for UL or third party certification markings. Inspect cabling terminations in telecommunications rooms and at workstations to confirm color code for tip and ring assignments, and inspect cabling connections to confirm compliance with EIA/TIA-568-C. Visually confirm Category marking of outlets, wallplates, outlet/connectors, and patch panels.

G. Verification Tests

1. During installation of cabling systems, perform optical fiber end to end attenuation tests using an optical time domain reflectometer (OTDR) and manufacturer's recommended test procedures. Perform tests in accordance with EIA/TIA-526-14, Method B for horizontal, multimode optical fiber and EIA/TIA-526-7, Method B for backbone, single mode optical fiber. Perform verification acceptance tests and factory reel tests.

H. Final Verification Tests

1. After the complete telecommunications cabling and workstation outlet/ connectors are installed, perform verification tests for UTP and optical fiber systems These tests assume that dial tone service

has been installed. Connect to the network interface device at the demarcation point. Do off-hook and listen and receive a dial tone.... If a test number is available, make and receive a local, long distance, and DSN telephone call

SECTION 16720
SECURITY SYSTEMS

1.1 GENERAL

1.2 GENERAL DESCRIPTION

A. The security systems to be proposed to the Owner shall be capable of integrating, interfacing and/or operating with other systems.

B. This section covers the provision of the security systems including all items and subsystems shown on drawings or otherwise required by this specification.

1. Security systems computer hardware, software, and control panels for access control and alarm management
2. Card readers and other security input/output devices for access control and alarm monitoring of secured areas
3. Photo Identification Production
4. Interface with Vehicle Access and/or Parking Gate Operators
5. Video Surveillance System
6. Communication Equipment and Network Hardware
7. Fiber Optic Transmission Equipment, Fiber Optic Cable, and other required cable
8. Security Console and/or Racking Equipment

1.3 SCOPE OF WORK

A. The Security Contractor shall include all necessary wiring, cabling, labor, tools, equipment, and ancillary materials required to furnish and install a complete and operational security system.

B. Requirements are indicated elsewhere in this specification for work including, but not limited to:

1. Conduit, 220 VAC power extensions, and other electrical work shall be furnished and installed by the Contractor. Security Contractor shall coordinate with other trades to ensure the needed infrastructure is in place.
2. Electronic door hardware, electronic latch retraction egress devices and any associated power supplies at card reader doors shall be furnished and installed by the Door Contractor.
3. The Contractor shall provide local area network (LAN) connections as shown on the attached drawings for security systems.
4. The Security Contractor shall coordinate with the Owner for external local area network (LAN) connections as shown on the attached drawings for security systems.

C. The security systems shall provide management, control, and monitoring of card access and alarms.

D. The extent of security systems work is defined to include but not limited to

the following.

1. The security systems database and application host server shall be installed in the Main Server / Data Center that is shown in the Drawings. The space requirements and sizing for the room shall be confirmed during Design.
2. The database will be capable of being partitioned to provide for full control by the Owner and local programming and control by the Owner authorized personnel for their defined spaces.
3. Operator workstations (thick clients) shall be installed in the Front Guard Desk, the NIH
4. Director's Office, and the Containment Area security control room.
5. Browser based operator workstation (thin clients) license for up to five (5) users

E Installing the security systems and bringing it to operational status for acceptance shall include but not be limited to the following:

1. Determine hardware, software. and operations requirements for implementation.
2. Install security systems hardware and software.
3. Set up and configure communications between the host server, operator workstations. and control panels.
4. Set up and configure security systems application, database, and partitions.
5. Test security systems operations based on a point-by-point walkthrough inspection.
6. Perform end-user training.

1.4 SUBMITTALS

A Submittals shall ensure that all parties involved can determine that the proposals meet the security systems requirements as desired.

B. Executive Summary System Description: Descriptive statement of the system function and single-line block diagram to show how all related equipment shall interface and operate as complete security systems.

C. Value engineering is encouraged; however any value engineering must be equal to the system specified. The security contractor must make every attempt to meet the original specification or show exceptions with documentation of substitutions supporting any alternate equipment or systems.

D. Bid Pricing shall be submitted in the following forms:

1. Parts list (quantities, manufacturer and part numbers) for all major components.
2. Total price for the entire project.

E. Changes orders, moves, additions: Shall be submitted per general conditions of the Contract. Article 19.

F. Maintenance Agreements and Extended Warranty: refer to Section 1.8 of this document.

G. Product Data: Manufacturer's technical data sheets on each product proposed.

H Shop Drawings: Provide complete shop drawings that include the following:
1. Point-to-Point diagram of all security system device locations on architectural floor plans. No other system(s) shall be included on these plans.
2. Detailed schematic wiring diagrams for all system devices. Wiring information shall include cable type, conductor routings, quantities, and connection details at devices.

I. Manuals: Manufacturer's user's manuals for operations, administration, installation, and maintenance.

J. Software: one set of fully functional security systems software in manufacturer's original media packaging, temporarily licensed for a 30-day evaluation period.

K. Contract Close-Out Submittals:
1. Training Course Materials: Stated elsewhere in this document.
2. Commissioning Test Plan and Check-Off List: Stated elsewhere in this document.

L. As-Built Drawings: During system installation, the Security Contractor shall maintain a separate hard copy set of drawings, elementary diagrams, and wiring diagrams of the security systems to be used for record drawings This set shall be kept up to date, reflecting all changes and additions made to the security systems. Copies of the final as-built drawings shall be provided to the owner in DWG or DXF format using the latest version of AutoCAD.

1.4 QUALIFICATIONS

A. The Security Contractor shall be regularly engaged in providing security equipment and security related services and shall have been engaged in such work for a period of not less than five (5) years prior to bid submittal.

B. The Security Contractor shall, at the time of the bid, be licensed to perform security work. Security Contractors who have security licenses or permits pending shall not be considered acceptable for bidding on this project.

C. All personnel employed by the Security Contractor shall be registered with the appropriate Philippine licensing board as provided for by professional codes and regulations.

D. Each Security Contractor submitting a bid for this project shall include with his bid a copy of his current alarm system or low voltage license.

E The Security Contractor shall, at the time of the bid, be licensed as an Electrical Contractor in the SP-LV, Limited, Intermediate, or Unlimited, classification.

F Each Security Contractor submitting a bid for this project shall include with his bid a copy of his current Electrical Contractor license as issued by the professional board.

G. The Security Contractor shall, under provisions of Division 1, provide satisfactory evidence of liability insurance and Worker's Compensation coverage for employees as required by law.

H. The Security Contractor shall provide the name and location of three (3) similar projects that would be available for inspection by the Owner or his representative in order to verify the competency of the Security Contractor to perform within the scope of this project.

1.5 WARRANTY AND MAINTENANCE

A The security systems software, hardware, and installation shall be warranted against defects and workmanship for a period not less than 12 months from the date of final acceptance by the owner. The warranty shall cover all parts and labor, after final acceptance by Owner, per general conditions of the Contract, Article 42.

B. The Security Contractor shall guarantee that the security systems application software/firmware remains current at all times with the latest enhancements; supported by the security systems manufacturer with unlimited remote dial-in diagnostics capability and technical phone support.

C. The Security Contractor shall perform manufacturer's recommended preventative maintenance on all applicable components and/or devices during the warranty period.

D. The Security Contractor shall be the primary contact and respondent for all service and support; officially recognized and backed by the security systems manufacturer.

E. Extended and/or out of warranty terms at reasonable and customary rates shall be available from the Security Contractor.

F. The Security Contractor shall provide a separate proposal to the owner, after contract award, for an extended warranty and maintenance service contract.

1. Length of contract 5 years, to begin after the first year warranty

period. The period covered shall be the subsequent years two through six.

2. The service and maintenance contract shall consist of:
   a. A minimum of two (2) quarterly, on-site inspections or as required by manufacturers specifications, whichever is greater. Each inspection to include but not be limited to:
      1) Corrective maintenance and adjustments to restore the system to original operating condition.
      2) All required parts except those that are subject to normal wear or are expendable.
      3) All labor, travel and personnel expense.
   b On-call Service
      1) Submit separate labor costs for "on call" service to include but not be limited to:
         a) In shop service – including labor rates, transportation and shipping expenses.
         b) Non-emergency service (next business day).
         c) Emergency service (4-hour response, 24/7/365).

1.6 DOCUMENT PREPARATION AND CONTROL

A. All design guides, design development documents, construction drawings and record drawings are extremely confidential. Access to these documents shall be restricted to authorized personnel and the Security Contractor. Parties receiving these documents shall take every reasonable precaution to protect these documents from unauthorized access and must sign and non-disclosure agreement.

B. Drawings and documents relating to this project which are no longer required shall be disposed of by complete destruction.

C. Distribution of any section of these guidelines to other persons or companies shall not be made without prior written approval of the Owner or their representative.

1.7 DEFINITIONS

A. 24-Hour Zone is a zone that is always active.

B. Access Control is the method of regulating or restricting personnel movement in an area to those personnel previously authorized to be there

C. Access Control Module (ACM) is the termination point for alarm monitoring and low-voltage power supply cables servicing the building or major area of the building.

D Accessible components or devices are those which are readily available to

unauthorized personnel and which may be vulnerable to tampering or compromise. Components or devices are considered accessible if they are.

1. Located lower than ten feet from the floor on a finished or unfinished wall inside a building.
2. Mounted to the finished surface of a suspended ceiling inside a building.
3. Mounted on the exterior surface of a building.
4. Mounted to any surface or structure outside a building.
5. Note: Components or devices that are located completely inside another locked enclosure or which are normally concealed by building structure are generally considered to be inaccessible.

E. AHJ. or Authorities Having Jurisdiction, is a generic term used for a person or organization that has some form of joint sovereignty. This term is commonly used to refer to local governments, local/state Fire Marshals, or Building Inspectors

F Alarm Point is a connection to an alarm input on the alarm control panel. Alarm points are always normally-closed contact devices (contacts open on alarm). Each alarm point has a unique identity on the panel and may be custom programmed.

G. Anti-Passback is a system designed to prevent or discourage a user from using a card to gain entry and then pass the same card back to another to allow them entry.

H. Arm (also known as Set or Turn On) is a procedure followed by a system user or a remote facility to turn on an alarm system so the system is able to detect the conditions it is designed to protect against.

I Card Access is a method used to provide access control at designated doors.

J. Central Station (CS) is a monitoring facility that is listed by, and operating according to, standards established by UL and or FMRC, and providing installation, maintenance, and support services required for central station alarm systems by UL or FMRC, under the management and responsibility of the monitoring facility.

K. Close is the act of arming a security system.

L. Commercial Power Outage refers to the condition where a reduction of available commercially provided voltage at the load does not permit the equipment to function as designed

M. Contact refers to either a magnetic switch assembly used to detect door status or to a relay output from alarm initiation devices, security control panels or fire alarm control panels.

N. Controllers, access control and alarm inputs. are microprocessor-based, digital technology and distributed intelligence architecture. Controllers collect data from the field devices and provide the information to the file server Controllers operate independently of one another with all-database information stored at the control panel level.

O. Control Panel is the part of a security system that handles control and communication and to which initiating devices are connected. The Control Panel will seize the connected telephone line, dial a predesignated number to connect to the Central Monitoring Station, and transmit signals indicating a status change of the initiating device.

P Closed Circuit, or CCTV, means that the camera image is displayed via a complete or closed path from the camera to a specific display and/or recording device.

Q. Delayed Zone is a zone configured to provide a time delay, when activated, before an alarm is generated.

R. Disarm (also known as Closing or Turning Off) is a procedure followed by a system user to turn off an alarm system so that no alarm signals will be transmitted to the monitoring facility, nor will any audible or visual signal be generated at the alarm system location. If a system is disarmed within a pre-determined time period after a sensor has been triggered (typically referred to as a delay period), it may be possible to abort the alarm and prevent it from being transmitted to the monitoring facility.

S. Door Open Time is the time allowed for a controlled door to remain open after a valid entry. At the expiration of this time, the system records a transaction that may be defined as an alarm. If the alarm bypass relay were used, it would also de-energize at this time.

T. Drop # refers to the room(s) or location(s) housing the RTU, FIP, and associated equipment serving the building or a major area of the building. The security head end equipment generally requires ten (10) feet of unobstructed wall space and a minimum five (5) foot clearance for equipment access. The head end may share space with telecommunications equipment if necessary. The room containing the security head end is always protected with a contact on all doors and accessible openings with some cases having a motion detector or glass break detector as an additional layer detection.

U. Duress is the presence of one or more persons trying to force an individual to enter a facility against the individual's will.

V. Electronic Digital Locks is a method used to provide access control at some doors. Owner uses a stand-alone, fully keypad programmable type for all

applications. The lever set complies with the 1992 Americans with Disability Act and is equipped with key override.

W Electric Strike is electrical device that permits releasing of the door from the strike side of the door by remote control.

X. Embarrassment Alarm is a local door annunciation assembly used to control the use of certain doors by authorized or unauthorized personnel. This assembly includes a local sounder that can be bypassed through the system software.

Y. Emergency Power refers to electrical supply circuits that continue to provide power in the event of a commercial power outage. Emergency power may be supplied by generator or UPS and may be momentarily interrupted during the transition from commercial power to emergency power.

Z. Entry/Exit Zone is a delayed zone on the protected premises. These zones are usually associated with perimeter devices although interior devices or zones may be "followers" to the perimeter devices.

AA Fail-Safe is when, on loss of power, access points automatically electronically unlock, thereby allowing free access. The card access system would automatically be notified of a device malfunction or loss of power. Power is applied constantly to the lock hence the door is unlocked when power is lost. Also known as "fail open". In all cases free egress must be maintained. Doors using Fail Safe mode must be rated for Continuous Duty.

BB Fail Secure is when, on loss of power, access points remain mechanically locked. The card access system would automatically be notified of a device malfunction or loss of power. Provision should be made to allow for manual unlocking of the door hardware by using a key. Power is sent to the lock to unlock and in the event of power failure the door remains locked and requires a manual unlock (override) until the power is restored. In all cases free egress must be maintained.

CC. FIP is a Field Interface Panel that is the termination point (usually a locked enclosure) for copper and fiber optic cable entering and/or leaving a facility. The FIP always requires a dedicated quad receptacle with 115 VAC emergency power, mounted inside the enclosure. The FIP must be tampered (see definition below).

DD. Follower Zone is a non-entry/exit zone, typically an interior zone located on an entry/exit path and is treated as an entry/exit zone during an Entry or Exit delay time.

EE. Homerun cable and conduit must be separate from other cable and conduit runs for their entire length. Devices required being homerun to a FIP or RTU (see definitions) must use a separate conduit system and cable from

each device back to the FIP or RTU. No splices of any kind are permitted in any cable used in a Security System.

FF. Inaccessible components or devices are those that are located completely inside another locked enclosure or which are normally concealed by building structure.

GG. Magnetic Lock is a locking device that consists of a metal plate that is fastened to the door and an electromagnet is attached to the door frame. When the electromagnet is energized, it holds the plate, and by extension, the door to which it is attached, together.

HH. Open is the act of disarming the intrusion system.

II. Partition is a defined area within the security system that can be armed or disarmed independent of the other areas, but is operated under a single system control. (Dedicated or shared user interfaces may be used to operate a system.)

JJ Point is an electronically addressable sensor, sometimes used interchangeably with the term's sensor or device.

KK. Protected indicates the area which requires the greater degree of security or the higher level of restriction. Details of door contacts and other security devices should always indicate which side is the protected side.

LL. Reader is the card access assembly that detects the presence of an access control card presented by an individual and transmits the card data to the associated card access controller.

MM. Request To Exit (REX) is a device that allows egress through an access control door without setting off an alarm by providing input to the access control system authorizing the egress.

NN. Strike is a plate mortised into or mounted on the doorjamb to accept and restrain a bolt when the door is closed. (Also known as a "keeper")

OO. Tampered indicates that the device or enclosure has been provided with a switch which reports to the Owner's Security System as an alarm point Removal or opening of the component will immediately transmit an alarm to security personnel. All equipment enclosures must be tampered.

PP Tamperproof refers to the use of screws or fasteners that cannot be removed with readily available hand tools.

QQ Unprotected indicates the area which requires the lesser degree of security or the lower level of restriction. Details of door contacts and other security devices should always indicate which the unprotected side is.

RR. UPS Power refers to electrical supply circuits that continue to provide power in the event of a commercial power outage. UPS power differs from emergency power in that it is not momentarily interrupted during the transition from commercial power to emergency power.

SS. Zone is a dedicated input to the control panel containing one or more sensor devices which will trip that input upon activation of any one sensor device.

1.8 SITE VISIT

The Security Contractor is advised to visit the site to ascertain for himself the prevailing local conditions there at and to check the existing level of access and security at the NIH. Also, to investigate other pertinent things that may affect his work. It shall be presumed that he had done this before preparing his proposal and no subsequent claim on the ground of inadequate or inaccurate information will be entertained.

2.1 PRODUCTS

2.2 QUALITY ASSURANCE

Where specifications of any type of material or equipment are in question, such materials shall conform to the standard specifications set by the following:

A. U.S. UNDERWRITERS LABORATORIES
B. U.S. NATIONAL BOARD OF FIRE UNDERWRITERS
C. NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION
D. INSULATED POWER CABLE
E. AMERICAN STANDARDS ASSOCIATION
F. BUREAU OF STANDARDS, DEPARTMENT OF TRADE
G. PHILIPPINE NATIONAL STANDARDS

2.3 CARD ACCESS CONTROL SYSTEM

A. The devices described herein are intended to provide a reference for the Card Access/Security System and are to be provided as described in the Contract Documents. The devices shall be housed in a secure location approved by the owner.

B. Certain devices described may not be applicable to all systems. All devices required to complete the installation may not be described but shall be provided as if specifically called for within the Specification. It is the responsibility of the Security Contractor to provide a complete working system.

C. All system components shall be approved for the function they will perform.

D. The system shall be of an open architecture design and shall support

industry standard databases such as Sybase Adaptive Server Anywhere, Microsoft SQL Server, or MSDE.

E. A system server shall provide enterprise wide database services, system programming, system monitoring, administrative services, report, and proximity card generation.

F. A workstation computer shall provide interfacing and control of the local, site specific, Access Control Security System.

G. The System shall be of a distributed database design, using intelligent microprocessor panels, to make smart decisions at the door.

H. The system shall be capable of utilizing a true client server network configured to support the system database service, all panel services and user interfaces optimizing the users' options for system programming, event monitoring and record keeping.

I. The database service shall be ODBC compliant allowing the system to access an existing compatible ODBC compliant database as the system data source. A single system database shall maintain credential holder's records as well as access system information and programming parameters.

J. Provide servers and workstations that at least meet the minimum specifications as outlined by the manufacturer. If the system requires faster computers, it is the responsibility of the security contractor to provide computers that will perform as required and meet the manufacturers' requirements.

K. All security workstations shall have dual monitor cards and two (2) 19" to 21" flat screen displays.

L. Elevator Control

1. The system shall have the ability to provide elevator access control by (1) using a card reader to activate the elevator call button, (2) using a card reader in the cab to activate the correct floor selection button, or (3) a combination of both of these functions. The system shall have special field panels specifically designed to handle inputs and outputs used to interface with the elevator controls.

2. The panels specifically designed for elevator control shall support either a single elevator cab for up to 64 floors, or up to 4 elevator cabs for up to 16 floors each.

3. Each cardholder shall then have floor permissions assigned as part of the normal access rights. The system shall provide outputs to the elevator controls to uniquely verify which floors are authorized for

each cardholder. The system shall be capable of tracking which floor was enabled or selected by that person.

4. Where destination elevators are used, coordinate with the elevator contractor for specific interfaces.

M. High Availability and Disaster Recovery

1. To provide greater client software availability, software shall support the ability so that in the event of a database server failure, client machines will quickly and without operator intervention, automatically connect to a standby server machine.
2. This configuration shall utilize the industry standard Microsoft clustering solution and allows an installation with a large number of client machines the ability to continue to operate without interruption while the cause of the main server failure is investigated.
3. The SMS product must be capable of supporting options for 99.99% and 99.999% availability.
4. The SMS product must support a disaster recovery solution using off-site database replication.

N. Operator Permissions

1. System operators shall be associated with a log in Name and Password. A system option will determine whether strong operator passwords will be used. The minimum definition of a strong password shall be a password that contains at least one upper case character, one lower case character, one numeral and one punctuation mark. with a minimum password length of six characters. Additionally the password cannot contain any full word of the operator's username.
2. The option to use a Secure Biometric or Smart card for system logon shall be provided.

   TT. When used, this option will force the operator to present their Name, Password and Biometric or Smart card.
3. Operators shall be assigned to permission profiles. This will determine the functions

   UU. that will be available to that operator when logged on to the system. Each operator is required to only see the functions for which he or she has access. The system shall support an option to hide Personal Identification Numbers of cardholders when an operator is viewing a record.
4. Card record data entry shall be divided into operator permission areas. allowing separate permission categories to be assigned for the viewing of personal data, ID badge printing and access right management.
5. For all operators, a means of re-arranging their Icon tool bar shall be provided to allow the most frequently used Icons to be repositioned by the operator.

O. Video Imaging and ID Badge Printing

1. The system shall incorporate video imaging as a fully integrated function to customize access control cards by printing an identity badge directly onto the card. The badge design and image capture capabilities shall combine with the latest technology card printers to allow the production of an ID badge pass for each card holder at the time of registration.
2. For each cardholder both a facial image and a signature shall be able to be captured or imported and stored as part of the card record. These images shall be captured from a standard CCTV camera connected to the computer via a Video Card supporting DirectX 8 (or later) or MCI format, or imported if available as a bit map or JPEG file. The system shall use data compression techniques to ensure efficient use of the available hard disk space to maximize the number of images that can be stored on the hard disk.
3. Alternatively a signature may be imported from a signature capture terminal connected to the system via an RS 232 com port of the client PC local to where the card is being issued.
4. A comprehensive integrated badge design facility shall also be provided, allowing an unrestricted number of custom badge layouts to be defined then saved with a suitable description as a reference. This shall make full use of the card record details such as name, card number, and inactive date as well as allowing personal data to be included in the badge design. Company logos shall be imported as bit maps or JPEG images to provide a personalized corporate appearance to the card.
5. All elements incorporated into the design shall be able to be rotated.
6. Each badge design shall contain either a single sided design or a double-sided design. Each side of the card shall also be designated as being blank, or magnetic stripe side, or smart chip side, to ensure the designer is aware of the available space where printing may be incorporated for each card combination. The badge designer function shall be capable of supporting portrait, landscape, standard and custom-sized card designs.
7. When creating a new card record a badge preview screen shall also be included that displays the specific card's details on the selected badge design to allow confirmation prior to requesting the badge to be printed.
8. Each new cardholder record shall have the option to be flagged for future printing. Cards flagged in this manner shall be easily recalled at a later stage and processed for output to the printer in a single action. Selecting multiple cards for bulk printing shall also allow each card to be printed either with its specific badge design, as defined within each card's record, or alternatively printed with a selected common badge design. Encoding of magnetic stripe cards shall also be included as part of the bulk printing process.
9. The SMS shall support any manufacturer's ID badge printer with a Microsoft Windows 2000 or Windows XP (depending on the workstation configuration) compatible printer driver.
10. Each badge design shall include a default printer, validity period, and

access rights.

11. The security contractor shall provide and install complete ID badge creation and printing as part of the base bid.

12. Video Verification

    a. The Video Imaging option shall also provide a monitoring screen that will automatically display the stored image for a card when used at a reader. This screen shall operate in conjunction with a live video input from a CCTV camera viewing the selected access point, allowing the operator to verify that each card offered is in fact being used by the person to whom it was issued.

    b. This screen shall also be frozen and printed to provide a hard copy evidence of any abuse observed by the operator. For high security access points, the system shall be configured to not grant access until the operator has verified the stored and live images are the same person, with the door release being controlled by the system operator.

13. Report Generation

    a. Extensive history reporting shall be a standard integrated feature, and shall include the ability to review all system alarms, access control activity, and operator actions. These reports shall be made available for review via the operator's display screen, or to a printer, or to another disk media. Extensive sort parameters shall include by any of the "Personal Details" fields or Titles, for example by "Department", and only Names commencing with "SM*".

    b. The system shall support generation of reports detailing the system operation.
       The following reports shall be available in the software:
       1) Cards on site
       2) Hours on site
       3) Cardholders with access to each door
       4) Access rights of each cardholder
       5) System Configuration
       6) Scheduled and Conditional Commands defined
       7) System operator transaction history

2.4 CARD READERS

A. Provide a contactless smart card reader that will read the secure sector of a smart card presented for access.

B. The reader shall have a minimum read range of one to three inches of a type technology system that complies with UL 294 standards and is certified as complying by Underwriters' Laboratories.

C. Shall be an indoor/outdoor wall switch or mullion mounted contactless smart card reader providing a Wiegand output.

   1. Shall mount in a door entry panel electrical box and shall be powered directly from the panel.

2 The reader shall be sealed in a rugged, weatherized enclosure designed to withstand harsh environments as well as provide a high degree of vandal resistance when installed

2.5 ACCESS CARD REQUIREMENTS

A. Access cards shall be PVC multi-technology type cards.
   1. Shall be either ISO 14443 or ISO 15693.
   2. Shall contain a proximity chip that works with the current proximity card format in use at other State of North Carolina office facilities
   3. Verify exact card requirements with Owner.

B. The cards shall be pre-fabricated, credit-card size, constructed of molded plastic. The card shall be capable of having multi-color custom graphics and permanently marked numbers printed directly onto both sides.

C. The card shall be made of robust ABS plastic to provide maximum protection for the circuitry inside and provide minimal flexing which could cause damage to the card. The user may specify codes or numbers and exact replacement of cards that may be have been lost, damaged or stolen shall be available upon request.

D. All cards shall be passive devices with no internal battery, but shall contain a semiconductor element that is energized when brought within the operating range of the reader causing transmission of the code from the card to the reader.

3.1 EXECUTION

3.2 DESIGN DEVELOPMENT

Final design for the security system in the NIH building shall be determined during preparation of construction documents. Requirements for utilities shall be coordinated with the architectural and engineering designers, contractor and the Owner.

3.3 CONSTRUCTION

Work shall be coordinated with that of other trades. All work shall be protected with temporary protection and shall be replaced if damaged prior to acceptance by the Owner.

3.4 INSTALLATION

Work shall be coordinated through the Owner's designated representative.

Prior to Beneficial Occupancy of the building, installation of security systems may be requested to protect and safeguard laboratories that are significantly completed.

3.5 DOCUMENTATION

The Security Contractor shall provide electronic copies of drawings and manuals.

3.6 TESTING

A. Site tests shall be performed with a representative of Owner in attendance

B. The Security Contractor shall coordinate the scheduled time of testing and access to the site with Owner to minimize the disruption of the activities of the Owner or other contractors.

C. The Security Contractor shall provide all test equipment, tools, recorders, connectors, cables, and other devices required for the completion of systems tests.

D. The Security Contractor shall provide or coordinate the availability of ladders, lifts, scaffolding, or other equipment required to provide safe and ready access to all installed devices for the use of the Owner representative.

E. The Security Contractor shall provide two-way radios, telephones, cellular telephones, or other communications devices necessary to communicate with any remote facility monitoring the security systems during the testing.

F The Security Contractor shall demonstrate to Owner that all sequences operate correctly and that all products, devices and system software operate as designed and specified.

G. Tests shall be performed on each major component of the Electronic Access Control system.

H. Sufficient replacement parts shall be available to allow for timely replacement of any parts that are found to be unsatisfactory in performance.

I Alarm Inputs

1. All alarm points shall be tested back to the monitoring facility by activating the alarm devices to which they are attached. Activating or simulating an alarm condition at the control panel is not acceptable.
2. The proper programming of alarm points shall be verified and a hard copy of the signals provided by the monitoring facility (if monitored).
3. Magnetic switches and other similar alarm initiating devices shall be tested in the manner and method recommended by the manufacturer.

J. Card Access

4. All card readers shall be tested with cards previously loaded into the local controller database and with cards that have only been loaded into the system server files. Cards previously loaded into the local database should be validated and access granted within three seconds of presentation. Cards that have not been loaded into the local database should require no more than fifteen seconds from presentation to be validated through the server.
5. Card access doors shall be checked for proper operation of the electronic locking devices, including the internal monitor switch operation.
6. All associated tamper switches and trouble relays shall be tested back to the security console.
7. The proper programming of card readers shall be verified at the Security Console.

   Programming items to be verified for each reader shall include. but not be limited to, the following:

   a. Assignment of new inputs and outputs to the system.
   b Necessary time and day interval programming.
   c. All control by event sequences to assure system operation is as specified.
   d Selective logging and report programming.
   e Access interval and access group programming for the card access system.
   f. Alarm message generation programming.
   g. Assignment of new card readers into the system

K. Electronic Locking Hardware

8. Locks shall be checked for proper alignment and bolt operation and full engagement of the strike plate.
9. Doors equipped with electric locks shall be checked for the proper operation of an automatic door closing device. When released, the doors shall close completely and re-latch automatically within the "door open time" programmed in the local controller.

3.7 TRAINING

A. The Security Contractor shall hold an eight (8) hour training session, for up to six (6) personnel at the job site at times mutually agreed upon with Owner.

B. Users of the Security Management System shall be thoroughly instructed verbally and in writing of the proper operation of all equipment and the procedures to be followed.

C. Time spent on field set-up, start-up and testing shall not be considered as

training time.

3.8 ACCEPTANCE AND PERFORMANCE REQUIREMENTS

A. This system shall not be considered accepted until all punch list items have been corrected. Beneficial use of part or all of the system shall not be considered as acceptance.

B The owner reserves the right to evaluate the installed system for a period of 30 days. subsequent to the satisfactory completion of the system acceptance tests, before final payment shall be made.

C. The Security Contractor shall complete the installation of all equipment in a reasonable and timely manner consistent with the Owner's construction schedule.

D. The Security Contractor shall provide properly skilled and factory trained personnel. the proper materials. and perform in a good workmanlike and timely manner satisfactory to the Owner.

E. The Security Contractor shall not hire any subcontractors for installation, maintenance, or service of the system without prior written approval by the Owner of such subcontractors for this work.

F. If the Security Contractor fails to make a good faith effort to complete the project in a timely manner, or attempts to block or delay installation and turnover of the specified system in any manner, then the Owner may, without prejudice to any other right or remedy it may have, terminate the contract and take possession of any materials, equipment, tools, and machinery thereon owned by the Security Contractor and may finish the services by whatever method the Owner may deem expedient.

G. If the Security Contractor fails to make prompt payment to subcontractors for materials or labor, or disregards laws, ordinances, rules, regulations, or orders of any public authority having jurisdiction, then the Owner may, without prejudice to any other right or remedy it may have, terminate the contract and take possession of any materials, equipment, tools, and machinery thereon owned by the Security Contractor and may finish the services by whatever method the Owner may deem expedient.

3.9 WARRANTY & MAINTENANCE

A. The Security Contractor shall guarantee all equipment, wiring, labor, and other components of this system to be free of defects in workmanship and material for one year or the manufacturer's warranty period, whichever is longer, from the date of acceptance by Owner.

B Warranty service by the Security Contractor shall include four-hour emergency response service during normal contractor working hours and

twelve-hour emergency response service after normal working hours, on weekends, and on holidays. Response time shall be measured from the time of Security Contractor notification to the arrival of service personnel at the affected site to initiate repairs. The Security Contractor shall provide a method of requesting emergency service after normal working hours, on weekends, and on holidays appropriate to the required response times.

C. Service requests are requests for work to repair or replace a system component or software application which has malfunctioned or been damaged. Service requests shall not include routine system additions, equipment relocations, or system upgrades.

D. The Security Contractor shall, after project completion, include the cost for a full-coverage service and maintenance contract for the second through sixth years following the initial warranty period. The service and maintenance contract shall be provided directly to the owner and provide for service and response times identified in Section 1. Owner shall be permitted to elect the service contract(s) any time prior to the expiration of the initial warranty period at the price submitted with the original bid.

E. If the extended warranty is executed by Owner, the labor rate and margin rate shall be the same as the initial bid for the project. Rate increases are allowed once per year due to equipment and labor cost increases. The owner must be notified in writing, thirty (30) prior to the increase going into effect. Cost increases cannot increase greater than the national Consumer Price Index.

SECTION 16721
FIRE PROTECTION

1.00 GENERAL

1.01 SCOPE

The work includes the furnishing, installation, commissioning and putting into operation and ready for use a non-coded Class A automatically activated pre-signal. general alarm. pre-signal. 2-wire supervised detection system. The fire alarm system shall consist of main control panel, manual stations with key switch, manual stations with key switch and vibrating bells. The main control panel shall include alarm silencing switches, system test switches, battery check switch, visual indicator for power. fault and alarm condition; and a trouble sound alarm for system fault indication. The fire alarm system shall be provided with nickel-cadmium batteries for reliable backup operation.

1.02 SYSTEM OPERATION

The fire detection main control panel shall have a capacity of at least 8 zones (expandable) in which alarm horns shall be used as the sounding device.

The activation of a manual station shall initially activate a buzzer pre-signal alarm at the main control of the panel. The corresponding that zone shall be lighted forewarning key personnel to investigate and evaluate the danger at the indicated area. If conditions warrant, the alarm mode can be initiated manually either by inserting a key at any manual station or at the main control panel. The system shall automatically trigger a general alarm should the pre-signal not be canceled at the present time. System restart shall be effected at the main control panel.

1.03 SHOP DRAWINGS AND TECHNICAL CATALOGUES

The Contractor shall provide together with his proposal technical catalogues (3 sets) and shop drawings indicating the numbers of wires and sizes or conduits required for his equipment to properly function as required for approval by the Engineer prior to installation.

1.04 TESTING AND GUARANTEE

After completion of the system installation and at such time the Engineer may direct, the Contractor shall conduct system and equipment operational tests and make all adjustments required to fully and completely demonstrate that the system has been installed and will operate in accordance with the specifications, drawings, codes and free from any ground, shorts or defects. Copies of test results shall be provided to the Engineer and the Owner's representatives.

The Contractor shall guarantee his work, equipment for a period of not less than one (1) year from the date of final acceptance. Any part of the work or equipment that becomes defective or that will show evidence of defect or neglect during the said period shall be replaced or remedied at the expense of the Contractor without any contest.

2.00 PRODUCTS

Refer to Section 01020 Summary of Materials and Finishes

3.00 EXECUTION

3.01 INSTALLATION

Install fire alarm system as per manufacturer's instruction.

SECTION 16726
PUBLIC ADDRESS SYSTEMS

1.1 GENERAL

1.2 DESCRIPTION OF WORK

A. Section Includes:
   1. Preamplifiers.
   2. Power amplifiers.
   3. Transfer to standby amplifier.
   4. Microphones.
   5. Volume limiter/compressors.
   6. Control console.
   7. Equipment cabinet.
   8. Equipment rack.
   9. Telephone paging adapters.
   10. Tone generator.
   11. Monitor panel.
   12. Loudspeakers.
   13. Noise-operated gain controllers.
   14. Microphone and headphone outlets.
   15. Battery backup power unit.
   16. Conductors and cables.
   17. Raceways.

1.3 DEFINITIONS

A. Channels: Separate parallel signal paths, from sources to loudspeakers or loudspeaker zones, with separate amplification and switching that permit selection between paths for speaker alternative program signals.

B. VU: Volume unit.

C. Zone: Separate group of loudspeakers and associated supply wiring that may be arranged for selective switching between different channels.

1.4 PERFORMANCE REQUIREMENTS

A. Delegated Design: Design supports and seismic restraints for control consoles, equipment cabinets and racks, and components, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

1.5 SUBMITTALS

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

B. Shop Drawings: For supports and seismic restraints for control

consoles. equipment cabinets and racks, and components. Include plans, elevations, sections. details. and attachments to other work.

1. Detail equipment assemblies and indicate dimensions. weights, required clearances, method of field assembly. components, and location and size of each field connection.
2. Console layouts.
3. Control panels.
4. Rack arrangements.
5. Wiring Diagrams: For power. signal, and control wiring.
   a. Identify terminals to facilitate installation, operation, and maintenance.
   b. Single-line diagram showing interconnection of components.
   c. Cabling diagram showing cable routing.

C. Delegated-Design Submittal: For supports and seismic restraints for control consoles. equipment cabinets and racks. and components indicated to comply with performance requirements and design criteria. including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1. Detail fabrication and assembly of supports and seismic restraints for control consoles, equipment cabinets and racks, and components.

D. Coordination Drawings: Reflected ceiling plans. drawn to scale. on which ceiling-mounted items including lighting fixtures, diffusers, grilles, speakers, sprinklers, access panels, and special moldings are shown and coordinated with each other, using input from installers of the items involved.

E. Field quality-control reports.

F. Operation and Maintenance Data. For public address and mass notification systems to include in emergency, operation, and maintenance manuals.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of units required for this Project.

1. Personnel certified by NICET as Audio Systems Level III Technician.

B. Testing Agency Qualifications: Qualified agency, with the experience and capability to conduct testing indicated.

1. Testing Agency's Field Supervisor: Currently certified by NICET at Level III to supervise on-site testing.

C. Source Limitations: Obtain public address from single source from single manufacturer.

D. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

E. Comply with NFPA 70.

1.7 COORDINATION

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

1.8 EXTRA MATERIALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
   1 Microphone: One.

2.1 PRODUCTS

2.2 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Alpha Communications.
   2. Altec Lansing Technologies, Inc.
   3. Atlas Sound LP.
   4. Bogen Communications, Inc.
   5. Dukane Communication Systems; part of GE Infrastructure, Security.
   6. Edwards Signaling & Security Systems; part of GE Infrastructure, Security.
   7 Electro-Voice; Telex Communications, Inc.
   8. Federal Signal Corporation; Electrical Products Division.
   9. Rauland-Borg Corporation.
   10. Whelen Engineering Company, Inc.

2.3 FUNCTIONAL DESCRIPTION OF SYSTEM

A. System Functions:
   1. Selectively connect any zone to any available signal channel.
   2. Selectively control sound from microphone outlets and other inputs.
   3. "All-call" feature shall connect the all-call sound signal simultaneously to all zones regardless of zone or channel switch settings.
   4. Telephone paging adapter shall allow paging by dialing an extension from any local telephone instrument and speaking into the telephone.

5. Produce a program-signal tone that is amplified and sounded over all speakers, overriding signals currently being distributed.
6. Reproduce high-quality sound that is free of noise and distortion at all loudspeakers at all times during equipment operation including standby mode with inputs off: output free of non-uniform-coverage of amplified sound.

2.4 GENERAL EQUIPMENT AND MATERIAL REQUIREMENTS

A. Compatibility of Components: Coordinate component features to form an integrated system. Match components and interconnections for optimum performance of specified functions.

B. Equipment: Comply with UL 813. Equipment shall be modular, using solid-state components, and fully rated for continuous duty unless otherwise indicated. Select equipment for normal operation on input power usually supplied at 110 to 130 V, 60 Hz.

C. Equipment Mounting: Where rack, cabinet, or console mounting is indicated, equipment shall be designed to mount in a 19-inch housing complying with TIA/EIA-310-D.

D. Weather-Resistant Equipment: Listed and labeled by a qualified testing agency for duty outdoors or in damp locations.

2.5 PREAMPLIFIERS

A. Preamplifier: Separately mounted integral to power amplifier.
B. Output Power: Plus 4 dB above 1 mW at matched power-amplifier load.
C. Total Harmonic Distortion: Less than 1 percent.
D. Frequency Response: Within plus or minus 2 dB from 20 to 20,000 Hz.
E. Input Jacks: Minimum of two. One matched for low-impedance microphone; the other matchable to cassette deck, CD player, or radio tuner signals without external adapters.
F. Minimum Noise Level: Minus 55 dB below rated output.
G. Controls: On-off, input levels, and master gain.

2.6 POWER AMPLIFIERS

A Mounting: Rack.
B. Output Power. 70-V balanced line. 80 percent of the sum of wattage settings of connected for each station and speaker connected in all-call mode of operation, plus an allowance for future stations.
C. Total Harmonic Distortion. Less than 3 percent at rated power output from 50 to 12,000Hz
D. Minimum Signal-to-Noise Ratio: 60 dB, at rated output.
E. Frequency Response: Within plus or minus 2 dB from 50 to 12.000 Hz.
F. Output Regulation: Less than 2 dB from full to no load.
G. Controls: On-off, input levels, and low-cut filter.

H. Input Sensitivity: Matched to preamplifier and to provide full-rated output with sound- pressure level of less than 10 dynes/sq. cm impinging on speaker microphone or handset transmitter.

2.7 TRANSFER TO STANDBY AMPLIFIER

A Monitoring Circuit and Sensing Relay: Detect reduction in output of power amplifier of 40 percent or more and, in such event, transfer load and signal automatically to standby amplifier.

2.8 MICROPHONES

A. Paging Microphone.
   1. Type: Dynamic, with cardioid polar characteristic.
   2. Impedance: 150 ohms
   3. Frequency Response: Uniform, 50 to 14,000 Hz.
   4. Output Level: Minus 58 dB, minimum.
   5. Finish: Satin chrome.
   6. Cable: C25J.
   7. Mounting: Desk stand with integral-locking, press-to-talk switch.

K.

2.9 VOLUME LIMITER /COMPRESSOR

A. Minimum Performance Requirements:
   1. Frequency Response: 45 to 15,000 Hz, plus or minus 1 dB minimum.
   2. Signal Reduction Ratio: At least a 10:1 and 5:1 selectable capability.
   3. Distortion: 1 percent, maximum.
   4. Rated Output: Minimum of plus 14 dB.
   5. Inputs: Minimum of two inputs with variable front-panel gain controls and VU or decibel meter for input adjustment.
   6. Rack mounting.

2.10 EQUIPMENT RACK

A. Racks: 19 inches standard, complying with TIA/EIA-310-D.
B. Power-Supply Connections: Compatible plugs and receptacles.
C. Enclosure Panels: Ventilated rear and sides and solid top. Use louvers in panels to ensure adequate ventilation.
D. Finish: Uniform, baked-enamel factory finish over rust-inhibiting primer.
E. Power-Control Panel: On front of equipment housing, with master power on-off switch and pilot light: and with socket for 5-A cartridge fuse for rack equipment power.
F. Service Light: At top rear of rack with an adjacent control switch.
G. Vertical Plug Strip: Grounded receptacles, 12 inches o.c.; the full height of rack.
H. Maintenance Receptacles: Duplex convenience outlets supplied independent of vertical plug strip and located in front and bottom rear

of rack.

I. Spare Capacity. 20 percent in rack for future equipment.

2.11 TELEPHONE PAGING ADAPTER

A. Adapters shall accept voice signals from telephone extension dialing access and automatically provide amplifier input and program override for preselected zones.

1. Minimum Frequency Response: Flat, 200 to 2500 Hz.
2. Impedance Matching: Adapter matches telephone line to public address equipment input.
3. Rack mounting.

2.12 TONE GENERATOR

A Generator shall provide clock and program interface with public address and mass notification system.

B. Signals: Minimum of seven distinct, audible signal types including wail, warble, high/low, alarm, repeating and single-stroke chimes, and tone.

C. Pitch Control: Chimes and tone.

D. Volume Control: All outputs.

E. Activation-Switch Network: Establishes priority and hierarchy of output signals produced by different activation setups.

F. Mounting: Rack.

L.

2.13 MONITOR PANEL

A. Monitor power amplifiers.

B Components: VU or dB meter, speaker with volume control, and multiple-position rotary selector switch.

C Selector Switch and Volume Control: Selective monitoring of output of each separate power amplifier via VU or dB meter and speaker.

D. Mounting: Rack.

2.14 LOUDSPEAKERS

A. Cone-Type Loudspeakers.

1. Minimum Axial Sensitivity: 91 dB at one meter, with 1-W input.
2. Frequency Response: Within plus or minus 3 dB from 50 to 15,000 Hz.
3. Size. 8 inches with 1-inch voice coil and minimum 5-oz. ceramic magnet.
4. Minimum Dispersion Angle: 100 degrees.
5. Rated Output Level: 10 W.
6. Matching Transformer: Full-power rated with four taps.

Maximum insertion loss of 0.5 dB.

7. Surface-Mounting Units: Ceiling, wall, or pendant mounting, as indicated, in steel back boxes, acoustically dampened. Front face of at least 0.0478-inch (1.2-mm) steel and whole assembly rust proofed and shop primed for field painting.
8. Flush-Ceiling-Mounting Units: In steel back boxes, acoustically dampened. Metal ceiling grille with white baked enamel.

B. Horn-Type Loudspeakers.

1. Type: Single-horn units, double-reentrant design, with minimum full-range power rating of 15 W.
2. Matching Transformer: Full-power rated with four standard taps. Maximum insertion loss of 0.5 dB.
3. Frequency Response: Within plus or minus 3 dB from 250 to 12,000 Hz
4. Dispersion Angle: 130 by 110 degrees.
5. Mounting: Integral bracket.
6. Units in Hazardous (Classified) Locations: Listed and labeled for environment in which they are located.

2.15 NOISE-OPERATED GAIN CONTROLLER

A. Gain controller shall be designed to continuously sense space noise level and automatically adjust signal level to local speakers.
B. Frequency Response: 20 to 20,000 Hz, plus or minus 1 dB.
C. Level Adjustment Range: 20 dB minimum.
D. Maximum Distortion: 1 percent.
E. Control: Permits adjustment of sensing level of device.

2.16 OUTLETS

A. Volume Attenuator Station: Wall-plate-mounted autotransformer type with paging priority feature.

1. Wattage Rating: 10 W unless otherwise indicated.
2. Attenuation per Step: 3 dB, with positive off position.
3. Insertion Loss: 0.4 dB maximum.
4. Attenuation Bypass Relay: Single pole, double throw. Connected to operate and bypass attenuation when all-call, paging, program signal, or prerecorded message features are used. Relay returns to normal position at end of priority transmission.
5. Label: "PA Volume."

B. Microphone Outlet: Three-pole, polarized, locking-type, microphone receptacles in single- gang boxes. Equip wall outlets with brushed stainless-steel device plates. Equip floor outlets with gray tapered rubber or plastic cable nozzles and fixed outlet covers.

C. Headphone Outlet (for the Hearing Impaired): Microphone receptacles in single-gang boxes. Equip wall outlets with brushed

stainless-steel device plates. Equip floor outlets with gray tapered rubber or plastic cable nozzles and fixed-outlet covers

2.17 CONDUCTORS AND CABLES

A. Jacketed, twisted pair and twisted multi-pair, untinned solid copper.
   1 Insulation for Wire in Conduit: Thermoplastic, not less than 1/32 inch thick.
   2. Microphone Cables: Neoprene jacketed, not less than 2/64 inch thick. over shield with filled interstices. Shield No. 34 AWG, tinned. soft-copper strands formed into a braid or approved equivalent foil. Shielding coverage on conductors is not less than 60 percent.
   3. Plenum Cable: Listed and labeled for plenum installation.

2.18 RACEWAYS

A. Conduit and Boxes: Comply with Division 16 Section "Raceways and Boxes. "
   1. Outlet boxes shall be not less than 2 inches wide. 3 inches high, and 2-1/2 inches deep.

3.1 EXECUTION

3.2 WIRING METHODS

A Wiring Method: Install cables in raceways and cable trays except within consoles, cabinets, desks, and counters, and except in accessible ceiling spaces and in gypsum board partitions where unenclosed wiring method may be used. Conceal raceway and cables except in unfinished spaces.
   1. Install plenum cable in environmental air spaces, including plenum ceilings.
   2. Comply with requirements for raceways and boxes specified in Division 16 Section "Raceways and Boxes."

B. Wiring Method. Conceal conductors and cables in accessible ceilings, walls, and floors where possible.

C. Wiring within Enclosures: Bundle. lace, and train cables to terminal points with no excess and without exceeding manufacturer's limitations on bending radii. Provide and use lacing bars and distribution spools.

3.3 INSTALLATION OF RACEWAYS

A. Comply with requirements in Division 16 Section "Raceways and Boxes" for installation of conduits and wireways.

B. Install manufactured conduit sweeps and long-radius elbows whenever possible.

3.4 INSTALLATION OF CABLES

A. Comply with NECA 1.

B. General Cable Installation Requirements:
   1. Terminate conductors: no cable shall contain unterminated elements. Make terminations only at outlets and terminals.
   2. Splices, Taps, and Terminations: Arrange on numbered terminal strips in junction, pull, and outlet boxes; terminal cabinets; and equipment enclosures. Cables may not be spliced.
   3. Secure and support cables at intervals not exceeding 30 inches and not more than 6 inches from cabinets, boxes, fittings, outlets, racks, frames, and terminals.
   4. Bundle, lace, and train conductors to terminal points without exceeding manufacturer's limitations on bending radii. Install lacing bars and distribution spools.
   5. Do not install bruised, kinked, scored, deformed, or abraded cable. Do not splice cable between termination, tap, or junction points. Remove and discard cable if damaged during installation and replace it with new cable.
   6. Cold-Weather Installation: Bring cable to room temperature before de-reeling. Heat lamps shall not be used.

C. Open-Cable Installation:
   1. Install cabling with horizontal and vertical cable guides in telecommunications spaces with terminating hardware and interconnection equipment.
   2. Suspend speaker cable not in a wireway or pathway a minimum of 200 mm (8 inches) above ceiling by cable supports not more than 60 inches apart
   3. Cable shall not be run through structural members or be in contact with pipes, ducts, or other potentially damaging items.

D. Separation of Wires: Separate speaker-microphone, line-level, speaker-level, and power wiring runs. Install in separate raceways or, where exposed or in same enclosure, separate conductors at least 12 inches apart for speaker microphones and adjacent parallel power and telephone wiring. Separate other intercommunication equipment conductors as recommended by equipment manufacturer.

3.5 INSTALLATION

A. Match input and output impedances and signal levels at signal interfaces. Provide matching networks where required.

B. Identification of Conductors and Cables: Color-code conductors and apply wire and cable marking tape to designate wires and cables so they identify media in coordination with system wiring diagrams.

C. Equipment Cabinets and Racks:
   1. Group items of same function together, either vertically or side by side, and arrange controls symmetrically. Mount monitor panel

above the amplifiers.

2. Arrange all inputs, outputs, interconnections, and test points so they are accessible at rear of rack for maintenance and testing, with each item removable from rack without disturbing other items or connections.

3. Blank Panels: Cover empty space in equipment racks so entire front of rack is occupied by panels.

D. Volume Limiter/Compressor. Equip each zone with a volume limiter/compressor. Install in central equipment cabinet. Arrange to provide a constant input to power amplifiers.

E. Wall-Mounted Outlets: Flush mounted.

F. Floor-Mounted Outlets: Conceal in floor and install cable nozzles through outlet covers. Secure outlet covers in place. Trim with carpet in carpeted areas.

G. Conductor Sizing: Unless otherwise indicated, size speaker circuit conductors from racks to loudspeaker outlets not smaller than No. 18 AWG and conductors from microphone receptacles to amplifiers not smaller than No. 22 AWG.

H. Weatherproof Equipment: For units that are mounted outdoors, in damp locations, or where exposed to weather, install consistent with requirements of weatherproof rating.

I. Speaker-Line Matching Transformer Connections: Make initial connections using tap settings indicated on Drawings.

J. Connect wiring according to Division 16 Section "Conductors and Cables."

3.6 GROUNDING

A. Ground cable shields and equipment to eliminate shock hazard and to minimize ground loops, common-mode returns, noise pickup, cross talk, and other impairments.

B. Signal Ground Terminal: Locate at main equipment cabinet. Isolate from power system and equipment grounding.

C. Install grounding electrodes as specified in Division 16 Section "Grounding and Bonding."

3.7 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections.

C. Perform tests and inspections.

1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

D. Tests and Inspections:

1. Schedule tests with at least seven days' advance notice of test performance.
2. After installing public address and after electrical circuitry has been energized, test for compliance with requirements.
3. Operational Test: Perform tests that include originating program and page messages at microphone outlets, preamplifier program inputs, and other inputs. Verify proper routing and volume levels and that system is free of noise and distortion.
4. Signal-to-Noise Ratio Test: Measure signal-to-noise ratio of complete system at normal gain settings as follows:
   a. Disconnect microphone at connector or jack closest to it and replace it in the circuit with a signal generator using a 1000-Hz signal. Replace all other microphones at corresponding connectors with dummy loads, each equal in impedance to microphone it replaces. Measure signal-to-noise ratio.
   b. Repeat test for each separately controlled zone of loudspeakers
   c. Minimum acceptance ratio is 50 dB.
5. Distortion Test: Measure distortion at normal gain settings and rated power. Feed signals at frequencies of 50, 200, 400, 1000, 3000, 8000, and 12,000 Hz into each preamplifier channel. For each frequency, measure distortion in the paging and all- call amplifier outputs. Maximum acceptable distortion at any frequency is 3 percent total harmonics.
6. Acoustic Coverage Test: Feed pink noise into system using octaves centered at 500 and 4000 Hz. Use sound-level meter with octave-band filters to measure level at five locations in each zone. For spaces with seated audiences, maximum permissible variation in level is plus or minus 2 dB. In addition, the levels between locations in same zone and between locations in adjacent zones must not vary more than plus or minus 3 dB.
7. Power Output Test: Measure electrical power output of each power amplifier at normal gain settings of 50, 1000, and 12000 Hz. Maximum variation in power output at these frequencies must not exceed plus or minus 1 dB.
8. Signal Ground Test: Measure and report ground resistance at pubic address equipment signal ground. Comply with testing requirements specified in Division 16 Section "Grounding and Bonding."

E. Inspection: Verify that units and controls are properly labeled and interconnecting wires and terminals are identified. Prepare a list of

final tap settings of paging speaker-line matching transformers.

F. Public address and mass notification systems will be considered defective if they do not pass tests and inspections.

G. Prepare test and inspection reports.

1. Include a record of final speaker-line matching transformer-tap settings, and signal ground-resistance measurement certified by Installer.

3.8 STARTUP SERVICE

A. Engage a factory-authorized service representative to perform startup service.
   1. Verify that electrical wiring installation complies with manufacturer's submittal and installation requirements.
   2. Complete installation and startup checks according to manufacturer's written instructions.

3.9 ADJUSTING

A. On-Site Assistance: Engage a factory-authorized service representative to provide on- site assistance in adjusting sound levels, resetting transformer taps, and adjusting controls to meet occupancy conditions.

B Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting system to suit actual occupied conditions. Provide up to two visits to Project during other-than-normal occupancy hours

3.10 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain the public address systems and equipment.

Section VII. Drawings

Section VIII. Bill of Quantities

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Bid Form

Date: _____

To: *BIDS AND AWARDS COMMITTEE*
DEPARTMENT OF BUDGET AND MANAGEMENT
Address: *GENERAL SOLANO STREET,*
SAN MIGEUL, MANILA

We, the undersigned, declare that:

(a) We have examined and have no reservation to the Bidding Documents, including Addenda, for the Contract **RENOVATION OF THE DBM ARCACHE BUILDING;**

(b) We offer to execute the Works for this Contract in accordance with the Bid and Bid Data Sheet, General and Special Conditions of Contract accompanying this Bid;

The total price of our Bid, excluding any discounts offered below is: *[insert information]*;

The discounts offered and the methodology for their application are: *[insert information]*;

(c) Our Bid shall be valid for a period of **120** days from the date fixed for the Bid submission deadline in accordance with the Bidding Documents, and it shall remain binding upon us and may be accepted at any time before the expiration of that period;

(d) If our Bid is accepted, we commit to obtain a Performance Security in the amount of *[insert percentage amount]* percent of the Contract Price for the due performance of the Contract;

(e) Our firm, including any subcontractors or suppliers for any part of the Contract, have nationalities from the following eligible countries: *[insert information]*;

(f) We are not participating, as Bidders, in more than one Bid in this bidding process, other than alternative offers in accordance with the Bidding Documents;

(g) Our firm, its affiliates or subsidiaries, including any subcontractors or suppliers for any part of the Contract, has not been declared ineligible by the Funding Source;

(h) We understand that this Bid, together with your written acceptance thereof included in your notification of award, shall constitute a binding contract between us, until a formal Contract is prepared and executed; and

(i) We understand that you are not bound to accept the Lowest Calculated Bid or any other Bid that you may receive;

(j) We likewise certify/confirm that the undersigned, is the duly authorized representative of the bidder, and granted full power and authority to do, execute and perform any and all acts necessary to participate, submit the bid, and to sign and execute the ensuing contract for the **RENOVATION OF THE DBM ARCACHE BUILDING** of the **Department of Budget and Management**; and

(k) We acknowledge that failure to sign each and every page of this Bid Form, including the Bill of Quantities, shall be a ground for the rejection of our bid.

Name: _____

In the capacity of: _____

Signed: _____

Duly authorized to sign the Bid for and on behalf of: _____

Date: _____

COST ESTIMATE FORM

PROJECT : **RENOVATION OF THE DBM ARCACHE BUILDING**

LOCATION : **General Solano St. corner Nepomuceno St., San Miguel, Manila**

OWNER : **DEPARTMENT OF BUDGET AND MANAGEMENT**

DATE : _____

BIDDER : _____

NOTE: Prices include overhead, contingencies, VAT and profit

DIV	CODE	DESCRIPTION	UNIT	QUANTITY	MATERIAL	LABOR	TOTAL	DIV TOTAL
01	00	**GENERAL REQUIREMENTS**						
	01-01	Fees and Taxes						
	01-02	Overhead						
	01-03	Temporary Facilities						
	01-04	Equipment						
	01-05	Health and Safety						
	01-06	Insurances						
	01-07	Bonds						
		Sub-Total						
02	00	**SITEWORK-Land Development**						
	02-01	Site Drainage						
	02-02	Concrete Curbs, Gutters & Paved Walks						
	02-03	Roads and Parking						
	02-04	Site Electrical, Service Entrance & Transformers						
	02-05	Site Water Supply & Service Entrance						
		Sub-Total						

DIV	CODE	DESCRIPTION	UNIT	QUANTITY	MATERIAL	LABOR	TOTAL	DIV TOTAL
02	00	**SITEWORK-Struc'l**						
	02-06	Building Layout						
	02-07	Excavation						
	02-08	Fill/Backfill Compacted						
	02-09	Demolition Works						
	02-10	Termite Treatment						
		Sub-Total						
03	00	**CONCRETE**						
	03-01	Forms, Scaffoldings & Accessories						
	03-02	Footings/Pile Cap						
	03-03	Grade Beams / Footing Tie Beams / Floor Beams / Floor Girders						
	03-04	Columns						
	03-05	Suspended Slabs						
	03-06	Bored Piling						

	03-07	Slabs on Fill						
	03-08	Stairs						
	03-09	Cisterns / RC Tanks						
	03-10	Septic Tank						
	03-11	STP Tank						
	03-12	Elevator Pit						
	03-13	Concrete Gutters, Parapets & Ledges						
	03-14	Architectural Precast Concrete (GFRC)						
	03-15	RC Testing						
		Sub-Total						
04	00	**MASONRY**						
	04-01	Concrete Hollow Blocks						
	04-02	Accessories						
		Sub-total						
05	00	**METALS**						
	05-01	Structural Steel & Acc.						
	05-02	Misc Structural Steel						
	05-03	Welding& Fasteners						
	05-04	SS Railings						
	05-05	Misc. Stainless Steel						
	05-06	G.I. Pipes & Fittings						
	05-07	Brass Nosing & Brass Inserts						
		Sub-Total						
06	00	**WOOD & PLASTIC**						
	06-01	Miscellaneous Lumber						
	06-02	Baseboards & Misc Trim						
	06-03	Reception Table, Overhead Cabinets, Built-in Tables, etc.						
	06-04	Miscellaneous Wood, etc						
		Sub-Total						
07	00	**THERMAL&MOIST PROTECTION**						
	07-01	Slab, Deck, Elevator Pit, & Gutter Waterproofing						
	07-02	Ledges & Firewall Waterproofing						
	07-03	Toilet Waterproofing						
	07-04	Cistern Epoxy Waterproofing						
	07-05	Damp-proofing						
	07-06	Metal Roofing Insulation						
	07-07	Slab, Deck Insulation						
	07-08	Roofing Materials and Accessories						
	07-09	Fiber Cement Fascia Board						

	07-10	Caulking / Sealants						
		Sub-total						
08	**00**	**DOORS AND WINDOWS**						
	08-01	All Glass Doors, Alum Doors & Jambs						
	08-02	Steel Doors & Steel Frames						
	08-03	Wood Laminated Moulded Doors & Wood Jambs						
	08-04	Alum Frameless, Fixed, Casement & Awning Windows						
	08-05	Finish Hardware						
	08-06	Miscellaneous Glazing						
	08-07	Testing						
		Sub-Total						
09	**00**	**FINISHES**						
	09-01	Plaster						
	09-02	Skim Coat						
	09-03	Misc Concrete Finishes						
	09-04	Gypsum Wall Boards on Light Gauge Metal Wall Frame (with Acoustic Treatment)						
	09-05	Gypsum Ceiling Boards on Light Gauge Metal Ceiling Frame						
	09-06	Metal Spandrel Ceiling on Ceiling Frame						
	09-07	Polished Homogenous Porcelain Floor Tiles						
	09-08	Polished Homogenous Porcelain Wall Tiles						
	09-09	Homogenous Granite Floor Tiles						
	09-10	Homogenous Granite Wall Tiles						
	09-11	Homogenous Rolled Vinyl Sheets						
	09-12	Homogenous Vinyl Tiles						
	09-13	Homogenous Granite Countertops						
	09-14	Paintings & Accessories						
		Sub-Total						
10	**00**	**SPECIALTIES**						
	10-01	Identifying Devices						
	10-02	Toilet Doors & Partitions						
	10-03	Toilet Accessories						
	10-04	Laminated Sticker Wall						
		Sub-Total						

13	00	**SPECIAL CONSTRUCTION**						
	13-01	Solar Panel System						
		Sub-Total						
14	00	**CONVEYING SYSTEM**						
	14-01	Electric Elevator						
		Sub-Total						
15	00	**MECHANICAL**						
		FIRE SUPPRESSION SYSTEM						
	15-01	Fire Sprinkler Pipes & Fittings						
	15-02	Sprinkler Heads						
	15-03	FS Devices & Acc.						
	15-04	Fire Pump (Vertical) Set						
	15-05	Jockey Pump Set						
	15-06	FS System Testing & Commissioning						
		STORM DRAINAGE SYSTEM						
	15-07	Building Storm Drainage System						
		SANITARY, WASTE & VENT (SWV) SYSTEM						
	15-08	SWV Pipes & Fittings						
	15-09	SWV System Acc						
	15-10	Plumbing Fixtures						
	15-11	Septic Tanks						
	15-12	Sewage Treatment Plant (STP)						
	15-13	SWV Pipe Testing						
		WATER SUPPLY						
	15-14	Water Pipes and Fittings						
	15-15	Water Supply Acc						
	15-16	Water Pipe Testing						
	15-17	Elevated Water Tanks						
	15-18	Potable Water Cistern						
	15-19	Transfer Pumps						
		VENT & AIRCON						
	15-20	VAC Pipes & Fittings						
	15-21	VAC Piping Accessories						
	15-22	Ventilating Fans & Blowers						
	15-23	ACCU & FCU; VRV Split type units						
	15-24	VAC Pipe Testing & Commissioning						
		Sub-Total						
16	00	**ELECTRICAL**						
	16-01	Electrical Service Entrance						

	16-02	Cables, Wires, Race-ways & Conduits						
	16-03	Panelboard & Breakers						
	16-04	Boxes & Wiring Devices						
	16-05	Lighting Fixtures & Acc						
	16-06	Speaker & Sound System						
	16-07	Telephone System						
	16-08	Fire Alarm System & Fire Extinguishers						
	16-09	LAN System						
	16-10	CATV & CCTV Systems						
	16-11	Grounding System						
	16-12	Electrical & Electrical Auxiliaries Testing						
		Sub-Total						
		TOTAL						

NOTE: This Cost Estimate Form with the related explanations found in the Cost Estimate Guide is provided by the DBM as a guide to the Bidder in organizing his bid cost items. The Bidder shall fill-up this Cost Estimate Form. A Bill of Quantities (BOQ) shall also be provided by the Bidder to serve as a Breakdown of Materials/Labor Items and their Corresponding Values following the format of the Bidder's filled-up Cost Estimate Form. This BOQ, when approved by the DBM, shall be construed as supplemental to the Plans, Specifications and other Bid Documents; such that what is provided in one document is deemed included in the other documents. The Bidder shall verify the quantities in the BOQ and shall be responsible for its accuracy and completeness such that all items of work, materials, plant, tools, equipment and labor to complete the Project shall be covered in his Bid. All items of work, materials, plant, tools, equipment and labor inadvertently missing in the BOQ but called for in the plans, specifications and other bid documents shall be provided by the Bidder at no extra cost to the DBM. Submitted filled-up BOQ's imply that the Bidder has verified the quantities and agrees that the BOQ is in accordance with the Plans, Specifications and other Bid Documents. In addition, the Bidder is also required to submit a Detailed Unit Price Analysis (DUPA) for all cost items in the approved BOQ. Finally, the Contractor is responsible for completing the Project in accordance with the Plans, Specifications and the other Bid Documents.

PROJECT : **RENOVATION OF THE DBM ARCACHE BUILDING**

LOCATION : **General Solano St. corner Nepomuceno St., San Miguel, Manila.**

OWNER : **DEPARTMENT OF BUDGET AND MANAGEMENT**

Enumerated opposite each Account Code are the items that should be included under each heading. Should there be items that are required but are not found hereunder, include them under "Others", such that all items of work, materials, plant, tools, equipment and labor shall be covered and included in the Bid. The Contractor is responsible for completing the Project in accordance with the Plans, Specifications and the other Bid Documents. Include this guide in the Bid Envelope.

DIV.	CODE	DESCRIPTION	ITEM INCLUDED
01	**00**	**GENERAL REQUIREMENTS**	
	01-01	DIV. Fees and Taxes	Includes deposits, fees, government taxes and all other additional fee/tax items as called for by the local government unit, its agencies, and national agencies;
	01-02	Overhead	Includes supervision, security services, cost control, rentals, and home and field office overhead such as office supplies, as-built drawings, photographs, clean-up, phone, electricity, water & laboratory testing chargeable to the Project.
	01-03	Temporary Facilities	Includes field office for Contractor and Owner's Representative, material storage, barracks, security, temporary metal fences, barricades, first aid, fire extinguishers, toilets, and project signage.
	01-04	Equipment	Includes moving cost, rentals, small tool purchases, vehicle expense, fuel, oil and maintenance cost.
	01-05	Health and Safety	Includes all health and safety methods, equipment and supplies required according to law.
	01-06	Insurances	Contactor's All Risk Insurance and all other necessary insurances as called for in this Contract and by the local government unit and its agencies
	01-07	Bonds	Bid, Performance, Payment and Guarantee and all other bonds as called for by the local

			government and its agencies.
02	**00**	**SITE WORK - Land Development**	
	02-01	Site Drainage	Includes excavation, grading, laying of drainage lines, backfilling and compaction, area drains, catch basins, junction boxes, storm drain connections, drainage field / pit; connection to street drain.
	02-02	Concrete Curbs, Gutters and Paved Walks.	Includes R.C. curbs and gutters, curb cut-outs, ramps, walks, exterior slab on fill. gravel and sand beds, concrete pavers.
	02-03	Roads and Parking	Includes base course, concrete pavement, reinforcements and construction joints.
	02-04	Site Electrical, Service Entrance and Transformers	Includes laying of electrical/telephone conduits and cables/wires, pedestals, electrical and communications service entrances. Provision of concrete pad for transformers and assistance in the installation of transformers by others Includes tapping to transformers and main source. Energizing.
	02-05	Site Water Supply & Service Entrance	Includes excavation, grading, laying of underground water pipes from supply to cistern; including valves. meter, handhole box, warning tape, backfilling and compaction. Testing and commissioning.
02	**00**	**SITE WORK - Structural**	(NOTE: For building proper only. Exclude items designated in Division 02 - 00)
	02-06	Building Layout	Includes surveying works, batterboards, and benchmarks.
	02-07	Excavation	Includes manual and mechanical excavation works and excavation support system. Includes excavation for the foundation systems.
	02-08	Fill/Backfill Compacted	Includes all fill directly under the building and covered walk, in atrium, gravel base course and preparation, topsoil.
	02-09	Demolition works	As indicated (A I) in the demolition plans.

	02-10	Termite Treatment	Includes soil poisoning and bukbok-proofing of wood.
03	**00**	**CONCRETE - Structural**	(NOTE: For building proper only. Exclude items designated in Division 02-00)
	03-01	Forms, Scaffoldings and Accessories	Includes table forms and scaffolds, oil, ties, keyway, chain, expansion joint, wedges, block-outs, shoring, purlins, pins, clamps, reglets, insets, rental of form system, crane, form removal, as required.
	03-02	Footings/Pile Cap	Includes steel reinforcement, ties, concrete mix, admixtures, equipment for placing concrete and curing compound
	03-03	Grade Beams / Footing Tie Beams / Floor Beams / Floor Girders	Includes steel reinforcement, ties, concrete mix, admixtures, and equipment for placing concrete and curing compound.
	03-04	Columns	Includes steel reinforcement, ties, concrete mix, admixtures, and equipment for placing concrete, curing compound and plaster surface preparation.
	03-05	Suspended Slabs	Includes steel reinforcement, ties. concrete mix, admixtures, and equipment for placing concrete, curing compound and plaster surface preparation when necessary.
	03-06	Bored Piling	Includes 600mm dia. x 30 meters deep bored piles, 4000 psi. As specified.
	03-07	Slabs on Fill	Includes vapor barrier for damp-proofing, steel reinforcement, ties, concrete mix, admixtures, and equipment for placing concrete, curing compound and water stops.
	03-08	Stairs	Includes steel reinforcement, ties, concrete mix, admixtures, and equipment for placing concrete, curing compound: vapor barrier for portion of stairs on fill; brass nosing. railing.
	03-09	Cisterns / RC Tanks	Fire reserve and potable water cistern. A.I. in the plans. Includes steel reinforcement, ties, concrete mix, admixtures, and equipment for placing concrete, curing compound, and plaster surface preparation for waterproofing
	03-10	Septic Tank	Includes steel reinforcement, ties, concrete mix,

			admixtures, and equipment for placing concrete, curing compound, water stops and waterproofing and plaster surface preparation.
	03-11	STP Tank	Includes steel reinforcement, ties. concrete mix. admixtures, and equipment for placing concrete. curing compound, water stops and waterproofing and plaster surface preparation.
	03-12	Elevator Pit	Includes steel reinforcement, ties, concrete mix, admixtures, and equipment for placing concrete, curing compound, water stops and waterproofing and plaster surface preparation.
	03-13	Concrete Gutters / Parapets and Ledges	Includes steel reinforcement, ties, concrete mix, admixtures, and equipment for placing concrete, curing compound, waterproofing and plaster surface preparation.
	03-14	Architectural Precast Concrete	Includes all materials, labor, equipment, plant, tools, required to complete all architectural pre-cast concrete mouldings on windows and wall openings, **Glass Fiber Reinforced Concrete (GFRC)** GFRC balusters, GFRC hand railings, and GFRC exterior concrete mouldings, etc.
	03-15	RC Testing	Includes all testing of materials for concrete and reinforcements and all field quality control tests with guarantee.
04	**00**	**MASONRY**	
	04-01	Concrete Hollow Blocks	Includes all concrete hollow block units and plastering on both sides.
	04-02	Accessories	Includes mortar mix, steel reinforcement for CHB, R.C. lintel beams and stiffener columns, grout, plaster bond, saw, ties. bolts, shoring, sealer, and mixer as required.
05	**00**	**METALS**	
	05-01	Structural Steel and Accessories	Includes all structural steel sections for columns, beams, trusses, purlins, sag rods, clips, cross bracings; rafters of canopies; shear studs, plates and webs, non-shrink grout: including painting Includes all field quality control tests.
	05-02	Miscellaneous Structural	All mild steel sections for dropped frame units

		Steel	and hangers to support ceiling; overhead anchorage of overhead folding door partitions; grill work, miscellaneous mounting brackets, straps, dowels, frames and connectors; construction gap assembly and cover; and painting.
	05-03	Welding and Fasteners	Includes weld plates, welding rods, welding electrodes, powder actuated anchor, bolts, nails, screws, expansion anchors. saddles and connectors, and painting.
	05-04	Stainless Steel Railings	Includes SS tube rail and SS supports; grab rails for PWD toilets.
	05-05	Miscellaneous Stainless Steel	Including flashings and counter flashings, anchors, grating & framing, vent grille, fasteners, as required.
	05-06	G.I. Pipes and Fittings	Includes G.I. pipes and fittings for landscape hose bibbs and other miscellaneous items.
	05-07	Brass Nosing and Brass Inserts	A.I. for stairs and floors whenever necessary
06	**00**	**WOOD AND PLASTICS**	
	06-01	Miscellaneous Lumber	Includes joists, nailers, hangers, braces and other miscellaneous lumber needed to complete rough carpentry works.
	06-02	Baseboards & Miscellaneous Trims	A.I. in the plans. Includes continuous turn-up Vinyl baseboards for all walls and interior partitions; includes miscellaneous trims to cover joints when necessary or as required.
	06-03	Reception Table, Overhead Cabinets; and Built-in Tables	Includes Reception table, overhead cabinets, built-in tables and counters, framing systems, hangers, plates & others and misc wood needed to complete finish carpentry works; Laminate finish. For Pantries, Cashiers Offices, Lacturium.
	06-04	Miscellaneous Wood; etc.	Includes framing systems, hangers, plates & others and miscellaneous wood needed to complete finish carpentry works.
07	**00**	**THERMAL AND MOISTURE PROTECTION**	

	07-01	Slab. Deck, Elevator Pit & Gutter Waterproofing	A.I. in the detailed plans. Underlay waterproofing membrane for all roof decks and misc. decks, whole Mezzanine floor, elevator pit and gutters; includes topping and flood test with guarantee.
	07-02	Ledges & Firewall Waterproofing	Exposed type liquid waterproofing for all ledges and firewall; includes flood test with guarantee.
	07-03	Toilet Waterproofing	A.I. in the plans. Fluid type rubberized bitumen with cross laminated PVC plastic waterproofing for all suspended toilets; includes topping and flood test with guarantee.
	07-04	Cistern Epoxy Waterproofing	For interior walls and slab of underground water cisterns/tanks; includes topping and flood test with guarantee.
	07-05	Damp-proofing	A.I., under slab on fill liner.
	07-06	Metal Roofing Insulation	25mm thick glass wool/fiberglass thermal barrier with 2 sided aluminum foil insulation. Under all metal roofing areas; includes insulation, strap liner, wire mesh and accessories.
	07-07	Slab, Deck Insulation	25mm thk x 1.5 pcf density extruded polystyrene board insulation. Under all roof deck areas and atrium; includes 50mm thick protective concrete topping and flood test with guarantee.
	07-08	Roofing Materials and Accessories	Includes G A 25 pre-finished, pre-formed roofing sheets, including G.A. 25 gutters, fascia and waterstopper, ridge rolls. flashing, counter-flashing, drip caps, sealants and other accessories, complete with fasteners.
	07-09	Fiber Cement Fascia Board	A.I. in the plans. 9mm thick fiber cement board.
	07-10	Caulking and Sealants	A.I.
08	**00**	**DOORS AND WINDOWS**	
	08-01	All Glass Doors; Aluminum Doors and Jambs	As indicated in the door schedule. Includes all glass and aluminum doors; complete with integral locking devices. hinges, handles and other finishing hardware; jambs, glazing, sealants and weather-stripping.
	08-02	Steel Doors and Steel Frames	Includes all steel and steel louver doors, complete with integral locking devices, hinges,

			panic devices and all finishing hardware; door cores, all metal jambs; wired glass view panels, glazing, sealants and weather-stripping.
	08-03	Wood Laminated Moulded Doors and Wood Jambs	A.I. in the Schedule of Doors; complete with integral locking devices, hinges, handles and other finishing hardware; jambs, glazing, sealants and weather-stripping.
	08-04	Aluminum Frameless, Fixed, Casement, and Awning Windows	A.I. in the Schedule of Windows. Includes all aluminum framed windows, with integral locking devices, hinges, stays, integral screen complete with snap-on glass fasteners and accessories, glazing, weather-stripping and sealants
	08-05	Finish Hardware	A.I. in the schedule of doors. Includes all other finish hardware for doors, windows, and cabinet works; door closers, stops, holders, pulls, silencers; cabinet accessories and others.
	08-06	Miscellaneous Glazing	Includes all other glass and mirror panels, complete with aluminum frames. preformed sealants, caulking, accessories and plywood backing for mirrors; installed.
	08-07	Testing	Includes all testing for quality performance of all exterior doors and windows.
09	**00**	**FINISHES**	
	09-01	Plaster	Includes all types of brown plaster finishes complete with all aluminum u-clips where required, plastering guide system. ready for top coat.
	09-02	Skim coat	Includes cementitious thin plastering mortar as top finish for all exterior and interior concrete and CHB walls with plastering guide system, ready for painting
	09-03	Miscellaneous Concrete Finishes	Includes all other miscellaneous concrete finishes such as: steel troweled, smooth rubbed and tool joint broom finish.
	09-04	Gypsum Wall Boards on Light Gauge Metal Wall Frames (with Acoustic Treatment)	A.I., includes framing system, gypsum wall boards top to bottom of slab/beam, rock-wool inserts, acoustic sealants, joining plaster, cotton tape and all other standard accessories. Use moisture-resistant boards whenever necessary. Build up to bottom of beam/slab to avoid flanking

		transmission.
09-05	Gypsum Ceiling Boards on Light Gauge Metal Ceiling Frames	A.I., includes complete framing system with standard accessories; 10mm thick. gypsum ceiling boards, joining plaster, cotton tape and all other standard accessories. Use moisture-resistant boards (MR) whenever necessary.
09-06	Metal Spandrel Ceiling on Ceiling Frame	A.I., pre-painted long span G.I. ceiling sheets on reinforced metal/wood framing system: complete with hangers, plates, wall angles, carrying channels, bracings, etc.
09-07	Polished Homogenous Porcelain Floor Tiles	For Ground Floor main lobby area; Includes all surface preparation, mortar/ adhesive, grout, and 600mm x 600mm polished homogenous porcelain tile finish for floors as indicated in the plans and specifications.
09-08	Polished Homogenous Porcelain Wall Tiles	For Reception Area accent wall, Includes all surface preparation, mortar/ adhesive, grout, and 1200mm x 600mm polished homogenous porcelain tile finish for floors as indicated in the plans and specifications.
09-09	Homogenous Granite Floor Tiles	Includes all surface preparation, tile adhesive. grout, trims, and 600mm x 600mm homogenous granite tiles; finish for floors of toilets.
09-10	Homogenous Granite Wall Tiles	Includes all surface preparation, mortar/ adhesive, grout, trims and 300mm x 600mm homogenous granite tiles; finish for walls of toilets.
09-11	Homogenous Rolled Vinyl Sheets	For areas as indicated in the plans; Includes all plaster surface preparation using self-levelling compound, 2mm thick homogenous vinyl sheets with welded joints, adhesive, cleaned and polished.
09-12	Homogenous Vinyl Tiles	For areas as indicated in the plans, Includes all plaster surface preparation using self-levelling compound, 2mm thick homogenous vinyl sheets with welded joints, adhesive, cleaned and polished.
09-13	Homogenous Granite Countertops	Includes all surface preparation, mortar/ adhesive, grout, and homogenous granite tiles and trims, finish for kitchen countertops and lavatories

	09-14	Paintings & Accessories	Includes all surface preparation and paint finishes for exterior and interior masonry works, wood and metals, pipes, natural stains and varnishes. For all surfaces
10	**00**	**SPECIALTIES**	
	10-01	Identifying Devices	A.I.; Includes stainless steel and acrylic signage for all rooms showing room number and room name; two (2) units fire exit signage for each fire exit, acrylic graphic signage for each toilet and shower/locker rooms, complete with anchorages as required and installed as per Architects direction.
	10-02	Toilet Doors and Partitions	Includes all phenolic board toilet doors and partitions, 450mm x 1000mm urinal partitions, nylon fittings, finishing hardware, such as indicator locks, door pulls. etc. and their accessories.
	10-03	Toilet Accessories	Includes all toilet accessories as indicated in the specifications. Includes SS Tissue Holder, Hand Dryer, SS Hand Paper Towel Holder, Soap Holder.
	10-04	Laminated Sticker Wall	A.I. includes laminated sticker accent walls for Directors Office, Assistant Directors Office, Conference Rooms, and War Rooms. Installed.
13	**00**	**SPECIAL CONSTRUCTION**	
	13-01	Solar Panel System	Complete system including Solar cells, battery, inverters and control room. Includes mounting brackets and accessories.
14	**00**	**CONVEYING SYSTEM**	
	14-01	Electric Elevator	A.I., includes complete machine room-less electric elevator system as per specifications, ready for use.
15	**00**	**MECHANICAL**	
		FIRE SUPPRESSION SYSTEM	

15-01	Fire Sprinkler Pipes and Fittings	Includes pipes and fittings for fire suppression system; including screwed, flanged and weld fittings. Include wet and dry standpipe system.
15-02	Sprinkler Heads	A.I. all types of sprinkler heads and their accessories.
15-03	FS Devices and Accessories	Includes all valve assemblies, sleeves, gaskets, fire department connections, all switches, bells, horns, fire hose cabinets, fire extinguishers, , etc.
15-04	Fire Pump (Vertical) Set	For fire suppression; includes all fire pumps and their controllers, complete with their accessories, installed. As specified.
15-05	Jockey Pump Set	For fire suppression; includes all jockey pumps and their controllers, complete with their accessories. installed. As specified.
15-06	FS System Testing and Commissioning	Includes all field quality tests required for the fire suppression system.
	STORM DRAINAGE SYSTEM	
15-07	Building Storm Drainage System	Includes pipes, fittings and accessories for storm drainage; including catch basin/area drains, perforated pipes, downspouts. gutter and roof drains, a/c drains, etc. All other civil works related to storm drainage include in Site Drainage 02-01.
	SANITARY, WASTE & VENT (SWV) SYSTEM	
15-08	SWV Pipes and Fittings	Includes pipes and fittings for sanitary, waste, and ventilation systems, all fittings, traps, grease traps, drains, cleanouts, etc.
15-09	SWV System Accessories	Includes hangers, supports, pipe sleeves, painting and identification items and consumable items.
15-10	Plumbing Fixtures	Includes supply, installation and testing of all plumbing fixtures.
15-11	Septic Tanks	A.I. in the plans, as required.
15-12	Sewage Treatment Plant (STP)	Complete STP system, as indicated in the plans. Includes tanks, equipment, pumps, accessories, etc.

15-13	SWV Pipe Testing	Includes all field quality tests required for the sanitary and drainage system.
	WATER SUPPLY SYSTEM	
15-14	Water Pipes And Fittings	Includes pipes and fittings for water supply, including service entrance, water meter, sub-meters, valves. faucets, air chambers, etc.
15-15	Water Supply Accessories	Includes hangers, supports, pipe sleeves, painting and identification items and consumable items.
15-16	Water Pipe Testing	Includes all field quality tests required for the sanitary and drainage system.
15-17	Elevated Water Tanks	A.I. in the plans. Complete with accessories.
15-18	Potable Water Cistern	A.I. in the plans.
15-19	Transfer Pumps	For water supply system; includes all pumps and controllers, complete with their accessories, installed. As specified in the plans.
	VENTILATION & AIR-CONDITIONING SYSTEM	
15-20	VAC Pipes and Fittings	Includes all ventilation and refrigerant pipes and fittings, 1" thk polyolefin type insulation and vapor barrier. Includes all wires and conduits, wiring devices for all a/c units.
15-21	VAC Piping Accessories	Includes hangers, rods, supports, pipe sleeves for all a/c & electrical pipes through walls and floors, painting and identification items and consumable items.
15-22	Ventilating Fans and Blowers	Includes all ventilating equipment, duct, grilles and their accessories.
15-23	ACCU and FCU; VRV Split-type units	Supply and Install all air-con split-type units; includes stands / anchors for equipment set-up. Includes charging of refrigerant for all a/c units. Ready for use.
15-24	VAC Pipe Testing & Commissioning	Includes all field quality tests required for the ventilation and a/c system.

16 00 ELECTRICAL

16-01	Electrical Service Entrance	Includes concrete pole; service entrance conduit

		and cable to panel; electric meter and others up to energizing.
16-02	Cables, Wires, Raceways and Conduits	Includes EMT, I.M.C. and PVC conduits and fittings, all cables and wires, risers, weather heads, and all accessories as required.
16-03	Panelboards and Breakers	Includes circuit breakers, panelboards, starters, grounding, and accessories.
16-04	Boxes & Wiring Devices	Includes pull-boxes, junction boxes. convenience and weatherproof outlets, switches, cover plates, other wiring devices and accessories.
16-05	Lighting Fixtures and Accessories	A.I., all lighting fixtures, ballasts, housing, reflectors, including supports and fasteners for mounting, such as conduit drops.
16-06	Speaker & Sound System	Includes public address system, TV, cable, conduits and wires, wiring devices including cover plates, hangers and supports. Includes the installation of amplifiers and loudspeakers supplied by owner.
16-07	Telephone System	Includes main telephone terminal cabinet, splicing cabinets, conduits and wires, wiring devices including cover plates, hangers and supports. Includes the installation of PABX and owner supplied telephone fixtures.
16-08	Fire Alarm System & Fire Extinguishers	Includes Fire Alarm Control Panel, conduits and wires, detectors, pull stations, sounder with strobe lights. annunciator, alarm module, module for lift, module for SCP and other wiring devices, hangers and supports; supply and installation of Fire Extinguishers as indicated in the plans.
16-09	LAN System	Includes conduits and wires, wiring devices and all other components to complete the LAN system.
16-10	CATV and CCTV Systems	Includes conduits and wires, wiring devices and all other components to complete the CATV and CCTV systems.
16-11	Grounding System	A I , includes all conduits and wires, ground rods, exothermic welds, copper mesh and other components.

16-12	Electrical & Electrical Auxiliaries Testing	Includes all field quality tests required for the electrical and electrical auxiliaries systems.

NOTE: This Cost Estimate Form (Section 00410) with the related explanations found in the Cost Estimate Guide (Section 00420) is provided by the DBM as a guide to the Bidder in organizing his bid cost items. The Bidder shall fill-up this Cost Estimate Form. A Bill of Quantities (BOQ) shall also be provided by the Bidder to serve as a Breakdown of Materials/Labor Items and their Corresponding Values following the format of the Bidder's filled-up Cost Estimate Form. This BOQ, when approved by the DBM, shall be construed as supplemental to the Plans, Specifications and other Bid Documents, such that what is provided in one document is deemed included in the other documents. The Bidder shall verify the quantities in the BOQ and shall be responsible for its accuracy and completeness such that all items of work, materials, plant, tools, equipment and labor to complete the Project shall be covered in his Bid. All items of work, materials, plant, tools, equipment and labor inadvertently missing in the BOQ but called for in the plans, specifications and other bid documents shall be provided by the Bidder at no extra cost to the DBM. Submitted filled-up BOQ s imply that the Bidder has verified the quantities and agrees that the BOQ is in accordance with the Plans, Specifications and other Bid Documents. In addition, the Bidder is also required to submit a Detailed Unit Price Analysis (DUPA) for all cost items in the approved BOQ. Finally, the Contractor is responsible for completing the Project in accordance with the Plans, Specifications and the other Bid Documents

Form of Contract Agreement

THIS AGREEMENT, made this *[insert date]* day of *[insert month]*, *[insert year]* between *[name and address of PROCURING ENTITY]* (hereinafter called the "Entity") and *[name and address of Contractor]* (hereinafter called the "Contractor").

WHEREAS, the Entity is desirous that the Contractor execute *[name and identification number of contract]* (hereinafter called "the Works") and the Entity has accepted the Bid for *[insert the amount in specified currency in numbers and words]* by the Contractor for the execution and completion of such Works and the remedying of any defects therein.

NOW THIS AGREEMENT WITNESSETH AS FOLLOWS:

1. In this Agreement, words and expressions shall have the same meanings as are respectively assigned to them in the Conditions of Contract hereinafter referred to.

2. The following documents shall be attached, deemed to form, and be read and construed as integral part of this Agreement, to wit:

   (a) General and Special Conditions of Contract;

   (b) Drawings/Plans;

   (c) Specifications;

   (d) Invitation to Bid;

   (e) Instructions to Bidders;

   (f) Bid Data Sheet;

   (g) Addenda and/or Supplemental/Bid Bulletins, if any;

   (h) Bid form, including all the documents/statements contained in the Bidder's bidding envelopes, as annexes, and all other documents submitted (e.g., Bidder's response to request for clarifications on the bid), including corrections to the bid, if any, resulting from the Procuring Entity's bid evaluation;

   (i) Eligibility requirements, documents and/or statements;

   (j) Performance Security;

   (k) Notice of Award of Contract and the Bidder's conforme thereto;

   (l) Other contract documents that may be required by existing laws and/or the Entity.

3. In consideration of the payments to be made by the Entity to the Contractor as hereinafter mentioned, the Contractor hereby covenants with the Entity to execute and complete the Works and remedy any defects therein in conformity with the provisions of this Contract in all respects.

4. The Entity hereby covenants to pay the Contractor in consideration of the execution and completion of the Works and the remedying of defects wherein, the Contract Price or such other sum as may become payable under the provisions of this Contract at the times and in the manner prescribed by this Contract.

IN WITNESS whereof the parties thereto have caused this Agreement to be executed the day and year first before written.

Signed, sealed, delivered by _____the _____ (for the Entity)

Signed, sealed, delivered by _____the _____(for the Contractor)

Binding Signature of Procuring Entity

_____

Binding Signature of Contractor

_____

[Addendum showing the corrections, if any, made during the Bid evaluation should be attached with this agreement]

Omnibus Sworn Statement

REPUBLIC OF THE PHILIPPINES)
CITY/MUNICIPALITY OF _____) S.S.

AFFIDAVIT

I, *[Name of Affiant]*, of legal age, *[Civil Status]*, *[Nationality]*, and residing at *[Address of Affiant]*, after having been duly sworn in accordance with law, do hereby depose and state that:

1. ***Select one, delete the other:***

   If a sole proprietorship, I am the sole proprietor or authorized representative of *[Name of Bidder]* with office address at *[address of Bidder]*;

   If a partnership, corporation, cooperative, or joint venture, I am the duly authorized and designated representative of *[Name of Bidder]* with office address at *[address of Bidder]*;

2. ***Select one, delete the other:***

   If a sole proprietorship As the owner and sole proprietor or authorized representative of *[Name of Bidder]*, I have full power and authority to do, execute and perform any and all acts necessary to participate, submit the bid, and to sign and execute the ensuing contract for *[Name of the Project]* of the *[Name of the Procuring Entity] [insert "as shown in the attached duly notarized Special Power of Attorney" for the authorized representative]*;

   If a partnership, corporation, cooperative, or joint venture: I am granted full power and authority to do, execute and perform any and all acts necessary to participate, submit the bid, and to sign and execute the ensuing contract for *[Name of the Project]* of the *[Name of the Procuring Entity]*, accompanied by the duly notarized Special Power of Attorney, Board/Partnership Resolution, or Secretary's Certificate, whichever is applicable;

3. *[Name of Bidder]* is not "blacklisted" or barred from bidding by the Government of the Philippines or any of its agencies, offices, corporations, or Local Government Units, foreign government/foreign or international financing institution whose blacklisting rules have been recognized by the Government Procurement Policy Board;

4. Each of the documents submitted in satisfaction of the bidding requirements is an authentic copy of the original, complete, and all statements and information provided therein are true and correct;

5. *[Name of Bidder]* is authorizing the Head of the Procuring Entity or its duly authorized representative(s) to verify all the documents submitted;

6. ***Select one, delete the rest:***

   If a sole proprietorship: The owner or sole proprietor is not related to the Head of the Procuring Entity, members of the Bids and Awards Committee (BAC), the Technical Working Group, and the BAC Secretariat, the head of the Project Management Office or the end-user unit, and the project consultants by consanguinity or affinity up to the third civil degree;

   If a partnership or cooperative: None of the officers and members of *[Name of Bidder]* is related to the Head of the Procuring Entity, members of the Bids and Awards Committee (BAC), the Technical Working Group, and the BAC Secretariat, the head of the Project Management Office or the end-user unit, and the project consultants by consanguinity or affinity up to the third civil degree;

   If a corporation or joint venture: None of the officers, directors, and controlling stockholders of *[Name of Bidder]* is related to the Head of the Procuring Entity, members of the Bids and Awards Committee (BAC), the Technical Working Group, and the BAC Secretariat, the head of the Project Management Office or the end-user unit, and the project consultants by consanguinity or affinity up to the third civil degree;

7. *[Name of Bidder]* complies with existing labor laws and standards; and

8. *[Name of Bidder]* is aware of and has undertaken the following responsibilities as a Bidder:

   a) Carefully examine all of the Bidding Documents;

   b) Acknowledge all conditions, local or otherwise, affecting the implementation of the Contract;

   c) Made an estimate of the facilities available and needed for the contract to be bid, if any; and

   d) Inquire or secure Supplemental/Bid Bulletin(s) issued for the *[Name of the Project]*.

9. *[Name of Bidder]* did not give or pay directly or indirectly, any commission, amount, fee, or any form of consideration, pecuniary or otherwise, to any person or official, personnel or representative of the government in relation to any procurement project or activity.

IN WITNESS WHEREOF, I have hereunto set my hand this __ day of ___, 20__ at _____, Philippines.

_____
Bidder's Representative/Authorized Signatory

SUBSCRIBED AND SWORN to before me this ___ day of *[month] [year]* at *[place of execution]*, Philippines. Affiant/s is/are personally known to me and was/were identified by me through competent evidence of identity as defined in the 2004 Rules on Notarial Practice (A.M. No 02-8-13-SC). Affiant/s exhibited to me his/her [insert type of government identification card used], with his/her photograph and signature appearing thereon, with no. _____ and his/her Community Tax Certificate No. _____ issued on ____ at _____.

Witness my hand and seal this ___ day of *[month] [year]*.

NAME OF NOTARY PUBLIC
Serial No. of Commission _____
Notary Public for _____ until _____
Roll of Attorneys No. _____
PTR No. _____ *[date issued], [place issued]*
IBP No. _____ *[date issued], [place issued]*

Doc. No. _____
Page No. _____
Book No. _____
Series of _____

* This form will not apply for WB funded projects.

Bid-Securing Declaration

(REPUBLIC OF THE PHILIPPINES)
CITY OF _____) S.S.
x----------x

Invitation to Bid *[Insert reference number]*

To. *[Insert name and address of the Procuring Entity]*

I/We, the undersigned, declare that:

1. I/We understand that, according to your conditions, bids must be supported by a Bid Security, which may be in the form of a Bid-Securing Declaration.

2. I/We accept that: (a) I/we will be automatically disqualified from bidding for any contract with any procuring entity for a period of two (2) years upon receipt of your Blacklisting Order; and, (b) I/we will pay the applicable fine provided under Section 6 of the Guidelines on the Use of Bid Securing Declaration, within fifteen (15) days from receipt of written demand by the procuring entity for the commission of acts resulting to the enforcement of the bid securing declaration under Sections 23.1(b), 34.2, 40.1 and 69.1, except 69.1 (f), of the IRR of RA 9184; without prejudice to other legal action the government may undertake.

3. I/We understand that this Bid-Securing Declaration shall cease to be valid on the following circumstances:

   a. Upon expiration of the bid validity period, or any extension thereof pursuant to your request;

   b. I am/we are declared ineligible or post-disqualified upon receipt of your notice to such effect, and (i) I/we failed to timely file a request for reconsideration or (ii) I/we filed a waiver to avail of said right;

   c. I am/we are declared as the bidder with the Lowest Calculated Responsive Bid, and I/we have furnished the performance security and signed the Contract.

IN WITNESS WHEREOF, I/We have hereunto set my/our hand/s this ____ day of *[month] [year]* at *[place of execution]*.

[Insert NAME OF BIDDER'S AUTHORIZED REPRESENTATIVE]
[Insert signatory's legal capacity]

Affiant

SUBSCRIBED AND SWORN to before me this __ day of *[month] [year]* at *[place of execution]*, Philippines. Affiant/s is/are personally known to me and was/were identified by me through competent evidence of identity as defined in the 2004 Rules on Notarial Practice (A.M. No. 02-8-13-SC). Affiant/s exhibited to me his/her *[insert type of government identification card used]*, with his/her photograph and signature appearing thereon, with no. _____.

Witness my hand and seal this ___ day of *[month] [year]*.

NAME OF NOTARY PUBLIC

Serial No. of Commission _____
Notary Public for _____ until _____
Roll of Attorneys No. _____
PTR No. __, *[date issued], [place issued]*
IBP No. __, *[date issued], [place issued]*
Doc. No. ___
Page No. ___
Book No. ___
Series of ____.

AFFIDAVIT OF SITE INSPECTION

I, *[Name of Affiant]*, of legal age, *[Civil Status]*, *[Nationality]*, and residing at *[Address of Affiant]*; after having been duly sworn in accordance with law, do hereby depose and state that:

1. That I am the [Position of the Authorized Representative] of the [Name of Bidder] with office at [Address of the Bidder]

2. That I have inspected the site for [Name of Contract/Project]. Located at [Location of the Contract/Project] on [Date of Inspection].

3. That I am making this statement as part of the requirement for the Technical Proposal of the [Name of Bidder] for the [Name of Contract/Project] of the Procurement Service (PS).

IN WITNESS WHEREOF, I have hereunto set my hand this __ day of ___, 20__ at _____, Philippines.

_____
Affiant

SUBSCRIBED AND SWORN to before me in the City/Municipality of _____(indicate also the Province in the case of the Municipality)_____ this _____ day of ____(month & year) ____ by ____(name of affiant)_____, who has satisfactorily proven to me his identity through his ____(ID name and number)___ valid until ___(expiry date)___, that he is the same person who personally signed before me the foregoing Affiant and acknowledged that he executed the same.

_____
(Notary Public)

Until _____
PTR No. _____
Date _____
Place _____
TIN _____
IBP _____

Doc No. ;
Page No. ;
Book No. ;
Series of 20__.

REPUBLIC OF THE PHILIPPINES)
CITY/MUNICIPALITY OF _____) S.S.

SUB-CONTRACTOR LISTING

PROJECT : **RENOVATION OF THE DBM ARCACHE BUILDING**

LOCATION :**General Solano St., San Miguel, Manila**

OWNER . **DEPARTMENT OF BUDGET AND MANAGEMENT**

CONTRACTOR : _____Bid Opening Date: _____

Division of Work	Sub-Contractor Proposed	Labor Amount	Materials Amount	Total Amount

NOTE: Provide additional sheet/s of same format if necessary.

STATEMENT OF ALL ONGOING GOVERNMENT & PRIVATE CONSTRUCTION CONTRACTS INCLUDING CONTRACTS AWARDED BUT NOT YET STARTED

Business Name : _____

Business Address : _____

Name of Contract/Location Project Cost	a. Owner Name b. Address c. Telephone Nos.	Nature of Work	Contractor's Role		a. Date Awarded b. Date Started c. Date of Completion	% of Accomplishment		Value of Outstanding Works
			Description	%		Planned	Actual	
Government								
Private								

							Total Cost:	

Note: This statement shall be supported by:

1. State all ongoing contracts including those awarded but not yet started (government and private contracts which may be similar or not similar to the project called for bidding) as of:

   (The day before the deadline of submission of bids.)

2. If there is no ongoing contract including awarded but not yet started as of the aforementioned period, state none or equivalent term

Submitted by : _____

(Printed Name & Signature of Authorized Representative)

Designation _____ Date : _____

STATEMENT OF SINGLE LARGEST COMPLETED CONTRACT

Business Name : _____

Business Address : _____

Name of Contract/Location Project Cost	a. Owner Name b. Address c. Telephone Nos.	Nature of Work	Contractor's Role		a. Date Awarded b. Date Started c. Date of Completion	% of Accomplishment		Value of Outstanding Works
			Description	%		Planned	Actual	
Government								
Private								
							Total Cost:	

Submitted by : _____

(Printed Name & Signature of Authorized Representative)

Designation _____ Date : _____

LIST OF KEY PERSONNEL PROPOSED TO BE ASSIGNED TO THE CONTRACT *(TEMPLATE)*

Business Name : _____

Business Address : _____

	Project Manager	Architect	Structural Engineer	Electrical Engineer	Mechanical Engineer	Sanitary Engineer	Electronics Communications Engineer	Health and Safety Officer
1 Name								
2 Address								
3. Date of Birth								
4. Employed Since								
5. Experience								
6 Previous Employment								
7. Education								
8. PRC License/Accreditation from DOLE-OHSC *(for the Health and Safety Officer)*								
9. Cost of Biggest Project Handled								
10. Years of Experience in Proposed Position								

Note: This List must be supported by individual resumes of all personnel and photocopy of PRC Licenses of the Project Manager and Engineers.

Submitted by : _____

(Printed Name & Signature of Authorized Representative)

Designation : _____

Date : _____

LIST OF EQUIPMENT, OWNED OR LEASED AND/OR UNDER PURCHASE AGREEMENT, PLEDGED TO THE PROPOSED CONTRACT

Business Name : _____

Business Address : _____

Description	Model/Year	Capacity/Performance/Size	Plate No.	Motor No./ Body No.	Location	Condition	Proof of Ownership/ Lessor/Vendor
A. Owned							
i.							
ii.							
iii.							
iv.							
v.							
B. Leased							
i.							
ii.							
iii.							
iv.							
v.							

C. Under Purchase Agreement							
i.							
ii.							
iii.							
iv.							
v.							

Note: This List must be supported by proof of ownership, lease and/or purchase agreement. For lease and purchase agreement, such proof must include a certification of availability of equipment from the lessor/vendor for the duration of the project.

Submitted by : _____

(Printed Name & Signature of Authorized Representative)

Designation : _____ Date : _____

SWORN STATEMENT OF COMPLIANCE WITH THE DRAWINGS AND SPECIFICATIONS

I, *[Name of Affiant]*, of legal age, *[Civil Status]*, *[Nationality]*, and residing at *[Address of Affiant]*, after having been duly sworn in accordance with law, do hereby depose and state that:

1. That I am the [Position of the Authorized Representative] of the [Name of Bidder] with office at [Address of the Bidder]

2. That in compliance the requirements of Procurement Service (PS), I hereby certify that [Name of Bidder] will undertake construction of the Project in accordance with the Drawings and Building Specifications as indicated in the Bidding Documents including Supplemental/Bid Bulletins, if any, for said Project

3. That I am making this statement as part of the requirement for the Technical Proposal of the [Name of Bidder] for the [Name of Contract/Project] of the Procurement Service (PS)

IN WITNESS WHEREOF, I have hereunto set my hand this __ day of ___, 20__ at _____, Philippines.

_____

Affiant

SUBSCRIBED AND SWORN to before me in the City/Municipality of _____(indicate also the Province in the case of the Municipality)_____ this _____ day of ____(month & year) ____ by ____(name of affiant)_____, who has satisfactorily proven to me his identity through his ____(ID name and number)___ valid until ___(expiry date)___, that he is the same person who personally signed before me the foregoing Affiant and acknowledged that he executed the same.

_____

(Notary Public)

Until _____
PTR No. _____
Date _____
Place _____
TIN _____
IBP _____

Doc. No. ;
Page No. :
Book No. ;
Series of 20__.

STATEMENT OF AVAILABILITY OF KEY PERSONNEL AND EQUIPMENT

[Date of Issuance]

The Chairman
Bids and Awards Committee
Department of Budget and Management

Dear _____:

In compliance with the requirements of the DBM Bids and Awards Committee for the bidding of the *[Name of the Project]* ("the Project"), we certify that *[Name of the Bidder]* has in its employ key personnel, such as ***Project Manager, Architect, Structural Engineer, Electrical Engineer, Mechanical Engineer, Sanitary Engineer, Electronics Communications Engineer and Health and Safety Officer*** who will be engaged for the construction of the said Project.

Further, we likewise certify the availability of equipment that *[Name of the Bidder]* owns, has under lease, and/or has under purchase agreement that may be used for the Project.

Very truly yours,

[Name of Authorized Representative]

[Position]