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

# BIDDING DOCUMENTS

# FOR THE

# SUPPLY, DELIVERY, FABRICATION, INSTALLATION, TESTING AND COMMISSIONING OF VARIABLE REFRIGERATION FLOW MULTI-SPLIT SYSTEM FOR THE DBM ARCACHE BUILDING

**PROJECT ID NO.: DBM-2018-24**

## CHECKLIST OF ELIGIBILITY AND TECHNICAL DOCUMENTS FOR SUBMISSION

**Class "A" Documents**

**(1) Legal Documents**

☐ PhilGEPS Platinum Certificate of Registration with Annex A

Note: If PhilGEPS Platinum Certificate of Registration is not available, the following shall be submitted, together with the PhilGEPS Certificate of Registration:

- ☐ SEC/DTI Registration Certificate
- ☐ Valid Mayor's Permit
- ☐ Tax Clearance Certificate
- ☐ Audited Financial Statements stamped "received by the BIR or its duly accredited and authorized institutions, for the preceding calendar year

* In case of recently expired Mayor's/Business permit, it shall be accepted together with its official receipt as proof that the bidder has applied for renewal within the period prescribed by the concerned local government unit, provided that the renewed permit shall be submitted as a post qualification requirement in accordance with Section 34.2 of the IRR of R.A. No. 9184.

**(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 two (2) 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)
- ☐ Certificate of Completion or Acceptance from the Bidder's client or Official Receipt

☐ 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

☐ Compliance with Section VI. Schedule of Requirements

☐ Compliance with Section VII. Technical Specifications

☐ Omnibus Sworn Statement

☐ Authority of the Signatory

**(3) Financial Documents**

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

**Class "B" Documents**

☐ 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**
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# INVITATION TO BID FOR THE SUPPLY, DELIVERY, FABRICATION, INSTALLATION, TESTING AND COMMISSIONING OF VARIABLE REFRIGERATION FLOW MULTI-SPLIT SYSTEM FOR THE DBM ARCACHE BUILDING

1. The Department of Budget and Management (DBM), through the authorized appropriations under the FY 2018 General Appropriations Act, intends to apply the sum of Twenty One Million Pesos (P21,000,000.00) being the Approved Budget for the Contract (ABC) to payments under the contract for the Project, "Supply, Delivery, Fabrication, Installation, Testing and Commissioning of Variable Refrigeration Flow Multi-Split System for the DBM Arcache Building." Bids received in excess of the ABC shall be automatically rejected at bid opening.

2. The DBM now invites bids for the Project, "Supply, Delivery, Fabrication, Installation, Testing and Commissioning of Variable Refrigeration Flow Multi-Split System for the DBM Arcache Building." Delivery of the Goods shall be in accordance with the Delivery Schedule under Section VI. Schedule of Requirements. Bidders should have completed, within two (2) 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, partnerships, or organizations with at least sixty percent (60%) interest or outstanding capital stock belonging to citizens of the Philippines, and to citizens or organizations of a country the laws or regulations of which grant similar rights or privileges to Filipino citizens, pursuant to RA No. 5183.

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 October 2, 2018 from the address below and upon payment of a fee in the amount of Twenty Five Thousand Pesos (P25,000.00).

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 October 9, 2018, 9:00 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 October 23, 2018, 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 October 23, 2018, 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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# General

## 1. Scope of Bid

1.1. The Procuring Entity named in the **BDS** invites bids for the supply and delivery of the Goods as described in Section VII. Technical 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 28.

## 2. Source of Funds

The Procuring Entity has a budget or has 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.

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

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

(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 government, 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 RA 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.

(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 any of the practices mentioned in this Clause for purposes of competing for the contract.

3.2. Further, the Procuring Entity will seek to impose the maximum civil, administrative, and/or criminal penalties available under 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 bidder or supplier in the bidding for and performance of a contract themselves or through independent auditors as reflected in the **GCC** Clause 3.

## 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 (c) below 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 provided 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 sixty percent (60%) of the interest belongs to citizens of the Philippines;

(c) Corporations duly organized under the laws of the Philippines, and of which at least sixty percent (60%) of the outstanding capital stock belongs to citizens of the Philippines;

(d) Cooperatives duly organized under the laws of the Philippines; and

(e) Persons/entities forming themselves into a Joint Venture (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 Filipino ownership or interest of the JV concerned shall be at least sixty percent (60%).

5.2. Foreign bidders may be eligible to participate when any of the following circumstances exist, as specified in the **BDS**:

(a) When a Treaty or International or Executive Agreement as provided in Section 4 of RA 9184 and its IRR allow foreign bidders to participate;

(b) Citizens, corporations, or associations of a country, the laws or regulations of which grant reciprocal rights or privileges to citizens, corporations, or associations of the Philippines;

(c) When the Goods sought to be procured are not available from local suppliers; or

(d) When there is a need to prevent situations that defeat competition or restrain trade.

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. Unless otherwise provided in the **BDS**, the Bidder must have completed a Single Largest Completed Contract (SLCC) similar to the Project and the value of which, adjusted, if necessary, by the Bidder to current prices using the Philippine Statistics Authority (PSA) consumer price index, must be at least equivalent to a percentage of the ABC stated in the **BDS**.

For this purpose, contracts similar to the Project shall be those described in the **BDS**, and completed within the relevant period stated in the Invitation to Bid and **ITB** Clause 12.1(a)(ii).

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 to be bid.

The values of the domestic bidder's current assets and current liabilities shall be based on the latest Audited Financial Statements 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.

If the prospective bidder opts to submit a committed Line of Credit, it must be at least equal to ten percent (10%) of the ABC to be bid. If issued by a foreign universal or commercial bank, it shall be confirmed or authenticated by a local universal or commercial bank.

## 6. Bidder's Responsibilities

6.1. The Bidder or its duly authorized representative shall submit a sworn statement in the form prescribed in Section VIII. 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 and/or to represent the Bidder in the bidding, with the duly notarized Secretary's Certificate attesting to such fact, if the Bidder is a corporation, partnership, cooperative, or joint venture;

(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 government in relation to any procurement project or activity.

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

6.3. The Bidder is expected to examine all instructions, forms, terms, and specifications in the Bidding Documents.

6.4. It shall be the sole responsibility of the Bidder to determine and to satisfy itself by such means as it considers necessary or desirable as to all matters pertaining to the contract to be bid, including: (a) the location and the nature of this Project; (b) climatic conditions; (c) transportation facilities; and (d) other factors that may affect the cost, duration, and execution or implementation of this Project.

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 bid/supplemental bid bulletin/s issued, are correct and consistent.

6.6. Before submitting their bids, the Bidder is deemed to have become familiar with all existing laws, decrees, ordinances, acts and regulations of the Philippines which may affect this Project 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

Unless otherwise indicated in the **BDS**, there is no restriction on the origin of goods other than those prohibited by a decision of the United Nations Security Council taken under Chapter VII of the Charter of the United Nations, subject to **ITB** Clause 27.1.

## 8. Subcontracts

8.1. Unless otherwise specified in the **BDS**, the Bidder may subcontract portions of the Goods 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 Goods shall be disallowed.

8.3. The Bidder may identify the subcontractor to whom a portion of the Goods 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.

# 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 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 on and/or interpretation of any part of the Bidding Documents. Such 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.

# 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, within the relevant period as provided in the **BDS.**

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) kinds of Goods;

(ii.6) For Statement of Ongoing Contracts - amount of contract and value of outstanding contracts;

(ii.7) For Statement of SLCC - amount of completed contracts, adjusted by the Bidder to current prices using PSA's consumer price index, if necessary for the purpose of meeting the SLCC requirement;

(ii.8) date of delivery; and

(ii.9) end user's acceptance or official receipt(s) or sales invoice issued for the contract, if completed, which shall be attached to the statements.

(iii) NFCC computation in accordance with ITB Clause 5.5 or a committed Line of Credit from a universal or commercial bank.

Class "B" Document:

(iv) If applicable, the Joint Venture Agreement (JVA) in case the joint venture is already in existence, or duly notarized statements from all the potential joint venture partners in accordance with Section 23.1(b) of the IRR.

(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, it shall be accompanied by a certification by the Insurance Commission that the surety or insurance company is authorized to issue such instruments;

(ii) Conformity with technical specifications, as enumerated and specified in Sections VI and VII of the Bidding Documents; and

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

(iv) For foreign bidders claiming eligibility by reason of their country's extension of reciprocal rights to Filipinos, a certification from the relevant government office of their country stating that Filipinos are allowed to participate in their government procurement activities for the same item or product.

## 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 applicable Price Schedules, in accordance with **ITB** Clauses 15.1 and 15.4;

(b) If the Bidder claims preference as a Domestic Bidder, a certification from the DTI issued in accordance with **ITB** Clause 27, unless otherwise provided in the **BDS**; and

(c) 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 responsible unit of the procuring entity and that the estimates 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.

(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 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 Bidder shall complete the appropriate Schedule of Prices included herein, stating the unit prices, total price per item, the total amount and the expected countries of origin of the Goods to be supplied under this Project.

15.2. The Bidder shall fill in rates and prices for all items of the Goods described in the Schedule of Prices. Bids not addressing or providing all of the required items in the Bidding Documents including, where applicable, Schedule of Prices, 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 accomplished.

15.3. The terms Ex Works (EXW), Cost, Insurance and Freight (CIF), Cost and Insurance Paid to (CIP), Delivered Duty Paid (DDP), and other trade terms used to describe the obligations of the parties, shall be governed by the rules prescribed in the current edition of the International Commercial Terms (INCOTERMS) published by the International Chamber of Commerce, Paris.

15.4. Prices indicated on the Price Schedule shall be entered separately in the following manner:

(a) For Goods offered from within the Procuring Entity's country:

(i) The price of the Goods quoted EXW (ex works, ex factory, ex warehouse, ex showroom, or off-the-shelf, as applicable);

(ii) The cost of all customs duties and sales and other taxes already paid or payable;

(iii) The cost of transportation, insurance, and other costs incidental to delivery of the Goods to their final destination; and

(iv) The price of other (incidental) services, if any, listed in the **BDS**.

(b) For Goods offered from abroad:

(i) Unless otherwise stated in the **BDS**, the price of the Goods shall be quoted DDP with the place of destination in the Philippines as specified in the **BDS**. In quoting the price, the Bidder shall be free to use transportation through carriers registered in any eligible country. Similarly, the Bidder may obtain insurance services from any eligible source country.

(ii) The price of other (incidental) services, if any, listed in the **BDS**.

(c) For Services, based on the form which may be prescribed by the Procuring Entity, in accordance with existing laws, rules and regulations

15.5. Prices quoted by the Bidder shall be fixed during the Bidder's performance of the contract and not subject to variation or price escalation on any account. A bid submitted with an adjustable price quotation shall be treated as non-responsive and shall be rejected, pursuant to **ITB** Clause 24.

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. 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. 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.

## 16. Bid Currencies

16.1. Prices shall be quoted in the following currencies:

(a) For Goods that the Bidder will supply from within the Philippines, the prices shall be quoted in Philippine Pesos.

(b) For Goods that the Bidder will supply from outside the Philippines, the prices may be quoted in the currency(ies) stated 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 as published in the *Bangko Sentral ng Pilipinas* (BSP) reference rate bulletin 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 foregoing exchange rates.

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 the 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.<br><br>*For biddings conducted by LGUs, the Cashier's/Manager's Check may be issued by other banks certified by the BSP as authorized to issue such financial instrument.* | Two percent (2%) |
| (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.<br><br>*For biddings conducted by 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. | 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 33.2, 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 upon the lapse of the reglementary period to file 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 32, and the posting of the performance security pursuant to **ITB** Clause 33, the successful Bidder's bid security will be discharged, but in no case later than the bid security validity period as indicated in the **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 28.3(b);

(iii) has a finding against the veracity of any of the documents submitted as stated in **ITB** Clause 29.2;

(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 32; or

(ii) fails to furnish performance security in accordance with **ITB** Clause 33.

## 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 VIII. Bidding Forms on or before the deadline specified in the **ITB** Clauses 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 Schedule of Prices, under Section VIII 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 1.1;

(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.

## 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 ITB 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 duly 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, 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 requirements in **ITB** Clause 12.1(a)(i). Submission of documents required

under **ITB** Clauses 12.1(a)(ii) to 12.1(a)(iii) 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.

## 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. Domestic Preference

27.1. Unless otherwise stated in the **BDS**, the Procuring Entity will grant a margin of preference for the purpose of comparison of bids in accordance with the following:

(a) The preference shall be applied when the lowest Foreign Bid is lower than the lowest bid offered by a Domestic Bidder.

(b) For evaluation purposes, the lowest Foreign Bid shall be increased by fifteen percent (15%).

(c) In the event that the lowest bid offered by a Domestic Bidder does not exceed the lowest Foreign Bid as increased, then the Procuring Entity shall award the contract to the Domestic Bidder at the amount of the lowest Foreign Bid.

(d) If the Domestic Bidder refuses to accept the award of contract at the amount of the Foreign Bid within two (2) calendar days from receipt of written advice from the BAC, the Procuring Entity shall award to the bidder offering the Foreign Bid, subject to post-qualification and submission of all the documentary requirements under these Bidding Documents.

27.2. A Bidder may be granted preference as a Domestic Bidder subject to the certification from the DTI that the Bidder is offering unmanufactured articles, materials or supplies of the growth or production of the Philippines, or manufactured articles, materials, or supplies manufactured or to be manufactured in the Philippines substantially from articles, materials, or supplies of the growth, production, or manufacture, as the case may be, of the Philippines.

## 28. Detailed Evaluation and Comparison of Bids

28.1. 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.

28.2. 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 the highest. The bid with the lowest price shall be identified as the Lowest Calculated Bid.

28.3. The Procuring Entity's BAC shall immediately conduct a detailed evaluation of all bids rated "passed," using non-discretionary pass/fail criteria. 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, Schedule of Prices, 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.

28.4. 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**.

28.5. The Procuring Entity's evaluation of bids shall be based on the bid price quoted in the Bid Form, which includes the Schedule of Prices.

28.6. 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.

28.7. 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 items specified for each lot and to all quantities specified for each item of a 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 28.3.

## 29. Post-Qualification

29.1. 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.

29.2. 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.

29.3. 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.

29.4. 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.

29.5. 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 for contract award.

29.6. 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.

29.7. 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.

## 30. Reservation Clause

30.1. 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.

30.2. 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.

30.3. 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 or 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.

## Award of Contract

## 31. Contract Award

31.1. Subject to **ITB** Clause 29, the HoPE or its duly authorized representative shall award the contract to the Bidder whose bid has been determined to be the LCRB.

31.2. 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 sent 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.

31.3. 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) Valid JVA, if applicable; or

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

(b) Posting of the performance security in accordance with **ITB** Clause 33;

(c) Signing of the contract as provided in **ITB** Clause 32; and

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

31.4. At the time of contract award, the Procuring Entity shall not increase or decrease the quantity of goods originally specified in Section VI. Schedule of Requirements.

## 32. Signing of the Contract

32.1. 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.

32.2. 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.

32.3. 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.

32.4. 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**.

## 33. Performance Security

33.1. 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.

33.2. 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.<br><br>*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.* | Five percent (5%) |

| | |
|---|---|
| (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.<br><br>*For biddings conducted by the 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. | Thirty percent (30%) |

33.3. 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 the 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.

## 34. 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.

## 35. Protest Mechanism

Decisions of the procuring entity at any stage of the procurement process may be questioned in accordance with Section 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**.<br><br>The name of the Project is "Supply, Delivery, Fabrication, Installation, Testing and Commissioning of Variable Refrigeration Flow Multi-Split System for the DBM Arcache Building."<br><br>The identification number of the Project is DBM-2018-24. |
| 1.2 | This bidding shall only have one (1) lot, as follows:<br><br>**Supply, Delivery, Fabrication, Installation, Testing and Commissioning of Variable Refrigeration Flow Multi-Split System for the DBM Arcache Building** |
| 2 | The Funding Source is:<br><br>The Government of the Philippines (GOP) through the authorized appropriations under the FY 2018 General Appropriations Act in the amount of **Twenty One Million Pesos (P21,000,000.00).**<br><br>The name of the Project is **Supply, Delivery, Fabrication, Installation, Testing and Commissioning of Variable Refrigeration Flow Multi-Split System for the DBM Arcache Building.** |
| 3.1 | No further instructions. |
| 5.1 | No further instructions. |
| 5.2 | Foreign bidders, except those falling under **ITB** Clause 5.2(b), may not participate in this Project. |
| 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.<br><br>Bidders shall include in their bids:<br><br>1. a photocopy of Single Largest Completed Contract or Purchase Order; and<br><br>2. the corresponding proof of completion, which could either be:<br><br>(i) Certificate of Final Acceptance/Completion from the bidder's client; or<br><br>(ii) Official Receipt of the bidder covering the full amount of the contract. |

| | |
|---|---|
| | Failure to submit a copy of the Single Largest Completed Contract with proof of completion is a valid ground for disqualification of the bidder.<br><br>For this purpose, similar contract shall refer to Supply, Delivery, Fabrication, Installation, Testing and Commissioning of Variable Refrigeration Flow Multi-Split System. |
| 7 | No further instructions. |
| 8.1 | No further instructions. |
| 8.2 | Not applicable. |
| 9.1 | The Procuring Entity will hold a Pre-bid Conference for this Project on October 9, 2018, 9:00 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:<br><br>Department of Budget and Management<br>DBM Bldg. III, General Solano St.<br>San Miguel, Manila |
| 12.1(a) | No further instructions. |
| 12.1(a)(i) | For corporations/partnerships, the following may also be submitted: latest articles of incorporation/partnerships, by-laws, or amendments thereto, duly approved by the Securities and Exchange Commission.<br><br>If the bidder is not a PhilGEPS Platinum Member, the following shall be submitted:<br><br>a) SEC/DTI Registration Certificate<br>b) Valid Mayor's Permit<br>c) Tax Clearance Certificate<br>d) Audited Financial Statements stamped "received" by the BIR or its duly accredited and authorized institutions, for the preceding calendar year<br><br>In case of recently expired Mayor's/Business permit, it shall be accepted together with its official receipt as proof that the bidder has applied for renewal within the period prescribed by the concerned local government unit, provided that the renewed permit shall be submitted as a post qualification requirement in accordance with Section 34.2 of the IRR of R.A. No. 9184. |
| 12.1(a)(ii) | The bidder's SLCC similar to the contract to be bid should have been completed within two (2) years prior to the deadline for the submission and receipt of bids. |

| | |
|---|---|
| 12.1(b)(iii) | Notarization of this document shall comply with the 2004 Rules on Notarial Practice which limits competent evidence of identity to the following:<br><br>(i) identification documents issued by an official agency bearing the photograph and signature of the individual (i.e., passport, driver's license, SSS ID, GSIS e-card, etc.); and<br><br>(ii) the oath of affirmation of one credible witness not privy to the instrument, document or transaction who is personally known to the notary public and who personally knows the individual and shows to the notary public documentary identification. |
| 13.1 | No additional requirements. |
| 13.1(b) | No further instructions. |
| 13.1(c) | No additional requirements. |
| 13.2 | The ABC is **Twenty One Million Pesos (P21,000,000.00)**. Any bid with a financial component exceeding this amount shall not be accepted. |
| 15.4(a)(iv) | No further instructions. |
| 15.4(b) | Not applicable. |
| 16.1(b) | Not applicable. |
| 16.3 | No further instructions. |
| 17.1 | Bids will be valid until February 20, 2019. |
| 18.1 | The bid security shall be in the form of a Bid Securing Declaration, or any of the following forms and amounts:<br><br>1. The amount of not less than ₱420,000.00 *[2% of ABC],* if bid security in cash, cashier's/manager's check, bank draft/guarantee or irrevocable letter of credit; or<br><br>2. The amount of not less than ₱1,050,000.00 *[5% of ABC],* if bid security is in Surety Bond. |
| 18.2 | The bid security shall be valid until February 20, 2019. |
| 20.3 | Each Bidder shall submit one (1) original and two (2) duplicate copies of the first and second components of its bid. |

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| 21 | The address for submission of bids is at the BAC Conference Room, Ground Floor, DBM Building III, General Solano St., San Miguel, Manila.<br><br>The deadline for submission of bids is October 23, 2018, 9:00 a.m.<br><br>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.<br><br>The date and time of bid opening is October 23, 2018, 9:00 a.m. |
| 24.2 | No further instructions. |
| 24.3 | No further instructions. |
| 27.1 | No further instructions. |
| 28.3 | No further instructions. |
| 28.3(b) | Bid modification is allowed in case of arithmetical corrections only. |
| 28.4 | No further instructions. |
| 29.2 | The following shall be submitted in addition to those specified under Section 29.2 of the GCC:<br><br>Latest Income and Business Tax Returns, filed and paid through the Electronic Filing and Payments System (EFPS), consisting of the following:<br><br>i. 2017 Income Tax Return with proof of payment; and<br><br>ii. VAT Returns (Form 2550M and 2550Q) or Percentage Tax Returns (2551M) with proof of payment covering the months from March 2018 to August 2018. |
| 32.4(f) | No additional requirement. |

# *Section IV. General Conditions of Contract*

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## 1. Definitions

1.1. In this Contract, the following terms shall be interpreted as indicated:

(a) "The Contract" means the agreement entered into between the Procuring Entity and the Supplier, as recorded in the Contract Form signed by the parties, including all attachments and appendices thereto and all documents incorporated by reference therein.

(b) "The Contract Price" means the price payable to the Supplier under the Contract for the full and proper performance of its contractual obligations.

(c) "The Goods" means all of the supplies, equipment, machinery, spare parts, other materials and/or general support services which the Supplier is required to provide to the Procuring Entity under the Contract.

(d) "The Services" means those services ancillary to the supply of the Goods, such as transportation and insurance, and any other incidental services, such as installation, commissioning, provision of technical assistance, training, and other such obligations of the Supplier covered under the Contract.

(e) "GCC" means the General Conditions of Contract contained in this Section.

(f) "SCC" means the Special Conditions of Contract.

(g) "The Procuring Entity" means the organization purchasing the Goods, as named in the **SCC**.

(h) "The Procuring Entity's country" is the Philippines.

(i) "The Supplier" means the individual contractor, manufacturer distributor, or firm supplying/manufacturing the Goods and Services under this Contract and named in the **SCC**.

(j) The "Funding Source" means the organization named in the **SCC**.

(k) "The Project Site," where applicable, means the place or places named in the **SCC**.

(l) "Day" means calendar day.

(m) The "Effective Date" of the contract will be the date of signing the contract, however the Supplier shall commence performance of its obligations only upon receipt of the Notice to Proceed and copy of the approved contract.

(n) "Verified Report" refers to the report submitted by the Implementing Unit to the HoPE setting forth its findings as to the existence of grounds or causes for termination and explicitly stating its recommendation for the issuance of a Notice to Terminate.

## 2. Corrupt, Fraudulent, Collusive, and Coercive Practices

2.1. Unless otherwise provided in the **SCC**, the Procuring Entity as well as the bidders, contractors, or suppliers shall observe the highest standard of ethics during the procurement and execution of this Contract. In pursuance of this policy, the Procuring Entity:

(a) defines, for the 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 it 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 Government, 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.

(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 any of the practices mentioned in this Clause for purposes of competing for the contract.

2.2. Further the Funding Source, Borrower or 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 any of the practices mentioned in **GCC** Clause 2.1(a).

## 3. Inspection and Audit by the Funding Source

The Supplier shall permit the Funding Source to inspect the Supplier's accounts and records relating to the performance of the Supplier and to have them audited by auditors appointed by the Funding Source, if so required by the Funding Source.

## 4. Governing Law and Language

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

4.2. 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 exchanged by the parties shall be written in English.

## 5. Notices

5.1. Any notice, request, or consent required or permitted to be given or made pursuant to this Contract shall be in writing. Any such notice, request, or consent shall be deemed to have been given or made when received by the concerned party, either in person or through an authorized representative of the Party to whom the communication is addressed, or when sent by registered mail, telex, telegram, or facsimile to such Party at the address specified in the **SCC**, which shall be effective when delivered and duly received or on the notice's effective date, whichever is later.

5.2. A Party may change its address for notice hereunder by giving the other Party notice of such change pursuant to the provisions listed in the **SCC** for **GCC** Clause 5.1.

## 6. Scope of Contract

6.1. The Goods and Related Services to be provided shall be as specified in Section VI. Schedule of Requirements.

6.2. This Contract shall include all such items, although not specifically mentioned, that can be reasonably inferred as being required for its completion as if such items were expressly mentioned herein. Any additional requirements for the completion of this Contract shall be provided in the **SCC**.

## 7. Subcontracting

7.1. Subcontracting of any portion of the Goods, if allowed in the **BDS**, does not relieve the Supplier of any liability or obligation under this Contract. The Supplier will be responsible for the acts, defaults, and negligence of any subcontractor, its agents, servants or workmen as fully as if these were the Supplier's own acts, defaults, or negligence, or those of its agents, servants or workmen.

7.2. If subcontracting is allowed, the Supplier may identify its subcontractor during contract implementation. 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 the Procuring Entity to be ineligible, the subcontracting of such portion of the Goods shall be disallowed.

## 8. Procuring Entity's Responsibilities

8.1. Whenever the performance of the obligations in this Contract requires that the Supplier obtain permits, approvals, import, and other licenses from local public authorities, the Procuring Entity shall, if so needed by the Supplier, make its best effort to assist the Supplier in complying with such requirements in a timely and expeditious manner.

8.2. The Procuring Entity shall pay all costs involved in the performance of its responsibilities in accordance with **GCC** Clause 6.

## 9. Prices

9.1. For the given scope of work in this Contract as awarded, all bid prices are considered fixed prices, and therefore not subject to price escalation during contract implementation, except under extraordinary circumstances and upon prior approval of the GPPB in accordance with Section 61 of R.A. 9184 and its IRR or except as provided in this Clause.

9.2. Prices charged by the Supplier for Goods delivered and/or services performed under this Contract shall not vary from the prices quoted by the Supplier in its bid, with the exception of any change in price resulting from a Change Order issued in accordance with **GCC** Clause 29.

## 10. Payment

10.1. Payments shall be made only upon a certification by the HoPE to the effect that the Goods have been rendered or delivered in accordance with the terms of this Contract and have been duly inspected and accepted. Except with the prior approval of the President no payment shall be made for services not yet rendered or for supplies and materials not yet delivered under this Contract. Ten percent (10%) of the amount of each payment shall be retained by the Procuring Entity to cover the Supplier's warranty obligations under this Contract as described in **GCC** Clause 17.

10.2. The Supplier's request(s) for payment shall be made to the Procuring Entity in writing, accompanied by an invoice describing, as appropriate, the Goods delivered and/or Services performed, and by documents submitted pursuant to the **SCC** provision for **GCC** Clause 6.2, and upon fulfillment of other obligations stipulated in this Contract.

10.3. Pursuant to **GCC** Clause 10.2, payments shall be made promptly by the Procuring Entity, but in no case later than sixty (60) days after submission of an invoice or claim by the Supplier. Payments shall be in accordance with the schedule stated in the **SCC**.

10.4. Unless otherwise provided in the **SCC**, the currency in which payment is made to the Supplier under this Contract shall be in Philippine Pesos.

10.5. Unless otherwise provided in the **SCC**, payments using Letter of Credit (LC), in accordance with the Guidelines issued by the GPPB, is allowed. For this purpose, the amount of provisional sum is indicated in the **SCC**. All charges for the opening of the LC and/or incidental expenses thereto shall be for the account of the Supplier.

## 11. Advance Payment and Terms of Payment

11.1. Advance payment shall be made only after prior approval of the President, and shall not exceed fifteen percent (15%) of the Contract amount, unless otherwise directed by the President or in cases allowed under Annex "D" of RA 9184.

11.2. All progress payments shall first be charged against the advance payment until the latter has been fully exhausted.

11.3. For Goods supplied from abroad, unless otherwise indicated in the **SCC**, the terms of payment shall be as follows:

(a) On Contract Signature: Fifteen Percent (15%) of the Contract Price shall be paid within sixty (60) days from signing of the Contract and upon submission of a claim and a bank guarantee for the equivalent

amount valid until the Goods are delivered and in the form provided in Section VIII. Bidding Forms.

(b) On Delivery: Sixty-five percent (65%) of the Contract Price shall be paid to the Supplier within sixty (60) days after the date of receipt of the Goods and upon submission of the documents (i) through (vi) specified in the SCC provision on Delivery and Documents.

(c) On Acceptance: The remaining twenty percent (20%) of the Contract Price shall be paid to the Supplier within sixty (60) days after the date of submission of the acceptance and inspection certificate for the respective delivery issued by the Procuring Entity's authorized representative. In the event that no inspection or acceptance certificate is issued by the Procuring Entity's authorized representative within forty five (45) days of the date shown on the delivery receipt, the Supplier shall have the right to claim payment of the remaining twenty percent (20%) subject to the Procuring Entity's own verification of the reason(s) for the failure to issue documents (vii) and (viii) as described in the SCC provision on Delivery and Documents.

## 12. Taxes and Duties

The Supplier, whether local or foreign, shall be entirely responsible for all the necessary taxes, stamp duties, license fees, and other such levies imposed for the completion of this Contract.

## 13. Performance Security

13.1. 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 successful Bidder shall furnish the performance security in any the forms prescribed in the **ITB** Clause 33.2.

13.2. The performance security posted in favor of the Procuring Entity shall be forfeited in the event it is established that the winning bidder is in default in any of its obligations under the contract.

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

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

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

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

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

13.5. In case of a reduction of the contract value, 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.

## 14. Use of Contract Documents and Information

14.1. The Supplier shall not, except for purposes of performing the obligations in this Contract, without the Procuring Entity's prior written consent, disclose this Contract, or any provision thereof, or any specification, plan, drawing, pattern, sample, or information furnished by or on behalf of the Procuring Entity. Any such disclosure shall be made in confidence and shall extend only as far as may be necessary for purposes of such performance.

14.2. Any document, other than this Contract itself, enumerated in **GCC** Clause 14.1 shall remain the property of the Procuring Entity and shall be returned (all copies) to the Procuring Entity on completion of the Supplier's performance under this Contract if so required by the Procuring Entity.

## 15. Standards

The Goods provided under this Contract shall conform to the standards mentioned in the Section VII. Technical Specifications; and, when no applicable standard is mentioned, to the authoritative standards appropriate to the Goods' country of origin. Such standards shall be the latest issued by the institution concerned.

## 16. Inspection and Tests

16.1. The Procuring Entity or its representative shall have the right to inspect and/or to test the Goods to confirm their conformity to the Contract specifications at no extra cost to the Procuring Entity. The **SCC** and Section VII. Technical Specifications shall specify what inspections and/or tests the Procuring Entity requires and where they are to be conducted. The Procuring Entity shall notify the Supplier in writing, in a timely manner, of the identity of any representatives retained for these purposes.

16.2. If applicable, the inspections and tests may be conducted on the premises of the Supplier or its subcontractor(s), at point of delivery, and/or at the goods' final destination. If conducted on the premises of the Supplier or its subcontractor(s), all reasonable facilities and assistance, including access to drawings and production data, shall be furnished to the inspectors at no charge to the Procuring Entity. The Supplier shall provide the Procuring Entity with results of such inspections and tests.

16.3. The Procuring Entity or its designated representative shall be entitled to attend the tests and/or inspections referred to in this Clause provided that the Procuring Entity shall bear all of its own costs and expenses incurred in connection with such attendance including, but not limited to, all traveling and board and lodging expenses.

16.4. The Procuring Entity may reject any Goods or any part thereof that fail to pass any test and/or inspection or do not conform to the specifications. The Supplier shall either rectify or replace such rejected Goods or parts thereof or make alterations necessary to meet the specifications at no cost to the Procuring Entity, and shall repeat the test and/or inspection, at no cost to the Procuring Entity, upon giving a notice pursuant to **GCC** Clause 5.

16.5. The Supplier agrees that neither the execution of a test and/or inspection of the Goods or any part thereof, nor the attendance by the Procuring Entity or its representative, shall release the Supplier from any warranties or other obligations under this Contract.

## 17. Warranty

17.1. The Supplier warrants that the Goods supplied under the Contract are new, unused, of the most recent or current models, and that they incorporate all recent improvements in design and materials, except when the technical specifications required by the Procuring Entity provides otherwise.

17.2. The Supplier further warrants that all Goods supplied under this Contract shall have no defect, arising from design, materials, or workmanship or from any act or omission of the Supplier that may develop under normal use of the supplied Goods in the conditions prevailing in the country of final destination.

17.3. In order to assure that manufacturing defects shall be corrected by the Supplier, a warranty shall be required from the Supplier for a minimum period specified in the **SCC**. The obligation for the warranty shall be covered by, at the Supplier's option, either retention money in an amount equivalent to at least one percent (1%) of every progress payment, or a special bank guarantee equivalent to at least one percent (1%) of the total Contract Price or other such amount if so specified in the **SCC**. The said amounts shall only be released after the lapse of the warranty period specified in the **SCC**; provided, however, that the Supplies delivered are free from patent and latent defects and all the conditions imposed under this Contract have been fully met.

17.4. The Procuring Entity shall promptly notify the Supplier in writing of any claims arising under this warranty. Upon receipt of such notice, the Supplier shall, within the period specified in the **SCC** and with all reasonable speed, repair or replace the defective Goods or parts thereof, without cost to the Procuring Entity.

17.5. If the Supplier, having been notified, fails to remedy the defect(s) within the period specified in **GCC** Clause 17.4, the Procuring Entity may proceed to take such remedial action as may be necessary, at the Supplier's risk and expense and without prejudice to any other rights which the Procuring Entity may have against the Supplier under the Contract and under the applicable law.

## 18. Delays in the Supplier's Performance

18.1. Delivery of the Goods and/or performance of Services shall be made by the Supplier in accordance with the time schedule prescribed by the Procuring Entity in Section VI. Schedule of Requirements.

18.2. If at any time during the performance of this Contract, the Supplier or its Subcontractor(s) should encounter conditions impeding timely delivery of the Goods and/or performance of Services, the Supplier shall promptly notify the Procuring Entity in writing of the fact of the delay, its likely duration and its cause(s). As soon as practicable after receipt of the Supplier's notice, and upon causes provided for under **GCC** Clause 22, the Procuring Entity shall evaluate the situation and may extend the Supplier's time for performance, in which case the extension shall be ratified by the parties by amendment of Contract.

18.3. Except as provided under **GCC** Clause 22, a delay by the Supplier in the performance of its obligations shall render the Supplier liable to the imposition of liquidated damages pursuant to **GCC** Clause 19, unless an extension of time is agreed upon pursuant to **GCC** Clause 29 without the application of liquidated damages.

## 19. Liquidated Damages

Subject to **GCC** Clauses 18 and 22, if the Supplier fails to satisfactorily deliver any or all of the Goods and/or to perform the Services within the period(s) specified in this Contract inclusive of duly granted time extensions if any, the Procuring Entity shall, without prejudice to its other remedies under this Contract and under the applicable law, deduct from the Contract Price, as liquidated damages, the applicable rate of one tenth (1/10) of one (1) percent of the cost of the unperformed portion for every day of delay until actual delivery or performance. The maximum deduction shall be ten percent (10%) of the amount of contract. Once the maximum is reached, the Procuring Entity may rescind or terminate the Contract pursuant to **GCC** Clause 23, without prejudice to other courses of action and remedies open to it.

## 20. Settlement of Disputes

20.1. If any dispute or difference of any kind whatsoever shall arise between the Procuring Entity and the Supplier in connection with or arising out of this Contract, the parties shall make every effort to resolve amicably such dispute or difference by mutual consultation.

20.2. If after thirty (30) days, the parties have failed to resolve their dispute or difference by such mutual consultation, then either the Procuring Entity or the Supplier may give notice to the other party of its intention to commence arbitration, as hereinafter provided, as to the matter in dispute, and no arbitration in respect of this matter may be commenced unless such notice is given.

20.3. Any dispute or difference in respect of which a notice of intention to commence arbitration has been given in accordance with this Clause shall be

settled by arbitration. Arbitration may be commenced prior to or after delivery of the Goods under this Contract.

20.4. In the case of a dispute between the Procuring Entity and the Supplier, the dispute shall be resolved in accordance with Republic Act 9285 ("R.A. 9285"), otherwise known as the "Alternative Dispute Resolution Act of 2004."

20.5. Notwithstanding any reference to arbitration herein, the parties shall continue to perform their respective obligations under the Contract unless they otherwise agree; and the Procuring Entity shall pay the Supplier any monies due the Supplier.

## 21. Liability of the Supplier

21.1. The Supplier's liability under this Contract shall be as provided by the laws of the Republic of the Philippines, subject to additional provisions, if any, set forth in the **SCC**.

21.2. Except in cases of criminal negligence or willful misconduct, and in the case of infringement of patent rights, if applicable, the aggregate liability of the Supplier to the Procuring Entity shall not exceed the total Contract Price, provided that this limitation shall not apply to the cost of repairing or replacing defective equipment.

## 22. Force Majeure

22.1. The Supplier shall not be liable for forfeiture of its performance security, liquidated damages, or termination for default if and to the extent that the Supplier's delay in performance or other failure to perform its obligations under the Contract is the result of a *force majeure*.

22.2. 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 Supplier 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 Supplier. Such events may include, but not limited to, acts of the Procuring Entity in its sovereign capacity, wars or revolutions, fires, floods, epidemics, quarantine restrictions, and freight embargoes.

22.3. If a *force majeure* situation arises, the Supplier shall promptly notify the Procuring Entity in writing of such condition and the cause thereof. Unless otherwise directed by the Procuring Entity in writing, the Supplier shall continue to perform its obligations under the Contract as far as is reasonably practical, and shall seek all reasonable alternative means for performance not prevented by the *force majeure*.

## 23. Termination for Default

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

(a) Outside of *force majeure*, the Supplier fails to deliver or perform any or all of the Goods within the period(s) specified in the contract, or within any extension thereof granted by the Procuring Entity pursuant to a request made by the Supplier prior to the delay, and such failure amounts to at least ten percent (10%) of the contact price;

(b) As a result of *force majeure*, the Supplier is unable to deliver or perform any or all of the Goods, amounting to at least ten percent (10%) of the contract price, for a period of not less than sixty (60) calendar days after receipt of the notice from the Procuring Entity stating that the circumstance of force majeure is deemed to have ceased; or

(c) The Supplier fails to perform any other obligation under the Contract.

23.2. In the event the Procuring Entity terminates this Contract in whole or in part, for any of the reasons provided under **GCC** Clauses 23 to 26, the Procuring Entity may procure, upon such terms and in such manner as it deems appropriate, Goods or Services similar to those undelivered, and the Supplier shall be liable to the Procuring Entity for any excess costs for such similar Goods or Services. However, the Supplier shall continue performance of this Contract to the extent not terminated.

23.3. In case the delay in the delivery of the Goods and/or performance of the Services exceeds a time duration equivalent to ten percent (10%) of the specified contract time plus any time extension duly granted to the Supplier, the Procuring Entity may terminate this Contract, forfeit the Supplier's performance security and award the same to a qualified Supplier.

## 24. Termination for Insolvency

The Procuring Entity shall terminate this Contract if the Supplier 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 Supplier, 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 Supplier.

## 25. Termination for Convenience

25.1. The Procuring Entity may terminate this Contract, in whole or in part, at any time for its convenience. The HoPE may terminate a contract for the convenience of the Government 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.

25.2. The Goods that have been delivered and/or performed or are ready for delivery or performance within thirty (30) calendar days after the Supplier's receipt of Notice to Terminate shall be accepted by the Procuring Entity at the contract terms and prices. For Goods not yet performed and/or ready for delivery, the Procuring Entity may elect:

(a) to have any portion delivered and/or performed and paid at the contract terms and prices; and/or

(b) to cancel the remainder and pay to the Supplier an agreed amount for partially completed and/or performed goods and for materials and parts previously procured by the Supplier.

25.3. If the Supplier suffers loss in its initial performance of the terminated contract, such as purchase of raw materials for goods specially manufactured for the Procuring Entity which cannot be sold in open market, it shall be allowed to recover partially from this Contract, on a *quantum meruit* basis. Before recovery may be made, the fact of loss must be established under oath by the Supplier to the satisfaction of the Procuring Entity before recovery may be made.

## 26. Termination for Unlawful Acts

26.1. The Procuring Entity may terminate this Contract in case it is determined *prima facie* that the Supplier has engaged, before or during the implementation of this Contract, in unlawful deeds and behaviors relative to contract acquisition and implementation. Unlawful acts include, but are not limited to, the following:

(a) Corrupt, fraudulent, and coercive practices as defined in **ITB** Clause 3.1(a);

(b) Drawing up or using forged documents;

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

(d) Any other act analogous to the foregoing.

## 27. Procedures for Termination of Contracts

27.1. The following provisions shall govern the procedures for 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 Implementing Unit 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 Implementing Unit, the HoPE shall terminate this Contract only by a written notice to the Supplier 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 Supplier to show cause as to why this Contract should not be terminated; and

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

(c) The Notice to Terminate shall be accompanied by a copy of the Verified Report;

(d) Within a period of seven (7) calendar days from receipt of the Notice of Termination, the Supplier shall submit to the HoPE a verified position paper stating why this Contract should not be terminated. If the Supplier 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 this Contract;

(e) The Procuring Entity may, at any time before receipt of the Supplier's verified position paper described in item (d) 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 Supplier's receipt of the notice;

(f) 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 Supplier of its decision and, unless otherwise provided, this Contract is deemed terminated from receipt of the Supplier of the notice of decision. The termination shall only be based on the ground(s) stated in the Notice to Terminate;

(g) 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; and

(h) The Supplier must serve a written notice to the Procuring Entity of its intention to terminate the contract at least thirty (30) calendar days before its intended termination. The Contract is deemed terminated if it is not resumed in thirty (30) calendar days after the receipt of such notice by the Procuring Entity.

## 28. Assignment of Rights

The Supplier shall not assign his rights or obligations under this Contract, in whole or in part, except with the Procuring Entity's prior written consent.

## 29. Contract Amendment

Subject to applicable laws, no variation in or modification of the terms of this Contract shall be made except by written amendment signed by the parties.

## 30. Application

These General Conditions shall apply to the extent that they are not superseded by provisions of other parts of this Contract.

# *Section V. Special Conditions of Contract*

# Special Conditions of Contract

| GCC Clause | |
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| 1.1(g) | The Procuring Entity is the **Department of Budget and Management (DBM).** |
| 1.1(i) | The Supplier is |
| 1.1(j) | The Funding Source is:<br><br>The Government of the Philippines (GOP) through the authorized appropriations under the FY 2018 General Appropriations Act in the amount of **Twenty One Million Pesos (P21,000,000.00).** |
| 1.1(k) | The Project Site is:<br><br>Department of Budget and Management<br>Arcache Building, General Solano St.<br>San Miguel, Manila. |
| 2.1 | No further instructions. |
| 5.1 | The Procuring Entity's address for Notices is:<br><br>Department of Budget and Management<br>Ground Floor, DBM Building III, General Solano St.<br>San Miguel, Manila<br>Tel No. (02)657-3300 loc. 3117<br><br>Contact Person: Engr. Argee M. Sta. Barbara<br>OIC-Chief<br>Administrative Service-General Services Division (AS-GSD)<br><br>The Supplier's address for Notices is: |
| 6.2 | The delivery schedule as indicated in Section VI. Schedule of Requirements may be modified at the option of the Procuring Entity, with prior due notice, written or verbal, to the Supplier. |
| 10.4 | Not applicable. |
| 10.5 | Payment using LC is not allowed. |
| 11.3 | Maintain the GCC Clause. |
| 13.4(c) | No further instructions. |
| 15 | No further instructions. |
| 16.1 | The quantity of the Goods delivered to DBM shall be inspected by the AS-GSD. However, inspection and approval as to the acceptability of the Goods vis-a-vis its compliance with the technical specifications, and its order and condition, will be done with prior notice, written or |

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| | verbal, to the authorized representative of the Supplier. The inspection will push through as scheduled even in the absence of the Supplier's representative, if the latter was duly notified. In which case, the results of the inspection conducted by the Procuring Entity shall be final and binding upon the Supplier. |
| 17.3 | Not applicable. |
| 17.4 | Not applicable. |
| 21.1 | No additional provision. |

# *Section VI. Schedule of Requirements*

The delivery schedule expressed as weeks/months stipulates hereafter the date of delivery to the project site.

| Item | Description | Delivery Date |
|---|---|---|
| The Contractor shall provide the needed materials, tools and equipment, manpower, and supervision needed for the Project. | | |
| 1. | Supply, Delivery, Fabrication, Installation, Testing and Commissioning of Brand New Variable Refrigeration Flow (VRF) Multi-Split Air-conditioning System, as follows:<br><br>*Installation of pipes, fittings, conduits, insulation, etc.<br><br>*Installation of the following indoor and outdoor units:<br><br>**Indoor Units**<br>*Wall Mounted*<br><br>- 51 units – 2TR 24,000 BTU/HR<br>- 18 units – 1.5TR 18,000 BTU/HR<br>- 2 units – 1.3TR 15,600 BTU/HR<br>- 2 units – 0.6TR 7,200 BTU/HR<br><br>*Ceiling Cassette*<br>- 11 units – 4TR 48,000 BTU/HR<br><br>**Outdoor Units**<br>- 1 unit – 24.6TR 295,000BTU/HR, 14HP + 18 HP<br>- 1 unit – 20.6TR 247,200 BTU/HR, 12Hp + 14Hp<br>- 1 unit – 20TR 240,000 BTU/HR, 12Hp + 14Hp<br>- 1 unit- 18TR 216,000 BTU/HR, 10Hp + 14Hp<br>- 1 unit- 16TR 192,000 BTU/HR, 8Hp + 14Hp<br>- 1 unit- 15.6TR 187,200 BTU/HR, 8Hp + 12Hp<br>- 1 unit- 14.6TR 175,200 BTU/HR, 8Hp + 12Hp<br>- 1 unit- 10TR 120,000 BTU/HR, 12Hp<br>- 1 unit – 9TR 108,000 BTU/HR, 12Hp<br>- 3 units – 8TR 96,000 BTU/HR, 8Hp<br>- 1 unit – 5TR 60,000 BTU/HR, 8Hp | Within 30 calendar days after issuance of the Notice to Proceed (NTP)<br><br>Within 7 calendar days after issuance of the NTP<br><br>Within 30 calendar days after issuance of the NTP |

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| 2. | Warranty | One (1) year for workmanship and five (5) years for the motor compressor from the issuance of Certificate of Acceptance. |
| 3. | Response time for the repair and replacement of defective parts/units | Within twenty-four (24) hours upon receipt of written or verbal notice from AS-GSD |

**I hereby certify to comply and deliver all the above requirements.**

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| **Name of Company/Bidder** | **Signature Over Printed Name of Representative** | **Date** |

# *Section VII. Technical Specifications*

Bidders must state here either "Comply" or any equivalent term in the column "Bidder's Statement of Compliance" against each of the individual parameters of each "Specification."

| Item | Specification | Bidder's Statement of Compliance |
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| **1.** | **Scope of Work** | |
| 1.1 | Work included:<br>The works of the air conditioning contractor shall consist of furnishing all labor and materials, air conditioning equipment including all related incidental items for the complete installation and operation of the air conditioning system.<br>Contractor shall provide complete, fully tested and operational mechanical systems to meet the requirements described herein, in complete accordance with applicable codes and ordinances. Also, contractor shall provide the following;<br>1. Materials, equipment and plant, of specified design, performance and quality; and, current models with published certified ratings for which replacement parts are readily available.<br>2. Project management on-site supervision to undertake administration meet schedules, ensured timely performance, ensured coordination, established orderly completion and the delivery of a fully commissioned installation.<br>3. Follow manufacturer's recommendation installation details and procedures for equipment, supplemented by requirements of Contract Documents.<br>4. The most stringent requirements of this and other mechanical sections shall govern. Should inconsistencies exist in the drawings or with the specifications, the better quality and/or greater quantity of work or materials shall be estimated upon, performed and furnished unless otherwise ordered by the Consultant in writing during the bidding period.<br>5. All work shall be in accordance with the Project Drawings and Specification and their intents, complete with all necessary components, including those not normally shown or specified, but required for a complete installation.<br>6. Connect to equipment specified in the attached drawings/plans and to equipment supplied and installed by other Contractors or by the Owner.<br>7. The Contractor shall be responsible for certifying the adequacy of seismic restraint details. Restraints shall be cables, expansion joints, flexible joints and others as required. Details showing specifically required restraints shall be submitted for review to the Architect and Consultant's. | |

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| 1.2 | Standard of Acceptance<br>1. Item named and specified by manufacturer and/or catalogue number forms part of specification and sets standard regarding performance, quality of material and workmanship and when used in conjunction with a referenced standard, shall be deemed to supplement the standard.<br>2. Where other than the underlined manufacturer or scheduled/specified manufacturer is selected or approved, include for the cost of any resulting work and any necessary redesign of installation or structure. Submit redesign drawings for review with Shop Drawings. Maintain installation, access and servicing clearances. Redesign drawings shall be to scale and of a standard equal to the Project Drawings.<br>3. Where two or more items of equipment and/or material, of the same type, are required, provide products of a single manufacturer.<br>4. Install and test all equipment and material, in accordance with the detailed recommendation of the manufacturer<br>5. A visible manufacturer's nameplate shall indicate manufacturer's name, model number, serial number, capacity data, electrical characteristics and approval stamps. | |
| 1.3 | Scheduling<br>1. Contractor to submit and incorporate within the Construction Schedule, a complete and realistic schedule, integrated with, and recognizing the reliance on, other divisions of the work. Take into account the lead time for the review of operating and maintenance manuals, commissioning, verification of system operation by the Consultant and the demonstration and instruction to the Owner. The schedule shall include but not limited to the following items:<br>a. Installation and testing of piping systems and equipment.<br>b. Installation and cleaning of duct systems and equipment.<br>c. Control system and installation.<br>d. Air balancing<br>e. Air measurements of existing systems prior to any renovation work.<br>f. Connection of electrical services to equipment by electrical contractor.<br>g. Startup of mechanical equipment and systems.<br>h. Check-out of control systems.<br>i. Commissioning of mechanical systems.<br>j. Demonstration of systems and equipment to Consultant and Owner.<br>k. Preparation of maintenance manuals and as-built drawings.<br>l. Submission of the various documents required prior to substantial performance. | |

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| 1.4 | Responsibilities<br>1. Visit the site before tendering. Examine all local and existing conditions on which the work is dependent. No consideration will be granted for any misunderstanding, of work to be done, resulting from failure to visit the site.<br>2. Ensure that equipment does not transmit noise and/or vibration to other parts of the building, as a result of poor installation practice.<br>3. Where the Contract Documents do not contain sufficient information for the proper selection of equipment for bidding, notify the Consultant during the tendering period. If clarification is not obtainable, allow for the most expensive arrangement. Failure to do this shall not relieve the Contractor of responsibility to provide the intended equipment.<br>4. Examine carefully the mechanical, electrical, structural and architectural drawings and confirm that the work under this Contract can be satisfactorily carried out without changes to the building as shown on the plans.<br>5. Be responsible for prompt installation of this work in advance of concrete pouring or similar work. Provide and set sleeves where required.<br>6. On completion of the work, all tools and surplus and waste materials shall be removed and work left in a clean and perfect condition. | |
| 1.5 | Coordination<br>1. Check drawings of all trades to verify space and headroom limitations for work to be installed. Coordinate work with all trades and make changes to facilitate a satisfactory installation.<br>2. The drawing indicates the general location and route to be followed by the piping and ductwork. Where details are not shown on the drawings or only shown diagrammatically, the pipes and ductwork shall be installed in such a way as to conserve head room and interfere as little as possible with the free use of space through which they pass.<br>3. Work out jointly all interference problems on the site with other trades and coordinate all work before fabricating, or installing any material or equipment. Ensure that all materials and equipment fit into the allotted spaces and that all equipment can be properly serviced and replaced, if and when required. | |

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| 1.6 | Warranty<br>1. Use of installed equipment during construction shall not shorten or alter the warranty period as specified in the General Conditions.<br>2. Take note of any extended warranties specified<br>3. Furnish a written warranty stating that all work executed under this Contract will be free from defects of material and workmanship for a period of one (1) year from the date of substantial performance. Warranty shall include any part of equipment, units or structures furnished here under that show defects in the works under normal operating conditions and/or for the purpose of which they were intended.<br>4. The above parties further agree that they will at their own expense promptly investigate any mechanical or control malfunction, and repair all such defective work and all other damages thereby which becomes defective during the time of the guaranty warrant. | |
| 1.7 | Drawings and Measurements<br>1. Drawings are generally diagrammatic and are intended to indicate the scope and general arrangement of work and are not detailed installation drawings. Do not scale the drawings. Obtain accurate dimensions from the Architectural and Structural drawings.<br>2. Consult the architectural drawings and details for exact locations of fixtures and equipment. Obtain this information from the Consultant where definite locations are not indicated.<br>3. Take field measurements, where equipment and material dimensions are dependent upon building dimensions.<br>4. Where imperial units have been indicated in brackets [ ] following the requirements in SI units, the conversion is approximate and provided for convenience. The SI units shall govern. | |
| 1.8 | Phased Construction<br>1. See Architectural specification and drawings for construction phasing. Make all allowances to phase the work in accordance with the project phasing.<br>2. All existing services and the existing building(s) must be maintained in operation. Provide and install temporary services as required.<br>3. All trades in this Contract shall make allowance for the implications of having to totally complete all work in the new addition before proceeding with work in the existing building. | |

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| 1.9 | Shop Drawing/Product Data<br>1. Process<br>a. Installed materials and equipment shall meet specified requirements regardless of whether or not shop drawings are reviewed by the Consultant.<br>b. Do not order equipment or material until the Consultant has reviewed and returned shop drawings.<br>c. Shop drawings shall be reviewed by the General Contractor and the Winning Bidder indicating that the shop drawings have been reviewed and coordinated with the work and that the shop drawings are submitted without qualifications. Shop drawings shall bear the "reviewed" stamp dated and initialed by the General Contractor and Mechanical General Sub-contractor prior to submitting the shop drawings to the consultant. Shop drawings, which do not bear the contractors and sub-trades "reviewed" stamps, initials and date will be rejected and sent back as "not reviewed".<br>2. Content<br>a. Shop drawings submitted title sheet.<br>b. Data shall be specific and technical.<br>c. Identify each piece of equipment.<br>d. Information shall include all scheduled data.<br>e. The project shall be identified on each document.<br>f. The shop drawings/product data shall include:<br>i. Clearly mark submittal material using arrows, underlining or circling to show differences from specified ratings, capabilities and options being proposed. Cross out non-applicable material. Specifically note on the submittal specified features such as special tank linings, pumps, seals, materials, or painting.<br>ii. Dimensioned construction drawing with plans and sections showing size, arrangement and necessary clearances, with mounting point loads.<br>iii. Weighs of all major equipment for review by the appropriate Consultant.<br>iv. Mounting arrangements.<br>v. Detailed drawings of bases, supports and anchor bolts. | |
| 1.10 | Demolitions<br>Carry out demolition in a manner to cause as little inconvenience to the adjustment occupied building area as possible. Coordinate the activity with the Owner and/or the Consultant. Carry out demolition in an orderly and careful manner. All removal of existing equipment, pipes and ductwork that may affect occupied areas of the building. | |

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| 1.11 | Project Close-out Requirements<br>1. All life safety systems must be operational and tested demonstrated to Consultant. The following is a summary of the requirements.<br>a. Controls:<br>• Controls system completion report (check sheet)<br>• Controls system final electrical approval certificate.<br>• As built control drawings.<br>• Control training signed off by Owner (Indicate dates of training in letter and attendance).<br>• List of control manuals and documents turned over.<br>• Printed copy of control program and database. Printed to disk on word format acceptable.<br>• Disc of control system database.<br>• Calibration report for refrigeration, carbon monoxide and CO sensors.<br>• Airflow station start up and calibration report.<br>b. Cooling<br>• Pressure test reports for refrigeration lines.<br>• Vibration isolation report.<br>• Seismic inspection report.<br>• Valve tag chart.<br>• As built drawings.<br>• Welding certificate and x-ray reports.<br>• Flushing and cleaning of piping report.<br>c. HVAC<br>• Fire damper test report letter and schedule.<br>• As built drawings.<br>• Duct cleaning certificate<br>d. Miscellaneous<br>• Identification Schedules<br>• Demonstrations to Owner signed off by Owner.<br>• List of incomplete of deficient work prepared by each sub trade.<br>• Contractor's Letter of Guarantee<br>• Signed-off substantial completion inspection report.<br>• List of spare parts signed off by Owner.<br>e. Manufacture start-up and other reports including:<br>• Air and Water Balance<br>• Commissioning<br>• Fire stop letter of assurance<br>• Chilled and Chemical Treatment<br>• VFD's | |

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| **2.** | **Permits, Codes Regulations and Standards**<br>1. Obtain all required permits and pay all fees therefore and comply with all Provincial, Municipal and other legal regulations and by laws applicable to the work.<br>2. Arrange for inspection of all Work by the authorities having jurisdiction. On completion of the Work, furnish final unconditional certificates of approval by the inspecting authorities.<br>3. Work shall conform to the following codes, regulations and standards, and all other codes in effect at the time of award of Contract, and any others having jurisdiction. The latest revision of each code and standard shall apply unless otherwise specified in the contract documents:<br>a. American Society of Heating, Refrigerating and Air conditioning Engineers (ASHRAE)<br>b. American Society of Ventilating Engineers (ASVE)<br>c. American Refrigeration Institute (ARI)<br>d. Bureau of Labor Standards and Industrial Safety<br>e. National Electric Manufacturing Association (NEMA)<br>f. Philippine Mechanical Engineering Code<br>g. Department of Health (DOH)<br>h. National Fire Codes<br>i. Industrial Health & Safety Regulations<br>j. SMACNA Publications | |
| **3.** | **Record Drawings**<br>Maintain one set of contract drawing white prints, including all supplementary and revision drawing on site, solely for the purpose of recording, in red, any change and/ or deviation from the Contract Drawings as it occurs. Include elevations and detailed locations of buried services. The set of white prints will be provided to the contractor by the Consultant at the contractors cost. The marked-up set of prints shall be reviewed on site monthly by the consultant during the construction process. This review will form a requirement for approval of the monthly progress claim. At the completion of the work, certify the above-mentioned drawings as being accurate and complete by labeling each drawing in the lower right hand corner in letters of at least 12 mm [1/2"] high as follow. "AS BUILT DRAWING". | |
| **4.** | **Mechanical Equipment, Materials & Method** | |
| **4.1** | **Hangers & Support For HVAC Piping & Equipment**<br>1. General<br>a. Provide hangers and supports to secure equipment in place, prevent vibration, protect appropriate against damage from earthquake, maintain grade, provided for expansion and contraction and accommodate insulation. | |

b. Provide insulation protection saddles on all insulated piping.
c. Fabricated hangers, supports and sway braces in accordance with ANSI B31.1 and MSSSP58.
d. Set inserts in position in advance of concrete work. Use grid system in equipment rooms.
e. Support structural members. Where structural bearings do not exist or inserts are not in suitable locations, suspend hanger from steel channels or angles. Provide supplementary structural members, as necessary.
f. Do not suspend from metal deck.
g. Hangers for copper pipe shall be copper plated or plastic dipped unless pipe hangers bear on piping insulation (cold services).

2. Execution

a. Hanger Spacing

Maximum hanger spacing table.

| Pipe Size: NPS | Rod Diameter mm [in] | Maximum Spacing Steel Pipe m [ft] | Maximum Spacing Copper Piper m [ft] |
|---|---|---|---|
| 1/2 | 10 [3/8] | 1.8 [6] | 1.5 [5] |
| ¾, 1 | 10 [3/8] | 2.4 [8] | 1.8 [6] |
| 1 ¼, 1 1/2 | 10 [3/8] | 3.0 [10] | 1.8 [6] |
| 2 | 10 [3/8] | 3.0 [10] | 3.0 [10] |
| 2 ½, 3, 4 | 12 [1/2] | 3.0 [10] | 3.0 [10] |

b. Hanger Installation
i. Offset hanger so that rod is vertical in operating position.
ii. Adjust hangers to equalize load.
iii. Install hanger to provide minimum 12mm [1/2"] clear space between finished covering and adjacent work.
iv. Support vertical piping at every other floor.
v. Where several pipes can be installed in parallel and at the same elevation, provide multiple or trapeze hangers.
vi. Where practical, support riser piping independently of connected horizontal piping.
vii. Install plastic inserts between steel studs and piping.

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| | viii. For beam clamps, extend hanger rod tight to underside of beam with top bolt and washer.<br>c. Inserts<br>i. Use inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams wherever practicable.<br>ii. Set inserts in position in advance of concrete work. Provide reinforcement rod in concrete for inserts carrying piping over 100 mm (4") or ducts over 1500 mm (60") wide.<br>iii. Where concrete slabs form finished ceiling, finish inserts, flush with slab surface.<br>iv. Where inserts are omitted, drill through concrete slab from below and provide rod with recessed square plate and nut above slab, in concealed locations.<br>v. Provide a test mock up for review.<br>vi. Insert shall be installed in accordance with manufacturer's recommendations and in no case closer than 2.1 m (7ft) apart. | |
| **4.2** | **Vibration Isolation for HVAC Piping and Equipment**<br>1. Related Work<br>a. Provide vibration isolation on all motor driven equipment, piping and ductwork such that noise transmitted to occupied space by any other path than airborne is less than airborne noise transmitted from mechanical space to occupied space.<br>2. General Requirements<br>a. This project is deemed a post disaster design.<br>b. Provide vibration isolation on all motor driven equipment with motors of ½ HP and greater power output (as indicated on the motor nameplate) and on piping and ductwork, as specified herein. For equipment less than ½ HP, provide vibration isolation grommets at the support points.<br>c. Place isolators under equipment so that the minimum distance between adjacent corner isolators is at least equal to the height of the center of gravity of the equipment.<br>d. Ensure isolation systems have a vertical natural frequency no higher than one third of the lowest forcing frequency, unless otherwise specified.<br>e. Provide concrete inertia bases or structural steel bases, where specified or required by equipment manufacturers, located between vibrating equipment and the vibration isolation elements, unless the equipment manufacturer certifies direct attachment capabilities. | |

f. Use ductile materials in all vibration and seismic restraint equipment.
g. Follow structural consultant's instruction for drilling for installation of anchors.
h. Provide flexible connectors between equipment and piping where required by manufacturers to protect equipment from stress and reduce vibration in the piping system. Meet connector manufacturer's installation specifications as well as equipment manufacturer's requirements.

3. Execution
   a. Installation
      i. Execute the work in accordance with the specifications and, where applicable, in accordance with the manufacturer's instructions and only by workmen experienced in this type of work.
      ii. For all equipment mounted on vibration isolators, provide a minimum clearance of 50 mm [2"] to other structures, piping, equipment, etc.
      iii. Before bolting isolators to the structure, start equipment and balance the systems so that the isolators can be adjusted to the correct operating position before installing (seismically rated) anchor and/ or welding.
      iv. After installation and adjustment of isolators verify deflection under load to ensure loading is within specified range and isolation is being obtained.
      v. Where hold down bolts for isolators or seismic restraint equipment penetrates roofing membranes, provide "gum cups" and sealing compound to maintain waterproof integrity of roof. Ensure sealing compound is compatible with isolator components such as neoprene. Coordinate with roofing section of specifications and with roofing subcontractor.
      vi. Use Type 1 pads only where specified.
      vii. Use the lowest RPM scheduled for two-speed equipment in determining isolator deflection.
      viii. Provide concrete inertia bases on centrifugal fans where specified.
      ix. Be responsible for ensuring that flexible duct connections. Ducts are installed with a minimum of 40 mm [1-1/2"] metal-to-metal gap. Use flange to ensure that flexible connectors are clear of the airstream.
      x. Isolate all equipment within rooftop units in accordance with this section, including fans,

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| | compressor, pumps and piping. Ensure structure borne transmission of noise from rooftop unit is less than airborne transmission.<br>b. Inspections<br>i. The supplier shall provide assistance to the contractor as necessary during the course of installation of isolation equipment.<br>ii. The supplier shall inspect the complete installation after system start up and establish that the isolators for each piece of equipment are properly installed and adjusted. Correct any malfunction performance. The supplier shall submit a statutory declaration to the Consultant stating that the complete vibration isolation installation is installed in accordance with his drawings and instructions and operate to his satisfaction. | |
| **4.3** | **HVAC Piping Insulation**<br>1. General<br>a. Provide thermal insulation on all piping, valves, fittings and radiant ceiling panels, as called for and as scheduled. Note items listed that do not require insulation.<br>b. Journeyman insulation applicators, skilled in this trade, shall perform the work.<br>c. Be responsible for ensuring that sufficient space is always provided to allow proper installation of insulation materials.<br>d. Make good all existing insulation disturbed or removed to facilitate alterations and additions to existing piping.<br>2. Execution<br>a. Application<br>i. Apply insulation to piping only after all tests have been made and systems accepted by Consultant as tight.<br>ii. Apply insulation and insulation finish in a workmanlike manner so that the finished product in uniform in diameter, smooth in finish, pleasing to the eye and with the longitudinal seams positioned to be concealed from view. Apply piping insulation materials, accessories and finishes in accordance with manufacturer's recommendations.<br>b. Insulation Termination Points<br>i. Terminate insulation 75 mm [3"] back from all un-insulated fittings to provide working clearance and terminate insulation at 90° and finish with reinforced scrim cloth and vapor | |

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| | barrier mastic system. Cover onto pipe and over the insulation vapor barrier. On concealed hot services terminate insulation 75 mm [3"] back from all un-insulated fittings, cut off at 90° and apply reinforced scrim cloth and breather mastic system.<br>ii. Cut back insulation at 45° and finish with a silicone caulking sealant around the base of thermometer wells, pressure gauges, flow switches and pressure and control sensors.<br>c. Vertical Risers<br>On vertical pipe over 75 mm [3"] provide insulation supports welded or bolted to pipe, directly above lowest pipe fitting. Thereafter, locate on 4.5 m [15 ft.] centers.<br>d. Pipe Insulation Finishes<br>i. Concealed insulation in horizontal and vertical service spaces will require no further finish.<br>ii. Concealed pipe insulation in damp locations, e.g. trenches shall have a vapor barrier jacket, vapor sealed.<br>iii. Exposed flexible insulation shall be painted with a heavy brush coating of foam plastic white insulation coating.<br>e. Fire Stopping and Smoke Seals<br>i. Install fire stopping and smoke seal material and components in accordance with the attached drawings/plans.<br>ii. Maintain insulation around pipes penetrating fire separation only as permitted by Firestop Assembly Listing.<br>iii. Submit Certificate of Inspection that all work is complete and in accordance with the specified requirements before Substantial Completion. | |
| **4.4** | **Variable Refrigerant Flow (VRF) Type Air-conditioning Unit**<br>1. Submittals<br>a. Product Data<br>Include rated capacities, furnished specialties, and accessories for each type of product indicated. Include performance data in terms of capacities, outlet velocities, static pressures, sound power characteristics, motor requirements, and electrical characteristics.<br>2. Quality Assurance<br>a. Product Options<br>Drawings indicate size, profiles, and dimensional requirements of split-system units and are based on the specific system indicated. Refer to attached drawings/plans – See "Equipment Schedule."<br>b. Electrical Components, Devices and Accessories<br>Listed and labelled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction and marked for | |

intended use.

c. ASHRAE Compliance

Applicable requirements in ASHRAE 62.1-2004, Section 5- "Systems and Equipment" and Section 7- "Construction and Startup."

d. ASHRAE/IESNA 90.1-2004 Compliance

Applicable requirements in ASHRAE/IESNA 90.1-2004, Section 6 – "Heating, Ventilating, and Air-conditioning."

3. Coordination
   a. Coordinate size and location of concrete bases for units. Supply and cast anchor-bolt inserts into concrete bases done by the General Contractor.
4. Concealed evaporator-fan components
   a. Chassis

Galvanized steel with flanged edges, removable panels for servicing, and insulation on back of panel.

i. Insulation: Faced, glass-fiber duct liner
ii. Drain Pans: Galvanized steel, with connection for drain; insulated and complying with ASHRAE 62.1-2004.
iii. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1-2004.

b. Refrigerant Coil

Copper tube, with mechanically bonded aluminum fins, complying with ARI 210/240, and with thermal expansion valve.

c. Fans

Forward-curved, double-width wheel of galvanized steel; directly connected to motor.

d. Fan Motors

Comply with requirements in the attached Drawings /plans and Division 15 Section "Motors" – Annex 1.

i. Special Motor Features: Multispeed with internal thermal protection and permanent lubrication.

e. Disposable Filters

1 inch (25 mm) thick, in fiberboard frames with ASHRAE 52.2 MERV rating of 8 or higher.

f. Wiring Terminations

Connect motor to chassis wiring with plug connection.

5. Floor-mounting, evaporator-fan components
   a. Cabinet

Enameled steel with removable panels on front and ends in color selected by Architect.

i. Discharge Grill: Steel with surface-mounted frame.
ii. Insulation: Faced, glass-fiber, duct liner.
iii. Drain Pans: Galvanized steel, with connection for drain; insulated and complying with ASHRAE 62.1-2004.

iv. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1-2004.

b. Refrigerant Coil

Copper tube, with mechanically bonded aluminum fins, complying with ARI 210/240, and with thermal expansion valve.

c. Water Coil

(For CHW FCU only) Copper tube, with mechanically bonded aluminum fins spaced no closer than 0.1 inch (2.5 mm); leak tested to 300 psig (2070 kPa) underwater; and having a 2-position control valve.

d. Fan

Direct drive, centrifugal, with power-induced outside air.

e. Fan Motors

Comply with requirements in the attached Drawings /plans and Division 15 Section "Motors" – Annex 1.

i. Special Motor Features: Multi-tapped, multispeed with internal thermal protection and permanent lubrication.

f. Filters

Disposable, with ASHRAE 52.2 MERV rating of 8 or higher.

6. Wall –mounting, evaporator-fan components

a. Cabinet

Enameled steel with removable panels on front and ends in color selected by Architect, and discharge drain pans with drain connection.

i. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1-2004.

ii. Drain Pan and Drain Connection: Comply with ASHRAE 62.1-2004.

b. Refrigerant Coil

Copper tube, with mechanically bonded aluminum fins, complying with ARI 210/240, and with thermal expansion valve.

c. Fan

Direct drive, centrifugal fan.

d. Fan Motors

Comply with requirements in the attached drawings /plans and Division 15 Section "Motors" – Annex 1.

i. Special Motor Features: Multi-tapped, multispeed with internal thermal protection and permanent lubrication.

e. Filter

Disposable, with ASHRAE 52.2 MERV rating of 8 or higher.

7. Ceiling-mounting, evaporator-fan component

a. Cabinet

Enameled steel with removable panels on front and ends in color selected by Architect, and discharge drain pans with drain connection.

i. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1-2004.
ii. Drain Pan and Drain Connection: Comply with ASHRAE 62.1-2004.

b. Refrigerant Coil

Copper tube, with mechanically bonded aluminum fins, complying with ARI 210/240, and with thermal-expansion valve.

c. Electric Coil

Helical, nickel-chrome, resistance-wire heating elements with refractory ceramic support bushings; automatic-reset thermal cutout; built-in magnetic contractors; manual-reset thermal cutout; airflow proving device; and one-time fuses in terminal box for overcurrent protection.

d. Fan

Direct drive, centrifugal fan, with power-induced outside air, and integral condensate pump.

e. Fan Motors

Comply with requirements in the attached drawings /plans and Division 15 Section "Motors" – Annex 1.

i. Special Motor Features: Multi-tapped, multispeed with internal thermal protection and permanent lubrication.

f. Filters

Disposable, with ASHRAE 52.2 MERV rating of 8 or higher.

8. Air-cooled compressor-condenser components

a. Casing

Steel, finished with baked enamel in color selected by Architect, with removable panels for access to controls, weep holes for water drainage, and mounting holes in base. Provide brass service valves, fittings, and gage sports on exterior of casing.

b. Compressor

Hermetically sealed with crankcase heater and mounted on vibration isolation. Compressor motor shall have thermal-and current-sensitive overload devices, start capacitor, relay and contactor.

i. Compressor Type: Scroll
ii. Two-speed compressor motor with manual-reset high-pressure switch and automatic reset low-pressure switch.
iii. Refrigerant: R-407C/R R-407/410-A/R-134-A

c. Refrigerant Coil

Copper tube, with mechanically bonded aluminum fins, complying with ARI 210/240, and with liquid sub-cooler.

d. Fan

Aluminum propeller type, directly connected to motor.

e. Motor

Permanently lubricated, with integral thermal-overload protection.

f. Low Ambient Kit

Permits operation down to 45° F (7°C)

g. Mounting Base

Polyethylene.

h. Minimum Energy Efficiency

Comply with ASHRAE/IESNA 90.1-2004, "Energy Standard for Building except Low-rise Residential Buildings."

9. Accessories
   a. Control equipment and sequence of operation are specified in Division 15 Sections "HVAC Instrumentation and Controls" and "Sequence of Operation." – Annex 1.
   b. Thermostat
      - Low voltage with sub-base to control compressor and evaporator fan.
      - Wireless infrared functioning to remotely control compressor and evaporator fan, with the following features:
        i. Compressor time delay.
        ii. 24 hour time-control of system stop and start.
        iii. Liquid-crystal display indicating temperature, set-point temperature, time setting, operating mode, and fan speed.
        iv. Fan-speed selection, including auto setting.
   c. Automatic-reset timer to prevent rapid cycling of compressor.
   d. Refrigerant Line Kits

Soft-annealed copper suction and liquid lines factory cleaned, dried, pressurized, and sealed; factory-insulated suction line with flared fittings at both ends.

i. Minimum Insulation Thickness: 1 inch (25 mm) thick.

10. Execution
    a. Installation
       i. Install units level and plumb
       ii. Install evaporator-fan components using manufacturer's standard mounting devices securely fastened to building structure.
       iii. Install ground-mounting, compressor-condenser components on 4 inches (100 mm) thick, reinforced concrete base; 4 inches (100 mm) larger on each side that unit. Coordinate anchor installation with concrete base done by the General Contractor.
       iv. Install ground-mounting, compressor-condenser components on polyethylene mounting base.
       v. Install seismic restraints.

vi. Install compressor-condenser components on restrained, spring isolators with a minimum static deflection on 1 inch (25 mm)

vii. Install and connect pre-charged refrigerant tubing to component's quick-connect fittings. Install tubing to allow access to unit.

b. Connections

i. Piping installation requirements are specified in the attached Drawings/plans. Drawings indicate general arrangement of piping, fittings, and specialties.

ii. Install piping adjacent to unit to allow service and maintenance

iii. Duct Connections: Duct installation requirements are specified in Division 15 Section "Metal Ducts." Drawings indicate the general arrangement of ducts. Connect supply to split system air-conditioning unit with flexible duct connectors. Flexible duct connectors are specified in Division 15 Section "Duct Accessories."

iv. Ground equipment according to Division 16 Section "Grounding and Bonding."

v. Electrical Connections: Comply with requirements in the attached Electrical Drawings/Plans for power wiring, switches, and motor controls.

c. Field Quality Control

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

ii. Perform the following field and inspections and prepare test reports:

- Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
- Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
- Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

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

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| 4.5 | **General Execution**<br>1. Concealment<br>Conceal all piping, ductwork and conduit in partitions, walls, crawlspaces, and ceiling spaces, unless otherwise noted. Do not install piping and conduit in outside wall of roofs slabs unless specifically directed, in which case, install them with the building insulation between them and the outside face of the building.<br>2. Accessibility<br>Install all works included in the Contract to be readily accessible for adjustment, operation and maintenance.<br>3. Protection of Work<br>Protect equipment and materials, stored or in place, from the weather, moisture, dust and physical damage. Mask machined surfaces. Secure covers over equipment openings and open ends of piping, ductwork and conduits, as installation work progresses. Equipment having operating parts, bearings or machined surfaces, showing signs of rusting, pitting or physical damage will be rejected.<br>4. Air system to have air filters installed before fans is operated. Install new air filters before system acceptance.<br>5. Service Penetrations in Rated Fire Separations<br>All piping, tubing, ducts wiring, conduits, etc. passing through rated fire separations shall be smoke and fire proofed with ULC approved materials and which meet the requirements of the Building Code in effect. This includes new services, which pass through existing separations, and also all existing services, which pass through a new rated separation or existing separations whose rating has been upgraded. Fire resistance rating of installed fire stopping assembly shall not be less than fire resistance rating of surrounding assembly indicated on Architectural drawings. All smoke and fire stopping shall be installed by a qualified Contractor who shall submit a letter certifying that all work is complete and in accordance with this specification. Install fire stopping and smoke seal material and components in accordance with ULC certification and manufacturer's instructions in formed sleeved or cored penetrations.<br>6. Service Penetration in Non-Rated Separations<br>All piping, tubing, ducts, wiring, conduits, etc. passing through non-rated fire separations and non-rated walls and floors shall be tightly fitted and sealed on both sides of the separation with silicon sealant to prevent the passage of smoke and/or transmission of sound. Refer to "pipe sleeve" clause in this section for packing and sealing of pipe sleeves.<br>7. Pipe Sleeves<br>Provide pipe sleeves for all piping passing through rated walls and floors. Sleeves are to be concentric with pipe. Pipes and ducts passing through fire rated separations that no fire resistance (non-rated separations) do not require a sleeve, but the insulations at the separation should be wrapped with 0.61 [24 ga] thick galvanized sheet steel band to which to apply the flexible caulking compound to. Pipe sleeves for floors and interior walls shall be minimum 0.61 [24 ga] thick galvanized sheet steel with lock seam joints. Pipe sleeves | |

for perimeter walls and foundation walls shall be cast iron sleeves or Schedule 40 steel pipe with annular fin continuously welded at midpoint and protruding 150 mm [6"] beyond sleeve diameter. Annular fin shall be embedded into center of wall. Pipe sleeves for wet or wash down floor areas such as washrooms, janitor's rooms, laboratories and mechanical equipment room shall be Schedule 40 steel pipe. Except as otherwise noted pipe sleeves are not required for holes formed or cored in interior concrete walls or floors. Pipe sleeves shall extend 50 mm [2"] above floors in unfinished areas and wet areas and 6 mm [1/4"] above floors in finished areas. .8 Pipe sleeves shall extend 25 mm [1"] on each side of wall in unfinished areas and 6 mm [1/4"] in finished areas. Pipe sleeves shall extend 25 mm [1"] beyond exterior face of building. Caulk with flexible caulking compound. Sleeve size: 12 mm [1/2"] clearance all around, between sleeve and pipe or between sleeve and pipe insulation. Paint exterior surfaces of ferrous sleeves with heavy application of rust inhibiting primer.

8. Escutcheons and Plates

Provide on pipes passing through finished walls, partitions, floors and ceilings. Plates shall be stamped steel, split type, chrome plated or stainless steel, concealed hinge, complete with springs, suitable for external dimensions of piping/insulations. Secure to pipe or finished surface. For all pipes passing through suspended ceilings and uninsulated piping passing through walls. Outside diameter shall cover opening or sleeve. Where pipe sleeve extends above finished floor, escutcheons or plates shall clear sleeve extension. Do not install escutcheons and plates in concealed locations.

9. Equipment Supports

Provide stands and supports for equipment and materials supplied. Lay out concrete bases and curbs required under Division.

10. Equipment Installation

Provide unions and flanges to permit equipment maintenance and disassembly and to minimize disturbance to piping and duct systems and without interfering with building structure or other equipment. Provide means of access for servicing equipment including permanently lubricated bearings. Pipe equipment drains to floor drains. Line up equipment, rectangular cleanouts and similar items with building walls whatever possible.

11. Flashing

Flash and counter flash where mechanical equipment passes through weather or water proofed walls, floors and roofs.

12. Lubrication of Equipment

Lubricate all new equipment prior to being operated, except sealed bearings, which shall be checked. Use the lubricant recommended by the manufacturer for the service for which the equipment is specified. Extend lubricating connections and sight glasses to the outside of housings where lubricating positions are not readily accessible. Submit a checklist, showing that all operated equipment has been lubricated prior to and during any temporary heating period and the demonstration and instruction period.

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| | 13. Painting<br>Clean exposed bare metal surfaces supplied removing all dirt, dust, grease and mill scale. Apply at least one coat of corrosion resistant primer paint to all supports and equipment fabricated from ferrous metal. Paint all pipe hangers and exposed sleeves, in exposed areas, with a rust inhibiting primer, as they are installed. Repaint all marred factory finished equipment supplied which is not scheduled to be repainted, to match the original factory finish.<br>14. Equipment Protection and Clean-up<br>Protect equipment and material in storage, on site and after installation until final acceptance. Leave factory covers in place. Take special precautions to prevent entry of foreign materials into working parts of piping and duct systems. All mechanical equipment stored on site shall be kept in a dry, heated and ventilated storage area. Thoroughly clean piping, ducts and equipment of dirt, cuttings, and other foreign material. Protect bearings and shafts during installation. Grease shafts and sheaves to prevent corrosion. Supply and install necessary extended nipples for lubrication purposes. Provide, install and maintain 30% efficient temporary filters to return and exhaust air openings from ceiling spaces to prevent air born dust from entering ducts, plenums and coils. Install filters to return air grilles when fans are operated and building is not at a clean condition. | |
| **5.** | **Testing, Adjusting and Balancing For HVAC** | |
| **5.1** | **Test**<br>1. Give written 24 hour notice of date for tests<br>2. Do not externally insulate or conceal work until tested and approved. Follow construction schedule and arrange for tests.<br>3. Conduct test in presence of Inspector. Arrange for the Owners representative to be present.<br>4. Bear costs including retesting and making good.<br>5. Refer to Piping Section for specific requirements.<br>6. Prior to tests, isolate all equipment or other parts which are not designed to withstand test pressures. | |
| **5.2** | **Testing and Balancing**<br>1. Employ an approved independent testing and balancing agency to test and balance the following systems. Prior to finalizing contractual arrangements with the balancing agency, submit the names, qualifications and years of direct field testing and balancing experience in the testing and balancing field for all members of the balancing team that is scheduled to carry out the balancing work. The senior site technologist must have a minimum of five years testing and balancing experience of similar projects. Provide a list of a minimum of ten comparable projects successfully completed by all key members of the balancing team. | |

a. Supply Air System(s)
b. Exhaust Air System(s)
c. Fire/smoke Pressurization System(s)
d. Existing System(s)

2. Work with the agency with:
   a. Ensure that all mechanical systems are complete and ready to be balanced and provide sufficient time for testing and balancing prior to substantial performance.
   b. Make corrections to achieve system balance without delay, include all corrections made during the balancing procedure on "AS Built" Drawings. Mechanical contractor to provide "AS Built" information to the balancing agency before balancing commences.
   c. Adjust fan drives, change blade pitch angles and change sheaves and belts as directed by the agency.
   d. Maintain all systems in full operation during the complete testing and balancing period.
   e. Employ control technicians to make adjustment to the control system to facilitate the balancing process.
   f. Employ the journeyman millwright to check the alignment of any V-Belt drives and/or shaft coupling drives if they have been adjusted during the balancing process. Belt tension correctness to be verified.
3. Consult with the Consultant to clarify the design intent where necessary or in any case there are any problems foreseen as the balancing processes.
4. Complete air balance before commencing water balance where heating/cooling coils are installed in the air system. Balancing shall not commence until systems have been cleaned and treated and the air removed from within the piping systems.
5. Accuracy: Balance to maximum flow deviation of 10% at terminal device and to 5% at equipment. Measurements to be accurate to within plus or minus 5% of actual values.
6. This agency shall remove and re-install ceiling tile to provide access to ductwork and piping. The balancing agency will make good any damage or soiling caused by his forces.
7. Instrument Calibration: At the Consultants request, the balancing agency shall submit a date calibration chart for all instruments. Permanently mark final setting on valves, dampers and other adjustment devices. Set and lock all memory stop balancing devices.
8. Seal all holes with snap plugs or approved alternate method, use for flow and pressure measurements.
9. The control contractor and balancing agency are to allow for checking and making adjustments during the 12 month warranty period, when weather conditions provide natural loads and in cases where complaints arise.

10. Test all fire dampers (including combination smoke/fire dampers). The test shall be made by releasing the fusible link and witnessing closure of the damper. All fire dampers shall be left in the open position.
11. Air System Balancing
    a. Prior to demolition, in renovated areas, measure and record supply, return and exhaust airflow into existing areas that are not included in the renovations. After renovations are completed, rebalance existing branches to the conditions as found in the pre-construction measurements. Provide written report including all areas that have been pre-measured including pilot tube traverse sheets.
    b. Adjust duct and terminal balance dampers, and adjust or change drive sheaves and fan blade pitch angles to obtain design quantities (within +/-10%) at each outlet and inlet. Use terminal balance dampers to regulate air quantities only to the extent that adjustments do not create objectionable air motion or sound levels. The sheet metal sub-contractor shall provide additional dampers where required by the balancing agency to achieve a satisfactory balance without creating noise problems.
12. Make air quantity measurements in ducts by "Pilot Tube" traverse of entire cross sectional area of duct. Provide a pilot tube traverse test sheet for each major duct branch.
13. Measure air quantities at each air terminal.
14. Maintain the design relationship between the supply and exhaust air system quantities/
15. Balance all air system for 100% outdoor air and 100% relief air. Upon completion of each system balance, check to ensure that the fan motor does not overload and that the main duct pressure does not change substantially when the system is switched over to minimum outside air condition.
16. Include in the air balance report
    a. Date of test, Name and address of building and balancing technician's name.
    b. Range of outdoor air temperature during the balancing period.
    c. System schematics indicating damper positions, design and measured air quantities at each inlet and outlet. Show room numbers and floors.
    d. If installation permits, record both air terminals and fan discharge traverse air volumes to establish system leakage.
    e. Main branch duct traverses. Maximum and minimum outdoor air quantities.
    f. Static pressure across each component in an air handing system at full flow.

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| | g. Face velocities across major components such as filter or coils.<br>h. Static pressure across each fan.<br>i. Systematic static pressures at selected points throughout a VAV supply duct system and in main branch duct in low velocity systems.<br>j. Fan and motor speed<br>k. Motor size, starting time, amps and voltage.<br>l. Coil air entering and leaving temperatures (D.B. and W.B.)<br>17. Maximum and minimum zone supply air temperatures under prevailing conditions at time of test. Provide fan performance curve for each new air handling system. | |
| **6.** | **Commissioning of HVAC Systems** | |
| **6.1** | **Quality Assurance**<br>1. The commissioning shall be executed in accordance with the intent of ASHRAE Standard guideline for "Commissioning of HVAC System". For list of acceptable Commissioning Agency, refer to DBM. | |
| **6.2** | **General**<br>1. Be responsible for the performance and commissioning of all equipment supplied. Commissioning is the process of advancing the installation from the stage of static completion to full working order in accordance with the contract documents and design intent. It is the activation of the completed installation.<br>2. In consultation with the General Contractor, ensure that sufficient time is allowed and fully identified on the construction schedule for the proper commissioning of all mechanical systems. | |
| **6.3** | **Commissioning and Demonstration**<br>1. Submit a schedule for the commissioning phase of the work. This schedule shall show:<br>a. Equipment start-up schedule<br>b. Submission dates for the various documents required prior to substantial completion.<br>c. Timing of the various phases of the commissioning, testing, balancing and demonstration process.<br>2. Commissioning is concluded when air and water system have been balanced and the installation is in full working order and acceptable for use. The work will include the following:<br>a. Balancing of the air systems as specified in this section.<br>b. Balancing of the liquid system as specified in this section.<br>c. Set up air diffusers, registers and grilles for optimum distribution/comfort.<br>d. Set up and test all implosions/explosions doors. | |

e. Set up variable volume fans.
f. Adjust air valves as necessary.
g. Plug all air pressure and flow measuring holes.
h. Adjust vibration isolators and earthquake restraints for optimum performance.
i. Verification and certification of the sealing of all HVAC penetrations through fire separations (rated and non-rated) and sound separations.
j. Verification of water tightness of all roof and exterior wall penetrations.
k. Verification that all coil drain pans operate.
l. Set up all automatic control valves/dampers and automatic temperature control devices.
m. Testing and debugging of Building Management System (BMS)
n. Set up and test all alarm and protective devices
o. Power failure test with emergency generator start-up.
p. Calibration and adjustment of the smoke venting and pressurization systems.

3. At the conclusion of commissioning demonstrate the operation of the systems to be Consultant and then to the Owner's Operation Staff.
4. The verification process shall include the demonstration of the following:
    a. The ease of access that has been provided throughout for servicing coils, motor, drives, fusible link fire dampers, smoke dampers, control dampers and damper operators.
    b. Location of and opening and closing of all access panels.
    c. Operation of all automatic control dampers and automatic temperature control devices.
    d. Operation of all alarm and protective devices.
    e. Proper response of all mixing boxes and air valves to thermostats and volume adjustment controls.
    f. Operation of all smoke dampers and all smoke pressurization and removal provisions.
    g. Operability of randomly selected fire dampers.
    h. Noise level from typical mixing boxes and air valves under extreme operating conditions.
    i. Operation of all equipment and system under each mode of operating, and failure, including: BMS control features, Automatic control including air compressors, Fan, Coils, Humidifiers, Steam pressure reducing stations, Condensate return units.
5. At the completion of the commissioning, testing, balancing and demonstration submit the following to the Consultant:
    a. A letter certifying that all work specified under this contract is complete, clean and operational in accordance with the specification and drawings.

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| | b. Completed copies of all commissioning check lists plus copies of start-up reports from specialty contractors and vendors.<br>c. "AS-BUILT" record drawing, as specified. | |
| **6.4** | **Commissioning and Demonstration**<br>1. Provide the services of an approved independent specialist firm to coordinate the commissioning process.<br>2. The cooperation of all trades is essential for an efficient and planned process. A team comprising the following is recommended.<br>3. Commissioning Coordinator:<br>a. General Contractor<br>b. Mechanical Contractor's Supervisor<br>c. Mechanical Consultant<br>d. Building Owner's Representative<br>e. Trades: Especially Control Contractor and Balancing Agency<br>f. Electrical<br>4. Prepare a commissioning statement for each of the four (4) phases that the process is perceived to be worked through. In sequence, the phase are expected to be:<br>a. PHASE 1 – System readiness<br>b. PHASE 2 – System start-up, testing, balancing, etc.<br>c. PHASE 3 – Verification of system performance<br>d. PHASE 4 - Demonstration and instruction.<br>5. Regular meetings shall be held during the commissioning process. Minutes of the meeting shall be issued to all contractors involved, the Consultant and the Owners representative.<br>6. Plan the work to be specific in respect of personnel, schedule, and review and laboratory tests.<br>a. Personnel: Assign direct overall charge of commissioning to a person (the commissioning coordinator) fully qualified through practical experience and a comprehensive knowledge of the interactive nature of building and their controls to understand the complete system and be available to carry the project through to total completion. This person shall be responsible for – Commissioning, Demonstration to the Consultant and Owner and Certification of Substantial and Total Performance.<br>b. Schedule: Submit a schedule, as part of the construction schedules, for the commissioning phase of the work.<br>c. Review: Within three (3) months of commencing with the project work, the person having direct overall charge of commissioning shall review design intent and intended commissioning procedures with the Consultant. Six (6) prior to the date of schedules | |

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| | substantial performance, submit a detailed plan that addresses the entire approach to the commissioning process. The plan should be prepared specifically for the project at hand.<br>d. Troubleshooting: Where problems become apparent during the commissioning process, work at the identification and resolution of these problems. The basic function in troubleshooting are:<br>i. What – Identification and definition of the problem<br>ii. Why – Determination and evaluation of the cause.<br>iii. When – Determine the time available to resolve the problem.<br>iv. Involve the Consultant in the review of the problem and proposed resolution.<br>v. Coordinate remedial action with the appropriate parties.<br>vi. Evaluate the effectiveness of the remedial action.<br>e. Laboratory Tests: If the field tests indicate that equipment supplied to the project does not meet specifications, laboratory certification of the potentially deficient equipment may be requested by the Owner.<br>7. The work included in each of the four (4) phases shall be generally as follows:<br>a. PHASE 1 – System Readiness<br>b. PHASE 2 – System startup, testing and balancing<br>c. PHASE 3 – Verification of system performance<br>d. PHASE 4 – Demonstration and Acceptance<br>e. Post Substantial Performance Visits | |
| **6.5** | **Shop Drawings**<br>1. Submit shop drawings<br>2. Shop drawings shall include:<br>a. Control center layouts.<br>b. Manufacturer's descriptive technical literature for all equipment and devices.<br>c. Interconnection schematics.<br>d. Wiring and piping diagrams.<br>e. One-line diagram from sensor and control points to Field Interface device and/or standalone DDC panel including all components and cables.<br>f. Terminal cabinets, including termination listings.<br>g. Written description indicating sequence of operation. Shop drawings will be rejected if the written description is not included with the submission. Sequences should reference English descriptors and labels for each point described. | |

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| | h. All input/output points which shall include the following information associated with each point.<br>i. Sensing element type and location.<br>ii. Details of associated field wiring schematics and schedules.<br>iii. Pneumatic schematics and schedules. (Not required on "all electronic" projects).<br>iv. Software and programming details.<br>i. Detailed block diagrams of transmission trunk routing and configuration.<br>j. Valve and damper schedules indicating size, configuration, capacity and locations. If size varies greater than 10% obtain approval of Consultant.<br>k. Copies of all system graphics complete with system specific point labels. | |
| **6.6** | **Operating and Mechanical Manuals**<br>1. The maintenance manual data is intended to cover the operation and maintenance of all control systems and equipment installed. Forward 3 copies of the Controls and Instrumentation section of the operating and maintenance manuals to the Balancing Agency to ensure the binding and format of material are compatible. Ensure sufficient time has been given to the Balancing Agency for the compiling of the complete operating and maintenance manuals by the commissioning deadline. One complete manual shall be furnished prior to the time that system or equipment tests are performed.<br>2. The manual shall include the name, address and telephone number of the control subcontractor installing the systems and a list of emergency number for service personnel. The manuals shall have a table of contents and be assembled to conform to the table of contents with the tab sheets placed before instructions covering the subject.<br>3. Manuals shall be furnished which provide full and complete coverage of the following subjects:<br>a. Operational Requirements<br>b. System Operation<br>c. Functional Description<br>d. Software | |
| **6.7** | **Demonstration and Instruction to Owner**<br>1. The Controls Contractor shall provide the services of competent instructors who will give full instruction to designated personnel in the adjustment, operation and maintenance, including pertinent safety requirements, of the equipment and system specified. The training shall be oriented toward the system installed rather than being a general training course. Instructors shall be thoroughly familiar with all aspects of the subject matter they are to | |

| | | |
|---|---|---|
| | teach. A training manual shall be provided for each trainee which describes in detail the data included in each training program. All equipment and material required for classroom training shall be provided by the Contractor. | |

**I hereby certify to comply with all the above Technical Specifications.**

| Name of Company/Bidder | Signature over Printed Name of Representative | Date |
|---|---|---|

# *Section VIII. Drawing/Annexes*

## GENERAL NOTES:

ALL WORKS SHALL BE DONE IN ACCORDANCE WITH THE PROVISION OF THE LATEST APPROVED EDITION OF THE PHILIPPINE ELECTRICAL CODE, THE LAWS AND ORDINANCES OF THE LOCAL CODE ENFORCING AUTHORITIES AND REQUIREMENTS OF THE LOCAL POWER, TELEPHONE COMPANY AND BUILDING ADMINISTRATION REQUIREMENTS.

1. CONTRACTOR SHALL SECURE ALL WIRING PERMITS AND ALL FEES REQUIRED FOR THE WORKS AND FURNISH THE OWNER WITH THE FINAL CERTIFICATE OF ELECTRICAL INSPECTION.
2. CONTRACTOR SHALL CONDUCT THE FOLLOWING:
   - 2.1 GROUNDING SYSTEM RESISTANCE TEST
   - 2.2 MEGGER INSULATION TESTS
   - 2.3 PROTECTIVE DEVICE COORDINATION

   IN THE EVENT THAT THE MEASURED GROUNDING RESISTANCE EXCEEDS 3 OHMS, THE CONTRACTOR SHALL INSTALL SUPPLEMENTARY GROUND RODS TO AUGMENT THE GROUNDING SYSTEM.
3. IN CASE OF ANY DISCREPANCY BETWEEN PLANS AND SITE CONDITION, SPECIFICATION AND INCLUSION/ CHANGES, THE CONTRACTOR SHALL IMMEDIATELY VERIFY AND CONSULT WITH THE ARCHITECT AND/OR THE CONSULTATIVE ENGINEER FOR RESOLUTION. THE CONTRACTOR SHALL WAIT FOR THE RESOLUTION PRIOR TO RESUMPTION OF WORK.
4. ALL LOCATION AND MOUNTING HEIGHT OF ELECTRICAL EQUIPMENT SUCH AS SWITCHES AND RECEPTACLES, ETC. SHALL BE SUBJECT TO THE APPROVAL OF THE ARCHITECT AND/OR THE CONSULTANT ENGINEER.
5. CONTRACTOR SHALL BE RESPONSIBLE IN THE PREPARATION OF ELECTRICAL AS-BUILT PLANS AND ELECTRONIC CAD FILES. AS-BUILT PLANS SHALL BE DULY SIGNED AND SEALED BY PROFESSIONAL ELECTRICAL ENGINEER.
6. FINAL LIGHTING FIXTURES, FASHMEN AND WIRING DEVICES SHALL BE APPROVED BY THE ARCHITECT OR DULY DESIGNATED OWNER'S REPRESENTATIVE.
7. CONTRACTOR SHALL BE RESPONSIBLE FOR THE PREPARATION OF SHOP OR CONSTRUCTION DRAWINGS REQUIRED BY OWNER/ARCHITECT/ENGINEERS. DRAWINGS SHALL BE PREPARED BY CONTRACTOR'S QUALIFIED ENGINEER.
8. CONTRACTOR SHALL VISIT THE JOB SITE AND ENSURE THAT ALL REQUIRED MISCELLANEOUS WORK, SUCH AS CORING COSTS AND RELATED RESTORATION COSTS FOR ANY AFFECTED SURFACES, ARE INCLUDED IN HIS/HER BID, AT NO COST TO THE OWNER.
9. CONTRACTOR'S TO LOCATE ALL PULLING BOXES TO ACCESSIBLE PLACE OR PROVIDE ACCESS PANELS, WHERE REQUIRED.
10. CONTRACTOR SHALL FIELD VERIFY DIMENSION OF ALL EQUIPMENT TO BE INSTALLED AND MAKE ALL REQUIRED ADJUSTMENT TO SUIT FIELD CONDITION. FIELD ADJUSTMENTS MUST BE APPROVED BY THE ARCHITECT AND/OR CONSULTANT ENGINEER.
11. THESE DRAWINGS ARE DIAGRAMMATIC LAYOUT ONLY. ANY MATERIALS AND FITTINGS NOT SHOWN BUT NEEDED TO COMPLETE THE SYSTEM, SHALL BE DEEMED INCLUDED WITH THE CONTRACTOR SCOPE OF WORKS.
12. ALL WORKS SHALL BE DONE UNDER DIRECT SUPERVISION OF LICENSED PROFESSIONAL OR REGISTERED ELECTRICAL ENGINEER
13. POWER AVERAGE TO THE BUILDING SHALL BE 230V 3Ø (L-L) + GND, 60 HZ
14. ALL MATERIALS TO BE USED SHALL BE NEW AND APPROVED TYPE FOR LOCATION.
15. NORMAL AND EMERGENCY CIRCUITS SHALL NOT BE CONFINED IN ONE RACEWAY
16. ALL WIRES SHALL NOT BE LOADED MORE THAN 80% OF THEIR CODE ALLOWABLE AMPACITY
17. RECEPTACLES FOR GENERAL USE SHALL BE DUPLEX 20A 250VAC GROUNDING TYPE
18. LIGHT SWITCHES MEDIUM EXTENDING SHALL BE 20A 125VAC
19. ALL MATERIALS TO BE USED SHALL BE BRAND NEW AND MUST HAVE AT LEAST A PHILIPPINE STANDARD (PS) MARK AND OTHER RECOGNIZED INTERNATIONAL STANDARDS
20. UNLESS OTHERWISE INDICATED, THE MOUNTING HEIGHT IS FROM FINISHED FLOOR LEVEL FOR VARIOUS ITEMS OF ELECTRICAL WIRING ACCESSORIES / EQUIPMENT SHALL BE FOLLOWS:

| | |
|---|---|
| LIGHTING SWITCHES | 1200mm TO CENTER LINE |
| RECEPTACLES OUTLETS | 300mm TO CENTER LINE |
| PANELBOARDS | 1800mm TO TOP OF PANEL |
| WALL/CEILING LIGHTS | 2300mm TO CENTER LINE |

21. COLOR FOR ALL SWITCHES, RECEPTACLE, SHALL BE AS PER ARCHITECT/ INTERIOR DESIGNER'S SELECTION.
22. ALL ELECTRICAL EQUIPMENT & ACCESSORIES THAT ARE EXPOSED OR LESS THAN 2.0M AWAY FROM WATER SOURCES SHALL BE OF WATER ROOF TYPE.
23. CONDUIT PIPE EMBEDDED WITH IN CONCRETE WALL SHALL HAVE A MINIMUM PLASTERED COVER OF 20MM THICK.
24. ALL LIGHTING FIXTURES SHALL HAVE INDEPENDENT HANGER/ SUPPORTS.
25. ALL CONDUIT/PIPE ABOVE CEILING SHALL HAVE INDEPENDENT HANGERS/SUPPORTS.
26. ALLOWABLE WIRE FILL FOR A JUNCTION BOXES MUST NOT EXCEED 60% OF THEIR VOLUME
27. ALLOWABLE STEADY STATE VOLTAGE DROP FOR ALL CIRCUITS FROM MAIN DISTRIBUTION PANEL TO THE LIGHTING PANEL BOARDS MUST NOT EXCEED 3%.
28. CIRCUIT BREAKER SERVING MOTORS AND LIGHTING LOAD SHALL BE INDUSTRIAL AND COMMERCIAL BOLT-ON TYPE, RESPECTIVELY, WITH MINIMUM OF 10KAIC.
29. CONDUITS FOR TELEPHONE AND DATA SYSTEM SHALL BE RGC 40 PVC. CONDUITS FOR LIGHTING AND POWER SYSTEM SHALL BE INTERMEDIATE METAL CONDUIT (IMC)
30. ALL POWER OUTLETS LOCATED AT WET AREAS SHALL BE 20A, 250V 3P, 3WIRE AND EQUIPPED WITH "GFCI" (GROUND FAULT CIRCUIT INTERRUPTER).
31. USE OF MDA TUBING SHALL BE LIMITED TO SIX (6) METERS (6') MAXIMUM.
32. USE OF FLEXIBLE METALLIC CONDUIT (FMC) SHALL BE LIMITED TO ONE METER (1M) MAX.
33. PROVIDE PROPER CONDUIT SUPPORT, GI WIRES AS SUPPORT IS NOT ALLOWED.
34. PROVIDE DOUBLE COAT OF RUST-PROTECTIVE PAINT (RED-OXIDE PRIMER) ON HANGERS AND SUPPORTS (WITH A DISTANCE OF 1800mm)

WIRE COLOR CODING SHALL BE AS FOLLOWS

| | |
|---|---|
| L1 | - RED |
| L2 | - YELLOW |
| L3 | - BLUE |
| GROUND | - GREEN |
| NEUTRAL | - WHITE |

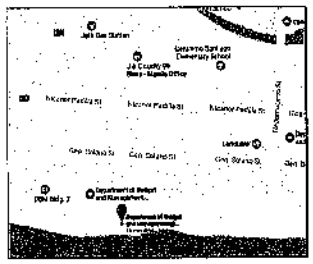
| LEGEND | DESCRIPTION |
|---|---|
| | DUPLEX CONVENIENCE OUTLET 15A, 250V GROUNDING TYPE |
| | CONVENIENCE OUTLET (UNDER COUNTER) |
| | CONVENIENCE OUTLET (WEATHER PROOF) 15A, 250V GROUNDING TYPE |
| | CONVENIENCE OUTLET (COUNTER TOP) VERIFY COUNTER EQUIPMENT HEIGHT |
| | CONVENIENCE OUTLET (HAND DRYER) |
| | CONVENIENCE OUTLET (REFRIGERATOR) |
| | JUNCTION BOX |
| UPS | UNINTERRUPTIBLE POWER SUPPLY |
| FJ | FLOOR JUNCTION BOX |
| | EMERGENCY LIGHT |
| | HEIGHT OF 0.3M |
| | AUTOMATIC TRANSFER SWITCH |
| | MANUAL TRANSFER SWITCH |
| | CIRCUIT BREAKER |
| M | ELECTRIC MOTOR |
| GR | GROUND RESISTOR |
| G CTC | STANDBY GENERATOR SET |
| GB | GROUND BUS |
| NB | NEUTRAL BUS |

| LEGEND | DESCRIPTION |
|---|---|
| | PULL BOX SIZE AS REQUIRED |
| S | SINGLE POLE TOGGLE SWITCH, 15A, 300V<br>NOTE:<br>S - SINGLE POLE SWITCH IN ONE SWITCH PLATE<br>2S - TWO SINGLE POLE SWITCH IN ONE SWITCH PLATE<br>S3W - 15A, 250V, 3 WAY SWITCH |
| | ELECTRICAL PANEL BOARD |
| | 13MM IN DIA. LED DOWNLIGHT (7 X 5 WATTS IN WARM WHITE LIGHT) |
| | 150MM IN DIA. LED DOWNLIGHT |
| | EXIT LIGHT 150mm ABOVE DOOR POST |
| CJ | CEILING JUNCTION BOX |

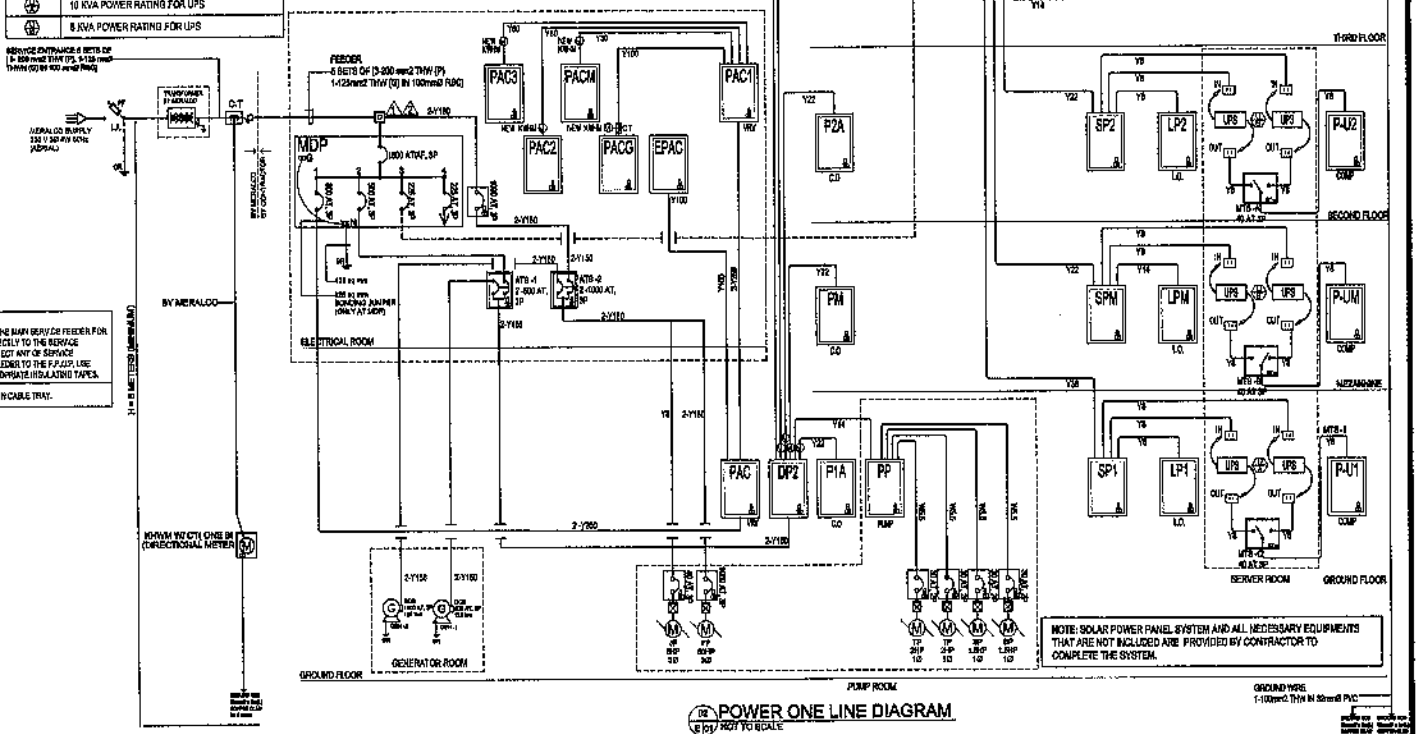
| LEGEND | DESCRIPTION |
|---|---|
| | (1 X 5 WATTS IN WARM WHITE LIGHT) |
| | LED SINGLE KARIHAN LIGHT (1 X 5 WATTS IN DAY LIGHT) |
| | LED DOUBLE KARIHAN LIGHT (9 X 5 WATTS IN DAY LIGHT) |
| | 1 X 11 WATTS LED TS IN 600MM X 150MM RECESSED TYPE LOUVED CASEMENT IN DAYLIGHT |
| | 1 X 11 WATTS LED TS IN 1200MM X 300MM RECESSED TYPE LOUVED CASEMENT IN DAYLIGHT |
| | LED TAPE LIGHT IN WARM WHITE |
| | CIRCUIT HOMERUN |
| | DIGITAL KWH METER |
| | CONVENIENCE OUTLET (FLOOR OUTLET) |

| | |
|---|---|
| | DRY TYPE TRANSFORMER 45 KVA 400V / 230V 3Ø |
| | SOLAR PANEL |
| | 3 UNITS GRID TYPE INVERTER 15 KW 3Ø 400V |
| | 10 KVA POWER RATING FOR UPS |
| | 5 KVA POWER RATING FOR UPS |

NOTE:
⚠ THE CONTRACTOR SHOULD CONNECT THE MAIN SERVICE FEEDER FOR THE FIRE PUMP AND JOCKEY PUMP DIRECTLY TO THE SERVICE ENTRANCE. CONTRACTOR TO FIELD SELECT ANY OF SERVICE ENTRANCE CONDUCTOR TO TAP THE FEEDER TO THE F.P.J.P. USE MECHANICAL CONNECTORS WITH APPROPRIATE INSULATING TAPES.
⚠ PARTIALLY IN CONDUIT AND PARTIALLY IN CABLE TRAY.




01 VICINITY MAP
E 01 NOT TO SCALE




02 POWER ONE LINE DIAGRAM
E 01 NOT TO SCALE

NOTE: SOLAR POWER PANEL SYSTEM AND ALL NECESSARY EQUIPMENTS THAT ARE NOT INCLUDED ARE PROVIDED BY CONTRACTOR TO COMPLETE THE SYSTEM.

UNIVERSITY OF THE PHILIPPINES SYSTEM
OVPD
OFFICE OF THE VICE PRESIDENT FOR DEVELOPMENT
ODPI
OFFICE OF DESIGN AND PLANNING INITIATIVES

REPUBLIC ACT 9246: Article IV, Section 23
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| ARCHITECTS OF RECORD | | CONSULTANT/ENGINEER | PROJECT TITLE |
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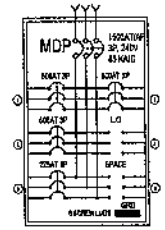
| UNIVERSITY REPRESENTATIVE | OWNER |
|---|---|
| ENRICO B. TABARINDA<br>DIRECTOR IV<br>RUBRA A. ZAMORA<br>VICE PRESIDENT, OVPD | BENJAMIN E. DIOKNO<br>DBM SECRETARY |

| | | SHEET CONTENTS | SHEET NO. |
|---|---|---|---|
| DRAWN BY: | DSO | GENERAL NOTES AND SPECS | E 01 |
| DATE: | 10/10/2017 | LEGENDS AND SYMBOLS | |
| CHECKED BY: | RJR | TABLE OF CONTENTS | 13 |
| DATE: | 12.16.18 | POWER ONE LINE DIAGRAM | |
| REVISED BY: | DSO | VICINITY MAP | ELECTRICAL |
| DATE: | 07.10.19 | | |

| CKT NO | CIRCUIT BREAKER RATING AT | AF | P | KAIC | TYPE | NO OF OUTLETS CO | LTG | LOAD SERVE | KVA | KW | AMPERE LOAD 3P | 3PAB | 3PCA | 3PDC | SIZE OF WIRE PHASE WIRE | GROUND WIRE | INC PIPE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| PANEL: MDP | | | | | | | | VOLT : 230V (L-L) 3Ø 60HZ | | | | | | | 2-5mm2 THWN | mm2 THWN | mm0 |
| 1 | 400 | 600 | 3 | 65 | B.O | | | PANEL PAC | 247.45 | 203.49 | 597.00 | | | | 2-5mm 5-125 | 5-100 | 100 |
| 2 | 800 | 800 | 3 | 65 | B.O | | | PANEL DP2 THRU ATS-1 | 159.30 | 111.65 | 44.00 | 165.84 | 153.28 | 108.57 | 2-5mm 3-125 | 1-100 | 90 |
| 3 | 1000 | 1000 | 3 | 65 | B.O | | | SUMMARY OF LOAD ( MTS-1) THRU ATS-2 | 46.27 | 41.65 | 145.20 | | | | 2-5mm 5-125 | 1-100 | 90 |
| 4 | 225 | 225 | 3 | 65 | B.O | | | SOLAR PANEL | | | | | | | 3-125 | 1-60 | 50 |
| 5 | 225 | 250 | 3 | 65 | B.O | | | FUTURE CAPACITOR BANK | | | | | | | | | |
| 6 | | | | | | | | SPACE | | | | | | | | | |
| | | | | | | | | TOTAL CONNECTED LOAD | 410.97 | 352.57 | 786.20 | 165.84 | 153.28 | 108.57 | | | |

COMPUTATIONS : DEMAND FACTOR = 100 %
I 3ph = 100% DF x 1.732 x 352.84 = (26% x 130)+ 786.20 = 1742 Amps
I CB = 125% x 1052 + 100%(130) = 1443 Amps

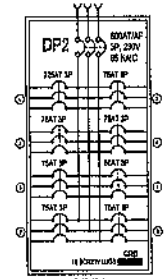
USE : 2 Sets of 3- 200mm2 THW (P) + 1-125mm2 THW (G) in 100mm dia PVC
MAIN BREAKER : 1600 AT 1200 AF 3P 240V 65 KAIC




| CKT NO | CIRCUIT BREAKER RATING AT | AF | P | KAIC | TYPE | NO OF OUTLETS CO | LTG | LOAD SERVE | KVA | KW | AMPERE LOAD 3P | 3PAB | 3PCA | 3PDC | SIZE OF WIRE PHASE WIRE | GROUND WIRE | INC PIPE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| PANEL: DP2 THRU ATS-1 | | | | | | | | VOLT : 230V (L-L) 3Ø 60HZ | | | | | | | mm2 THWN | mm2 THWN | mm0 |
| 1 | 225 | 225 | 3 | 65 | B.O | | | PANEL 3P THRU ATS-3 | 43.69 | 43.66 | | 71.58 | 74.63 | 58.03 | 3-60 | 1-50 | 60 |
| 2 | 70 | 100 | 3 | 25 | B.O | | | PANEL P1A | 14.01 | 13.84 | | 21.12 | 21.08 | 20.45 | 3-22 | 1-8 | 40 |
| 3 | 70 | 100 | 4 | 35 | B.O | | | PANEL P2A | 15.16 | 15.15 | | 21.74 | 21.89 | 22.75 | 3-22 | 1-8 | 40 |
| 4 | 75 | 100 | 5 | 20 | B.O | | | PANEL P3A | 12.80 | 12.47 | | 19.21 | 19.38 | 18.96 | 3-22 | 1-8 | 40 |
| 5 | 75 | 100 | 5 | 20 | B.O | | | PANEL PM | 7.53 | 7.00 | | 14.01 | 13.87 | 12.11 | 3-14 | 1-8 | 32 |
| 6 | 60 | 80 | 3 | 20 | B.O | | | PANEL PP | 8.04 | 8.20 | | 16.36 | 13.89 | 13.36 | 3-14 | 1-8 | 32 |
| 7 | 75 | 100 | 3 | 18 | B.O | | | ELEV.1 7.5HP 3Ø | 6.61 | 6.60 | 22.00 | | | | 3-22 | 1-8 | 40 |
| 8 | 75 | 100 | 3 | 18 | B.O | | | ELEV.2 7.5HP 3Ø | 6.61 | 6.60 | 22.00 | | | | 3-22 | 1-8 | 40 |
| | | | | | | | | TOTAL CONNECTED LOAD | 119.61 | 112.39 | 44.00 | 183.64 | 163.26 | 158.67 | | | |

COMPUTATIONS : DEMAND FACTOR = 100 %
I 3Ø = 100% x 1.732 x 183.64 x (100% x 231 + 44.00 = 348 Amps
I CB = 1.25 x 348 = (100% x 22)= 499 Amps

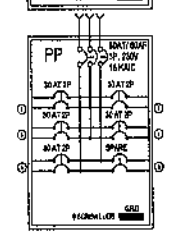
USE : 2 Sets of 3 -150mm2 THWN(P) + 1 -100mm2 THWN (G) in 90mm2 IMC
MAIN BREAKER : 600AT/AF 3P 230V 65kaic




| CKT NO | CIRCUIT BREAKER RATING AT | AF | P | KAIC | TYPE | NO OF OUTLETS CO | LTG | LOAD SERVE | KVA | KW | AMPERE LOAD 3P | 3PAB | 3PCA | 3PDC | SIZE OF WIRE PHASE WIRE | GROUND WIRE | INC PIPE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| PANEL: PP | | | | | | | | VOLT : 230V (L-L) 3Ø 60HZ | | | | | | | mm2 THWN | mm2 THWN | mm0 |
| 1 | 30 | 60 | 2 | 18 | B.O | | | TRANSFER PUMP 2HP | 1.74 | 1.49 | | 7.56 | | | 2-5.5 | 1-5.5 | 25 |
| 2 | 30 | 60 | 2 | 18 | B.O | | | TRANSFER PUMP 2HP | 1.74 | 1.49 | | 7.56 | | | 2-5.5 | 1-5.5 | 25 |
| 3 | 30 | 60 | 2 | 18 | B.O | | | ELEVATOR PIT-1 (2HP) | 1.75 | 1.49 | | | 7.56 | | 2-5.5 | 1-5.5 | 25 |
| 4 | 30 | 60 | 2 | 18 | B.O | | | SUBMERSIBLE PUMP 1.5HP | 1.32 | 1.12 | | | 5.74 | | 2-5.5 | 1-5.5 | 25 |
| 5 | 30 | 60 | 2 | 18 | B.O | | | SUBMERSIBLE PUMP 1.5HP | 1.32 | 1.12 | | | | 5.74 | 2-5.5 | 1-5.5 | 25 |
| 6 | 30 | 60 | 2 | 18 | B.O | | | ELEVATOR PIT-2 (2HP) | 1.15 | 3.49 | | | | 7.65 | 2-5.5 | 1-5.5 | 25 |
| | | | | | | | | TOTAL CONNECTED LOAD | 8.88 | 9.20 | | 15.90 | 13.59 | 13.39 | | | |

COMPUTATIONS : DEMAND FACTOR = 100 %
I 3Ø = [ 1.732 x 15.90 x (26% x 1.25) =26 Amps
I CB = 125% x 26 + (100% x 0.13) = 59 Amps

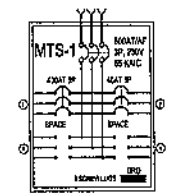
USE : 3-14 mm2 THWN (P) + 1-5.5mm2 (G) in 32 mm2 IMC
MAIN BREAKER : 60 AT 60 AF 3P 230V 25 KAIC




| CKT NO. | CIRCUIT BREAKER RATING AT | AF | P | KAIC | TYPE | NO OF OUTLETS CO | LTG | LOAD SERVE | KVA | KW | AMPERE LOAD 3P | 3PAB | 3PCA | 3PDC | SIZE OF WIRE PHASE WIRE | GROUND WIRE | INC PIPE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| PANEL: SUMMARY OF LOAD ( MTS-1) | | | | | | | | VOLT : 230V (L-L) 3Ø 60HZ | | | | | | | mm2 THWN | mm2 THWN | mm0 |
| 1 | 400 | 400 | 3 | 50 | B.O | | | FIRE PUMP 60HP 3Ø | 41.81 | 37.36 | 150.00 | | | | 3-250 | 1-150 | 100 |
| 2 | 45 | 60 | 3 | 50 | B.O | | | JOCKEY PUMP 5HP 3Ø | 4.39 | 3.73 | 15.20 | | | | 3-8 | 1-6.6 | 32 |
| 3 | | | | | B.O | | | SPACE | | | | | | | | | |
| 4 | | | | | B.O | | | SPACE | | | | | | | | | |
| | | | | | | | | TOTAL CONNECTED LOAD | 46.27 | 41.03 | 145.20 | | | | | | |

COMPUTATIONS : DEMAND FACTOR = 100 %
I 3Ø = 100% DF x 145.20 = (26% x 130) = 127.70 Amps
I CB = 125% x 15.20 + 100%(130) = 469 Amps

USE : 2 Sets of 3- 150mm2 THHN (P) + 1-60mm2 THHN (G) in 90mm IMC
MAIN BREAKER : 600 AT 600 AF 3P 240V 65 KAIC

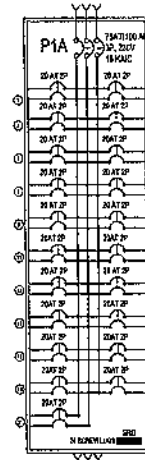



NOTE :
B.O = BOLT ON

| CKT NO | CIRCUIT BREAKER RATING AT | AF | P | KAIC | TYPE | NO OF OUTLETS CO | LTG | LOAD SERVE | KVA | KW | AMPERE LOAD 3P | 3PAB | 3PCA | 3PDC | SIZE OF WIRE PHASE WIRE | GROUND WIRE | INC PIPE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| PANEL: P1A | | | | | | | | VOLT : 230V (L-L) 3Ø 60HZ | | | | | | | mm2 THWN | mm2 THWN | mm0 |
| 1 | 20 | 50 | 2 | 14 | B.O | 2 | | CONV. OUTLET / AIR CURTAIN | 0.30 | 0.30 | 1.30 | | | | 2-3.5 | 1-3.5 | 16 |
| 2 | 20 | 50 | 2 | 14 | B.O | 3 | | HAND DRYER | 2.40 | 2.40 | 10.43 | | | | 2-3.5 | 1-3.5 | 16 |
| 3 | 20 | 50 | 2 | 14 | B.O | 3 | | REF. / CONV. OUTLET | 0.65 | 0.65 | | | 2.82 | | 2-3.5 | 1-3.5 | 16 |
| 4 | 20 | 50 | 2 | 14 | B.O | 4 | | CONV. OUTLET/HAND DRYER | 1.74 | 1.74 | | | 7.57 | | 2-3.5 | 1-3.5 | 16 |
| 5 | 20 | 50 | 2 | 14 | B.O | 2 | | CONV. OUTLET | 0.58 | 0.58 | | | | 2.52 | 2-3.5 | 1-3.5 | 16 |
| 6 | 20 | 50 | 2 | 14 | B.O | 2 | | HAND DRYER / REF | 2.70 | 2.70 | | | | 11.74 | 2-3.5 | 1-3.5 | 16 |
| 7 | 20 | 50 | 2 | 14 | B.O | 2 | | CONV. OUTLET | 0.35 | 0.35 | 1.52 | | | | 2-3.5 | 1-3.5 | 16 |
| 8 | 20 | 50 | 2 | 14 | B.O | 1 | | CONV. OUTLET | 0.18 | 0.18 | 0.78 | | | | 2-3.5 | 1-3.5 | 16 |
| 9 | 20 | 50 | 2 | 14 | B.O | 2 | | SERVER RM OUTLET | 0.36 | 0.32 | | | 1.57 | | 2-3.5 | 1-3.5 | 16 |
| 10 | 20 | 50 | 2 | 14 | B.O | | | FSF A1-A8 | 0.20 | 0.20 | | | 0.87 | | 2-3.5 | 1-3.5 | 16 |
| 11 | 20 | 50 | 2 | 14 | B.O | 5 | | CONV. OUTLET | 0.80 | 0.95 | | | | 3.91 | 2-3.5 | 1-3.5 | 16 |
| 12 | 20 | 50 | 2 | 14 | B.O | | | FSF B1-B7 | 0.32 | 0.32 | | | | 1.39 | 2-3.5 | 1-3.5 | 16 |
| 13 | 20 | 50 | 2 | 14 | B.O | | | FSF B4-B13 | 0.30 | 0.30 | 1.30 | | | | 2-3.5 | 1-3.5 | 16 |
| 14 | 20 | 50 | 2 | 14 | B.O | | | ERV 1 / ERV 2 | 1.20 | 1.20 | 5.22 | | | | 2-3.5 | 1-3.5 | 16 |
| 15 | 20 | 50 | 2 | 14 | B.O | | | FSF C5-C9 | 0.17 | 0.17 | | | 0.74 | | 2-3.5 | 1-3.5 | 16 |
| 16 | 20 | 50 | 2 | 14 | B.O | | | ROLL UP DOOR 1HP | 0.38 | 0.75 | | | 3.26 | | 2-3.5 | 1-3.5 | 16 |
| 17 | 20 | 50 | 2 | 14 | B.O | | | AIR CURTAIN | 0.12 | 0.12 | | | | 0.52 | 2-3.5 | 1-3.5 | 16 |
| 18 | 20 | 50 | 2 | 14 | B.O | | | AIR CURTAIN | 0.12 | 0.12 | | | | 0.52 | 2-3.5 | 1-3.5 | 16 |
| 19 | 20 | 50 | 2 | 14 | B.O | | | AIR CURTAIN | 0.12 | 0.12 | 0.52 | | | | 2-3.5 | 1-3.5 | 16 |
| 20 | 20 | 50 | 2 | 14 | B.O | | | AIR CURTAIN | 0.12 | 0.12 | 0.52 | | | | 2-3.5 | 1-3.5 | 16 |
| 21 | 20 | 50 | 2 | 14 | B.O | | | FACP | 0.50 | 0.50 | | | 2.17 | | 2-3.5 | 1-3.5 | 16 |
| | | | | | | | | TOTAL CONNECTED LOAD | 14.01 | 13.84 | 21.12 | 21.08 | 20.45 | | | | |

COMPUTATIONS : DEMAND FACTOR = 100 %
I 3Ø = 1.732 x 21.12 = (1.25 x 49)= 39 Amps
I CB = 1.25 x 39 = (0.02 x 1.53)= 50 Amps

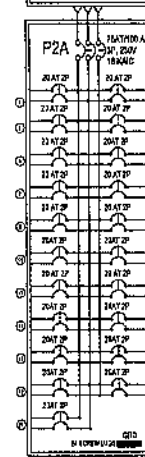
USE : 3-22 mm2 THWN (P) + 1-14mm2 THWN (G) in 32mm IMC
MAIN BREAKER : 75 AT / 60 AF 3P 230V 10 KAIC




| CKT NO | CIRCUIT BREAKER RATING AT | AF | P | KAIC | TYPE | NO OF OUTLETS CO | LTG | LOAD SERVE | KVA | KW | AMPERE LOAD 3P | 3PAB | 3PCA | 3PDC | SIZE OF WIRE PHASE WIRE | GROUND WIRE | INC PIPE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| PANEL: P2A | | | | | | | | VOLT : 230V (L-L) 3Ø 60HZ | | | | | | | mm2 THWN | mm2 THWN | mm0 |
| 1 | 20 | 50 | 2 | 14 | B.O | 9 | | HAND DRYER | 1.20 | 1.20 | 5.22 | | | | 2-3.5 | 1-3.5 | 16 |
| 2 | 20 | 50 | 2 | 14 | B.O | 9 | | HAND DRYER | 1.20 | 1.20 | 5.22 | | | | 2-3.5 | 1-3.5 | 16 |
| 3 | 20 | 50 | 2 | 14 | B.O | 5 | | REF. / CONV. OUTLET | 0.65 | 0.65 | | | 2.82 | | 2-3.5 | 1-3.5 | 16 |
| 4 | 20 | 50 | 2 | 14 | B.O | 5 | | CONV. OUTLET | 0.64 | 0.64 | | | 2.55 | | 2-3.5 | 1-3.5 | 16 |
| 5 | 20 | 50 | 2 | 14 | B.O | 2 | | HAND DRYER | 2.40 | 2.40 | | | | 10.43 | 2-3.5 | 1-3.5 | 16 |
| 6 | 20 | 50 | 2 | 14 | B.O | 2 | | CONV. OUTLET | 0.38 | 0.38 | | | | 1.57 | 2-3.5 | 1-3.5 | 16 |
| 7 | 20 | 50 | 2 | 14 | B.O | 1 | | CONV OUTLET | 0.18 | 0.18 | 0.78 | | | | 2-3.5 | 1-3.5 | 16 |
| 8 | 20 | 50 | 2 | 14 | B.O | 1 | | HAND DRYER | 1.20 | 1.20 | 5.22 | | | | 2-3.5 | 1-3.5 | 16 |
| 9 | 20 | 50 | 2 | 14 | B.O | 3 | | SERVER OUET / CONV OUTLET | 0.64 | 0.64 | | | 2.55 | | 2-3.5 | 1-3.5 | 16 |
| 10 | 20 | 50 | 2 | 14 | B.O | 7 | | CONV. OUTLET | 0.38 | 0.38 | | | 1.57 | | 2-3.5 | 1-3.5 | 16 |
| 11 | 20 | 50 | 2 | 14 | B.O | 2 | | CONV. OUTLET | 0.38 | 0.38 | | | | 1.57 | 2-3.5 | 1-3.5 | 16 |
| 12 | 20 | 50 | 2 | 14 | B.O | 3 | | CONV OUTLET | 0.54 | 0.54 | | | | 2.31 | 2-3.5 | 1-3.5 | 16 |
| 13 | 20 | 50 | 2 | 14 | B.O | | | P2F A3-A10 | 0.12 | 0.12 | 0.52 | | | | 2-3.5 | 1-3.5 | 16 |
| 14 | 20 | 50 | 2 | 14 | B.O | 1 | | REF. | 0.30 | 0.30 | 1.30 | | | | 2-3.5 | 1-3.5 | 16 |
| 15 | 20 | 50 | 2 | 14 | B.O | 2 | | HAND DRYER | 2.40 | 2.40 | | | 10.43 | | 2-3.5 | 1-3.5 | 16 |
| 16 | 20 | 50 | 2 | 14 | B.O | | | P2F A1-A5 | 0.11 | 0.11 | | | 0.48 | | 2-3.5 | 1-3.5 | 16 |
| 17 | 20 | 50 | 2 | 14 | B.O | 1 | | HAND DRYER | 1.20 | 1.20 | | | | 5.22 | 2-3.5 | 1-3.5 | 16 |
| 18 | 20 | 50 | 2 | 14 | B.O | | | P2F B1-B9 | 0.37 | 0.37 | | | | 1.61 | 2-3.5 | 1-3.5 | 16 |
| 19 | 20 | 50 | 2 | 14 | B.O | | | P2F C1-C10 | 0.46 | 0.46 | 2.00 | | | | 2-3.5 | 1-3.5 | 16 |
| 20 | 20 | 50 | 2 | 14 | B.O | | | ERV-8 | 0.34 | 0.34 | 1.48 | | | | 2-3.5 | 1-3.5 | 16 |
| 21 | 20 | 50 | 2 | 14 | B.O | | | ERV-9 | 0.34 | 0.34 | | | 1.48 | | 2-3.5 | 1-3.5 | 16 |
| | | | | | | | | TOTAL CONNECTED LOAD | 16.16 | 16.16 | 28.74 | 25.58 | 22.76 | | | | |

COMPUTATIONS : DEMAND FACTOR = 100 %
I 3Ø = 100% x 1.732 x 22.76 = 39 Amps
I CB = 1.25 x 42 = 52 Amps

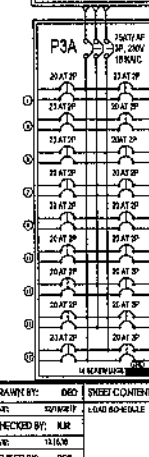
USE : 3-22mm2 THWN (P) + 1-14mm2 THWN (G) in 32mm2 IMC
MAIN BREAKER : 75AT / 100AF 3P 230V 10 KAIC




| CKT NO | CIRCUIT BREAKER RATING AT | AF | P | KAIC | TYPE | NO OF OUTLETS CO | LTG | LOAD SERVE | KVA | KW | AMPERE LOAD 3P | 3PAB | 3PCA | 3PDC | SIZE OF WIRE PHASE WIRE | GROUND WIRE | INC PIPE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| PANEL: P3A | | | | | | | | VOLT : 230V (L-L) 3Ø 60HZ | | | | | | | mm2 THWN | mm2 THWN | mm0 |
| 1 | 20 | 50 | 2 | 14 | B.O | 7 | | CONV. OUTLET | 0.26 | 0.26 | 0.48 | | | | 2-3.5 | 1-3.5 | 16 |
| 2 | 20 | 50 | 2 | 14 | B.O | 1 | | CONV. OUTLET | 0.15 | 0.15 | 0.78 | | | | 2-3.5 | 1-3.5 | 16 |
| 3 | 20 | 50 | 2 | 14 | B.O | 5 | | CONV. OUTLET | 0.90 | 0.90 | | | 3.91 | | 2-3.5 | 1-3.5 | 16 |
| 4 | 20 | 50 | 2 | 14 | B.O | 4 | | CONV. OUTLET | 0.90 | 0.90 | | | 3.91 | | 2-3.5 | 1-3.5 | 16 |
| 5 | 20 | 50 | 2 | 14 | B.O | 1 | | HAND DRYER | 1.20 | 1.20 | | | | 5.22 | 2-3.5 | 1-3.5 | 16 |
| 6 | 20 | 50 | 2 | 14 | B.O | | | HAND DRYER | 1.20 | 1.20 | | | | 5.22 | 2-3.5 | 1-3.5 | 16 |
| 7 | 20 | 50 | 2 | 14 | B.O | | | FSF D1-D3 | 0.10 | 0.10 | 0.43 | | | | 2-3.5 | 1-3.5 | 16 |
| 8 | 20 | 50 | 2 | 14 | B.O | | | FSF A1-A4 | 1.04 | 1.04 | 4.52 | | | | 2-3.5 | 1-3.5 | 16 |
| 9 | 20 | 50 | 2 | 14 | B.O | | | FSF B1-B4 | 1.04 | 1.04 | | | 4.52 | | 2-3.5 | 1-3.5 | 16 |
| 10 | 20 | 50 | 2 | 14 | B.O | | | FSF C1-C2 | 0.42 | 0.42 | | | 1.83 | | 2-3.5 | 1-3.5 | 16 |
| 11 | 20 | 50 | 2 | 14 | B.O | 7 | | CONV. OUTLET | 1.26 | 1.26 | | | | 5.48 | 2-3.5 | 1-3.5 | 16 |
| 12 | 20 | 50 | 2 | 14 | B.O | | | FSF D3-D4 | 0.42 | 0.42 | | | | 0.43 | 2-3.5 | 1-3.5 | 16 |
| 13 | 20 | 50 | 2 | 14 | B.O | 1 | | TRANSFER PUMP MOTOR 11HP, 3Ø | 0.86 | 0.73 | | 6.00 | | | 2-3.5 | 1-3.5 | 16 |
| 14 | 20 | 50 | 2 | 14 | B.O | | | SPARE | | | | | | | 2-3.5 | 1-3.5 | 16 |
| 15 | 20 | 50 | 2 | 14 | B.O | | | ERV 6 | 0.60 | 0.60 | | | 2.61 | | 2-3.5 | 1-3.5 | 16 |
| 16 | 20 | 50 | 2 | 14 | B.O | | | ERV 7 | 0.60 | 0.60 | | | 2.61 | | 2-3.5 | 1-3.5 | 16 |
| 17 | 20 | 50 | 2 | 14 | B.O | | | ERV 8 | 0.50 | 0.50 | | | | 2.61 | 2-3.5 | 1-3.5 | 16 |
| 18 | 20 | 50 | 2 | 14 | B.O | | | SPARE | | | | | | | 2-3.5 | 1-3.5 | 16 |
| 19 | 20 | 50 | 2 | 14 | B.O | | | ERV 9 | 0.60 | 0.60 | | | 2.61 | | 2-3.5 | 1-3.5 | 16 |
| 20 | 20 | 50 | 2 | 14 | B.O | | | ERV 7 | 0.60 | 0.60 | | | 2.61 | | 2-3.5 | 1-3.5 | 16 |
| 21 | 20 | 50 | 2 | 14 | B.O | | | ERV 8 | 0.50 | 0.50 | | | | 2.61 | 2-3.5 | 1-3.5 | 16 |
| 22 | 20 | 50 | 2 | 14 | B.O | | | SPARE | | | | | | | 2-3.5 | 1-3.5 | 16 |
| | | | | | | | | TOTAL CONNECTED LOAD | 12.65 | 12.47 | 19.31 | 19.38 | 18.84 | | | | |

COMPUTATIONS : DEMAND FACTOR = 100 %
I 3Ø = 100% x 1.732 x 19.39 = ( 8 x 0.25 ) = 36 Amps
I CB = 125% x 36 + 8 = 53 Amps

USE : 3-22mm2 THWN (P) + 1-8mm2 THWN (G) in 32mm2 IMC
MAIN BREAKER : 75AT / 100AF 3P 230V 10 KAIC




UNIVERSITY OF THE PHILIPPINES SYSTEM
OVPD
OFFICE OF THE VICE PRESIDENT FOR DEVELOPMENT
ODPI
OFFICE OF DESIGN AND PLANNING INITIATIVES

REPUBLIC ACT 9266
Article IV, Section 23

ARCHITECTS OF RECORD
DOLORES CECILIA F. TAYSON
JESUS APOLINARIO C. SALAONG

CONSULTANT/ENGINEER
RODOLFO J. BENCILLA
PROFESSIONAL ELECTRICAL ENGINEER

PROJECT TITLE
THREE - STOREY BUILDING RENOVATION
Department of Budget and Management Arcache Building
SAN MIGUEL, CITY OF MANILA

UNIVERSITY REPRESENTATIVE
ENRICO B. TABALINDA
DIRECTOR
ELVIRA A. ZAMORA
VICE PRESIDENT (OVD)

OWNER
BENJAMIN E. DIOKNO
SECRETARY

DRAWN BY: DEO
DATE: 02/04/18
CHECKED BY: NJR
DATE: 10.16.18
REVISED BY: DEO
DATE: 07.03.18

SHEET CONTENTS
LOAD SCHEDULE

SHEET NO.
E 02
13
ELECTRICAL

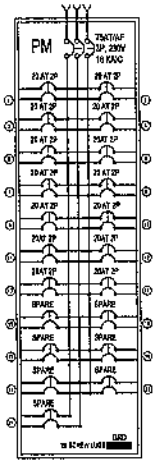
## PANEL: PM

VOLT : 230V (L-L) 3Ø 60HZ

| CKT NO. | CIRCUIT BREAKER RATING AT | AF | P | KAIC | TYPE | NO. OF OUTLETS CO | LTG | LOAD SERVE | KVA | KW | AMPERE LOAD 3Ø | SAB | SCA | DBC | SIZE OF WIRE PHASE WIRE | GROUND WIRE | EMT PIPE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | | | | mm2 THWN | mm2 THWN | mmØ |
| 1 | 20 | 50 | 2 | 14 | B.O | 1 | | HAND DRYER | 1.20 | 1.20 | | 0.22 | | | 2-3.5 | 1-3.5 | 16 |
| 2 | 20 | 50 | 2 | 14 | B.O | 2 | | CONV. OUTLET | 0.96 | 0.96 | | 1.07 | | | 2-3.5 | 1-3.5 | 16 |
| 3 | 20 | 50 | 2 | 14 | B.O | 3 | | CONV OUTLET / PROJECTOR | 0.64 | 0.64 | | | 2.35 | | 2-3.5 | 1-3.5 | 16 |
| 4 | 20 | 50 | 2 | 14 | B.O | 1 | | REF. | 0.50 | 0.50 | | | 1.30 | | 2-3.5 | 1-3.5 | 16 |
| 5 | 25 | 50 | 2 | 14 | B.O | 1 | | HAND DRYER | 1.20 | 1.20 | | | | 0.22 | 2-3.5 | 1-3.5 | 16 |
| 6 | 20 | 50 | 2 | 14 | B.O | 2 | | SERVER OUTLET | 0.96 | 0.96 | | | | 1.07 | 2-3.5 | 1-3.5 | 16 |
| 7 | 20 | 50 | 2 | 14 | B.O | 2 | | SERVER OUTLET | 0.96 | 0.96 | | 1.07 | | | 2-3.5 | 1-3.5 | 16 |
| 8 | 20 | 50 | 2 | 14 | B.O | 3 | | CONV OUTLET | 0.64 | 0.64 | | 2.35 | | | 2-3.5 | 1-3.5 | 16 |
| 9 | 20 | 50 | 2 | 14 | B.O | 1 | | REF. | 0.50 | 0.50 | | | 1.30 | | 2-3.5 | 1-3.5 | 16 |
| 10 | 20 | 50 | 2 | 14 | B.O | 1 | | REF. | 0.50 | 0.50 | | | 1.30 | | 2-3.5 | 1-3.5 | 16 |
| 11 | 20 | 50 | 2 | 14 | B.O | 3 | | CONV. OUTLET | 0.96 | 0.96 | | | | 1.07 | 2-3.5 | 1-3.5 | 16 |
| 12 | 20 | 50 | 2 | 14 | B.O | 2 | | CONV. OUTLET | 0.96 | 0.96 | | | | 1.07 | 2-3.5 | 1-3.5 | 16 |
| 13 | 20 | 50 | 2 | 14 | B.O | 2 | | CONV. OUTLET | 0.96 | 0.96 | | 1.07 | | | 2-3.5 | 1-3.5 | 16 |
| 14 | 20 | 50 | 2 | 14 | B.O | | | FN C1-C6 | 0.23 | 0.23 | | 2.65 | | | 2-3.5 | 1-3.5 | 16 |
| 15 | 25 | 50 | 2 | 14 | B.O | | | FN B1-B4 | 0.11 | 0.11 | | | 0.48 | | 2-3.5 | 1-3.5 | 16 |
| 16 | 25 | 50 | 2 | 14 | B.O | | | FN A1-A5 | 0.20 | 0.22 | | | 0.87 | | 2-3.5 | 1-3.5 | 16 |
| 17 | 20 | 50 | 2 | 14 | B.O | | | EXH 3 | 0.25 | 0.25 | | | | 1.09 | 2-3.5 | 1-3.5 | 16 |
| 18 | 20 | 50 | 2 | 14 | B.O | | | EXH 4 | 0.25 | 0.25 | | | | 1.09 | 2-3.5 | 1-3.5 | 16 |
| 19 | 20 | 50 | 2 | 14 | B.O | | | SPARE | | | | | | | 2-3.5 | 1-3.5 | 16 |
| 20 | 20 | 50 | 2 | 14 | B.O | | | SPARE | | | | | | | 2-3.5 | 1-3.5 | 16 |
| 21 | 20 | 50 | 2 | 14 | B.O | | | SPARE | | | | | | | 2-3.5 | 1-3.5 | 16 |
| | | | | | | | | TOTAL CONNECTED LOAD | 7.56 | 7.56 | 14.91 | 13.97 | 12.11 | | | | |

COMPUTATIONS : DEMAND FACTOR = 100 %
1ØB = 100% x 1.732 x 14.91 = 26 Amps
1ØB = 125% x 26 = 33 Amps

USE : 3-22mm2 THWN (P) + 1-8mm2 THWN (G) in 32mmØ IMC
MAIN BREAKER : 75AT /100AF 3P 230V 18 KAIC



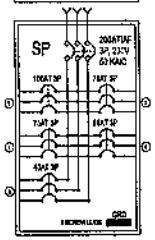

## PANEL: SP

VOLT : 230V (L-L) 3Ø 60HZ

| CKT NO. | CIRCUIT BREAKER RATING AT | AF | P | KAIC | TYPE | NO. OF OUTLETS CO | LTG | LOAD SERVE | KVA | KW | AMPERE LOAD 3Ø | SAB | SCA | DBC | SIZE OF WIRE PHASE WIRE | GROUND WIRE | EMT PIPE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | | | | mm2 THWN | mm2 THWN | mmØ |
| 1 | 150 | 100 | 3 | 42 | B.O | | | PANEL SP1 | 17.95 | 17.95 | | 29.91 | 25.13 | 26.00 | 5-30 | 1-14 | 40 |
| 2 | 75 | 100 | 3 | 42 | B.O | | | PANEL SP2 | 10.18 | 10.18 | | 12.78 | 18.28 | 12.08 | 3-22 | 1-8 | 40 |
| 3 | 75 | 100 | 3 | 42 | B.O | | | PANEL SP3 | 8.66 | 8.66 | | 15.66 | 15.78 | 14.00 | 3-14 | 1-8 | 32 |
| 4 | 60 | 60 | 3 | 25 | B.O | | | PANEL LP2 | 5.80 | 5.80 | | 11.87 | 12.30 | 15.10 | 3-14 | 1-8 | 32 |
| 5 | 45 | 50 | 3 | 18 | B.O | | | PANEL P-U2 | 1.06 | 1.06 | | 1.66 | 1.06 | 1.06 | 3-6 | 1-3.5 | 20 |
| | | | | | | | | TOTAL CONNECTED LOAD | 43.68 | 43.68 | | 71.06 | 74.03 | 69.03 | | | |

COMPUTATIONS : DEMAND FACTOR = 100 %
1ØB = 100% x 1.732 x 74.03 = 124 Amps
1CB = 125% x 118 = 149 Amps

USE : 3-50mm2 THWN (P) + 1-30mm2 THWN (G) in 50mmØ IMC
MAIN BREAKER : 200 AT/ AF 3P 230V 50 KAIC



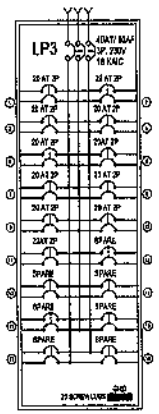

## PANEL: LP3

VOLT : 230V (L-L) 3Ø 60HZ

| CKT NO. | CIRCUIT BREAKER RATING AT | AF | P | KAIC | TYPE | NO. OF OUTLETS CO | LTG | LOAD SERVE | KVA | KW | AMPERE LOAD 3Ø | SAB | SCA | DBC | SIZE OF WIRE PHASE WIRE | GROUND WIRE | EMT PIPE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | | | | mm2 THWN | mm2 THWN | mmØ |
| 1 | 20 | 50 | 2 | 14 | B.O | | 10 | LIGHTING LOAD | 0.40 | 0.40 | | 0.86 | | | 2-3.5 | 1-3.5 | 16 |
| 2 | 20 | 50 | 2 | 14 | B.O | | 9 | LIGHTING LOAD | 0.14 | 0.14 | | 0.61 | | | 2-3.5 | 1-3.5 | 16 |
| 3 | 20 | 50 | 2 | 14 | B.O | | 8 | LIGHTING LOAD | 0.12 | 0.12 | | | 0.91 | | 2-3.5 | 1-3.5 | 16 |
| 4 | 20 | 50 | 2 | 14 | B.O | | 2 | LIGHTING LOAD | 0.09 | 0.09 | | | 0.19 | | 2-3.5 | 1-3.5 | 16 |
| 5 | 20 | 50 | 2 | 14 | B.O | | 2 | LIGHTING LOAD | 0.03 | 0.03 | | | | 0.13 | 2-3.5 | 1-3.5 | 16 |
| 6 | 20 | 50 | 2 | 14 | B.O | | 2 | LIGHTING LOAD | 0.03 | 0.03 | | | | 0.13 | 2-3.5 | 1-3.5 | 16 |
| 7 | 20 | 50 | 2 | 14 | B.O | | 2 | LIGHTING LOAD | 0.08 | 0.08 | | 0.35 | | | 2-3.5 | 1-3.5 | 16 |
| 8 | 20 | 50 | 2 | 14 | B.O | | 7 | LIGHTING LOAD | 0.11 | 0.11 | | 0.48 | | | 2-3.5 | 1-3.5 | 16 |
| 9 | 20 | 50 | 2 | 14 | B.O | | 10 | LIGHTING LOAD | 0.15 | 0.15 | | | 0.65 | | 2-3.5 | 1-3.5 | 16 |
| 10 | 20 | 50 | 2 | 14 | B.O | | 15 | LIGHTING LOAD | 0.23 | 0.23 | | | 1.00 | | 2-3.5 | 1-3.5 | 16 |
| 11 | 20 | 50 | 2 | 14 | B.O | | 16 | LIGHTING LOAD | 0.24 | 0.24 | | | | 1.04 | 2-3.5 | 1-3.5 | 16 |
| 12 | 20 | 50 | 2 | 14 | B.O | | | SPARE | 1.15 | 1.15 | | | | 5.00 | 2-3.5 | 1-3.5 | 16 |
| 13 | 20 | 50 | 2 | 14 | B.O | | | SPARE | 1.15 | 1.15 | | 5.00 | | | 2-3.5 | 1-3.5 | 16 |
| 14 | 20 | 50 | 2 | 14 | B.O | | | SPARE | 1.15 | 1.15 | | 5.00 | | | 2-3.5 | 1-3.5 | 16 |
| 15 | 20 | 50 | 2 | 14 | B.O | | | SPARE | 1.15 | 1.15 | | | 5.00 | | 2-3.5 | 1-3.5 | 16 |
| 16 | 20 | 50 | 2 | 14 | B.O | | | SPARE | 1.15 | 1.15 | | | 5.00 | | 2-3.5 | 1-3.5 | 16 |
| 17 | 20 | 50 | 2 | 14 | B.O | | | SPARE | 1.15 | 1.15 | | | | 5.00 | 2-3.5 | 1-3.5 | 16 |
| 18 | 20 | 50 | 2 | 14 | B.O | | | SPARE | 1.15 | 1.15 | | | | 5.00 | 2-3.5 | 1-3.5 | 16 |
| | | | | | | | | TOTAL CONNECTED LOAD | 5.80 | 5.80 | | 11.87 | 12.30 | 15.30 | | | |

COMPUTATIONS : DEMAND FACTOR = 100 %
1 3Ø = 1.732 x 16.36 x 100% = 28 Amps
1CB = 125% x 28 = 35 Amps

USE : 3-54mm2 THWN (P) + 1-8mm2 THWN (G) in 32mmØ IMC
MAIN BREAKER : 65 AT 80 AF 3P 230V 18 KAIC




NOTE :
B.O = BOLT ON

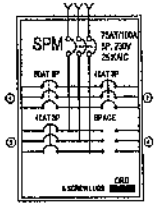
## PANEL: SP2

VOLT : 230V (L-L) 3Ø 60HZ

| CKT NO. | CIRCUIT BREAKER RATING AT | AF | P | KAIC | TYPE | NO. OF OUTLETS CO | LTG | LOAD SERVE | KVA | KW | AMPERE LOAD 3Ø | SAB | SCA | DBC | SIZE OF WIRE PHASE WIRE | GROUND WIRE | EMT PIPE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | | | | mm2 THWN | mm2 THWN | mmØ |
| 1 | 80 | 80 | 3 | 25 | B.O | | | PANEL LP3 | 3.50 | 3.50 | | 8.65 | 4.80 | 4.90 | 3-8 | 1-5.5 | 25 |
| 2 | 40 | 80 | 3 | 25 | B.O | | | PANEL P-U2 (BACK-UP) | | | | | | | 3-8 | 1-5.5 | 25 |
| 3 | 60 | 60 | 3 | 25 | B.O | | | PANEL P-U2 | 5.00 | 5.00 | | 9.13 | 10.80 | 9.13 | 3-8 | 1-8.0 | 25 |
| 4 | | 60 | 3 | 25 | B.O | | | SPACE | | | | | | | | | |
| | | | | | | | | TOTAL CONNECTED LOAD | 8.65 | 8.65 | | 16.65 | 15.78 | 14.03 | | | |

COMPUTATIONS : DEMAND FACTOR = 100 %
1 3Ø = 1.732 x 100% x 16.764= 27Amps
1 CB = 1.25 x 27 = 34 Amps

USE : 3- 22mm2 THWN (P) + 1-8 mm2 THWN (G) in 32mmØ IMC
MAIN BREAKER : 75 AT /100 AF 3P 230V 32 KAIC



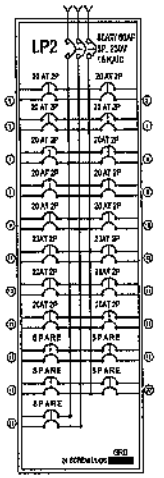

## PANEL: LP2

VOLT : 230V (L-L) 3Ø 60HZ

| CKT NO. | CIRCUIT BREAKER RATING AT | AF | P | KAIC | TYPE | NO. OF OUTLETS CO | LTG | LOAD SERVE | KVA | KW | AMPERE LOAD 3Ø | SAB | SCA | DBC | SIZE OF WIRE PHASE WIRE | GROUND WIRE | EMT PIPE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | | | | mm2 THWN | mm2 THWN | mmØ |
| 1 | 20 | 50 | 2 | 14 | B.O | | 29 | LIGHTING LOAD | 0.44 | 0.44 | | 1.91 | | | 2-3.5 | 1-3.5 | 16 |
| 2 | 20 | 60 | 2 | 14 | B.O | | 31 | LIGHTING LOAD | 0.47 | 0.47 | | 2.04 | | | 2-3.5 | 1-3.5 | 16 |
| 3 | 20 | 50 | 2 | 14 | B.O | | 14 | LIGHTING LOAD | 0.21 | 0.21 | | | 0.91 | | 2-3.5 | 1-3.5 | 16 |
| 4 | 20 | 50 | 2 | 14 | B.O | | 14 | LIGHTING LOAD | 0.21 | 0.21 | | | 0.91 | | 2-3.5 | 1-3.5 | 16 |
| 5 | 20 | 50 | 2 | 14 | B.O | | 26 | LIGHTING LOAD | 0.30 | 0.30 | | | | 1.30 | 2-3.5 | 1-3.5 | 16 |
| 6 | 20 | 50 | 2 | 14 | B.O | | 16 | LIGHTING LOAD | 0.27 | 0.27 | | | | 1.17 | 2-3.5 | 1-3.5 | 16 |
| 7 | 20 | 50 | 2 | 14 | B.O | | 20 | LIGHTING LOAD | 0.30 | 0.30 | | 1.30 | | | 2-3.5 | 1-3.5 | 16 |
| 8 | 20 | 50 | 2 | 14 | B.O | | 10 | LIGHTING LOAD | 0.14 | 0.14 | | 1.04 | | | 2-3.5 | 1-3.5 | 16 |
| 9 | 20 | 50 | 2 | 14 | B.O | | 22 | LIGHTING LOAD | 0.33 | 0.33 | | | 1.43 | | 2-3.5 | 1-3.5 | 16 |
| 10 | 20 | 50 | 2 | 14 | B.O | | 21 | LIGHTING LOAD | 0.32 | 0.32 | | | 1.39 | | 2-3.5 | 1-3.5 | 16 |
| 11 | 20 | 60 | 2 | 14 | B.O | | 19 | LIGHTING LOAD | 0.28 | 0.28 | | | | 1.20 | 2-3.5 | 1-3.5 | 16 |
| 12 | 20 | 60 | 2 | 14 | B.O | | 18 | LIGHTING LOAD | 0.27 | 0.27 | | | | 1.17 | 2-3.5 | 1-3.5 | 16 |
| 13 | 20 | 50 | 2 | 14 | B.O | | 2 | LIGHTING LOAD | 0.05 | 0.05 | | 0.13 | | | 2-3.5 | 1-3.5 | 16 |
| 14 | 20 | 50 | 2 | 14 | B.O | | 2 | LIGHTING LOAD | 0.03 | 0.03 | | 0.13 | | | 2-3.5 | 1-3.5 | 16 |
| 15 | 20 | 50 | 2 | 14 | B.O | | 2 | LIGHTING LOAD | 0.03 | 0.03 | | | 0.13 | | 2-3.5 | 1-3.5 | 16 |
| 16 | 20 | 50 | 2 | 14 | B.O | | 2 | LIGHTING LOAD | 0.05 | 0.03 | | | 0.13 | | 2-3.5 | 1-3.5 | 16 |
| 17 | 20 | 50 | 2 | 14 | B.O | | | SPARE | | | | | | | 2-3.5 | 1-3.5 | 16 |
| 18 | 20 | 50 | 2 | 14 | B.O | | | SPARE | | | | | | | 2-3.5 | 1-3.5 | 16 |
| 19 | 20 | 50 | 2 | 14 | B.O | | | SPARE | | | | | | | 2-3.5 | 1-3.5 | 16 |
| 20 | 20 | 50 | 2 | 14 | B.O | | | SPARE | | | | | | | 2-3.5 | 1-3.5 | 16 |
| 21 | 20 | 50 | 2 | 14 | B.O | | | SPARE | | | | | | | 2-3.5 | 1-3.5 | 16 |
| | | | | | | | | TOTAL CONNECTED LOAD | 3.58 | 3.58 | | 6.53 | 4.50 | 4.50 | | | |

COMPUTATIONS : DEMAND FACTOR = 100 %
1 3Ø = 1.732 x 6.53 x 100% = 12 Amps
1 CB = 1.25 x 12 = 15 Amps

USE : 3-8mm2 THWN (P) + 1-5.5mm2 THWN (G) in 25mmØ IMC
MAIN BREAKER : 30 AT 60 AF 3P 230V 18 KAIC



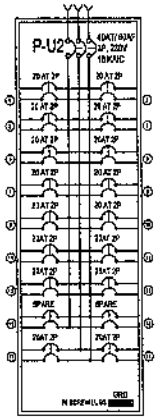

## PANEL: P-U2

VOLT : 230V (L-L) 3Ø 60HZ

| CKT NO. | CIRCUIT BREAKER RATING AT | AF | P | KAIC | TYPE | NO. OF OUTLETS CO | LTG | LOAD SERVE | KVA | KW | AMPERE LOAD 3Ø | SAB | SCA | DBC | SIZE OF WIRE PHASE WIRE | GROUND WIRE | EMT PIPE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | | | | mm2 THWN | mm2 THWN | mmØ |
| 1 | 20 | 50 | 2 | 14 | B.O | | 6 | COMP. OUTLET @ 100VA | 0.60 | 0.60 | | 2.61 | | | 2-3.5 | 1-3.5 | 16 |
| 2 | 20 | 50 | 2 | 14 | B.O | | 5 | COMP. OUTLET @ 100VA | 0.50 | 0.50 | | 2.17 | | | 2-3.5 | 1-3.5 | 16 |
| 3 | 20 | 50 | 2 | 14 | B.O | | 8 | COMP. OUTLET @ 100VA | 0.80 | 0.80 | | | 3.48 | | 2-3.5 | 1-3.5 | 16 |
| 4 | 20 | 50 | 2 | 14 | B.O | | 4 | COMP. OUTLET @ 100VA | 0.40 | 0.40 | | | 1.74 | | 2-3.5 | 1-3.5 | 16 |
| 5 | 20 | 60 | 2 | 14 | B.O | | 2 | COMP. OUTLET @ 100VA | 0.20 | 0.20 | | | | 0.87 | 2-3.5 | 1-3.5 | 16 |
| 6 | 20 | 50 | 2 | 14 | B.O | | 6 | COMP. OUTLET @ 100VA | 0.60 | 0.65 | | | | 2.61 | 2-3.5 | 1-3.5 | 16 |
| 7 | 20 | 50 | 2 | 14 | B.O | | 3 | COMP. OUTLET @ 100VA | 0.30 | 0.30 | | 1.30 | | | 2-3.5 | 1-3.5 | 16 |
| 8 | 20 | 50 | 2 | 14 | B.O | | 2 | COMP. OUTLET @ 100VA | 0.20 | 0.20 | | 0.87 | | | 2-3.5 | 1-3.5 | 16 |
| 9 | 20 | 50 | 2 | 14 | B.O | | 4 | COMP. OUTLET @ 100VA | 0.40 | 0.40 | | | 1.74 | | 2-3.5 | 1-3.5 | 16 |
| 10 | 20 | 50 | 2 | 14 | B.O | | 8 | COMP. OUTLET @ 100VA | 0.80 | 0.60 | | | 2.61 | | 2-3.5 | 1-3.5 | 16 |
| 11 | 20 | 50 | 2 | 14 | B.O | | 4 | COMP. OUTLET @ 100VA | 0.40 | 0.40 | | | | 1.74 | 2-3.5 | 1-3.5 | 16 |
| 12 | 20 | 50 | 2 | 14 | B.O | | 4 | COMP. OUTLET @ 100VA | 0.10 | 0.10 | | | | 0.43 | 2-3.5 | 1-3.5 | 16 |
| 13 | 20 | 60 | 2 | 14 | B.O | | | SPARE | 0.60 | 0.60 | | 1.74 | | | 2-3.5 | 1-3.5 | 16 |
| 14 | 20 | 60 | 2 | 14 | B.O | | | SPARE | 0.60 | 0.60 | | 1.74 | | | 2-3.5 | 1-3.5 | 16 |
| 15 | 20 | 60 | 2 | 14 | B.O | | | SPARE | 0.60 | 0.05 | | | 0.22 | | 2-3.5 | 1-3.5 | 16 |
| 16 | 20 | 60 | 2 | 14 | B.O | | | SPARE | 0.05 | 0.05 | | | 0.22 | | 2-3.5 | 1-3.5 | 16 |
| 17 | 20 | 50 | 2 | 14 | B.O | | | SPARE | 0.60 | 0.60 | | | | 1.74 | 2-3.5 | 1-3.5 | 16 |
| 18 | 20 | 50 | 2 | 14 | B.O | | | SPARE | 0.60 | 0.60 | | | | 1.74 | 2-3.5 | 1-3.5 | 16 |
| | | | | | | | | TOTAL CONNECTED LOAD | 5.00 | 5.00 | | 9.13 | 10.88 | 9.13 | | | |

COMPUTATIONS : DEMAND FACTOR = 100 %
1 3Ø = 1.732 x 10.44 x 100% = 18 Amps
1 CB = 1.25% x 18 = 23 Amps

USE : 3-8 mm2 THWN (P) + 1-5.5mm2 THWN (G) in 25mmØ IMC
MAIN BREAKER : 40 AT 80 AF 3P 230V 18 KAIC




NOTE :
B.O = BOLT ON



ARCHITECTS OF RECORD
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PROJECT TITLE
THREE - STOREY BUILDING RENOVATION
Department of Budget and Management Arcache Building
SAN MIGUEL, CITY OF MANILA

UNIVERSITY REPRESENTATIVE
ENRICO B. TABARUNDA, DIRECTOR, OVPD
ELVIRA A. ZAMORA, VICE PRESIDENT, OVPD

OWNER
BENJAMIN E. DIOKNO, DBM SECRETARY

| | |
|---|---|
| DRAWN BY: | DEO |
| DATE: | 10/10/2017 |
| CHECKED BY: | RJR |
| DATE: | 12.18.18 |
| REVISED BY: | DEO |
| DATE: | 07.23.18 |

SHEET CONTENTS: LOAD SCHEDULE

SHEET NO.: E 03 13

ELECTRICAL

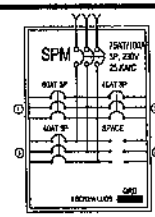
## PANEL: SPM

VOLT : 230V (L-L) 3Ø 60HZ

| CKT NO. | CIRCUIT BREAKER RATING AT | AF | P | KAIC | TYPE | NO OF OUTLETS CO | LTG | LOAD SERVE | KVA | KW | AMPERE LOAD 3Ø | BAB | BCA | BBC | SIZE OF WIRE PHASE WIRE | GROUND WIRE | IMC PIPE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | | | | mm2 THWN | mm2 THWN | mm2 |
| 1 | 60 | 60 | 3 | 25 | B.O | | | PANEL LPM | 7.26 | 7.26 | | 10.01 | 12.75 | 8.50 | 3-14 | 1-8 | 32 |
| 2 | 40 | 60 | 3 | 25 | B.O | | | PANEL P-U1(BACK UP) | | | | | | | 3-8 | 1-8.5 | 25 |
| 3 | 40 | 60 | 3 | 25 | B.O | | | PANEL P-U1 | 2.40 | 2.00 | | 2.17 | 3.48 | 2.40 | 3-8 | 1-8.5 | 25 |
| 4 | | 60 | 3 | 25 | B.O | | | SPACE | | | | | | | | | |
| | | | | | | | | TOTAL CONNECTED LOAD | 10.16 | 10.16 | | 12.75 | 16.23 | 12.66 | | | |

COMPUTATIONS : DEMAND FACTOR = 100 %
1.3Ø = 1.732 x 101% x 16.23 = 27 Amps
1 CB = 1.25 x 27 = 34 Amps

USE : 3-12 mm2 THWN (P) + 1-8 mm2 THWN (G) in 40mm2 IMC
MAIN BREAKER : 75 AT TAF 3P 230V 32 KAIC



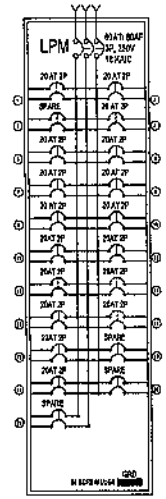

## PANEL: LPM

VOLT : 230V (L-L) 3Ø 60HZ

| CKT NO. | CIRCUIT BREAKER RATING AT | AF | P | KAIC | TYPE | NO OF OUTLETS CO | LTG | LOAD SERVE | KVA | KW | AMPERE LOAD 3Ø | BAB | BCA | BBC | SIZE OF WIRE PHASE WIRE | GROUND WIRE | IMC PIPE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | | | | mm2 THWN | mm2 THWN | mm2 |
| 1 | 20 | 30 | 2 | 14 | B.O | | 14 | LIGHTING LOAD | 0.21 | 0.21 | | 0.91 | | | 2-3.5 | 1-3.5 | 15 |
| 2 | 20 | 60 | 2 | 14 | B.O | | 21 | LIGHTING LOAD | 0.32 | 0.32 | | 1.39 | | | 2-3.5 | 1-3.5 | 15 |
| 3 | 20 | 60 | 2 | 14 | B.O | | 14 | SPARE | 1.15 | 1.15 | | | 5.00 | | | | |
| 4 | 20 | 60 | 2 | 14 | B.O | | 12 | LIGHTING LOAD | 0.16 | 0.16 | | | 0.74 | | 2-3.5 | 1-3.5 | 15 |
| 5 | 20 | 60 | 2 | 14 | B.O | | 19 | LIGHTING LOAD | 0.15 | 0.15 | | | | 0.65 | 2-3.5 | 1-3.5 | 15 |
| 6 | 20 | 60 | 2 | 14 | B.O | | 8 | LIGHTING LOAD | 0.08 | 0.08 | | | | 0.35 | 2-3.5 | 1-3.5 | 15 |
| 7 | 20 | 60 | 2 | 14 | B.O | | 8 | LIGHTING LOAD | 0.09 | 0.09 | | 0.39 | | | 2-3.5 | 1-3.5 | 15 |
| 8 | 20 | 60 | 2 | 14 | B.O | | 12 | LIGHTING LOAD | 0.15 | 0.15 | | 0.78 | | | 2-3.5 | 1-3.5 | 15 |
| 9 | 20 | 60 | 2 | 14 | B.O | | 11 | LIGHTING LOAD | 0.17 | 0.17 | | | 0.74 | | 2-3.5 | 1-3.5 | 15 |
| 10 | 20 | 60 | 2 | 14 | B.O | | 9 | LIGHTING LOAD | 0.14 | 0.14 | | | 0.61 | | 2-3.5 | 1-3.5 | 15 |
| 11 | 20 | 60 | 2 | 14 | B.O | | 11 | LIGHTING LOAD | 0.17 | 0.17 | | | | 0.74 | 2-3.5 | 1-3.5 | 15 |
| 12 | 20 | 60 | 2 | 14 | B.O | | 20 | LIGHTING LOAD | 0.30 | 0.30 | | | | 1.30 | 2-3.5 | 1-3.5 | 15 |
| 13 | 20 | 60 | 2 | 14 | B.O | | 19 | LIGHTING LOAD | 0.15 | 0.15 | | 0.65 | | | 2-3.5 | 1-3.5 | 15 |
| 14 | 20 | 60 | 2 | 14 | B.O | | 2 | LIGHTING LOAD | 0.03 | 0.03 | | 0.13 | | | 2-3.5 | 1-3.5 | 15 |
| 15 | 20 | 60 | 2 | 14 | B.O | | 2 | LIGHTING LOAD | 0.03 | 0.03 | | | 0.13 | | 2-3.5 | 1-3.5 | 15 |
| 16 | 20 | 60 | 2 | 14 | B.O | | 8 | LIGHTING LOAD | 0.12 | 0.12 | | | 0.52 | | 2-3.5 | 1-3.5 | 15 |
| 17 | 20 | 60 | 2 | 14 | B.O | | 8 | LIGHTING LOAD | 0.12 | 0.12 | | | | 0.52 | 2-3.5 | 1-3.5 | 15 |
| 18 | 20 | 60 | 2 | 14 | B.O | | | SPARE | 1.15 | 1.15 | | | | 5.00 | | | |
| 19 | 20 | 60 | 2 | 14 | B.O | | 14 | LIGHTING LOAD | 0.21 | 0.21 | | 0.91 | | | 2-3.5 | 1-3.5 | 15 |
| 20 | 20 | 60 | 2 | 14 | B.O | | | SPARE | 1.15 | 1.15 | | 5.00 | | | 2-3.5 | 1-3.5 | 15 |
| 21 | 20 | 60 | 2 | 14 | B.O | | | SPARE | 1.15 | 1.15 | | | 5.00 | | | | |
| | | | | | | | | TOTAL CONNECTED LOAD | 7.39 | 7.39 | | 10.61 | 12.78 | 8.50 | | | |

COMPUTATIONS : DEMAND FACTOR = 100 %
1.3Ø = 1.732 x 12.78 = 22 Amps
1 CB = 1.25% x 22 = 28 Amps

USE : 3-14 mm2 THHN (P) + 1-8mm2 THHN (G) in 32mm2 IMC
MAIN BREAKER : 60 AT 60 AF 3P 230V 18 KAIC



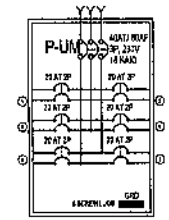

## PANEL: P-U1M

VOLT : 230V (L-L) 3Ø 60HZ

| CKT NO. | CIRCUIT BREAKER RATING AT | AF | P | KAIC | TYPE | NO OF OUTLETS CO | LTG | LOAD SERVE | KVA | KW | AMPERE LOAD 3Ø | BAB | BCA | BBC | SIZE OF WIRE PHASE WIRE | GROUND WIRE | IMC PIPE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | | | | mm2 THWN | mm2 THWN | mm2 |
| 1 | 20 | 30 | 2 | 14 | B.O | | 6 | COMP. OUTLET @ 100VA | 0.10 | 0.10 | | 0.43 | | | 2-3.5 | 1-3.5 | 15 |
| 2 | 20 | 60 | 2 | 14 | B.O | | 4 | COMP. OUTLET @ 100VA | 0.40 | 0.40 | | 1.74 | | | 2-3.5 | 1-3.5 | 15 |
| 3 | 20 | 60 | 2 | 14 | B.O | | | SPARE | 0.80 | 0.80 | | | 1.74 | | 2-3.5 | 1-3.5 | 15 |
| 4 | 20 | 60 | 2 | 14 | B.O | | | SPARE | 0.80 | 0.80 | | | 1.74 | | 2-3.5 | 1-3.5 | 15 |
| 5 | 20 | 60 | 2 | 14 | B.O | | | SPARE | 0.80 | 0.80 | | | | 1.74 | 2-3.5 | 1-3.5 | 15 |
| 6 | 20 | 60 | 2 | 14 | B.O | | | SPARE | 0.80 | 0.80 | | | | 1.74 | 2-3.5 | 1-3.5 | 15 |
| | | | | | | | | TOTAL CONNECTED LOAD | 2.90 | 2.90 | | 2.17 | 3.48 | 3.48 | | | |

COMPUTATIONS : DEMAND FACTOR = 100 %
1.3Ø = 100% x 1.732 x 3.48 = 6 Amps
1 CB = 1.25% x 6 = 8 Amps

USE : 3-8 mm2 THWN (P) + 1-8.6mm2 THWN (G) in 25mm2 IMC
MAIN BREAKER : 40 AT 40 AF 3P 230V 18 KAIC




NOTE :
B.O = BOLT ON

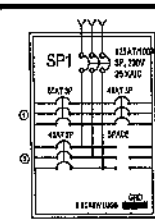
## PANEL: SP1

VOLT : 230V (L-L) 3Ø 60HZ

| CKT NO. | CIRCUIT BREAKER RATING AT | AF | P | KAIC | TYPE | NO OF OUTLETS CO | LTG | LOAD SERVE | KVA | KW | AMPERE LOAD 3Ø | BAB | BCA | BBC | SIZE OF WIRE PHASE WIRE | GROUND WIRE | IMC PIPE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | | | | mm2 THWN | mm2 THWN | mm2 |
| 1 | 60 | 60 | 3 | 25 | B.O | | | PANEL LP1 | 9.68 | 9.68 | | 14.25 | 9.49 | 11.13 | 3-14 | 1-8 | 32 |
| 2 | 40 | 60 | 3 | 25 | B.O | | | PANEL P-U1(BACK UP) | | | | | | | 3-8 | 1-8.5 | 25 |
| 3 | 40 | 60 | 3 | 25 | B.O | | | PANEL P-U1 | 11.10 | 11.10 | | 16.65 | 10.70 | 13.02 | 3-8 | 1-8.5 | 25 |
| 4 | | 60 | 3 | 25 | B.O | | | SPACE | | | | | | | | | |
| | | | | | | | | TOTAL CONNECTED LOAD | 17.90 | 17.90 | | 29.91 | 20.19 | 24.05 | | | |

COMPUTATIONS : DEMAND FACTOR = 100 %
1.3Ø = 1.732 x 102% x 29.91 = 52 Amps
1 CB = 1.25 x 52= 65 Amps

USE : 3-38 mm2 THWN (P) + 1-14mm2 THWN (G) in 40mm2 IMC
MAIN BREAKER : 125 AT 125 AF 3P 230V 30 KAIC



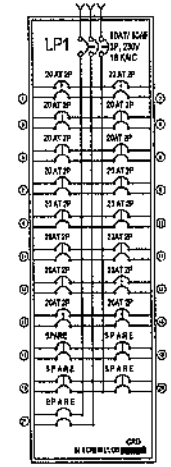

## PANEL: LP1

VOLT : 230V (L-L) 3Ø 60HZ

| CKT NO. | CIRCUIT BREAKER RATING AT | AF | P | KAIC | TYPE | NO OF OUTLETS CO | LTG | LOAD SERVE | KVA | KW | AMPERE LOAD 3Ø | BAB | BCA | BBC | SIZE OF WIRE PHASE WIRE | GROUND WIRE | IMC PIPE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | | | | mm2 THWN | mm2 THWN | mm2 |
| 1 | 20 | 60 | 2 | 14 | B.O | | 5 | LIGHTING LOAD | 0.09 | 0.09 | | 0.39 | | | 2-3.5 | 1-3.5 | 15 |
| 2 | 20 | 60 | 2 | 14 | B.O | | 15 | LIGHTING LOAD | 0.24 | 0.24 | | 1.04 | | | 2-3.5 | 1-3.5 | 15 |
| 3 | 20 | 60 | 2 | 14 | B.O | | 15 | LIGHTING LOAD | 0.20 | 0.20 | | | 0.87 | | 2-3.5 | 1-3.5 | 15 |
| 4 | 20 | 60 | 2 | 14 | B.O | | 8 | LIGHTING LOAD | 0.14 | 0.14 | | | 0.61 | | 2-3.5 | 1-3.5 | 15 |
| 5 | 20 | 60 | 2 | 14 | B.O | | 9 | LIGHTING LOAD | 0.14 | 0.14 | | | | 0.61 | 2-3.5 | 1-3.5 | 15 |
| 6 | 20 | 60 | 2 | 14 | B.O | | 4 | LIGHTING LOAD | 0.06 | 0.06 | | | | 0.26 | 2-3.5 | 1-3.5 | 15 |
| 7 | 20 | 60 | 2 | 14 | B.O | | 6 | LIGHTING LOAD | 0.08 | 0.08 | | 0.35 | | | 2-3.5 | 1-3.5 | 15 |
| 8 | 20 | 60 | 2 | 14 | B.O | | 12 | LIGHTING LOAD | 0.18 | 0.18 | | 0.78 | | | 2-3.5 | 1-3.5 | 15 |
| 9 | 20 | 60 | 2 | 14 | B.O | | 17 | LIGHTING LOAD | 0.26 | 0.26 | | | 1.13 | | 2-3.5 | 1-3.5 | 15 |
| 10 | 20 | 60 | 2 | 14 | B.O | | 2 | LIGHTING LOAD | 0.03 | 0.03 | | | 0.13 | | 2-3.5 | 1-3.5 | 15 |
| 11 | 20 | 60 | 2 | 14 | B.O | | 2 | LIGHTING LOAD | 0.03 | 0.03 | | | | 0.13 | 2-3.5 | 1-3.5 | 15 |
| 12 | 20 | 60 | 2 | 14 | B.O | | 2 | LIGHTING LOAD | 0.03 | 0.03 | | | | 0.13 | 2-3.5 | 1-3.5 | 15 |
| 13 | 20 | 60 | 2 | 14 | B.O | | 14 | LIGHTING LOAD | 0.21 | 0.21 | | 0.91 | | | 2-3.5 | 1-3.5 | 15 |
| 14 | 20 | 60 | 2 | 14 | B.O | | 13 | LIGHTING LOAD + EXIT LIGHT | 0.19 | 0.19 | | 0.83 | | | 2-3.5 | 1-3.5 | 15 |
| 15 | 20 | 60 | 2 | 14 | B.O | | 15 | LIGHTING LOAD | 0.15 | 0.15 | | | 0.65 | | 2-3.5 | 1-3.5 | 15 |
| 16 | 20 | 60 | 2 | 14 | B.O | | 15 | LIGHTING LOAD | 0.24 | 0.24 | | | 1.04 | | 2-3.5 | 1-3.5 | 15 |
| 17 | 20 | 60 | 2 | 14 | B.O | | | SPARE | 1.15 | 1.15 | | | | 5.00 | | | |
| 18 | 20 | 60 | 2 | 14 | B.O | | | SPARE | 1.15 | 1.15 | | | | 5.00 | | | |
| 19 | 20 | 60 | 2 | 14 | B.O | | | SPARE | 1.15 | 1.15 | | 5.00 | | | | | |
| 20 | 20 | 60 | 2 | 14 | B.O | | | SPARE | 1.15 | 1.15 | | 5.00 | | | | | |
| 21 | 20 | 60 | 2 | 14 | B.O | | | SPARE | 1.15 | 1.15 | | | 5.00 | | | | |
| | | | | | | | | TOTAL CONNECTED LOAD | 6.38 | 6.38 | | 14.20 | 9.43 | 11.13 | | | |

COMPUTATIONS : DEMAND FACTOR = 100 %
1.3Ø = 1.732 x 100% x 14.20 = 25 Amps
1 CB = 1.25 x 25 = 31 Amps

USE : 3-8 mm2 THWN (P) + 1-8 mm2 THWN (G) in 32mm2 IMC
MAIN BREAKER : 40 AT 60 AF 3P 230V 18 KAIC



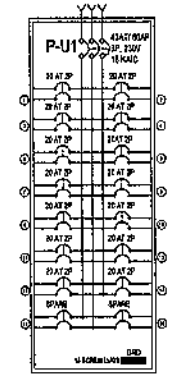

## PANEL: P-U1

VOLT : 230V (L-L) 3Ø 60HZ

| CKT NO. | CIRCUIT BREAKER RATING AT | AF | P | KAIC | TYPE | NO OF OUTLETS CO | LTG | LOAD SERVE | KVA | KW | AMPERE LOAD 3Ø | BAB | BCA | BBC | SIZE OF WIRE PHASE WIRE | GROUND WIRE | IMC PIPE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | | | | mm2 THWN | mm2 THWN | mm2 |
| 1 | 20 | 30 | 2 | 14 | B.O | 6 | | COMP. OUTLET @ 100VA | 0.60 | 0.60 | | 3.48 | | | 2-3.5 | 1-3.5 | 15 |
| 2 | 20 | 60 | 2 | 14 | B.O | 6 | | COMP. OUTLET @ 100VA | 0.60 | 0.60 | | | 3.48 | | 2-3.5 | 1-3.5 | 15 |
| 3 | 20 | 60 | 2 | 14 | B.O | 2 | | COMP. OUTLET @ 100VA | 0.60 | 0.60 | | | | 3.48 | 2-3.5 | 1-3.5 | 15 |
| 4 | 20 | 60 | 2 | 14 | B.O | 3 | | COMP. OUTLET @ 100VA | 0.80 | 0.80 | | 2.17 | | | 2-3.5 | 1-3.5 | 15 |
| 5 | 20 | 60 | 2 | 14 | B.O | 2 | | COMP. OUTLET @ 100VA | 0.20 | 0.20 | | | 0.87 | | 2-3.5 | 1-3.5 | 15 |
| 6 | 20 | 60 | 2 | 14 | B.O | 6 | | COMP. OUTLET @ 100VA | 0.60 | 0.60 | | | 3.48 | | 2-3.5 | 1-3.5 | 15 |
| 7 | 20 | 60 | 2 | 14 | B.O | 6 | | COMP. OUTLET @ 100VA | 0.60 | 0.60 | | 3.48 | | | 2-3.5 | 1-3.5 | 15 |
| 8 | 20 | 60 | 2 | 14 | B.O | 6 | | COMP. OUTLET @ 100VA | 0.60 | 0.60 | | 2.61 | | | 2-3.5 | 1-3.5 | 15 |
| 9 | 20 | 60 | 2 | 14 | B.O | 3 | | COMP. OUTLET @ 100VA | 0.30 | 0.30 | | | 1.30 | | 2-3.5 | 1-3.5 | 15 |
| 10 | 20 | 60 | 2 | 14 | B.O | 4 | | COMP. OUTLET @ 100VA | 0.40 | 0.40 | | | 1.74 | | 2-3.5 | 1-3.5 | 15 |
| 11 | 20 | 60 | 2 | 14 | B.O | | | PACP | 0.60 | 0.60 | | | | 2.61 | 2-3.5 | 1-3.5 | 15 |
| 12 | 20 | 60 | 2 | 14 | B.O | | | BSM | 0.60 | 0.60 | | | | 2.61 | 2-3.5 | 1-3.5 | 15 |
| 13 | 20 | 60 | 2 | 14 | B.O | | | TELEVOICE | 0.60 | 0.60 | | 2.61 | | | 2-3.5 | 1-3.5 | 15 |
| 14 | 20 | 60 | 2 | 14 | B.O | | | CCTV | 0.60 | 0.60 | | 2.61 | | | 2-3.5 | 1-3.5 | 15 |
| 15 | 20 | 60 | 2 | 14 | B.O | | | SPARE | 1.00 | 1.00 | | | 4.35 | | 2-3.5 | 1-3.5 | 15 |
| 16 | 20 | 60 | 2 | 14 | B.O | | | SPARE | 1.00 | 1.00 | | | 4.35 | | 2-3.5 | 1-3.5 | 15 |
| | | | | | | | | TOTAL CONNECTED LOAD | 11.10 | 11.10 | | 16.86 | 16.70 | 13.92 | | | |

COMPUTATIONS : DEMAND FACTOR = 100 %
1.3Ø = 100% x 1.732 x 16.85 = 27 Amps
1 CB = 1.25 x 27 = 33 Amps

USE : 3-8 mm2 THWN (P) + 1-8.6mm2 THWN (G) in 32mm2 IMC
MAIN BREAKER : 40 AT 60 AF 3P 230V 18 KAIC




NOTE :
B.O = BOLT ON

UNIVERSITY OF THE PHILIPPINES SYSTEM
OVPD
OFFICE OF THE VICE PRESIDENT FOR DEVELOPMENT
ODPI
OFFICE OF DESIGN AND PLANNING INITIATIVES

REPUBLIC ACT 9184 Article IV, Section 33

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BENJAMIN E. DIOKNO
DBM SECRETARY

DRAWN BY: DBO
DATE: 12/16/2017
CHECKED BY: RJR
DATE: 12.13.17
REVISED BY: DBO
DATE: 02.13.18

SHEET CONTENTS
LOAD SCHEDULE

SHEET NO.
E 04
13
ELECTRICAL

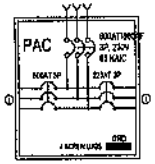
## PANEL: PAC

VOLT : 230V (L-L) 3Ø 60HZ

| CKT NO. | CIRCUIT BREAKER RATING AT | AF | P | KAIC | TYPE | NO OF OUTLETS CO | LTG | LOAD SERVE | KVA | KW | AMPERE LOAD 3Ø | 2ØAB | 2ØCA | 1ØC | SIZE OF WIRE PHASE WIRE | GROUND WIRE | RMC PIPE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | | | | mm2 THWN | mm2 THWN | mmØ |
| 1 | 600 | 600 | 3 | 65 | B.O | | | PAC1 | 176.00 | 151.51 | 447.00 | | | | 3 sets 3-250 | 1-100 | 100 |
| 2 | 225 | 225 | 3 | 65 | B.O | | | EPAC | 64.44 | 55.16 | 162.00 | | | | 3-100 | 1-80 | 65 |
| | | | | | | | | TOTAL CONNECTED LOAD | 247.43 | 206.45 | 677.00 | | | | | | |

COMPUTATIONS : DEMAND FACTOR = 100 %
1ØB = 100% x 677 = [205 x 3] = 685Amps
1 CB = 1.25 x 548 (80% x 3) = 247Amps

USE : 2 sets of 3-250mm2 THWN (P) + 1-100mm2 THWN (G) in 100mmØ IMC
MAIN BREAKER : 600AT 600 AF 3P 230V 65 KAIC



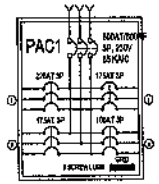

## PANEL: PAC1

VOLT : 230V (L-L) 3Ø 60HZ

| CKT NO. | CIRCUIT BREAKER RATING AT | AF | P | KAIC | TYPE | NO OF OUTLETS CO | LTG | LOAD SERVE | KVA | KW | AMPERE LOAD 3Ø | 2ØAB | 2ØCA | 1ØC | SIZE OF WIRE PHASE WIRE | GROUND WIRE | RMC PIPE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | | | | mm2 THWN | mm2 THWN | mmØ |
| 1 | 225 | 225 | 3 | 42 | B.O | | | PAC5 | 91.41 | 82.19 | 153.05 | | | | 3-100 | 1-30 | 65 |
| 2 | 112 | 200 | 3 | 42 | B.O | | | PAC2 | 82.85 | 44.74 | 122.00 | | | | 3-60 | 1-22 | 50 |
| 3 | 175 | 200 | 3 | 42 | B.O | | | PAC3 | 45.94 | 37.27 | 105.00 | | | | 3-60 | 1-22 | 50 |
| 4 | 100 | 100 | 3 | 42 | B.O | | | HACM | 24.03 | 17.98 | 54.00 | | | | 3-30 | 1-14 | 40 |
| | | | | | | | | TOTAL CONNECTED LOAD | 278.56 | 181.31 | 442.00 | | | | | | |

COMPUTATIONS : DEMAND FACTOR = 100 %
1 3Ø = 100% x 417 = [225 x 3] = 425 Amps
1 CB = 1.25 x 425 = [80% x 3] = 640 Amps

USE : 2 sets of 3- 250mm2 THWN (P) + 1-100mm2 THWN (G) in 100mmØ IMC
MAIN BREAKER : 600AT /AF 3P 230V 50 KAIC



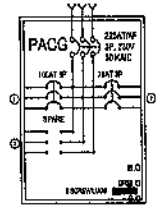

## PANEL: PACG

VOLT : 230V (L-L) 3Ø 60HZ

| CKT NO. | CIRCUIT BREAKER RATING AT | AF | P | KAIC | TYPE | NO OF OUTLETS CO | LTG | LOAD SERVE | KVA | KW | AMPERE LOAD 3Ø | 2ØAB | 2ØCA | 1ØC | SIZE OF WIRE PHASE WIRE | GROUND WIRE | RMC PIPE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | | | | mm2 THWN | mm2 THWN | mmØ |
| 1 | 150 | 100 | 3 | 18 | B.O | | | ACCU GF-B 18HP | 13.78 | 13.42 | 35.00 | | | | 3-38 | 1-14 | 40 |
| | | | | | | | | ACCU GF-B 14HP | 11.88 | 10.44 | 28.00 | | | | | | |
| 2 | 75 | 100 | 3 | 18 | B.O | | | ACCU GF-C 14HP | 12.26 | 10.44 | 28.00 | | | | 3-22 | 1-8 | 40 |
| | | | | | | | | ACCU GF-C 10HP | 8.76 | 7.45 | 20.00 | | | | | | |
| 3 | 60 | 60 | 3 | 18 | B.O | | | SPARE | 12.26 | 10.44 | 28.00 | | | | 3-14 | 1-8 | 32 |
| | | | | | | | | TOTAL CONNECTED LOAD | 61.61 | 53.19 | 139.00 | | | | | | |

COMPUTATIONS : DEMAND FACTOR = 100 %
1 3Ø = 100% x 139.00 = [29% x 3] = 143 Amps
1 CB = 125% x 143= [80% x 3] = 194 Amps

USE : 3-150mm2 THWN (P) + 1-38mm2 THWN (G) in 65mmØ IMC
MAIN BREAKER : 225AT / AF 3P 230V 50 KAIC




B.O

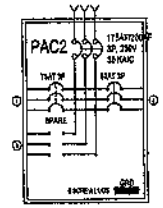
## PANEL: PAC2

VOLT : 230V (L-L) 3Ø 60HZ

| CKT NO. | CIRCUIT BREAKER RATING AT | AF | P | KAIC | TYPE | NO OF OUTLETS CO | LTG | LOAD SERVE | KVA | KW | AMPERE LOAD 3Ø | 2ØAB | 2ØCA | 1ØC | SIZE OF WIRE PHASE WIRE | GROUND WIRE | RMC PIPE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | | | | mm2 THWN | mm2 THWN | mmØ |
| 1 | 75 | 100 | 3 | 18 | B.O | | | ACCU 2F-B 14HP | 12.26 | 10.44 | 28.00 | | | | 3-22 | 1-8 | 40 |
| | | | | | | | | ACCU 2F-B 13HP | 10.65 | 9.05 | 24.00 | | | | | | |
| 2 | 60 | 60 | 3 | 18 | B.O | | | ACCU 2F-C 10HP | 10.58 | 8.65 | 24.00 | | | | 3-14 | 1-8 | 40 |
| | | | | | | | | ACCU 2F-C 8HP | 7.01 | 5.96 | 16.00 | | | | | | |
| 3 | 60 | 60 | 3 | 18 | B.O | | | SPARE | 12.26 | 10.44 | 28.00 | | | | 3-14 | 1-8 | 32 |
| | | | | | | | | TOTAL CONNECTED LOAD | 52.61 | 44.74 | 122.00 | | | | | | |

COMPUTATIONS : DEMAND FACTOR = 100 %
1 3Ø = 100% x 122.00 = [29% x 3] = 129 Amps
1 CB = 125% x 129 = [80% x 3] = 141 Amps

USE : 3-50mm2 THWN (P) + 1-22mm2 THWN (G) in 40mmØ IMC
MAIN BREAKER : 150AT / 175AF 3P 230V 30 KAIC




## PANEL: PACM

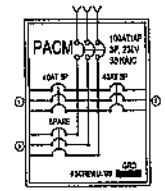
VOLT : 230V (L-L) 3Ø 60HZ

| CKT NO. | CIRCUIT BREAKER RATING AT | AF | P | KAIC | TYPE | NO OF OUTLETS CO | LTG | LOAD SERVE | KVA | KW | AMPERE LOAD 3Ø | 2ØAB | 2ØCA | 1ØC | SIZE OF WIRE PHASE WIRE | GROUND WIRE | RMC PIPE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | | | | mm2 THWN | mm2 THWN | mmØ |
| 1 | 40 | 60 | 3 | 18 | B.O | | | ACCU M-A 8HP | 7.01 | 5.96 | 16.00 | | | | 3-8 | 1-5.5 | 25 |
| 2 | 40 | 60 | 3 | 18 | B.O | | | ACCU M-B 8HP | 7.01 | 5.96 | 16.00 | | | | 3-8 | 1-5.5 | 25 |
| 3 | 40 | 60 | 3 | 18 | B.O | | | SPARE | 7.01 | 5.96 | 16.00 | | | | | | |
| | | | | | | | | TOTAL CONNECTED LOAD | 21.03 | 17.88 | 64.00 | | | | | | |

COMPUTATIONS : DEMAND FACTOR = 100 %
1 3Ø = 100% x 54.00 = [25% x 18] = 69 Amps
1 CB = 125% x 69 = [60% x 18] = 83 Amps

USE : 3-30mm2 THWN (P) + 1-14mm2 THWN (G) in 40mmØ IMC
MAIN BREAKER : 100AT /AF 3P 230V 30 KAIC

NOTE :
B.O = BOLT ON



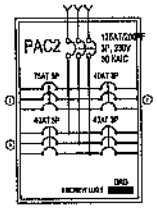

## PANEL: PAC3

VOLT : 230V (L-L) 3Ø 60HZ

| CKT NO. | CIRCUIT BREAKER RATING AT | AF | P | KAIC | TYPE | NO OF OUTLETS CO | LTG | LOAD SERVE | KVA | KW | AMPERE LOAD 3Ø | 2ØAB | 2ØCA | 1ØC | SIZE OF WIRE PHASE WIRE | GROUND WIRE | RMC PIPE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | | | | mm2 THWN | mm2 THWN | mmØ |
| 1 | 70 | 100 | 3 | 18 | B.O | | | ACCU 3F-B 14HP | 12.26 | 10.44 | 28.00 | | | | 3-22 | 1-8 | 32 |
| | | | | | | | | ACCU 3F-B 8HP | 7.01 | 5.96 | 16.00 | | | | | | |
| 2 | 40 | 60 | 3 | 18 | B.O | | | ACCU 3F-C 8HP | 7.01 | 5.96 | 16.00 | | | | 3-8 | 1-5.5 | 25 |
| 3 | 40 | 60 | 3 | 18 | B.O | | | ACCU 3F-D 8HP | 7.01 | 5.96 | 16.00 | | | | 3-8 | 1-5.5 | 25 |
| 4 | 40 | 60 | 3 | 18 | B.O | | | SPARE | 7.01 | 5.96 | 16.00 | | | | 3-8 | 1-5.5 | 25 |
| | | | | | | | | TOTAL CONNECTED LOAD | 45.32 | 34.26 | 100.00 | | | | | | |

COMPUTATIONS : DEMAND FACTOR = 150 %
1 3Ø = 150% x 100.00 = [25% x 26] = 107 Amps
1 CB = 125% x 107 = [80% x 26] = 140 Amps

USE : 3-60mm2 THWN (P) + 1-22mm2 THWN (G) in 50mmØ IMC
MAIN BREAKER : 175AT / 200AF 3P 230V 30 KAIC



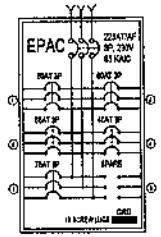

## PANEL: EPAC

VOLT : 230V (L-L) 3Ø 60HZ

| CKT NO. | CIRCUIT BREAKER RATING AT | AF | P | KAIC | TYPE | NO OF OUTLETS CO | LTG | LOAD SERVE | KVA | KW | AMPERE LOAD 3Ø | 2ØAB | 2ØCA | 1ØC | SIZE OF WIRE PHASE WIRE | GROUND WIRE | RMC PIPE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | | | | mm2 THWN | mm2 THWN | mmØ |
| 1 | 80 | 80 | 3 | 18 | B.O | | | ACCU GF-A 12HP | 10.58 | 8.98 | 24.00 | | | | 3-14 | 1-8 | 32 |
| 2 | 60 | 80 | 3 | 18 | B.O | | | ACCU M-C 12HP | 10.55 | 8.81 | 24.00 | | | | 3-14 | 1-8 | 32 |
| 3 | 60 | 60 | 3 | 18 | B.O | | | ACCU 2F-A 12HP | 10.58 | 8.85 | 24.00 | | | | 3-14 | 1-8 | 32 |
| | | | | | | | | ACCU 2F-A 8HP | 7.02 | 5.97 | 16.00 | | | | | | |
| 4 | 40 | 60 | 3 | 18 | B.O | | | ACCU 3F-C 8HP | 7.02 | 5.97 | 16.00 | | | | 3-8 | 1-5.5 | 25 |
| | | | | | | | | ACCU 3F-A 14HP | 12.25 | 10.44 | 28.00 | | | | 3-22 | 1-8 | 40 |
| 5 | 75 | 100 | 3 | 18 | B.O | | | ACCU 3F-A 12HP | 10.55 | 8.98 | 24.00 | | | | | | |
| 6 | | 60 | 3 | | B.O | | | SPARE | | | | | | | | | |
| | | | | | | | | TOTAL CONNECTED LOAD | 84.44 | 66.18 | 180.00 | | | | | | |

COMPUTATIONS : DEMAND FACTOR = 100 %
1 3Ø = 100% x 180.00= [25% x 26] = 191 Amps
1 CB = 125% x 187= [80% x 26]= 221 Amps

USE : 3-100mm2 THWN (P) + 1-38mm2 THWN (G) in 65mmØ IMC
MAIN BREAKER : 225AT / AF 3P 230V 50 KAIC



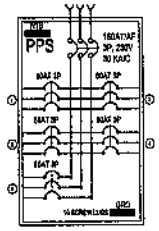

## PANEL: PPS

VOLT : 400V (L-L) 3Ø 60HZ

| CKT NO. | CIRCUIT BREAKER RATING AT | AF | P | KAIC | TYPE | NO OF OUTLETS CO | LTG | LOAD SERVE | KVA | KW | AMPERE LOAD 3Ø | 2ØAB | 2ØCA | 1ØC | SIZE OF WIRE PHASE WIRE | GROUND WIRE | RMC PIPE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | | | | mm2 THWN | mm2 THWN | mmØ |
| 1 | 80 | 80 | 3 | 30 | B.O | | | INVERTER 1 | 16.00 | 13.00 | 37.50 | | | | 3-14 | 3-14 | 32 |
| 2 | 80 | 80 | 3 | 30 | B.O | | | INVERTER 2 | 16.00 | 13.00 | 37.50 | | | | 3-14 | 3-14 | 32 |
| 3 | 60 | 80 | 3 | 30 | B.O | | | INVERTER 3 | 16.00 | 13.00 | 37.50 | | | | 3-14 | 3-14 | 32 |
| 4 | 40 | BRD | 3 | 30 | B.O | | | SPARE | | | | | | | | | |
| 5 | 60 | BRD | 3 | 30 | B.O | | | SPARE | | | | | | | | | |
| | | | | | | | | TOTAL CONNECTED LOAD | 48.00 | 39.00 | 112.50 | | | | | | |

COMPUTATIONS : DEMAND FACTOR = 100 %
1 3Ø = 100% x 112.50 = 113 Amps
1 CB = 125% x 113 = 145 Amps

USE : 2-50mm2 THWN (P) + 1-60mm2 THWN (N), 1-22mm2 THWN (G) in 40mmØ IMC
MAIN BREAKER : 150AT / AF 3P 230V 30 KAIC




## PANEL: PS

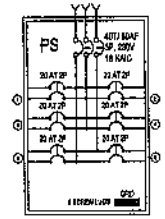
VOLT : 400V (L-L) 3Ø 60HZ

| CKT NO. | CIRCUIT BREAKER RATING AT | AF | P | KAIC | TYPE | NO OF OUTLETS CO | LTG | LOAD SERVE | KVA | KW | AMPERE LOAD 3Ø | 2ØAB | 2ØCA | 1ØC | SIZE OF WIRE PHASE WIRE | GROUND WIRE | RMC PIPE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | | | | mm2 THWN | mm2 THWN | mmØ |
| 1 | 20 | 50 | 2 | 18 | B.O | 1 | | CONV. OUTLET | 0.18 | 0.18 | | 0.78 | | | 3-3.5 | 1-3.5 | 19 |
| 2 | 20 | 50 | 2 | 18 | B.O | 1 | | CONV. OUTLET | 0.18 | 0.18 | | 0.78 | | | 3-3.5 | 1-3.5 | 19 |
| 3 | 20 | 50 | 2 | 18 | B.O | 2 | | EXHAUST FAN | 0.36 | 0.18 | | | 0.78 | | 3-3.5 | 1-3.5 | 19 |
| 4 | 20 | 50 | 2 | 18 | B.O | | 2 | LIGHTING LOAD | 0.36 | 0.18 | | | 0.78 | | 3-3.5 | 1-3.5 | 19 |
| 5 | 20 | 60 | 2 | 18 | B.O | | | SPARE | 0.18 | 0.18 | | | | 0.78 | | | |
| 6 | 20 | 60 | 2 | 18 | B.O | | | SPARE | 0.18 | 0.18 | | | | 0.78 | | | |
| | | | | | | | | TOTAL CONNECTED LOAD | 1.08 | 1.08 | | 1.56 | 1.56 | 1.56 | | | |

COMPUTATIONS : DEMAND FACTOR = 100 %
1 3Ø = 100% x 1.32 x 1.56 = 3 Amps
1 CB = 125% x 3 = 4 Amps

USE : 3-8mm2 THWN (P) + 1-5.5mm2 THWN (G) in 25mmØ IMC
MAIN BREAKER : 40AT / 60 AF 3P 230V 18 KAIC

NOTE :
B.O = BOLT ON




UNIVERSITY OF THE PHILIPPINES SYSTEM
OVPD
OFFICE OF THE VICE PRESIDENT FOR DEVELOPMENT
ODPI
OFFICE OF DESIGN AND PLANNING INITIATIVES

REPUBLIC ACT 9184
Article IV, Section 33

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PROJECT TITLE
THREE - STOREY BUILDING RENOVATION
Department of Budget and Management Arcache Building
SAN MIGUEL, CITY OF MANILA

UNIVERSITY REPRESENTATIVE
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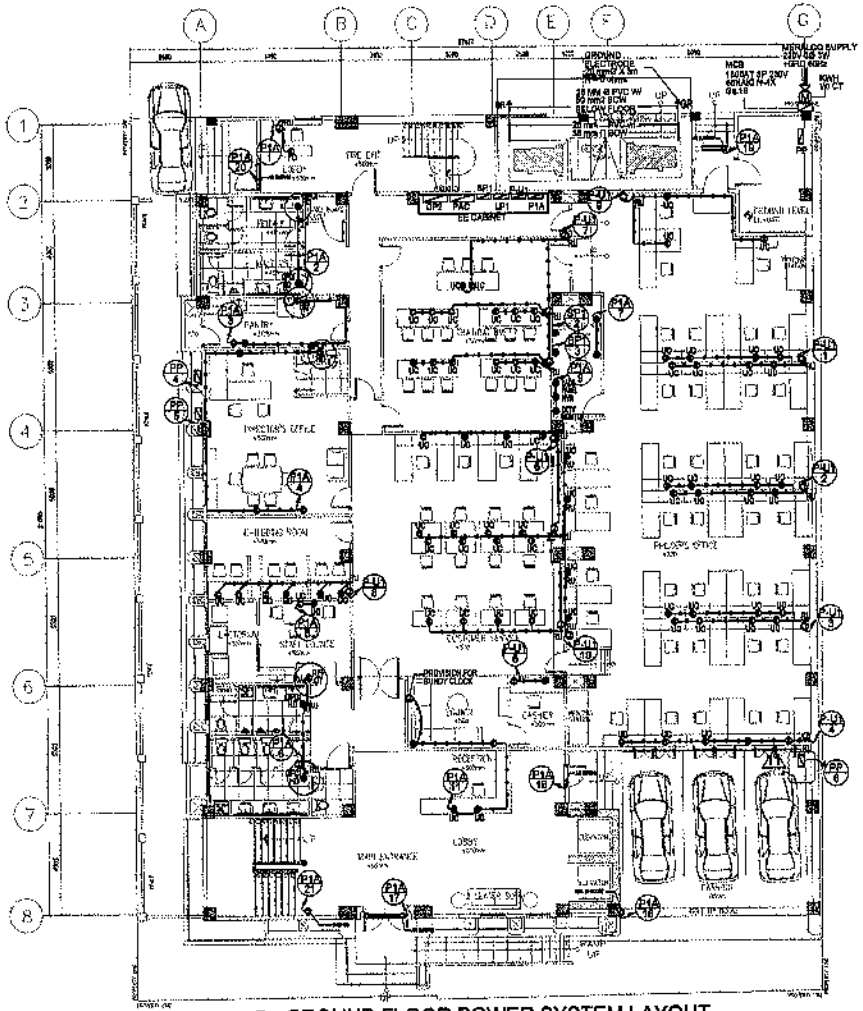
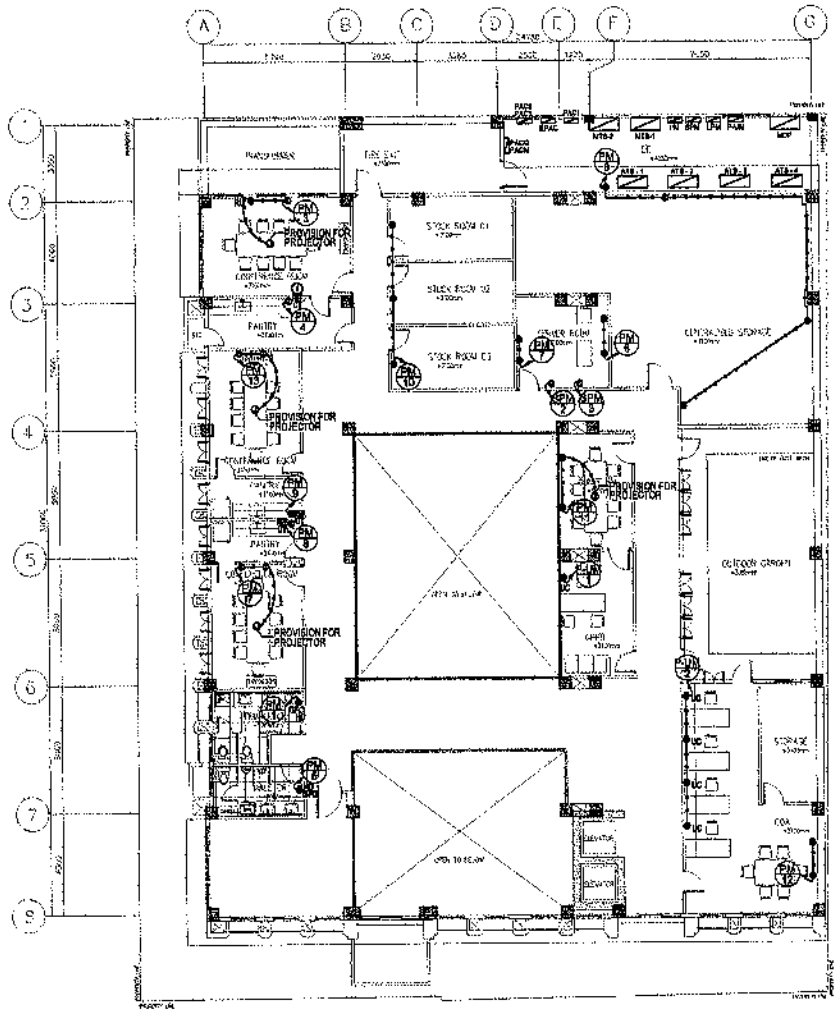
DRAWN BY: DEO
DATE: 12/04/2017
CHECKED BY: RJR
DATE: 12/13/17
REVISED BY: DEO
DATE: 01.13.18

SHEET CONTENTS
LOAD SCHEDULE

SHEET NO.
E 05
13
ELECTRICAL



01 E06 GROUND FLOOR POWER SYSTEM LAYOUT
SCALE 1 : 100 MTS.



02 E06 MEZZANINE POWER SYSTEM LAYOUT
SCALE 1 : 100 MTS.

AS PER PEC 2017
APPENDIX A ELECTRICAL SYMBOLS

| LEGEND | DESCRIPTION |
|---|---|
| | CONDUIT |
| | OPEN WIRING |
| | UNDERGROUND |
| | EMERGENCY |

UNIVERSITY OF THE PHILIPPINES SYSTEM
OVPD
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ODPI
OFFICE OF DESIGN AND PLANNING INITIATIVES

REPUBLIC ACT 9266
Article IV, Section 33

ARCHITECTS OF RECORD
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PROJECT TITLE
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Department of Budget and Management Arcache Building
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DIRECTOR, OVPD
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OWNER
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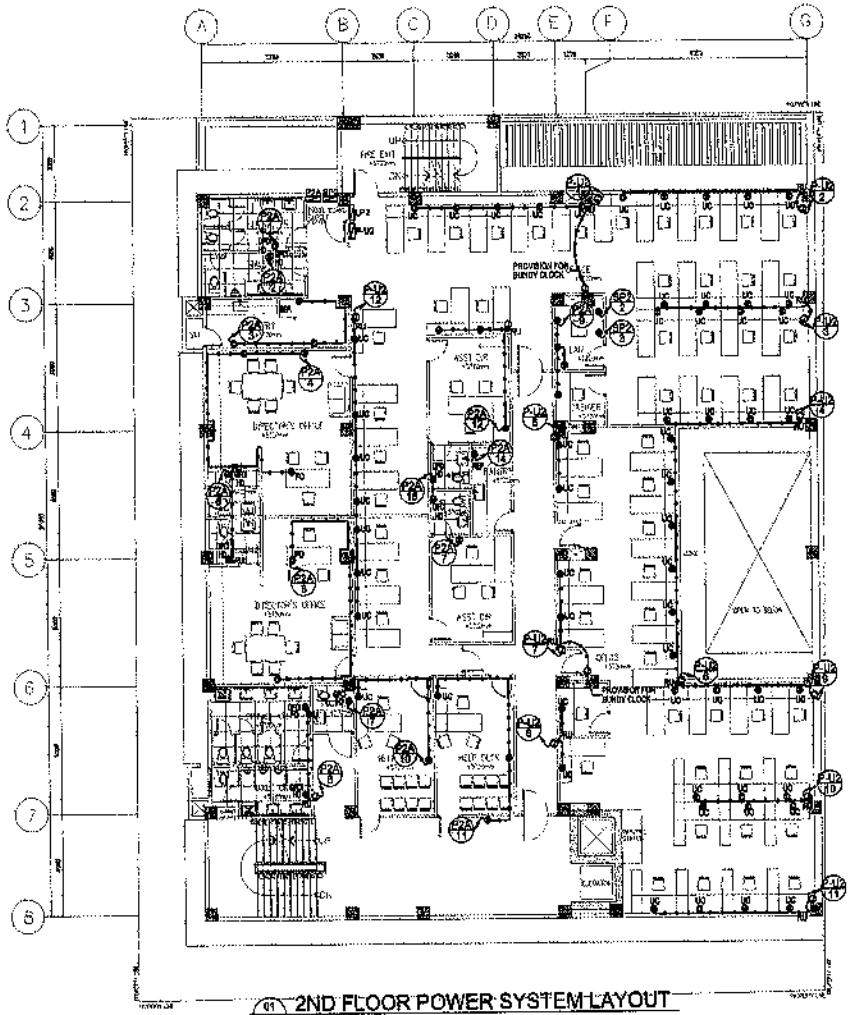
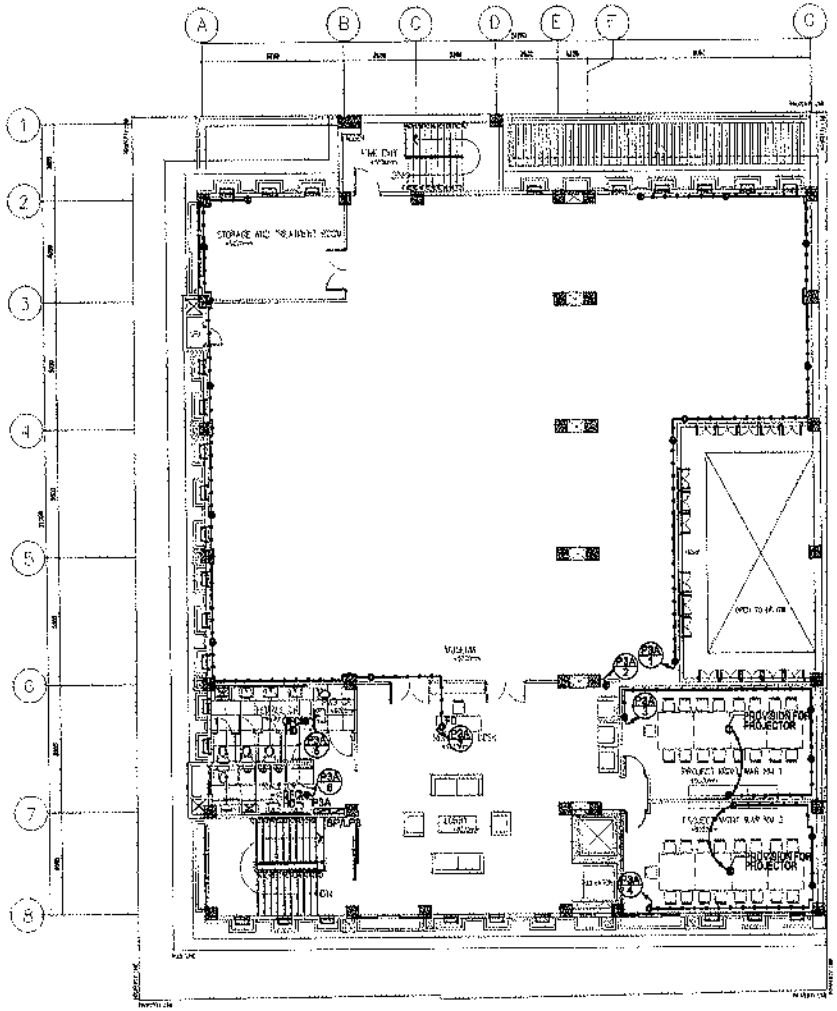
| | |
|---|---|
| DRAWN BY: | DEO |
| DATE: | 01.23.18 |
| CHECKED BY: | R.R |
| DATE: | 01.23.18 |
| REVISED BY: | DEO |
| DATE: | 05.15.18 |

SHEET CONTENTS
GF POWER SYSTEM LAYOUT
MEZZANINE POWER SYSTEM LAYOUT

SHEET NO.
E 06 13
ELECTRICAL



01 / E 07 2ND FLOOR POWER SYSTEM LAYOUT
SCALE 1 : 100 MTS.



02 / E 07 3RD FLOOR POWER SYSTEM LAYOUT
SCALE 1 : 100 MTS.

AS PER PEC 2017
APPENDIX A/ELECTRICAL SYMBOLS

| LEGEND | DESCRIPTION |
|---|---|
| | CONDUIT |
| | OPEN WIRING |
| | UNDERGROUND |
| | EMERGENCY |

UNIVERSITY OF THE PHILIPPINES SYSTEM
OVPD
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OFFICE OF DESIGN AND PLANNING INITIATIVES

REPUBLIC ACT 9266
Architects Section 35

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Department of Budget and Management Arcache Building
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OWNER
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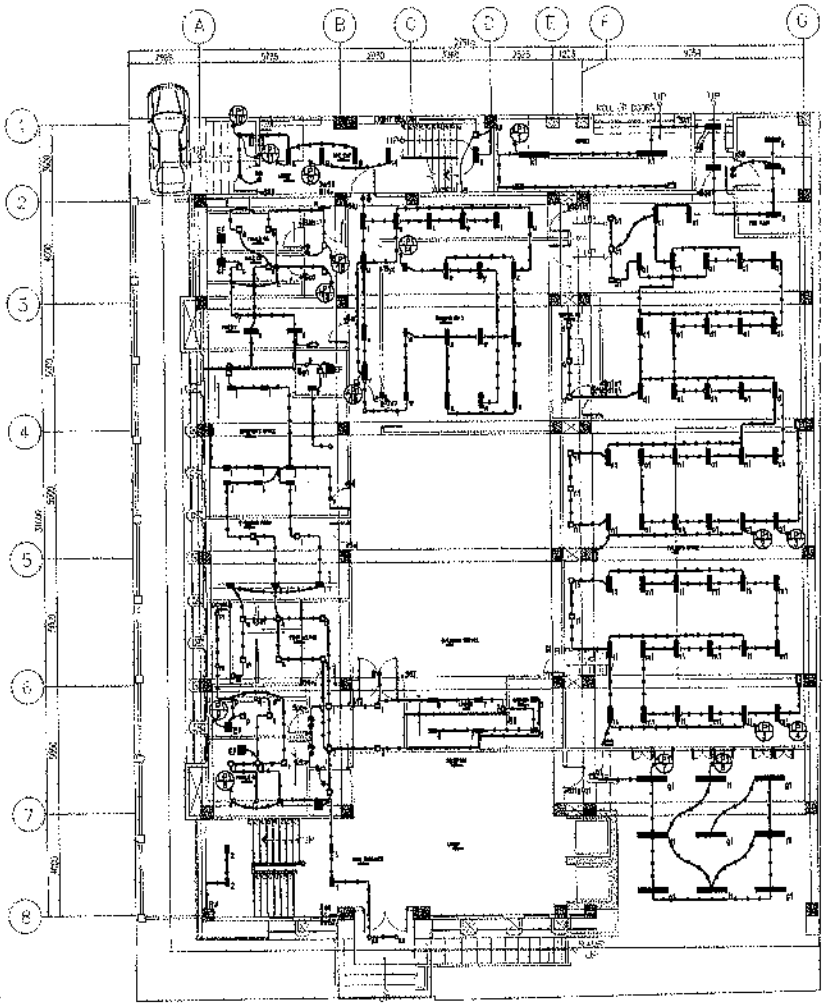
SECRETARY

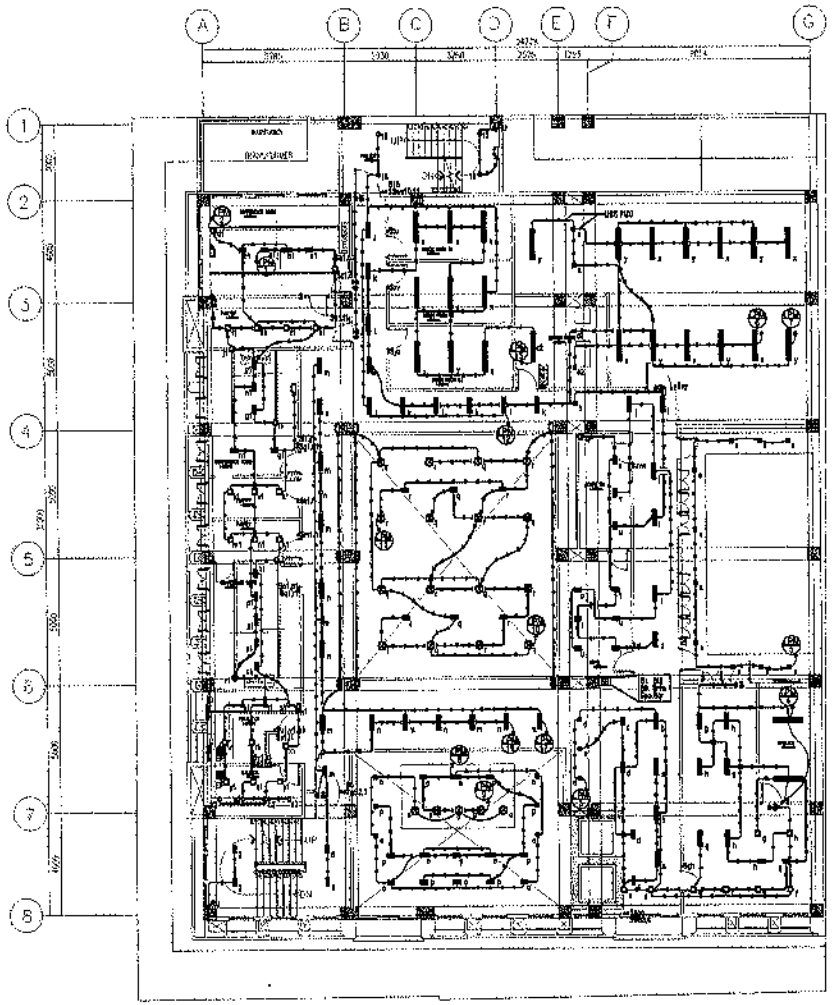
DRAWN BY: DBD
DATE: 01.05.18
CHECKED BY: RJR
DATE: 01.05.18
REVISED BY: DBD
DATE: 07.12.18

SHEET CONTENTS
2ND FLOOR POWER SYSTEM LAYOUT
3RD FLOOR POWER SYSTEM LAYOUT

SHEET NO.
E 07
13
ELECTRICAL



01 E06 GROUND FLOOR LIGHTING SYSTEM LAYOUT
SCALE 1:100 MTS.



02 E06 MEZZANINE LIGHTING SYSTEM LAYOUT
SCALE 1:100 MTS.

AS PER PEC 2017
APPENDIX A ELECTRICAL SYMBOLS

| LEGEND | DESCRIPTION |
|---|---|
| | CONDUIT |
| | OPEN WIRING |
| | UNDERGROUND |
| | EMERGENCY |

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REPUBLIC ACT 9184:
Article 77, Section 33

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PROJECT TITLE
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DRAWN BY: DEO
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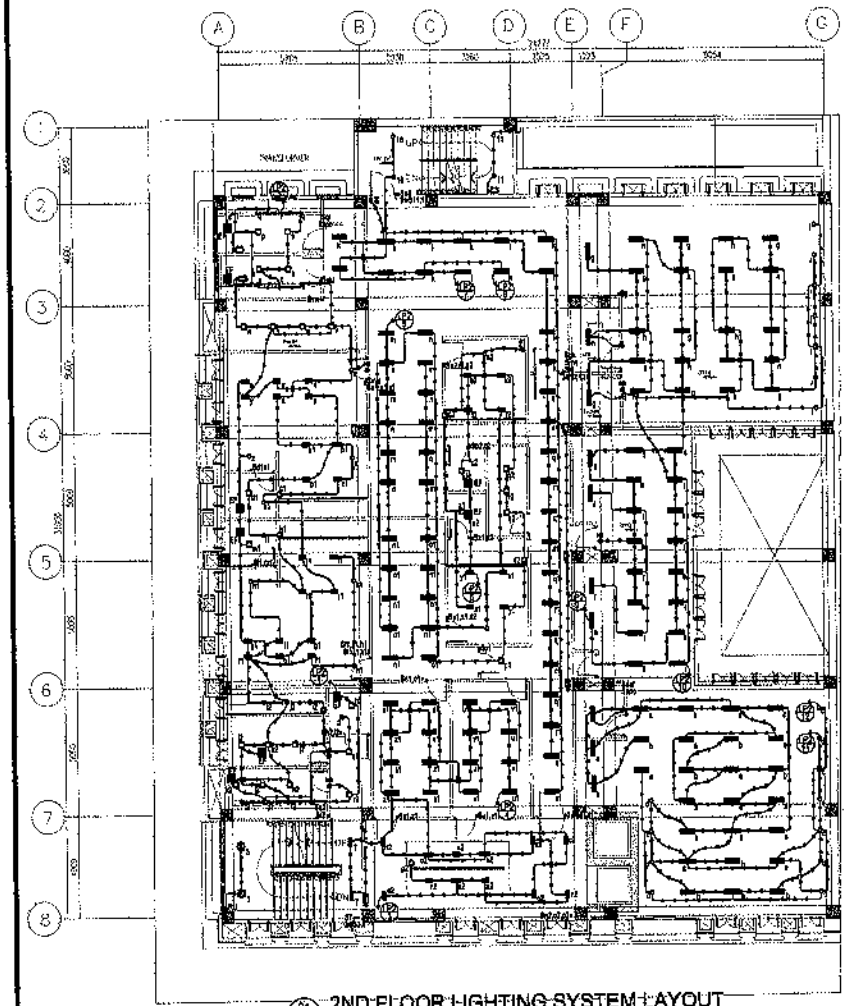
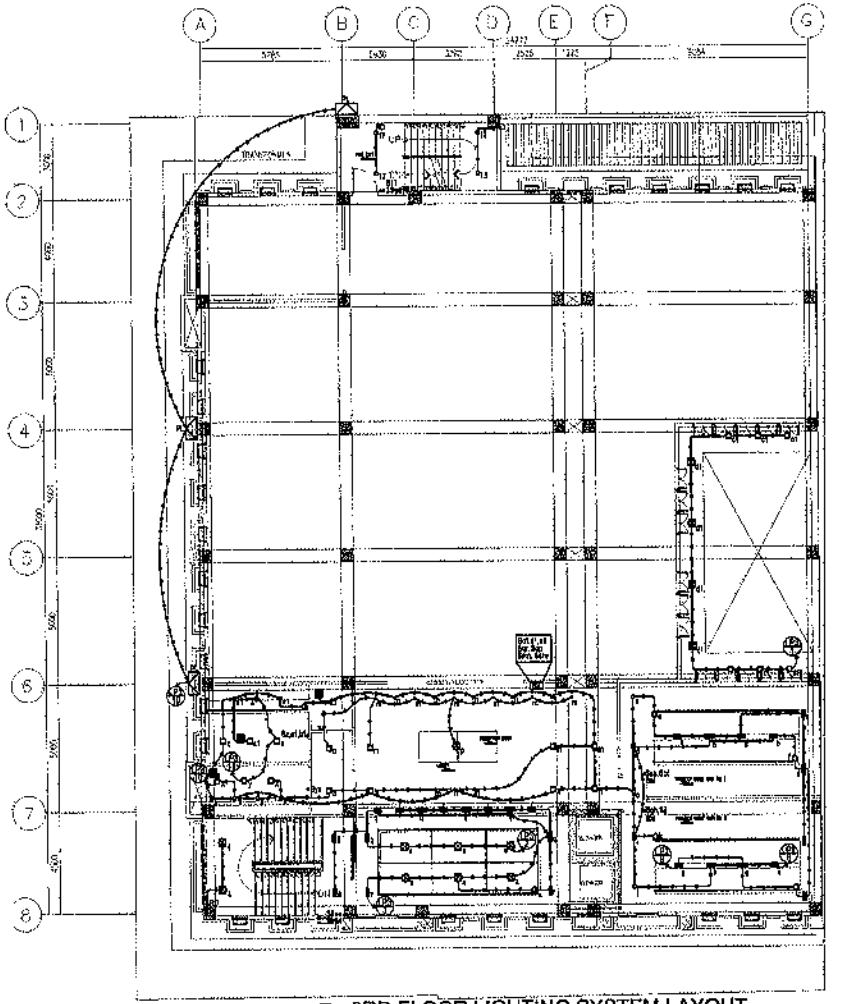
CHECKED BY: ELR
DATE: 10/18/17
REVISED BY: DEO
DATE: 12/4/17

SHEET CONTENTS
GF LIGHTING SYSTEM LAYOUT
MEZZANINE LIGHTING SYSTEM LAYOUT

SHEET NO.
E 08
13
ELECTRICAL



01 2ND FLOOR LIGHTING SYSTEM LAYOUT
SCALE 1 : 100 MTS.



02 3RD FLOOR LIGHTING SYSTEM LAYOUT
SCALE 1 : 100 MTS.

AS PER PEC 2017
APPENDIX A ELECTRICAL SYMBOLS

| LEGEND | DESCRIPTION |
|---|---|
| | CONDUIT |
| | OPEN WIRING |
| | UNDERGROUND |
| | EMERGENCY |

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REPUBLIC ACT 9246:
Article III, Section 23

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ENRICO B. TABAFUNDA
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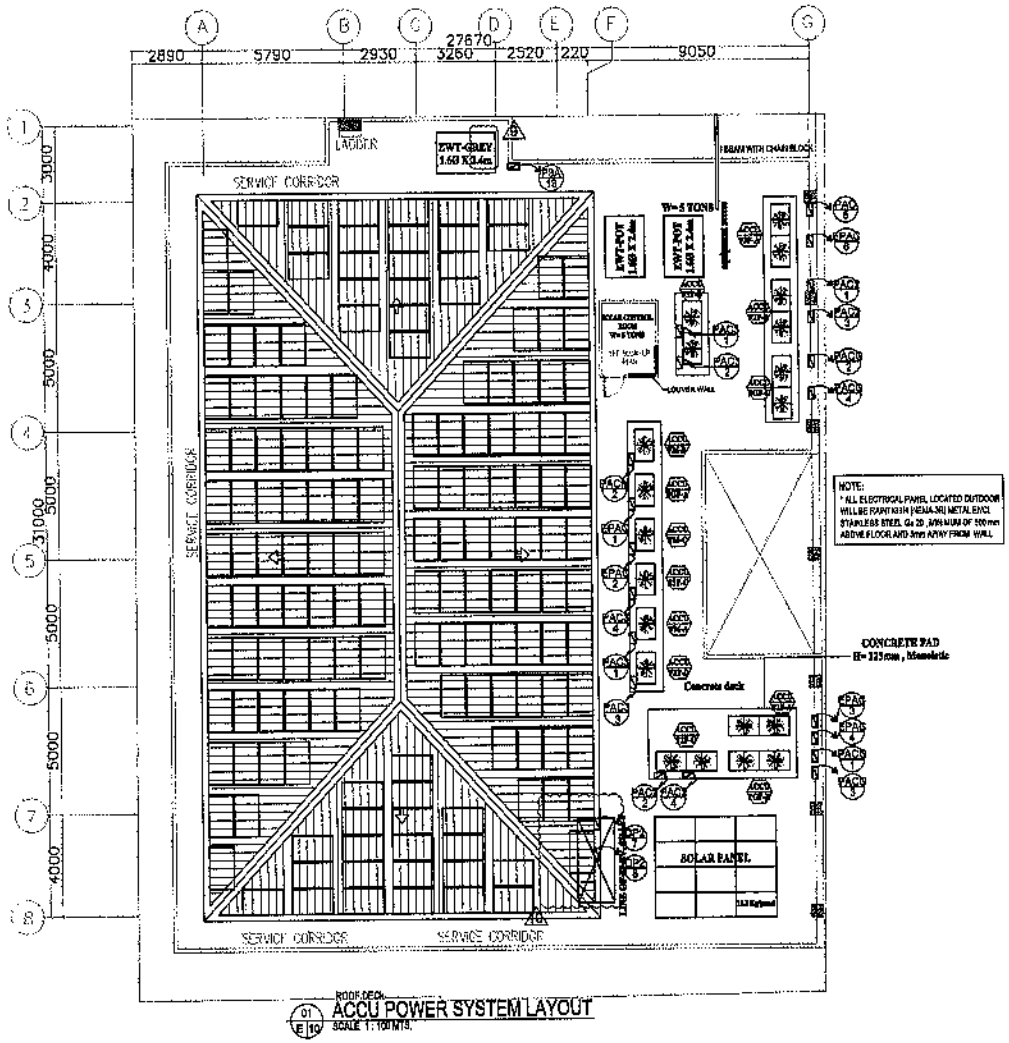
OWNER
BENJAMIN E. DIOKNO
SECRETARY

DRAWN BY: DED
DATE: 12/18/2017
CHECKED BY: RJR
DATE: 12.18.18
REVISED BY: DED
DATE: 02.15.18

SHEET CONTENTS
2ND FLOOR LIGHTING SYSTEM LAYOUT
3RD FLOOR LIGHTING SYSTEM LAYOUT

SHEET NO.
E 09
13
ELECTRICAL




01 E 10 ACCU POWER SYSTEM LAYOUT
SCALE 1:100 MTS.

AS PER PEC 2017
APPENDIX A, ELECTRICAL SYMBOLS

| LEGEND | DESCRIPTION |
|---|---|
| | CONDUIT |
| | OPEN WIRING |
| | UNDERGROUND |
| | EMERGENCY |

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OVPD
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REPUBLIC ACT 9184, Article IV, Section 33

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PROJECT TITLE
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UNIVERSITY REPRESENTATIVE
ENRICO B. TABARINDA
DIRECTOR, OVPD
ELVIRA A. ZAMORA
VICE PRESIDENT, OVPD

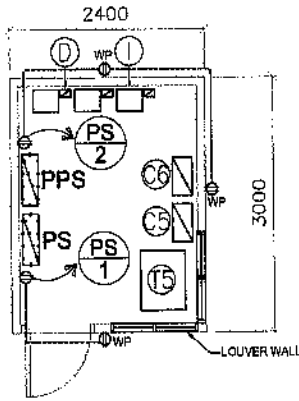
OWNER
BENJAMIN E. DIOKNO
SECRETARY

| | |
|---|---|
| DRAWN BY: | DEO |
| DATE: | 01.22.18 |
| CHECKED BY: | RJR |
| DATE: | 01.30.18 |
| REVISED BY: | DEO |
| DATE: | 07.12.18 |

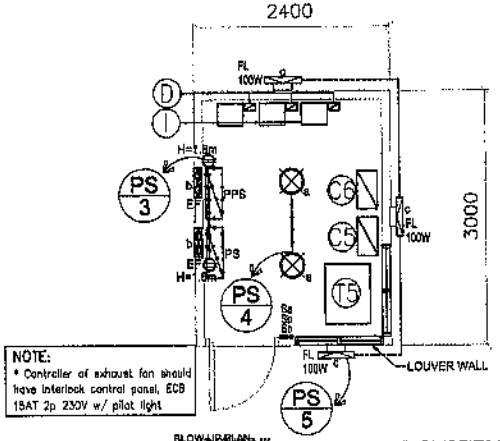
SHEET CONTENTS: ACCU POWER SYSTEM LAYOUT

SHEET NO. E 10 13

ELECTRICAL

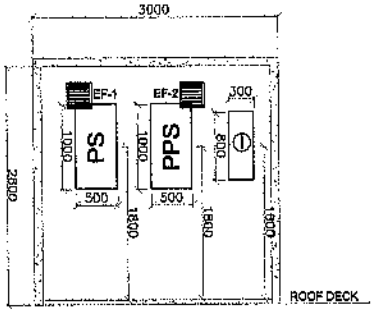



BLOW-UP PLAN
01 E11 SOLAR ROOM POWER SYSTEM LAYOUT
SCALE 1:50 MTS.



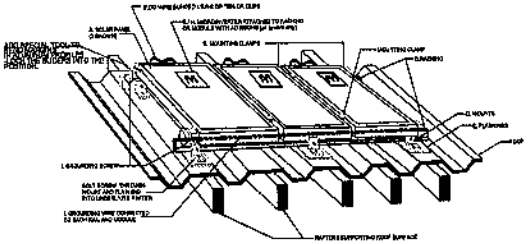

NOTE:
* Controller of exhaust fan should have interlock control panel, ECB 15AT 2p 230V w/ pilot light

BLOW-UP PLAN
02 E11 SOLAR ROOM LIGHTING SYSTEM LAYOUT
SCALE 1:50 MTS.

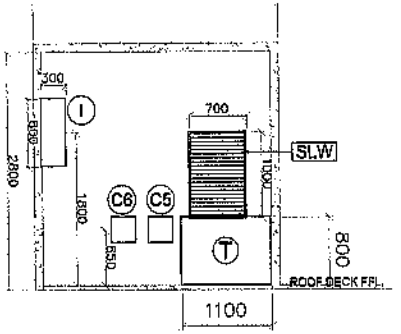



08 E11 SECTION D
SCALE 1:50 MTS.

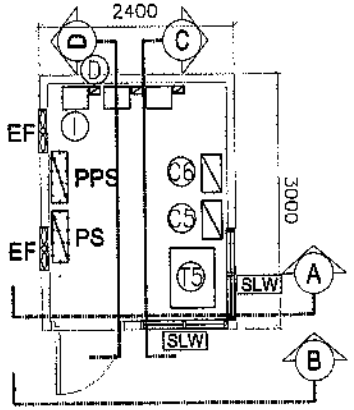
- DC DISCONNECTION SWITCH W/ SUPRESSOR 60AT/AF 3Ø 400V 30KAIC
- INVERTER WITH STEEL RACK GALVANIZED 50mm x 50mm x 6mm(T) STEEL
- TRANSFORMER 75KVA, 400V (PRI) / 230V (SEC) 3Ø
- CIRCUIT BREAKER 150AT/AF 400V 3P, 30KAIC NEMA 1 ENCLOSURE
- CIRCUIT BREAKER 225AT/AF 230V 3P, 30KAIC NEMA 1 ENCLOSURE
- FL FLOOD LIGHT 100w
- WP WATER PROOF
- EF EXHAUST FAN



03 E11 MOUNTING DETAILS OF SOLAR PANEL
NOT TO SCALE

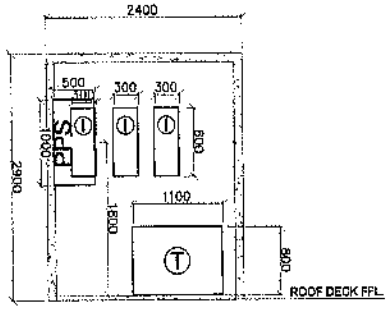



08 E11 SECTION C
SCALE 1:50 MTS.

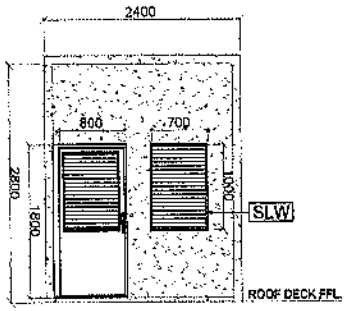



04 E11 PLAN
SCALE 1:50 MTS.

- SLW STEEL LOUVER WALL
- T TRANSFORMER
- I INVERTER
- C5 CIRCUIT BREAKER
- C6 CIRCUIT BREAKER
- EF EXHAUST FAN
- PS PANEL BOARD
- PPS PANEL BOARD




05 E11 SECTION A
SCALE 1:50 MTS.




07 E11 SECTION B
SCALE 1:50 MTS.

AS PER PEC 2017
APPENDIX A ELECTRICAL SYMBOLS

| LEGEND | DESCRIPTION |
|---|---|
| ——— | CONDUIT |
| - - - - - | OPEN WIRING |
| ——— | UNDERGROUND |
| —•—•— | EMERGENCY |

UNIVERSITY OF THE PHILIPPINES SYSTEM
OVPD OFFICE OF THE VICE PRESIDENT FOR DEVELOPMENT
ODPI OFFICE OF DESIGN AND PLANNING INITIATIVES

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DOLORES CECILIA F. TAYSON — PRC NO. 0029814 — VALIDITY 04/09/2019 — PTR NO. A-3889 — DATE 05/14/2019 — TIN NO. 106-666-999 — PLACE QUEZON CITY
JERIS APOLINARIO C. BULAONG — PRC NO. 0034699 — VALIDITY 04/09/2019 — PTR NO. 5442999 — DATE 01/02/2019 — TIN NO. 009-017-882 — PLACE QUEZON CITY

CONSULTANTS/ENGINEER
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PROJECT TITLE
THREE - STOREY BUILDING RENOVATION
Department of Budget and Management Arcache Building
SAN MIGUEL, CITY OF MANILA

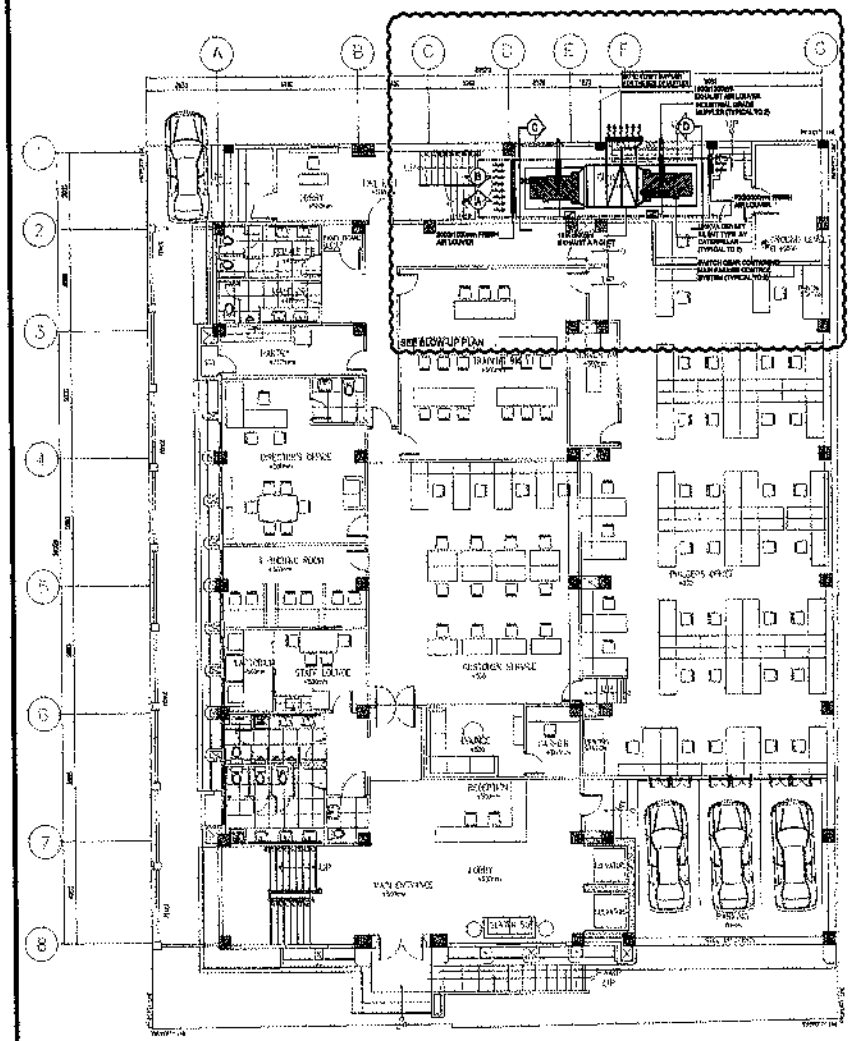
UNIVERSITY REPRESENTATIVE
ENRICO B. TABARLINDA — DIRECTOR, OVPD
ELVIRA A. ZAMORA — VICE PRESIDENT, OVPD

OWNER
BENJAMIN E. DIOKNO — SECRETARY

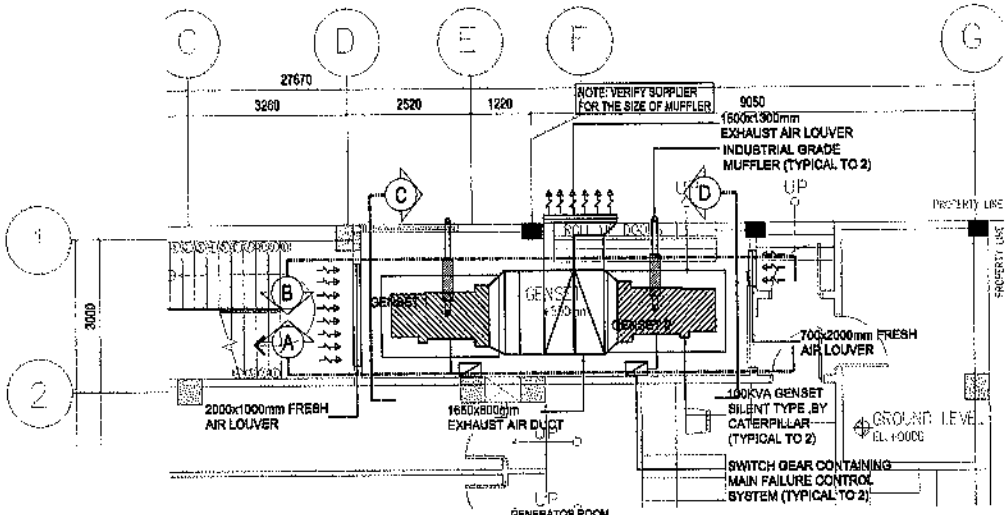
DRAWN BY: DEO — DATE: 01.30.19
CHECKED BY: R-R — DATE: 01.30.19
REVISED BY: DEO — DATE: 03.13.19

SHEET CONTENTS
SOLAR ROOM POWER SYSTEM LAYOUT
SOLAR ROOM LIGHTING SYSTEM LAYOUT
MOUNTING DETAILS OF SOLAR PANEL
SOLAR CONTROL ROOM SECTION

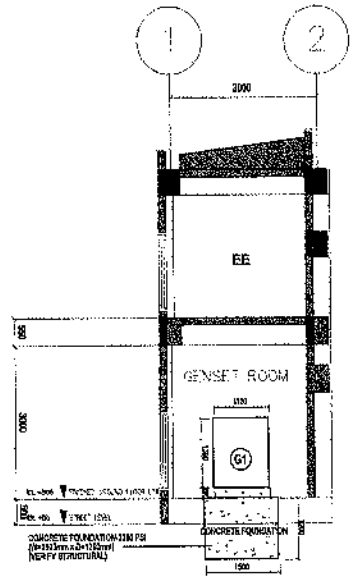
SHEET NO. E 11 13
ELECTRICAL



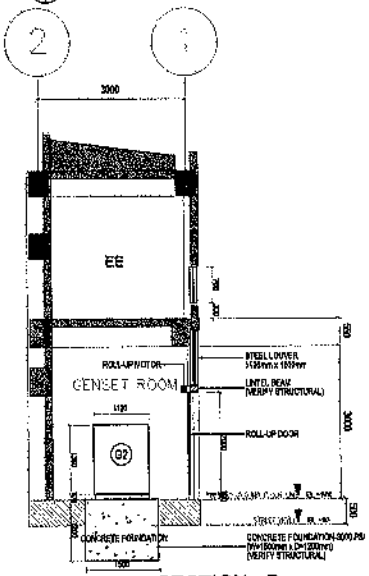
01 GROUND FLOOR PLAN
E12 SCALE 1 : 100 MTS.




02 BLOW - UP PLAN
E12 SCALE 1 : 50 MTS.




03 SECTION - C
E12 SCALE 1 : 50 MTS.




04 SECTION - D
E12 SCALE 1 : 50 MTS.

AS PER PEC 2017
APPENDIX A ELECTRICAL SYMBOLS

| LEGEND | DESCRIPTION |
|---|---|
| | CONDUIT |
| | OPEN WIRING |
| | UNDERGROUND |
| | EMERGENCY |

UNIVERSITY OF THE PHILIPPINES SYSTEM
OVPD
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OFFICE OF DESIGN AND PLANNING INITIATIVES

REPUBLIC ACT 9184 Article IV, Section 35

ARCHITECTS OF RECORD
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JESUS APOLINARIO C. BUSAONG

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RODOLFO J. RINCULLA
PROFESSIONAL ELECTRICAL ENGINEER

PROJECT TITLE
THREE - STOREY BUILDING RENOVATION
Department of Budget and Management Arcache Building
SAN MIGUEL, CITY OF MANILA

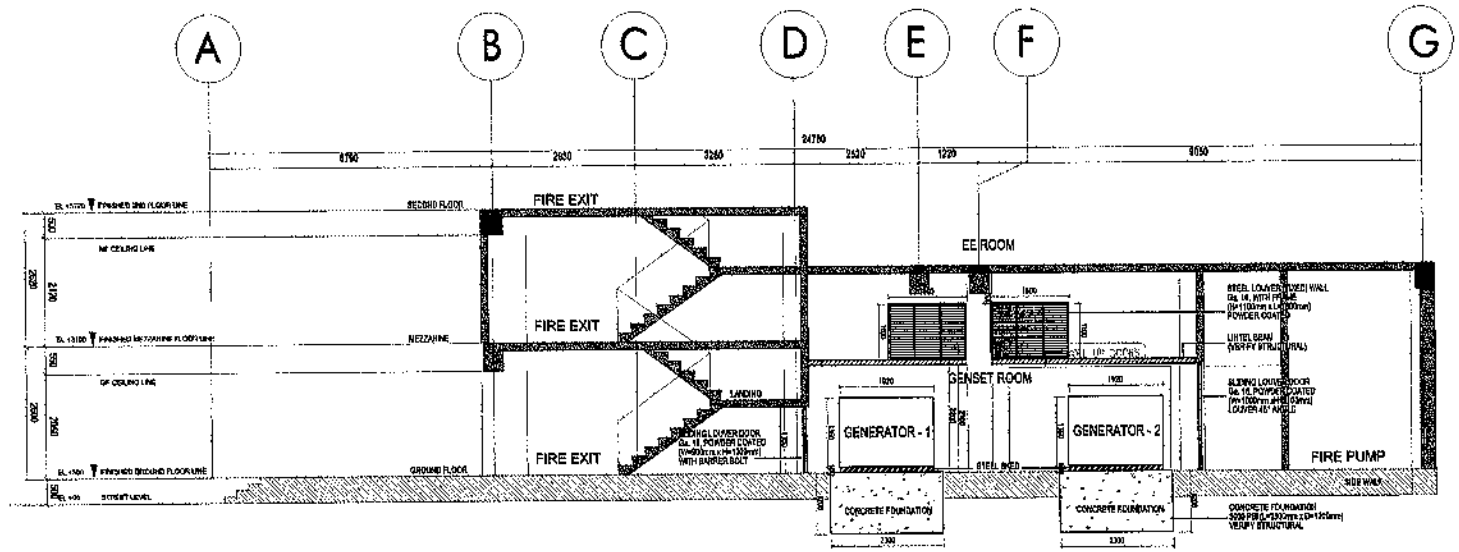
UNIVERSITY REPRESENTATIVE
ENRICO S. TABAFUNDA
DIRECTOR, OVPD
ELVIRA A. ZAMORA
VICE PRESIDENT, OVPD

OWNER
BENJAMIN E. DIOKNO
DEAN, UP SCHOOL OF ECONOMICS

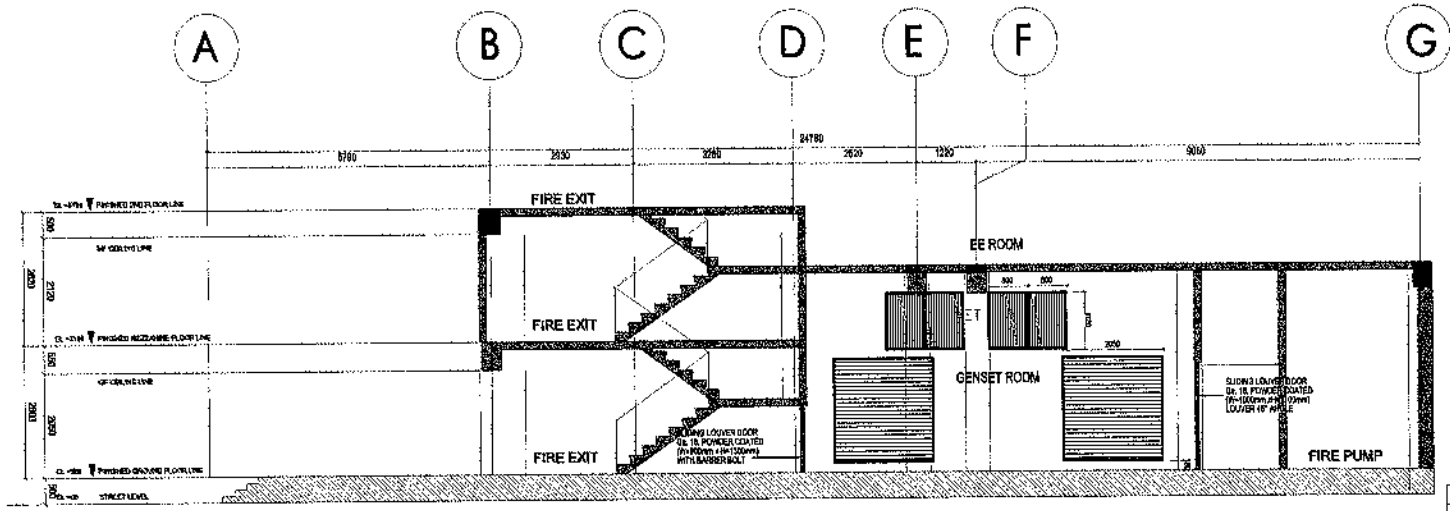
| | |
|---|---|
| DRAWN BY: | DRG |
| DATE: | 04/2018 |
| CHECKED BY: | RJR |
| DATE: | 01/2019 |
| REVISED BY: | DRG |
| DATE: | 07/2018 |

SHEET CONTENTS
GROUND FLOOR PLAN
GENERATOR ROOM BLOW-UP PLAN
SECTION C
SECTION D

SHEET NO.
E 12
13
ELECTRICAL




01 E13 SECTION A
SCALE 1 : 50 MTS.




02 E13 SECTION B
SCALE 1 : 50 MTS.

AS PER PEC 2017
APPENDIX A ELECTRICAL SYMBOLS

| LEGEND | DESCRIPTION |
|---|---|
| | CONDUIT |
| | OPEN WIRING |
| | UNDERGROUND |
| | EMERGENCY |

UNIVERSITY OF THE PHILIPPINES SYSTEM
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REPUBLIC ACT 9266
Article IV, Section 26

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PROJECT TITLE
THREE - STOREY BUILDING RENOVATION
Department of Budget and Management Arcache Building
SAN MIGUEL, CITY OF MANILA

UNIVERSITY REPRESENTATIVE
ENRICO B. TABAFUNDA
DIRECTOR, ODPI
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CHECKED BY: RJR
DATE: 01.30.18
REVISED BY: DPO
DATE: 09.10.18

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ELECTRICAL

## GENERAL NOTE AND SPECIFICATIONS :

1. ALL EQUIPMENT SHALL BE INSTALLED IN APPROXIMATE LOCATION AS SHOWN ON THE DRAWINGS.
2. ALL EQUIPMENT SHALL BE MOUNTED ON OR SUPPORTED WITH VIBRATION ISOLATOR OR ASSEMBLIES AS SPECIFIED ON THE DRAWINGS.
3. INSTALLATION OF ALL WORKS SHALL BE DONE IN A NEAT AND WORKMANLIKE MANNER. IMPROPERLY SETWORK OR FINISH AS DETERMINED BY THE ARCHITECT SHALL BE REMOVED AND REPLACED AT NO EXTRA COST.
4. ALL MATERIALS TO BE USED SHALL BE BRAND NEW & CLEAN.
5. DEVIATIONS AND REVISIONS FROM PLANS SHALL BE REFERED TO THE ARCHITECT FOR REVIEW AND APPROVAL.
6. ALL NECCESSARY GOVERNMENT PERMIT SHALL BE SECURED AND PAID FOR BY THE CONTRACTOR.
7. ALL DIMENSION ARE IN MILLIMETER UNLESS OTHERWISE SPECIFIED.
8. ALL MECHANICAL WORKS SHALL BE , IN ACCORDANCE WITH THE LATEST MECHANICAL ENGINEER'S CODE ASME, SMACNA AND ASHRAE STANDARD AND ALL ON SITE ACTIVITIES SHALL BE SUPERVISED BY THE REGISTERED MECHANICAL ENGINEER.
9. MECHANICAL CONTRACTOR SHALL OBSERVED ALWAYS SAFETY AND ORDERLINESS.
10. MECHANICAL CONTRACTOR SHALL VERIFY SITE PRIOR TO ACTUAL INSTALLATION.
11. ALL AIRCONDITIONING DUCT SHALL BE AS PER SMACNA USING GI SHEET GALVASOND MATERIALS AND FULLY INSULATED WITH 25mm CLOSED CELL ELASTOMERIC RUBBER INSULATION OR 19MM MIN. THK. FOR POLYOLEFIN INSULATION W/ REINFORCED ALUMINUM SHEATHING AND ADHESIVE BACKING, CLASS O FIRE RATING.
12. ALL A/C & VENTILATING EQUIPMENT CONTROL PANEL SWITCH SHALL BE LOCATED AT THE ADMIN'S OFFICE.
13. ALL FRESH AIR DUCT EXPOSED TO WEATHER SHALL BE PAINTED WITH ANTI-CORROSIVE PAINT. USE EPOXY PRIMER FOR ALL APPLICATION.
14. THE MECHANICAL CONTRACTOR SHALL SUBMIT TESTING, BALANCING AND COMMISSIONING PROCEDURE FOR APPROVAL BY PROJECT MANAGEMENT, CONSULTANTS AND OWNER REPRESENTATIVE PRIOR TO IMPLEMENTATION AT SITE AND SHALL BE WITNESSED BY EITHER INHOUSE OR OUTSOURCED TESTING BALANCING AND COMMISSIONING PROVIDER.
15. USE SEAL TYPE MOTOR FOR BLOWER DRIVES. ( MITSUBISHI BRAND OR EQUAL) .
16. ALL METAL SUPPORTS SHALL BE FULLY WELDED.
17. ALL CONTROL WIRING SHALL BE BY TMS CONTRACTOR.
18. ALL POWER WIRING SHALL BE BY ELECTRICAL CONTRACTOR.
19. ALL AIRCONDITIONING UNITS SHALL BE PROVIDED WITH FILTER DRIERS.
20. REFRIGERANT PIPING SHALL BE TYPE "L" HARD DRAWN SEAMLESS COPPER PIPE.
21. REFRIGERANT PIPE INSULATION SHALL BE 25mm MIN. THK. CLOSED CELL ELASTOMERIC RUBBER INSULATION OR 20MM MIN. THK. FOR POLYOLEFIN INSULATION W/ REINFORCED ALUMINUM SHEATHING AND ADHESIVE BACKING, CLASS O FIRE RATING.
22. DRAIN LINE SHALL BE CLOSED CELL ELASTOMERIC RUBBER INSULATION M 15MM. MIN. THK. CLASS O W/ ADHESIVE BACKING, CLASS O FIRE RATING.
23. ALL PLANS WITH COMMENTS MUST ALWAYS BE PRESENT ON SITE PRIOR TO CONSTRUCTION MONITORING AND AS BASIS OF CONSTRUCTION.
24. ALL ALTERNATIVE MATERIAL/EQUIPMENT TO BE USED BY CONTRACTOR/SUPPLIER OTHER THAN THOSE SPECIFIED BY CONSULTANT SHALL BE COMMUNICATED FOR CHANGE SPECIFICATION APPROVAL.
25. THE CONTRACTOR SHALL ENSURE THAT EVERYTHING HAS BEEN VERIFIED AND COORDINATED WITH ALL OTHER DISCIPLINES AS TO CONSTRUCTIBILITY, FUNCTIONALITY AND MAINTAINABILITY OF THE EQUIPMENT AND UTILITIES. IF FOR ANY REASON, CONFLICT ARISE DUE TO CONTRACTORS FAILURE TO FOLLOW STANDARD SPECIFICATIONS AND GOOD ENGINEERING PRACTICES OR ITS LACK OF DUE DELIGENCE, ALL WORKS AS NECESSITATED SHALL BE PERFORMED BY THE CONTRACTOR WITHOUT ADDITIONAL COST VARIATION ORDER TO THE OWNER.
26. IN THE ABSENCE OF ANY OTHER REQUIREMENT NOT FOUND IN PSME CODE, THE MATERIALS, CONSTRUCTION AND INSTALLATION OF DUCTWORKS SHALL COMPLY WITH THE REQUIREMENT OF SMACNA OR ASHRAE.
27. ALL AIR CONDITIONING, FRESH AIR AND EXHAUST VENTILATION DUCTS SHALL BE OF ASTM 653 HOT DIPPED, ZINC COATED STEEL SHEET CONFORMING TO SMACNA STANDARDS AND LOCK FORMED AND SEALED WITH DUCT SEALANT CONFORMING TO ASTM E 84-30. PRIOR TO INSULATION, ALL DUCTWORKS SHALL BE SMOKE-LIGHT TESTED FOR LEAKS.
28. PROVIDE CONTINUOUS CORNER BENDS ON ALL DUCTS MADE OF 0.6mm ASTM 653 HOT DIPPED, ZINC COATED STEEL SHEET, PROPERLY FASTENED WITH PLASTIC STRAPS EVERY 300mm.
29. HANGERS AND SADDLES SHALL BE MADE OF SMOOTH SURFACE ROUND BARS MADE OF MILD STEEL. SIZING SHALL BE IN ACCORDANCE WITH THE PHILIPPINE MECHANICAL CODE AS ILLUSTRATED.
30. ALL HVAC WORKS SHALL BE SUPERVISED BY A REGISTERED MECHANICAL ENGINEER OF GOOD STANDING.
31. REFRIGERANT PIPE SIZES OF THE FCU TO ACCU (VRF) ARE BASED ON MANUFACTURER'S APPROVAL.

## LEGENDS, SYMBOLS & ABBREVIATION

| SYMBOL/ ABBREV. | DESCRIPTION | ABBREV. | DESCRIPTION |
|---|---|---|---|
| | EQUIPMENT TAG | TYP | TYPICAL |
| | FAN COIL UNIT | MH | MANHOLE |
| ERV | ENERGY RECOVERY VENTILATOR | FCU | FAN COIL UNIT |
| | CASSETTE TYPE EXHAUST FAN | CFCU | CUBIC FEET PER MINUTE |
| | AIR COOLED CONDENSING UNIT | TSP | TOTAL STATIC PRESSURE |
| CEF | CEILING EXHAUST FAN | EF | EXHAUST FAN |
| SAD | SUPPLY AIR DUCT | TR | TONS OF REFRIGERATION |
| SAG | SUPPLY AIR GRILLE | Pa | PASCAL |
| EAG | EXHAUST AIR GRILLE | W | WATTS |
| FAG | FRESH AIR GRILLE | CFCU | CUBIC FEET PER MINUTE |
| AC | AIR CURTAIN | BTU | BRITISH THERMAL UNIT |
| EAD | EXHAUST AIR DUCT | FAD | FRESH AIR DUCT |
| FAD | FRESH AIR DUCT | SH | SERVICE HANDHOLE |
| HP | HORSEPOWER | A | AMPERE |
| VCD | VOLUME CONTROL DAMPER | KG | KILOGRAM |
| TED | TOILET EXHAUST DUCT | PH | PHASE |
| TSP | TOTAL STATIC PRESSURE | HZ | HERTZ |

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REPUBLIC ACT 9184, Article IV, Section 33
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MECHANICAL

## EQUIPMENT SCHEDULE

### FAN COIL UNIT ( FCU)

| ITEM NO. | QTY. | UNIT DESIGNATION | AREA SERVED | FLOOR LEVEL | SELECTED DESIGN | | | | TYPE OF DRIVE | ELECTRICAL CHARACTERISTICS | | | REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | UNIT TYPE | COOLING CAPACITY | | AIR FLOW RATE ( CFM) | | VOLTS | PHASE | HZ | |
| | | | | | | TR | BTU/HR | | | | | | |
| 1 | 2 | FCU-A1 - FCU-A2 | DIRECTOR'S OFFICE | GF | WALL MOUNTED | 1.5 | 18000 | 600 | DIRECT | 230 | 1 | 60 | UNIT SHALL BE VRF-TYPE FAN COIL UNIT COMPLETE WITH STANDARD ACCESSORIES ( DAIKIN BRAND OR APPROVED EQUAL)<br><br>NOTE: GROUPINGS OF FCU TO ACCU IS BASED ON THE FLOOR LEVEL AND LETTER INDICATED.<br>EXAMPLE:<br>ACCU - GF - A<br>FGF-A1 TO FGF-A6 |
| 2 | 1 | FCU-A3 | E-BIDDING ROOM | GF | WALL MOUNTED | 1.5 | 18000 | 600 | DIRECT | 230 | 1 | 60 | |
| 3 | 1 | FCU-A4 | STAFF LOUNGE | GF | WALL MOUNTED | 1.5 | 18000 | 600 | DIRECT | 230 | 1 | 60 | |
| 4 | 2 | FCU-A5-FCU-A6 | SERVER ROOM | GF | WALL MOUNTED | 1.5 | 18000 | 600 | DIRECT | 230 | 1 | 60 | |
| 5 | 6 | FCU-B1-FCU-B6 | CUSTOMER SERVICE | GF | WALL MOUNTED | 2 | 24000 | 800 | DIRECT | 230 | 1 | 60 | |
| 6 | 1 | FCU-B7 | CASHIER | GF | WALL MOUNTED | 0.6 | 7200 | 240 | DIRECT | 230 | 1 | 60 | |
| 7 | 2 | FCU-B8 - FCU-B9 | PHILGEPS OFFICE | GF | WALL MOUNTED | 2 | 24000 | 800 | DIRECT | 230 | 1 | 60 | |
| 8 | 4 | FCU-B10 - FCU-B13 | LOBBY | GF | WALL MOUNTED | 2 | 24000 | 800 | DIRECT | 230 | 1 | 60 | |
| 9 | 3 | FCU-C1 - FCU-C3 | TRAINING RM1 | GF | WALL MOUNTED | 2 | 24000 | 800 | DIRECT | 230 | 1 | 60 | |
| 10 | 6 | FCU-C4 - FCU-C9 | PHILGEPS OFFICE | GF | WALL MOUNTED | 2 | 24000 | 800 | DIRECT | 230 | 1 | 60 | |
| 11 | 1 | FCU-D1 | CONF. RM 1 | MEZZANINE | WALL MOUNTED | 2 | 24000 | 800 | DIRECT | 230 | 1 | 60 | |
| 12 | 1 | FCU-D2 | CONF. RM 2 | MEZZANINE | WALL MOUNTED | 1.5 | 18000 | 600 | DIRECT | 230 | 1 | 60 | |
| 13 | 1 | FCU-D3 | CONF. RM 3 | MEZZANINE | WALL MOUNTED | 1.5 | 18000 | 600 | DIRECT | 230 | 1 | 60 | |
| 14 | 4 | FCU-E1 - FCU-E4 | CENTRALIZED STORAGE | MEZZANINE | WALL MOUNTED | 2 | 24000 | 800 | DIRECT | 230 | 1 | 60 | |
| 15 | 2 | FCU-F1-FCU-F2 | SERVER ROOM | MEZZANINE | WALL MOUNTED | 1.5 | 18000 | 600 | DIRECT | 230 | 1 | 60 | |
| 16 | 1 | FCU-F3 | CONF. RM 4 | MEZZANINE | WALL MOUNTED | 2 | 24000 | 800 | DIRECT | 230 | 1 | 60 | |
| 17 | 1 | FCU-F4 | OPPB | MEZZANINE | WALL MOUNTED | 2 | 24000 | 800 | DIRECT | 230 | 1 | 60 | |
| 18 | 2 | FCU-F5 - FCU-F6 | COA | MEZZANINE | WALL MOUNTED | 2 | 24000 | 800 | DIRECT | 230 | 1 | 60 | |
| 19 | 2 | FCU-G1 - FCU-G2 | DIRECTOR'S OFFICE 1 | 2F | WALL MOUNTED | 1.5 | 18000 | 600 | DIRECT | 230 | 1 | 60 | |
| 20 | 2 | FCU-G3 - FCU-G4 | DIRECTOR'S OFFICE 2 | 2F | WALL MOUNTED | 1.5 | 18000 | 600 | DIRECT | 230 | 1 | 60 | |
| 21 | 1 | FCU-G5 | ASST. DIR 1 | 2F | WALL MOUNTED | 1.3 | 15600 | 520 | DIRECT | 230 | 1 | 60 | |
| 22 | 1 | FCU-G6 | ASST. DIR 2 | 2F | WALL MOUNTED | 1.3 | 15600 | 520 | DIRECT | 230 | 1 | 60 | |
| 23 | 1 | FCU-G7 | OFFICE 1 | 2F | WALL MOUNTED | 2 | 24000 | 800 | DIRECT | 230 | 1 | 60 | |
| 24 | 2 | FCU-G8 - FCU-G9 | LAN | 2F | WALL MOUNTED | 1.5 | 18000 | 600 | DIRECT | 230 | 1 | 60 | |
| 25 | 1 | FCU-H1 | CASHIER 1 | 2F | WALL MOUNTED | 0.6 | 7200 | 240 | DIRECT | 230 | 1 | 60 | |
| 26 | 6 | FCU-H2 - FCU-H7 | OFFICE 1 | 2F | WALL MOUNTED | 2 | 24000 | 800 | DIRECT | 230 | 1 | 60 | |
| 27 | 1 | FCU-H8 | OFFICE 2 | 2F | WALL MOUNTED | 2 | 24000 | 800 | DIRECT | 230 | 1 | 60 | |
| 28 | 3 | FCU-I1 -FCU-I3 | ELEVATOR LOBBY | 2F | WALL MOUNTED | 2 | 24000 | 800 | DIRECT | 230 | 1 | 60 | |
| 29 | 6 | FCU-I4 -FCU-I9 | OFFICE 2 | 2F | WALL MOUNTED | 2 | 24000 | 800 | DIRECT | 230 | 1 | 60 | |
| 30 | 1 | FCU-I10 | HELP DESK 1 | 2F | WALL MOUNTED | 1.5 | 18000 | 600 | DIRECT | 230 | 1 | 60 | |
| 31 | 1 | FCU-I11 | HELP DESK 2 | 2F | WALL MOUNTED | 1.5 | 18000 | 600 | DIRECT | 230 | 1 | 60 | |
| 32 | 4 | FCU-J1 - FCU-J4 | MUSEUM | 3F | CEILING CASSETTE | 4 | 48000 | 1600 | DIRECT | 230 | 1 | 60 | |
| 33 | 4 | FCU-K1 - FCU-K4 | LOBBY | 3F | CEILING CASSETTE | 4 | 48000 | 1600 | DIRECT | 230 | 1 | 60 | |
| 34 | 1 | FCU-K5 | STORAGE & TREATMENT RM. | 3F | CEILING CASSETTE | 4 | 48000 | 1600 | DIRECT | 230 | 1 | 60 | |
| 35 | 2 | FCU-L1 - FCU-L2 | RECEPTION DESK | 3F | CEILING CASSETTE | 4 | 48000 | 1600 | DIRECT | 230 | 1 | 60 | |
| 36 | 2 | FCU-M1 - FCU-M2 | PROJECT MGMT WAR RM. 1 | 3F | WALL MOUNTED | 2 | 24000 | 800 | DIRECT | 230 | 1 | 60 | |
| 37 | 2 | FCU - M3 -FCU -M4 | PROJECT MGMT WAR RM2 | 3F | WALL MOUNTED | 2 | 24000 | 800 | DIRECT | 230 | 1 | 60 | |

## EQUIPMENT SCHEDULE

### AIR COOLED CONDENSING UNIT ( ACCU-VRF-TYPE)

| ITEM NO. | UNIT DESIG. | FLOOR LEVEL | ACCU COOLING CAPACITY | | NO. OF MODULE AND CAPACITY | COOLING POWER CONSUMPTION ( KW) | SOUND LEVEL ( DB) | OPERATING WEIGHT ( KG) | ELECTRICAL CHARACTERISTICS | | | REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | TR | BTU/HR | | | | | VOLTS | PHASE | HZ | |
| 1 | ACCU-A | GF | 9 | 108,000 | 12hp | 8.82 | 59 | 200 | 230 | 3 | 60 | 1. APPROPRIATE ACCU CLEARANCES SHALL BE BY MANUFACTURER'S INSTALLATION STANDARD.<br>2. APPROPRIATE ACCU FOOTING/MOUNTING BASE SUPPORT SHALL BE BY MANUFACTURER'S INSTALLATION STANDARD.<br>3. PROVIDE APPROPRIATE VIBRATION ISOLATOR FOR BLOWERS, ACCU'S AND E.MOTORS.<br>4. UNIT SHALL BE SUITABLE FOR OUTDOOR INSTALLATION C/W STD. ACCUS. ( DAIKIN BRAND OR APPROVED EQUAL) .<br>NOTE: GROUPINGS OF FCU TO ACCU IS BASED ON THE FLOOR LEVEL AND LETTER INDICATED.<br>EXAMPLE:<br>ACCU - GF -A<br>FGF-A1 TO FGF-A8 |
| 2 | ACCU-B | GF | 24.6 | 295,200 | 14hp + 18hp | 28.1 | 64 | 600 | 230 | 3 | 60 | |
| 3 | ACCU-C | GF | 18 | 216,000 | 10hp + 14hp | 17.6 | 61 | 500 | 230 | 3 | 60 | |
| 4 | ACCU-D | M | 5 | 60,000 | 6hp | 5.18 | 56 | 200 | 230 | 3 | 60 | |
| 5 | ACCU-E | M | 8 | 96,000 | 8hp | 5.18 | 56 | 200 | 230 | 3 | 60 | |
| 6 | ACCU-F | M | 10 | 120,000 | 12hp | 8.82 | 59 | 200 | 230 | 3 | 60 | |
| 7 | ACCU-G | 2F | 16.8 | 187,200 | 8hp + 12hp | 14.0 | 61 | 400 | 230 | 3 | 60 | |
| 8 | ACCU-H | 2F | 20.8 | 247,200 | 12hp + 14hp | 19.8 | 63 | 600 | 230 | 3 | 60 | |
| 9 | ACCU-I | 2F | 14.8 | 175,200 | 8hp + 12hp | 14.0 | 61 | 400 | 230 | 3 | 60 | |
| 10 | ACCU-J | 3F | 20 | 240,000 | 12hp + 14hp | 19.5 | 63 | 600 | 230 | 3 | 60 | |
| 11 | ACCU-K | 3F | 16 | 192,000 | 8hp + 14hp | 15.9 | 63 | 600 | 230 | 3 | 60 | |
| 12 | ACCU-L | 3F | 8 | 96,000 | 8hp | 5.18 | 56 | 200 | 230 | 3 | 60 | |
| 13 | ACCU-M | 3F | 8 | 96,000 | 8hp | 5.18 | 56 | 200 | 230 | 3 | 60 | |

### VENTILATION EQUIPMENT

| ITEM NO. | QTY | UNIT DESIGNATION | AREA SERVED | DRIVE | TYPE | AIR FLOWRATE | | STATIC PRESSURE | | ELECTRICAL CHARACTERISTICS | | | | REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | CFM | CMH | INCH | PASCAL | WATT | VOLT | PHASE | Hz | |
| 1 | 20 | EF - 1 TO 20 | TOILET | DIRECT | TOILET EXHAUST FAN CEILING CASSETTE | 450 | 765 | 0.40 | 100 | 55 | 220 | 1 | 60 | UNIT SHALL BE KDK MODEL OR EQUIVALENT, CEILING CASSETTE TYPE SERVED AS TOILET EXHAUST FAN MECHANICAL CONTRACTOR TO INSTALL WIRE AND MAKE UNIT OPERATIONAL. |
| 2 | 4 | WF - 1 TO 4 | PANTRY | DIRECT | WALL FAN | - | - | - | - | 60 | 220 | 1 | 60 | UNIT TO BE INSTALLED IS WALL MOUNTED TYPE FAN FROM REPUTABLE MANUFACTURER. |
| 3 | 2 | CF - 1 & 2 | PANTRY | DIRECT | CIRCULATING FAN | - | - | - | - | 60 | 220 | 1 | 60 | UNIT TO BE INSTALLED IS CEILING MOUNTED TYPE FAN FROM REPUTABLE MANUFACTURER |
| 4 | 5 | AC 1-5 | ENTRANCE | DIRECT | AIR CURTAIN | 800 | 1360 | 0.05 | 125 | 200 | 220 | 1 | 60 | SIMILAR TO KDK W65C OR APPROVED EQUAL ( LENGHT = 900 ) MECHANICAL CONTRACTOR TO INSTALL WIRE AND MAKE UNIT OPERATIONAL |
| 5 | 2 | WEF 1-2 | SOLAR CONTROL ROOM | DIRECT | WALL EXHAUST FAN | 350 | 510 | 0.40 | 100 | 40 | 220 | 1 | 60 | UNIT SHALL BE KDK MODEL OR EQUIVALENT, WALL EXHAUST FAN TYP. MECHANICAL CONTRACTOR TO INSTALL WIRE AND MAKE UNIT OPERATIONAL. |

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REPUBLIC ACT 9184, Article XI, Section 33
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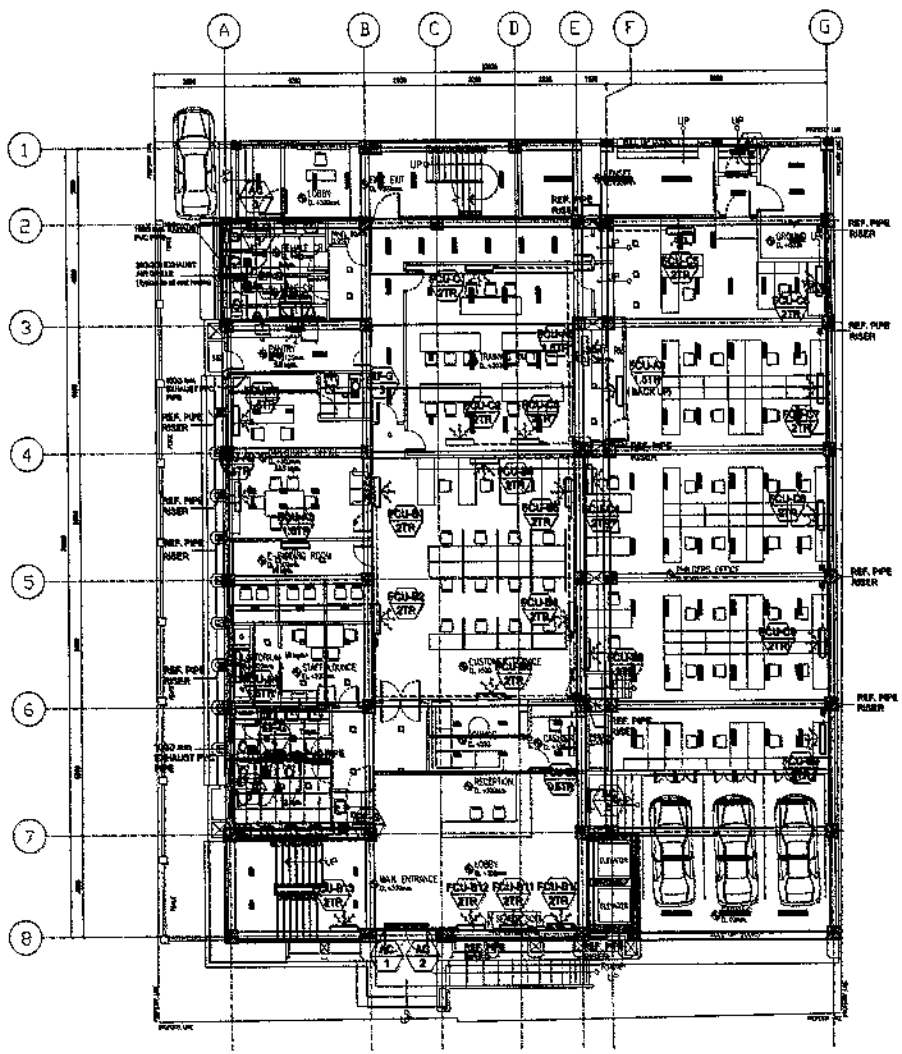
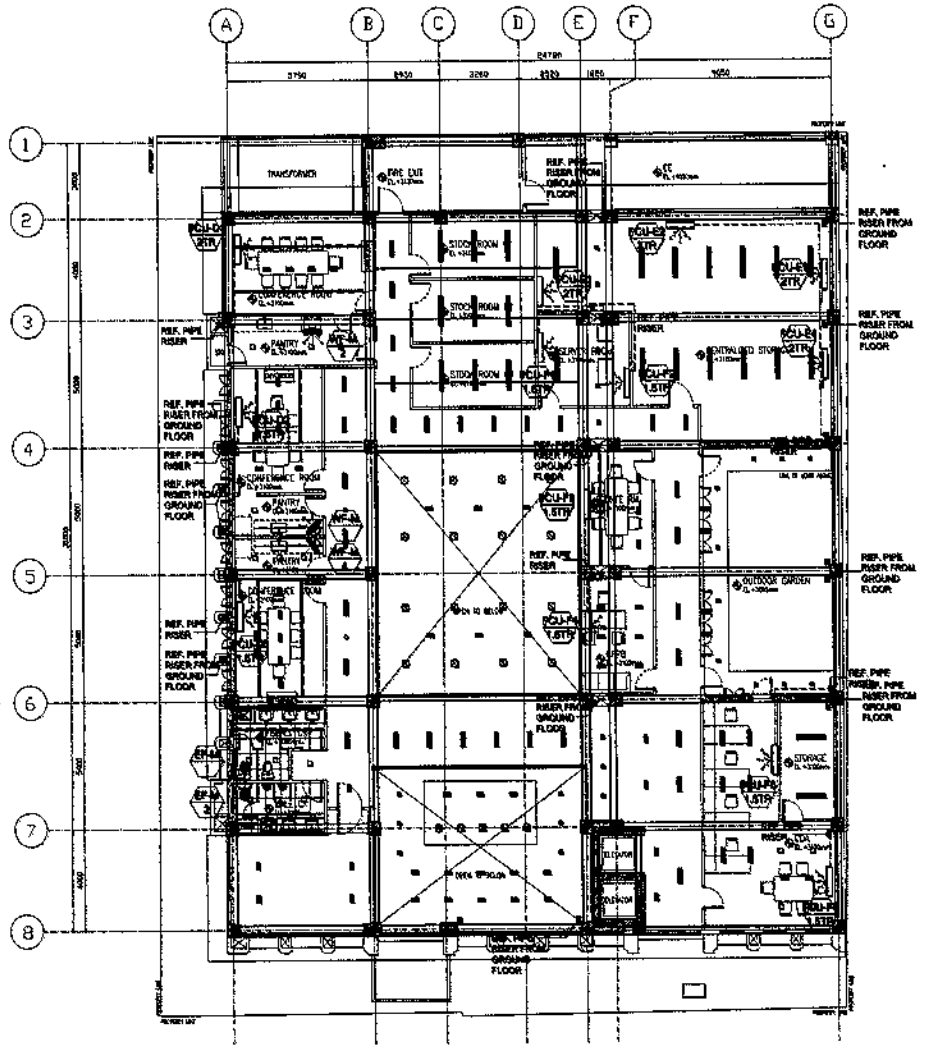
SHEET NO.
M 03 08
MECHANICAL



GROUND FLOOR
## A/C AND VENTILATION SYSTEM LAY-OUT
SCALE: 1:100 MTS



MEZZANINE
## A/C AND VENTILATION SYSTEM LAY-OUT
SCALE: 1:100 MTS

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REPUBLIC ACT 9184: Article IV, Section 35

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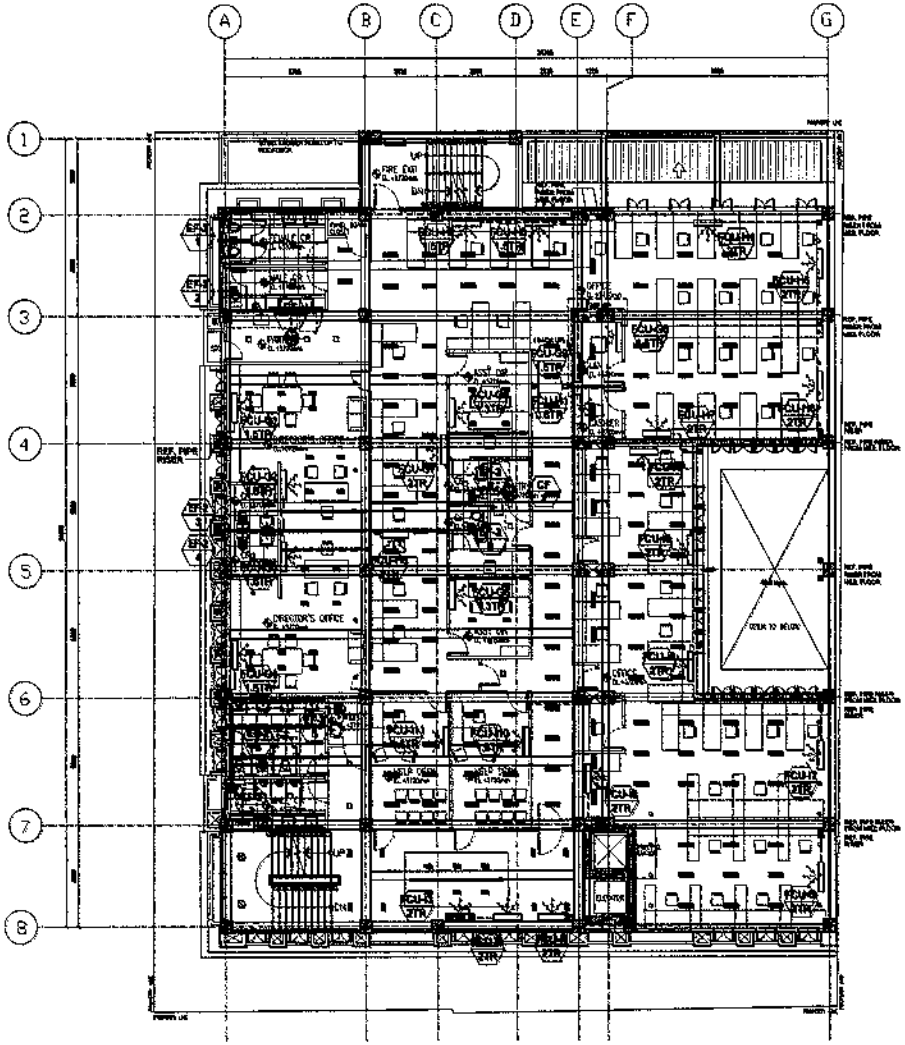
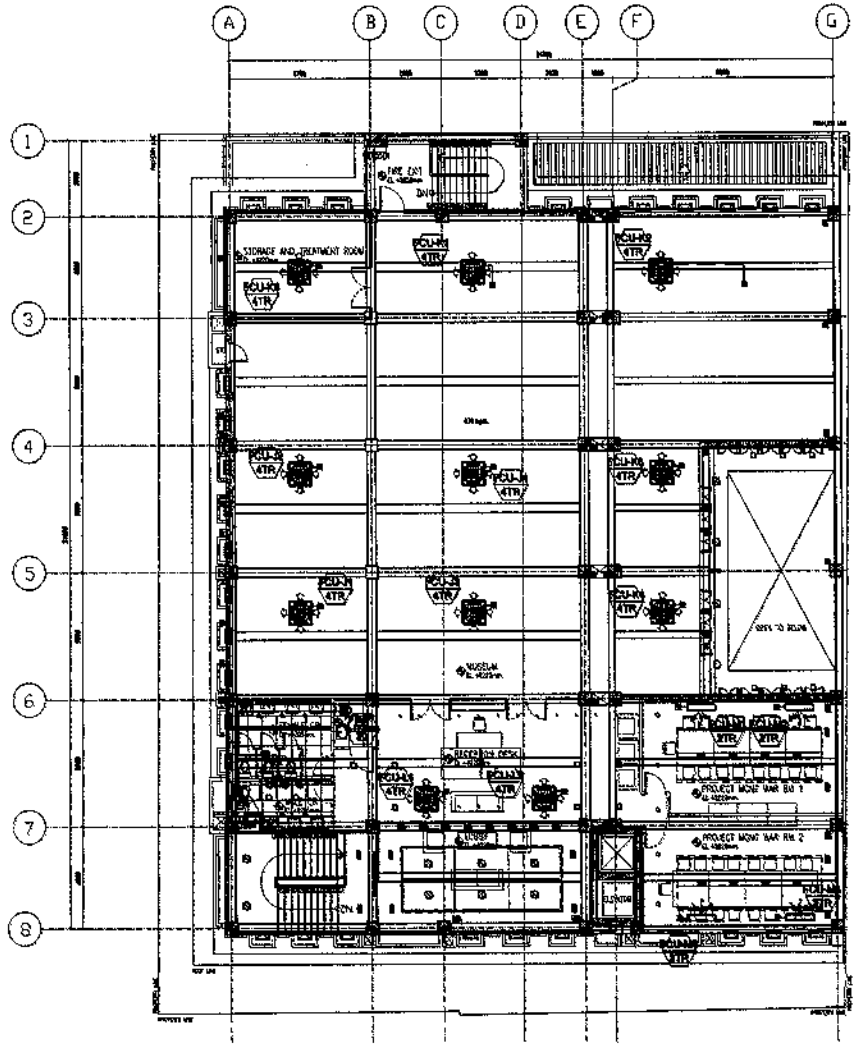
DATE: 03.07.19

SHEET CONTENTS
GF & MEZZANINE A/C AND VENTILATION SYSTEM LAYOUT

SHEET NO.
M 04 08
MECHANICAL




SECOND FLOOR
## A/C AND VENTILATION SYSTEM LAY-OUT
SCALE: 1:100 MTS




THIRD FLOOR
## A/C AND VENTILATION SYSTEM LAY-OUT
SCALE: 1:100 MTS

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REPUBLIC ACT 9184:
Article 19, Section 33

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**Department of Budget and Management Arcache Building**
SAN MIGUEL, CITY OF MANILA

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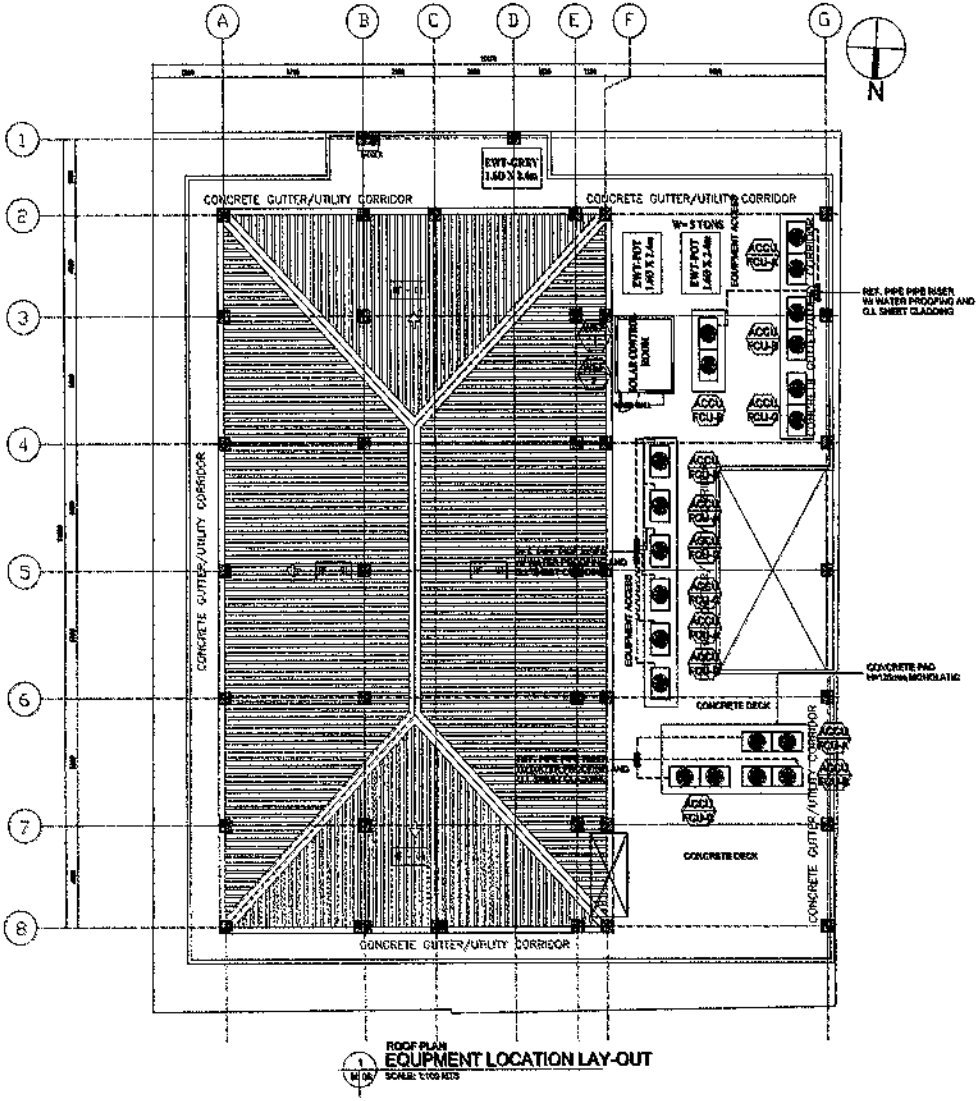
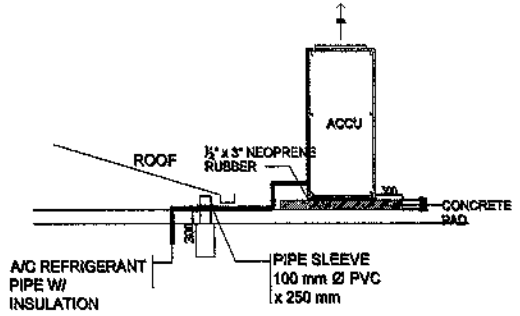
CHECKED BY: EJR / GE
DATE: 12.13.16
REVISED BY: NNNO
DATE: 05.01.18

SHEET CONTENTS
2F & 3F AC AND VENTILATION SYSTEM LAY-OUT

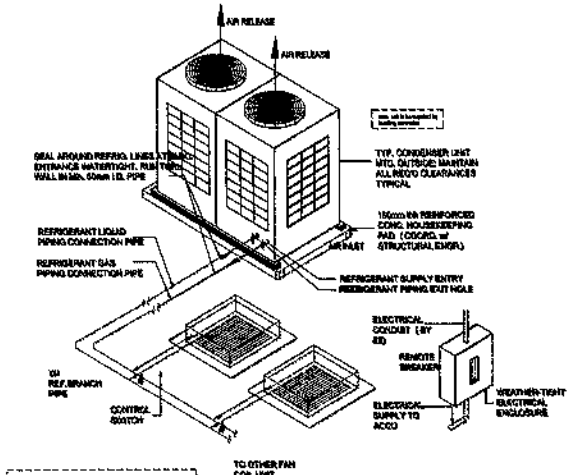
SHEET NO.
M 05
08
MECHANICAL




ROOF PLAN
**EQUIPMENT LOCATION LAY-OUT**
SCALE: 1:100 MTS



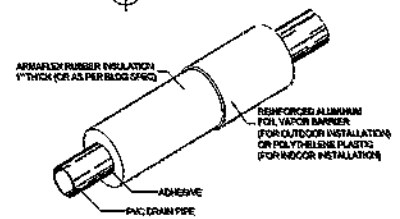

**TYPICAL ACCU MOUNTING DETAIL**
NOT TO SCALE




NOTE:
1. REFRIGERANT PIPE SIZE & OTHER ACCESSORIES TO BE VERIFY TO SUPPLIER
2. ACTUAL PIPE ROUTE AND RISER TO BE CHECK AND VERIFY ON SITE
3. ALL WORKS TO BE COORDINATED W/ BLDG. ADMIN

**ISOMETRIC DIAGRAM OF VRF ACCU & FCU SYSTEM**

**VRF ACCU & FCU ISOMETRIC DRAWING**
NOT TO SCALE




**AC DRAIN PIPE INSULATION DETAIL**
NOT TO SCALE

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REPUBLIC ACT 9246: A Right to Practice Profession (Section 23)

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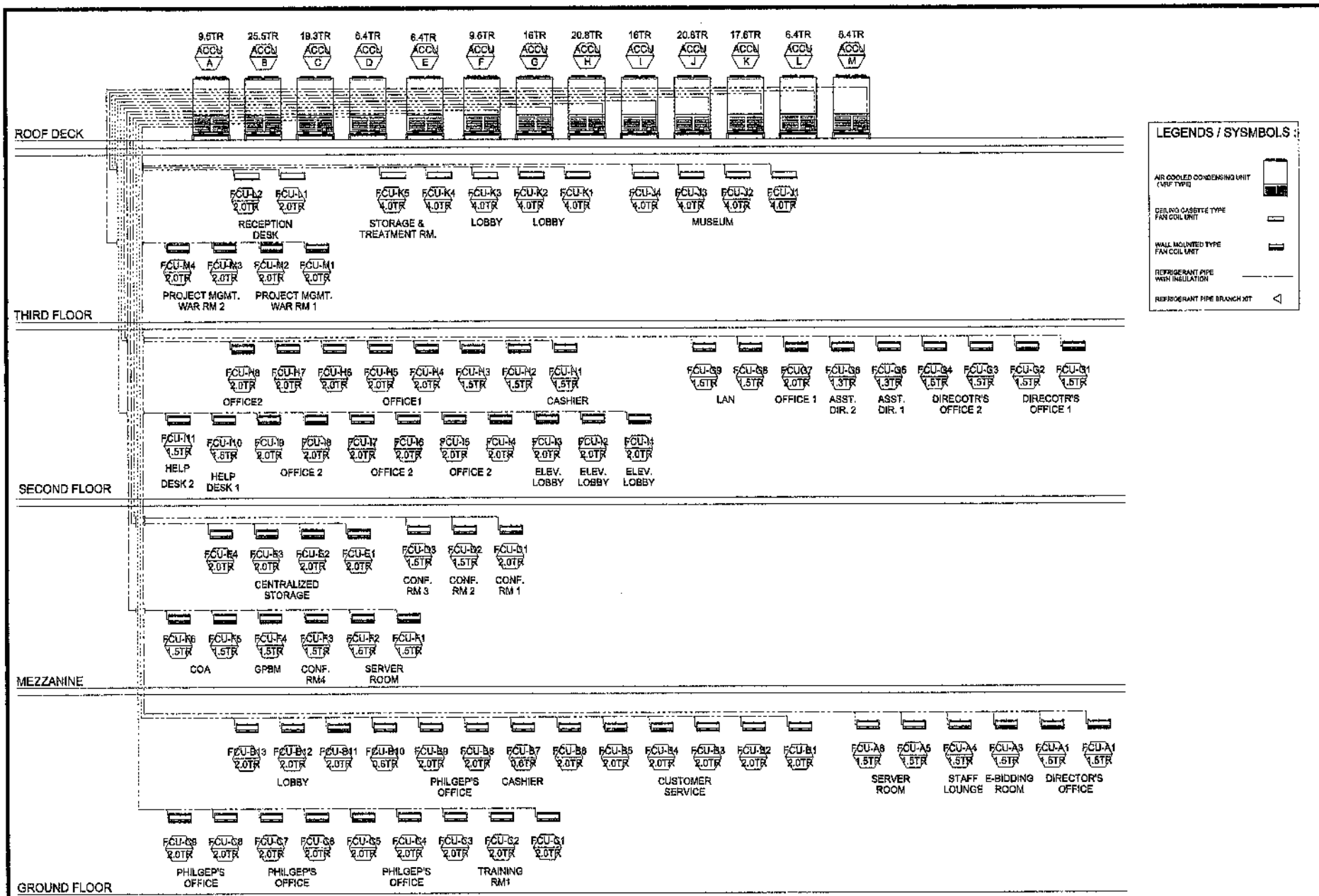
SHEET CONTENTS
EQUIPMENT LOCATION MISC. DETAILS

SHEET NO.
M 06
08
MECHANICAL

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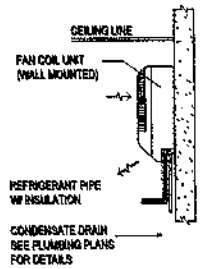
SHEET CONTENTS
FCU LAYOUT SCHEMATIC RISER DIAGRAM

SHEET NO.
M 07 08
MECHANICAL




## 1 M/07 MOUNTING DETAIL OF WALL MOUNTED FCU
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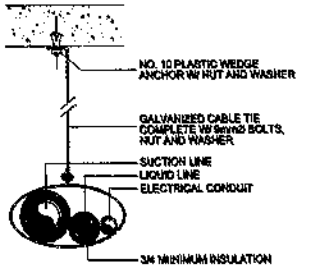
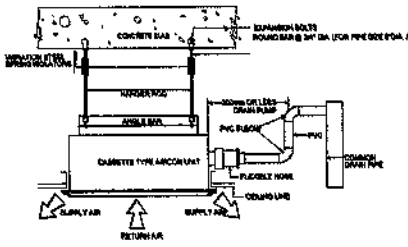
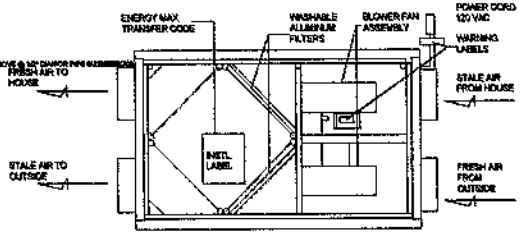



## 2 M/07 REF. PIPE HANGER & SUPPORT DET.
NOT TO SCALE




## 3 M/07 FCU MOUNTING & DRAIN DETAILS
NOT TO SCALE




## 4 M/07 ENERGY RECOVERY VENTILATOR DETAIL
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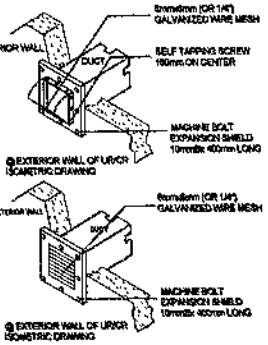
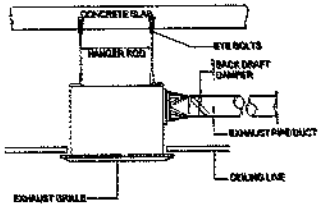
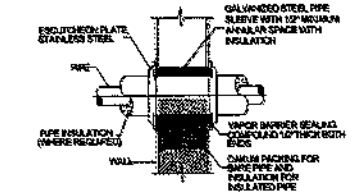


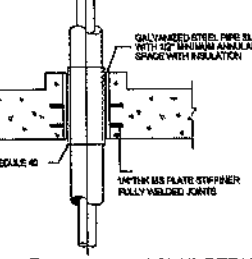

## 5 M/07 WALL-DISCHARGE EXHAUST AIR GRILLE
NOT TO SCALE



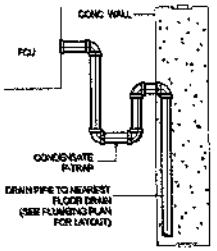

## 6 M/07 CEILING MOUNTED EXHAUST FAN DETAIL
NOT TO SCALE



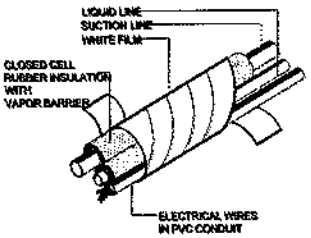

## 13 M/07 PIPE THRU WALL DETAIL
NOT TO SCALE



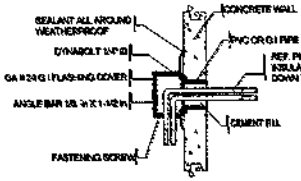

## 8 M/07 PIPE THRU SLAB DETAIL
NOT TO SCALE



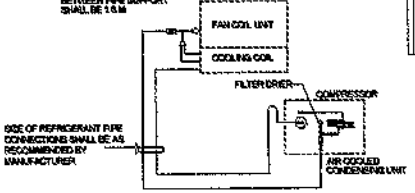

## 10 M/07 CONDENSATE DRAIN DETAIL
NOT TO SCALE




## 14 M/07 SECTION PIPES DETAIL
NOT TO SCALE




## 7 M/07 INSULATION CARRIED THRU WALL & SUPPORT DETAIL
NOT TO SCALE

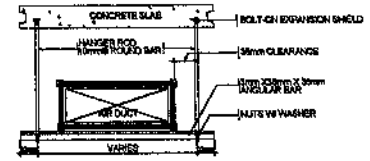


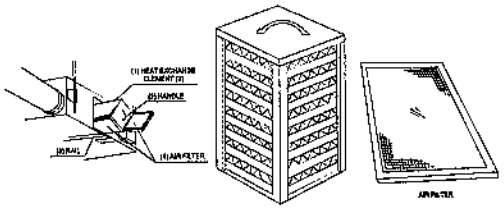

## 11 M/07 REFRIGERANT PIPES THRU OUTSIDE WALL DETAIL
NOT TO SCALE

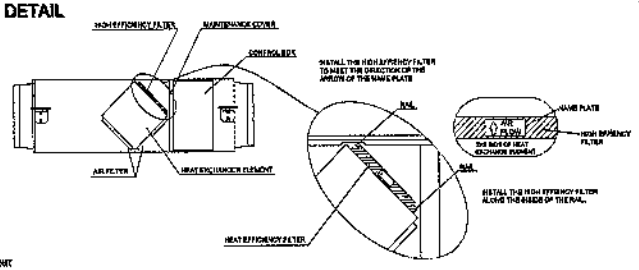
## 9 M/07 SCHEDULE OF A/C AND E/A DUCT GAUGES & HANGERS
NOT TO SCALE

DUCT GAUGES & HANGER DETAIL

| DIMENSION LONGEST SIDE | G.I SHEET U.S STANDARD GAUGES | SIZE OF SUPPORT ANGLE BAR (mm) | DISTANCE OF HANGERS (mm) | MINIMUM SIZE OF STEEL ROD HANGERS |
|---|---|---|---|---|
| UP TO 300 | GAUGE NO. 26 | 25 X 25 X 3 | 1200 | 10 diameter |
| 325 TO 750 | GAUGE NO. 24 | 35 X 35 X 4 | 1200 | 10 diameter |
| 775 TO 1500 | GAUGE NO. 22 | 35 X 35 X 4 | 1200 | 10 diameter |
| 1525 TO 2600 | GAUGE NO. 20 | 50 X 50 X 6 | 1200 | 12 diameter |
| 2625 AND UP | GAUGE NO. 18 | 50 X 50 X 6 | 1200 | 12 diameter |




## 12 M/07 FILTER DETAILS
NOT TO SCALE

## 15 M/07 REFRIGERANT SCHEMATIC DIAGRAM
NOT TO SCALE

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SHEET CONTENTS
MISC. DETAILS

SHEET NO.
M 08
MECHANICAL

# HVAC INSTRUMENTATION AND CONTROLS

## PART 1 - GENERAL

### 1.2 SUMMARY

A. This Section includes control equipment for HVAC systems and components, including control components for cooling units not supplied with factory-wired controls.

### 1.3 DEFINITIONS

A. DDC: Direct-digital controls.
B. LAN: Local area network.
C. MS/TP: Master-slave/token-passing.
D. PICS: Protocol Implementation Conformance Statement.

### 1.4 SYSTEM DESCRIPTION

A. Control system consists of sensors, indicators, actuators, final control elements, interface equipment, other apparatus, and accessories to control mechanical systems.

B. Control system consists of sensors, indicators, actuators, final control elements, interface equipment, other apparatus, accessories, and software connected to distributed controllers operating in multiuser, multitasking environment on token-passing network and programmed to control mechanical systems.

### 1.5 SUBMITTALS

A. Product Data: Include manufacturer's technical literature for each control device. Indicate dimensions, capacities, performance characteristics, electrical characteristics, finishes for materials, and installation and startup instructions for each type of product indicated.

1. Each control device labeled with setting or adjustable range of control.

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. Schematic flow diagrams showing fans, pumps, coils, dampers, valves, and control devices.
2. Wiring Diagrams: Power, signal, and control wiring. Differentiate between manufacturer-installed and field-installed wiring.
3. Details of control panel faces, including controls, instruments, and labeling.
4. Written description of sequence of operation.
5. Schedule of dampers including size, leakage, and flow characteristics.
6. Schedule of valves including leakage and flow characteristics.
7. Trunk cable schematic showing programmable control unit locations and trunk data conductors.
8. Listing of connected data points, including connected control unit and input device.
9. System graphics indicating monitored systems, data (connected and calculated) point addresses, and operator notations.
10. System configuration showing peripheral devices, batteries, power supplies, diagrams, modems, and interconnections.

C. Software and Firmware Operational Documentation: Include the following:

1. Software operating and upgrade manuals.
2. Program Software Backup: On a magnetic media or compact disc, complete with data

files.

3. Device address list.
4. Printout of software application and graphic screens.
5. Software license required by and installed for DDC workstations and control systems.

D. Field Test Reports: Indicate and interpret test results for compliance with performance requirements.

E. Maintenance Data: For systems to include in maintenance manuals specified in Contract. Include the following:

1. Maintenance instructions and lists of spare parts for each type of control device and compressed-air station.
2. Interconnection wiring diagrams with identified and numbered system components and devices.
3. Keyboard illustrations and step-by-step procedures indexed for each operator function.
4. Inspection period, cleaning methods, cleaning materials recommended, and calibration tolerances.
5. Calibration records and list of set points.

F. Project Record Documents: Record actual locations of control components, including control units, thermostats, and sensors. Revise Shop Drawings to reflect actual installation and operating sequences.

## 1.8 DELIVERY, STORAGE, AND HANDLING

A. Factory-Mounted Components: Where control devices specified in this Section are indicated to be factory mounted on equipment, arrange for shipping of control devices to unit manufacturer.

## 1.9 COORDINATION

A. Coordinate location of thermostats, humidistats, and other exposed control sensors with plans and room details before installation.

# PART 2 - PRODUCTS

## 2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

B. Manufacturers: Subject to compliance with requirements, provide products by the following:

1. Control Systems and DDC Components

C. Application Software: Include the following:

1. Input/output capability from operator station.
2. Operator system access levels via software password.
3. Database creation and support.
4. Dynamic color graphic displays.
5. Alarm processing.
6. Event processing.
7. Automatic restart of field equipment on restoration of power.
8. Data collection.
9. Graphic development on workstation.

D. Control Units: Modular, comprising processor board with programmable, nonvolatile, random-access memory; integral interface equipment; and backup power source.

1. Units monitor or control each input/output point; process information; execute commands from other control units, devices, and operator stations; and download from or upload to

operator station.

2. Stand-alone mode control functions operate regardless of network status. Functions include the following:

a. Global communications.

b. Discrete/digital, analog, and pulse input/output.

c. Monitoring, controlling, or addressing data points.

d. Testing and developing control algorithms without disrupting field hardware and controlled environment.

2.2 SENSORS

A. Electronic Sensors: Vibration and corrosion resistant; for wall, immersion, or duct mounting as required.

1. Thermistor temperature sensors as follows:

a. Accuracy: Plus or minus 0.5 deg F at calibration point.

b. Wire: Twisted, shielded-pair cable.

c. Insertion Elements in Ducts: Single point, 18 inches long; use where not affected by temperature stratification or where ducts are smaller than 9 sq. ft.

d. Averaging Elements in Ducts: 36 inches long, flexible; use where prone to temperature stratification or where ducts are larger than 9 sq. ft.; length as required.

e. Insertion Elements for Liquids: Brass socket with minimum insertion length of 2-1/2 inches.

f. Room Sensors: Stainless-steel cover plate with insulated back and security screws and no pushbutton override.

2. Humidity Sensors: Bulk polymer sensor element.

a. Accuracy: 5 percent full range with linear output.

b. Room Sensors: With locking cover matching room thermostats, span of 25 to 90 percent relative humidity.

c. Duct and Outside-Air Sensors: With element guard and mounting plate, range of 0 to 100 percent relative humidity.

B. Equipment operation sensors as follows:

1. Status Inputs for Electric Motors: Current-sensing relay with current transformers, adjustable and set to 175 percent of rated motor current.

C. Carbon-Dioxide Sensor and Transmitter: Single detectors, using solid-state infrared sensors, suitable over a temperature range of 23 to 130 deg F, calibrated for 0 to 2 percent, with continuous or averaged reading, 4 to 20 mA output, and wall mounted.

D. Electric Low-Limit Duct Thermostat: Snap-acting, single-pole, single-throw, manual- or automatic-reset switch that trips if temperature sensed across any 12 inches of bulb length is equal to or below set point.

1. Bulb Length: Minimum 20 feet.

2. Quantity: One thermostat for every 20 sq. ft. of coil surface.

2.3 ACTUATORS

A. Electric Motors: Size to operate with sufficient reserve power to provide smooth modulating action or two-position action.

1. Permanent Split-Capacitor or Shaded-Pole Type: Gear trains completely oil immersed and sealed. Equip spring-return motors with integral spiral-spring mechanism in housings designed for easy removal for service or adjustment of limit switches, auxiliary switches, or feedback potentiometer.

2. Non-spring-Return Motors for Valves Larger than NPS 2-1/2: Size for running torque of 150 in. x lbf and breakaway torque of 300 in. x lbf.

3. Spring-Return Motors for Valves Larger than NPS 2-1/2: Size for running and breakaway torque of 150 in. x lbf.
4. Non-spring-Return Motors for Dampers Larger than 25 Sq. Ft.: Size for running torque of 150 in. x lbf and breakaway torque of 300 in. x lbf.
5. Spring-Return Motors for Dampers Larger than 25 Sq. Ft.: Size for running and breakaway torque of 150 in. x lbf.

B. Electronic Damper Actuators: Direct-coupled type designed for minimum 60,000 full-stroke cycles at rated torque.
1. Valves: Size for torque required for valve close-off at maximum pump differential pressure.
2. Dampers: Size for running torque calculated as follows:
   a. Parallel-Blade Damper with Edge Seals: 7 inch-pounds/sq. ft. of damper.
   b. Opposed-Blade Damper with Edge Seals: 5 inch-pounds/sq. ft. of damper.
   c. Parallel-Blade Damper without Edge Seals: 4 inch-pounds/sq. ft of damper.
   d. Opposed-Blade Damper without Edge Seals: 3 inch-pounds/sq. ft. of damper.
   e. Dampers with 2 to 3 Inches wg of Pressure Drop or Face Velocities of 1000 to 2500 FPM: Multiply the minimum full-stroke cycles above by 1.5.
   f. Dampers with 3 to 4 Inches wg of Pressure Drop or Face Velocities of 2500 to 3000 FPM: Multiply the minimum full-stroke cycles above by 2.0.
3. Coupling: V-bolt and V-shaped, toothed cradle.

## 2.4 CONTROL VALVES

A. Control Valves: Factory fabricated, of type, body material, and pressure class based on maximum pressure and temperature rating of piping system, unless otherwise indicated.

B. Globe Valves NPS 2 and Smaller: Bronze body, bronze trim, rising stem, renewable composition disc, and screwed ends with backseating capacity repackable under pressure.

C. Globe Valves NPS 2-1/2 and Larger: Iron body, bronze trim, rising stem, plug-type disc, flanged ends, and renewable seat and disc.

## 2.5 DAMPERS

A. Dampers: AMCA-rated, opposed-blade design; 0.1084-inch minimum, galvanized-steel frames with holes for duct mounting; damper blades shall not be less than 0.0635-inch galvanized steel with maximum blade width of 8 inches.
1. Blades shall be secured to 1/2-inch- diameter, zinc-plated axles using zinc-plated hardware, with nylon blade bearings, blade-linkage hardware of zinc-plated steel and brass, ends sealed against spring-stainless-steel blade bearings, and thrust bearings at each end of every blade.
2. Operating Temperature Range: From minus 40 to plus 200 deg F.
3. For standard applications, include optional closed-cell neoprene edging.
4. For low-leakage applications, use parallel- or opposed-blade design with inflatable seal blade edging, or replaceable rubber seals, rated for leakage at less than 10 cfm per sq. ft. of damper area, at differential pressure of 4 inches wg when damper is being held by torque of 50 in. x lbf; when tested according to AMCA 500D.

## 2.6 CONTROL CABLE

A. Electronic and Fiber-Optic Cable for Control Wiring: As specified in Division 16 Section "Control/Signal Transmission Media. "Plenum Rated Cable neatly affixed to building structure shall be used above accessible ceilings.

## PART 3 – EXECUTION

### 3.1 EXAMINATION

A. Verify that conditioned power supply is available to control units and operator workstation.
B. Verify that duct-, pipe-, and equipment-mounted devices and wiring are installed before proceeding with installation.

### 3.2 INSTALLATION

A. Install equipment level and plumb.
B. Install software in control units and operator workstation. Implement all features of programs to specified requirements and as appropriate to sequence of operation.
C. Connect and configure equipment and software to achieve sequence of operation specified.
D. Verify location of thermostats, humidistats, and other exposed control sensors with plans and room details before installation. Locate all 60 inches above the floor.
   1. Install averaging elements in ducts and plenums in crossing or zigzag pattern.
E. Install damper motors on outside of duct in warm areas, not in locations exposed to outdoor temperatures.
F. Install labels and nameplates to identify control components according to Contract. "Basic Mechanical Materials and Methods."
G. Install electronic and fiber-optic cables according to Contract "Control/Signal Transmission Media."

### 3.3 ELECTRICAL WIRING AND CONNECTION INSTALLATION

A. Install raceways, boxes, and cabinets according to the attached drawings/plans.
B. Install building wire and cable according to the attached drawings/plans.
   1. Conceal cable, except in mechanical rooms and areas where other conduit and piping are exposed.
   2. Install exposed cable in raceway.
   3. Install concealed cable in accessible ceilings.
   4. Bundle and harness multi-conductor instrument cable in place of single cables where several cables follow a common path.
   5. Fasten flexible conductors, bridging cabinets and doors, along hinge side; protect against abrasion. Tie and support conductors.
   6. Number-code or color-code conductors for future identification and service of control system, except local individual room control cables.
D. Connect manual-reset limit controls independent of manual-control switch positions. Automatic duct heater resets may be connected in interlock circuit of power controllers.
E. Connect hand-off-auto selector switches to override automatic interlock controls when switch is in hand position.

### 3.4 CONNECTIONS

A. Piping installation requirements are specified in Plans. Drawings indicate general arrangement of piping, fittings, and specialties.
   1. Install piping adjacent to machine to allow service and maintenance.
B. Ground equipment.
   1. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

3.5 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including piping and electrical connections. Report results in writing.
   1. Operational Test: After electrical circuitry has been energized, start units to confirm proper unit operation. Remove malfunctioning units, replace with new units, and retest.
   2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment, and retest.
   3. Calibration test electronic controllers by disconnecting input sensors and stimulating operation with compatible signal generator.

B. Engage a factory-authorized service representative to perform startup service.

C. Replace damaged or malfunctioning controls and equipment.
   1. Start, test, and adjust control systems.
   2. Demonstrate compliance with requirements, including calibration and testing, and control sequences.
   3. Adjust, calibrate, and fine tune circuits and equipment to achieve sequence of operation specified.

D. Verify DDC as follows:
   1. Verify software including automatic restart, control sequences, scheduling, reset controls, and occupied/unoccupied cycles.
   2. Verify operation of operator workstation.
   3. Verify local control units including self-diagnostics.

3.6 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain control systems and components.
   1. Train Owner's maintenance personnel on procedures and schedules for starting and topping, troubleshooting, servicing, and maintaining equipment and schedules.
   2. Provide operator training on data display, alarm and status descriptors, requesting data, executing commands, calibrating and adjusting devices, resetting default values, and requesting logs. Include a minimum of 4 hours' dedicated instructor time on-site.
   3. Review data in maintenance manuals. Refer to "Operation and Maintenance Data."
   4. Schedule training with Owner, through Architect, with at least seven days' advance notice.

END OF SECTION

## ELECTRICAL REQUIREMENTS

A. Motors:
1. Electric motors furnished as a component part of equipment furnished under this Division shall conform to the requirements of IEEE, NEMA, UL, ANSI C50, and ANSI CI. Motors to be suitable for required load, duty voltage, phase, frequency, service and location.
2. Motors to be suitable for continuous duty at rated horsepower with temperature rise not to exceed 40°C for drip-proof motors, 50°C for splash-proof motors, and 55°C for totally enclosed motors. Motors to be capable of withstanding momentary overloads of 25 percent without injurious overheating.
3. Motors to have nameplates giving Manufacturer's name, serial number, horsepower, speed and current characteristics.
4. Motor leads shall be permanently identified and supplied with connectors.
5. Each motor to be selected for quiet operation in accordance with NEMA standards.

B. Motor Starters:
1. Electric motor starters shall conform to requirements of IEEE, NEMA, UL, ANSI, CI and shall be suitable for the required load, duty, voltage, phase, frequency, service, and location.
2. When interlocking or automatic control of single phase motors is required, motors to be furnished with full voltage, across-the-line starters.

C. Connections:
1. All wiring on the supply side shall be furnished and installed by the General Contractor while wiring on the load side and its termination to supply shall be furnished and installed by the Winning Bidder in this Contract.
2. Starters not factory mounted on equipment shall be furnished and installed under this Contract.

END OF SECTION

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK:

A. Types of ductwork accessories required for project include the following:

1. Dampers.
   a. Low pressure manual dampers.
   b. Control dampers.
   c. Counterbalanced relief dampers.
2. Fire and smoke dampers.
3. Turning vanes.
4. Duct hardware.
5. Duct access doors.
6. Flexible connections.

1.2 QUALITY ASSURANCE:

A. Manufacturer's Qualifications: Firms regularly engaged in manufacture of ductwork accessories, of types and sizes required, whose products have been in satisfactory use in similar service for not less than 3 years.

B. Codes and Standards:

1. SMACNA Compliance: Comply with applicable portions of SMACNA "HVAC Duct Construction Standards, Metal and Flexible".
2. Industry Standards: Comply with ASHRAE recommendations pertaining to construction of ductwork accessories, except as otherwise indicated.
3. UL Compliance: Construct, test, and label fire dampers in accordance with UL Standard 555 "Fire Dampers and Ceiling Dampers".
4. NFPA Compliance: Comply with applicable provisions of NFPA 90A "Air Conditioning and Ventilating Systems", pertaining to installation of ductwork accessories.

1.3 SUBMITTALS:

A. Product Data: Submit manufacturer's technical product data for each type of ductwork accessory, including dimensions, capacities, and materials of construction; and installation instructions.

B. Shop Drawings: Submit manufacturer's assembly-type shop drawings for each type of ductwork accessory showing interfacing requirements with ductwork, method of fastening or support, and methods of assembly of components.

C. Maintenance Data: Submit manufacturer's maintenance data including parts lists for each type of duct accessory. Include this data, product data, and shop drawings in maintenance manual; in accordance with requirements.

PART 2 - PRODUCTS

2.1 DAMPERS:

A. Low Pressure Manual Dampers: Provide dampers of single blade type or multi-blade type, constructed in accordance with SMACNA "HVAC Duct Construction Standards".

B. Control Dampers: Provide dampers with parallel blades for 2- position control, or opposed blades for modulating control. Construct blades of 16-ga steel, provide heavy-duty molded self-lubricating nylon bearings, 1/2" diameter steel axles spaced on 9" centers. Construct frame of 2" x 1/2"

x 1/8" steel channel for face areas 25 sq. ft. and under; 4" x 1-1/4" x 16-ga channel for face areas over 25 sq. ft. Provide galvanized steel finish with aluminum touch-up.

C. Control Dampers: "Control Systems" for control dampers; not work of this section.

D. Counterbalanced Relief Dampers: Provide dampers with parallel blades, counterbalanced and factory-set to relieve at indicated static pressure. Construct blades of 16-ga aluminum, provide 1/2" diameter ball bearings, 1/2" diameter steel axles spaced on 9" centers. Construct frame of 2" x 1/2" x 1/8" steel channel for face areas 25 sq. ft. and under; 4" x 1-1/4" x 16-ga channel for face areas over 25 sq. ft. Provide galvanized steel finish on frame with aluminum touch-up.

2.2 FIRE AND SMOKE DAMPERS:

A. Fabricated Fire Dampers: Provide dampers constructed in accordance with SMACNA "Fire Dampers and Heat Stop Guide".

B. Fire Dampers: Provide fire dampers, of types and sizes indicated. Construct casings of 11-ga galvanized steel with bonded red acrylic enamel finish. Provide fusible link rated at 160 to 165 degrees F (71 to 74 degrees C) unless otherwise indicated. Provide damper with positive lock in closed position, and with the following additional features:

1. Damper Blade Assembly: Single-blade type.
2. Damper Blade Assembly: Multi-blade type.
3. Damper Blade Assembly: Curtain type.
4. Blade Material: Steel, match casing.
5. Blade Material: Stainless steel.

C. Fire/Smoke Dampers: Provide fire/smoke dampers, of types and sizes indicated. Construct casings of 11-ga galvanized steel with bonded red acrylic enamel finish. Provide fusible link rated at 160 to 165 degrees F (71 to 74 degrees C) unless otherwise indicated. Provide additional frangible link containing explosive charge, connected in series with fusible link. Provide stainless steel spring loaded leakage seals in sides of casing, and 36" long wire leads for connecting smoke link to smoke detector, and the following additional features:

1. Damper Blade Assembly: Single-blade type.
2. Damper Blade Assembly: Multi-blade type.
3. Damper Blade Assembly: Curtain type.
4. Blade Material: Steel, matching casing.
5. Blade Material: Stainless steel.

D. Motor-Driven Fire/Smoke Dampers: Provide motor-driven fire/smoke dampers in types and sizes indicated, with casing constructed of 11-ga galvanized steel with bonded red acrylic enamel finish, fusible link 160 to 165 degrees F (71 to 74 degrees C), unless otherwise indicated, and curtain type stainless steel interlocking blades, with electric motor equipped with instant closure clutch, stainless steel cable damper blade linkage, motor mounting bracket, and 32" long wire leads for connecting to smoke detector, and with the following construction features:

1. Unit Assembly: Motor mounted outside air stream.
2. Unit Assembly: Motor mounted inside air stream.

2.3 TURNING VANES:

A. Fabricated Turning Vanes: Provide fabricated turning vanes and vane runners, constructed in accordance with SMACNA "HVAC Duct Construction Standards".

B. Manufactured Turning Vanes: Provide turning vanes constructed of 1-1/2" wide curved blades set at 3/4" o.c., supported with bars perpendicular to blades set at 2" o.c., and set into side strips suitable for mounting in ductwork.

C. Acoustic Turning Vanes: Provide acoustic turning vanes constructed of airfoil shaped aluminum extrusion with perforated faces and fiberglass fill.

2.4 DUCT HARDWARE:

A. General: Provide duct hardware, manufactured by one manufacturer for all items on project, for following:

1. Test Holes: Provide in ductwork at fan inlet and outlet, and elsewhere as indicated, duct test holes, consisting of slot and cover, for instrument tests.

2. Quadrant Locks: Provide for each damper, quadrant lock device on one end of shaft; and end bearing plate on other end for damper lengths over 12". Provide extended quadrant locks and end extended bearing plates for externally insulated ductwork.

2.5 DUCT ACCESS DOORS:

A. General: Provide where indicated, duct access doors of size indicated.

B. Construction: Construct of same or greater gage as ductwork served, provide insulated doors for insulated ductwork. Provide flush frames for uninsulated ductwork, extended frames for externally insulated duct. Provide one size hinged, other side with one handle-type latch for doors 12" high and smaller, 2 handle-type latches for larger doors.

2.6 FLEXIBLE CONNECTORS:

A. General: Provide flexible duct connections wherever ductwork connects to vibration isolated equipment. Construct flexible connections of neoprene-coated flameproof fabric crimped into duct flanges for attachment to duct and equipment. Make airtight joint. Provide adequate joint flexibility to allow for thermal, axial, transverse, and torsional movement, and also capable of absorbing vibration of connected equipment.

PART 3 - EXECUTION

3.1 INSPECTION:

A. Examine areas and conditions under which ductwork accessories will be installed. Do not proceed with work until unsatisfactory conditions have been corrected in manner acceptable to Installer.

3.2 INSTALLATION OF DUCTWORK ACCESSORIES:

A. Install ductwork accessories in accordance with manufacturer's installation instructions, with applicable portions of details of construction as shown in SMACNA standards, and in accordance with recognized industry practices to ensure that products serve intended function.

B. Install turning vanes in square or rectangular 90 degree elbows in supply and exhaust air systems, and elsewhere as indicated.

C. Install access doors to open against system air pressure, with latches operable from either side, except outside only where duct is too small for person to enter.

D. Coordinate with other work, including ductwork, as necessary to interface installation of ductwork accessories properly with other work.

3.3 FIELD QUALITY CONTROL:

A. Operate installed ductwork accessories to demonstrate compliance with requirements. Test for air leakage while system is operating. Repair or replace faulty accessories, as required to obtain proper operation and leak-proof performance.

3.4 ADJUSTING AND CLEANING:

A. Adjusting: Adjust ductwork accessories for proper settings, install fusible links in fire dampers and adjust for proper action.

1. Label access doors in accordance with "Mechanical Identification".
2. Final positioning of manual dampers is specified in "Testing, Adjusting, and Balancing".

B. Cleaning: Clean factory-finished surfaces. Repair any marred or scratched surfaces with manufacturer's touch-up paint.

3.5 EXTRA STOCK:

A. Furnish extra fusible links to Owner, one link for every 10 installed of each temperature range; obtain receipt.

END OF SECTION

## PART 1 - GENERAL

1.1 SUMMARY
A. This Section specifies piping materials and installation methods common to more than one section of Division 15 and includes joining materials, piping specialties, and basic piping installation instructions.

1.2 SUBMITTALS:
A. Product Data: Submit product data on the following items:
1. Escutcheons
2. Dielectric Unions and Fittings
3. Mechanical Sleeve Seals
4. Strainers
B. Quality Control Submittals:
1. Submit welders' certificates specified in Quality Assurance below.

2.2 PIPE AND FITTINGS
A. Refer to the individual piping system specification sections in this Division for specifications on piping and fittings relative to that particular system.

2.3 JOINING MATERIALS:
A. Welding Materials: Comply with Section II, Part C, ASME Boiler and Pressure Vessel Code for welding materials appropriate for the wall thickness and chemical analysis of the pipe being welded.
B. Brazing Materials: Comply with SFA-5.8, Section II, ASME Boiler and Pressure Vessel Code for brazing filler metal materials appropriate for the materials being joined.
C. Soldering Materials: Refer to individual piping system specifications for solder appropriate for each respective system.
D. Gaskets for Flanged Joints: Gasket material shall be full-faced for cast-iron flanges and raised-face for steel flanges. Select materials to suit the service of the piping system in which installed and which conform to their respective ANSI Standard (A21.11, B16.20, or B16.21). Provide materials that will not be detrimentally affected by the chemical and thermal conditions of the fluid being carried.

2.4 PIPING SPECIALTIES:
A. Escutcheons: Chrome-plated, stamped steel, hinged, split-ring escutcheon, with set screw. Inside diameter shall closely fit pipe outside diameter, or outside of pipe insulation where pipe is insulated. Outside diameter shall completely cover the opening in floors, walls, or ceilings.
B. Unions: Malleable-iron, Class 150 for low pressure service and class 250 for high pressure service; hexagonal stock, with ball-and-socket joints, metal-to-metal bronze seating surfaces; female threaded ends.
C. Dielectric Unions: Provide dielectric unions with appropriate end connections for the pipe materials in which installed (screwed, soldered, or flanged), which effectively isolate dissimilar metals, prevent galvanic action, and stop corrosion.
D. Dielectric Waterway Fittings: Electroplated steel or brass nipple, with an inert and non-corrosive, thermoplastic lining.
E. Y-Type Strainers: Provide strainers full line size of connecting piping, with ends matching piping system materials. Screens shall be Type 304 stainless steel, with 3/64" perforations at 233 per square inch.
1. Provide strainers with 125 psi working pressure rating for low pressure applications, and 250 psi

pressure rating for high pressure application.
2. Threaded Ends, 2" and Smaller: Cast-iron body, screwed screen retainer with centered blowdown fitted with pipe plug.
3. Threaded Ends, 2-1/2" and Larger: Cast-iron body, bolted screen retainer with off-center blowdown fitted with pipe plug.
4. Flanged Ends, 2-1/2" and Larger: Cast-iron body, bolted screen retainer with off-center blowdown fitted with pipe plug.
5. Butt Welded Ends, 2-1/2" and Larger for Low Pressure Application: Schedule 40 cast carbon steel body, bolted screen retainer with off-center blowdown fitted with pipe plug.
6. Butt Welded Ends, 2-1/2" and Larger for High Pressure Application: Schedule 80 cast carbon steel body, bolted screen retainer with off-center blowdown fitted with pipe plug.
7. Grooved Ends, 2-1/2" and Larger: Tee pattern, ductile-iron or malleable-iron body and access end cap, access coupling with EDPM gasket.
F. Sleeves:
1. Sheet-Metal Sleeves: 10 gauge, galvanized sheet metal, round tube closed with welded longitudinal joint.
2. Steel Sleeves: Schedule 40 galvanized, welded steel pipe, ASTM A53, Grade A.
G. Mechanical Sleeve Seals: Modular mechanical type, consisting of interlocking synthetic rubber links shaped to continuously fill annular space between pipe and sleeve, connected with bolts and pressure plates which cause rubber sealing elements to expand when tightened, providing watertight seal and electrical insulation.

## PART 3 - EXECUTION

3.1 PREPARATION:
A. Ream ends of pipes and tubes, and remove burrs. Bevel plain ends of steel pipe.
B. Remove scale, slag, dirt, and debris for both inside and outside of piping and fittings before assembly.

3.2 INSTALLATIONS:
A. General Locations and Arrangements: Drawings (plans, schematics, and diagrams) indicate the general location and arrangement of the piping systems. Location and arrangement of piping layout take into consideration pipe sizing and friction loss, expansion, pump sizing, and other design considerations. So far as practical, install piping as indicated. Refer to individual system specifications for requirements for coordination drawing submittals.
B. Conceal all pipe installations in walls, pipe chases, utility spaces, above ceilings, below grade or floors, unless indicated otherwise.
C. Install piping free of sags or bends and with ample space between piping to permit proper insulation applications.
D. Install exposed piping at right angles or parallel to building walls. Diagonal runs are not permitted, unless expressly indicated on the Drawings.
E. Install piping tight to slabs, beams, joists, columns, walls and other permanent elements of the building. Provide space to permit insulation applications, with 1" clearance outside the insulation. Allow sufficient space above removable ceiling panels to allow for panel removal.
F. Locate groups of pipes parallel to each other, spaced to permit applying full insulation and servicing of valves.
G. Install drains at low points in mains, risers, and branch lines consisting of a tee fitting, 3/4" ball valve, and short 3/4" threaded nipple and cap.
H. Exterior Wall Penetrations: Seal pipe penetrations through exterior walls using sleeves and

mechanical sleeve seals. Pipe sleeves smaller than 6" shall be steel; pipe sleeves 6" and larger shall be sheet metal.
I. Fire Barrier Penetrations: Where pipes pass through fire rated walls, partitions, ceilings, or floors, the fire rated integrity shall be maintained.

3.3 FITTINGS AND SPECIALTIES:
A. Use fittings for all changes in direction and all branch connections.
B. Remake leaking joints using new materials.
C. Install strainers on the supply side of each control valve, pressure reducing or regulating valve, solenoid valve, and elsewhere as indicated.
D. Install unions adjacent to each valve, and at the final connection to each piece of equipment and plumbing fixture having 2" and smaller connections, and elsewhere as indicated.
E. Install Flanges in piping 2-1/2" and larger, where indicated, adjacent to each valve, and at the final connection to each piece of equipment.
F. Install dielectric unions to connect piping materials of dissimilar metals in dry piping systems (gas, compressed air, vacuum).
G. Install dielectric fittings to connect piping materials of dissimilar metals in wet piping systems (water, steam).

3.4 JOINTS:
A. Steel Pipe Joints:
1. Pipe 2" and Smaller: Thread pipe with tapered pipe threads in accordance with ANSI B2.1. Cut threads full and clean using sharp dies. Ream threaded ends to remove burrs and restore full inside diameter. Apply pipe joint lubricant or sealant suitable for the service for which the pipe is intended on the male threads at each joint and tighten joint to leave not more than 3 threads exposed.
2. Pipe Larger Than 2":
a. Weld pipe joints (except for exterior water service pipe) in accordance with ASME Code for Pressure Piping, B31.
b. Weld pipe joints of exterior water service pipe in accordance with AWWA C206.
c. Install flanges on all valves, apparatus, and equipment. Weld pipe flanges to pipe ends in accordance with ASME B31.1.0 Code for Pressure Piping. Clean flange faces and install gaskets. Tighten bolts to torque specified by manufacturer of flange and flange bolts, to provide uniform compression of gaskets.
B. Non-ferrous Pipe Joints:
1. Brazed And Soldered Joints: For copper tube and fitting joints, braze joints in accordance with ANSI B31.1.0 - Standard Code for Pressure Piping, Power Piping and ANSI B9.1 - Standard Safety Code for Mechanical Refrigeration.
2. Thoroughly clean tube surface and inside surface of the cup of the fittings, using very fine emory cloth, prior to making soldered or brazed joints. Wipe tube and fittings clean and apply flux. Flux shall not be used as the sole means for cleaning tube and fitting surfaces.
3. Mechanical Joints: Flared compression fittings may be used for refrigerant lines 3/4" and smaller.
C. Joints for other piping materials are specified within the respective piping system sections.

3.5 FIELD QUALITY CONTROL:
A. Testing: Refer to individual piping system specification sections.

END OF SECTION

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes rectangular, round, and flat-oval metal ducts and plenums for heating, ventilating, and air conditioning systems in pressure classes from minus 2 inches to plus 10 inches water gage.

1.2 DEFINITIONS

A. Sealing Requirements Definitions: For the purposes of duct systems sealing requirements specified in this Section, the following definitions apply:

1. Seams: A seam is defined as joining of two longitudinally (in the direction of airflow) oriented edges of duct surface material occurring between two joints. All other duct surface connections made on the perimeter are deemed to be joints.

2. Joints: Joints include girth joints; branch and sub branch intersections; so-called duct collar tap-ins; fitting subsections; louver and air terminal connections to ducts; access door and access panel frames and jambs; duct, plenum, and casing abutments to building structures.

1.3 SYSTEM PERFORMANCE REQUIREMENTS

A. The duct system design, as indicated, has been used to select and size air moving and distribution equipment and other components of the air system. Changes or alterations to the layout or configuration of the duct system must be specifically approved in writing. Accompany requests for layout modifications with calculations showing that the proposed layout will provide the original design results without increasing the system total pressure.

1.4 SUBMITTALS

A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.

B. Product data including details of construction relative to materials, dimensions of individual components, profiles, and finishes for the following items:

1. Duct Liner.
2. Sealing Materials.
3. Fire-Stopping Materials.

C. Shop drawings from duct fabrication shop, drawn to a scale not smaller than 1/4 inch equals 1 foot, on drawing sheets same size as the Contract Drawings, detailing:

1. Fabrication, assembly, and installation details, including plans, elevations, sections, details of components, and attachments to other work.
2. Duct layout, indicating pressure classifications and sizes in plan view. For exhaust ducts systems, indicate the classification of the materials handled as defined in this Section.
3. Fittings.
4. Reinforcing details and spacing.
5. Seam and joint construction details.
6. Penetrations through fire-rated and other partitions.
7. Terminal unit, coil, and humidifier installations.
8. Hangers and supports, including methods for building attachment, vibration isolation, and duct attachment.

D. Coordination drawings for ductwork installation in accordance in this Division "Basic Mechanical Requirements." In addition to the requirements specified in "Basic Mechanical Requirements" show the following:

1. Coordination with ceiling suspension members.

2. Spatial coordination with other systems installed in the same space with the duct systems.

3. Coordination of ceiling- and wall-mounted access doors and panels required to provide access to dampers and other operating devices.

4. Coordination with ceiling-mounted lighting fixtures and air outlets and inlets.

E. Welding certificates including welding procedures specifications, welding procedures qualifications test records, and welders' qualifications test records complying with requirements specified in "Quality Assurance" below.

F. Record drawings including duct systems routing, fittings details, reinforcing, support, and installed accessories and devices, in accordance with Division 15 Section "Basic Mechanical Requirements" and Division 1.

G. Maintenance data for volume control devices, fire dampers, and smoke dampers, in accordance with this Division "Basic Mechanical Requirements"

1.5 QUALITY ASSURANCE

A. Qualify welding processes and welding operators in accordance with AWS D1.1 "Structural Welding Code - Steel" for hangers and supports and AWS D9.1 "Sheet Metal Welding Code."

B. Qualify each welder in accordance with AWS qualification tests for welding processes involved. Certify that their qualification is current.

C. NFPA Compliance: Comply with the following NFPA Standards:

1. NFPA 90A, "Standard for the Installation of Air Conditioning and Ventilating Systems," except as indicated otherwise.

2. NFPA 96, "Standard for the Installation of Equipment for the Removal of Smoke and Grease-Laden Vapors for Commercial Cooking Equipment," Chapter 3, "Duct System," for kitchen hood duct systems, except as indicated otherwise.

D. Field-Constructed Mock-Up: Prior to installation of duct systems erect mock-ups representing duct systems pressure classifications greater than 2 inches. Build mock-ups to comply with the following requirements, using materials indicated for final unit of Work.

1. Locate mock-ups on the site. Mock-up may be a representative section of the actual duct system.

2. Include the minimum number of each of the following features and fittings:

a. Five transverse joints.

b. One access door.

c. Two typical branch connections each with at least one elbow.

d. Two typical flexible duct or flexible connector connections for each type duct and apparatus.

3. Perform tests specified in "Field Quality Control." Modify mock-up construction and perform additional tests as required to achieve specified minimum acceptable results.

4. Obtain approval of mock-ups before beginning final fabrication.

5. Retain and maintain mock-ups during construction in undisturbed condition as a standard for judging completed unit of Work.

6. Demolish and remove mock-ups from Project site when directed.

7. Accepted mock-ups that form a part of the actual duct system may remain and become part of completed unit of Work.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver sealant and fire-stopping materials to site in original unopened containers or bundles with labels informing about manufacturer, product name and designation, color, expiration period for use, pot life, curing time, and mixing instructions for multi-component materials.

B. Store and handle sealant fire-stopping materials in compliance with manufacturers' recommendations to prevent their deterioration or damage due to moisture, high or low temperatures, contaminants, or other causes.

C. Deliver and store stainless steel sheets with mill-applied adhesive protective paper, maintained through fabrication and installation.

## PART 2 - PRODUCTS

### 2.1 SHEET METAL MATERIALS

A. Sheet Metal, General: Provide sheet metal in thicknesses indicated, packaged and marked as specified in ASTM A 700.

B. Galvanized Sheet Steel: Lock-forming quality, ASTM A 527, Coating Designation G 90. Provide mill phosphatized finish for exposed surfaces of ducts exposed to view.

C. PVC-Coated Galvanized Steel: UL-181 Class 1 Listing. Lock-forming quality galvanized sheet steel with ASTM A 527, Coating Designation G 90. Provide with factory-applied, 4-mil, PVC coating on the exposed surfaces of ducts and fittings (exterior of ducts and fittings for underground applications, and the interior of ducts and fittings for fume-handing applications) and 2-mil PVC coating on the reverse side of the ducts and fittings.

D. Carbon Steel Sheets: ASTM A 366, cold-rolled sheets, commercial quality, with oiled, exposed matte finish.

E. Stainless Steel: ASTM A 480, Type 316, sheet form, with No. 4 finish on exposed surface for ducts exposed to view; Type 304, sheet form, with No. 1 finish for concealed ducts.

F. Aluminum Sheets: ASTM B 209, Alloy 3003, Temper H14, sheet form; with standard, one-side bright finish where ducts are exposed to view, and mill finish for concealed ducts.

G. Reinforcement Shapes and Plates: Unless otherwise indicated, provide galvanized steel reinforcing where installed on galvanized sheet metal ducts. For aluminum and stainless steel ducts provide reinforcing of compatible materials.

H. Tie Rods: Galvanized steel, 1/4-inch minimum diameter for 36-inch length or less; 3/8-inch minimum diameter for lengths longer than 36 inches.

### 2.2 DUCT LINER

A. General: Comply with NFPA Standard 90A and TIMA Standard AHC-101.

B. Materials: ASTM C 1071, Type II, with coated surface exposed to airstream to prevent erosion of glass fibers.

1. Thickness: 1/2 inch.
2. Thickness: 1 inch.
3. Thickness: 1-1/2 inch.
4. Density: 1-1/2 pounds.
5. Density: 2 pounds.
6. Density: 3 pounds.
7. Thermal Performance: "K-Factor" equal to 0.28 or better, at a mean temperature of 75 deg
8. Fire Hazard Classification: Flame spread rating of not more than 25 without evidence of continued progressive combustion and a smoke developed rating of no higher than 50, when tested in accordance with ASTM C 411.
9. Liner Adhesive: Comply with NFPA Standard 90A and ASTM C 916.
10. Mechanical Fasteners: Galvanized steel, suitable for adhesive attachment, mechanical attachment, or welding attachment to duct. Provide fasteners that do not damage the liner when applied as recommended by the manufacturer, that do not cause leakage in the duct, and will

indefinitely sustain a 50-pound tensile dead load test perpendicular to the duct wall.

a. Fastener Pin Length: As required for thickness of insulation, and without projecting more than 1/8 inch into the airstream.

b. Adhesive for Attachment of Mechanical Fasteners: Comply with the "Fire Hazard Classification" of duct liner system.

2.3 SEALING MATERIALS

A. Joint and Seam Sealants, General: The term sealant used here is not limited to materials of adhesive or mastic nature, but also includes tapes and combinations of open weave fabric strips and mastics.

B. Joint and Seam Tape: 2 inches wide, glass-fiber-fabric reinforced.

C. Tape Sealing System: Woven-fiber tape impregnated with a gypsum mineral compound and a modified acrylic/silicone activator to react exothermically with the tape to form a hard, durable, airtight seal.

D. Joint and Seam Sealant: One-part, non-sag, solvent-release-curing, polymerized butyl sealant complying with FS TT-S-001657, Type I; formulated with a minimum of 75 percent solids.

E. Flanged Joint Mastics: One-part, acid-curing, silicone elastomeric joint sealants, complying with ASTM C 920, Type S, Grade NS, Class 25, Use O.

2.4 FIRE-STOPPING

A. Fire-Resistant Sealant: Provide two-part, foamed-in-place, fire-stopping silicone sealant formulated for use in a through-penetration fire-stop system for filling openings around duct penetrations through walls and floors, having fire-resistance ratings indicated as established by testing identical assemblies per ASTM E 814 by Underwriters Laboratory, Inc. or other testing and inspecting agency acceptable to authorities having jurisdiction.

B. Fire-Resistant Sealant: Provide one-part elastomeric sealant formulated for use in a through-penetration fire-stop system for filling openings around duct penetrations through walls and floors, having fire-resistance ratings indicated as established by testing identical assemblies per ASTM E 814 by Underwriters Laboratory, Inc. or other testing and inspecting agency acceptable to authorities having jurisdiction.

2.5 HANGERS AND SUPPORTS

A. Building Attachments: Concrete inserts, powder actuated fasteners, or structural steel fasteners appropriate for building materials. Do not use powder actuated concrete fasteners for lightweight aggregate concretes or for slabs less than 4 inches thick.

B. Hangers: Galvanized sheet steel, or round, uncoated steel, threaded rod.

1. Hangers Installed In Corrosive Atmospheres: Electro-galvanized, all-thread rod or hot-dipped-galvanized rods with threads painted after installation.

2. Straps and Rod Sizes: Conform to Table 4-1 in SMACNA HVAC Duct Construction Standards, 1985 Edition, for sheet steel width and gage and steel rod diameters.

C. Duct Attachments: Sheet metal screws, blind rivets, or self-tapping metal screws; compatible with duct materials.

D. Trapeze and Riser Supports: Steel shapes conforming to ASTM A 36.

1. Where galvanized steel ducts are installed, provide hot-dipped-galvanized steel shapes and plates.

2. For stainless steel ducts, provide stainless steel support materials.

3. For aluminum ducts, provide aluminum support materials, except where materials are electrolytically separated from ductwork.

2.6 RECTANGULAR DUCT FABRICATION

A. General: Except as otherwise indicated, fabricate rectangular ducts with galvanized sheet steel, in accordance with SMACNA "HVAC Duct Construction Standards," Tables 1-3 through 1-19, including their associated details. Conform to the requirements in the referenced standard for metal thickness, reinforcing types and intervals, tie rod applications, and joint types and intervals.

1. Fabricate rectangular ducts in lengths appropriate to reinforcement and rigidity class required for pressure classification.

2. Provide materials that are free from visual imperfections such as pitting, seam marks, roller marks, stains, and discolorations.

B. Static Pressure Classifications: Except where otherwise indicated, construct duct systems to the following pressure classifications:

1. Supply Ducts: 3 inches water gage.
2. Return Ducts: 2 inches water gage, negative pressure.
3. Exhaust Ducts: 2 inches water gage, negative pressure.

C. Crossbreaking or Cross Beading: Crossbreak or bead duct sides that are 19 inches and larger and are 20 gage or less, with more than 10 sq. ft. of unbraced panel area, as indicated in SMACNA "HVAC Duct Construction Standard," Figure 1-4, unless they are lined or are externally insulated.

2.7 RECTANGULAR DUCT FITTINGS

A. Fabricate elbows, transitions, offsets, branch connections, and other duct construction in accordance with SMACNA "HVAC Metal Duct Construction Standard,"

2.8 SHOP APPLICATION OF LINER IN RECTANGULAR DUCTS

A. Adhere a single layer of indicated thickness of duct liner with 90 percent coverage of adhesive at liner contact surface area. Multiple layers of insulation to achieve indicated thickness is prohibited.

B. Apply a coat of adhesive to liner facing in direction of airflow not receiving metal nosing.

C. Butt transverse joints without gaps and coat joint with adhesive.

D. Fold and compress liner in corners of rectangular ducts or cut and fit to assure butted edge overlapping.

E. Longitudinal joints in rectangular ducts shall not occur except at corners of ducts, unless the size of the duct and standard liner product dimensions make longitudinal joints necessary.

1. Apply an adhesive coating on longitudinal seams in ducts exceeding 2,500 FPM air velocity.

F. Secure liner with mechanical fasteners 4 inches from corners and at intervals not exceeding 12 inches transversely around perimeter; at 3 inches from transverse joints and at intervals not exceeding 18 inches longitudinally.

G. Secure transversely oriented liner edges facing the airstream with metal nosings that are either channel or "Z" profile or are integrally formed from the duct wall at the following locations:

1. Fan discharge.
2. Intervals of lined duct preceding unlined duct.
3. Upstream edges of transverse joints in ducts.

H. Secure insulation liner with perforated sheet metal liner of the same gage specified for the duct, secured to ducts with mechanical fasteners that maintain metal liner distance from duct without compressing insulation. Provide 3/32-inch-diameter perforations, with an overall open area of 23 percent.

I. Terminate liner with duct build-outs installed in ducts to attach dampers, turning vane assemblies, and other devices. Fabricated build-outs (metal hat sections) or other build-out means are optional; when used, secure build-outs to the duct wall with bolts, screws, rivets, or welds. Terminate

liner at fire dampers at connection to fire damper sleeve through fire separation.

2.9 ROUND AND FLAT OVAL DUCT FABRICATION

A. General: "Basic Round Diameter" as used in this article is the diameter of the size of round duct that has a circumference equal to the perimeter of a given sized of flat oval duct. Except where interrupted by fittings, provide round and flat oval ducts in lengths not less than 12 feet.

B. Round Ducts: Fabricate round supply ducts with spiral lock seam construction, except where diameters exceed 72 inches. Fabricate ducts having diameters greater than 72 inches with longitudinal butt-welded seams. Comply with SMACNA "HVAC Duct Construction Standards,"

C. Round Ducts: Fabricate round supply ducts using seam types identified in SMACNA "HVAC Duct Construction Standards," Seams Types RL-2 or Comply with SMACNA "HVAC Duct

D. Flat Oval Ducts: Fabricate flat oval supply ducts with standard spiral lock seams (without intermediate ribs) or with butt-welded longitudinal seams in gages listed in SMACNA "HVAC Duct

E. Double-Wall (Insulated) Ducts: Fabricate double-wall insulated ducts with an outer shell, insulation, and an inner liner as specified below. Dimensions indicated on internally insulated ducts are nominal inside dimensions.

1. Thermal Conductivity: 0.27 Btu/sq.ft./deg F/inch thickness at 75 deg F mean temperature.

2. Outer Shell: Base outer shell gage on actual outer shell dimensions. Provide outer shell lengths 2 inches longer than inner shell and insulation, and in gages specified above for single-wall duct.

3. Insulation: Unless otherwise indicated, provide 1-inch-thick fiber-glass insulation. Provide insulation ends where internally insulated duct connects to single-wall duct or non-insulated components. The insulation end shall terminate the insulation and reduce the outer shell diameter to the inner liner diameter.

4. Solid Inner Liner: Construct round and flat oval inner liners with solid sheet metal of the gages listed below. For flat oval ducts, the diameter indicated in the table below is the "basic round diameter."

5. Perforated Inner Liner: Construct round and flat oval inner liners with perforated sheet metal of the gages listed below. Provide 3/32-inch-diameter perforations, with an overall open area of 23 percent. For flat oval ducts, the diameter indicated below is the "basic round diameter."

a. 3 to 8 inches: 28 gage with standard spiral construction.
b. 9 to 42 inches: 28 gage with single-rib spiral construction.
c. 44 to 60 inches: 26 gage with single-rib spiral construction.
d. 62 to 88 inches: 22 gage with standard spiral construction.

6. Maintain concentricity of liner to outer shell by mechanical means. Retain insulation from dislocation by mechanical means.

2.10 ROUND AND FLAT OVAL SUPPLY AND EXHAUST FITTINGS FABRICATION

A. 90-Degree Tees and Laterals and Conical Tees: Fabricate to conform to SMACNA "HVAC Duct Construction Standards," 1985 Edition, Figures 3-4 and 3-5 and with metal thicknesses specified for longitudinal seam straight duct.

B. Diverging-Flow Fittings: Fabricate with a reduced entrance to branch taps with no excess material projecting from the body onto branch tap entrance.

C. Elbows: Fabricate in die-formed, gored, pleated, or mitered construction. Fabricate the bend radius of die-formed, gored, and pleated elbows 1.5 times the elbow diameter. Unless elbow construction type is indicated, provide elbows meeting the following requirements:

1. Mitered Elbows: Fabricate mitered elbows with welded construction in gages specified below.

a. Mitered Elbows Radius and Number of Pieces: Unless otherwise indicated, construct elbow to comply with SMACNA "HVAC Duct Construction Standards,"

b. Round Mitered Elbows: Solid welded and with metal thickness listed below for pressure classes from minus 2 inches to plus 2 inches:

1. 3 to 26 inches: 24 gage.
2. 27 to 36 inches: 22 gage.
3. 37 to 50 inches: 20 gage.
4. 52 to 60 inches: 18 gage.
5. 62 to 84 inches: 16 gage.

c. Round Mitered Elbows: Solid welded and with metal thickness listed below for pressure classes from 2 inches to 10 inches:

1. 3 to 14 inches: 24 gage.
2. 15 to 26 inches: 22 gage.
3. 27 to 50 inches: 20 gage.
4. 52 to 60 inches: 18 gage.
5. 62 to 84 inches: 16 gage.

d. Flat Oval Mitered Elbows: Solid welded and with the same metal thickness as longitudinal seam flat oval duct.

e. 90-Degree, 2-Piece, Mitered Elbows: Use only for supply systems, or exhaust systems for material handling classes A and B; and only where space restrictions do not permit the use of 1.5 bend radius elbows. Fabricate with a single-thickness turning vanes.

2 Round Elbows - 8 Inches and Smaller: Die-formed elbows for 45- and 90-degree elbows and pleated elbows for 30, 45, 60, and 90 degrees only. Fabricate nonstandard bend angle configurations or 1/2-inch-diameter (e.g. 3-1/2- and 4-1/2-inch) elbows with gored construction.

3 Round Elbows - 9 Through 14 Inches: Gored or pleated elbows for 30, 45, 60, and 90 degrees, except where space restrictions require a mitered elbow. Fabricate nonstandard bend angle configurations or 1/2-inch-diameter (e.g. 9-1/2- and 10-1/2-inch) elbows with gored construction.

4 Round Elbows - Larger than 14 Inches and All Flat Oval Elbows: Gored elbows, except where space restrictions require a mitered elbow.

5 Die-Formed Elbows for Sizes through 8 Inches and All Pressures: 20 gage with 2-piece welded construction.

6 Round Gored Elbows Gages: Same as for nonelbow fittings specified above.

7 Flat Oval Elbows Gages: Same as longitudinal seam flat oval duct.

8 Pleated Elbows Sizes Through 14 Inches and Pressures through 10 Inches: 26 gage.

D. Double-Wall (Insulated) Fittings: Fabricate double-wall insulated fittings with an outer shell, insulation, and an inner liner as specified below. Dimensions indicated on internally insulated ducts are nominal inside dimensions.

1. Thermal Conductivity: 0.27 Btu/sq.ft./deg F/inch thickness at 75 deg F mean temperature.

2. Outer Shell: Base outer shell gage on actual outer shell dimensions. Provide outer shell lengths 2 inches longer than inner shell and insulation. Gages for outer shell shall be same as for uninsulated fittings specified above.

3. Insulation: Unless otherwise indicated, provide 1-inch-thick fiber-glass insulation. Provide insulation ends where internally insulated duct connects to single-wall duct or noninsulated components. The insulation end shall terminate the insulation and reduce the outer shell diameter to the nominal single-wall size.

PART 3 - EXECUTION

3.1 DUCT INSTALLATION, GENERAL

A. Duct System Pressure Class: Construct and install each duct system for the specific duct pressure classification indicated.

B. Install ducts with the fewest possible joints.

C. Use fabricated fittings for all changes in directions, changes in size and shape, and connections.

D. Install couplings tight to duct wall surface with projections into duct at connections kept to a minimum.

E. Locate ducts, except as otherwise indicated, vertically and horizontally, parallel and perpendicular to building lines; avoid diagonal runs. Install duct systems in shortest route that does not obstruct useable space or block access for servicing building and its equipment.

F. Install ducts close to walls, overhead construction, columns, and other structural and permanent enclosure elements of building.

G. Provide clearance of 1 inch where furring is shown for enclosure or concealment of ducts, plus allowance for insulation thickness, if any.

H. Install insulated ducts with 1-inch clearance outside of insulation.

I. Conceal ducts from view in finished and occupied spaces by locating in mechanical shafts, hollow wall construction, or above suspended ceilings. Do not encase horizontal runs in solid partitions, except as specifically shown.

J. Coordinate layout with suspended ceiling and lighting layouts and similar finished work.

K. Electrical Equipment Spaces: Route ductwork to avoid passing through transformer vaults and electrical equipment spaces and enclosures.

L. Non-Fire-Rated Partition Penetrations: Where ducts pass interior partitions and exterior walls, and are exposed to view, conceal space between construction opening and duct or duct insulation with sheet metal flanges of same gage as duct. Overlap opening on 4 sides by at least 1-1/2 inches.

3.2 SEAM AND JOINT SEALING

A. General: Seal duct seams and joints as follows:

B. Pressure Classifications Greater Than 3 Inches Water Gage: All transverse joints, longitudinal seams, and duct penetrations.

C. Pressure Classification 2 and 3 Inches Water Gage: All transverse joints and longitudinal seams.

1. Pressure Classification Less than 2 Inches Water Gage: Transverse joints only.

D. Seal externally insulated ducts prior to insulation installation.

3.3 HANGING AND SUPPORTING

A. Install rigid round, rectangular, and flat oval metal duct with support systems indicated in SMACNA "HVAC Duct Construction Standards,"

B. Support horizontal ducts within 2 feet of each elbow and within 4 feet of each branch intersection.

C. Support vertical ducts at a maximum interval of 16 feet and at each floor.

D. Upper attachments to structures shall have an allowable load not exceeding 1/4 of the failure (proof test) load but are not limited to the specific methods indicated.

E. Install concrete insert prior to placing concrete.

F. Install powder actuated concrete fasteners after concrete is placed and completely cured.

3.4 CONNECTIONS

A. Equipment Connections: Connect equipment with flexible connectors in accordance with this Division "Duct Accessories."

B. Branch Connections: Comply with SMACNA "HVAC Duct Construction Standards,"

C. Outlet and Inlet Connections: Comply with SMACNA "HVAC Duct Construction Standards,"

D. Terminal Units Connections: Comply with SMACNA "HVAC Duct Construction Standards,"

3.5 FIELD QUALITY CONTROL

A. The Owner will contract with an independent testing agency to perform, record, and report leakage tests.

B. Remake leaking joints as required and apply sealants to achieve specified maximum allowable leakage.

3.6 FIELD QUALITY CONTROL

A. Disassemble, reassemble, and seal segments of the systems as required to accommodate leakage testing, and as required for compliance with test requirements.

B. Conduct tests, in the presence of the Owner/Owner's Representative, at static pressures equal to the maximum design pressure of the system or the section being tested. If pressure classifications are not indicated, test entire system at the maximum system design pressure. Do not pressurize systems above the maximum design operating pressure. Give 7 days' advanced notice for testing.

C. Determine leakage from entire system or section of the system by relating leakage to the surface area of the test section.

D. Maximum Allowable Leakage: As described in ASHRAE. Comply with requirements for leakage classification 3 for round and flat oval ducts, leakage classification 12 for rectangular ducts in pressure classifications less than and equal to 2 inches water gage (both positive and negative pressures), and leakage classification 6 for pressure classifications greater than 2 inches water gage and less than and equal to 10 inches water gage.

E. Remake leaking joints as required and apply sealants to achieve specified maximum allowable leakage.

F. Leakage Test: Perform volumetric measurements and adjust air systems as described in ASHRAE "TESTING, ADJUSTING, AND BALANCING."

3.7 ADJUSTING AND CLEANING

A. Adjust volume control devices as required by the testing and balancing procedures to achieve required air flow. "TESTING, ADJUSTING, AND BALANCING" for requirements and procedures for adjusting and balancing air systems.

B. Vacuum ducts systems prior to final acceptance to remove dust and debris.

END OF SECTION

# *Section IX. Bidding Form*

# TABLE OF CONTENTS

# Bid Form

Date: _____
Invitation to Bid No.: DBM-2018-24

*To: [name and address of Procuring Entity]*

Gentlemen and/or Ladies:

Having examined the Bidding Documents including Bid Bulletin Numbers *[insert numbers]*, the receipt of which is hereby duly acknowledged, we, the undersigned, offer to the DBM, our services for the Project, **"Supply, Delivery, Fabrication, Installation, Testing and Commissioning of Supply, Delivery, Fabrication, Installation, Testing and Commissioning of Variable Refrigeration Flow Multi-Split System for the DBM Arcache Building,"** in conformity with the said Bidding Documents for the sum of *[total Bid amount in words and figures]* or such other sums as may be ascertained in accordance with the Schedule of Prices attached herewith and made part of this Bid.

We undertake, if our Bid is accepted, to deliver the goods in accordance with the delivery schedule specified in the Schedule of Requirements.

If our Bid is accepted, we undertake to provide a performance security in the form, amounts, and within the times specified in the Bidding Documents.

We agree to abide by this Bid for the Bid Validity Period specified in **BDS** provision for **ITB** Clause 18.2 and it shall remain binding upon us and may be accepted at any time before the expiration of that period.

Until a formal Contract is prepared and executed, this Bid, together with your written acceptance thereof and your Notice of Award, shall be binding upon us.

We understand that you are not bound to accept the Lowest Calculated Bid or any Bid you may receive.

We certify/confirm that we comply with the eligibility requirements as per **ITB** Clause 5 of the Bidding Documents.

We likewise certify/confirm that the undersigned, *[for sole proprietorships, insert:* as the owner and sole proprietor or authorized representative of *Name of Bidder,* has the full power and authority to participate, submit the bid, and to sign and execute the ensuing contract, on the latter's behalf for the **Supply, Delivery, Fabrication, Installation, Testing and Commissioning of Variable Refrigeration Flow Multi-Split System for the DBM Arcache Building** of the **Department of Budget and Management***] [for partnerships, corporations, cooperatives, or joint ventures, insert:* is granted full power and authority by the *Name of Bidder*, to participate, submit the bid, and to sign and execute the ensuing contract on the latter's behalf for **Supply, Delivery, Fabrication, Installation, Testing and Commissioning of Variable Refrigeration Flow Multi-Split System for the DBM Arcache Building** of the **Department of Budget and Management.**

We acknowledge that failure to sign each and every page of this Bid Form, including the attached Schedule of Prices, shall be a ground for the rejection of our bid.

Dated this _____ day of _____ 20_____.

_____ _____

*[signature]* *[in the capacity of]*

Duly authorized to sign Bid for and on behalf of _____

**For Goods Offered From Within the Philippines**

Name of Bidder _____. Invitation to Bid Number __. Page . of ___.

| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|
| Item | Description | Country of origin | Quantity | Unit price EXW per item | Transportation and Insurance and all other costs incidental to delivery, per item | Sales and other taxes payable if Contract is awarded, per item | Cost of Incidental Services, if applicable, per item | Total Price, per unit (col 5+6+7+8) | Total Price delivered Final Destination (col 9) x (col 4) |
| | | | | | | | | | |

Note: Please attach the brochures for the products offered, subject for technical evaluation during post-qualification.

_____ _____

*[signature]* *[in the capacity of]*

Duly authorized to sign Bid for and on behalf of _____

## *Statement of Single Largest Completed Contract which is Similar in Nature*

(indicate only one)

Business Name: _____

Business Address: _____

| Name of Client | Date of the Contract | Kinds of Goods | Amount of Contract | Date of Delivery | End User's Acceptance or Official Receipt(s) Issued for the Contract |
|---|---|---|---|---|---|
| | | | | | |

Submitted by : _____
(Printed Name and Signature)

Designation : _____

Date : _____

Instructions:

a) Cut-off date is October 23, 2018.
b) Similar contract shall refer to Supply, Delivery, Fabrication, Installation, Testing and Commissioning of Variable Refrigeration Flow Multi-Split System

## *Statement of all Ongoing Government and Private Contracts Including Contracts Awarded but not yet Started*

Business Name: _____

Business Address: _____

| Name of Client | Date of the Contract | Kinds of Goods | Value of Outstanding Contracts | Date of Delivery |
|---|---|---|---|---|
| Government | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| Private | | | | |
| | | | | |
| | | | | |
| | | | | |

Submitted by : _____
(Printed Name and Signature)

Designation : _____

Date : _____

Instructions:

i. 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 being bidded) prior to October 23, 2018.

ii. If there is no ongoing contract including awarded but not yet started as of the aforementioned period, state none or equivalent term.

iii. The total amount of the ongoing and awarded but not yet started contracts should be consistent with those used in the Net Financial Contracting Capacity (NFCC).

## Contract Agreement Form

THIS AGREEMENT made the _____ day of _____ 20_____ between *[name of PROCURING ENTITY]* of the Philippines (hereinafter called "the Entity") of the one part and *[name of Supplier]* of *[city and country of Supplier]* (hereinafter called "the Supplier") of the other part:

WHEREAS the Entity invited Bids for certain goods and ancillary services, viz., *[brief description of goods and services]* and has accepted a Bid by the Supplier for the supply of those goods and services in the sum of *[contract price in words and figures]* (hereinafter called "the Contract Price").

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 referred to.

2. The following documents shall be deemed to form and be read and construed as part of this Agreement, viz.:

(a) the Supplier's Bid, including the Technical and Financial Proposals, and all other documents/statements submitted (*e.g.* bidder's response to clarifications on the bid), including corrections to the bid resulting from the Procuring Entity's bid evaluation;
(b) the Schedule of Requirements;
(c) the Technical Specifications;
(d) the General Conditions of Contract;
(e) the Special Conditions of Contract;
(f) the Performance Security; and
(g) the Entity's Notice of Award.

3. In consideration of the payments to be made by the Entity to the Supplier as hereinafter mentioned, the Supplier hereby covenants with the Entity to provide the goods and services and to remedy defects therein in conformity in all respects with the provisions of the Contract

4. The Entity hereby covenants to pay the Supplier in consideration of the provision of the goods and services and the remedying of defects therein, the Contract Price or such other sum as may become payable under the provisions of the contract at the time and in the manner prescribed by the contract.

IN WITNESS whereof the parties hereto have caused this Agreement to be executed in accordance with the laws of the Republic of the Philippines on the day and year first above written.

Signed, sealed, delivered by _____ the _____ (for the Entity)

Signed, sealed, delivered by _____ the _____ (for the Supplier).

## 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], as shown in the attached duly notarized Special Power of Attorney*;

   *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]*, as shown in the attached *[state title of attached document showing proof of authorization (e.g., duly notarized Secretary's Certificate, Board/Partnership Resolution, or Special Power of Attorney, 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. _____.

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.

## Bank Guarantee Form for Advance Payment

---

To: *[name and address of PROCURING ENTITY]*
*[name of Contract]*

Gentlemen and/or Ladies:

In accordance with the payment provision included in the Special Conditions of Contract, which amends Clause 10 of the General Conditions of Contract to provide for advance payment, *[name and address of Supplier]* (hereinafter called the "Supplier") shall deposit with the PROCURING ENTITY a bank guarantee to guarantee its proper and faithful performance under the said Clause of the Contract in an amount of *[amount of guarantee in figures and words]*.

We, the *[bank or financial institution]*, as instructed by the Supplier, agree unconditionally and irrevocably to guarantee as primary obligator and not as surety merely, the payment to the PROCURING ENTITY on its first demand without whatsoever right of objection on our part and without its first claim to the Supplier, in the amount not exceeding *[amount of guarantee in figures and words]*.

We further agree that no change or addition to or other modification of the terms of the Contract to be performed thereunder or of any of the Contract documents which may be made between the PROCURING ENTITY and the Supplier, shall in any way release us from any liability under this guarantee, and we hereby waive notice of any such change, addition, or modification.

This guarantee shall remain valid and in full effect from the date of the advance payment received by the Supplier under the Contract until *[date]*.

Yours truly,

Signature and seal of the Guarantors

_____
*[name of bank or financial institution]*

_____
*[address]*

_____
*[date]*

## BID SECURING DECLARATION FORM

**REPUBLIC OF THE PHILIPPINES)**
**CITY OF _____) S.S.**

x----------x

**BID SECURING DECLARATION**
**Invitation to Bid:** DBM-2018-24

To: *[Insert name and address of the Procuring Entity]*

I/We[1], 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 the 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 the bidder with the Lowest Calculated Responsive Bid, and I/we have furnished the performance security and signed the Contract.

---

[1] *Select one and delete the other. Adopt the same instruction for similar terms throughout the document.*

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 _____