

# DEPARTMENT OF FINANCE

**Indicate format of BOQ and required information**

## **Renovation of the Department of Finance Building Offices – Package 2**

**ITB No. 2017-04-I  
September 2017**

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## ***Section I. Invitation to Bid***

**Invitation to Bid for the  
Renovation of the Department of Finance Building Offices – Package 2**

1. The Department of Finance (DOF), through the Government of the Philippines under the General Appropriations Act for CY 2017, intends to apply the sum of **ONE HUNDRED SIXTEEN MILLION EIGHT HUNDRED TWENTY THOUSAND PESOS (P116,820,000.00)** being the Approved Budget for the Contract (ABC) to payments under the contract for the **Renovation of the Department of Finance Building Offices – Package 2** includes Architectural Works, Sanitary/Plumbing Works, Fire Protection Works, Mechanical Works and Electrical Works as may be applicable, for the following areas/floors :
  - a. Podium Level
  - b. Third Floor;
  - c. Fourth Floor;
  - d. Fifth Floor;

Bids received in excess of the ABC shall be automatically rejected at bid opening.

2. The DOF now invites bids for the Renovation of the Department of Finance Building Offices – Package 2. Completion of the Works is required in **150 calendar days**. Bidders should have completed 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 non-discretionary “pass/fail” criterion as specified in the 2016 Revised Implementing Rules and Regulations (IRR) of Republic Act 9184 (RA 9184), otherwise known as the “Government Procurement Reform Act.”

Bidding is restricted to Filipino citizens/sole proprietorships, cooperatives, and partnerships or organizations with at least seventy five percent (75%) interest or outstanding capital stock belonging to citizens of the Philippines. Prospective bidders must have been at least 10 years in the Construction Industry with a PCAB Size Range of Medium B and License Category A.

4. Interested bidders may obtain further information from the BAC Secretariat at the address given below during office hours.
5. A complete set of Bidding Documents may be acquired by interested bidders starting on **September 8, 2017 up to October 2, 2017** at the BAC Secretariat, 8<sup>th</sup> Floor, EDPC Building BSP Complex, Pablo Ocampo Sr. Street corner Roxas Boulevard, Malate, Manila upon payment of a non-refundable fee in the amount of **FIFTY THOUSAND PESOS (P50,000.00)**.

It may also be downloaded free of charge from the website of the Philippine Government Electronic Procurement System (PhilGEPS) and the website of the Procuring Entity, provided that bidders shall pay the applicable fee for the Bidding Documents not later than the submission of their bids. However, due to volume and size of files, detailed plans may only be secured by interested bidders from the BAC Secretariat, 8<sup>th</sup> Floor, EDPC Building, Roxas Boulevard corner Pablo Ocampo St., Roxas Boulevard Manila.

6. The DOF will hold a Pre-Bid Conference on **10:00 a.m., September 18, 2017** at the DFG Conference Room, 4<sup>th</sup> DOF Building, Roxas Boulevard, Malate, 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 **9:30 a.m. on October 2, 2017**. All bids must be accompanied by a bid security in any of the acceptable forms and in the amount stated in **ITB** Clause a.18.

Bid opening shall be on **10:00 a.m. October 2, 2017** at the DFG Conference Room, 4<sup>th</sup> Floor DOF Building, Roxas Boulevard, Malate, 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 Eligibility Check/Screening as well as the Preliminary Examination of Bids shall use the non- discretionary "pass/fail" criteria. Failure to submit the required document under the bidding documents or the submission of a document which does not comply with the legal formalities shall be rated "failed".

All particulars relative to Eligibility Statement and Screening, Bid Security, Performance Security, Pre-Bidding Conference, Evaluation of Bids, Post-Qualification and Award of Contract shall be governed by the pertinent provisions of R.A. 9184 and its Revised Implementing Rules and Regulations (RIRR).

The schedules of activities are as follows:

<b>ACTIVITIES</b>	<b>SCHEDULE</b>
<b>Advertisement/Posting of Invitation to Bid</b>	<b>September 8, 2017</b>
<b>Issuance and Availability of Bid Documents</b>	<b>starting September 8, 2017</b>
<b>Pre-Bid Conference</b>	<b>September 18, 2017, 10:00 am</b>
<b>Request for Clarification</b>	<b>September 22, 2017 (by email)</b>
<b>Issuance of Supplemental Bid Bulletin</b>	<b>September 25, 2017</b>
<b>Deadline for Submission of Bids</b>	<b>October 2, 2017, 9:30 am</b>
<b>Opening of Bids</b>	<b>October 2, 2017, 10:00 am</b>

9. The DOF 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 9184 and its IRR, without thereby incurring any liability to the affected bidder or bidders.
10. For further information, please refer to:

BAC Secretariat  
 8<sup>th</sup> Floor EDPC Building, BSP Complex,  
 Pablo Ocampo Sr. Street corner Roxas Boulevard  
 Malate, Manila  
 Telephone No. 526-8475  
 Fax No. 525-4227  
 Email address: [lte@dof.gov.ph](mailto:lte@dof.gov.ph)

**GIL S. BELTRAN**  
 Undersecretary and  
 BAC Chairman

***Section II. Instructions to Bidders***

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## A. General

### 1. Scope of Bid

- (i) The Procuring Entity named in the **BDS**, invites bids for the construction of Works, as described in Section VI. Specifications.
- (ii) The name, identification, and number of lots specific to this bidding are provided in the **BDS**. The contracting strategy and basis of evaluation of lots is described in **ITB** Clause 27.
- (iii) The successful Bidder will be expected to complete the Works by the intended completion date specified in **SCC** Clause 1.17.

### 2. Source of Funds

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

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

- (i) Unless otherwise specified in the **BDS**, the Procuring Entity, as well as bidders and contractors, shall observe the highest standard of ethics during the procurement and execution of the contract. In pursuance of this policy, the Funding Source:
  - (a) defines, for purposes of this provision, the terms set forth below as follows:
    - (i) "corrupt practice" means behavior on the part of officials in the public or private sectors by which they improperly and unlawfully enrich themselves, others, or induce others to do so, by misusing the position in which they are placed, and includes the offering, giving, receiving, or soliciting of anything of value to influence the action of any such official in the procurement process or in contract execution; entering, on behalf of the Procuring Entity, into any contract or transaction manifestly and grossly disadvantageous to the same, whether or not the public officer profited or will profit thereby, and similar acts as provided in Republic Act 3019;
    - (ii) "fraudulent practice" means a misrepresentation of facts in order to influence a procurement process or the execution of a contract to the detriment of the Procuring Entity, and includes collusive practices among Bidders (prior to or after Bid submission) designed to establish bid prices at artificial, non-competitive levels and to deprive the Procuring Entity of the benefits of free and open competition;

- (iii) “collusive practices” means a scheme or arrangement between two or more Bidders, with or without the knowledge of the Procuring Entity, designed to establish bid prices at artificial, non-competitive levels; and
- (iv) “coercive practices” means harming or threatening to harm, directly or indirectly, persons, or their property to influence their participation in a procurement process, or affect the execution of a contract;
- (v) “obstructive practice” is
  - (aa) deliberately destroying, falsifying, altering or concealing of evidence material to an administrative proceedings or investigation or making false statements to investigators in order to materially impede an administrative proceedings or investigation of the Procuring Entity or any foreign government/foreign or international financing institution into allegations of a corrupt, fraudulent, coercive or collusive practice; and/or threatening, harassing or intimidating any party to prevent it from disclosing its knowledge of matters relevant to the administrative proceedings or investigation or from pursuing such proceedings or investigation; or
  - (bb) acts intended to materially impede the exercise of the inspection and audit rights of the Procuring Entity or any foreign government/foreign or international financing institution herein.
- (b) will reject a proposal for award if it determines that the Bidder recommended for award has engaged in corrupt or fraudulent practices in competing for the Contract; and
- (c) will declare a firm ineligible, either indefinitely or for a stated period of time, to be awarded Contract funded by the Funding Source if it at any time determines that the firm has engaged in corrupt or fraudulent practices in competing or, or in executing, a Contract funded by the Funding Source.
- (ii) Further, the Procuring Entity will seek to impose the maximum civil, administrative, and/or criminal penalties available under the applicable laws on individuals and organizations deemed to be involved in any of the practices mentioned in **ITB** Clause 3.1(a).
- (iii) Furthermore, the Funding Source and the Procuring Entity reserve the right to inspect and audit records and accounts of a contractor in the bidding for and performance of a contract themselves or through independent auditors as reflected in the **GCC** Clause 34.

#### 4. Conflict of Interest

- (i) 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) 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.
- (ii) 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

- (i) Unless otherwise indicated in the **BDS**, the following persons shall be eligible to participate in this Bidding:
  - (a) Duly licensed Filipino citizens/sole proprietorships;
  - (b) Partnerships duly organized under the laws of the Philippines and of which at least seventy five percent (75%) of the interest belongs to citizens of the Philippines;
  - (c) Corporations duly organized under the laws of the Philippines, and of which at least seventy five percent (75%) of the outstanding capital stock belongs to citizens of the Philippines;
  - (d) Cooperatives duly organized under the laws of the Philippines.
  - (e) Persons/entities forming themselves into a JV, i.e., a group of two (2) or more persons/entities that intend to be jointly and severally responsible or liable for a particular contract: Provided, however, that, in accordance with Letter of Instructions No. 630, Filipino ownership or interest of the joint venture concerned shall be at least seventy five percent (75%): Provided, further, that joint ventures in which Filipino ownership or interest is less than seventy five percent (75%) may be eligible where the structures to be built require the application of techniques and/or technologies which are not adequately possessed by a person/entity meeting the seventy five percent (75%) Filipino ownership requirement: Provided, finally, that in the latter case, Filipino ownership or interest shall not be less than twenty five percent (25%). For this purpose, Filipino ownership or interest shall be based on the contributions of each of the members of the joint venture as specified in their JVA.
- (ii) The Procuring Entity may also invite foreign bidders when provided for under any Treaty or International or Executive Agreement as specified in the **BDS**.
- (iii) 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.

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

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

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

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

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

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

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

## **6. Bidder's Responsibilities**

- (i) The Bidder or its duly authorized representative shall submit a sworn statement in the form prescribed in Section VIII. Bill of Quantities

PODIUM FLOOR						
Architectural Bill of Quantities						
Package 2 (Podium Floor)						
ITEM NO.	ITEM DESCRIPTION AND LOCATION	QUANTITY	UNIT	DIRECT UNIT COST	TOTAL COST	REMARKS
I.	<b>GENERAL REQUIREMENTS</b>					
1.01	All insurances such as bonds and guarantee performance bonds, third party insurance and surety bond against down payment and retention bond, building permit and occupancy permit.	1.00	lot			

1.02	Mobilization and demobilization of workers, tools and equipment	1.00	lot			
1.03	Temporary facilities and temporary utilities	1.00	lot			
1.04	Safety and security, daily cleaning and maintenance works	1.00	lot			
1.05	Demolition, dismantling and hauling of debris (verify architectural technical specifications)	1.00	lot			
	Demolish all existing walls and partitions as stated in the plan.					
	Strip all existing wall finishes affected with the renovation					
	Dismantle existing ceiling finishes except for bottom of slab ceiling.					
	Dismantle all existing doors, door jambs, hardware and accessories and turnover all items to the owner for proper handling except for doors to be retained					
	Dismantle all existing glass partition and accessories and turnover all items to the owner for proper handling.					
	Dismantle all existing lighting fixtures and electrical devices on site and all items are subject for turnover to the owner for proper handling.					
	Dismantle all existing AC equipment on site subject for replacement and turnover all items to the over for proper handling.					
	Dismantle and relocation of all necessary existing utility lines, conduits, pipes, ductworks and sprinkler heads subject for replacement as per plan. i					
	Demolish and dismantle all existing floor finishes as per plan					

ITEM NO.	ITEM DESCRIPTION AND LOCATION	QUANTITY	UNIT	DIRECT UNIT COST	TOTAL COST	REMARKS
	Demolish and dismantle all existing wall cubicle partition and floor tiles at existing toilets.					
	Demolish all existing CHB toilet partitions at common toilets.					
	Demolish existing lavatory counter at existing toilets.					

	Dismantle all existing toilet fixtures and accessories for replacement.					
	Dismantle existing wall mounted facial mirror at existing toilets.					
	Demolish existing walls and slab affected for the accommodation of new elevator shaft. p					
	Demolish affected slab for all areas to be converted to pipe chase.					
	Demolish existing slab affected for the accommodation of new elevator shaft.					
1.06	As-buit drawings. Including all disciplines	1.00	lot			
1.08	H-frame scaffolding complete with necessary things and accessories; and formworks	1.00	lot			
	<b>SUBTOTAL COST:</b>					
<b>II.</b>	<b>FLOOR WORKS</b>					
2.01	200mm x 200mm non-skid vitrified paver block finish with 100mm wide concrete curb border for walkway and other areas as shown in the plans	706.37	sq.m.			
2.02	500mm x 500mm integrated tufted pattern loop solution dyed 100% synthetic fiber with 4.00mm pile height carpet tiles with Polyester spunbonded primary backing and condensed vinyl with fiberglass reinforcement secondary backing at offices and other areas shown in the plans	256.29	sq.m.			
2.03	10mm thk. x 600mm x 600mm non-skid, non-vitreous porcelain tiles for toilets and other areas shown in the plans	340.46	sq.m.			
2.04	3mm thk. x 300mm x 300mm homogenous and resilient type Vinyl tiles, with primer and water-based acrylic floor adhesive at security, pantry, storage and other areas shown in the plans	10.00	sq.m.			
2.05	Exisiting marble floor finish subject for crystallization for areas shown in the plans	682.93	sq.m.			
<b>ITEM NO.</b>	<b>ITEM DESCRIPTION AND LOCATION</b>	<b>QUANTITY</b>	<b>UNIT</b>	<b>DIRECT UNIT COST</b>	<b>TOTAL COST</b>	<b>REMARKS</b>
	<b>SUBTOTAL COST:</b>					
<b>III.</b>	<b>WALL WORKS</b>					
3.01	Drywall partition using 12mm thk. fiber cement board using 100mm thk. Using 400mm x 400mm metal suds vertical and horizontal on center	187.96	sq.m.			



3.02	150mm thick concrete hollow blocks with 25mm thick plaster on both sides complete with steel bars for Ground floor walls as shown in the plans	62.65	sq.m.			
3.03	100mm thick concrete hollow blocks with 25mm thick plaster on both sides complete with steel bars for Ground floor walls as shown in the plans	30.65	sq.m.			
3.03	25mm thk x 100mm. Wood plastic composite baseboard installed on both sides of all drywall and CHB wall partitions	270.68	l.m			
3.04	Existing grille band to be clad with ACP for Podium glass perimeter wall	80.69	sq.m.			
3.05	Decorative stone at main entrance portal	15.57	sq.m.			
3.06	Existing marble wall finish subject for crystallization for areas shown in the plans	74.10	sq.m.			
0.00	SUBTOTAL COST:					
IV.	WALL FINISHES					
4.01	10mm thick x 600mm x 600mm glazed porcelain wall tiles for all toilets and other areas shown in the plans	123.55	sq. m			
	<b>SUBTOTAL COST:</b>					
V.	<b>CEILING WORKS</b>					
5.01	12mm thk. Gypsumboard on 400mm x 400mm furring channel horizontal and vertical with 1200mm x 1200mm hanger both ways with 50mm shadow gap between walls and ceiling as per plan	980.64	sq.m.			
5.02	12mm thk. Moisture Resistant Gypsumboard on 400mm x 400mm furring channel both ways with 1200mm x 1200mm hanger both ways with 50mm shadow gap between walls and ceiling as per plan	32.65	sq.m.			
5.03	10mm thick 75mm x 75mm angular bar vertical hangers with 10mm x 200mm x 200mm steel plate ceiling structural support for owner supplied decorative drop lights and chandeliers at lobby and other areas shown in the plans	1.00	set			

ITEM NO.	ITEM DESCRIPTION AND LOCATION	QUANTITY	UNIT	DIRECT UNIT COST	TOTAL COST	REMARKS
5.04	Corrosion Resistant Aluminum metal suspended ceiling panel for walkway as shown in the plans	530.36	sq.m.			
0.00	SUBTOTAL COST:					
VI.	PAINTING WORKS					

6.01	Existing walls and columns shall be repainted for areas indicated in the plans	365.00	sq.m.			
6.02	New CHB wall and drywall partitions shall be painted with latex paint for interior wall surfaces as shown in the plans	281.25	sq.m.			
6.03	Epoxy paint for all utility floor areas as per plan; for fire exit existing pebble wash out floor finish to be painted with chemical emulsion	83.38	sq.m.			
6.04	All ceiling works shall be painted with latex paint as shown in the plans	1,013.29	sq.m.			
6.05	All existing bottom of slab shall be painted with latex paint at utility areas as shown in the plans	146.72	sq.m.			
<b>VII.</b>	<b>DOORS AND WINDOWS</b>					
7.01	D10. 2.1m x 0.9m; 12mm thk tempered single-swing glass on FD-100 aluminum frame complete with hardwares and accessories as per plan.	1.00	set			
7.02	D11. 2.10m x 0.90m; 44mm thick kiln dried mahogany wood panel single-swing door with 50mm x 100mm kiln dried mahogany wood door jamb in wood stain finish with clear gloss top coat lacquer, complete with hardwares, and accessories as per plan.	12.00	set			
7.03	D16. 2.10m x 0.9m; GA 20 B.I. bended sheet steel single swing louvered with GA. 16 standard steel jamb painted with epoxy paint finish complete with hardwares and accessories as per plan	3.00	set			
7.04	D17. 2.10m x 0.70m; 44mm thick kiln dried louvered mahogany wood panel door with 50mm x 100mm kiln dried mahogany wood door jamb in wood stain finish with clear gloss top coat lacquer, complete with hardwares and accessories as per plan.	1.00	set			

ITEM NO.	ITEM DESCRIPTION AND LOCATION	QUANTITY	UNIT	DIRECT UNIT COST	TOTAL COST	REMARKS
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7.05	D22. 2.10m x 8.30 m; Automatic door mechanism with 5 position program switch (auto/ exit/ half open/ close/ open), presence detector with 12mm thick tempered clear glass panel complete with hardware and accessories as per plan.	1.00	set			
7.06	D23. 2.1m x 8.3m. Combination of 12mm thk fixed tempered glass on FD-100 aluminum frame and 2.10 mx 1.80m double-swing glass door, complete with hardwares and accessories as per plan.	1.00	set			
7.07	D24. 2.1m x 10.68m. Combination of 12mm thk fixed tempered glass on FD-100 aluminum frame and 2.10 m x 1.80m double-swing glass door, complete with accessories as per plan.	2.00	set			
7.08	D25. 2.5m x 7.7m. Equally- divided operable partition with fabric finish on both side, with STC rating of 50, complete with hardwares and accessories as per plan.	1.00	set			
7.09	D26. 2.5m x 1.0m; 44mm thick kiln dried louvered mahogany wood panel double-swing door with 50mm x 100mm kiln dried solid wood door jamb in wood stain finish with clear gloss top coat lacquer, complete with hardwares and accessories as per plan.	1.00	set			
7.10	D27. 2.1m x 1.2m; 44mm thick kiln dried louvered mahogany wood panel double-swing door with 50mm x 100mm kiln dried solid wood door jamb in wood stain finish with clear gloss top coat lacquer, complete with hardwares and accessories as per plan.	1.00	set			
7.11	D28. 2.1m x 0.7m; 44mm thick kiln dried louvered mahogany wood panel single-swing door with 50mm x 100mm kiln dried mahogany wood door jamb in wood stain finish with clear gloss top coat lacquer, complete with hardwares and accessories as per plan.	1.00	set			
7.12	D29. 2.1m x 0.90m; 44 mm thick kiln dried louvered mahogany wood panel single-swing door with 50mm x 100mm kiln dried mahogany wood door jamb in wood stain finish with clear gloss top coat lacquer, complete with hardwares and accessories as per plan.	1.00	set			

ITEM NO.	ITEM DESCRIPTION AND LOCATION	QUANTITY	UNIT	DIRECT UNIT COST	TOTAL COST	REMARKS
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7.13	D30. 2.1m x 5.1m. Combination of 12mm thk fixed tempered glass on FD-100 aluminum frame and 2.10 m x 0.90m single-swing glass door, complete with accessories as per plan.	1.00	set			
7.14	D31. 2.1m x 4.1m. Combination of 12mm thk fixed tempered glass on FD-100 aluminum frame and 2.10 m x 0.90m single-swing glass door, complete with accessories as per plan.	1.00	set			
7.15	D32. 2.1m x 6m. Combination of 12mm thk fixed tempered glass on FD-100 aluminum frame and 2.10 m x 0.90m single-swing glass door, complete with hardwares accessories as per plan.	1.00	set			
7.16	D33. 2.1m x 1.3m. Combination of 12mm thk fixed tempered glass on FD-100 aluminum frame and 2.10 mx 0.90m single-swing glass door, complete with hardwares and accessories as per plan.	1.00	set			
7.17	D34. 2.10m x 5.0m. Combination of 12mm thk fixed tempered glass on FD-100 aluminum frame and 2.10 m x 0.90m single-swing glass door, complete with hardwares and accessories as per plan.	2.00	set			
7.18	DR. Existing fire exit doors to be retained and repainted. Hardwares and accessories including panic device to be replaced	3.00	set			
7.19	100mm wide door threshold at all doors with different floor elevations from entry point and area interior	12.20	l.m			
	<b>SUBTOTAL COST:</b>					
<b>VIII.</b>	<b>GLASS WORKS</b>					
8.01	12mm thick tempered glass in FD 100 powder-coated aluminum framing including sealant application and frosted sticker for all glass partitions as shown in the plans	38.43	sq.m.			
8.02	Facial Mirror with 6mm thick marine plywood backing for toilets as shown in the plans	4.42	sq.m			
8.03	Graphicote with 6mm thick marine plywood backing for meeting rooms as shown in the plans	22.97	sq.m			
	<b>SUBTOTAL COST:</b>					

ITEM NO.	ITEM DESCRIPTION AND LOCATION	QUANTITY	UNIT	DIRECT UNIT	TOTAL COST	REMARKS
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				<b>COST</b>		
<b>IX.</b>	<b>MASONRY WORKS</b>					
9.01	25mm thk. granite countertop including 300mm high splashboard on concrete slab sub-counter at all pantry areas.	5.40	sq.m			
9.02	25mm thk. granite countertop including 300mm high splashboard in 50mm x 50mm solid wood k.d. tanguile framing on 3/4" thk marine plywood counter support for toilet counters	3.93	sq.m			
9.03	25mm thk. X 200mm granite ledge installed on top of concrete ledge.	0.63	sq.m			
9.04	25mm thk. Granite ledge on reinforced concrete support embedded to walls at 1400mm above floor finish for water closet	1.20	sq.m			
	<b>SUBTOTAL COST:</b>					
<b>X.</b>	<b>LIGHTING FIXTURES</b>					
10.01	18 watts daylight recessed type LED in 210mm diameter aluminium casing with glass frame down light fixture general ceiling areas and other areas shown in the plans	200.00	set			
10.02	Surface mounted LED light fixture. Supply, delivery and installation of 5.7W LED daylight bulb with E27 lamp base with 100mm diameter round aluminium surface mounted down light fixture with glass cover and E27 socket for existing slab ceiling works and other areas shown in the plans	20.00	set			
10.03	6 watts warm white recessed type LED in 110mm diameter aluminium casing with glass frame down light fixture located above toilet sink and other areas shown in the plans	6.00	set			
10.04	600mm x 600mm x 12mmH 39W daylight slim type LED panel ceiling light fixture with aluminium housing, 100-240Vac Input and 26-30Vdc Output and optical PMMA diffuser for offices, elevator lobby and other areas as shown in the plans	73.00	set			

<b>ITEM NO.</b>	<b>ITEM DESCRIPTION AND LOCATION</b>	<b>QUANTITY</b>	<b>UNIT</b>	<b>DIRECT UNIT COST</b>	<b>TOTAL COST</b>	<b>REMARKS</b>
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10.05	Low bay lighting fixtures comprising of low bay reflector bracket with E27 socket, 400mm diameter sand blasted reflector and glass cover, and 15W LED PAR38 daylight bulb with E27 lamp base for storages, utility areas and other areas as shown in the plans	12.00	set			
10.06	Indoor recessed wall lamp: recessed type aluminium die cast with glass lens wall light fixture with 60W E27 compact fluorescent lamp for hallways and other areas as shown in the plans	13.00	set			
10.06	T5 electronic fluorescent lamp with slim type luminaire (14W, 21W, 28W), for mirror lighting and other areas for cove lighting as shown in the plans	102.00	set			
	<b>SUBTOTAL COST:</b>					
<b>XI.</b>	<b>TOILET FIXTURES</b>					
11.01	Water closet	6.00	set			
11.02	Water Closet Sensor	6.00	set			
11.03	Bidet spray	6.00	set			
11.04	Urinal	3.00	set			
11.05	Urinal Sensor	3.00	set			
11.06	Countertop porcelain basin	6.00	set			
11.07	Basin Faucet (Sensor)	6.00	set			
11.08	Slop sink faucet	1.00	set			
11.09	Enamel cast iron slop sink complete with accessories	1.00	set			
11.10	Stainless steel grab bar for PWD toilet	2.00	set			
	<b>SUBTOTAL COST:</b>					
<b>XII.</b>	<b>TOILET PARTITION</b>					
12.01	12mm thick machine pressed laminated phenolic board substrate partitions with high scratch and impact resistance with aluminium edge and corner profile, complete with indicator and accessories for water closet and shower	5.00	set			
12.02	12mm thick machine pressed laminated phenolic board substrate partitions with high scratch and impact resistance with aluminium edge and corner profile for urinal partition	1.00	set			
	<b>SUBTOTAL COST:</b>					

ITEM NO.	ITEM DESCRIPTION AND LOCATION	QUANTITY	UNIT	DIRECT UNIT COST	TOTAL COST	REMARKS
<b>XIII.</b>	<b>PANTRY FIXTURES AND ACCESSORIES</b>					

13.01	Pantry sink – chrome finish stainless steel L760 x W460mm single bowl upper-counter sink with drain board with corrosion resistance property for pantry	3.00	set			
13.02	Pantry sink faucet mixer – stainless steel chrome finish faucet mixer faucet with brass fittings H121 x L222mm with minimal lead traces in waterways and corrosion resistance for pantry	3.00	set			
13.03	0.75HP – 225v food waste disposer, with 3 grind stages, stainless steel grind elements and 1180mL stainless steel grind chamber for pantry	3.00	set			
	<b>SUBTOTAL COST:</b>					
<b>XIV.</b>	<b>MISCELLANEOUS WORKS</b>					
14.01	Existing veneer cladding to be retained and re-stained and new 3mm thk. Natural wood veneer cladding on 6mm thk plywood substrate (machine-pressed) with 25mm x 25mm aluminum corner guard and aluminum strip at 2100mm high above floor finish at elevator lobby	19.83	sq.m.			
14.02	12mm thk machine-pressed natural wood veneer cladding on 12mm x 50mm wood spacers, with 25mm x 25mm aluminum corner guard and aluminum strip at 2100mm high from floor finish at elevator lobby. Provide 1" x 2" x10" wood slats on wood stain finish at the back of the issuance counter (Verify drawing)	1.00	lot			
14.03	2.1m x 3.5m; Galvanized steel panel roll-up door, manual and motor operated. Size of motor 1/2 HP single phase including electronic device push button switch at 5 seconds located in areas shown in the plans	4.00	set			
14.04	4.4m x 7.0m; Galvanized steel panel roll-up door, manual and motor operated. Size of motor 3/4 HP single phase including electronic device push button switch at 5 seconds located in areas shown in the plans	11.00	set			
<b>ITEM NO.</b>	<b>ITEM DESCRIPTION AND LOCATION</b>	<b>QUANTITY</b>	<b>UNIT</b>	<b>DIRECT UNIT COST</b>	<b>TOTAL COST</b>	<b>REMARKS</b>

14.05	4.4m x 6.4m; Galvanized steel panel roll-up door, manual and motor operated. Size of motor 3/4 HP single phase including electronic device push button switch at 5 seconds located in. areas shown in the plans	8.00	set			
	<b>SUBTOTAL COST:</b>					
<b>XV.</b>	<b>WATER PROOFING WORKS</b>					
15.01	Cementitious crystallization waterproofing using crystalline waterproofing formulation for all pantry and toilets	115.00	sqm			
	<b>SUBTOTAL COST:</b>					
	<b>ARCHITECTURAL TOTAL COST:</b>					
<b>Sanitary/Plumbing Works Bill of Quantities</b>						
<b>XVI.</b>	<b>FACILITY STORM DRAINAGE PIPING</b>					
	<b>Storm Line (Collectors/Downspouts)</b>					
	Supply and installation of Polyvinyl Chloride (PVC) pipes, Series 1000 II or approved equal, including fittings, painting, sleeves, supports, hangers and other miscellaneous items as shown and as required to complete the system					
16.01	250mm diameter x 3m	24.00	l.m.			
16.02	150mm diameter x 3m	114.00	l.m.			
16.03	100mm diameter x 3m	204.00	l.m.			
	Supply and installation of Cast Iron Pipe, Service weight or approved equal, including fittings, painting, sleeves, supports, hangers and other miscellaneous items as shown and as required to complete the system					
16.04	250mm diameter x 3m	3.00	l.m.			
16.05	150mm diameter x 3m	3.00	l.m.			
	<b>Clean-out</b>					
	Supply and installation of Ceiling Clean-out					
16.06	250mm diameter jointing to PVC Pipe	4.00	pc/s			
16.07	150mm diameter jointing to PVC Pipe	9.00	pc/s			
	<b>Drains</b>					
	Supply and installation of drains including adaptors and p-trap as required, setting in concrete, making good around with approved grouting					
	<b>Gutter Drain</b>					
16.08	150mm diameter jointing to PVC Pipe	4.00	pc/s			
16.09	75mm diameter jointing to PVC Pipe	4.00	pc/s			
	<b>Podium Balcony Drain</b>					
<b>ITEM NO.</b>	<b>ITEM DESCRIPTION AND LOCATION</b>	<b>QUANTITY</b>	<b>UNIT</b>	<b>DIRECT UNIT COST</b>	<b>TOTAL COST</b>	<b>REMARKS</b>



16.10	100mm diameter jointing to PVC Pipe	4.00	pc/s			
	<b>Deck Drain</b>					
16.11	75mm diameter jointing to PVC Pipe	1.00	pc/s			
	<b>AIRCON DRAINAGE PIPING</b>					
<b>XVII.</b>	<b>Aircon Drain Line (Collectors and risers)</b>					
	Supply and installation of Polyvinyl Chloride (PVC) pipes, Series 1000 II or approved equal, including fittings, painting, sleeves, supports, hangers and other miscellaneous items as shown and as required to complete the system					
17.01	150mm diameter x 3m	153.00	l.m.			
17.02	100mm diameter x 3m	39.00	l.m.			
17.03	50mm diameter x 3m	51.00	l.m.			
17.04	25mm diameter x 3m	57.00	l.m.			
	<b>Plumbing Insulation</b>					
	Supply and installation of 20mm thick, pre- molded elastomeric closed cell rubber insulation, wrapped with polyethylene tape and clad with GA-26 aluminum sheets, including vapor barrier and other miscellaneous items as shown and as required to complete the system					
17.05	Condensate Insulation					
17.06	150mm diameter	153.00	m			
17.07	100mm diameter	39.00	m			
17.08	50mm diameter	51.00	m			
	25mm diameter	57.00	m			
	<b>Clean-out</b>					
	Supply and installation of Ceiling Clean-out					
17.09	150mm diameter jointing to PVC Pipe	8.00	pc/s			
<b>XVIII.</b>	<b>FACILITY SANITARY SEWERAGE</b>					
	Sanitary Sewer Line (Collectors and Risers)					
	Supply and installation of Polyvinyl Chloride (PVC) pipes, Series 1000 II or approved equal, including fittings, painting, sleeves, supports, hangers and other miscellaneous items as shown and as required to complete the system					
18.01	200mm diameter x 3m	24.00	l.m.			
18.02	150mm diameter x 3m	18.00	l.m.			
18.03	100mm diameter x 3m	195.00	l.m.			
18.04	75mm diameter x 3m	9.00	l.m.			
18.05	50mm diameter x 3m	51.00	l.m.			
<b>ITEM NO.</b>	<b>ITEM DESCRIPTION AND LOCATION</b>	<b>QUANTITY</b>	<b>UNIT</b>	<b>DIRECT UNIT COST</b>	<b>TOTAL COST</b>	<b>REMARKS</b>

	Supply and installation of Cast Iron Pipe, Service weight or approved equal, including fittings, painting, sleeves, supports, hangers and other miscellaneous items as shown and as required to complete the system					
18.06	200mm diameter x 3m	3.00	l.m.			
18.07	100mm diameter x 3m	3.00	l.m.			
	Vent Line (Horizontal and Vertical)					
	Supply and installation of Polyvinyl Chloride (PVC) pipes, Series 1000 II or approved equal, including fittings, painting, sleeves, supports, hangers and other miscellaneous items as shown and as required to complete the system					
18.08	75mm diameter x 3m	39.00	l.m.			
18.09	50mm diameter x 3m	21.00	l.m.			
	Supply and installation of Cast Iron Pipe, Service weight or approved equal, including fittings, painting, sleeves, supports, hangers and other miscellaneous items as shown and as required to complete the system					
18.10	75mm diameter x 3m	3.00	l.m.			
18.11	50mm diameter x 3m	3.00	l.m.			
	<b>Clean-out</b>					
	Supply and installation of Ceiling Clean-out					
18.12	200mm diameter jointing to PVC Pipe	6.00	pc/s			
18.13	150mm diameter jointing to PVC Pipe	2.00	pc/s			
18.14	100mm diameter jointing to PVC Pipe	6.00	pc/s			
18.15	50mm diameter jointing to PVC Pipe	4.00	pc/s			
	<b>Supply and installation of Floor Clean-out</b>					
18.16	100mm diameter jointing to PVC Pipe	5.00	pc/s			
18.17	75mm diameter jointing to PVC Pipe	3.00	pc/s			
	<b>Drains</b>					
	Supply and installation of drains including adaptors and p-trap as required, setting in concrete, making good around with approved grouting					
	<b>Floor Drain</b>					
18.18	50mm diameter jointing to PVC Pipe	11.00	pc/s			
<b>ITEM NO.</b>	<b>ITEM DESCRIPTION AND LOCATION</b>	<b>QUANTITY</b>	<b>UNIT</b>	<b>DIRECT UNIT COST</b>	<b>TOTAL COST</b>	<b>REMARKS</b>

	Supply and installation of grease trap, complete with removable stainless wire basket, 6mm thick hot dipped checkered steel plate cover, round bar lifting handle and all other necessary accessories and connections					
18.19	Grease trap; stainless steel Capacity: 4 GPM	3.00	pc/s			
<b>XIX.</b>	<b>FACILITY WATER DISTRIBUTION</b>					
	Cold Water Line (Main line,Horizontal and Vertical)					
	High Density Polypropylene Random Copolymer (PPR) pipes, Class PN-20 including fittings, painting, sleeves, support, hangers, and other miscellaneous items as shown and as required to complete the system. (Including connection of new PPR to existing GI main)					
19.01	100mm diameter x 4m	8.00	l.m.			
19.02	50mm diameter x 4m	12.00	l.m.			
19.03	40mm diameter x 4m	8.00	l.m.			
19.04	20mm diameter x 4m	24.00	l.m.			
19.05	15mm diameter x 4m	32.00	l.m.			
	<b>Cold Water Line (Roughing-ins)</b>					
	High Density Polypropylene Random Copolymer (PPR) pipes, Class PN-20 including fittings, painting, sleeves, support, hangers, and other miscellaneous items as shown and as required to complete the system.					
19.06	32mm diameter x 4m	36.00	l.m.			
19.07	25mm diameter x 4m	4.00	l.m.			
19.08	20mm diameter x 4m	20.00	l.m.			
19.09	15mm diameter x 4m	64.00	l.m.			
	<b>Gate Valves</b>					
	Supply and Install					
19.10	50mm diameter Screwed	1.00	pc/s			
19.11	32mm diameter Screwed	6.00	pc/s			
19.12	20mm diameter Screwed	1.00	pc/s			
19.13	15mm diameter Screwed	3.00	pc/s			
	<b>The following are in respect of the whole of the Plumbing installations</b>					
19.15	Sealing, packing and fire proofing wherever required where pipes, conduits, cables or trunking pass through slabs, walls, beams and the like	1.00	item			
19.16	providing identification, color coding and labelling	1.00	item			
<b>ITEM NO.</b>	<b>ITEM DESCRIPTION AND LOCATION</b>	<b>QUANTITY</b>	<b>UNIT</b>	<b>DIRECT UNIT COST</b>	<b>TOTAL COST</b>	<b>REMARKS</b>

19.17	providing operation and maintenance manuals consisting of five (5) sets	1.00	item			
19.18	testing and commissioning including making good all defects and re-testing as necessary and leaving all in sound and perfect working order on completion	1.00	item			
	Supply and installation of grease trap, complete with removable stainless wire basket, 6mm thick hot dipped checkered steel plate cover, round bar lifting handle and all other necessary accessories and connections					
19.19	instructing the Owner's representatives in operation, maintenance and service of completed installation; a period of twelve (12) months from the date of issuance of Certificate of Completion	1.00	item			
19.20	maintenance including labor and parts replacement; a period of twelve (12) months from the date of issuance of Certificate of Completion	1.00	item			
19.24	disinfecting the whole water distribution system issuing of the certificate of insurance that the whole system is free from contamination	1.00	item			
<b>SANITARY / PLUMBING TOTAL COST:</b>						
<b>Fire Protection Works Bill of Quantities</b>						
XX.	<b>Fire Protection Lines (Horizontal Pipes)</b>					
	Supply and installation of Black Iron Pipes, Schedule 40, or approved equal, including fittings, painting, sleeves, supports, hangers and other miscellaneous items as shown and as required to complete the system					
21.01	65mm diameter x 6m	72.00	pc/s			
21.04	40mm diameter x 6m	18.00	pc/s			
21.07	32mm diameter x 6m	36.00	pc/s			
21.10	25mm diameter x 6m	2,874.00	pc/s			
XXII.	<b>Sprinkler Heads</b>					
	Supply and installation of sprinkler heads and other miscellaneous items as shown and as required to complete the system (All existing and relocated sprinkler heads to be replaced with new)					
22.01	Pendent	128.00	pc/s			
22.02	Upright	5.00	pc/s			
22.03	Sidewall	2.00	pc/s			
	<b>SUBTOTAL COST:</b>					
	<b>SUNDRIES</b>					
<b>ITEM NO.</b>	<b>ITEM DESCRIPTION AND LOCATION</b>	<b>QUANTITY</b>	<b>UNIT</b>	<b>DIRECT UNIT COST</b>	<b>TOTAL COST</b>	<b>REMARKS</b>

	<b>The following are in respect of the whole of the Fire Protection installations</b>					
23.01	Sealing, packing and fire proofing wherever required where pipes, conduits, cables or trunking pass through slabs, walls, beams and the like	1.00	item			
23.02	providing identification, color coding and labelling	1.00	item			
23.03	providing operation and maintenance manuals consisting of five (5) sets	1.00	item			
23.04	testing and commissioning including making good all defects and re-testing as necessary and leaving all in sound and perfect working order on completion	1.00	item			
23.05	instructing the Owner's representatives in operation, maintenance and service of completed installation; a period of twelve (12) months from the date of issuance of Certificate of Completion	1.00	item			
23.06	maintenance including labor and parts replacement; a period of twelve (12) months from the date of issuance of Certificate of Completion	1.00	item			
23.07	disinfecting the whole water distribution system issuing of the certificate of insurance that the whole system is free from contamination	1.00	item			
	<b>SUBTOTAL COST:</b>					
	<b>FIRE PROTECTION WORKS TOTAL COST:</b>					
<b>Mechanical Works Bill of Quantities</b>						
XXIV.	AIR CONDITIONING UNIT					
24.01	ACCUV-2-03, 14HP Variable Refrigerant Flow Air Cooled Condensing Unit. Coil Blue Fin Coated	1.00	set			
24.02	ACCUV-2-04, 14HP Variable Refrigerant Flow Air Cooled Condensing Unit. Coil Blue Fin Coated	1.00	set			
24.03	ACCUV-2-05, 14HP Variable Refrigerant Flow Air Cooled Condensing Unit. Coil Blue Fin Coated	1.00	set			
24.04	ACUV 2-01, 2.0HP Ceiling Cassette Unit, c/w signals wires and local thermostat. Coil Blue Fin Coated	1.00	set			
24.05	ACUV 2-02, 2.0HP Ceiling Cassette Unit, c/w signals wires and local thermostat. Coil Blue Fin Coated	1.00	set			
24.06	ACUV 2-03, 2.0HP Ceiling Cassette Unit, c/w signals wires and local thermostat. Coil Blue Fin Coated	1.00	set			
24.07	ACUV 2-04, 1.0HP Wall Mounted Unit, c/w signals wires and local thermostat. Coil Blue Fin Coated	1.00	set			
<b>ITEM NO.</b>	<b>ITEM DESCRIPTION AND LOCATION</b>	<b>QUANTITY</b>	<b>UNIT</b>	<b>DIRECT</b>	<b>TOTAL COST</b>	<b>REMARKS</b>

				UNIT COST		
24.08	ACUV 2-05, 1.5HP Ceiling Cassette Unit, c/w signals wires and local thermostat. Coil Blue Fin Coated	1.00	set			
24.09	ACUV 2-06, 4.0HP Ceiling Cassette Unit, c/w signals wires and local thermostat. Coil Blue Fin Coated	1.00	set			
24.10	ACUV 2-07, 4.0HP Ceiling Cassette, c/w signals wires and local thermostat. Coil Blue Fin Coated	1.00	set			
24.11	ACUV 2-08, 2.0HP Ceiling Cassette, c/w signals wires and local thermostat. Coil Blue Fin Coated	1.00	set			
24.12	ACUV 2-09, 4.0HP Ceiling Cassette, c/w signals wires and local thermostat. Coil Blue Fin Coated	1.00	set			
24.13	ACUV 2-10, 4.0HP Ceiling Cassette, c/w signals wires and local thermostat. Coil Blue Fin Coated	1.00	set			
24.14	ACUV 2-11, 2.0HP Ceiling Cassette, c/w signals wires and local thermostat. Coil Blue Fin Coated	1.00	set			
24.15	ACUV 2-12, 2.0HP Ceiling Cassette, c/w signals wires and local thermostat. Coil Blue Fin Coated	1.00	set			
24.16	Refrigerant Pipes, Pipe Insulation and Special Pipe Connectors for VRF. Coil Blue Fin Coated	1.00	lot			
24.17	Electrical Wirings, Panel Boards and other signal wires	1.00	lot			
24.18	Podium Floor VRF Central Control and Monitoring System	1.00	set			
	<b>SUBTOTAL COST:</b>					
<b>XXV.</b>	<b>FANS AND BLOWERS</b>					
25.01	EF 2-01, Ceiling Mounted Type at 120 Lps	1.00	set			
25.02	EF 2-02, Ceiling Mounted Type at 120 Lps	1.00	set			
25.03	EF 2-02, Ceiling Mounted Type at 120 Lps	1.00	set			
25.04	TEF 2-01, Ceiling Mounted Type at 75 Lps	1.00	set			
25.05	TEF 2-02, Ceiling Mounted Type at 75 Lps	1.00	set			
25.06	TEF 2-03, Ceiling Mounted Type at 120 Lps	1.00	set			
25.07	TEF 2-04, Ceiling Mounted Type at 120 Lps	1.00	set			
25.08	AC 1-01, Air Curtain	4.00	set			
	<b>SUBTOTAL COST:</b>					
<b>ITEM NO.</b>	<b>ITEM DESCRIPTION AND LOCATION</b>	<b>QUANTITY</b>	<b>UNIT</b>	<b>DIRECT UNIT COST</b>	<b>TOTAL COST</b>	<b>REMARKS</b>

<b>XXVI.</b>	<b>DUCTWORK AND ACCESSORIES</b>					
26.01	Galvanized Iron Sheet					
	US Ga. # 26	140.00	sq.m.			
	US Ga. # 24	70.00	sq.m.			
	US Ga. # 22	20.00	sq.m.			
26.02	Flexible Duct c/w insulation and vapor barrier					
	250 dia.	255.00	lm			
	200 dia.	30.00	lm			
26.03	25mm thk. Crosslinked Polyolefin Insulation c/w vapor barrier and adhesive	210.00	sqm			
	Volume Control Dampers, Damper Splitter	1.00	lot			
	<b>SUBTOTAL COST:</b>					
<b>XXVII.</b>	<b>AIR DIFFUSERS</b>					
27.01	1200x50mm Linear Bar Grille c/w Opposed Blaed Damper, Aluminum Type	10.00	pcs			
27.02	1200x75mm Linear Bar Grille c/w Opposed Blade Damper, Aluminum Type	100.00	pcs			
27.03	250x250 4-way ceiling diffuser c/w obd	1.00	pcs			
27.04	200x200 4-way ceiling diffuser c/w obd	1.00	pcs			
27.05	1200x75mm Continuous Linear Bar Grille	1.00	lot			
	<b>SUBTOTAL COST:</b>					
<b>XXVIII.</b>	<b>OTHERS</b>					
28.01	Duct and Pipe Hangers, equipment Support, noise and vibration isolators	1.00	lot			
28.02	<b>Consumables</b>	1.00	lot			
28.03	Testing and Commissioning and Miscellaneous Items other miscellaneous items to complete the system	1.00	lot			
	<b>SUBTOTAL COST:</b>					
	<b>MECHANICAL WORKS WORKS TOTAL COST:</b>					
<b>Electrical Works Budgetary Estimates</b>						
<b>XXIX.</b>	<b>PANEL BOARDS, TRANSFORMERS &amp; CIRCUIT BREAKERS</b>					
29.01	<b>PP-RUD, 230V, 3P+G, NEMA 1</b>	1.00	assy			
	Main: 1 - Ezc F 100AT, 100AF, 3P, 25KAIC, 230V, MCCB					
	Brs: 19 - iC60 N 50AT, 63AF, 2P, 20KAIC, 230V, MCB					
	1 - iC60 N 32AT, 63AF, 2P, 20KAIC, 230V, MCB					
<b>ITEM NO.</b>	<b>ITEM DESCRIPTION AND LOCATION</b>	<b>QUANTITY</b>	<b>UNIT</b>	<b>DIRECT UNIT COST</b>	<b>TOTAL COST</b>	<b>REMARKS</b>

29.02	<b>2L2 (NEW) 230V, 3P+G, NEMA 1, SURFACE MOUNTED</b>	1.00	assy			
	Main: 12 - E ZC F 70AT, 100AF, 3P, 25KAIC, 230V, MCCB					
	Brs: 12 - iC60 N 20AT, 63AF, 2P, 10KAIC, 230V, MCB					
	Spare: 24- iC60 N 20AT, 63AF, 2P, 20KAIC, 230V, MCB					
	Space: 2 - 63AF, 2P					
29.03	<b>PPGH 230V, 3P+G, NEMA 1, SURFACE MOUNTED</b>	1.00	assy			
	Main: 1 - E ZC F 100AT, 100AF, 3P, 25KAIC, 230V, MCCB					
	Brs: 22 - iC60 N 20AT, 63AF, 2P, 10KAIC, 230V, MCB					
	Spare: 2 - iC60 N 20AT, 63AF, 2P, 10KAIC, 230V, MCB					
29.04	<b>PACU-PF (NEW) 480V, 3P+G</b>	1.00	assy			
	Main: 1 - E ZC N 250AT 250AF, 3P, 36KAIC, 480V					
	6 - E ZC F 70AT, 100AF, 3P, 25KAIC, 480V, MCCB					
	8 - E ZC H 60AT, 100AF, 3P, 25KAIC, 480V, MCCB					
29.05	<b>R2 230V, 3P+G, NEMA 1, SURFACE MOUNTED</b>	1.00	assy			
	Main: 12 - E ZC F 50AT, 100AF, 3P, 25KAIC, 230V, MCCB					
	Brs: 6 - iC60 N 20AT, 63AF, 2P, 20KAIC, 230V, MCB					
	Spare: 3 - iC60 N 20AT, 63AF, 2P, 20KAIC, 230V, MCB					
	Space: 3 - 63AF, 2P					
29.06	<b>2UP2 230V, 3P+G, NEMA 1, SURFACE MOUNTED</b>	1.00	assy			
	Main: 1 - iC60 N 50AT, 100AF, 3P, 20KAIC, 230V, MCB					
	Brs: 12 - iC60 N 20AT, 63AF, 2P, 20KAIC, 230V, MCB					
	Spare: 3 - iC60 N 20AT, 63AF, 2P, 20KAIC, 230V, MCB					
	Space: 3 - 63AF, 2P					
29.10	<b>PP-2 230V, 3P+G, NEMA 1, SURFACE MOUNTED</b>	1.00	assy			
	Main: 1 - iC60 N 50AT, 100AF, 3P, 20KAIC, 230V, MCB					
	Brs: 23 - iC60 N 20AT, 63AF, 2P, 20KAIC, 230V, MCB					
<b>ITEM NO.</b>	<b>ITEM DESCRIPTION AND LOCATION</b>	<b>QUANTITY</b>	<b>UNIT</b>	<b>DIRECT UNIT COST</b>	<b>TOTAL COST</b>	<b>REMARKS</b>



	Spare: 1 - iC60 N 20AT, 63AF, 2P, 20KAIC, 230V, MCB					
29.11	<b>25kVA 480V/ 230 DRY TYPE TRANSFORMER</b>	1.00	assy			
	<b>SUBTOTAL COST:</b>					
	<b>WIRING DEVICES</b>					
30.01	one gang switch					
	two gang switch	7.00	set			
	three gang switch	11.00	set			
	Three-way switch - one gang	1.00	set			
30.02	<b>CONDUITS</b>					
	15mmØ EMT conduits					
	15mmØ EMT elbow	297.00	pcs			
	15mmØ EMT coupling	594.00	pcs			
	15mmØ EMT connector	652.00	pcs			
	15mmØ EMT Locknut & Bushing	652.00	pcs			
	15mmØ flexible metal conduit	489.00	lm			
	15mmØ straight connector	326.00	pcs			
	15mmØ angle connector	326.00	pcs			
30.03	<b>BOXES</b>					
	4" x 4" x 2" Octagonal Box, Gauge 16, Zinc-Chromate	326.00	pcs			
	2" x 4" Utility Box, Gauge 16, Zinc-Chromate	30.00	pcs			
	6" x 6" x 4" Pull Box, Gauge 16, Zinc-Chromate	1.00	pcs			
	4-11/16" x 4-11/16" Square Box, Gauge 16, Zinc-Chromate	131.00	pcs			
30.05	<b>WIRES &amp; CABLES</b>					
	3.5mm <sup>2</sup>	7,192.00	lm			
	<b>SUBTOTAL COST:</b>					
XXXI.	<b>POWER SYSTEM</b>					
31.01	<b>WIRING DEVICES</b>					
	<b>Duplex Convenience Outlet</b>	157.00	sets			
	<b>Refrigerator Outlet, Grounding Type</b>	3.00	sets			
	<b>Microwave oven Outlet, Grounding Type</b>	4.00	sets			
	Food waste disposal outlet, Grounding Type	5.00	sets			
	Plate Cover WEG 6801W-1	16.00	sets			
31.02	<b>CONDUITS</b>					
	15mmØ EMT conduits	234.00	lghts			
	15mmØ EMT elbow	78.00	pcs			
	<b>15mmØ EMT coupling</b>					
	15mmØ EMT connector	261.00	pcs			
	15mmØ EMT Locknut & Bushing	261.00	pcs			
31.03	<b>BOXES &amp; PULL BOXES</b>					
<b>ITEM NO.</b>	<b>ITEM DESCRIPTION AND LOCATION</b>	<b>QUANTITY</b>	<b>UNIT</b>	<b>DIRECT</b>	<b>TOTAL COST</b>	<b>REMARKS</b>

				UNIT COST		
	4" x 4" Octagonal Box, Gauge 16, Zinc-Chromate	53.00	pcs			
	4-11/16" x 4-11/16" Square Box, Gauge 16, Zinc-Chromate	59.00	pcs			
	2" x 4" Utility Box, Gauge 16, Zinc-Chromate					
31.04	<b>WIRES &amp; CABLES</b>					
	3.5mm <sup>2</sup>	2,115.00	lm			
	<b>SUBTOTAL COST:</b>					
<b>XXXII.</b>	<b>TELEPHONE SYSTEM</b>					
32.01	CONDUIT & FITTINGS					
	25mmØ EMT conduits	16.00	pcs			
	25mmØ EMT elbow	8.00	pcs			
	25mmØ EMT coupling	16.00	pcs			
	25mmØ EMT connector	17.00	pcs			
	25mmØ Locknut & Bushing	17.00	pcs			
	25mmØ flexible metal conduit	14.00	pcs			
	25mmØ straight connector	9.00	pcs			
	25mmØ angle connector	9.00	pcs			
	32mmØ EMT conduits	159.00	lgths			
	32mmØ EMT elbow	80.00	pcs			
	32mmØ EMT coupling	159.00	pcs			
	32mmØ EMT connector	175.00	pcs			
	32mmØ Locknut & Bushing	175.00	pcs			
	32mmØ flexible metal conduit	14.00	pcs			
	32mmØ straight connector	9.00	pcs			
	32mmØ angle connector	9.00	pcs			
32.02	BOXES & PULL BOXES					
	4" x 4" x 2" Octagonal Box, Gauge 16, Zinc-Chromate	30.00	pcs			
	2" x 4" Utility Box, Gauge 16, Zinc-Chromate	30.00	pcs			
32.03	WIRES & CABLES					
	Cat5e Cable	2,280.00	l.m.			
32.04	EQUIPMENTS & DEVICES					
	Socket	19.00	pcs			
	<b>SUBTOTAL COST:</b>					
<b>XXXIII.</b>	<b>FIRE DETECTION ALARM SYSTEM</b>					
33.01	CONDUIT & FITTINGS					
	20mmØ EMT conduits	143.00	lgths			
	20mmØ EMT elbow					
	20mmØ EMT coupling	143.00	pcs			
	20mmØ EMT connector					
	20mmØ Locknut & Bushing	124.00	pcs			
<b>ITEM NO.</b>	<b>ITEM DESCRIPTION AND LOCATION</b>	<b>QUANTITY</b>	<b>UNIT</b>	<b>DIRECT UNIT</b>	<b>TOTAL COST</b>	<b>REMARKS</b>

				<b>COST</b>		
	15mmØ flexible metal conduit	93.00	lghts			
	15mmØ straight connector	62.00	pcs			
	15mmØ angle connector	62.00	pcs			
33.02	<b>BOXES &amp; PULL BOXES</b>					
	4" x 4" x 2" Octagonal Box, Gauge 16, Zinc-Chromate	62.00	pcs			
	2" x 4" Utility Box, Gauge 16, Zinc-Chromate	23.00	pcs			
	4-11/16" x 4-11/16" Square Box, Gauge 16, Zinc-Chromate	20.00	pcs			
33.03	<b>WIRES &amp; CABLES</b>					
	Twisted Pair #16 (MINERAL INSULATION FRC)	441.00	pcs			
33.04	<b>EQUIPMENT &amp; DEVICES</b>					
	manual pull station	5.00	pcs			
	horn with strobe light					
	smoke detector	39.00	pcs			
	<b>SUBTOTAL COST:</b>					
	<b>ELECTRICAL WORKS TOTAL COST:</b>					
	<b>PODIUM TOTAL COST (A, S/P, FP, M, E,)</b>					

THIRD FLOOR						
Architectural Works Bill of Quantities for Third Floor						
Package 2 (Third Floor)						
ITEM NO.	ITEM DESCRIPTION AND LOCATION	QTY	UNIT	DIRECT UNIT COST	TOTAL COST	REMARKS
I.	<b>GENERAL REQUIREMENTS</b>					
1.01	All insurances such as bonds and guarantee performance bonds, third party insurance and surety bond against down payment and retention bond, building permit and occupancy permit.	1.00	lot			
1.02	Mobilization and demobilization of workers, tools and equipment	1.00	lot			
1.03	Temporary facilities and temporary utilities	1.00	lot			
1.04	Safety and security, daily cleaning and maintenance works	1.00	lot			
1.05	Demolition, dismantling and hauling of debris (verify architectural technical specifications)	1.00	lot			
	Demolish all existing walls and partitions as stated in the plan.					
	Strip all existing wall finishes affected with the renovation					
	Dismantle existing ceiling finishes except for bottom of slab ceiling.					
	Dismantle all existing doors, door jambs, hardware and accessories and turnover all items to the owner for proper handling except for doors to be retained					
	Dismantle all existing glass partition and accessories and turnover all items to the owner for proper handling.					
	Dismantle all existing lighting fixtures and electrical devices on site and all items are subject for turnover to the owner for proper handling.					
	Dismantle all existing AC equipment on site subject for replacement and turnover all items to the over for proper handling.					
	Dismantle all existing utility lines, conduits, pipes and ductworks subject for replacement as per plan. i					
	Demolish and dismantle all existing floor finishes as per plan					
ITEM	ITEM DESCRIPTION AND LOCATION	QTY	UNIT	DIRECT	TOTAL	REMARKS

NO.				UNIT COST	COST	
	Demolish and dismantle all existing wall cubicle partition and floor tiles at existing toilets.					
	Demolish all existing CHB toilet partitions at common toilets.					
	Demolish existing lavatory counter at existing toilets.					
	Dismantle all existing toilet fixtures and accessories for replacement.					
	Dismantle existing wall mounted facial mirror at existing toilets.					
	Demolish existing walls and slab affected for the accommodation of new elevator shaft.					
	Demolish affected slab for all areas to be converted to pipe chase.					
	Demolish existing walls at executive toilets as per plan					
1.06	As-buit drawings. Including all disciplines	1.00	lot			
1.07	equipment Rental using twin cage building hoist (total of 4T capacity)	1.00	lot			
1.08	H-frame scaffolding complete with necessary things and accessories; and formworks	1.00	lot			
<b>II.</b>	<b>FLOOR WORKS</b>					
2.01	500mm x 500mm integrated tufted pattern loop solution dyed 100% synthetic fiber with 4.00mm pile height carpet tiles with Polyester spunbouned primary backing and condensed vinyl with fiberglass reinforcement secondary backing at offices and other areas shown in the plans	1,275.13	sq.m.			
2.02	12mm thk. x 600mm x 600mm non-skid, indoor granite tiles at hallways and other areas shown in the plans	231.15	sq.m.			
2.03	10mm thk. x 600mm x 600mm non-skid, non-vitreous porcelain tiles for toilets and other areas shown in the plans	42.42	sq.m.			
2.04	3mm thk. x 300mm x 300mm homogenous and resilient type Vinyl tiles, with primer and water-based acrylic floor adhesive at pantry, storage and other areas shown in the plans	151.53	sq.m.			
2.05	Existing marble floor finish subject for crystallization at elevator lobby and other areas shown in the plans	87.00	sq.m.			
	<b>SUBTOTAL COST:</b>					
<b>III.</b>	<b>WALL WORKS</b>					
<b>ITEM</b>	<b>ITEM DESCRIPTION AND LOCATION</b>	<b>QTY</b>	<b>UNIT</b>	<b>DIRECT</b>	<b>TOTAL</b>	<b>REMARKS</b>

NO.				UNIT COST	COST	
3.01	Drywall partition using 12mm thk. fiber cement board using 100mm thk. Using 400mm x 400mm metal studs vertical and horizontal on center	391.86	sq.m.			
3.02	100mm thick concrete hollow blocks with 25mm thick plaster on both sides complete with steel bars for Ground floor walls as shown in the plans	29.70	sq.m.			
3.03	25mm thk x 100mm. Wood plastic composite baseboard installed on both sides of all drywall and CHB wall partitions	270.68	l.m			
3.04	Existing marble wall finish subject for crystallization for areas shown in the plans	87.87	sq.m.			
	<b>SUBTOTAL COST:</b>					
<b>IV.</b>	<b>WALL FINISHES</b>					
4.01	10mm thick x 600mm x 600mm glazed porcelain wall tiles for all toilets and other areas shown in the plans	174.63	sq. m			
	<b>SUBTOTAL COST:</b>					
<b>V.</b>	<b>CEILING WORKS</b>					
5.01	12mm thk. Gypsumboard on 400mm x 400mm furring channel horizontal and vertical with 1200mm x 1200mm hanger both ways with 50mm shadow gap between walls and ceiling as per plan	1,477.32	sq.m.			
5.02	12mm thk. Moisture Resistant Gypsumboard on 400mm x 400mm furring channel both ways with 1200mm x 1200mm hanger both ways with 50mm shadow gap between walls and ceiling as per plan	37.29	sq.m.			
	<b>SUBTOTAL COST:</b>					
<b>VI.</b>	<b>PAINTING WORKS</b>					
6.01	Existing walls and columns shall be repainted for areas indicated in the plans	450.80	sq.m.			
6.02	New CHB wall and drywall partitions shall be painted with latex paint for interior wall surfaces as shown in the plans	738.83	sq.m.			
6.03	Epoxy paint for all utility floor areas as per plan; for fire exit existing pebble wash out floor finish to be painted with chemical emulsion	175.60	sq.m.			
6.04	All ceiling works shall be painted with latex paint as shown in the plans	1,499.61	sq.m.			
6.05	All existing bottom of slab shall be painted with latex paint at utility areas as shown in the plans	169.39	sq.m.			
	<b>SUBTOTAL COST:</b>					
<b>VII.</b>	<b>DOORS AND WINDOWS</b>					

7.01	D07. 2.1m x 1.8m;12mm thk tempered double-swing glass on FD-100 aluminum frame and 2.10 m x 1.80m double-swing glass door, complete with hardwares and accessories as per plan.	1.00	set			
<b>ITEM NO.</b>	<b>ITEM DESCRIPTION AND LOCATION</b>	<b>QTY</b>	<b>UNIT</b>	<b>DIRECT UNIT COST</b>	<b>TOTAL COST</b>	<b>REMARKS</b>
7.11	D11. 2.10m x 0.90m; 44mm thick kiln dried mahogany wood panel single-swing door with 50mm x 100mm kiln dried mahogany wood door jamb in wood stain finish with clear gloss top coat lacquer, complete with hardwares, and accessories as per plan.	11.00	set			
7.16	D16. 2.10m x 0.9m; GA 20 B.I. bended sheet steel single swing louvered with GA. 16 standard steel jamb painted with epoxy paint finish complete with hardwares and accessories as per plan	1.00	set			
7.17	D17. 2.10m x 0.70m; 44mm thick kiln dried louvered mahogany wood panel door with 50mm x 100mm kiln dried mahogany wood door jamb in wood stain finish with clear gloss top coat lacquer, complete with hardwares and accessories as per plan.	2.00	set			
7.18	D18. 2.10m x 1.00m; 44mm thick kiln dried louvered mahogany wood panel single-swing door with 50mm x 100mm kiln dried mahogany wood door jamb in wood stain finish with clear gloss top coat lacquer, complete with hardwares and accessories as per plan.	1.00	set			
7.23	D28. 2.1m x 0.7m; 44mm thick kiln dried louvered mahogany wood panel single-swing door with 50mm x 100mm kiln dried mahogany wood door jamb in wood stain finish with clear gloss top coat lacquer, complete with hardwares and accessories as per plan.	1.00	set			
7.24	D29. 2.1m x 0.90m; 44mm thick kiln dried louvered mahogany wood panel single-swing door with 50mm x 100mm kiln dried solid wood door jamb in wood stain finish with clear gloss top coat lacquer, complete with hardwares and accessories as per plan.	1.00	set			
7.08	D30. 2.1m x 5.1m. Combination of 12mm thk fixed tempered glass on FD-100 aluminum frame and 2.10 m x 0.90m single-swing glass door, complete with accessories as per plan.	1.00	set			

7.09	D31. 2.1m x 4.1m. Combination of 12mm thk fixed tempered glass on FD-100 aluminum frame and 2.10 m x 0.90m single-swing glass door, complete with accessories as per plan.	1.00	set			
ITEM NO.	ITEM DESCRIPTION AND LOCATION	QTY	UNIT	DIRECT UNIT COST	TOTAL COST	REMARKS
7.10	D32. 2.1m x 6m. Combination of 12mm thk fixed tempered glass on FD-100 aluminum frame and 2.10 m x 0.90m single-swing glass door, complete with hardwares and accessories as per plan.	1.00	set			
7.11	D34. 2.1m x 5.0m. Combination of 12mm thk fixed tempered glass on FD-100 aluminum frame and 2.10 m x 0.90m single-swing glass door, complete with hardwares and accessories as per plan.	1.00	set			
7.12	D35. 2.1m x 6.70m. Combination of 12mm thk fixed tempered glass on FD-100 aluminum frame and 2.10 m x 1.80m double-swing glass door, complete with hardwares and accessories as per plan.	2.00	set			
7.13	D36. 2.1m x 7.30m. Combination of 12mm thk fixed tempered glass on FD-100 aluminum frame and 2.10 m x 0.90m single-swing glass door, complete with hardwares and accessories as per plan.	3.00	set			
7.14	D37. 2.10m x 4.75m. Combination of 12mm thk fixed tempered glass on FD-100 aluminum frame and 2.10 m x 0.90m single-swing glass door, complete with accessories as per plan.	3.00	set			
7.15	D38. 2.10m x 3.30m. Combination of 12mm thk fixed tempered glass on FD-100 aluminum frame and 2.10 m x 0.90m single-swing glass door, complete with hardwares and accessories as per plan.	1.00	set			
7.16	D39. 2.10m x 8.20m. Combination of 12mm thk fixed tempered glass on FD-100 aluminum frame and 2.10 m x 0.90m single-swing glass door, complete with hardwares and accessories as per plan.	1.00	set			
7.17	D40. 2.10m x 7.90m. Combination of 12mm thk fixed tempered glass on FD-100 aluminum frame and 2.10 m x 0.90m single-swing glass door, complete with hardwares and accessories as per plan.	1.00	set			



7.18	DR.Existing single swing steel door panels and door jamb jamb to be retained and repainted. Existing door shall be painted with one (1) coat epoxy primer and two (2) coats epoxy top coat. All existing hardware and accessories subject for replacement.	3.00	set			
<b>ITEM NO.</b>	<b>ITEM DESCRIPTION AND LOCATION</b>	<b>QTY</b>	<b>UNIT</b>	<b>DIRECT UNIT COST</b>	<b>TOTAL COST</b>	<b>REMARKS</b>
7.19	DR. Existing fire exit doors to be retained and repainted. Hardwares and accessories including panic device to be replaced.	2.00	set			
7.20	DR. Existing vault doors to be retained and repainted. Hardwares and accessories to be replaced.	1.00	set			
7.21	100mm wide door threshold at all doors with different floor elevations from entry point and area interior	17.50	l.m			
	<b>SUBTOTAL COST:</b>					
<b>VIII.</b>	<b>GLASS WORKS</b>					
8.01	12mm thick tempered glass in FD 100 powder-coated aluminum framing including sealant application and frosted sticker for all glass partitions as shown in the plans	161.28	sq.m.			
8.02	Facial Mirror with 6mm thick marine plywood backing for toilets as shown in the plans	7.83	sq.m			
8.03	Graphicote with 6mm thick marine plywood backing for meeting rooms as shown in the plans	22.97	sq.m			
	<b>SUBTOTAL COST:</b>					
<b>IX.</b>	<b>MASONRY WORKS</b>					
9.01	25mm thk. granite countertop including 300mm high splashboard on concrete slab sub-counter at all pantry areas.	7.56	sq.m			
9.02	25mm thk. granite countertop including 300mm high splashboard in 50mm x 50mm solid wood k.d. tanguile framing on 3/4" thk marine plywood counter support for toilet counters	4.46	sq.m			
9.03	25mm thk. X 200mm granite ledge installed on top of concrete ledge.	0.63	sq.m			
9.04	25mm thk. Granite ledge on reinforced concrete support embedded to walls at 1400mm above floor finish for water closet	1.60	sq.m			
	<b>SUBTOTAL COST:</b>					
<b>X.</b>	<b>LIGHTING FIXTURES</b>					

10.01	18 watts daylight recessed type LED in 210mm diameter aluminium casing with glass frame down light fixture general ceiling areas and other areas shown in the plans	207.00	set			
ITEM NO.	ITEM DESCRIPTION AND LOCATION	QTY	UNIT	DIRECT UNIT COST	TOTAL COST	REMARKS
10.02	Surface mounted LED light fixture. Supply, delivery and installation of 5.7W LED daylight bulb with E27 lamp base with 100mm diameter round aluminium surface mounted down light fixture with glass cover and E27 socket for existing slab ceiling works and other areas shown in the plans	9.00	set			
10.03	6 watts warm white recessed type LED in 110mm diameter aluminium casing with glass frame down light fixture located above toilet sink and other areas shown in the plans	6.00	set			
10.04	600mm x 600mm x 12mmH 39W daylight slim type LED panel ceiling light fixture with aluminium housing, 100-240Vac Input and 26-30Vdc Output and optical PMMA diffuser for offices, elevator lobby and other areas as shown in the plans	172.20	set			
10.05	Low bay lighting fixtures comprising of low bay reflector bracket with E27 socket, 400mm diameter sand blasted reflector and glass cover, and 15W LED PAR38 daylight bulb with E27 lamp base for storages, utility areas and other areas as shown in the plans	36.00	set			
10.06	Indoor recessed wall lamp: recessed type aluminium die cast with glass lens wall light fixture with 60W E27 compact fluorescent lamp for hallways and other areas as shown in the plans	7.00	set			
10.07	T5 electronic fluorescent lamp with slim type luminaire (14W, 21W, 28W), for mirror lighting and other areas for cove lighting as shown in the plans	21.00	set			
	<b>SUBTOTAL COST:</b>					
<b>XI.</b>	<b>TOILET FIXTURES</b>					
11.01	Water closet	7.00	set			
11.02	Water Closet Sensor	7.00	set			
11.03	Bidet spray	7.00	set			
11.04	Urinal	4.00	set			
11.05	Urinal Sensor	4.00	set			
11.06	Countertop porcelain basin	7.00	set			

ITEM NO.	ITEM DESCRIPTION AND LOCATION	QTY	UNIT	DIRECT UNIT COST	TOTAL COST	REMARKS
11.07	Basin Faucet (Sensor)	7.00	set			
11.08	Slop sink faucet	1.00	set			
11.09	Enamel cast iron slop sink complete with accessories	1.00	set			
11.10	Stainless steel grab bar for PWD toilet	1.00	set			
	<b>SUBTOTAL COST:</b>					
<b>XII.</b>	<b>TOILET PARTITION</b>					
12.01	12mm thick machine pressed laminated phenolic board substrate partitions with high scratch and impact resistance with aluminium edge and corner profile, complete with indicator and accessories for water closet and shower	6.00	set			
12.02	12mm thick machine pressed laminated phenolic board substrate partitions with high scratch and impact resistance with aluminium edge and corner profile for urinal partition	3.00	set			
	<b>SUBTOTAL COST:</b>					
<b>XIII.</b>	<b>PANTRY FIXTURES AND ACCESSORIES</b>					
13.01	Pantry sink – chrome finish stainless steel L760 x W460mm single bowl upper-counter sink with drain board with corrosion resistance property for pantry	4.00	set			
13.02	Pantry sink faucet mixer – stainless steel chrome finish faucet mixer faucet with brass fittings H121 x L222mm with minimal lead traces in waterways and corrosion resistance for pantry	4.00	set			
13.03	0.75HP – 225v food waste disposer, with 3 grind stages, stainless steel grind elements and 1180mL stainless steel grind chamber for pantry	4.00	set			
	<b>SUBTOTAL COST:</b>					
<b>XVI.</b>	<b>MISCELLANEOUS WORKS</b>					
14.01	12mm thk machine-pressed natural wood veneer cladding on 12mm x 50mm wood spacers, with 25mm x 25mm aluminum corner guard and aluminum strip at 2100mm high from floor finish at elevator lobby.	3.88	sq.m.			
14.02	2.1m x 2.4m; Galvanized steel panel roll- up door, manual and motor operated with 1/4 HP single phase motor including electronic device push button switch at 5 seconds located in areas shown in the plans	2.00	set			
	<b>SUBTOTAL COST:</b>					

ITEM NO.	ITEM DESCRIPTION AND LOCATION	QTY	UNIT	DIRECT UNIT COST	TOTAL COST	REMARKS
XV.	WATER PROOFING WORKS					
15.01	Cementitious crystallization waterproofing using crystalline formulation for all pantry and toilets	51.67	sqm			
	<b>SUBTOTAL COST:</b>					
	<b>ARCHITECTURAL WORKS TOTAL COST:</b>					
<b>Sanitary / Plumbing Works Budgetary Estimates</b>						
<b>XVI.</b>	<b>FACILITY STORM DRAINAGE PIPING</b>					
	Storm Line (Collectors/Downspouts)					
	Supply and installation of Polyvinyl Chloride (PVC) pipes, Series 1000 II or approved equal, including fittings, painting, sleeves, supports, hangers and other miscellaneous items as shown and as required to complete the system					
16.01	150mm diameter x 3m	39.00	l.m.			
16.02	100mm diameter x 3m	24.00	l.m.			
<b>XVII.</b>	<b>AIRCON DRAINAGE PIPING</b>					
	Aircon Drain Line (Collectors and risers)					
	Supply and installation of Polyvinyl Chloride (PVC) pipes, Series 1000 II or approved equal, including fittings, painting, sleeves, supports, hangers and other miscellaneous items as shown and as required to complete the system					
17.01	100mm diameter x 3m	18.00	l.m.			
17.02	50mm diameter x 3m	72.00	l.m.			
17.03	25mm diameter x 3m	51.00	l.m.			
	Plumbing Insulation					
	Supply and installation of 20mm thick, pre-molded elastomeric closed cell rubber insulation, wrapped with polyethylene tape and clad with GA-26 aluminum sheets, including vapor barrier and other miscellaneous items as shown and as required to complete the system					
17.04	Condensate Insulation					
17.05	100mm diameter	18.00	m			
17.06	50mm diameter	72.00	m			
	25mm diameter	51.00	m			
	<b>Clean-out</b>					

ITEM NO.	ITEM DESCRIPTION AND LOCATION	QTY	UNIT	DIRECT UNIT COST	TOTAL COST	REMARKS
17.07	Supply and installation of Ceiling Clean-out					
	150mm diameter jointing to PVC Pipe	5.00	pc/s			
	<b>Drains</b>					
	Supply and installation of drains including adaptors and p-trap as required, setting in concrete, making good around with approved grouting					
	<b>Gutter Drain</b>					
17.08	100mm diameter jointing to PVC Pipe	16.00	pc/s			
<b>XVIII.</b>	<b>FACILITY SANITARY SEWERAGE</b>					
	Sanitary Sewer Line (Collectors and Risers)					
	Supply and installation of Polyvinyl Chloride (PVC) pipes, Series 1000 II or approved equal, including fittings, painting, sleeves, supports, hangers and other miscellaneous items as shown and as required to complete the system					
18.01	150mm diameter x 3m	6.00	l.m			
18.02	100mm diameter x 3m	84.00	l.m.			
18.03	75mm diameter x 3m	9.00	l.m.			
18.04	50mm diameter x 3m	90.00	l.m.			
	Supply and installation of Cast Iron Pipe, Service weight or approved equal, including fittings, painting, sleeves, supports, hangers and other miscellaneous items as shown and as required to complete the system					
18.05	100mm diameter x 3m	3.00	l.m.			
	<b>Vent Line (Horizontal and lateral branches)</b>					
	Supply and installation of Polyvinyl Chloride (PVC) pipes, Series 1000 II or approved equal, including fittings, painting, sleeves, supports, hangers and other miscellaneous items as shown and as required to complete the system					
18.06	75mm diameter x 3m	6.00	l.m.			
18.07	50mm diameter x 3m	192.00	l.m.			
	Supply and installation of Cast Iron Pipe, Service weight or approved equal, including fittings, painting, sleeves, supports, hangers and other miscellaneous items as shown and as required to complete the system					

ITEM NO.	ITEM DESCRIPTION AND LOCATION	QTY	UNIT	DIRECT UNIT COST	TOTAL COST	REMARKS
18.08	75mm diameter x 3m	3.00	l.m.			
18.09	50mm diameter x 3m	3.00	l.m.			
	<b>Clean-out</b>					
	Supply and installation of Ceiling Clean-out					
18.10	50mm diameter jointing to PVC Pipe	5.00	pc/s			
	Supply and installation of Floor Clean-out					
18.11	100mm diameter jointing to PVC Pipe	8.00	pc/s			
18.12	75mm diameter jointing to PVC Pipe	4.00	pc/s			
	<b>Drains</b>					
	Supply and installation of drains including adaptors and p-trap as required, setting in concrete, making good around with approved grouting					
	<b>Floor Drain</b>					
18.13	50mm diameter jointing to PVC Pipe	9.00	pc/s			
	Grease trap					
	Supply and installation of grease trap, complete with removable stainless wire basket, 6mm thick hot dipped checkered steel plate cover, round bar lifting handle and all other necessary accessories and connections					
18.14	Grease trap; stainless steel Capacity: 4 GPM	4.00	pc/s			
<b>XIX.</b>	<b>FACILITY WATER DISTRIBUTION</b>					
	Cold Water Line (Main distribution line)					
	High Density Polypropylene Random Copolymer (PPR) pipes, Class PN-20 including fittings, painting, sleeves, support, hangers, and other miscellaneous items as shown and as required to complete the system. (Including connection of new PPR to existing GI main)					
19.01	50mm diameter x 4m	4.00	l.m.			
19.02	40mm diameter x 4m	12.00	l.m.			
19.03	32mm diameter x 4m	16.00	l.m.			
19.04	25mm diameter x 4m	16.00	l.m.			
19.05	20mm diameter x 4m	52.00	l.m.			
19.06	15mm diameter x 4m	16.00	l.m.			

ITEM NO.	ITEM DESCRIPTION AND LOCATION	QTY	UNIT	DIRECT UNIT COST	TOTAL COST	REMARKS
	Cold Water Line (Roughing-ins)					
	High Density Polypropylene Random Copolymer (PPR) pipes, Class PN-20 including fittings, painting, sleeves, support, hangers, and other miscellaneous items as shown and as required to complete the system.					
19.07	32mm diameter x 4m	16.00	l.m.			
19.08	25mm diameter x 4m	4.00	l.m.			
19.09	20mm diameter x 4m	36.00	l.m.			
19.10	15mm diameter x 4m	80.00	l.m.			
	<b>Gate Valves</b>					
	Supply and Install					
19.11	50mm diameter Screwed	1.00	pc/s			
19.12	40mm diameter Screwed	1.00	pc/s			
19.13	32mm diameter Screwed	3.00	pc/s			
19.14	25mm diameter Screwed	1.00	pc/s			
19.15	20mm diameter Screwed	2.00	pc/s			
19.16	15mm diameter Screwed	5.00	pc/s			
	<b>The following are in respect of the whole of the Plumbing installations</b>					
19.17	Sealing, packing and fire proofing wherever required where pipes, conduits, cables or trunking pass through slabs, walls, beams and the like	1.00	item			
19.19	providing identification, color coding and labelling	1.00	item			
19.20	providing operation and maintenance manuals consisting of five (5) sets	1.00	item			
19.21	testing and commissioning including making good all defects and re-testing as necessary and leaving all in sound and perfect working order on completion	1.00	item			
19.22	instructing the Owner's representatives in operation, maintenance and service of completed installation; a period of twelve (12) months from the date of issuance of Certificate of Completion	1.00	item			

ITEM NO.	ITEM DESCRIPTION AND LOCATION	QTY	UNIT	DIRECT UNIT COST	TOTAL COST	REMARKS
19.23	maintenance including labor and parts replacement; a period of twelve (12) months from the date of issuance of Certificate of Completion	1.00	item			
19.24	disinfecting the whole water distribution system issuing of the certificate of insurance that the whole system is free from contamination	1.00	item			
	<b>SANITARY / PLUMBING TOTAL COST:</b>					
<b>Fire Protection Works Bill of Quantities</b>						
XXI.	<b>Fire Protection Lines (Horizontal Pipes)</b>					
	Supply and installation of Black Iron Pipes, Schedule 40, or approved equal, including fittings, painting, sleeves, supports, hangers and other miscellaneous items as shown and as required to complete the system					
	75mm diameter x 6m	6.00	lm			
21.03	65mm diameter x 6m	30.00	pc/s			
21.07	50mm diameter x 6m	6.00	pc/s			
21.09	40mm diameter x 6m	6.00	pc/s			
21.12	32mm diameter x 6m	6.00	pc/s			
21.17	25mm diameter x 6m	984.00	pc/s			
XXII.	<b>Sprinkler Heads</b>					
	Supply and installation of sprinkler heads and other miscellaneous items as shown and as required to complete the system (All existing and relocated sprinkler heads to be replaced with new)					
22.01	Pendent	186.00	pc/s			
22.02	Upright	7.00	pc/s			
22.03	Sidewall	2.00	pc/s			
	<b>SUBTOTAL COST:</b>					
XXIII.	<b>SUNDRIES</b>					
	The following are in respect of the whole of the Fire Protection installations	-				
23.01	Sealing, packing and fire proofing wherever required where pipes, conduits, cables or trunking pass through slabs, walls, beams and the like	1.00	item			



ITEM NO.	ITEM DESCRIPTION AND LOCATION	QTY	UNIT	DIRECT UNIT COST	TOTAL COST	REMARKS
23.03	providing identification, color coding and labelling	1.00	item			
23.04	providing operation and maintenance manuals consisting of five (5) sets	1.00	item			
23.05	testing and commissioning including making good all defects and re-testing as necessary and leaving all in sound and perfect working order on completion	1.00	item			
23.06	instructing the Owner's representatives in operation, maintenance and service of completed installation; a period of twelve (12) months from the date of issuance of Certificate of Completion	1.00	item			
23.09	maintenance including labor and parts replacement; a period of twelve (12) months from the date of issuance of Certificate of Completion	1.00	item			
23.10	disinfecting the whole water distribution system issuing of the certificate of insurance that the whole system is free from contamination	1.00	item			
	<b>SUBTOTAL COST:</b>					
	<b>FIRE PROTECTION WORKS TOTAL COST:</b>					
<b>Mechanical Works Budgetary Estimates</b>						
<b>XXIV.</b>	<b>AIR CONDITIONING UNIT</b>					
24.01	ACCUV-2-06, 17HP Variable Refrigerant Flow Air Cooled Condensing Unit. Coil Blue Fin Coated	1.00	set			
24.02	ACCUV-2-07, 17HP Variable Refrigerant Flow Air Cooled Condensing Unit. Coil Blue Fin Coated	1.00	set			
24.03	ACUV 3-01, 2.0HP Ceiling Cassette Unit, c/w signals wires and local thermostat. Coil Blue Fin Coated	1.00	set			
24.04	ACUV 3-02, 2.0HP Ceiling Cassette Unit, c/w signals wires and local thermostat. Coil Blue Fin Coated	1.00	set			
24.05	ACUV 3-03, 1.5HP Ceiling Cassette Unit, c/w signals wires and local thermostat. Coil Blue Fin Coated	1.00	set			
24.06	ACUV 3-04, 1.5HP Ceiling Cassette Unit, c/w signals wires and local thermostat. Coil Blue Fin Coated	1.00	set			
24.07	ACUV 3-05, 1.5HP Ceiling Cassette Unit, c/w signals wires and local thermostat. Coil Blue Fin Coated	1.00	set			
24.08	ACUV 3-06, 1.5HP Ceiling Cassette Unit, c/w signals wires and local thermostat. Coil Blue Fin Coated	1.00	set			

ITEM NO.	ITEM DESCRIPTION AND LOCATION	QTY	UNIT	DIRECT UNIT COST	TOTAL COST	REMARKS
24.09	ACUV 3-07, 2.0HP Ceiling Cassette Unit, c/w signals wires and local thermostat. Coil Blue Fin Coated	1.00	set			
24.10	ACUV 3-08, 3.0HP Ceiling Cassette Unit, c/w signals wires and local thermostat. Coil Blue Fin Coated	1.00	set			
24.11	ACUV 3-09, 2.0HP Ceiling Cassette Unit, c/w signals wires and local thermostat. Coil Blue Fin Coated	1.00	set			
24.12	ACUV 3-10, 1.5HP Ceiling Cassette Unit, c/w signals wires and local thermostat. Coil Blue Fin Coated	1.00	set			
24.13	ACUV 3-11, 1.5HP Ceiling Cassette Unit, c/w signals wires and local thermostat. Coil Blue Fin Coated	1.00	set			
24.14	Refrigerant Pipes, Pipe Insulation and Special Pipe Connectors for VRF	1.00	lot			
24.15	Electrical Wirings, Panel Boards and other signal wires	1.00	lot			
24.16	Podium Floor VRF Central Control and Monitoring System	1.00	set			
	<b>SUBTOTAL COST:</b>					
<b>XXV.</b>	<b>FANS AND BLOWERS</b>					
25.01	EF 3-01, Ceiling Mounted Type at 120 Lps	1.00	set			
25.02	EF 3-02, Ceiling Mounted Type at 120 Lps	1.00	set			
25.03	EF 3-03, Ceiling Mounted Type at 120 Lps	1.00	set			
25.04	EF 3-04, Ceiling Mounted Type at 120 Lps	1.00	set			
25.05	TEF 3-01, Ceiling Mounted Type at 75 Lps	1.00	set			
25.06	TEF 3-02, Ceiling Mounted Type at 120 Lps	1.00	set			
25.07	TEF 3-03, Ceiling Mounted Type at 120 Lps	1.00	set			
	<b>SUBTOTAL COST:</b>					
<b>XXVI.</b>	<b>DUCTWORK AND ACCESSORIES</b>					
26.01	Galvanized Iron Sheet					
	US Ga. # 26	250.00	sq.m.			
	US Ga. # 24	294.00	sq.m.			
26.02	Flexible Duct c/w insulation					
	300 dia.	6.00	lm			
	250 dia.	334.00	lm			

ITEM NO.	ITEM DESCRIPTION AND LOCATION	QTY	UNIT	DIRECT UNIT COST	TOTAL COST	REMARKS
	200 dia.	30.00	lm			
26.03	25mm thk. Crosslinked Polyolefin Insulation c/w vapor barrier and adhesive	515.00	sqm			
	Volume Control Dampers, Damper Splitter	1.00	lot			
	<b>SUBTOTAL COST:</b>					
<b>XXVII.</b>	<b>AIR DIFFUSERS</b>					
27.01	1200x50mm Linear Bar Grille c/w Opposed Blaed Damper, Aluminum Type	35.00	pcs			
27.02	1200x75mm Linear Bar Grille c/w Opposed Blaed Damper, Aluminum Type	135.00	pcs			
27.03	250x250 4-way ceiling diffuser c/w obd	1.00	pcs			
27.04	300x300 4-way ceiling diffuser c/w obd	4.00	pcs			
27.05	350x350 4-way ceiling diffuser c/w obd	1.00	pcs			
27.06	1200x75mm Continuos Linear Bar Grille	1.00	lot			
27.07	350X350 4-Way Ceiling Diffuser c/w Opposed Blade Damper	4.00	pcs			
27.08	300X300 4-Way Ceiling Diffuser c/w Opposed Blade Damper	2.00	pcs			
	<b>SUBTOTAL COST:</b>					
<b>XXVIII.</b>	<b>OTHERS</b>					
28.01	Duct and Pipe Hangers, equipment Support, noise and vibration isolators	1.00	lot			
28.02	Consumables	1.00	lot			
28.03	Testing and Commissioning and Miscellaneous Items other miscellaneous items to complete the system	1.00	lot			
	<b>SUBTOTAL COST:</b>					
	<b>MECHANICAL WORKS TOTAL COST:</b>					
<b>Electrical Works Budgetary Estimates</b>						
<b>XXIX.</b>	<b>PANEL BOARDS, TRANSFORMERS &amp; CIRCUIT BREAKERS</b>					
29.01	2UP3 230V, 3P+G, NEMA 1, SURFACE MOUNTED	1.00	assy			
	Main: 1 - EZC F 100AT, 100AF, 3P, 25KAIC, 230V, MCCB					
	Brs: 18 - iC60 N 20AT, 63AF, 2P, 20KAIC, 230V, MCB					
29.02	2L3 230V, 3P+G, NEMA 1, SURFACE MOUNTED	1.00	assy			

ITEM NO.	ITEM DESCRIPTION AND LOCATION	QTY	UNIT	DIRECT UNIT COST	TOTAL COST	REMARKS
	Main: 1 - EZC F 80AT, 100AF, 3P, 25KAIC, 230V, MCCB					
	Brs: 1 - iC60 N 50AT, 63AF, 2P, 20KAIC, 230V, MCB					
	17 - iC60 N 20AT, 63AF, 2P, 20KAIC, 230V, MCB					
	Spare: 1- iC60 N 20AT, 63AF, 2P, 20KAIC, 230V, MCB					
29.03	R3 230V, 3P+G, NEMA 1, SURFACE MOUNTED	1.00	assy			
	Main: 1 - Main Lugs Only, 60A, 3P					
	Brs: 10 - iC60 N 20AT, 63AF, 2P, 20KAIC, 230V, MCB					
	Spare: 2 - iC60 N 20AT, 63AF, 2P, 20KAIC, 230V, MCB					
29.04	PP-3 230V, 3P+G, NEMA 1, SURFACE MOUNTED	1.00	assy			
	Main: 1 - iC60 N 100AT, 100AF, 3P, 25KAIC, 230V, MCB					
	Brs: 24 - iC60 N 20AT, 63AF, 2P, 10KAIC, 230V, MCB					
29.05	25kVA 480V/ 230 DRY TYPE TRANSFORMER	1.00	assy			
	<b>SUBTOTAL COST:</b>					
	<b>WIRING DEVICES</b>					
	one gang switch					
30.01	two gang switch	11.00	set			
30.02	three gang switch	19.00	set			
30.03	Three-way switch - one gang					
30.04	Three-way switch - two gang					
30.05	Three-way switch - three gang	4.00	set			
30.06	<b>CONDUITS</b>					
	15mmØ EMT conduits					
30.07	15mmØ EMT elbow	489.00	pcs			
30.08	15mmØ EMT coupling	978.00	pcs			
30.09	15mmØ EMT connector	1,074.00	pcs			
30.10	15mmØ EMT Locknut & Bushing	1,074.00	pcs			
30.11	15mmØ flexible metal conduit	806.00	lm			
30.12	15mmØ straight connector	537.00	pcs			

ITEM NO.	ITEM DESCRIPTION AND LOCATION	QTY	UNIT	DIRECT UNIT COST	TOTAL COST	REMARKS
30.13	15mmØ angle connector	537.00	pcs			
30.14	BOXES					
	4" x 4" x 2" Octagonal Box, Gauge 16, Zinc-Chromate					
30.15	2" x 4" Utility Box, Gauge 16, Zinc-Chromate	38.00	pcs			
30.16	6" x 6" x 4" Pull Box, Gauge 16, Zinc-Chromate	1.00	pcs			
30.17	4-11/16" x 4-11/16" Square Box, Gauge 16, Zinc-Chromate	205.00	pcs			
	<b>WIRES &amp; CABLES</b>					
30.19	3.5mm <sup>2</sup>	8,802.00	lm			
	<b>SUBTOTAL COST:</b>					
	<b>POWER SYSTEM</b>					
XXXI.	WIRING DEVICES					
31.01	<b>Duplex Convenience Outlet</b>	332.00	sets			
31.02	Refrigerator Outlet, Grounding					
31.03	Microwave oven Outlet, Grounding Type	4.00	sets			
31.04	Food waste disposal outlet, Grounding Type	4.00	sets			
31.05	Hand Dryer Outlet	4.00	sets			
	<b>CONDUITS</b>	2.00	sets			
31.06	15mmØ EMT conduits					
31.07	15mmØ EMT elbow	591.00	lghts			
	15mmØ EMT coupling	197.00	pcs			
31.09	15mmØ EMT connector	591.00	pcs			
31.10	15mmØ EMT Locknut & Bushing	534.00	pcs			
	<b>BOXES &amp; PULL BOXES</b>	534.00	pcs			
31.11	4" x 4" Octagonal Box, Gauge 16, Zinc-Chromate					
31.12	4-11/16" x 4-11/16" Square Box, Gauge 16, Zinc-Chromate	107.00	pcs			
	2" x 4" Utility Box, Gauge 16, Zinc-Chromate	89.00	pcs			
	<b>WIRES &amp; CABLES</b>					
	3.5mm <sup>2</sup>	5,315.00	lm			
	<b>SUBTOTAL COST:</b>					

ITEM NO.	ITEM DESCRIPTION AND LOCATION	QTY	UNIT	DIRECT UNIT COST	TOTAL COST	REMARKS
<b>XXXII.</b>	<b>FIRE DETECTION ALARM SYSTEM</b>					
	<b>CONDUIT &amp; FITTINGS</b>					
32.01	20mmØ EMT conduits	215.00	lghts			
32.02	20mmØ EMT elbow	166.00	pcs			
32.03	20mmØ EMT coupling	215.00	pcs			
32.04	20mmØ EMT connector	184.00	pcs			
32.05	20mmØ Locknut & Bushing	184.00	pcs			
32.06	15mmØ flexible metal conduit	138.00	lghts			
32.07	15mmØ straight connector	92.00	pcs			
32.08	15mmØ angle connector	92.00	pcs			
	<b>BOXES &amp; PULL BOXES</b>					
32.09	4" x 4" x 2" Octagonal Box, Gauge 16, Zinc-Chromate	92.00	pcs			
32.10	2" x 4" Utility Box, Gauge 16, Zinc-Chromate	37.00	pcs			
32.11	4-11/16" x 4-11/16" Square Box, Gauge 16, Zinc-Chromate	20.00	pcs			
	<b>WIRES &amp; CABLES</b>					
32.12	Twisted Pair #16 (MINERAL INSULATION FRC)	663.00	pcs			
	<b>EQUIPMENT &amp; DEVICES</b>					
32.13	manual pull station	6.00	pcs			
32.14	horn with strobe light	37.00	set			
32.15	smoke detector	55.00	pcs			
	<b>SUBTOTAL COST:</b>					
<b>XXXIII.</b>	<b>TELEPHONE SYSTEM</b>					
	<b>CONDUIT &amp; FITTINGS</b>					
33.01	25mmØ EMT conduits	317.67	pcs			
33.02	25mmØ EMT elbow	158.83	pcs			
33.03	25mmØ EMT coupling	317.67	pcs			
33.04	25mmØ EMT connector	349.43	pcs			
33.05	25mmØ Locknut & Bushing	349.43	pcs			
33.06	25mmØ flexible metal conduit	87.00	pcs			

ITEM NO.	ITEM DESCRIPTION AND LOCATION	QTY	UNIT	DIRECT UNIT COST	TOTAL COST	REMARKS
33.07	25mmØ straight connector	174.72	pcs			
33.08	25mmØ angle connector	174.72	pcs			
33.09	32mmØ EMT conduits	49.00	pcs			
33.10	32mmØ EMT elbow	24.50	pcs			
33.11	32mmØ EMT coupling	49.00	pcs			
33.12	32mmØ EMT connector	53.90	pcs			
33.13	32mmØ Locknut & Bushing	53.90	pcs			
33.14	32mmØ flexible metal conduit	14.00	pcs			
33.15	32mmØ straight connector	26.95	pcs			
33.16	32mmØ angle connector	26.95	pcs			
	<b>BOXES &amp; PULL BOXES</b>					
33.17	4" x 4" x 2" Octagonal Box, Gauge 16, Zinc-Chromate	41.00	pcs			
33.18	2" x 4" Utility Box, Gauge 16, Zinc-Chromate	41.00	pcs			
	<b>WIRES &amp; CABLES</b>					
33.19	<b>CAT 5e Cable</b>	2,626.00	lm			
	<b>SUBTOTAL COST:</b>					
	<b>ELECTRICAL WORKS TOTAL COST:</b>					
	<b>THIRD FLOOR TOTAL COST (A,S/P,FP,M,E,S)</b>					

FOURTH FLOOR						
Architectural Works Bill of Quantities for Fourth Floor						
Package 2 (Fourth Floor)						
ITEM NO.	ITEM DESCRIPTION AND LOCATION	QTY	UNIT	DIRECT UNIT COST	TOTAL COST	REMARKS
I.	<b>GENERAL REQUIREMENTS</b>					
1.01	All insurances such as bonds and guarantee performance bonds, third party insurance and surety bond against down payment and retention bond, building permit and occupancy permit.	1.00	lot			
1.02	Mobilization and demobilization of workers, tools and equipment	1.00	lot			
1.03	Temporary facilities and temporary utilities	1.00	lot			

ITEM NO.	ITEM DESCRIPTION AND LOCATION	QTY	UNIT	DIRECT UNIT COST	TOTAL COST	REMARKS
1.01	Safety and security, daily cleaning and maintenance works	1.00	lot			
1.02	Demolition, dismantling and hauling of debris (verify architectural technical specifications)	1.00	lot			
	Demolish all existing walls and partitions as stated in the plan.					
	Strip all existing wall finishes affected with the renovation					
	Dismantle existing ceiling finishes except for bottom of slab ceiling.					
	Dismantle all existing doors, door jambs, hardware and accessories and turnover all items to the owner for proper handling except for doors to be retained					
	Dismantle all existing glass partition and accessories and turnover all items to the owner for proper handling.					
	Dismantle all existing lighting fixtures and electrical devices on site and all items are subject for turnover to the owner for proper handling.					
	Dismantle all existing AC equipment on site subject for replacement and turnover all items to the over for proper handling.					
	Dismantle and relocation of all necessary existing utility lines, conduits, pipes, ductworks and sprinkler heads subject for replacement as per plan. i					
	Demolish and dismantle all existing floor finishes as per plan					
	Demolish and dismantle all existing wall cubicle partition and floor tiles at existing toilets.					
	Demolish all existing CHB toilet partitions at common toilets.					
	Demolish existing lavatory counter at existing toilets.					
	Dismantle all existing toilet fixtures and accessories for replacement.					
	Dismantle existing wall mounted facial mirror at existing toilets.					
	Demolish existing walls and slab affected for the accommodation of new elevator shaft.					
	Demolish affected slab for all areas to be converted to pipe chase.					



ITEM NO.	ITEM DESCRIPTION AND LOCATION	QTY	UNIT	DIRECT UNIT COST	TOTAL COST	REMARKS
	Demolish existing walls at executive toilets as per plan					
1.06	As-buit drawings. Including all disciplines	1.00	lot			
1.07	equipment Rental using twin cage building hoist (total of 4T capacity)	1.00	lot			
1.08	H-frame scaffolding complete with necessary things and accessories; and formworks	1.00	lot			
	<b>SUBTOTAL COST:</b>					
<b>II.</b>	<b>FLOOR WORKS</b>					
2.01	500mm x 500mm integrated tufted pattern loop solution dyed 100% synthetic fiber with 4.00mm pile height carpet tiles with Polyester spunbouned primary backing and condensed vinyl with fiberglass reinforcement secondary backing at offices and other areas shown in the plans	1,291.72	sq.m.			
2.02	12mm thk. x 600mm x 600mm non-skid, indoor granite tiles at hallways and other areas shown in the plans	58.87	sq.m.			
2.03	10mm thk. x 600mm x 600mm non-skid, non-vitreous porcelain tiles for toilets and other areas shown in the plans	38.95	sq.m.			
2.04	3mm thk. x 300mm x 300mm homogenous and resilient type Vinyl tiles, with primer and water-based acrylic floor adhesive at pantry, storage and other areas shown in the plans	188.83	sq.m.			
2.05	Exisiting marble floor finish subject for crystallization at elevator lobby and other areas shown in the plans	79.89	sq.m.			
	<b>SUBTOTAL COST:</b>					
<b>III.</b>	<b>WALL WORKS</b>					
3.01	Drywall partition using 12mm thk. fiber cement board using 100mm thk. Using 400mm x 400mm metal suds vertical and horizontal on center	367.18	sq.m.			
3.02	100mm thick concrete hollow blocks with 25mm thick plaster on both sides complete with steel bars for Ground floor walls as shown in the plans	91.79	sq.m.			
3.03	25mm thk x 100mm. Wood plastic composite baseboard installed on both sides of all drywall and CHB wall partitions	285.17	l.m			
3.04	Exisiting marble wall finish subject for crystallization for areas shown in the plans	87.87	sq.m.			
	<b>SUBTOTAL COST:</b>					

ITEM NO.	ITEM DESCRIPTION AND LOCATION	QTY	UNIT	DIRECT UNIT COST	TOTAL COST	REMARKS
<b>IV.</b>	<b>WALL FINISHES</b>					
4.01	10mm thick x 600mm x 600mm glazed porcelain wall tiles for all toilets and other areas shown in the plans	174.63	sq. m			
	<b>SUBTOTAL COST:</b>					
<b>V.</b>	<b>CEILING WORKS</b>					
5.01	12mm thk. Gypsumboard on 400mm x 400mm furring channel horinztal and vertical with 1200mm x 1200mm hanger both ways with 50mm shadow gap between walls and ceiling as per plan	1,468.92	sq.m.			
5.02	12mm thk. Moisture Resistant Gypsumboard on 400mm x 400mm furring channel both ways with 1200mm x 1200mm hanger both ways with 50mm shadow gap between walls and ceiling as per plan	37.29	sq.m.			
	<b>SUBTOTAL COST:</b>					
<b>VI.</b>	<b>PAINTING WORKS</b>					
6.01	Existing walls and columns shall be repainted for areas indicated in the plans	538.58	sq.m.			
6.02	New CHB wall and drywall partitions shall be painted with latex paint for interior wall surfaces as shown in the plans	776.46	sq.m.			
6.03	Epoxy paint for all utility floor areas as per plan; for fire exit existing pebble wash out floor finish to be painted with chemical emulsion	175.60	sq.m.			
6.04	All ceiling works shall be painted with latex paint as shown in the plans	1,506.21	sq.m.			
6.05	All existing bottom of slab shall be painted with latex paint at utility areas as shown in the plans	198.99	sq.m.			
	<b>SUBTOTAL COST:</b>					
<b>VII.</b>	<b>DOORS AND WINDOWS</b>					
7.11	D11. 2.10m x 0.90m; 44mm thick kiln dried mahogany wood panel single-swing door with 50mm x 100mm kiln dried mahogany wood door jamb in wood stain finish with clear gloss top coat lacquer, complete with hardwares, and accessories as per plan.	11.00	set			
7.14	D14. 2.10m x 0.9m; GA 20 bended sheet panel, steel reinforced single-swing vault door with rockwool insulation, with GA16 50mm x 150mm standard steel door jamb in epoxy paint finish, complete with hardware and accessories as per plan.	1.00	set			

ITEM NO.	ITEM DESCRIPTION AND LOCATION	QTY	UNIT	DIRECT UNIT COST	TOTAL COST	REMARKS
7.16	D16. 2.10m x 0.9m; GA 20 B.I. bended sheet steel single swing louvered with GA. 16 standard steel jamb painted with epoxy paint finish complete with hardwares and accessories as per plan	1.00	set			
7.17	D17. 2.10m x 0.70m; 44mm thick kiln dried louvered mahogany wood panel door with 50mm x 100mm kiln dried mahogany wood door jamb in wood stain finish with clear gloss top coat lacquer, complete with hardwares and accessories as per plan.	2.00	set			
7.18	D18. 2.10m x 1.00m; 44mm thick kiln dried louvered mahogany wood panel single-swing door with 50mm x 100mm kiln dried mahogany wood door jamb in wood stain finish with clear gloss top coat lacquer, complete with hardwares and accessories as per plan.	1.00	set			
7.23	D28. 2.1m x 0.7m; 44mm thick kiln dried louvered mahogany wood panel single-swing door with 50mm x 100mm kiln dried mahogany wood door jamb in wood stain finish with clear gloss top coat lacquer, complete with hardwares and accessories as per plan.	1.00	set			
7.24	D29. 2.1m x 0.90m; 44mm thick kiln dried louvered mahogany wood panel single-swing door with 50mm x 100mm kiln dried solid wood door jamb in wood stain finish with clear gloss top coat lacquer, complete with hardwares and accessories as per plan.	1.00	set			
7.08	D32. 2.10m x 6.0m. Combination of 12mm thk fixed tempered glass on FD-100 aluminum frame and 2.10 m x 0.90m single-swing glass door, complete with accessories as per plan.	2.00	set			
7.09	D34. 2.1m x 5.0m. Combination of 12mm thk fixed tempered glass on FD-100 aluminum frame and 2.10 m x 0.90m single-swing glass door, complete with accessories as per plan.	1.00	set			
7.10	D35. 2.1m x 6.70m. Combination of 12mm thk fixed tempered glass on FD-100 aluminum frame and 2.10 m x 1.80m double-swing glass door, complete with accessories as per plan.	2.00	set			

ITEM NO.	ITEM DESCRIPTION AND LOCATION	QTY	UNIT	DIRECT UNIT COST	TOTAL COST	REMARKS
7.11	D36. 2.1m x 7.30m. Combination of 12mm thk fixed tempered glass on FD-100 aluminum frame and 2.10 m x 0.90m single-swing glass door, complete with hardwares and accessories as per plan.	3.00	set			
7.12	D37.2.10m x 4.75m. Combination of 12mm thk fixed tempered glass on FD-100 aluminum frame and 2.10 m x 0.90m single-swing glass door, complete with hardwares and accessories as per plan.	2.00	set			
7.13	D41. 2.1m x 4.0m. Combination of 12mm thk fixed tempered glass on FD-100 aluminum frame and 2.10 m x 0.90m single-swing glass door, complete with hardwares and accessories as per plan.	4.00	set			
7.14	D42. 2.1m x 2.4m. Combination of 12mm thk fixed tempered glass on FD-100 aluminum frame and 2.10 m x 0.90m single-swing glass door, complete with accessories as per plan.	1.00	set			
7.15	D43. 2.1m x 5.79m. Combination of 12mm thk fixed tempered glass on FD-100 aluminum frame and 2.10 m x 0.90m single-swing glass door, complete with hardwares and accessories as per plan.	1.00	set			
7.16	D44. 2.10m x 8.10m. Combination of 12mm thk fixed tempered glass on FD-100 aluminum frame and 2.10 m x 1.80m double-swing glass door, complete with accessories as per plan.	1.00	set			
7.17	D45. 2.10m x 7.30m. Combination of 12mm thk fixed tempered glass on FD-100 aluminum frame and two 2.10 m x 0.90m single-swing glass door, complete with hardwares and accessories as per plan.	1.00	set			
7.18	D46. 2.10m x 5.70m. Combination of 12mm thk fixed tempered glass on FD-100 aluminum frame and 2.10 m x 1.80m double-swing glass door, complete with hardwares and accessories as per plan.	1.00	set			
7.19	D47. 2.10m x 2.30m. Combination of 12mm thk fixed tempered glass on FD-100 aluminum frame and 2.10 m x 0.90 single-swing glass door, complete with accessories as per plan.	1.00	set			

ITEM NO.	ITEM DESCRIPTION AND LOCATION	QTY	UNIT	DIRECT UNIT COST	TOTAL COST	REMARKS
7.20	D48. 2.10m x 10.24m. Combination of 12mm thk fixed tempered glass on FD-100 aluminum frame and 2.10 m x 1.80m double-swing glass door, complete with hardwares and accessories as per plan.	1.00	set			
7.21	D49. 2.10m x 8.55m. Combination of 12mm thk fixed tempered glass on FD-100 aluminum frame and two 2.10 m x 0.90 m single-swing glass door, complete with hardwares and accessories as per plan.	1.00	set			
7.22	DR. Existing single swing steel door panels and door jamb jamb to be retained and repainted. Existing door shall be painted with one (1) coat epoxy primer and two (2) coats epoxy top coat. All existing hardware and accessories subject for replacement.	3.00	set			
7.23	DR. Existing fire exit doors to be retained and repainted. Hardwares and accessories including panic device to be replaced	2.00	set			
7.24	DR. Existing vault doors to be retained and repainted. Hardwares and accessories including panic device to be replaced	1.00	set			
7.25	100mm wide door threshold at all doors with different floor elevations from entry point and area interior	20.70	l.m			
	<b>SUBTOTAL COST:</b>					
<b>VIII.</b>	<b>GLASS WORKS</b>					
8.01	12mm thick tempered glass in FD 100 powder-coated aluminum framing including sealant application and frosted sticker for all glass partitions as shown in the plans	122.01	sq.m.			
8.02	Facial Mirror with 6mm thick marine plywood backing for toilets as shown in the plans	7.83	sq.m			
8.03	Graphicote with 6mm thick marine plywood backing for meeting rooms as shown in the plans	30.89	sq.m			
	<b>SUBTOTAL COST:</b>					
<b>IX.</b>	<b>MASONRY WORKS</b>					
9.01	25mm thk. granite countertop including 300mm high splashboard on concrete slab sub-counter at all pantry areas.	6.56	sq.m			
9.02	25mm thk. granite countertop including 300mm high splashboard in 50mm x 50mm solid wood k.d. tanguile framing on 3/4" thk marine plywood counter support for toilet counters	4.46	sq.m			

ITEM NO.	ITEM DESCRIPTION AND LOCATION	QTY	UNIT	DIRECT UNIT COST	TOTAL COST	REMARKS
9.03	25mm thk. X 200mm granite ledge installed on top of concrete ledge.	0.63	sq.m			
9.04	25mm thk. X 200mm Granite ledge installed 25mm thk. Granite ledge on reinforced concrete support embedded to walls at 1400mm above floor finish for water closet	1.60	sq.m			
	<b>SUBTOTAL COST:</b>					
<b>X.</b>	<b>LIGHTING FIXTURES</b>					
10.01	18 watts daylight recessed type LED in 210mm diameter aluminium casing with glass frame down light fixture general ceiling areas and other areas shown in the plans	244.00	set			
10.02	Surface mounted LED light fixture. Supply, delivery and installation of 5.7W LED daylight bulb with E27 lamp base with 100mm diameter round aluminium surface mounted down light fixture with glass cover and E27 socket for existing slab ceiling works and other areas shown in the plans	9.00	set			
10.03	6 watts warm white recessed type LED in 110mm diameter aluminium casing with glass frame down light fixture located above toilet sink and other areas shown in the plans	6.00	set			
10.04	600mm x 600mm x 12mmH 39W daylight slim type LED panel ceiling light fixture with aluminium housing, 100-240Vac Input and 26-30Vdc Output and optical PMMA diffuser for offices, elevator lobby and other areas as shown in the plans	169.68	set			
10.05	Low bay lighting fixtures comprising of low bay reflector bracket with E27 socket, 400mm diameter sand blasted reflector and glass cover, and 15W LED PAR38 daylight bulb with E27 lamp base for storages, utility areas and other areas as shown in the plans	26.26	set			
10.06	Indoor recessed wall lamp: recessed type aluminium die cast with glass lens wall light fixture with 60W E27 compact fluorescent lamp for hallways and other areas as shown in the plans	1.00	set			
10.07	T5 electronic fluorescent lamp with slim type luminaire (14W, 21W, 28W), for mirror lighting and other areas for cove lighting as shown in the plans	14.40	set			
	<b>SUBTOTAL COST:</b>					
<b>XI.</b>	<b>TOILET FIXTURES</b>					
11.01	Water closet	7.00	set			

ITEM NO.	ITEM DESCRIPTION AND LOCATION	QTY	UNIT	DIRECT UNIT COST	TOTAL COST	REMARKS
11.02	Water Closet Sensor	7.00	set			
11.03	Bidet spray	7.00	set			
11.04	Urinal	4.00	set			
11.05	Urinal Sensor	4.00	set			
11.06	Countertop porcelain basin	7.00	set			
11.07	Basin Faucet (Sensor)	7.00	set			
11.08	Slop sink faucet	1.00	set			
11.09	Enamel cast iron slop sink complete with accessories	1.00	set			
11.10	Stainless steel grab bar for PWD toilet	1.00	set			
	<b>SUBTOTAL COST:</b>					
<b>XII.</b>	<b>TOILET PARTITION</b>					
12.01	12mm thick machine pressed laminated phenolic board substrate partitions with high scratch and impact resistance with aluminium edge and corner profile, complete with indicator and accessories for water closet and shower	6.00	set			
12.02	12mm thick machine pressed laminated phenolic board substrate partitions with high scratch and impact resistance with aluminium edge and corner profile for urinal partition	3.00	set			
	<b>SUBTOTAL COST:</b>					
<b>XIII.</b>	<b>PANTRY FIXTURES AND ACCESSORIES</b>					
13.01	Pantry sink – chrome finish stainless steel L760 x W460mm single bowl upper-counter sink with drain board with corrosion resistance property for pantry	3.00	set			
13.02	Pantry sink faucet mixer – stainless steel chrome finish faucet mixer faucet with brass fittings H121 x L222mm with minimal lead traces in waterways and corrosion resistance for pantry	3.00	set			
13.03	0.75HP – 225v food waste disposer, with 3 grind stages, stainless steel grind elements and 1180mL stainless steel grind chamber for pantry	3.00	set			
	<b>SUBTOTAL COST:</b>					

ITEM NO.	ITEM DESCRIPTION AND LOCATION	QTY	UNIT	DIRECT UNIT COST	TOTAL COST	REMARKS
<b>XIV.</b>	<b>MISCELLANEOUS WORKS</b>					
14.01	12mm thk machine-pressed natural wood veneer cladding on 12mm x 50mm wood spacers, with 25mm x 25mm aluminum corner guard and aluminum strip at 2100mm high from floor finish at elevator lobby.	3.88	sq.m.			
14.02	2.1m x 2.4m; Galvanized steel panel roll- up door, manual and motor operated with 1/4 HP single phase motor including electronic device push button switch at 5 seconds located in areas shown in the plans	2.00	set			
	<b>SUBTOTAL COST:</b>					
<b>XV.</b>	<b>WATER PROOFING WORKS</b>					
15.01	Cementitious crystallization waterproofing using crystalline waterproofing formulation for all pantry and toilets	53.13	sqm			
	<b>SUBTOTAL COST:</b>					
	<b>ARCHITECTURAL WORKS TOTAL COST:</b>					
<b>Sanitary / Plumbing Works Budgetary Estimates</b>						
<b>XVI.</b>	<b>FACILITY STORM DRAINAGE PIPING</b>					
	<b>Storm Line (Collectors/Downspouts)</b>					
	Supply and installation of Polyvinyl Chloride (PVC) pipes, Series 1000 II or approved equal, including fittings, painting, sleeves, supports, hangers and other miscellaneous items as shown and as required to complete the system					
16.01	150mm diameter x 3m	39.00	l.m.			
16.05	100mm diameter x 3m	21.00	l.m.			
	<b>Drains</b>					
	Supply and installation of drains including adaptors and p-trap as required, setting in concrete, making good around with approved grouting					
	<b>Gutter Drain</b>					
16.08	100mm diameter jointing to PVC Pipe	16.00	pc/s			
<b>XVII.</b>	<b>AIRCON DRAINAGE PIPING</b>					
	Aircon Drain Line (Collectors and risers)					
	Supply and installation of Polyvinyl Chloride (PVC) pipes, Series 1000 II or approved equal, including fittings, painting, sleeves, supports, hangers and other miscellaneous items as shown and as required to complete the system					



ITEM NO.	ITEM DESCRIPTION AND LOCATION	QTY	UNIT	DIRECT UNIT COST	TOTAL COST	REMARKS
	100mm diameter x 3m					
17.03	50mm diameter x 3m	66.00	l.m.			
17.08	25mm diameter x 3m					
	Plumbing Insulation					
	Supply and installation of 20mm thick, pre-molded elastomeric closed cell rubber insulation, wrapped with polyethylene tape and clad with GA-26 aluminum sheets, including vapor barrier and other miscellaneous items as shown and as required to complete the system					
	Condensate Insulation					
17.12	100mm diameter	18.00	m			
17.13	50mm diameter	66.00	m			
17.14	25mm diameter	66.00	m			
XVIII.	FACILITY SANITARY SEWERAGE					
	Sanitary Sewer Line (Horizontal and lateral branches)					
	Supply and installation of Polyvinyl Chloride (PVC) pipes, Series 1000 II or approved equal, including fittings, painting, sleeves, supports, hangers and other miscellaneous items as shown and as required to complete the system					
18.01	150mm diameter x 3m	6.00	l.m.			
18.03	100mm diameter x 3m	84.00	l.m.			
18.09	75mm diameter x 3m	9.00	l.m.			
18.13	50mm diameter x 3m	96.00	l.m.			
	Supply and installation of Cast Iron Pipe, Service weight or approved equal, including fittings, painting, sleeves, supports, hangers and other miscellaneous items as shown and as required to complete the system					
	100mm diameter x 3m					
	Vent Line (Horizontal and lateral branches)					
	Supply and installation of Polyvinyl Chloride (PVC) pipes, Series 1000 II or approved equal, including fittings, painting, sleeves, supports, hangers and other miscellaneous items as shown and as required to complete the system					

ITEM NO.	ITEM DESCRIPTION AND LOCATION	QTY	UNIT	DIRECT UNIT COST	TOTAL COST	REMARKS
18.21	75mm diameter x 3m	3.00	l.m.			
18.23	50mm diameter x 3m	177.00	l.m.			
	Supply and installation of Cast Iron Pipe, Service weight or approved equal, including fittings, painting, sleeves, supports, hangers and other miscellaneous items as shown and as required to complete the system					
	75mm diameter x 3m					
	50mm diameter x 3m					
	<b>Clean-out</b>					
	Supply and installation of Ceiling Clean-out					
18.32	100mm diameter jointing to PVC Pipe	3.00	pc/s			
18.33	50mm diameter jointing to PVC Pipe	7.00	pc/s			
	Supply and installation of Floor Clean-out					
18.34	100mm diameter jointing to PVC Pipe	8.00	pc/s			
18.35	75mm diameter jointing to PVC Pipe	4.00	pc/s			
	<b>Drains</b>					
	Supply and installation of drains including adaptors and p-trap as required, setting in concrete, making good around with approved grouting					
	<b>Floor Drain</b>					
18.36	50mm diameter jointing to PVC Pipe	9.00	pc/s			
	<b>Grease trap</b>					
	Supply and installation of grease trap, complete with removable stainless wire basket, 6mm thick hot dipped checkered steel plate cover, round bar lifting handle and all other necessary accessories and connections					
18.37	Grease trap; stainless steel Capacity: 4 GPM	3.00	pc/s			
XIX.	<b>FACILITY WATER DISTRIBUTION</b>					
	Cold Water Line (Main line, Horizontal and lateral branches)					
	High Density Polypropylene Random Copolymer (PPR) pipes, Class PN-20 including fittings, painting, sleeves, support, hangers, and other miscellaneous items as shown and as required to complete the system. (Including connection of new PPR to existing GI main)					

	50mm diameter x 4m					
19.06	40mm diameter x 4m	12.00	l.m.			
19.12	32mm diameter x 4m	16.00	l.m.			
19.16	25mm diameter x 4m	16.00	l.m.			
	20mm diameter x 4m					
	15mm diameter x 4m					
	Cold Water Line (Roughing-ins)					
	High Density Polypropylene Random Copolymer (PPR) pipes, Class PN-20 including fittings, painting, sleeves, support, hangers, and other miscellaneous items as shown and as required to complete the system.					
19.29	32mm diameter x 4m	16.00	l.m.			
19.34	25mm diameter x 4m	4.00	l.m.			
19.39	20mm diameter x 4m	36.00	l.m.			
	15mm diameter x 4m					
	Gate Valves					
	Supply and Install					
19.49	50mm diameter Screwed	1.00	pc/s			
19.50	40mm diameter Screwed	1.00	pc/s			
19.51	32mm diameter Screwed	3.00	pc/s			
19.52	25mm diameter Screwed	1.00	pc/s			
	20mm diameter Screwed					
	15mm diameter Screwed					
	The following are in respect of the whole of the Plumbing installations					
19.56	Sealing, packing and fire proofing wherever required where pipes, conduits, cables or trunking pass through slabs, walls, beams and the like	1.00	item			
19.57	providing identification, color coding and labelling	1.00	item			
	providing operation and maintenance manuals consisting of five (5) sets	1.00	item			
	testing and commissioning including making good all defects and re-testing as necessary and leaving all in sound and perfect working order on completion	1.00	item			

19.60	instructing the Owner's representatives in operation, maintenance and service of completed installation; a period of twelve (12) months from the date of issuance of Certificate of Completion	1.00	item			
	maintenance including labor and parts replacement; a period of twelve (12) months from the date of issuance of Certificate of Completion	1.00	item			
	disinfecting the whole water distribution system issuing of the certificate of insurance that the whole system is free from contamination	1.00	item			
<b>SANITARY / PLUMBING TOTAL COST:</b>						
<b>Fire Protection Works Budgetary Estimates</b>						
<b>XXI.</b>	<b>Fire Protection Lines (Horizontal Pipes)</b>					
	Supply and installation of Black Iron Pipes, Schedule 40, or approved equal, including fittings, painting, sleeves, supports, hangers and other miscellaneous items as shown and as required to complete the system					
21.01	65mm diameter x 6m	6.00	l.m.			
21.05	50mm diameter x 6m	6.00	l.m.			
	40mm diameter x 6m					
21.10	32mm diameter x 6m	6.00	l.m.			
	25mm diameter x 6m					
XXII.	Sprinkler Heads					
0.00	Supply and installation of sprinkler heads and other miscellaneous items as shown and as required to complete the system (All existing and relocated sprinkler heads to be replaced with new)					
	Pendent					
22.02	Upright	6.00	pc/s			
22.03	Sidewall	2.00	pc/s			
XXIII.	Portable Fire Extinguishers					
	<b>Supply and installation of portable fire extinguishers and other miscellaneous items as shown and as required to complete the system</b>					
	10lbs PFE-36					
	Data center Fire Suppression (Novec 1230)					
23.02	Supply and Install	1.00	lot			
	<b>SUBTOTAL COST:</b>					

ITEM NO.	ITEM DESCRIPTION AND LOCATION	QTY	UNIT	DIRECT UNIT COST	TOTAL COST	REMARKS
XXIV.	SUNDRIES					
	The following are in respect of the whole of					
	the Fire Protection installations					
24.01	Sealing, packing and fire proofing wherever required where pipes, conduits, cables or trunking pass through slabs, walls, beams and the like	1.00	item			
24.02	providing identification, color coding and labelling	1.00	item			
24.03	providing operation and maintenance manuals consisting of five (5) sets	1.00	item			
24.04	testing and commissioning including making good all defects and re-testing as necessary and leaving all in sound and perfect working order on completion	1.00	item			
24.05	instructing the Owner's representatives in operation, maintenance and service of completed installation; a period of twelve (12) months from the date of issuance of Certificate of Completion	1.00	item			
24.06	maintenance including labor and parts replacement; a period of twelve (12) months from the date of issuance of Certificate of Completion	1.00	item			
24.07	disinfecting the whole water distribution system issuing of the certificate of insurance that the whole system is free from contamination	1.00	item			
	SUBTOTAL COST:					
	<b>FIRE PROTECTION WORKS TOTAL COST:</b>					
<b>Mechanical Works Budgetary Estimates</b>						
XXV.	<b>AIR CONDITIONING UNIT</b>					
25.01	ACCUV-6-10, 16HP Variable Refrigerant Flow Air Cooled Condensing Unit. Coil Blue Fin Coated	1.00	set			
25.02	ACCUV-6-11, 16HP Variable Refrigerant Flow Air Cooled Condensing Unit. Coil Blue Fin Coated	1.00	set			
25.03	ACUV 4-01, 1.5HP Ceiling Cassette Unit, c/w signals wires and local thermostat. Coil Blue Fin Coated	1.00	set			
25.04	ACUV 4-02, 1.5HP Ceiling Cassette Unit, c/w signals wires and local thermostat. Coil Blue Fin Coated	1.00	set			
25.05	ACUV 4-03, 1.5HP Ceiling Cassette Unit, c/w signals wires and local thermostat. Coil Blue Fin Coated	1.00	set			

ITEM NO.	ITEM DESCRIPTION AND LOCATION	QTY	UNIT	DIRECT UNIT COST	TOTAL COST	REMARKS
25.06	ACUV 4-04, 1.5HP Ceiling Cassette Unit, c/w signals wires and local thermostat. Coil Blue Fin Coated	1.00	set			
25.07	ACUV 4-05, 1.5HP Ceiling Cassette Unit, c/w signals wires and local thermostat. Coil Blue Fin Coated	1.00	set			
25.08	ACUV 4-06, 2.0HP Ceiling Cassette Unit, c/w signals wires and local thermostat. Coil Blue Fin Coated	1.00	set			
25.09	ACUV 4-07, 1.5HP Ceiling Cassette Unit, c/w signals wires and local thermostat. Coil Blue Fin Coated	1.00	set			
25.10	ACUV 4-08, 1.5HP Ceiling Cassette Unit, c/w signals wires and local thermostat. Coil Blue Fin Coated	1.00	set			
25.11	ACUV 4-09, 1.5HP Ceiling Cassette Unit, c/w signals wires and local thermostat. Coil Blue Fin Coated	1.00	set			
25.12	ACUV 4-10, 1.5HP Ceiling Cassette Unit, c/w signals wires and local thermostat. Coil Blue Fin Coated	1.00	set			
25.13	ACUV 4-10, 1.5HP Ceiling Cassette Unit, c/w signals wires and local thermostat. Coil Blue Fin Coated	1.00	set			
25.14	ACUV 4-11, 2.0HP Ceiling Cassette Unit, c/w signals wires and local thermostat. Coil Blue Fin Coated	1.00	set			
25.15	ACUV 4-12, 3.0HP Ceiling Cassette Unit, c/w signals wires and local thermostat. Coil Blue Fin Coated	1.00	set			
25.16	ACUV 4-13, 3.0HP Ceiling Cassette Unit, c/w signals wires and local thermostat. Coil Blue Fin Coated	1.00	set			
25.17	Refrigerant Pipes, Pipe Insulation and Special Pipe Connectors for VRF.	1.00	lot			
25.18	Electrical Wirings, Panel Boards and other signal wires	1.00	lot			
25.19	Podium Floor VRF Central Control and Monitoring System	1.00	set			
	<b>SUBTOTAL COST:</b>					
	<b>AIR CONDITIONING UNIT (DATA CENTER)</b>					
26.01	7.5 TR Precision Type Air Conditioning Unit c/w condensing unit, refrigerant pipes, power wires, signal wires	3.00	set			
	SUBTOTAL COST:					
<b>XXVII.</b>	<b>FANS AND BLOWERS</b>					
27.01	EF 4-01, Ceiling Mounted Type at 120 Lps	1.00	set			

ITEM NO.	ITEM DESCRIPTION AND LOCATION	QTY	UNIT	DIRECT UNIT COST	TOTAL COST	REMARKS
27.02	EF 4-02, Ceiling Mounted Type at 120 Lps	1.00	set			
27.03	TEF 4-01, Ceiling Mounted Type at 75 Lps	1.00	set			
27.04	TEF 4-02, Ceiling Mounted Type at 120 Lps	1.00	set			
27.05	TEF 4-03, Ceiling Mounted Type at 120Lps	1.00	set			
	<b>SUBTOTAL COST:</b>					
<b>XXVIII.</b>	<b>DUCTWORK AND ACCESSORIES</b>					
	Galvanized Iron Sheet					
28.01	US Ga. # 26	285.00	sq.m.			
28.02	US Ga. # 24	230.00	sq.m.			
28.03	US Ga. # 22	65.00	sq.m.			
	Flexible Duct c/w insulation and vapor barrier					
28.04	250 dia.	400.00	lm			
28.05	200 dia.	30.00	lm			
28.06	25mm thk. Crosslinked Polyolefin Insulation c/w vapor barrier and adhesive	550.00	sqm			
28.07	Volume Control Dampers, Damper Splitter	1.00	lot			
	<b>SUBTOTAL COST:</b>					
<b>XXIX.</b>	<b>AIR DIFFUSERS</b>					
29.01	1200x50mm Linear Bar Grille c/w Opposed Blaed Damper, Aluminum Type	25.00	pcs			
29.02	1200x75mm Linear Bar Grille c/w Opposed Blaed Damper, Aluminum Type	170.00	pcs			
29.03	1200x75mm Continuos Linear Bar Grille	1.00	lot			
29.04	350X350 4-Way Ceiling Diffuser c/w Opposed Blade Damper	4.00	pcs			
29.05	300X300 4-Way Ceiling Diffuser c/w Opposed Blade Damper	2.00	pcs			
	<b>SUBTOTAL COST:</b>					
<b>XXX.</b>	<b>OTHERS</b>					
30.01	Duct and Pipe Hangers, equipment Support, noise and vibration isolators	1.00	lot			
30.02	Consumables	1.00	lot			
30.03	Testing and Commissioning and Miscellaneous Items other miscellaneous items to complete the system	1.00	lot			
	<b>SUBTOTAL COST:</b>					

ITEM NO.	ITEM DESCRIPTION AND LOCATION	QTY	UNIT	DIRECT UNIT COST	TOTAL COST	REMARKS
	<b>MECHANICAL WORKS TOTAL COST:</b>					
<b>Electrical Works Budgetary Estimates</b>						
<b>XXXI.</b>	<b>PANEL BOARDS, TRANSFORMERS &amp; CIRCUIT BREAKERS</b>					
31.01	2L4 (NEW) 230V, 3P+G, NEMA 1, SURFACE MOUNTED	1.00	assy			
	Main: 1 - EZC F 80AT, 100AF, 3P, 25KAIC, 230V, MCCB					
	Brs: 2 - iC60 N 50AT, 63AF, 2P, 20KAIC, 230V, MCB					
	15 - iC60 N 20AT, 63AF, 2P, 20KAIC, 230V, MCB					
	Spare: 3 - iC60 N 20AT, 63AF, 2P, 20KAIC, 230V, MCB					
31.02	2UP4 240V, 3P+G, NEMA 1, SURFACE MOUNTED	1.00	assy			
	Main: EZC F 70AT, 100AF, 3P, 25KAIC, 240V, MCCB					
	Brs: 19 - iC60 N 20AT, 63AF, 2P, 20KAIC, 230V, MCB					
	Spare: 5 - iC60 N 20AT, 63AF, 2P, 20KAIC, 230V, MCB					
31.03	PP-4 230V, 3P+G, NEMA 1, SURFACE MOUNTED	1.00	assy			
	Main: 1 - iC60 N 60AT, 100AF, 3P, 25KAIC, 230V, MCB					
	Brs: 24 - iC60 N 20AT, 63AF, 2P, 10KAIC, 230V, MCB					
31.03	PP-DATA 400V, 3P+G, NEMA 1, SURFACE MOUNTED	1.00	assy			
	Main: 1 - iC60 N 350AT, 400AF, 3P, 36KAIC, 400V, MCB					
	R4 230V, 3P+G, NEMA 1, SURFACE MOUNTED					
	Main: 1 - iC60 N 60AT, 100AF, 3P, 25KAIC, 230V, MCB					
	Brs: 8 - iC60 N 20AT, 63AF, 2P, 20KAIC, 230V, MCB					
	Spare: 3 - iC60 N 20AT, 63AF, 2P, 20KAIC, 230V, MCB					
	Space: 1 - 63AF, 2P					
	15kVA 480V/ 230 DRY TYPE TRANSFORMER					
	<b>SUBTOTAL COST:</b>					
<b>XXXII.</b>	<b>WIRING DEVICES</b>					
32.01	one gang switch	9.00	set			
32.02	two gang switch	10.00	set			



ITEM NO.	ITEM DESCRIPTION AND LOCATION	QTY	UNIT	DIRECT UNIT COST	TOTAL COST	REMARKS
32.03	three gang switch	21.00	set			
32.04	Three-way switch - one gang	1.00	set			
32.05	Three-way switch - two gang	5.00	set			
32.06	Three-way switch - three gang	2.00	set			
	<b>CONDUITS</b>					
32.07	15mmØ EMT conduits	1,024.00	lights			
32.08	15mmØ EMT elbow	512.00	pcs			
32.09	15mmØ EMT coupling	1,024.00	pcs			
32.10	15mmØ EMT connector	1,230.00	pcs			
32.11	15mmØ EMT Locknut & Bushing	1,230.00	pcs			
32.12	15mmØ flexible metal conduit	843.00	lm			
32.13	15mmØ straight connector	562.00	pcs			
	15mmØ angle connector					
	<b>BOXES</b>					
	4" x 4" x 2" Octagonal Box, Gauge 16, Zinc-Chromate	562.00	pcs			
32.15	2" x 4" Utility Box, Gauge 16, Zinc-Chromate	47.00	pcs			
32.16	6" x 6" x 4" Pull Box, Gauge 16, Zinc-Chromate	1.00	pcs			
32.17	4-11/16" x 4-11/16" Square Box, Gauge 16, Zinc-Chromate					
32.18	<b>WIRES &amp; CABLES</b>					
32.19	3.5mm <sup>2</sup>	9,216.00	lm			
	<b>SUBTOTAL COST:</b>					
<b>XXXIII.</b>	<b>POWER SYSTEM</b>					
	<b>WIRING DEVICES</b>					
	Duplex Convenience Outlet	336.00	sets			
33.01	Refrigerator Outlet, Grounding Type	3.00	sets			
33.02	Microwave oven Outlet, Grounding Type	3.00	sets			
33.03	Food waste disposal outlet, Grounding Type	3.00	sets			
33.04	Hand Dryer Outlet	2.00	sets			

ITEM NO.	ITEM DESCRIPTION AND LOCATION	QTY	UNIT	DIRECT UNIT COST	TOTAL COST	REMARKS
	<b>CONDUITS</b>					
33.05	15mmØ EMT conduits	621.00	lghts			
33.06	15mmØ EMT elbow	207.00	pcs			
33.07	15mmØ EMT coupling	621.00	pcs			
33.08	15mmØ EMT connector	576.00	pcs			
33.09	15mmØ EMT Locknut & Bushing	576.00	pcs			
33.10	<b>BOXES &amp; PULL BOXES</b>					
33.11	4" x 4" Octagonal Box, Gauge 16, Zinc-Chromate	116.00	pcs			
	4-11/16" x 4-11/16" Square Box, Gauge 16, Zinc-Chromate	96.00	pcs			
33.12	2" x 4" Utility Box, Gauge 16, Zinc-Chromate	288.00	pcs			
33.14	<b>WIRES &amp; CABLES</b>	-	0			
33.15	3.5mm <sup>2</sup>					
	<b>SUBTOTAL COST:</b>	-	0			
<b>XXXIV.</b>	<b>FIRE DETECTION ALARM SYSTEM</b>					
	<b>CONDUIT &amp; FITTINGS</b>					
34.01	20mmØ EMT conduits					
34.02	20mmØ EMT elbow					
34.03	20mmØ EMT coupling	226.00	pcs			
34.04	20mmØ EMT connector	194.00	pcs			
34.05	20mmØ Locknut & Bushing	194.00	pcs			
34.06	15mmØ flexible metal conduit	146.00	lghts			
34.07	15mmØ straight connector	97.00	pcs			
34.08	15mmØ angle connector	97.00	pcs			
	<b>BOXES &amp; PULL BOXES</b>					
34.09	4" x 4" x 2" Octagonal Box, Gauge 16, Zinc-Chromate	97.00	pcs			
34.10	2" x 4" Utility Box, Gauge 16, Zinc-Chromate					
34.11	4-11/16" x 4-11/16" Square Box, Gauge 16, Zinc-Chromate	20.00	pcs			
	<b>WIRES &amp; CABLES</b>					
34.12	Twisted Pair #16 (MINERAL INSULATION FRC)	697.00	pcs			
	<b>EQUIPMENT &amp; DEVICES</b>					

ITEM NO.	ITEM DESCRIPTION AND LOCATION	QTY	UNIT	DIRECT UNIT COST	TOTAL COST	REMARKS
34.13	manual pull station	5.00	pcs			
34.14	horn with strobe light					
34.15	smoke detector	57.00	pcs			
	<b>SUBTOTAL COST:</b>					
<b>XXXV.</b>	<b>TELEPHONE SYSTEM</b>					
35.01	CONDUIT & FITTINGS					
	32mmØ EMT conduits	255.00	lghts			
	32mmØ EMT elbow	128.00	pcs			
	32mmØ EMT coupling	255.00	pcs			
	32mmØ EMT connector	280.00	pcs			
	32mmØ Locknut & Bushing	280.00	pcs			
	32mmØ flexible metal conduit	209.00	pcs			
	32mmØ straight connector	140.00	pcs			
	32mmØ angle connector	140.00	pcs			
35.02	BOXES & PULL BOXES					
	4" x 4" x 2" Octagonal Box, Gauge 16, Zinc-Chromate	41.00	pcs			
	2" x 4" Utility Box, Gauge 16, Zinc-Chromate	41.00	pcs			
35.03	WIRES & CABLES					
	Cat5e Cable	3,507.00	l.m.			
35.04	EQUIPMENTS & DEVICES					
	Socket	41.00	pcs			
	SUBTOTAL COST:					
	<b>ELECTRICAL WORKS TOTAL COST:</b>					
	<b>FOURTH FLOOR TOTAL COST (A,S/P,FP,M,E,S)</b>					

FIFTH FLOOR						
Architectural Works Bill of Quantities for Fifth Floor						
Package 2 (Fifth Floor)						
ITEM NO.	ITEM DESCRIPTION AND LOCATION	QTY	UNIT	DIRECT UNIT COST	TOTAL COST	REMARKS

ITEM NO.	ITEM DESCRIPTION AND LOCATION	QTY	UNIT	DIRECT UNIT COST	TOTAL COST	REMARKS
I.	<b>GENERAL REQUIREMENTS</b>					
1.01	All insurances such as bonds and guarantee performance bonds, third party insurance and surety bond against down payment and retention bond, building permit and occupancy permit.	1.00	lot			
1.02	Mobilization and demobilization of workers, tools and equipment	1.00	lot			
1.03	Temporary facilities and temporary utilities	1.00	lot			
1.04	Safety and security, daily cleaning and maintenance works	1.00	lot			
1.05	Demolition, dismantling and hauling of debris (verify architectural technical specifications)	1.00	lot			
	Demolish all existing walls and partitions as stated in the plan.					
	Strip all existing wall finishes affected with the renovation					
	Dismantle existing ceiling finishes except for bottom of slab ceiling.					
	Dismantle all existing doors, door jambs, hardware and accessories and turnover all items to the owner for proper handling except for doors to be retained					
	Dismantle all existing glass partition and accessories and turnover all items to the owner for proper handling.					
	Dismantle all existing lighting fixtures and electrical devices on site and all items are subject for turnover to the owner for proper handling.					
	Dismantle all existing AC equipment on site subject for replacement and turnover all items to the over for proper handling.					
	Dismantle and relocation of all necessary existing utility lines, conduits, pipes, ductworks and sprinkler heads subject for replacement as per plan. i					
	Demolish and dismantle all existing floor finishes as per plan					
	Demolish and dismantle all existing wall cubicle partition and floor tiles at existing toilets.					
	Demolish all existing CHB toilet partitions at common toilets.					
	Demolish existing lavatory counter at existing toilets.					

ITEM NO.	ITEM DESCRIPTION AND LOCATION	QTY	UNIT	DIRECT UNIT COST	TOTAL COST	REMARKS
	Dismantle all existing toilet fixtures and accessories for replacement.					
	Dismantle existing wall mounted facial mirror at existing toilets.					
	Demolish existing walls and slab affected for the accommodation of new elevator shaft.					
	Demolish affected slab for all areas to be converted to pipe chase.					
	Demolish existing walls at executive toilets as per plan					
1.06	As-buit drawings. Including all disciplines	1.00	lot			
1.07	equipment Rental using twin cage building hoist (total of 4T capacity)	1.00	lot			
1.08	H-frame scaffolding complete with necessary things and accessories; and formworks	1.00	lot			
	<b>SUBTOTAL COST:</b>					
<b>II.</b>	<b>FLOOR WORKS</b>					
2.01	500mm x 500mm integrated tufted pattern loop solution dyed 100% synthetic fiber with 4.00mm pile height carpet tiles with Polyester spunbonded primary backing and condensed vinyl with fiberglass reinforcement secondary backing at offices and other areas shown in the plans	1,449.89	sq.m.			
2.02	12mm thk. x 600mm x 600mm non-skid, indoor granite tiles at hallways and other areas shown in the plans	64.12	sq.m.			
2.03	10mm thk. x 600mm x 600mm non-skid, non-vitreous porcelain tiles for toilets and other areas shown in the plans	42.42	sq.m.			
2.04	3mm thk. x 300mm x 300mm homogenous and resilient type Vinyl tiles, with primer and water-based acrylic floor adhesive at pantry, storage and other areas shown in the plans	1,383.58	sq.m.			
2.05	Existing marble floor finish subject for crystallization at elevator lobby and other areas shown in the plans	87.01	sq.m.			
	<b>SUBTOTAL COST:</b>					
<b>III.</b>	<b>WALL WORKS</b>					
3.01	Drywall partition using 12mm thk. fiber cement board using 100mm thk. Using 400mm x 400mm metal studs vertical and horizontal on center	555.59	sq.m.			

ITEM NO.	ITEM DESCRIPTION AND LOCATION	QTY	UNIT	DIRECT UNIT COST	TOTAL COST	REMARKS
3.02	100mm thick concrete hollow blocks with 25mm thick plaster on both sides complete with steel bars for Ground floor walls as shown in the plans	49.50	sq.m.			
3.03	25mm thk x 100mm. Wood plastic composite baseboard installed on both sides of all drywall and CHB wall partitions	384.44	l.m			
3.04	Existing marble wall finish subject for crystallization for areas shown in the plans	87.87	sq.m.			
	<b>SUBTOTAL COST:</b>					
<b>IV.</b>	<b>WALL FINISHES</b>					
4.01	10mm thick x 600mm x 600mm glazed porcelain wall tiles for all toilets and other areas shown in the plans	174.63	sq. m			
	<b>SUBTOTAL COST:</b>					
<b>V.</b>	<b>CEILING WORKS</b>					
5.01	12mm thk. Gypsumboard on 400mm x 400mm furring channel horizontal and vertical with 1200mm x 1200mm hanger both ways with 50mm shadow gap between walls and ceiling as per plan	1,425.11	sq.m.			
5.02	12mm thk. Moisture Resistant Gypsumboard on 400mm x 400mm furring channel both ways with 1200mm x 1200mm hanger both ways with 50mm shadow gap between walls and ceiling as per plan	37.29	sq.m.			
	<b>SUBTOTAL COST:</b>					
<b>VI.</b>	<b>PAINTING WORKS</b>					
6.01	Existing walls and columns shall be repainted for areas indicated in the plans	538.58	sq.m.			
6.02	New CHB wall and drywall partitions shall be painted with latex paint for interior wall surfaces as shown in the plans	958.84	sq.m.			
6.03	Epoxy paint for all utility floor areas as per plan; for fire exit existing pebble wash out floor finish to be painted with chemical emulsion	175.60	sq.m.			
6.04	All ceiling works shall be painted with latex paint as shown in the plans	1,462.40	sq.m.			
6.05	All existing bottom of slab shall be painted with latex paint at utility areas as shown in the plans	172.05	sq.m.			
	<b>SUBTOTAL COST:</b>					

ITEM NO.	ITEM DESCRIPTION AND LOCATION	QTY	UNIT	DIRECT UNIT COST	TOTAL COST	REMARKS
<b>VII.</b>	<b>DOORS AND WINDOWS</b>					
7.07	D07. 2.1m x 1.8m; Combination of 12mm thk tempered double-swing glass on FD-100 aluminum frame and 2.10 m x 1.80m double-swing glass door, complete with hardwares and accessories as per plan.	4.00	set			
7.10	D10. 2.1m x 0.9m; 12mm thk tempered single-swing glass on FD-100 aluminum frame complete with hardwares and accessories as per plan.	10.00	set			
7.11	D11. 2.10m x 0.90m; 44mm thick kiln dried mahogany wood panel single-swing door with 50mm x 100mm kiln dried mahogany wood door jamb in wood stain finish with clear gloss top coat lacquer, complete with hardwares, and accessories as per plan.	11.00	set			
7.16	D16. 2.10m x 0.9m; GA 20 B.I. bended sheet steel single swing louvered with GA. 16 standard steel jamb painted with epoxy paint finish complete with hardwares and accessories as per plan	1.00	set			
7.17	D17. 2.10m x 0.70m; 44mm thick kiln dried louvered mahogany wood panel door with 50mm x 100mm kiln dried mahogany wood door jamb in wood stain finish with clear gloss top coat lacquer, complete with hardwares and accessories as per plan.	2.00	set			
7.18	D18. 2.10m x 1.00m; 44mm thick kiln dried louvered mahogany wood panel single-swing door with 50mm x 100mm kiln dried mahogany wood door jamb in wood stain finish with clear gloss top coat lacquer, complete with hardwares and accessories as per plan.	1.00	set			
7.23	D28. 2.1m x 0.7m; 44mm thick kiln dried louvered mahogany wood panel single-swing door with 50mm x 100mm kiln dried mahogany wood door jamb in wood stain finish with clear gloss top coat lacquer, complete with hardwares and accessories as per plan.	1.00	set			
7.24	D29. 2.1m x 0.90m; 44mm thick kiln dried louvered mahogany wood panel single-swing door with 50mm x 100mm kiln dried solid wood door jamb in wood stain finish with clear gloss top coat lacquer, complete with hardwares and accessories as per plan.	1.00	set			

ITEM NO.	ITEM DESCRIPTION AND LOCATION	QTY	UNIT	DIRECT UNIT COST	TOTAL COST	REMARKS
7.10	D34. 2.1m x 5.0m. Combination of 12mm thk fixed tempered glass on FD-100 aluminum frame and 2.10 mx 0.90m single-swing glass door, complete with accessories as per plan.	4.00	set			
7.11	D35. 2.1m x 6.70m. Combination of 12mm thk fixed tempered glass on FD-100 aluminum frame and 2.10 mx 1.80m double-swing glass door, complete with accessories as per plan.	2.00	set			
7.12	D36. 2.1m x 7.30m. Combination of 12mm thk fixed tempered glass on FD-100 aluminum frame and 2.10 m x 0.90m single-swing glass door, complete with accessories as per plan.	1.00	set			
7.13	D37. 2.10m x 4.75m. Combination of 12mm thk fixed tempered glass on FD-100 aluminum frame and 2.10 m x 0.90m single-swing glass door, complete with accessories as per plan.	4.00	set			
7.14	D42. 2.1m x 2.4m. Combination of 12mm thk fixed tempered glass on FD-100 aluminum frame and 2.10 m x 0.90m single-swing glass door, complete with accessories as per plan.	1.00	set			
7.15	D44. 2.10m x 8.10m. Combination of 12mm thk fixed tempered glass on FD-100 aluminum frame and 2.10 m x 1.80m double-swing glass door, complete with accessories as per plan.	1.00	set			
7.16	D47. 2.10m x 2.30m. Combination of 12mm thk fixed tempered glass on FD-100 aluminum frame and 2.10 m x 0.90 single-swing glass door, complete with accessories as per plan.	1.00	set			
7.17	D50. 2.1m x 7.80m. Combination of 12mm thk fixed tempered glass on FD-100 aluminum frame and two 2.10 m x 0.90 single-swing glass door, complete with accessories as per plan.	1.00	set			
7.18	D51. 2.10m x 8.50m. Combination of 12mm thk fixed tempered glass on FD-100 aluminum frame and 2.10 m x 0.90 single-swing glass door, complete with accessories as per plan.	1.00	set			
7.19	D52. 2.1m x 6.30m. Combination of 12mm thk fixed tempered glass on FD-100 aluminum frame and 2.10 m x 1.80m double-swing glass door, complete with accessories as per plan.	1.00	set			
7.20	D53. 2.10m x 3.30m. Combination of 12mm thk fixed tempered glass on FD-100 aluminum frame and 2.10 m x 0.90 single-swing glass door, complete with accessories as per plan.	1.00	set			



ITEM NO.	ITEM DESCRIPTION AND LOCATION	QTY	UNIT	DIRECT UNIT COST	TOTAL COST	REMARKS
7.21	D54. 2.1m x 1.8m;Combination of 12mm thk fixed tempered glass on FD-100 aluminum frame and 2.10 m x 0.90 single-swing glass door, complete with accessories as per plan.	3.00	set			
7.22	D55. 2.1m x 4.4m; Combination of 12mm thk fixed tempered glass on FD-100 aluminum frame and 2.10 m x 0.90 single-swing glass door, complete with accessories as per plan.	3.00	set			
7.23	D56. 2.1m x 5.4.m;Combination of 12mm thk fixed tempered glass on FD-100 aluminum frame and two 2.10 m x 0.90 single-swing glass door, complete with accessories as per plan.	1.00	set			
7.24	DR.Existing single swing steel door panels and door jamb jamb to be retained and repainted. Existing door shall be painted with one (1) coat epoxy primer and two (2) coats epoxy top coat. All existing hardware and accessories subject for replacement.	3.00	set			
7.25	DR. Existing fire exit doors to be retained and repainted. Hardwares and accessories including panic device to be replaced	2.00	set			
7.26	DR. Existing vault doors to be retained and repainted. Hardwares and accessories including panic device to be replaced	1.00	set			
7.27	100mm wide door theshold at all doors with different floor elevations from entry point and area interior	30.40	l.m			
0.00	SUBTOTAL COST:	-	0			
VIII.	GLASS WORKS	-	0			
8.01	12mm thick tempered glass in FD 100 powder-coated aluminum framing including sealant application and frosted sticker for all glass partitions as shown in the plans	81.27	sq.m.			
8.02	Facial Mirror with 6mm thick marine plywood backing for toilets as shown in the plans	7.83	sq.m			
8.03	Graphicote with 6mm thick marine plywood backing for meeting rooms as shown in the plans	46.80	sq.m			
	<b>SUBTOTAL COST:</b>					
IX.	<b>MASONRY WORKS</b>					
9.01	25mm thk. granite countertop including 300mm high splashboard on concrete slab sub-counter at all pantry areas.	16.20	sq.m			

ITEM NO.	ITEM DESCRIPTION AND LOCATION	QTY	UNIT	DIRECT UNIT COST	TOTAL COST	REMARKS
9.02	25mm thk. granite countertop including 300mm high splashboard in 50mm x 50mm solid wood k.d. tanguile framing on 3/4" thk marine plywood counter support for toilet counters	4.46	sq.m			
9.03	25mm thk. X 200mm granite ledge installed on top of concrete ledge.	0.63	sq.m			
9.04	25mm thk. Granite ledge on reinforced concrete support embedded to walls at 1400mm above floor finish for water closet	1.60	sq.m			
	<b>SUBTOTAL COST:</b>					
<b>X.</b>	<b>LIGHTING FIXTURES</b>					
10.01	18 watts daylight recessed type LED in 210mm diameter aluminium casing with glass frame down light fixture general ceiling areas and other areas shown in the plans	274.00	set			
10.02	Surface mounted LED light fixture. Supply, delivery and installation of 5.7W LED daylight bulb with E27 lamp base with 100mm diameter round aluminium surface mounted down light fixture with glass cover and E27 socket for existing slab ceiling works and other areas shown in the plans	6.00	set			
10.03	6 watts warm white recessed type LED in 110mm diameter aluminium casing with glass frame down light fixture located above toilet sink and other areas shown in the plans	11.55	set			
10.04	600mm x 600mm x 12mmH 39W daylight slim type LED panel ceiling light fixture with aluminium housing, 100-240Vac Input and 26-30Vdc Output and optical PMMA diffuser for offices, elevator lobby and other areas as shown in the plans	163.80	set			
10.05	Low bay lighting fixtures comprising of low bay reflector bracket with E27 socket, 400mm diameter sand blasted reflector and glass cover, and 15W LED PAR38 daylight bulb with E27 lamp base for storages, utility areas and other areas as shown in the plans	30.45	set			
10.06	Indoor recessed wall lamp: recessed type aluminium die cast with glass lens wall light fixture with 60W E27 compact fluorescent lamp for hallways and other areas as shown in the plans	1.00	set			
10.07	T5 electronic fluorescent lamp with slim type luminaire (14W, 21W, 28W), for mirror lighting and other areas for cove lighting as shown in the plans	60.90	set			

ITEM NO.	ITEM DESCRIPTION AND LOCATION	QTY	UNIT	DIRECT UNIT COST	TOTAL COST	REMARKS
0.00	SUBTOTAL COST:	-	0			
XI.	TOILET FIXTURES	-	0			
11.01	Water closet	7.00	set			
11.02	Water Closet Sensor	7.00	set			
11.03	Bidet spray	7.00	set			
11.04	Urinal	4.00	set			
11.05	Urinal Sensor	4.00	set			
11.06	Countertop porcelain basin	7.00	set			
11.07	Basin Faucet (Sensor)	7.00	set			
11.08	Slop sink faucet	1.00	set			
11.09	Enamel cast iron slop sink complete with accessories	1.00	set			
11.10	Stainless steel grab bar for PWD toilet	1.00	set			
	<b>SUBTOTAL COST:</b>					
XII.	<b>TOILET PARTITION</b>					
12.01	12mm thick machine pressed laminated phenolic board substrate partitions with high scratch and impact resistance with aluminium edge and corner profile, complete with indicator and accessories for water closet and shower	6.00	set			
12.02	12mm thick machine pressed laminated phenolic board substrate partitions with high scratch and impact resistance with aluminium edge and corner profile for urinal partition	3.00	set			
	<b>SUBTOTAL COST:</b>					
XIII.	<b>PANTRY FIXTURES AND ACCESSORIES</b>					
13.01	Pantry sink – chrome finish stainless steel L760 x W460mm single bowl upper-counter sink with drain board with corrosion resistance property for pantry	5.00	set			
13.02	Pantry sink faucet mixer – stainless steel chrome finish faucet mixer faucet with brass fittings H121 x L222mm with minimal lead traces in waterways and corrosion resistance for pantry	5.00	set			
13.03	0.75HP – 225v food waste disposer, with 3 grind stages, stainless steel grind elements and 1180mL stainless steel grind chamber for pantry	5.00	set			
	<b>SUBTOTAL COST:</b>					
XIV.	<b>MISCELLANEOUS WORKS</b>					

ITEM NO.	ITEM DESCRIPTION AND LOCATION	QTY	UNIT	DIRECT UNIT COST	TOTAL COST	REMARKS
14.01	12mm thk machine-pressed natural wood veneer cladding on 12mm x 50mm wood spacers, with 25mm x 25mm aluminum corner guard and aluminum strip at 2100mm high from floor finish at elevator lobby.	3.88	sq.m.			
14.02	Demolition and construction of partition of pipe chase at 6th floor	1.00	lot			
14.03	2.1m x 2.4m; Galvanized steel panel roll- up door, manual and motor operated with 1/4 HP single phase motor including electronic device push button switch at 5 seconds located in areas shown in the plans	2.00	set			
	<b>SUBTOTAL COST:</b>					
XV.	<b>WATER PROOFING WORKS</b>					
15.01	Cementitious crystallization waterproofing using crystalline waterproofing formulation for all pantry and toilets	73.42	sqm			
	<b>SUBTOTAL COST:</b>					
	<b>ARCHITECTURAL WORKS TOTAL COST:</b>					
<b>Sanitary / Plumbing Works Budgetary Estimates</b>						
	<b>FACILITY STORM DRAINAGE PIPING</b>					
	Storm Line (Collectors/Downspouts)					
0.00	Supply and installation of Polyvinyl Chloride (PVC) pipes, Series 1000 II or approved equal, including fittings, painting, sleeves, supports, hangers and other miscellaneous items as shown and as required to complete the system					
16.01	150mm diameter x 3m	39.00	l.m.			
16.05	100mm diameter x 3m	75.00	l.m.			
XVII.	<b>AIRCON DRAINAGE PIPING</b>					
	Aircon Drain Line (Collectors and risers)					
	Supply and installation of Polyvinyl Chloride (PVC) pipes, Series 1000 II or approved equal, including fittings, painting, sleeves, supports, hangers and other miscellaneous items as shown and as required to complete the system					
17.01	100mm diameter x 3m	24.00	l.m.			
17.03	75mm diameter x 3m					
	50mm diameter x 3m					
	25mm diameter x 3m					

ITEM NO.	ITEM DESCRIPTION AND LOCATION	QTY	UNIT	DIRECT UNIT COST	TOTAL COST	REMARKS
	<b>Plumbing Insulation</b>					
	Supply and installation of 20mm thick, pre-molded elastomeric closed cell rubber insulation, wrapped with polyethylene tape and clad with GA-26 aluminum sheets, including vapor barrier and other miscellaneous items as shown and as required to complete the system					
	<b>Condensate Insulation</b>					
17.16	100mm diameter	24.00	m			
17.17	75mm diameter	36.00	m			
17.18	50mm diameter	114.00	m			
17.19	25mm diameter	147.00	m			
	<b>Clean-out</b>					
	Supply and installation of Ceiling Clean-out					
17.20	100mm diameter jointing to PVC Pipe	8.00	pc/s			
17.21	75mm diameter jointing to PVC Pipe	2.00	pc/s			
	50mm diameter jointing to PVC Pipe	2.00	pc/s			
XVIII.	<b>FACILITY SANITARY SEWERAGE</b>					
	Sanitary Sewer Line (Collectors, lateral branches)					
18.01	Supply and installation of Polyvinyl Chloride (PVC) pipes, Series 1000 II or approved equal, including fittings, painting, sleeves, supports, hangers and other miscellaneous items as shown and as required to complete the system					
	150mm diameter x 3m					
	100mm diameter x 3m					
	75mm diameter x 3m					
18.13	50mm diameter x 3m	114.00	l.m.			
18.17	Supply and installation of Cast Iron Pipe, Service weight or approved equal, including fittings, painting, sleeves, supports, hangers and other miscellaneous items as shown and as required to complete the system					
18.18	100mm diameter x 3m	3.00	l.m.			
	<b>Vent Line (Horizontal and Vertical)</b>					

ITEM NO.	ITEM DESCRIPTION AND LOCATION	QTY	UNIT	DIRECT UNIT COST	TOTAL COST	REMARKS
	Supply and installation of Polyvinyl Chloride (PVC) pipes, Series 1000 II or approved equal, including fittings, painting, sleeves, supports, hangers and other miscellaneous items as shown and as required to complete the system					
	75mm diameter x 3m					
18.23	50mm diameter x 3m	225.00	l.m.			
18.25	Supply and installation of Cast Iron Pipe, Service weight or approved equal, including fittings, painting, sleeves, supports, hangers and other miscellaneous items as shown and as required to complete the system					
	75mm diameter x 3m	3.00	l.m.			
18.29	50mm diameter x 3m					
	<b>Clean-out</b>					
18.30	Supply and installation of Ceiling Clean-out					
18.31	100mm diameter jointing to PVC Pipe	4.00	pc/s			
	50mm diameter jointing to PVC Pipe	11.00	pc/s			
18.32	Supply and installation of Floor Clean-out					
18.33	100mm diameter jointing to PVC Pipe	11.00	pc/s			
	75mm diameter jointing to PVC Pipe	4.00	pc/s			
	<b>Drains</b>					
	Supply and installation of drains including adaptors and p-trap as required, setting in concrete, making good around with approved grouting					
18.34	Floor Drain					
	50mm diameter jointing to PVC Pipe	9.00	pc/s			
	<b>Grease trap</b>					
18.35	Supply and installation of grease trap, complete with removable stainless wire basket, 6mm thick hot dipped checkered steel plate cover, round bar lifting handle and all other necessary accessories and connections					
	Grease trap; stainless steel Capacity: 4 GPM	5.00	pc/s			
XIX.	<b>FACILITY WATER DISTRIBUTION</b>					
	Cold Water Line (Main line, Horizontal and Vertical)					

ITEM NO.	ITEM DESCRIPTION AND LOCATION	QTY	UNIT	DIRECT UNIT COST	TOTAL COST	REMARKS
	High Density Polypropylene Random Copolymer (PPR) pipes, Class PN-20 including fittings, painting, sleeves, support, hangers, and other miscellaneous items as shown and as required to complete the system. (Including connection of new PPR to existing GI main)					
	50mm diameter x 4m	4.00	l.m.			
19.06	40mm diameter x 4m					
19.12	32mm diameter x 4m	16.00	l.m.			
19.17	25mm diameter x 4m	16.00	l.m.			
	20mm diameter x 4m	60.00	l.m.			
	15mm diameter x 4m					
	<b>Cold Water Line (Roughing-ins)</b>					
	High Density Polypropylene Random Copolymer (PPR) pipes, Class PN-20 including fittings, painting, sleeves, support, hangers, and other miscellaneous items as shown and as required to complete the system.					
19.30	32mm diameter x 4m	16.00	l.m.			
19.35	25mm diameter x 4m	4.00	l.m.			
19.40	20mm diameter x 4m	36.00	l.m.			
	15mm diameter x 4m	92.00	l.m.			
	<b>HoseBibb</b>					
	Supply and Install					
19.50	15mm diameter	3.00	pc/s			
	<b>Gate Valves</b>					
	Supply and Install					
	50mm diameter Screwed	1.00	pc/s			
	40mm diameter Screwed	1.00	pc/s			
19.53	32mm diameter Screwed	3.00	pc/s			
19.54	25mm diameter Screwed	1.00	pc/s			
19.55	20mm diameter Screwed	2.00	pc/s			
19.56	15mm diameter Screwed	5.00	pc/s			

ITEM NO.	ITEM DESCRIPTION AND LOCATION	QTY	UNIT	DIRECT UNIT COST	TOTAL COST	REMARKS
	<b>The following are in respect of the whole of the Plumbing installations</b>					
19.57	Sealing, packing and fire proofing wherever required where pipes, conduits, cables or trunking pass through slabs, walls, beams and the like	1.00	item			
19.58	providing identification, color coding and labelling	1.00	item			
19.59	providing operation and maintenance manuals consisting of five (5) sets	1.00	item			
19.60	testing and commissioning including making good all defects and re-testing as necessary and leaving all in sound and perfect working order on completion	1.00	item			
19.61	instructing the Owner's representatives in operation, maintenance and service of completed installation; a period of twelve (12) months from the date of issuance of Certificate of Completion	1.00	item			
19.62	maintenance including labor and parts replacement; a period of twelve (12) months from the date of issuance of Certificate of Completion	1.00	item			
19.67	disinfecting the whole water distribution system issuing of the certificate of insurance that the whole system is free from contamination	1.00	item			
<b>SANITARY / PLUMBING TOTAL COST:</b>						
<b>Fire Protection Works Budgetary Estimates</b>						
<b>XXI.</b>	<b>Fire Protection Lines (Horizontal Pipes)</b>					
	Supply and installation of Black Iron Pipes, Schedule 40, or approved equal, including fittings, painting, sleeves, supports, hangers and other miscellaneous items as shown and as required to complete the system					
21.01	75mm diameter x 6m	6.00	l.m.			
21.03	65mm diameter x 6m	30.00	l.m.			
21.07	50mm diameter x 6m	6.00	l.m.			
21.09	40mm diameter x 6m	6.00	l.m.			
21.12	32mm diameter x 6m	6.00	l.m.			
21.17	25mm diameter x 6m	966.00	l.m.			



ITEM NO.	ITEM DESCRIPTION AND LOCATION	QTY	UNIT	DIRECT UNIT COST	TOTAL COST	REMARKS
XXII.	Sprinkler Heads					
	Supply and installation of sprinkler heads and other miscellaneous items as shown and as required to complete the system (All existing and relocated sprinkler heads to be replaced with new)					
22.01	Pendent	168.00	pc/s			
22.02	Upright	6.00	pc/s			
22.03	Sidewall	2.00	pc/s			
	<b>Portable Fire Extinguishers</b>					
	Supply and installation of portable fire extinguishers and other miscellaneous items as shown and as required to complete the system					
22.04	10lbs PFE-36	2.00	pc/s			
	<b>SUBTOTAL COST:</b>					
XXIII.	<b>SUNDRIES</b>					
	The following are in respect of the whole of the Fire Protection installations					
23.01	Sealing, packing and fire proofing wherever required where pipes, conduits, cables or trunking pass through slabs, walls, beams and the like	1.00	item			
23.03	providing identification, color coding and labelling	1.00	item			
23.04	providing operation and maintenance manuals consisting of five (5) sets	1.00	item			
23.05	testing and commissioning including making good all defects and re-testing as necessary and leaving all in sound and perfect working order on completion	1.00	item			
23.06	instructing the Owner's representatives in operation, maintenance and service of completed installation; a period of twelve (12) months from the date of issuance of Certificate of Completion	1.00	item			
23.07	maintenance including labor and parts replacement; a period of twelve (12) months from the date of issuance of Certificate of Completion	1.00	item			
23.08	disinfecting the whole water distribution system issuing of the certificate of insurance that the whole system is free from contamination	1.00	item			
	<b>SUBTOTAL COST:</b>					
	<b>FIRE PROTECTION WORKS TOTAL COST:</b>					

**Mechanical Works Budgetary Estimates**

<b>XXIV.</b>	<b>AIR CONDITIONING UNIT</b>					
<b>ITEM NO.</b>	<b>ITEM DESCRIPTION AND LOCATION</b>	<b>QTY</b>	<b>UNIT</b>	<b>DIRECT UNIT COST</b>	<b>TOTAL COST</b>	<b>REMARKS</b>
24.01	ACCUV-6-12, 16HP Variable Refrigerant Flow Air Cooled Condensing Unit. Coil Blue Fin Coated	1.00	set			
24.02	ACCUV-6-13, 16HP Variable Refrigerant Flow Air Cooled Condensing Unit. Coil Blue Fin Coated	1.00	set			
24.03	ACCUV-6-14, 16HP Variable Refrigerant Flow Air Cooled Condensing Unit. Coil Blue Fin Coated	1.00	set			
24.04	ACUV 5-01, 2.0HP Ceiling Cassette Unit, c/w signals wires and local thermostat. Coil Blue Fin Coated	1.00	set			
24.05	ACUV 5-02, 3.0HP Ceiling Cassette Unit, c/w signals wires and local thermostat. Coil Blue Fin Coated	1.00	set			
24.06	ACUV 5-03, 3.0HP Ceiling Cassette Unit, c/w signals wires and local thermostat. Coil Blue Fin Coated	1.00	set			
24.07	ACUV 5-04, 2.0HP Ceiling Cassette Unit, c/w signals wires and local thermostat. Coil Blue Fin Coated	1.00	set			
24.08	ACUV 5-05, 1.5HP Ceiling Cassette Unit, c/w signals wires and local thermostat. Coil Blue Fin Coated	1.00	set			
24.09	ACUV 5-06, 2.0HP Ceiling Cassette Unit, c/w signals wires and local thermostat. Coil Blue Fin Coated	1.00	set			
24.10	ACUV 5-07, 1.5HP Ceiling Cassette Unit, c/w signals wires and local thermostat. Coil Blue Fin Coated	1.00	set			
24.11	ACUV 5-08, 1.5HP Ceiling Cassette Unit, c/w signals wires and local thermostat. Coil Blue Fin Coated	1.00	set			
24.12	ACUV 5-09, 1.5HP Ceiling Cassette Unit, c/w signals wires and local thermostat. Coil Blue Fin Coated	1.00	set			
24.13	ACUV 5-10, 1.5HP Ceiling Cassette Unit, c/w signals wires and local thermostat. Coil Blue Fin Coated	1.00	set			
24.14	ACUV 5-11, 1.5HP Ceiling Cassette Unit, c/w signals wires and local thermostat. Coil Blue Fin Coated	1.00	set			
24.15	ACUV 5-12, 1.5HP Ceiling Cassette Unit, c/w signals wires and local thermostat. Coil Blue Fin Coated	1.00	set			
24.16	ACUV 5-13, 1.5HP Ceiling Cassette Unit, c/w signals wires and local thermostat. Coil Blue Fin Coated	1.00	set			
24.17	ACUV 5-14, 1.5HP Ceiling Cassette Unit, c/w signals wires and local thermostat. Coil Blue Fin Coated	1.00	set			

ITEM NO.	ITEM DESCRIPTION AND LOCATION	QTY	UNIT	DIRECT UNIT COST	TOTAL COST	REMARKS
24.18	ACUV 5-15, 2.0HP Ceiling Cassette Unit, c/w signals wires and local thermostat. Coil Blue Fin Coated	1.00	set			
24.19	ACUV 5-16, 2.0HP Ceiling Cassette Unit, c/w signals wires and local thermostat	1.00	set			
24.20	ACUV 5-17, 3.0HP Ceiling Cassette Unit, c/w signals wires and local thermostat. Coil Blue Fin Coated	1.00	set			
24.21	ACUV 5-18, 2.0HP Ceiling Cassette Unit, c/w signals wires and local thermostat. Coil Blue Fin Coated	1.00	set			
24.22	Refrigerant Pipes, Pipe Insulation and Special Pipe Connectors for VRF	1.00	lot			
24.23	Electrical Wirings, Panel Boards and other signal wires	1.00	lot			
24.24	Podium Floor VRF Central Control and Monitoring System	1.00	set			
	<b>SUBTOTAL COST:</b>					
XXV.	<b>FANS AND BLOWERS</b>					
25.01	EF 5-01, Ceiling Mounted Type at 120 Lps	2.00	set			
25.02	EF 5-02, Ceiling Mounted Type at 120 Lps	1.00	set			
25.03	EF 5-03, Ceiling Mounted Type at 120 Lps	1.00	set			
25.04	EF 5-04, Ceiling Mounted Type at 120 Lps	1.00	set			
25.05	TEF 5-01, Ceiling Mounted Type at 75 Lps	1.00	set			
	TEF 5-02, Ceiling Mounted Type at 120Lps	1.00	set			
	TEF 5-03, Ceiling Mounted Type at 120Lps	1.00	set			
	<b>SUBTOTAL COST:</b>					
XXVI.	<b>DUCTWORK AND ACCESSORIES</b>					
	Galvanized Iron Sheet					
26.01	US Ga. # 26	232.00	sq.m.			
26.02	US Ga. # 24	217.00	sq.m.			
0.00	Flexible Duct c/w insulation and vapor barrier					
26.03	250 dia.	402.00	lm			
26.04	200 dia.	30.00	lm			
26.05	25mm thk. Crosslinked Polyolefin Insulation c/w vapor barrier and adhesive	426.00	sqm			
26.06	Volume Control Dampers, Damper Splitter	1.00	lot			
	<b>SUBTOTAL COST:</b>					
XXVII.	<b>AIR DIFFUSERS</b>					
28.01	1200x50mm Linear Bar Grille c/w Opposed Blaed Damper, Aluminum Type	35.00	pcs			

ITEM NO.	ITEM DESCRIPTION AND LOCATION	QTY	UNIT	DIRECT UNIT COST	TOTAL COST	REMARKS
28.02	1200x75mm Linear Bar Grille c/w Opposed Blade Damper, Aluminum Type	150.00	pcs			
28.03	1200x75mm Continuous Linear Bar Grille	1.00	lot			
28.04	350X350 4-Way Ceiling Diffuser c/w Opposed Blade Damper	4.00	pcs			
28.05	300X300 4-Way Ceiling Diffuser c/w Opposed Blade Damper	2.00	pcs			
	<b>SUBTOTAL COST:</b>					
<b>XXVIII.</b>	<b>OTHERS</b>					
28.06	Duct and Pipe Hangers, equipment Support, noise and vibration isolators	1.00	lot			
28.07	Consumables	1.00	lot			
28.08	Testing and Commissioning and Miscellaneous Items other miscellaneous items to complete the system	1.00	lot			
	<b>SUBTOTAL COST:</b>					
	<b>MECHANICAL WORKS TOTAL COST:</b>					
<b>Electrical Works Budgetary Estimates</b>						
<b>XXIX.</b>	<b>PANEL BOARDS, TRANSFORMERS &amp; CIRCUIT BREAKERS</b>					
29.01	2UP5 230V, 3P+G, NEMA 1, SURFACE MOUNTED	1.00	assy			
	Main: 1 - EZC F 100AT, 100AF, 3P, 25KAIC, 230V, MCCB					
	Brs: 18 - iC60 N 20AT, 63AF, 2P, 20KAIC, 230V, MCB					
29.02	PP-5 230V, 3P+G, NEMA 1, SURFACE MOUNTED	1.00	assy			
	Main: 1 - iC60 N 60AT, 100AF, 3P, 25KAIC, 230V, MCB					
	Brs: 24 - iC60 N 20AT, 63AF, 2P, 10KAIC, 230V, MCB					
29.03	2L5 230V, 3P+G, NEMA 1, SURFACE MOUNTED	1.00	assy			
	Main: 1 - iC60 N 80AT, 100AF, 3P, 25KAIC, 230V, MCB					
	Brs: 2 - iC60 N 50AT, 63AF, 2P, 20KAIC, 230V, MCB					
	120- iC60 N 20AT, 63AF, 2P, 20KAIC, 230V, MCB					
	Spare: 4 - iC60 N 20AT, 63AF, 2P, 20KAIC, 230V, MCB					
29.04	PR5 230V, 3P+G, NEMA 1, SURFACE MOUNTED	1.00	assy			
	Main: 1 - EZC F 60AT, 100AF, 3P, 25KAIC, 230V, MCCB					

ITEM NO.	ITEM DESCRIPTION AND LOCATION	QTY	UNIT	DIRECT UNIT COST	TOTAL COST	REMARKS
	Brs: 17 - iC60 N 20AT, 63AF, 2P,20KAIC, 230V, MCB					
	Spare: 1 - iC60 N 20AT, 63AF, 2P, 20KAIC, 230V, MCB					
29.05	30kVA 480V/ 230 DRY TYPE TRANSFORMER	1.00	assy			
	<b>SUBTOTAL COST:</b>					
	<b>LIGHTING SYSTEM</b>					
30.01	<b>WIRING DEVICES</b>					
	one gang switch					
	two gang switch	12.00	set			
	three gang switch	18.00	set			
	Three-way switch - one gang	3.00	set			
	Three-way switch - two gang	11.00	set			
	Three-way switch - three gang	2.00	set			
30.02	<b>CONDUITS</b>	-	0			
	15mmØ EMT conduits					
	15mmØ EMT elbow	507.00	pcs			
	15mmØ EMT coupling	1,013.00	pcs			
	15mmØ EMT connector	1,217.00	pcs			
	15mmØ EMT Locknut & Bushing	1,217.00	pcs			
	15mmØ flexible metal conduit	834.00	lm			
	15mmØ straight connector	556.00	pcs			
	15mmØ angle connector	556.00	pcs			
30.03	<b>BOXES</b>	-	0			
	4" x 4" x 2" Octagonal Box, Gauge 16, Zinc-Chromate					
	2" x 4" Utility Box, Gauge 16, Zinc-Chromate	54.00	pcs			
	6" x 6" x 4" Pull Box, Gauge 16, Zinc-Chromate	1.00	pcs			
	4-11/16" x 4-11/16" Square Box, Gauge 16, Zinc-Chromate	152.00	pcs			
30.04	<b>WIRES &amp; CABLES</b>	-	0			
	3.5mm <sup>2</sup>					

ITEM NO.	ITEM DESCRIPTION AND LOCATION	QTY	UNIT	DIRECT UNIT COST	TOTAL COST	REMARKS
	<b>SUBTOTAL COST:</b>	-	0			
XXXI.	<b>POWER SYSTEM</b>	-	0			
31.01	<b>WIRING DEVICES</b>					
	<b>Duplex Convenience Outlet</b>					
	Refrigerator Outlet, Grounding Type					
	Microwave oven Outlet, Grounding Type	5.00	sets			
	Food waste disposal outlet, Grounding Type	5.00	sets			
	Hand Dryer Outlet	2.00	sets			
31.02	<b>CONDUITS</b>					
	15mmØ EMT conduits	808.00	lghts			
	15mmØ EMT elbow					
	15mmØ EMT coupling	808.00	pcs			
	15mmØ EMT connector	540.00	pcs			
	15mmØ EMT Locknut & Bushing	540.00	pcs			
31.03	<b>BOXES &amp; PULL BOXES</b>					
	4" x 4" Octagonal Box, Gauge 16, Zinc-Chromate	108.00	pcs			
	4-11/16" x 4-11/16" Square Box, Gauge 16, Zinc-Chromate					
	2" x 4" Utility Box, Gauge 16, Zinc-Chromate	270.00	pcs			
31.05	<b>WIRES &amp; CABLES</b>					
	3.5mm <sup>2</sup>	7,272.00	lm			
	<b>SUBTOTAL COST:</b>					
XXXII.	<b>FIRE DETECTION ALARM SYSTEM</b>					
32.01	<b>CONDUIT &amp; FITTINGS</b>					
	20mmØ EMT conduits	221.00	lghts			
	20mmØ EMT elbow	171.00	pcs			
	20mmØ EMT coupling	221.00	pcs			
	20mmØ EMT connector	190.00	pcs			
	20mmØ Locknut & Bushing	190.00	pcs			
	15mmØ flexible metal conduit	143.00	lghts			
	15mmØ straight connector	95.00	pcs			

ITEM NO.	ITEM DESCRIPTION AND LOCATION	QTY	UNIT	DIRECT UNIT COST	TOTAL COST	REMARKS
	15mmØ angle connector	95.00	pcs			
32.02	<b>BOXES &amp; PULL BOXES</b>	-	0			
	4" x 4" x 2" Octagonal Box, Gauge 16, Zinc-Chromate	95.00	pcs			
	2" x 4" Utility Box, Gauge 16, Zinc-Chromate	34.00	pcs			
	4-11/16" x 4-11/16" Square Box, Gauge 16, Zinc-Chromate	20.00	pcs			
32.03	<b>WIRES &amp; CABLES</b>					
	Twisted Pair #16 (MINERAL INSULATION FRC)	682.00	pcs			
32.04	<b>EQUIPMENT &amp; DEVICES</b>					
	manual pull station	5.00	pcs			
	horn with strobe light	15.00	set			
	heat detector					
	smoke detector	61.00	pcs			
	<b>SUBTOTAL COST:</b>					
<b>XXXIII.</b>	<b>TELEPHONE SYSTEM</b>					
33.01	<b>CONDUIT &amp; FITTINGS</b>					
	25mmØ EMT conduits	726.00	pcs			
	25mmØ EMT elbow	363.00	pcs			
	25mmØ EMT coupling	726.00	pcs			
	25mmØ EMT connector	798.00	pcs			
	25mmØ Locknut & Bushing	798.00	pcs			
	25mmØ flexible metal conduit	595.00	pcs			
	25mmØ straight connector	798.00	pcs			
	25mmØ angle connector	798.00	pcs			
	32mmØ EMT conduits	343.00	lghts			
	32mmØ EMT elbow	171.00	pcs			
	32mmØ EMT coupling	343.00	pcs			
	32mmØ EMT connector	377.00	pcs	PHP 340.97		
	32mmØ Locknut & Bushing	377.00	pcs	PHP 142.73		

ITEM NO.	ITEM DESCRIPTION AND LOCATION	QTY	UNIT	DIRECT UNIT COST	TOTAL COST	REMARKS
	32mmØ flexible metal conduit	281.00	pcs	PHP 198.24		
	32mmØ straight connector	188.00	pcs	PHP 134.80		
	32mmØ angle connector	188.00	pcs	PHP 206.17		
33.02	<b>BOXES &amp; PULL BOXES</b>					
	4" x 4" x 2" Octagonal Box, Gauge 16, Zinc-Chromate	41.00	pcs	PHP 62.80		
	2" x 4" Utility Box, Gauge 16, Zinc-Chromate	41.00	pcs	PHP 62.80		
33.03	<b>WIRES &amp; CABLES</b>					
	Cat5e Cable	4,802.00	l.m.	PHP 38.06		
33.04	<b>EQUIPMENTS &amp; DEVICES</b>					
	Socket	41.00	pcs	PHP 248.99		
	<b>SUBTOTAL COST:</b>					
	<b>ELECTRICAL WORKS TOTAL COST:</b>					
	<b>FIFTH FLOOR TOTAL COST (A,S/P,FP,M,E,S)</b>					



- (ii) Section IX. Bidding Forms as required in **ITB** Clause 12(i)(b)(iii).
- (iii) 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(iv).
  - (e) Ensuring that it is not “blacklisted” or barred from bidding by the GoP or any of its agencies, offices, corporations, or LGUs, including foreign government/foreign or international financing institution whose blacklisting rules have been recognized by the GPPB;
  - (f) Ensuring that each of the documents submitted in satisfaction of the bidding requirements is an authentic copy of the original, complete, and all statements and information provided therein are true and correct;
  - (g) Authorizing the HoPE or its duly authorized representative/s to verify all the documents submitted;
  - (h) Ensuring that the signatory is the duly authorized representative of the Bidder, and granted full power and authority to do, execute and perform any and all acts necessary to participate, submit the bid, and to sign and execute the ensuing contract, accompanied by the duly notarized Special Power of Attorney, Board/Partnership Resolution, or Secretary’s Certificate, whichever is applicable;
  - (i) Complying with the disclosure provision under Section 47 of RA 9184 and its IRR in relation to other provisions of RA 3019;
  - (j) Complying with existing labor laws and standards, in the case of procurement of services. Moreover, bidder undertakes to:
    - (i) Ensure the entitlement of workers to wages, hours of work, safety and health and other prevailing conditions of work as established by national laws, rules and regulations; or collective bargaining agreement; or arbitration award, if and when applicable.

In case there is a finding by the Procuring Entity or the DOLE of underpayment or non-payment of workers’ wage and wage-related benefits, bidder agrees that the performance security or portion of the contract amount shall be withheld in favor of the

complaining workers pursuant to appropriate provisions of Republic Act No. 9184 without prejudice to the institution of appropriate actions under the Labor Code, as amended, and other social legislations.

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

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

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

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

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

- (iv) The Bidder, by the act of submitting its bid, shall be deemed to have inspected the site, determined the general characteristics of the contract works and the conditions for this Project and examine all instructions, forms, terms, and project requirements in the Bidding Documents.
- (v) It shall be the sole responsibility of the prospective bidder to determine and to satisfy itself by such means as it considers necessary or desirable as to all matters pertaining to this Project, including: (a) the location and the nature of the contract, project, or work; (b) climatic conditions; (c) transportation facilities; (c) nature and condition of the terrain, geological conditions at the site communication facilities, requirements, location and availability of construction aggregates and other materials, labor, water, electric power and access roads; and (d) other factors that may affect the cost, duration and execution or implementation of the contract, project, or work.
- (vi) The Procuring Entity shall not assume any responsibility regarding erroneous interpretations or conclusions by the prospective or eligible bidder out of the data furnished by the procuring entity. However, the Procuring Entity shall ensure that all information in the Bidding Documents, including supplemental/bid bulletins issued are correct and consistent.
- (vii) Before submitting their bids, the Bidders are deemed to have become familiar with all existing laws, decrees, ordinances, acts and regulations of the Philippines which may affect the contract in any way.

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

## **7. Origin of Goods and Services**

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

## **8. Subcontracts**

- (i) Unless otherwise specified in the **BDS**, the Bidder may subcontract portions of the Works to an extent as may be approved by the Procuring Entity and stated in the **BDS**. However, subcontracting of any portion shall not relieve the Bidder from any liability or obligation that may arise from the contract for this Project.
- (ii) Subcontractors must submit the documentary requirements under **ITB** Clause 12 and comply with the eligibility criteria specified in the **BDS**. In the event that any subcontractor is found by the Procuring Entity to be ineligible, the subcontracting of such portion of the Works shall be disallowed.
- (iii) The Bidder may identify the subcontractor to whom a portion of the Works will be subcontracted at any stage of the bidding process or during contract implementation. If the Bidder opts to disclose the name of the subcontractor during bid submission, the Bidder shall include the required documents as part of the technical component of its bid.

### **B. Contents of Bidding Documents**

## **9. Pre-Bid Conference**

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

- (ii) 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.
- (iii) 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**

- (i) Prospective bidders may request for clarification(s) on and/or interpretation of any part of the Bidding Documents. Such a request must be in writing and submitted to the Procuring Entity at the address indicated in the **BDS** at least ten (10) calendar days before the deadline set for the submission and receipt of Bids.
- (ii) 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.
- (iii) 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.
- (iv) Any Supplemental/Bid Bulletin issued by the BAC shall also be posted in the PhilGEPS and the website of the Procuring Entity concerned, if available, and at any conspicuous place in the premises of the Procuring Entity concerned. It shall be the responsibility of all Bidders who have properly secured the Bidding Documents to inquire and secure Supplemental/Bid Bulletins that may be issued by the BAC. However, Bidders who have submitted bids before the issuance of the Supplemental/Bid Bulletin must be informed and allowed to modify or withdraw their bids in accordance with **ITB** Clause 23.

### **C. Preparation of Bids**

## **11. Language of Bids**

The eligibility requirements or statements, the bids, and all other documents to be submitted to the BAC must be in English. If the eligibility requirements or statements, the bids, and all other documents submitted to the BAC are in foreign language other

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

## 12. Documents Comprising the Bid: Eligibility and Technical Components

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

(a) Eligibility Documents –

Class “A” Documents

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

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

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

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

(ii.1) name of the contract;

(ii.2) date of the contract;

(ii.3) contract duration;

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

(ii.5) nature of work;

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

(ii.7) total contract value at award;

- (ii.8) date of completion or estimated completion time;
- (ii.9) total contract value at completion, if applicable;
- (ii.10) percentages of planned and actual accomplishments, if applicable; and
- (ii.11) value of outstanding works, if applicable.

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

- (iii) Unless otherwise provided in the **BDS**, a valid special PCAB License in case of joint ventures, and registration for the type and cost of the contract for this Project; and
- (iv) NFCC computation in accordance with ITB Clause 5.5.

Class "B" Documents

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

(b) Technical Documents –

- (i) Bid security in accordance with **ITB** Clause 18. If the Bidder opts to submit the bid security in the form of:
  - (i.1) a bank draft/guarantee or an irrevocable letter of credit issued by a foreign bank, it shall be accompanied by a confirmation from a Universal or Commercial Bank; or
  - (i.2) a surety bond accompanied by a certification coming from the Insurance Commission that the surety or insurance company is authorized to issue such instruments.
- (ii) Project Requirements, which shall include the following:
  - (ii.1) Organizational chart for the contract to be bid;
  - (ii.2) List of contractor's personnel (*e.g.*, Project Manager, Project Engineers, Materials Engineers, and Foremen), to be assigned to the contract to be bid, with their complete qualification and experience data. These personnel must meet the required minimum years of experience set in the **BDS**; and

- (ii.3) List of contractor's major equipment units, which are owned, leased, and/or under purchase agreements, supported by proof of ownership, certification of availability of equipment from the equipment lessor/vendor for the duration of the project, as the case may be, which must meet the minimum requirements for the contract set in the **BDS**; and
- (iii) Sworn statement in accordance with Section 25.3 of the IRR of RA 9184 and using the form prescribed in Section VIII. Bill of Quantities

### **13. Documents Comprising the Bid: Financial Component**

- (i) Unless otherwise stated in the **BDS**, the financial component of the bid shall contain the following:
  - (a) Financial Bid Form, which includes bid prices and the bill of quantities, in accordance with **ITB** Clauses 15.1 and 15.3; and
  - (b) Any other document related to the financial component of the bid as stated in the **BDS**.
- (ii) (a) Unless otherwise stated in the **BDS**, all Bids that exceed the ABC shall not be accepted.
- (b) Unless otherwise indicated in the **BDS**, for foreign-funded procurement, a ceiling may be applied to bid prices provided the following conditions are met:
  - (i) Bidding Documents are obtainable free of charge on a freely accessible website. If payment of Bidding Documents is required by the procuring entity, payment could be made upon the submission of bids.
  - (ii) The procuring entity has procedures in place to ensure that the ABC is based on recent estimates made by the engineer or the responsible unit of the procuring entity and that the estimates are based on adequate detailed engineering (in the case of infrastructure projects) and reflect the quality, supervision and risk and inflationary factors, as well as prevailing market prices, associated with the types of works or goods to be procured.
  - (iii) The procuring entity has trained cost estimators on estimating prices and analyzing bid variances. In the case of infrastructure projects, the procuring entity must also have trained quantity surveyors.
  - (iv) The procuring entity has established a system to monitor and report bid prices relative to ABC and engineer's/procuring entity's estimate.

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

#### **14. Alternative Bids**

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

- (i) The contract shall be for the whole Works, as described in **ITB** Clause 1(i), based on the priced Bill of Quantities submitted by the Bidder.
- (ii) The Bidder shall fill in rates and prices for all items of the Works described in the Bill of Quantities. Bids not addressing or providing all of the required items in the Bidding Documents including, where applicable, Bill of Quantities, shall be considered non-responsive and, thus, automatically disqualified. In this regard, where a required item is provided, but no price is indicated, the same shall be considered as non-responsive, but specifying a zero (0) or a dash (-) for the said item would mean that it is being offered for free to the Government, except those required by law or regulations to be provided for.
- (iii) All duties, taxes, and other levies payable by the Contractor under the Contract, or for any other cause, prior to the deadline for submission of bids, shall be included in the rates, prices, and total bid price submitted by the Bidder.
- (iv) All bid prices for the given scope of work in the contract as awarded shall be considered as fixed prices, and therefore not subject to price escalation during contract implementation, except under extraordinary circumstances as specified in GCC Clause 48. Upon the recommendation of the Procuring Entity, price escalation may be allowed in extraordinary circumstances as may



be determined by the National Economic and Development Authority in accordance with the Civil Code of the Philippines, and upon approval by the GPPB. Furthermore, in cases where the cost of the awarded contract is affected by any applicable new laws, ordinances, regulations, or other acts of the GoP, promulgated after the date of bid opening, a contract price adjustment shall be made or appropriate relief shall be applied on a no loss-no gain basis.

**16. Bid Currencies**

- (i) All bid prices shall be quoted in Philippine Pesos unless otherwise provided in the **BDS**. However, for purposes of bid evaluation, bids denominated in foreign currencies shall be converted to Philippine currency based on the exchange rate prevailing on the day of the Bid Opening.
- (ii) If so allowed in accordance with **ITB** Clause (i), the Procuring Entity for purposes of bid evaluation and comparing the bid prices will convert the amounts in various currencies in which the bid price is expressed to Philippine Pesos at the exchange rate as published in the *Bangko Sentral ng Pilipinas* (BSP) reference rate bulletin on the day of the bid opening.
- (iii) Unless otherwise specified in the **BDS**, payment of the contract price shall be made in Philippine Pesos.

**17. Bid Validity**

- (i) 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.
- (ii) 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**

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

Form of Bid Security	Amount of Bid Security (Not less than the Percentage of the ABC)
(a) Cash or cashier's/manager's check issued by a Universal or Commercial Bank.	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.	
(c) Surety bond callable upon demand issued by a surety or insurance company duly certified by the Insurance Commission as authorized to issue such security; and/or	Five percent (5%)
(d) Bid Securing Declaration	No amount involve

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

- (ii) 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.
- (iii) No bid securities shall be returned to Bidders after the opening of bids and before contract signing, except to those that failed or declared as post-disqualified, upon submission of a written waiver of their right to file a request for reconsideration and/or protest, or lapse of the reglementary period without having filed a request for reconsideration or protest. Without prejudice on its forfeiture, Bid Securities shall be returned only after the Bidder with the Lowest Calculated Responsive Bid (LCRB) has signed the contract and furnished the Performance Security, but in no case later than the expiration of the Bid Security validity period indicated in **ITB** Clause (ii).
- (iv) Upon signing and execution of the contract, pursuant to **ITB** Clause 31, and the posting of the performance security, pursuant to **ITB** Clause 32, the successful Bidder's Bid Security will be discharged, but in no case later than the Bid Security validity period as indicated in **ITB** Clause (ii).
- (v) The bid security may be forfeited:
  - (a) if a Bidder:

- (i) withdraws its bid during the period of bid validity specified in **ITB** Clause 17;
  - (ii) does not accept the correction of errors pursuant to **ITB** Clause 27(iii)(b);
  - (iii) has a finding against the veracity of the required documents submitted in accordance with ITB Clause 28.2;
  - (iv) submission of eligibility requirements containing false information or falsified documents;
  - (v) submission of bids that contain false information or falsified documents, or the concealment of such information in the bids in order to influence the outcome of eligibility screening or any other stage of the public bidding;
  - (vi) allowing the use of one's name, or using the name of another for purposes of public bidding;
  - (vii) withdrawal of a bid, or refusal to accept an award, or enter into contract with the Government without justifiable cause, after the Bidder had been adjudged as having submitted the LCRB;
  - (viii) refusal or failure to post the required performance security within the prescribed time;
  - (ix) refusal to clarify or validate in writing its bid during post-qualification within a period of seven (7) calendar days from receipt of the request for clarification;
  - (x) any documented attempt by a Bidder to unduly influence the outcome of the bidding in his favor;
  - (xi) failure of the potential joint venture partners to enter into the joint venture after the bid is declared successful; or
  - (xii) all other acts that tend to defeat the purpose of the competitive bidding, such as habitually withdrawing from bidding, submitting late Bids or patently insufficient bid, for at least three (3) times within a year, except for valid reasons.
- (b) if the successful Bidder:
- (i) fails to sign the contract in accordance with **ITB** Clause 31;
  - (ii) fails to furnish performance security in accordance with **ITB** Clause 32.

## **19. Format and Signing of Bids**

- 19.1 Bidders shall submit their bids through their duly authorized representative using the appropriate forms provided in
- 19.2 on or before the deadline specified in the **ITB** Clause 21 in two (2) separate sealed bid envelopes, and which shall be submitted simultaneously. The first shall contain the technical component of the bid, including the eligibility requirements under **ITB** Clause 12(i), 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 12(i)(b). In addition, the Bidder shall submit copies of the first and second envelopes. In the event of any discrepancy between the original and the copies, the original shall prevail.
- 19.4 Each and every page of the Bid Form, including the Bill of Quantities, under Section IX hereof, shall be signed by the duly authorized representative/s of the Bidder. Failure to do so shall be a ground for the rejection of the bid.
- 19.5 Any interlineations, erasures, or overwriting shall be valid only if they are signed or initialed by the duly authorized representative/s of the Bidder.

## **20. Sealing and Marking of Bids**

- (i) 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.”
- (ii) 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.
- (iii) 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.
- (iv) All envelopes shall:
  - (a) contain the name of the contract to be bid in capital letters;
  - (b) bear the name and address of the Bidder in capital letters;

- (c) be addressed to the Procuring Entity's BAC in accordance with **ITB** Clause 20.1;
  - (d) bear the specific identification of this bidding process indicated in the **ITB** Clause 1.2; and
  - (e) bear a warning "DO NOT OPEN BEFORE..." the date and time for the opening of bids, in accordance with **ITB** Clause 21.
- (v) Bid envelopes that are not properly sealed and marked, as required in the bidding documents, shall not be rejected, but the Bidder or its duly authorized representative shall acknowledge such condition of the bid as submitted. The BAC or the Procuring Entity shall assume no responsibility for the misplacement of the contents of the improperly sealed or marked bid, or for its premature opening.

#### **D. Submission and Opening of Bids**

##### **21. Deadline for Submission of Bids**

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

##### **22. Late Bids**

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

##### **23. Modification and Withdrawal of Bids**

- (i) The Bidder may modify its bid after it has been submitted; provided that the modification is received by the Procuring Entity prior to the deadline prescribed for submission and receipt of bids. The Bidder shall not be allowed to retrieve its original bid, but shall be allowed to submit another bid equally sealed and properly identified in accordance with Clause 20, linked to its original bid marked as "TECHNICAL MODIFICATION" or "FINANCIAL MODIFICATION" and stamped "received" by the BAC. Bid modifications received after the applicable deadline shall not be considered and shall be returned to the Bidder unopened.
- (ii) A Bidder may, through a Letter of Withdrawal, withdraw its bid after it has been submitted, for valid and justifiable reason; provided that the Letter of Withdrawal is received by the Procuring Entity prior to the deadline prescribed for submission and receipt of bids. The Letter of Withdrawal must be executed by the authorized representative of the Bidder identified in the Omnibus Sworn Statement, a copy of which should be attached to the letter.
- (iii) Bids requested to be withdrawn in accordance with **ITB** Clause (i) 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.

- (iv) 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(v), and the imposition of administrative, civil, and criminal sanctions as prescribed by RA 9184 and its IRR.

#### **24. Opening and Preliminary Examination of Bids**

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

- (vi) 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.
- (vii) Each partner of a joint venture agreement shall likewise submit the document required in **ITB** Clause 12.1(a)(i). Submission of documents required under **ITB** Clauses 12(i)(a)(ii) to 12.1(a)(iv) by any of the joint venture partners constitutes compliance.
- (viii) The Procuring Entity shall prepare the minutes of the proceedings of the bid opening that shall include, as a minimum: (a) names of Bidders, their bid price (per lot, if applicable, and/or including discount, if any), bid security, findings of preliminary examination, and whether there is a withdrawal or modification; and (b) attendance sheet. The BAC members shall sign the abstract of bids as read.
- 24.8. The Bidders or their duly authorized representatives may attend the opening of bids. The BAC shall ensure the integrity, security, and confidentiality of all submitted bids. The Abstract of Bids as read and the minutes of the Bid Opening shall be made available to the public upon written request and payment of a specified fee to recover cost of materials.
- 24.9 To ensure transparency and accurate representation of the bid submission, the BAC Secretariat shall notify in writing all Bidders whose bids it has received through its PhilGEPS-registered physical address or official e-mail address. The notice shall be issued within seven (7) calendar days from the date of the bid opening.

### **E. Evaluation and Comparison of Bids**

#### **25. Process to be Confidential**

- (i) 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.

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

## **26. Clarification of Bids**

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

## **27. Detailed Evaluation and Comparison of Bids**

- (i) 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.
- (ii) The Lowest Calculated Bid shall be determined in two steps:
  - (a) The detailed evaluation of the financial component of the bids, to establish the correct calculated prices of the bids; and
  - (b) The ranking of the total bid prices as so calculated from the lowest to highest. The bid with the lowest price shall be identified as the Lowest Calculated Bid.
- (iii) The Procuring Entity's BAC shall immediately conduct a detailed evaluation of all bids rated "passed," using non-discretionary "pass/fail" criterion. The BAC shall consider the following in the evaluation of bids:
  - (a) Completeness of the bid. Unless the **BDS** allows partial bids, bids not addressing or providing all of the required items in the Schedule of Requirements including, where applicable, bill of quantities, shall be considered non-responsive and, thus, automatically disqualified. In this regard, where a required item is provided, but no price is indicated, the same shall be considered as non-responsive, but specifying a zero (0) or a dash (-) for the said item would mean that it is being offered for free to the Procuring Entity, except those required by law or regulations to be provided for; and
  - (b) Arithmetical corrections. Consider computational errors and omissions to enable proper comparison of all eligible bids. It may also consider bid modifications. Any adjustment shall be calculated in monetary terms to determine the calculated prices.
- (iv) 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**.

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

## **28. Post Qualification**

- (i) 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 12(i)(b).
- (ii) 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.

- (iii) The determination shall be based upon an examination of the documentary evidence of the Bidder's qualifications submitted pursuant to **ITB** Clauses 12 and 12(i)(b), 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.
- (iv) If the BAC determines that the Bidder with the Lowest Calculated Bid passes all the criteria for post-qualification, it shall declare the said bid as the LCRB,

and recommend to the HoPE the award of contract to the said Bidder at its submitted price or its calculated bid price, whichever is lower, subject to **ITB** Clause 30(iii).

- (v) A negative determination shall result in rejection of the Bidder's bid, in which event the Procuring Entity shall proceed to the next Lowest Calculated Bid, with a fresh period to make a similar determination of that Bidder's capabilities to perform satisfactorily. If the second Bidder, however, fails the post qualification, the procedure for post qualification shall be repeated for the Bidder with the next Lowest Calculated Bid, and so on until the LCRB is determined for recommendation of contract award.
- (vi) 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.
- (vii) In the event of disapproval, which shall be based on valid, reasonable, and justifiable grounds as provided for under Section 41 of the IRR of RA 9184, the HoPE shall notify the BAC and the Bidder in writing of such decision and the grounds for it. When applicable, the BAC shall conduct a post-qualification of the Bidder with the next Lowest Calculated Bid. A request for reconsideration may be filed by the Bidder with the HoPE in accordance with Section 37.1.3 of the IRR of RA 9184.

## **29. Reservation Clause**

- (i) 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.
- (ii) 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.
- (iii) In addition, the Procuring Entity may likewise declare a failure of bidding when:
  - (a) No bids are received;
  - (b) All prospective Bidders are declared ineligible;
  - (c) All bids fail to comply with all the bid requirements, fail post-qualification; or
  - (d) The Bidder with the LCRB refuses, without justifiable cause, to accept the award of contract, and no award is made in accordance with Section 40 of the IRR of RA 9184.

#### **F. Award of Contract**

### **30. Contract Award**

- (i) Subject to **ITB** Clause 28, the HoPE or its duly authorized representative shall award the contract to the Bidder whose bid has been determined to be the LCRB.
- (ii) Prior to the expiration of the period of bid validity, the Procuring Entity shall notify the successful Bidder in writing that its bid has been accepted, through a Notice of Award duly received by the Bidder or its representative personally or by registered mail or electronically, receipt of which must be confirmed in writing within two (2) days by the Bidder with the LCRB and submitted personally or sent by registered mail or electronically to the Procuring Entity.
- (iii) Notwithstanding the issuance of the Notice of Award, award of contract shall be subject to the following conditions:

- (a) Submission of the following documents within ten (10) calendar days from receipt of the Notice of Award:
  - (i) In the case of procurement by a Philippine Foreign Service Office or Post, the PhilGEPS Registration Number of the winning foreign Bidder; or
  - (ii) Valid PCAB license and registration for the type and cost of the contract to be bid for foreign bidders when the Treaty or International or Executive Agreement expressly allows submission of the PCAB license and registration for the type and cost of the contract to be bid as a pre-condition to the Award;
- (b) Posting of the performance security in accordance with **ITB** Clause 32;
- (c) Signing of the contract as provided in **ITB** Clause 31; and
- (d) Approval by higher authority, if required, as provided in Section 37.3 of the IRR of RA 9184.

### **31. Signing of the Contract**

- (i) 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.
- (ii) 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.
- (iii) 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.
- (iv) The following documents shall form part of the contract:
  - (a) Contract Agreement;
  - (b) Bidding Documents;
  - (c) Winning Bidder's bid, including the Technical and Financial Proposals, and all other documents/statements submitted (*e.g.*, Bidder's response to request for clarifications on the bid), including corrections to the bid, if any, resulting from the Procuring Entity's bid evaluation;
  - (d) Performance Security;
  - (e) Notice of Award of Contract; and

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

**32. Performance Security**

- (i) 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.
- (ii) 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.	Ten percent (10%)
(b) Bank draft/guarantee or irrevocable letter of credit issued by a Universal or Commercial Bank: Provided, however, that it shall be confirmed or authenticated by a Universal or Commercial Bank, if issued by a foreign bank.	
(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%)

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

**33. Notice to Proceed**

Within seven (7) calendar days from the date of approval of the Contract by the appropriate government approving authority, the Procuring Entity shall issue the

Notice to Proceed (NTP) together with a copy or copies of the approved contract to the successful Bidder. All notices called for by the terms of the contract shall be effective only at the time of receipt thereof by the successful Bidder.

**34. Protest Mechanism**

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

*Section III. Bid Data Sheet*

### Bid Data Sheet

ITB Clause	
1(i)	<p>The Procuring Entity is the Department of Finance.</p> <p>The name of the Contract is project</p> <p>4. <b>Renovation of the Department of Finance Building Offices – Package 2</b> includes Architectural Works, Sanitary/Plumbing Works, Fire Protection Works, Mechanical Works and Electrical Works as maybe applicable, for the following areas/floors :</p> <ul style="list-style-type: none"> <li>e. Podium Level</li> <li>f. Third Floor;</li> <li>g. Fourth Floor;</li> <li>h. Fifth Floor;</li> </ul> <p>The identification number of the Contract is ITB No. 2017-04-I</p>
2	<p>The Funding Source is:</p> <p>The Government of the Philippines (GoP) through the General Appropriations for FY 2017 General Appropriations Act in the amount of <b>ONE HUNDRED SIXTEEN MILLION EIGHT HUNDRED TWENTY THOUSAND PESOS (P116,820,000.00)</b> being the Approved Budget of the Contract (ABC).</p>
3.1	No further instructions.
5.1	<p>Additional Provision:</p> <ol style="list-style-type: none"> <li>1. Bidding is restricted to Filipino citizens/sole proprietorships, partnerships, or organizations with at least seventy five percent (75%) interest or outstanding capital stock belonging to citizens of the Philippines.</li> <li>2. The Bidder must submit a valid PCAB License: Medium B Category A</li> <li>3. The statement of the prospective bidder of all its on-going government and private contracts, including contracts awarded but not yet started within the last 3 years, if any, whether similar or not similar in nature and complexity to the contract to be bid.</li> </ol>
5(ii)	Bidding is restricted to eligible bidders as defined in ITB Clause 5.1.
5(iv)(a)	<p>For this purpose, similar contract shall refer to the renovation and construction which includes Architectural, Sanitary/Plumbing Works, Fire Protection, Mechanical and Electrical Works for the following area/floor of the Department of Finance Building :</p>



	<p>a. Podium Level;  b. Third Floor;  c. Fourth Floor;  d. Fifth Floor;</p> <p>The following proofs for the single largest complete contract similar to the contract to be bid must be submitted:</p> <p>a. Certificate of Satisfactory Completion or Certificate of Acceptance from the clients or Official Receipt; and  b. Contract Agreement or Job Order or Purchase Order.</p> <p>For this purpose, the bidders must have completed, <i>within 5 years from the date of Bid Opening</i>, a single contract that is similar to this Project within the last 5 years, equivalent to at least FIFTY PERCENT (50%) of the ABC, that has the same major categories of renovation, construction of office works and specialty items such as mentioned above</p>
5(v)	<p>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:</p> $\text{NFCC} = [(\text{Current assets minus current liabilities}) (15)] \text{ minus the value of all outstanding or uncompleted portions of the projects under ongoing contracts, including awarded contracts yet to be started coinciding with the contract for this Project.}$ <p>The values of the domestic bidder's current assets and current liabilities shall be based on the latest Audited Financial Statements (AFS) submitted to the BIR.</p> <p>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.</p>
8(i)	Subcontracting is allowed only for the specialty works such as: Sanitary/plumbing works, fire protection works, mechanical works and electrical works
8(ii)	Subcontractors must submit the documentary requirements under ITB Clause 12 and must have completed a single contract equivalent to at least fifty percent (50%) of the ABC of the particular project the subcontractor is going to participate into.
9(i)	The Procuring Entity will hold a pre-bid conference for this Project on <b>September 18, 2017, 10:00 a.m.</b> at the DFG Conference Room, 4 <sup>th</sup> Floor DOF Building, Roxas Boulevard, Malate, Manila.

10.1	<p>The Procuring Entity's address is:</p> <p>BAC Secretariat  Department of Finance Manila  Email address: <u><a href="mailto:lte@dof.gov.ph">lte@dof.gov.ph</a></u>  Telefax No. 526-4786</p>
10(iv)	No further instructions.
12(i)	<p>The first envelope shall contain the eligibility and technical documents stated in the ITB Clause 12.1. As an additional requirement under this section particularly reflected in item 8 of the Omnibus Sworn Statement:</p> <ul style="list-style-type: none"> <li>a) Carefully examine all of the Bidding Documents;</li> <li>b) Acknowledge all conditions, local or otherwise, affecting the implementation of the Contract;</li> <li>c) Made an estimate of the facilities available and needed for the contract to be bid, if any; and</li> </ul> <p>The bidder therefore is required to conduct a site inspection together with DOF Representative/End-User of the Project (to be scheduled) to be bid in connection with <b>Renovation of the Department of Finance Building Offices – Package 2</b> includes Architectural, sanitary/plumbing, fire protection, mechanical and electrical works, as maybe applicable, for the following scope of works :</p> <ul style="list-style-type: none"> <li>i. Podium Level;</li> <li>j. Third Floor;</li> <li>k. Fourth Floor;</li> <li>l. Fifth Floor;</li> </ul> <p>Perspective bidder is required to examine the Architectural, sanitary/plumbing, fire protection, mechanical and electrical plans of the Project, to visit the site and carefully take note all the conditions thereat and to have informed himself thoroughly under which the particular work is to be done. No allowance shall subsequently be made in his behalf because of any error on his part. He will be deemed to have done this before submitting his proposal and no subsequent claim on the ground of inadequate or inaccurate information will be entertained. All cost implications, if any, shall be borne by the contractor.</p> <p>The certificate of inspection to be issued by the Department of Finance shall be an integral part of the technical documents and part of the eligibility requirement</p>
12.1(a)(ii)	The statement of all completed and on-going government and private contracts shall include all such contracts within CY 2013-2016 including

	<p>awarded by not yet started. Cut-off dates shall be from August 2014 to August 2017.</p> <p>Proof of completed government and private contracts must be submitted:</p> <ol style="list-style-type: none"> <li>1. Certificate of Completion, or satisfactory performance from the client/s and/or official receipt; and</li> <li>2. Contract Agreement.</li> </ol> <p>Proof for ongoing government and private contract must be submitted:</p> <ol style="list-style-type: none"> <li>1. Notice of Award and Notice to Proceed; or</li> <li>2. Purchase Order; or</li> <li>3. Contract</li> </ol>																
12(i)(a)(iii)	The statement of the Bidder's SLCC shall be supported by the Notice of Award and Notice to Proceed, Project Owner's Certificate of Final Acceptance issued by the Owner other than the Contractor or the Contractor's Performance Evaluation System (CPES) Final Rating which must be at least satisfactory. In case of contracts with the private sector, an equivalent document shall be submitted.																
12(i)(a)(iii)	Bidder must have a valid PCAB License Medium B Category A																
12.1(b)(ii.2)	<p>The Bidder must have in its employ Key personnel with at least the specified number of years experience</p> <table border="1"> <thead> <tr> <th>Position</th> <th>Experience</th> </tr> </thead> <tbody> <tr> <td>Project Manager</td> <td>10 years</td> </tr> <tr> <td>Project Engineers</td> <td>10 years</td> </tr> <tr> <td>Materials Engineers</td> <td>10 years</td> </tr> <tr> <td>Safety Engineers</td> <td>10 years</td> </tr> <tr> <td>Foreman</td> <td>5 years</td> </tr> <tr> <td>Skilled workers (for all disciplines)</td> <td>5 years</td> </tr> <tr> <td>Construction Helpers</td> <td></td> </tr> </tbody> </table> <p><i>In addition, personnel holding key positions (Project Manager, Project Engineers and Materials Engineers and Safety Engineers) are required to submit the required Curriculum Vitae duly notarized and attested to by the Bidder's designated representative.</i></p>	Position	Experience	Project Manager	10 years	Project Engineers	10 years	Materials Engineers	10 years	Safety Engineers	10 years	Foreman	5 years	Skilled workers (for all disciplines)	5 years	Construction Helpers	
Position	Experience																
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Skilled workers (for all disciplines)	5 years																
Construction Helpers																	
12.1(b)(ii.3)	The minimum major equipment requirements are the following: <u>Specify required equipment supported by proof of ownership, certification of availability of equipment from the equipment lessor/vendor for the duration of the project, as the case may be, which must meet the minimum requirements for the contract.</u>																
12.1(b)(iii)	Standard Statement for this requirement is included in the Omnibus Sworn Statement found in Section VIII. Sample Forms. The competent evidence of identity for Notary in the Sworn Affidavit of the Bidder shall comply with																

	<p>Sec. 12(2) rule II of the 2004 Rules of Notarial Practice, to wit:</p> <p>“Sec. 12. Competent Evidence of Identity – the phrase competent evidence of identity refers to the identification of an individual based on: At least one current identification document issued by an official agency bearing the photograph and signature of the individual, such as but not limited to, passport, driver’s license, Professional Regulations Commission ID, National Bureau of Investigation clearance, police clearance, postal ID, Voter’s ID, Barangay Certification, Government Service Insurance System (GSIS) E-card, Social Security System (SSS) card, Philhealth Card, Senior Citizen Card, Overseas Workers Welfare Administration (OWWA), OFW ID, seaman’s book, alien certificate of registration/immigrant certificate of registration, government office ID, certification from the National Council for the Welfare of Disabled Persons (CWDP) Department of social Welfare and Development (DSWD) certification.”</p>
13(i)	<i>List any additional requirements or state “No additional Requirements”</i>
13.1(b)	<p>This shall include all of the following documents:</p> <ol style="list-style-type: none"> <li>1) <i>Bid prices in the Bill of Quantities;</i></li> <li>2) <i>Detailed estimates, including a summary sheet indicating the unit prices of construction materials, labor rates, and equipment rentals used in coming up with the Bid; and</i></li> <li>3) <i>Cash flow by quarter or payment schedule.</i></li> </ol>
13.2	The ABC is <b>ONE HUNDRED SIXTEEN MILLION EIGHT HUNDRED TWENTY THOUSAND PESOS (P116,820,000.00)</b> . All Bids that exceed the ABC shall not be accepted.
14(ii)	No further instructions.
15.4	No further instruction.
16(i)	The bid prices shall be quoted in Philippine Pesos.
16.3	No further instructions.
17(i)	Bids will be valid until one hundred twenty (120) calendar days from bid opening.

18(i)	<p>The bidder shall submit a Bid Securing Declaration of any form of Bid Security which shall not be less than the percentage of the ABC in accordance with the following schedule:</p> <table border="1"> <thead> <tr> <th>Form of Bid Security</th> <th>Amount of Bid Security (Not less than the Percentage of ABC)</th> </tr> </thead> <tbody> <tr> <td>a. Cash or cashier's/manager's check issued by a Universal or Commercial Bank</td> <td rowspan="2">Two percent (2%)</td> </tr> <tr> <td>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.</td> </tr> <tr> <td>c. Surety bond callable upon demand issued by a surety or insurance company duly certified by the Insurance Commission as authorized to issue such security ; and/or</td> <td>Five percent (5%)</td> </tr> </tbody> </table> <p>The Bid Securing Declaration mentioned above is an undertaking which states, among others, that the Bidder shall enter into contract with the procuring entity and furnish the performance security required under ITB clause 32</p>	Form of Bid Security	Amount of Bid Security (Not less than the Percentage of ABC)	a. Cash or cashier's/manager's check issued by a Universal or Commercial Bank	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.	c. Surety bond callable upon demand issued by a surety or insurance company duly certified by the Insurance Commission as authorized to issue such security ; and/or	Five percent (5%)
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18.1.5	<p>The bid security may be forfeited:</p> <p>(a). If a bidder</p> <ul style="list-style-type: none"> <li>(i). withdraws its bid during the period of bid validity specified in <b>ITB</b> Clause 17;</li> <li>(ii) does not accept the correction of errors pursuant to <b>ITB</b> Clause 27(iii)(b);</li> <li>(iii) has a finding against the veracity of the required documents submitted in accordance with ITB Clause 28.2;</li> <li>(iv) submission of eligibility requirements containing false information or falsified documents;</li> <li>(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;</li> <li>(vi) allowing the use of one's name, or using the name of another for purposes of public bidding;</li> <li>(vii) withdrawal of a bid, or refusal to accept an award, or enter</li> </ul>							

	<p>into contract with the Government without justifiable cause, after the Bidder had been adjudged as having submitted the LCRB;</p> <ul style="list-style-type: none"> <li>(viii) refusal or failure to post the required performance security within the prescribed time;</li> <li>(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;</li> <li>(x) any documented attempt by a Bidder to unduly influence the outcome of the bidding in his favor;</li> <li>(xi) failure of the potential joint venture partners to enter into the joint venture after the bid is declared successful; or</li> <li>(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.</li> </ul> <p>(b) if the successful Bidder:</p> <ul style="list-style-type: none"> <li>(i) fails to sign the contract in accordance with <b>ITB</b> Clause 31;</li> <li>(ii) fails to furnish performance security in accordance with <b>ITB</b> Clause 32.</li> </ul>
18(ii)	The bid security shall be valid until <b>(January 24, 2018)</b> or for one hundred twenty (120) calendar days from the actual opening of bids, whichever is later.
20(iii)	<i>The original and the number of copies of the bid shall be typed or written in ink and shall be signed by the Bidder or its duly authorized representatives.</i>
21	<p>The address for submission of bids is</p> <p>BAC Secretariat 8<sup>th</sup> Floor EDPC Building, BSP Complex Pablo Ocampo Sr. Street corner Roxas Boulevard Malate, Manila.</p> <p>The deadline for submission of bids is 9:30 a.m. <b>October 2, 2017.</b></p>
24(i)	<p>The place of bid opening is</p> <p>DFG Conference Room 4<sup>th</sup> Floor – DOF Building Roxas Boulevard, Malate, Manila.</p> <p>The date and time of bid opening is <b>10:00 a.m., October 2, 2017.</b></p>
24.2	No further instructions.
24.3	No further instructions.

27.3(a)	Partial bid is not allowed. The infrastructure project is packaged in a single lot and the lot shall not be divided into sub-lots for the purpose of bidding, evaluation, and contract award.				
27(iv)	No further instructions.				
28.2	<p><i>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 the following documentary requirements:</i></p> <p><i>a. Latest Income Business Tax Returns filed through Electronic Filing and Payments System (EFPS);</i></p> <ol style="list-style-type: none"> <li><i>1. Annual Income Tax Return (BIR Form 1702) for CY 2015 and CY 2016; and</i></li> <li><i>2. Proof of VAT payments filed for CY 2017</i>  <i>March 2550Q 2017</i>  <i>April 2550M 2017</i>  <i>May 2550M 2017</i>  <i>June 2550Q 2017</i>  <i>July 2550M 2017</i>  <i>August 2550M 2017</i></li> <li><i>3. Taxpayer's Identification No. with photocopy of ID</i></li> <li><i>4. BIR Tax Registration Certificate (BITR Form 2303)</i></li> </ol>				
31(iv)(f)	<p><i>Submit the following contract documents relevant to the Project as required:</i></p> <ol style="list-style-type: none"> <li><i>1. Construction Schedule and S-curve;</i></li> <li><i>2. Man power schedule, construction methods, equipment utilization schedule;</i></li> <li><i>3. Construction safety and health program approved by the Department of Labor and Employment;</i></li> <li><i>4. Program Evaluation Review Technique (PERT)/Critical Path Method (CPM);</i></li> <li><i>5. Contractor's Risk (CARI); and</i></li> <li><i>6. Warranty Security after the issuance of Certificate of Completion by the DOF.</i></li> </ol>				
32.2	<p><i>The performance security shall be in an amount not less than the required percentage of the total contract price in accordance with the following schedule:</i></p> <table border="1"> <thead> <tr> <th><i>Form of Performance Security</i></th> <th><i>Amount of Performance Security (Not Less than the Percentage of the Total Contract Price)</i></th> </tr> </thead> <tbody> <tr> <td><i>a. Cash or Cashier's/Manager's Check issued by a Universal or</i></td> <td><i>Ten Percent (10%)</i></td> </tr> </tbody> </table>	<i>Form of Performance Security</i>	<i>Amount of Performance Security (Not Less than the Percentage of the Total Contract Price)</i>	<i>a. Cash or Cashier's/Manager's Check issued by a Universal or</i>	<i>Ten Percent (10%)</i>
<i>Form of Performance Security</i>	<i>Amount of Performance Security (Not Less than the Percentage of the Total Contract Price)</i>				
<i>a. Cash or Cashier's/Manager's Check issued by a Universal or</i>	<i>Ten Percent (10%)</i>				

	<p><i>Commercial Bank</i></p> <p>b. <i>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</i></p>	
	<p>c. <i>Surety bond callable upon demand issued by a surety or insurance company duly certified by the Insurance Commission as authorized to issue such security.</i></p>	<p><i>Thirty Percent (30%)</i></p>



*Section IV. General Conditions of Contract*

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## 1. Definitions

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

- 1.1. The **Arbiter** is the person appointed jointly by the Procuring Entity and the Contractor to resolve disputes in the first instance, as provided for in **GCC Clause 21**.
- 1.2. **Bill of Quantities** refers to a list of the specific items of the Work and their corresponding unit prices, lump sums, and/or provisional sums.
- 1.3. The **Completion Date** is the date of completion of the Works as certified by the Procuring Entity's Representative, in accordance with **GCC Clause 49**.
- 1.4. The **Contract** is the contract between the Procuring Entity and the Contractor to execute, complete, and maintain the Works.
- 1.5. The **Contract Effectivity Date** is the date of signing of the Contract. However, the contractor shall commence execution of the Works on the Start Date as defined in **GCC Clause 1.28**.
- 1.6. The **Contract Price** is the price stated in the Notice of Award and thereafter to be paid by the Procuring Entity to the Contractor for the execution of the Works in accordance with this Contract
- 1.7. **Contract Time Extension** is the allowable period for the Contractor to complete the Works in addition to the original Completion Date stated in this Contract.
- 1.8. The **Contractor** is the juridical entity whose proposal has been accepted by the Procuring Entity and to whom the Contract to execute the Work was awarded.
- 1.9. The **Contractor's Bid** is the signed offer or proposal submitted by the Contractor to the Procuring Entity in response to the Bidding Documents.
- 1.10. **Days** are calendar days; months are calendar months.
- 1.11. **Dayworks** are varied work inputs subject to payment on a time basis for the Contractor's employees and Equipment, in addition to payments for associated Materials and Plant.
- 1.12. A **Defect** is any part of the Works not completed in accordance with the Contract.
- 1.13. The **Defects Liability Certificate** is the certificate issued by Procuring Entity's Representative upon correction of defects by the Contractor.
- 1.14. The **Defects Liability Period** is the one year period between contract completion and final acceptance within which the Contractor assumes the responsibility to undertake the repair of any damage to the Works at his own expense.

- 1.15 **Drawings** are graphical presentations of the Works. They include all supplementary details, shop drawings, calculations, and other information provided or approved for the execution of this Contract.
- 1.16 **Equipment** refers to all facilities, supplies, appliances, materials or things required for the execution and completion of the Work provided by the Contractor and which shall not form or are not intended to form part of the Permanent Works.
- 1.17 The **Intended Completion Date** refers to the date specified in the SCC when the Contractor is expected to have completed the Works. The Intended Completion Date may be revised only by the Procuring Entity's Representative by issuing an extension of time or an acceleration order.
- 1.18 **Materials** are all supplies, including consumables, used by the Contractor for incorporation in the Works.
- 1.19 The **Notice to Proceed** is a written notice issued by the Procuring Entity or the Procuring Entity's Representative to the Contractor requiring the latter to begin the commencement of the work not later than a specified or determinable date.
- 1.20 **Permanent Works** are all permanent structures and all other project features and facilities required to be constructed and completed in accordance with this Contract which shall be delivered to the Procuring Entity and which shall remain at the Site after the removal of all Temporary Works.
- 1.21 **Plant** refers to the machinery, apparatus, and the like intended to form an integral part of the Permanent Works.
- 1.22 The **Procuring Entity** is the party who employs the Contractor to carry out the Works stated in the SCC.
- 1.23 The **Procuring Entity's Representative** refers to the Head of the Procuring Entity or his duly authorized representative, identified in the SCC, who shall be responsible for supervising the execution of the Works and administering this Contract.
- 1.24 The **Site** is the place provided by the Procuring Entity where the Works shall be executed and any other place or places which may be designated in the SCC, or notified to the Contractor by the Procuring Entity's Representative as forming part of the Site.
- 1.25 **Site Investigation Reports** are those that were included in the Bidding Documents and are factual and interpretative reports about the surface and subsurface conditions at the Site.
- 1.26 **Slippage** is a delay in work execution occurring when actual accomplishment falls below the target as measured by the difference between the scheduled and actual accomplishment of the Work by the Contractor as established from the work schedule. This is actually described as a percentage of the whole Works.

- 1.27 **Specifications** means the description of Works to be done and the qualities of materials to be used, the equipment to be installed and the mode of construction.
- 1.28 The **Start Date**, as specified in the **SCC**, is the date when the Contractor is obliged to commence execution of the Works. It does not necessarily coincide with any of the Site Possession Dates.
- 1.29 A **Subcontractor** is any person or organization to whom a part of the Works has been subcontracted by the Contractor, as allowed by the Procuring Entity, but not any assignee of such person.
- 1.30 **Temporary Works** are works designed, constructed, installed, and removed by the Contractor that are needed for construction or installation of the Permanent Works.
- 1.31 **Work(s)** refer to the Permanent Works and Temporary Works to be executed by the Contractor in accordance with this Contract, including (i) the furnishing of all labor, materials, equipment and others incidental, necessary or convenient to the complete execution of the Works; (ii) the passing of any tests before acceptance by the Procuring Entity's Representative; (iii) and the carrying out of all duties and obligations of the Contractor imposed by this Contract as described in the **SCC**.

## 2. Interpretation

- (i) In interpreting the Conditions of Contract, singular also means plural, male also means female or neuter, and the other way around. Headings have no significance. Words have their normal meaning under the language of this Contract unless specifically defined. The Procuring Entity's Representative will provide instructions clarifying queries about the Conditions of Contract.
- (ii) If sectional completion is specified in the **SCC**, references in the Conditions of Contract to the Works, the Completion Date, and the Intended Completion Date apply to any Section of the Works (other than references to the Completion Date and Intended Completion Date for the whole of the Works).
- (iii) The documents forming this Contract shall be interpreted in the following order of priority:
- a) Contract Agreement;
  - b) Bid Data Sheet;
  - c) Instructions to Bidders;
  - d) Addenda to the Bidding Documents;
  - e) Special Conditions of Contract;
  - f) General Conditions of Contract;

- g) Specifications;
- h) Bill of Quantities; and
- i) Drawings.

### **3. Governing Language and Law**

- (i) This Contract has been executed in the English language, which shall be the binding and controlling language for all matters relating to the meaning or interpretation of this Contract. All correspondence and other documents pertaining to this Contract which are exchanged by the parties shall be written in English.
- (ii) This Contract shall be interpreted in accordance with the laws of the Republic of the Philippines.

### **4. Communications**

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

### **5. Possession of Site**

- (i) On the date specified in the **SCC**, the Procuring Entity shall grant the Contractor possession of so much of the Site as may be required to enable it to proceed with the execution of the Works. If the Contractor suffers delay or incurs cost from failure on the part of the Procuring Entity to give possession in accordance with the terms of this clause, the Procuring Entity's Representative shall give the Contractor a Contract Time Extension and certify such sum as fair to cover the cost incurred, which sum shall be paid by Procuring Entity.
- (ii) If possession of a portion is not given by the date stated in the SCC Clause (i), the Procuring Entity will be deemed to have delayed the start of the relevant activities. The resulting adjustments in contract time to address such delay shall be in accordance with **GCC** Clause 47.
- (iii) The Contractor shall bear all costs and charges for special or temporary right-of-way required by it in connection with access to the Site. The Contractor shall also provide at his own cost any additional facilities outside the Site required by it for purposes of the Works.
- (iv) The Contractor shall allow the Procuring Entity's Representative and any person authorized by the Procuring Entity's Representative access to the Site and to any place where work in connection with this Contract is being carried out or is intended to be carried out.

### **6. The Contractor's Obligations**

- (i) The Contractor shall carry out the Works properly and in accordance with this Contract. The Contractor shall provide all supervision, labor, Materials, Plant and Contractor's Equipment, which may be required. All Materials and Plant on Site shall be deemed to be the property of the Procuring Entity.
- (ii) The Contractor shall commence execution of the Works on the Start Date and shall carry out the Works in accordance with the Program of Work submitted by the Contractor, as updated with the approval of the Procuring Entity's Representative, and complete them by the Intended Completion Date.
- (iii) The Contractor shall be responsible for the safety of all activities on the Site.
- (iv) The Contractor shall carry out all instructions of the Procuring Entity's Representative that comply with the applicable laws where the Site is located.
- (v) The Contractor shall employ the key personnel named in the Schedule of Key Personnel, as referred to in the **SCC**, to carry out the supervision of the Works. The Procuring Entity will approve any proposed replacement of key personnel only if their relevant qualifications and abilities are equal to or better than those of the personnel listed in the Schedule.
- (vi) If the Procuring Entity's Representative asks the Contractor to remove a member of the Contractor's staff or work force, for justifiable cause, the Contractor shall ensure that the person leaves the Site within seven (7) days and has no further connection with the Work in this Contract.
- (vii) During Contract implementation, the Contractor and his subcontractors shall abide at all times by all labor laws, including child labor related enactments, and other relevant rules.
- (viii) The Contractor shall submit to the Procuring Entity for consent the name and particulars of the person authorized to receive instructions on behalf of the Contractor.
- (ix) The Contractor shall cooperate and share the Site with other contractors, public authorities, utilities, and the Procuring Entity between the dates given in the schedule of other contractors particularly when they shall require access to the Site. The Contractor shall also provide facilities and services for them during this period. The Procuring Entity may modify the schedule of other contractors, and shall notify the Contractor of any such modification thereto.
- (x) Should anything of historical or other interest or of significant value be unexpectedly discovered on the Site, it shall be the property of the Procuring Entity. The Contractor shall notify the Procuring Entity's Representative of such discoveries and carry out the Procuring Entity's Representative's instructions in dealing with them.

## **7. Performance Security**

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



parties, the Contractor shall furnish the performance security in any of the forms prescribed in **ITB** Clause 32(ii).

- (ii) The performance security posted in favor of the Procuring Entity shall be forfeited in the event it is established that the Contractor is in default in any of its obligations under the Contract.
- (iii) The performance security shall remain valid until issuance by the Procuring Entity of the Certificate of Final Acceptance.
- (iv) The performance security may be released by the Procuring Entity and returned to the Contractor after the issuance of the Certificate of Final Acceptance subject to the following conditions:
  - (a) There are no pending claims against the Contractor or the surety company filed by the Procuring Entity;
  - (b) The Contractor has no pending claims for labor and materials filed against it; and
  - (c) Other terms specified in the **SCC**.
- (v) The Contractor shall post an additional performance security following the amount and form specified in **ITB** Clause 32(ii) to cover any cumulative increase of more than ten percent (10%) over the original value of the contract as a result of amendments to order or change orders, extra work orders and supplemental agreements, as the case may be. The Contractor shall cause the extension of the validity of the performance security to cover approved contract time extensions.
- (vi) In case of a reduction in the contract value or for partially completed Works under the contract which are usable and accepted by the Procuring Entity the use of which, in the judgment of the implementing agency or the Procuring Entity, will not affect the structural integrity of the entire project, the Procuring Entity shall allow a proportional reduction in the original performance security, provided that any such reduction is more than ten percent (10%) and that the aggregate of such reductions is not more than fifty percent (50%) of the original performance security.
- (vii) Unless otherwise indicated in the **SCC**, the Contractor, by entering into the Contract with the Procuring Entity, acknowledges the right of the Procuring Entity to institute action pursuant to Act 3688 against any subcontractor be they an individual, firm, partnership, corporation, or association supplying the Contractor with labor, materials and/or equipment for the performance of this Contract.

## **8. Subcontracting**

- (i) Unless otherwise indicated in the **SCC**, the Contractor cannot subcontract Works more than the percentage specified in **BDS** Clause (i).

- (ii) Subcontracting of any portion of the Works does not relieve the Contractor of any liability or obligation under this Contract. The Contractor will be responsible for the acts, defaults, and negligence of any subcontractor, its agents, servants or workmen as fully as if these were the Contractor's own acts, defaults, or negligence, or those of its agents, servants or workmen.
- (iii) If subcontracting is allowed. The contractor may identify its subcontractor during contract implementation stage. Subcontractors disclosed and identified during the bidding may be changed during the implementation of this Contract. In either case, subcontractors must submit the documentary requirements under ITB Clause 12 and comply with the eligibility criteria specified in the **BDS**. In the event that any subcontractor is found by any Procuring Entity to be eligible, the subcontracting of such portion of the Works shall be disallowed.

## **9. Liquidated Damages**

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

## **10. Site Investigation Reports**

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

## **11. The Procuring Entity, Licenses and Permits**

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

## **12. Contractor's Risk and Warranty Security**

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

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

- (ii) The defects liability period for infrastructure projects shall be one year from contract completion up to final acceptance by the Procuring Entity. During this period, the Contractor shall undertake the repair works, at his own expense, of any damage to the Works on account of the use of materials of inferior quality within ninety (90) days from the time the HoPE has issued an order to undertake repair. In case of failure or refusal to comply with this mandate, the Procuring Entity shall undertake such repair works and shall be entitled to full reimbursement of expenses incurred therein upon demand.
- (iii) Unless otherwise indicated in the SCC, in case the Contractor fails to comply with the preceding paragraph, the Procuring Entity shall forfeit its performance security, subject its property(ies) to attachment or garnishment proceedings, and perpetually disqualify it from participating in any public bidding. All payables of the GoP in his favor shall be offset to recover the costs.
- (iv) After final acceptance of the Works by the Procuring Entity, the Contractor shall be held responsible for “Structural Defects,” *i.e.*, major faults/flaws/deficiencies in one or more key structural elements of the project which may lead to structural failure of the completed elements or structure, or “Structural Failures,” *i.e.*, where one or more key structural elements in an infrastructure facility fails or collapses, thereby rendering the facility or part thereof incapable of withstanding the design loads, and/or endangering the safety of the users or the general public:
  - (a) Contractor – Where Structural Defects/Failures arise due to faults attributable to improper construction, use of inferior quality/substandard materials, and any violation of the contract plans and specifications, the contractor shall be held liable;
  - (b) Consultants – Where Structural Defects/Failures arise due to faulty and/or inadequate design and specifications as well as construction supervision, then the consultant who prepared the design or undertook construction supervision for the project shall be held liable;
  - (c) Procuring Entity’s Representatives/Project Manager/Construction Managers and Supervisors – The project owner’s representative(s), project manager, construction manager, and supervisor(s) shall be held liable in cases where the Structural Defects/Failures are due to his/their willful intervention in altering the designs and other specifications; negligence or omission in not approving or acting on proposed changes to noted defects or deficiencies in the design and/or specifications; and the use of substandard construction materials in the project;
  - (d) Third Parties - Third Parties shall be held liable in cases where Structural Defects/Failures are caused by work undertaken by them such as leaking pipes, diggings or excavations, underground cables and electrical wires, underground tunnel, mining shaft and the like, in

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

- (e) Users - In cases where Structural Defects/Failures are due to abuse/misuse by the end user of the constructed facility and/or non-compliance by a user with the technical design limits and/or intended purpose of the same, then the user concerned shall be held liable.
- (v) The warranty against Structural Defects/Failures, except those occasioned on force majeure, shall cover the period specified in the **SCC** reckoned from the date of issuance of the Certificate of Final Acceptance by the Procuring Entity.
- (vi) The Contractor shall be required to put up a warranty security in the form of cash, bank guarantee, letter of credit, GSIS or surety bond callable on demand, in accordance with the following schedule:

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

- (vii) The warranty security shall be stated in Philippine Pesos and shall remain effective for one year from the date of issuance of the Certificate of Final Acceptance by the Procuring Entity, and returned only after the lapse of said one year period.
- (viii) In case of structural defects/failure occurring during the applicable warranty period provided in **GCC** Clause (v), the Procuring Entity shall undertake the necessary restoration or reconstruction works and shall be entitled to full reimbursement by the parties found to be liable for expenses incurred therein upon demand, without prejudice to the filing of appropriate administrative, civil, and/or criminal charges against the responsible persons as well as the forfeiture of the warranty security posted in favor of the Procuring Entity.

### **13. Liability of the Contractor**

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

### **14. Procuring Entity's Risk**

- (i) From the Start Date until the Certificate of Final Acceptance has been issued, the following are risks of the Procuring Entity:
  - (a) The risk of personal injury, death, or loss of or damage to property (excluding the Works, Plant, Materials, and Equipment), which are due to:
    - (i) any type of use or occupation of the Site authorized by the Procuring Entity after the official acceptance of the works; or
    - (ii) negligence, breach of statutory duty, or interference with any legal right by the Procuring Entity or by any person employed by or contracted to him except the Contractor.
  - (b) The risk of damage to the Works, Plant, Materials, and Equipment to the extent that it is due to a fault of the Procuring Entity or in the Procuring Entity's design, or due to war or radioactive contamination directly affecting the country where the Works are to be executed.

### **15. Insurance**

- (i) The Contractor shall, under his name and at his own expense, obtain and maintain, for the duration of this Contract, the following insurance coverage:
  - (a) Contractor's All Risk Insurance;
  - (b) Transportation to the project Site of Equipment, Machinery, and Supplies owned by the Contractor;
  - (c) Personal injury or death of Contractor's employees; and
  - (d) Comprehensive insurance for third party liability to Contractor's direct or indirect act or omission causing damage to third persons.
- (ii) The Contractor shall provide evidence to the Procuring Entity's Representative that the insurances required under this Contract have been effected and shall, within a reasonable time, provide copies of the insurance policies to the Procuring Entity's Representative. Such evidence and such policies shall be provided to the Procuring Entity's through the Procuring Entity's Representative.
- (iii) The Contractor shall notify the insurers of changes in the nature, extent, or program for the execution of the Works and ensure the adequacy of the insurances at all times in accordance with the terms of this Contract and shall

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

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

- (iv) If the Contractor fails to obtain and keep in force the insurances referred to herein or any other insurance which he may be required to obtain under the terms of this Contract, the Procuring Entity may obtain and keep in force any such insurances and pay such premiums as may be necessary for the purpose. From time to time, the Procuring Entity may deduct the amount it shall pay for said premiums including twenty five percent (25%) therein from any monies due, or which may become due, to the Contractor, without prejudice to the Procuring Entity exercising its right to impose other sanctions against the Contractor pursuant to the provisions of this Contract.
- (v) In the event the Contractor fails to observe the above safeguards, the Procuring Entity may, at the Contractor's expense, take whatever measure is deemed necessary for its protection and that of the Contractor's personnel and third parties, and/or order the interruption of dangerous Works. In addition, the Procuring Entity may refuse to make the payments under GCC Clause 40 until the Contractor complies with this Clause.
- (vi) The Contractor shall immediately replace the insurance policy obtained as required in this Contract, without need of the Procuring Entity's demand, with a new policy issued by a new insurance company acceptable to the Procuring Entity for any of the following grounds:
  - (a) The issuer of the insurance policy to be replaced has:
    - (i) become bankrupt;
    - (ii) been placed under receivership or under a management committee;
    - (iii) been sued for suspension of payment; or
    - (iv) been suspended by the Insurance Commission and its license to engage in business or its authority to issue insurance policies cancelled; or
    - (v) Where reasonable grounds exist that the insurer may not be able, fully and promptly, to fulfill its obligation under the insurance policy.

## **16. Termination for Default of Contractor**

- (i) The Procuring Entity shall terminate this Contract for default when any of the following conditions attend its implementation:
  - (i) Due to the Contractor's fault and while the project is on-going, it has incurred negative slippage of fifteen percent (15%) or more in

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

- (ii) Due to its own fault and after this Contract time has expired, the Contractor incurs delay in the completion of the Work after this Contract has expired; or
- (iii) The Contractor:
  - (i) abandons the contract Works, refuses or fails to comply with a valid instruction of the Procuring Entity or fails to proceed expeditiously and without delay despite a written notice by the Procuring Entity;
  - (ii) does not actually have on the project Site the minimum essential equipment listed on the bid necessary to prosecute the Works in accordance with the approved Program of Work and equipment deployment schedule as required for the project;
  - (iii) does not execute the Works in accordance with this Contract or persistently or flagrantly neglects to carry out its obligations under this Contract;
  - (iv) neglects or refuses to remove materials or to perform a new Work that has been rejected as defective or unsuitable; or
  - (v) sub-lets any part of this Contract without approval by the Procuring Entity.
- (ii) All materials on the Site, Plant, Works, including Equipment purchased and funded under the Contract shall be deemed to be the property of the Procuring Entity if this Contract is rescinded because of the Contractor's default.

#### **17. Termination for Default of Procuring Entity**

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

- (a) Failure of the Procuring Entity to deliver, within a reasonable time, supplies, materials, right-of-way, or other items it is obligated to furnish under the terms of this Contract; or
- (b) The prosecution of the Work is disrupted by the adverse peace and order situation, as certified by the Armed Forces of the Philippines Provincial Commander and approved by the Secretary of National Defense.

#### **18. Termination for Other Causes**

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

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

- (ii) The Procuring Entity or the Contractor may terminate this Contract if the other party causes a fundamental breach of this Contract.
- (iii) Fundamental breaches of Contract shall include, but shall not be limited to, the following:
  - (a) The Contractor stops work for twenty eight (28) days when no stoppage of work is shown on the current Program of Work and the stoppage has not been authorized by the Procuring Entity's Representative;
  - (b) The Procuring Entity's Representative instructs the Contractor to delay the progress of the Works, and the instruction is not withdrawn within twenty eight (28) days;
  - (c) The Procuring Entity shall terminate this Contract if the Contractor is declared bankrupt or insolvent as determined with finality by a court of competent jurisdiction. In this event, termination will be without compensation to the Contractor, provided that such termination will not prejudice or affect any right of action or remedy which has accrued or will accrue thereafter to the Procuring Entity and/or the Contractor. In the case of the Contractor's insolvency, any Contractor's Equipment which the Procuring Entity instructs in the notice is to be used until the completion of the Works;
  - (d) A payment certified by the Procuring Entity's Representative is not paid by the Procuring Entity to the Contractor within eighty four (84) days from the date of the Procuring Entity's Representative's certificate;
  - (e) The Procuring Entity's Representative gives Notice that failure to correct a particular Defect is a fundamental breach of Contract and the Contractor fails to correct it within a reasonable period of time determined by the Procuring Entity's Representative;
  - (f) The Contractor does not maintain a Security, which is required;
  - (g) The Contractor has delayed the completion of the Works by the number of days for which the maximum amount of liquidated damages can be paid, as defined in the GCC Clause 9; and
  - (h) In case it is determined prima facie by the Procuring Entity that the Contractor has engaged, before or during the implementation of the contract, in unlawful deeds and behaviors relative to contract acquisition and implementation, such as, but not limited to, the following:



- (i) corrupt, fraudulent, collusive, coercive, and obstructive practices as defined in **ITB** Clause 3.1(a), unless otherwise specified in the SCC;
  - (ii) drawing up or using forged documents;
  - (iii) using adulterated materials, means or methods, or engaging in production contrary to rules of science or the trade; and
  - (iv) any other act analogous to the foregoing.
- (iv) The Funding Source or the Procuring Entity, as appropriate, will seek to impose the maximum civil, administrative and/or criminal penalties available under the applicable law on individuals and organizations deemed to be involved with corrupt, fraudulent, or coercive practices.
  - (v) When persons from either party to this Contract gives notice of a fundamental breach to the Procuring Entity's Representative in order to terminate the existing contract for a cause other than those listed under **GCC** Clause (iii), the Procuring Entity's Representative shall decide whether the breach is fundamental or not.
  - (vi) If this Contract is terminated, the Contractor shall stop work immediately, make the Site safe and secure, and leave the Site as soon as reasonably possible.

**19. Procedures for Termination of Contracts**

- (i) The following provisions shall govern the procedures for the termination of this Contract:
  - (a) Upon receipt of a written report of acts or causes which may constitute ground(s) for termination as aforementioned, or upon its own initiative, the Procuring Entity shall, within a period of seven (7) calendar days, verify the existence of such ground(s) and cause the execution of a Verified Report, with all relevant evidence attached;
  - (b) Upon recommendation by the Procuring Entity, the HoPE shall terminate this Contract only by a written notice to the Contractor conveying the termination of this Contract. The notice shall state:
    - (i) that this Contract is being terminated for any of the ground(s) afore-mentioned, and a statement of the acts that constitute the ground(s) constituting the same;
    - (ii) the extent of termination, whether in whole or in part;
    - (iii) an instruction to the Contractor to show cause as to why this Contract should not be terminated; and
    - (iv) special instructions of the Procuring Entity, if any.

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

- (c) Within a period of seven (7) calendar days from receipt of the Notice of Termination, the Contractor shall submit to the HoPE a verified position paper stating why the contract should not be terminated. If the Contractor fails to show cause after the lapse of the seven (7) day period, either by inaction or by default, the HoPE shall issue an order terminating the contract;
  - (d) The Procuring Entity may, at anytime before receipt of the Contractor's verified position paper described in item (c) above withdraw the Notice to Terminate if it is determined that certain items or works subject of the notice had been completed, delivered, or performed before the Contractor's receipt of the notice;
  - (e) Within a non-extendible period of ten (10) calendar days from receipt of the verified position paper, the HoPE shall decide whether or not to terminate this Contract. It shall serve a written notice to the Contractor of its decision and, unless otherwise provided in the said notice, this Contract is deemed terminated from receipt of the Contractor of the notice of decision. The termination shall only be based on the ground(s) stated in the Notice to Terminate; and
  - (f) The HoPE may create a Contract Termination Review Committee (CTRC) to assist him in the discharge of this function. All decisions recommended by the CTRC shall be subject to the approval of the HoPE.
- (ii) Pursuant to Section 69(f) of RA 9184 and without prejudice to the imposition of additional administrative sanctions as the internal rules of the agency may provide and/or further criminal prosecution as provided by applicable laws, the procuring entity shall impose on contractors after the termination of the contract the penalty of suspension for one (1) year for the first offense, suspension for two (2) years for the second offense from participating in the public bidding process, for violations committed during the contract implementation stage, which include but not limited to the following:
- (a) Failure of the contractor, due solely to his fault or negligence, to mobilize and start work or performance within the specified period in the Notice to Proceed ("NTP");
  - (b) Failure by the contractor to fully and faithfully comply with its contractual obligations without valid cause, or failure by the contractor to comply with any written lawful instruction of the procuring entity or its representative(s) pursuant to the implementation of the contract. For the procurement of infrastructure projects or consultancy contracts, lawful instructions include but are not limited to the following:
    - (i) Employment of competent technical personnel, competent engineers and/or work supervisors;

- (ii) Provision of warning signs and barricades in accordance with approved plans and specifications and contract provisions;
  - (iii) Stockpiling in proper places of all materials and removal from the project site of waste and excess materials, including broken pavement and excavated debris in accordance with approved plans and specifications and contract provisions;
  - (iv) Deployment of committed equipment, facilities, support staff and manpower; and
  - (v) Renewal of the effectivity dates of the performance security after its expiration during the course of contract implementation.
- (c) Assignment and subcontracting of the contract or any part thereof or substitution of key personnel named in the proposal without prior written approval by the procuring entity.
- (d) Poor performance by the contractor or unsatisfactory quality and/or progress of work arising from his fault or negligence as reflected in the Constructor's Performance Evaluation System ("CPES") rating sheet. In the absence of the CPES rating sheet, the existing performance monitoring system of the procuring entity shall be applied. Any of the following acts by the Contractor shall be construed as poor performance:
- (i) Negative slippage of 15% and above within the critical path of the project due entirely to the fault or negligence of the contractor; and
  - (ii) Quality of materials and workmanship not complying with the approved specifications arising from the contractor's fault or negligence.
- (e) Willful or deliberate abandonment or non-performance of the project or contract by the contractor resulting to substantial breach thereof without lawful and/or just cause.

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

## **20. Force Majeure, Release From Performance**

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

- (ii) If this Contract is discontinued by an outbreak of war or by any other event entirely outside the control of either the Procuring Entity or the Contractor, the Procuring Entity's Representative shall certify that this Contract has been discontinued. The Contractor shall make the Site safe and stop work as quickly as possible after receiving this certificate and shall be paid for all works carried out before receiving it and for any Work carried out afterwards to which a commitment was made.
- (iii) If the event continues for a period of eighty four (84) days, either party may then give notice of termination, which shall take effect twenty eight (28) days after the giving of the notice.
- (iv) After termination, the Contractor shall be entitled to payment of the unpaid balance of the value of the Works executed and of the materials and Plant reasonably delivered to the Site, adjusted by the following:
  - (a) any sum to which the Contractor is entitled under GCC Clause 28;
  - (b) the cost of his suspension and demobilization;
  - (c) any sum to which the Procuring Entity is entitled.
- (v) The net balance due shall be paid or repaid within a reasonable time period from the time of the notice of termination.

## **21. Resolution of Disputes**

- (i) If any dispute or difference of any kind whatsoever shall arise between the parties in connection with the implementation of the contract covered by the Act and this IRR, the parties shall make every effort to resolve amicably such dispute or difference by mutual consultation.
- (ii) If the Contractor believes that a decision taken by the Procuring Entity's Representative was either outside the authority given to the Procuring Entity's Representative by this Contract or that the decision was wrongly taken, the decision shall be referred to the Arbiter indicated in the SCC within fourteen (14) days of the notification of the Procuring Entity's Representative's decision.
- (iii) Any and all disputes arising from the implementation of this Contract covered by the R.A. 9184 and its IRR shall be submitted to arbitration in the Philippines according to the provisions of Republic Act No. 876, otherwise known as the "Arbitration Law" and Republic Act 9285, otherwise known as the "Alternative Dispute Resolution Act of 2004": *Provided, however, That*, disputes that are within the competence of the Construction Industry Arbitration Commission to resolve shall be referred thereto. The process of arbitration shall be incorporated as a provision in this Contract that will be executed pursuant to the provisions of the Act and its IRR: *Provided, further, That*, by mutual agreement, the parties may agree in writing to resort to other alternative modes of dispute resolution.

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

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

- (a) The Procuring Entity is obligated to notify the Contractor of such suspension within seven (7) days of having received the suspension notice.
- (b) If the Contractor has not received sums due it for work already done within forty five (45) days from the time the Contractor's claim for payment has been certified by the Procuring Entity's Representative, the Contractor may immediately issue a suspension of work notice in accordance with **GCC** Clause 45(ii).

**23. Procuring Entity's Representative's Decisions**

- (i) Except where otherwise specifically stated, the Procuring Entity's Representative will decide contractual matters between the Procuring Entity and the Contractor in the role representing the Procuring Entity.
- (ii) The Procuring Entity's Representative may delegate any of his duties and responsibilities to other people, except to the Arbiter, after notifying the Contractor, and may cancel any delegation after notifying the Contractor.

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

- (i) All Drawings prepared by the Contractor for the execution of the Temporary Works, are subject to prior approval by the Procuring Entity's Representative before its use.
- (ii) The Contractor shall be responsible for design of Temporary Works.
- (iii) The Procuring Entity's Representative's approval shall not alter the Contractor's responsibility for design of the Temporary Works.
- (iv) The Contractor shall obtain approval of third parties to the design of the Temporary Works, when required by the Procuring Entity.

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

- (i) When the Procuring Entity wants the Contractor to finish before the Intended Completion Date, the Procuring Entity's Representative will obtain priced proposals for achieving the necessary acceleration from the Contractor. If the Procuring Entity accepts these proposals, the Intended Completion Date will be adjusted accordingly and confirmed by both the Procuring Entity and the Contractor.
- (ii) If the Contractor's Financial Proposals for an acceleration are accepted by the Procuring Entity, they are incorporated in the Contract Price and treated as a Variation.

**26. Extension of the Intended Completion Date**

- (i) The Procuring Entity's Representative shall extend the Intended Completion Date if a Variation is issued which makes it impossible for the Intended Completion Date to be achieved by the Contractor without taking steps to accelerate the remaining work, which would cause the Contractor to incur additional costs. No payment shall be made for any event which may warrant the extension of the Intended Completion Date.
- (ii) The Procuring Entity's Representative shall decide whether and by how much to extend the Intended Completion Date within twenty one (21) days of the Contractor asking the Procuring Entity's Representative for a decision thereto after fully submitting all supporting information. If the Contractor has failed to give early warning of a delay or has failed to cooperate in dealing with a delay, the delay by this failure shall not be considered in assessing the new Intended Completion Date.

**27. Right to Vary**

- (i) The Procuring Entity's Representative with the prior approval of the Procuring Entity may instruct Variations, up to a maximum cumulative amount of ten percent (10%) of the original contract cost.
- (ii) Variations shall be valued as follows:
  - (a) At a lump sum price agreed between the parties;
  - (b) where appropriate, at rates in this Contract;
  - (c) in the absence of appropriate rates, the rates in this Contract shall be used as the basis for valuation; or failing which
  - (d) at appropriate new rates, equal to or lower than current industry rates and to be agreed upon by both parties and approved by the HoPE.

**28. Contractor's Right to Claim**

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

**29. Dayworks**

- (i) Subject to **GCC** Clause 43 on Variation Order, and if applicable as indicated in the **SCC**, the Dayworks rates in the Contractor's bid shall be used for small additional amounts of work only when the Procuring Entity's Representative has given written instructions in advance for additional work to be paid for in that way.
- (ii) All work to be paid for as Dayworks shall be recorded by the Contractor on forms approved by the Procuring Entity's Representative. Each completed

form shall be verified and signed by the Procuring Entity's Representative within two days of the work being done.

- (iii) The Contractor shall be paid for Dayworks subject to obtaining signed Dayworks forms.

### **30. Early Warning**

- (i) The Contractor shall warn the Procuring Entity's Representative at the earliest opportunity of specific likely future events or circumstances that may adversely affect the quality of the work, increase the Contract Price, or delay the execution of the Works. The Procuring Entity's Representative may require the Contractor to provide an estimate of the expected effect of the future event or circumstance on the Contract Price and Completion Date. The estimate shall be provided by the Contractor as soon as reasonably possible.
- (ii) The Contractor shall cooperate with the Procuring Entity's Representative in making and considering proposals for how the effect of such an event or circumstance can be avoided or reduced by anyone involved in the work and in carrying out any resulting instruction of the Procuring Entity's Representative.

### **31. Program of Work**

- (i) Within the time stated in the **SCC**, the Contractor shall submit to the Procuring Entity's Representative for approval a Program of Work showing the general methods, arrangements, order, and timing for all the activities in the Works.
- (ii) An update of the Program of Work shall show the actual progress achieved on each activity and the effect of the progress achieved on the timing of the remaining work, including any changes to the sequence of the activities.
- (iii) The Contractor shall submit to the Procuring Entity's Representative for approval an updated Program of Work at intervals no longer than the period stated in the **SCC**. If the Contractor does not submit an updated Program of Work within this period, the Procuring Entity's Representative may withhold the amount stated in the **SCC** from the next payment certificate and continue to withhold this amount until the next payment after the date on which the overdue Program of Work has been submitted.
- (iv) The Procuring Entity's Representative's approval of the Program of Work shall not alter the Contractor's obligations. The Contractor may revise the Program of Work and submit it to the Procuring Entity's Representative again at any time. A revised Program of Work shall show the effect of any approved Variations.
- (v) When the Program of Work is updated, the Contractor shall provide the Procuring Entity's Representative with an updated cash flow forecast. The cash flow forecast shall include different currencies, as defined in the Contract, converted as necessary using the Contract exchange rates.

- (vi) All Variations shall be included in updated Program of Work produced by the Contractor.

### **32. Management Conferences**

- (i) Either the Procuring Entity's Representative or the Contractor may require the other to attend a Management Conference. The Management Conference shall review the plans for remaining work and deal with matters raised in accordance with the early warning procedure.
- (ii) The Procuring Entity's Representative shall record the business of Management Conferences and provide copies of the record to those attending the Conference and to the Procuring Entity. The responsibility of the parties for actions to be taken shall be decided by the Procuring Entity's Representative either at the Management Conference or after the Management Conference and stated in writing to all who attended the Conference.

### **33. Bill of Quantities**

- (i) The Bill of Quantities shall contain items of work for the construction, installation, testing, and commissioning of work to be done by the Contractor.
- (ii) The Bill of Quantities is used to calculate the Contract Price. The Contractor is paid for the quantity of the work done at the rate in the Bill of Quantities for each item.
- (iii) If the final quantity of any work done differs from the quantity in the Bill of Quantities for the particular item and is not more than twenty five percent (25%) of the original quantity, provided the aggregate changes for all items do not exceed ten percent (10%) of the Contract price, the Procuring Entity's Representative shall make the necessary adjustments to allow for the changes subject to applicable laws, rules, and regulations.
- (iv) If requested by the Procuring Entity's Representative, the Contractor shall provide the Procuring Entity's Representative with a detailed cost breakdown of any rate in the Bill of Quantities.

### **34. Instructions, Inspections and Audits**

- (i) The Procuring Entity's personnel shall at all reasonable times during construction of the Work be entitled to examine, inspect, measure and test the materials and workmanship, and to check the progress of the construction.
- (ii) If the Procuring Entity's Representative instructs the Contractor to carry out a test not specified in the Specification to check whether any work has a defect and the test shows that it does, the Contractor shall pay for the test and any samples. If there is no defect, the test shall be a Compensation Event.
- (iii) The Contractor shall permit the Funding Source named in the SCC to inspect the Contractor's accounts and records relating to the performance of the Contractor and to have them audited by auditors appointed by the Funding Source, if so required by the Funding Source.



**35. Identifying Defects**

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

**36. Cost of Repairs**

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

**37. Correction of Defects**

- (i) The Procuring Entity's Representative shall give notice to the Contractor of any defects before the end of the Defects Liability Period, which is One (1) year from project completion up to final acceptance by the Procuring Entity's Representative.
- (ii) Every time notice of a defect is given, the Contractor shall correct the notified defect within the length of time specified in the Procuring Entity's Representative's notice.
- (iii) The Contractor shall correct the defects which he notices himself before the end of the Defects Liability Period.
- (iv) The Procuring Entity shall certify that all defects have been corrected. If the Procuring Entity considers that correction of a defect is not essential, he can request the Contractor to submit a quotation for the corresponding reduction in the Contract Price. If the Procuring Entity accepts the quotation, the corresponding change in the SCC is a Variation.

**38. Uncorrected Defects**

- (i) The Procuring Entity shall give the Contractor at least fourteen (14) days notice of his intention to use a third party to correct a Defect. If the Contractor does not correct the Defect himself within the period, the Procuring Entity may have the Defect corrected by the third party. The cost of the correction will be deducted from the Contract Price.
- (ii) The use of a third party to correct defects that are uncorrected by the Contractor will in no way relieve the Contractor of its liabilities and warranties under the Contract.

**39. Advance Payment**

- (i) The Procuring Entity shall, upon a written request of the contractor which shall be submitted as a contract document, make an advance payment to the contractor in an amount not exceeding fifteen percent (15%) of the total

contract price, to be made in lump sum or, at the most two, installments according to a schedule specified in the **SCC**.

- (ii) The advance payment shall be made only upon the submission to and acceptance by the Procuring Entity of an irrevocable standby letter of credit of equivalent value from a commercial bank, a bank guarantee or a surety bond callable upon demand, issued by a surety or insurance company duly licensed by the Insurance Commission and confirmed by the Procuring Entity.
- (iii) The advance payment shall be repaid by the Contractor by an amount equal to the percentage of the total contract price used for the advance payment.
- (iv) The contractor may reduce his standby letter of credit or guarantee instrument by the amounts refunded by the Monthly Certificates in the advance payment.
- (v) The Procuring Entity will provide an Advance Payment on the Contract Price as stipulated in the Conditions of Contract, subject to the maximum amount stated in **SCC** Clause (i).

#### **40. Progress Payments**

- (i) The Contractor may submit a request for payment for Work accomplished. Such request for payment shall be verified and certified by the Procuring Entity's Representative/Project Engineer. Except as otherwise stipulated in the **SCC**, materials and equipment delivered on the site but not completely put in place shall not be included for payment.
- (ii) The Procuring Entity shall deduct the following from the certified gross amounts to be paid to the contractor as progress payment:
  - (a) Cumulative value of the work previously certified and paid for.
  - (b) Portion of the advance payment to be recouped for the month.
  - (c) Retention money in accordance with the condition of contract.
  - (d) Amount to cover third party liabilities.
  - (e) Amount to cover uncorrected discovered defects in the works.
- (iii) Payments shall be adjusted by deducting therefrom the amounts for advance payments and retention. The Procuring Entity shall pay the Contractor the amounts certified by the Procuring Entity's Representative within twenty eight (28) days from the date each certificate was issued. No payment of interest for delayed payments and adjustments shall be made by the Procuring Entity.
- (iv) The first progress payment may be paid by the Procuring Entity to the Contractor provided that at least twenty percent (20%) of the work has been accomplished as certified by the Procuring Entity's Representative.

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

#### **41. Payment Certificates**

- (i) The Contractor shall submit to the Procuring Entity’s Representative monthly statements of the estimated value of the work executed less the cumulative amount certified previously.
- (ii) The Procuring Entity’s Representative shall check the Contractor’s monthly statement and certify the amount to be paid to the Contractor.
- (iii) The value of Work executed shall:
  - (a) be determined by the Procuring Entity’s Representative;
  - (b) comprise the value of the quantities of the items in the Bill of Quantities completed; and
  - (c) include the valuations of approved variations.
- (iv) The Procuring Entity’s Representative may exclude any item certified in a previous certificate or reduce the proportion of any item previously certified in any certificate in the light of later information.

#### **42. Retention**

- (i) The Procuring Entity shall retain from each payment due to the Contractor an amount equal to a percentage thereof using the rate as specified in GCC Sub-Clause (ii).
- (ii) Progress payments are subject to retention of ten percent (10%), referred to as the “retention money.” Such retention shall be based on the total amount due to the Contractor prior to any deduction and shall be retained from every progress payment until fifty percent (50%) of the value of Works, as determined by the Procuring Entity, are completed. If, after fifty percent (50%) completion, the Work is satisfactorily done and on schedule, no additional retention shall be made; otherwise, the ten percent (10%) retention shall again be imposed using the rate specified therefor.
- (iii) The total “retention money” shall be due for release upon final acceptance of the Works. The Contractor may, however, request the substitution of the retention money for each progress billing with irrevocable standby letters of credit from a commercial bank, bank guarantees or surety bonds callable on demand, of amounts equivalent to the retention money substituted for and acceptable to the Procuring Entity, provided that the project is on schedule and is satisfactorily undertaken. Otherwise, the ten (10%) percent retention shall be made. Said irrevocable standby letters of credit, bank guarantees and/or surety bonds, to be posted in favor of the Government shall be valid for a duration to be determined by the concerned implementing office/agency or Procuring Entity and will answer for the purpose for which the ten (10%)

percent retention is intended, *i.e.*, to cover uncorrected discovered defects and third party liabilities.

- (iv) On completion of the whole Works, the Contractor may substitute retention money with an “on demand” Bank guarantee in a form acceptable to the Procuring Entity.

#### **43. Variation Orders**

- (i) Variation Orders may be issued by the Procuring Entity to cover any increase/decrease in quantities, including the introduction of new work items that are not included in the original contract or reclassification of work items that are either due to change of plans, design or alignment to suit actual field conditions resulting in disparity between the preconstruction plans used for purposes of bidding and the “as staked plans” or construction drawings prepared after a joint survey by the Contractor and the Procuring Entity after award of the contract, provided that the cumulative amount of the Variation Order does not exceed ten percent (10%) of the original project cost. The addition/deletion of Works should be within the general scope of the project as bid and awarded. The scope of works shall not be reduced so as to accommodate a positive Variation Order. A Variation Order may either be in the form of a Change Order or Extra Work Order.
- (ii) A Change Order may be issued by the Procuring Entity to cover any increase/decrease in quantities of original Work items in the contract.
- (iii) An Extra Work Order may be issued by the Procuring Entity to cover the introduction of new work necessary for the completion, improvement or protection of the project which were not included as items of Work in the original contract, such as, where there are subsurface or latent physical conditions at the site differing materially from those indicated in the contract, or where there are duly unknown physical conditions at the site of an unusual nature differing materially from those ordinarily encountered and generally recognized as inherent in the Work or character provided for in the contract.
- (iv) Any cumulative Variation Order beyond ten percent (10%) shall be subject of another contract to be bid out if the works are separable from the original contract. In exceptional cases where it is urgently necessary to complete the original scope of work, the HoPE may authorize a positive Variation Order go beyond ten percent (10%) but not more than twenty percent (20%) of the original contract price, subject to the guidelines to be determined by the GPPB: *Provided, however,* That appropriate sanctions shall be imposed on the designer, consultant or official responsible for the original detailed engineering design which failed to consider the Variation Order beyond ten percent (10%).
- (v) In claiming for any Variation Order, the Contractor shall, within seven (7) calendar days after such work has been commenced or after the circumstances leading to such condition(s) leading to the extra cost, and within twenty-eight (28) calendar days deliver a written communication giving full and detailed particulars of any extra cost in order that it may be investigated at that time.

Failure to provide either of such notices in the time stipulated shall constitute a waiver by the contractor for any claim. The preparation and submission of Variation Orders are as follows:

- (a) If the Procuring Entity's representative/Project Engineer believes that a Change Order or Extra Work Order should be issued, he shall prepare the proposed Order accompanied with the notices submitted by the Contractor, the plans therefore, his computations as to the quantities of the additional works involved per item indicating the specific stations where such works are needed, the date of his inspections and investigations thereon, and the log book thereof, and a detailed estimate of the unit cost of such items of work, together with his justifications for the need of such Change Order or Extra Work Order, and shall submit the same to the HoPE for approval.
- (b) The HoPE or his duly authorized representative, upon receipt of the proposed Change Order or Extra Work Order shall immediately instruct the appropriate technical staff or office of the Procuring Entity to conduct an on-the-spot investigation to verify the need for the Work to be prosecuted and to review the proposed plan, and prices of the work involved.
- (c) The technical staff or appropriate office of the Procuring Entity shall submit a report of their findings and recommendations, together with the supporting documents, to the Head of Procuring Entity or his duly authorized representative for consideration.
- (d) The HoPE or his duly authorized representative, acting upon the recommendation of the technical staff or appropriate office, shall approve the Change Order or Extra Work Order after being satisfied that the same is justified, necessary, and in order.
- (e) The timeframe for the processing of Variation Orders from the preparation up to the approval by the Procuring Entity concerned shall not exceed thirty (30) calendar days.

#### **44. Contract Completion**

Once the project reaches an accomplishment of ninety five (95%) of the total contract amount, the Procuring Entity may create an inspectorate team to make preliminary inspection and submit a punch-list to the Contractor in preparation for the final turnover of the project. Said punch-list will contain, among others, the remaining Works, Work deficiencies for necessary corrections, and the specific duration/time to fully complete the project considering the approved remaining contract time. This, however, shall not preclude the claim of the Procuring Entity for liquidated damages.

#### **45. Suspension of Work**

- (i) The Procuring Entity shall have the authority to suspend the work wholly or partly by written order for such period as may be deemed necessary, due to *force majeure* or any fortuitous events or for failure on the part of the

Contractor to correct bad conditions which are unsafe for workers or for the general public, to carry out valid orders given by the Procuring Entity or to perform any provisions of the contract, or due to adjustment of plans to suit field conditions as found necessary during construction. The Contractor shall immediately comply with such order to suspend the work wholly or partly.

- (ii) The Contractor or its duly authorized representative shall have the right to suspend work operation on any or all projects/activities along the critical path of activities after fifteen (15) calendar days from date of receipt of written notice from the Contractor to the district engineer/regional director/consultant or equivalent official, as the case may be, due to the following:
  - (a) There exist right-of-way problems which prohibit the Contractor from performing work in accordance with the approved construction schedule.
  - (b) Requisite construction plans which must be owner-furnished are not issued to the contractor precluding any work called for by such plans.
  - (c) Peace and order conditions make it extremely dangerous, if not possible, to work. However, this condition must be certified in writing by the Philippine National Police (PNP) station which has responsibility over the affected area and confirmed by the Department of Interior and Local Government (DILG) Regional Director.
  - (d) There is failure on the part of the Procuring Entity to deliver government-furnished materials and equipment as stipulated in the contract.
  - (e) Delay in the payment of Contractor's claim for progress billing beyond forty-five (45) calendar days from the time the Contractor's claim has been certified to by the procuring entity's authorized representative that the documents are complete unless there are justifiable reasons thereof which shall be communicated in writing to the Contractor.
- (iii) In case of total suspension, or suspension of activities along the critical path, which is not due to any fault of the Contractor, the elapsed time between the effectivity of the order suspending operation and the order to resume work shall be allowed the Contractor by adjusting the contract time accordingly.

#### **46. Payment on Termination**

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

- (ii) If the Contract is terminated for the Procuring Entity's convenience or because of a fundamental breach of Contract by the Procuring Entity, the Procuring Entity's Representative shall issue a certificate for the value of the work done, Materials ordered, the reasonable cost of removal of Equipment, repatriation of the Contractor's personnel employed solely on the Works, and the Contractor's costs of protecting and securing the Works, and less advance payments received up to the date of the certificate.
- (iii) The net balance due shall be paid or repaid within twenty eight (28) days from the notice of termination.
- (iv) If the Contractor has terminated the Contract under GCC Clauses 17 or 18, the Procuring Entity shall promptly return the Performance Security to the Contractor.

#### **47. Extension of Contract Time**

- (i) Should the amount of additional work of any kind or other special circumstances of any kind whatsoever occur such as to fairly entitle the contractor to an extension of contract time, the Procuring Entity shall determine the amount of such extension; provided that the Procuring Entity is not bound to take into account any claim for an extension of time unless the Contractor has, prior to the expiration of the contract time and within thirty (30) calendar days after such work has been commenced or after the circumstances leading to such claim have arisen, delivered to the Procuring Entity notices in order that it could have investigated them at that time. Failure to provide such notice shall constitute a waiver by the Contractor of any claim. Upon receipt of full and detailed particulars, the Procuring Entity shall examine the facts and extent of the delay and shall extend the contract time completing the contract work when, in the Procuring Entity's opinion, the findings of facts justify an extension.
- (ii) No extension of contract time shall be granted the Contractor due to (a) ordinary unfavorable weather conditions and (b) inexcusable failure or negligence of Contractor to provide the required equipment, supplies or materials.
- (iii) Extension of contract time may be granted only when the affected activities fall within the critical path of the PERT/CPM network.
- (iv) No extension of contract time shall be granted when the reason given to support the request for extension was already considered in the determination of the original contract time during the conduct of detailed engineering and in the preparation of the contract documents as agreed upon by the parties before contract perfection.
- (v) Extension of contract time shall be granted for rainy/unworkable days considered unfavorable for the prosecution of the works at the site, based on the actual conditions obtained at the site, in excess of the number of rainy/unworkable days pre-determined by the Procuring Entity in relation to the original contract time during the conduct of detailed engineering and in the

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

**48. Price Adjustment**

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

**49. Completion**

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

**50. Taking Over**

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

**51. Operating and Maintenance Manuals**

- (i) If "as built" Drawings and/or operating and maintenance manuals are required, the Contractor shall supply them by the dates stated in the **SCC**.
- (ii) If the Contractor does not supply the Drawings and/or manuals by the dates stated in the **SCC**, or they do not receive the Procuring Entity's Representative's approval, the Procuring Entity's Representative shall withhold the amount stated in the **SCC** from payments due to the Contractor.



*Section V. Special Conditions of Contract*

### Special Conditions of Contract

GCC Clause																	
1.17	<p>The <b>Intended Completion Date</b> is <i>90 calendar days per floor based on start date to be defined after awarding as defined in GCC 1.28</i></p> <p><i>NOTE: The contract duration shall be reckoned from the start date and not from contract effectivity date.</i></p>																
1.22	The <b>Procuring Entity</b> is <i>Department of Finance (DOF).</i>																
1.23	The <b>Procuring Entity's Representative</b> is <b>Undersecretary Gil S. Beltran, Department of Finance Building, Roxas Boulevard, Malate, Manila</b>																
1.24	The <b>Site</b> is located at <i>the Department of Finance, BSP Complex, Roxas Boulevard, Malate Manila.</i>																
1.28	<p>The <b>Start Date</b> is <i>[Insert date].</i></p> <p><i>NOTE: The start date shall be the date of receipt of the Notice to Proceed.</i></p>																
1.31	<p>The <b>Works</b> consist of <b>Renovation of the Department of Finance Building Offices – Package 2</b> which includes Architectural, sanitary/plumbing, fire protection, mechanical and electrical works, as maybe applicable, for the following area/floors :</p> <ul style="list-style-type: none"> <li>m. Podium Level;</li> <li>n. Third Floor;</li> <li>o. Fourth Floor; and</li> <li>p. Fifth Floor</li> </ul>																
2(ii)	<i>No further instruction</i>																
5(i)	The <b>Procuring Entity</b> shall give possession of all parts of the Site to the Contractor <i>[insert date].</i>																
6(v)	<p>The Contractor shall employ the following <b>Key Personnel:</b></p> <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th style="text-align: center;">Position</th> <th style="text-align: center;">Experience</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">Project Manager</td> <td style="text-align: center;">10 years</td> </tr> <tr> <td style="text-align: center;">Project Engineers</td> <td style="text-align: center;">10 years</td> </tr> <tr> <td style="text-align: center;">Materials Engineers</td> <td style="text-align: center;">10years</td> </tr> <tr> <td style="text-align: center;">Safety Engineers</td> <td style="text-align: center;">10 years</td> </tr> <tr> <td style="text-align: center;">Foreman</td> <td style="text-align: center;">5 years</td> </tr> <tr> <td style="text-align: center;">Skilled workers</td> <td style="text-align: center;">5 years</td> </tr> <tr> <td style="text-align: center;">Helper</td> <td></td> </tr> </tbody> </table>	Position	Experience	Project Manager	10 years	Project Engineers	10 years	Materials Engineers	10years	Safety Engineers	10 years	Foreman	5 years	Skilled workers	5 years	Helper	
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Helper																	
7(iv)(c)	No further instructions.																
7(vii)	No further instructions.																

8(i)	<p>Subcontracting is allowed only for the specialty works such as: Sanitary/plumbing, fire protection, mechanical and electrical works</p> <p>Subcontractors must submit the documentary requirements under ITB Clause 12 and must have completed a single contract equivalent to at least fifty percent (50%) of the ABC of the particular project the subcontractor is going to participate into.</p>
10	The site investigation reports are given upon request by contractor for a walk through with the Procuring Entity's representative/s. The conduct of site survey and investigation will determine if there is a difference between the actual site conditions and the detail presented in the bid documents. The certificate of inspection shall be an integral part of the technical documents and part of the eligibility requirement.
12(iii)	No further instructions.
12(v)	In case of permanent structures, such as building of types 4 and 5 as classified under the National Building Code of the Philippines and other structures made of steel, iron or concrete which comply with relevant structural codes (e.g. DPWH Standard Specifications), such as, but not limited to, steel/concrete bridges, flyovers, aircraft movement areas, ports, dams, tunnel, filtration and treatment plants, sewerage systems, power plants, transmission and communication towers, railway system, and other similar permanent structures: Fifteen (15) years.
13	<i>if the Contractor is a joint venture, "All partners to the joint venture shall be jointly and severally liable."</i>
18.3(h)(i)	No further instructions.
21(ii)	The Arbiter is: <b><i>In case of a dispute between the procuring entity and the contractor, the dispute shall be resolved in accordance with Republic Act No. 9285 (Rev 9288) otherwise known as "Alternative Dispute Solution Act of 2004"</i></b>
29(i)	<i>Dayworks are applicable at the rate shown in the Contractor's original Bid.</i>
31(i)	<b>The Contractor shall submit to the Procuring Entity's Representative for approval a Program of Work showing the general methods, arrangements, orders, and timing for all the activities in the Works.</b>
31(iii)	<p>The period between Program of Work updates is 7 days.</p> <p>The amount to be withheld for late submission of an updated Program of Work is 5% of the contract price.</p>
34(iii)	The Funding Source is the <i>Government of the Philippines.</i>
39(i)	<i>The amount of the advance payment (mobilization fee) equivalent to not more than 10% shall be granted to the Contractor upon request.</i>
40(i)	<i>The first progress billing shall be allowed only after having 50% physical accomplishment of the project. Subsequent progress billing</i>

	<i>shall be after 75% and full accomplishment. Materials delivered but not installed shall not be allowed for billing.</i>
(i)	<i>The date by which operating and maintenance manuals are required is before the issuance of Certificate of Completion.</i>  <i>The date by which “as built” drawings are required is before the issuance of the certificate of completion.</i>
(ii)	<i>The amount to be withheld for failing to produce “as built” drawings and/or operating and maintenance manuals by the date required is 5% of the contract price.</i>

*Section VI. Specifications*

# TECHNICAL SPECIFICATION

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## **I. GENERAL REQUIREMENTS**

### **SECTION 1 : DEFINITION OF TERMS**

- 1.1 **CONTRACTOR** shall mean the person, company or firm whose proposal has been accepted by the Owner and includes is personally authorized representative, successors or permitted assignees. He is responsible to the Owner thru the Project Manager and Construction Manager.
- 1.2 **CONTRACT** shall mean the written agreement entered into by the Owner and the Contractor for the performance of work shown on the drawings and as described in the Specification, including the information for Bidders, the Proposal and all bid documents issued by the Owner prior to the opening of bids.
- 1.3 **SPECIFICATION** shall mean written or printed description of work to be done describing qualities of materials and mode of construction.
- 1.4 **DRAWINGS** shall mean the drawings issued together with the Specification to prospective bidders, showing the location, characteristics, extent, form and details of the work to be done under the Contract.
- 1.5 **APPROVED** means approval in writing including subsequent written information of previous verbal approval. "Approval" shall also mean the same thing abovementioned.

### **SECTION 2 : DRAWINGS AND SPECIFICATION**

- 2.1 It is the intent of the specification and drawings that all materials, labor, tools, equipment and plant and services, supervision, which are required to dully complete the work as shown and specified therein are to be done so by the Contractor.
- 2.2 The Drawings and Specification are meant to be complementary to each other and what is called for by one shall be called for by both.

Any apparent conflict between the Drawings and Specification and any controversial or unclear points in either shall in writing to Architect. Failure of the contractor to inform the architect within fifteen (15) calendar days after the award of contract, the final decision of the architect is executory for

implementation. The contractor shall report ring during construction. At the completion of the work, said copy of the plans shall be submitted to the owner for its copy and file.

### **SECTION 3 : REFERENCE LINES AND ELEVATION**

- 3.1 The Contractor shall establish stakes, marking lines and elevation required for construction work, referred from reference points and elevation pointed out by Engineer/Architect. The contractor shall be responsible for maintaining the correct alignment and position of these stakes as required by the Engineer throughout the life of the Contract. The Contractor shall use surveyor's transit in determining all control lines and elevation required for the construction work.

### **SECTION 4 : MATERIALS AND EQUIPMENT INCORPORATED IN THE WORK**

- 4.1 All materials and equipment to be incorporated in the work shall be new, of current manufacture and conforming to the requirements of the drawings and the specification. The Project Manager may require the contractor to its manufacturer of materials to make actual testing of samples prior to installation. For all approved materials, the contractor shall submit a warranty certificate to the owner during, on or before the turnover of the project.
- 4.2 Mere inspection, acceptance and certification for payment of any equipment or materials as part of the work which are found defective, non-complying after inspection does not release the contractor from the responsibility of replacing or repairing it at his own expense.

### **SECTION 5 : CONTRACTOR'S RESPONSIBILITY OF THE CONTRACT WORK**

- 5.1 The Contractor shall be responsible for the complete work or portion thereof until that it is wholly turned over and accepted by the Owner through the Project Manager or Construction Manager. He shall repair or restore and rebuild at his expense any damage thereto due to faults and action of elements, or other causes except damages due to enforceable or cataclysmic natural phenomena.
- 5.2 For accidents:
  - 5.2.1 The contractor shall bear all losses or damages from accidents, which may occur to a person or persons on account of the prosecutors of work until possession is taken over by the Owner.



- 5.2.2 The contractor shall hold himself of solely responsible for all liabilities under the existing compensation laws regarding injuries and/or death of workmen connected with this work.

## **SECTION 6 : LAWS, RULES AND REGULATION**

- 6.1 The Contractor shall comply with all national and local laws, rules and regulations regarding the health and safety of workmen, wages, labor codes, tax laws, buildings and construction rules and regulation and shall save the Owner, Architects, Engineers and The Project Manager or CM harmless in any third party claims and liabilities resulting from Contractor's noncompliance therewith.

## **SECTION 7: PERMITS AND LICENSES**

- 7.1 The Contractor at his expense shall obtain all necessary permits and licenses and charges, taxes, and fees for the lawful prosecution of the contract.

## **SECTION 8 : CONTRACT TIME**

- 8.1 The work to be done under this Contract shall consist of furnishing of all labor, materials (except those furnished by the Owner or by Others) equipment, supervision, facilities and performing all other related works necessary for the complete construction within the time specified in the Proposed Time Schedule attached in strict compliance with the contract drawings, specification and other related documents. The Bidders shall examine the site, drawings, specification schedules and all instruct. Failure to do so will be at the Bidder's that is aware of any concurs with all of the requirements or condition incorporated in the invitation to bid.

## **SECTION 9 : PROGRESS SCHEDULES**

- 9.1 The Contractor shall submit progress schedules showing the order of his proposed work sequences complete with the dates within which such work sequences will be started and completed. Such schedules shall be submitted within seven (7) calendar days after the receipt of Notice To Award/To Proceed and subject to the approval of the Construction Manager and Owner. The contractor shall also submit their S-curve, Critical Path Method (CPM), and Bar chart for the project. This should follow the prescribed form.

## **SECTION 10 :SANITARY PROVISION AND FIRE PROTECTION**

- 10.1 The Contractor's employees and men shall use designated comfort rooms outside the construction site and he shall be responsible for clean up of such comfort rooms upon leaving the place of work each day and after completion of the project.
- 10.2 The Contractor shall provide, as many portable fire extinguishers deemed necessary while performing the work.
- 10.3 The Contractor shall take extra care in the storage of flammable materials.
- 10.4 There shall be no smoking, cooking or eating allowed at the site premises during and after work. Eating, and smoking shall only be allowed at a designated area, and the contractor shall be responsible for proper clean up thereafter.

## **SECTION 11: AUTHORITY OF THE PROJECT MANAGER/ CONSTRUCTION MANAGER**

- 11.1 The Project Manager/Construction Manager shall decide on any and all quest, which may arise as to the quality and acceptability of materials furnished and work performed and as to the manner of performance and rate of progress of work, and shall decide on all , which may arise as to the acceptable fulfilment of the terms of the Contract.

## **SECTION 12 : ADJUSTMENTS OF DISPUTES**

- 12.1 Claims for adjustments of disputes must be made and submitted in writing by the Contractor within ten (10) days after the date of issue of the order dealing therewith and any disagreement with the interpretation of the plans and/or the Specification, made by the Engineer/Architect, must likewise be asserted and submitted in writing by the Contractor within ten (10) days from the date of such interpretation.

## **SECTION 13 : INSPECTION**

- 13.1 The Project Manager/Construction Manager shall be allowed access to all parts of the work at all times and shall be furnished such information and assistance by the contractor as may be required to make a complete and detailed inspection.

#### **SECTION 14 : REMOVAL OF DEFECTIVE AND UNAUTHORIZED WORK**

- 14.1 Any defective work whether the result of poor workmanship of defective materials, damages through carelessness, or of other cause, found to exist prior to acceptance of or final payment for the work, shall be removed immediately, replaced by work and materials conforming to the Specification, or shall be remedied otherwise in an acceptable manner.
- 14.2 Work done contrary to or regardless of the instruct of the Project Manager or C.M. work done beyond the lines shown on the plans or as given, except as therein provided, or extra work correction work done without authority will be considered as unauthorized and will not be paid for. All correction work of any description and removal and replacement of unsatisfactory materials shall be done at the contractor's expense.

#### **SECTION 15 : FINAL INSPECTION**

- 15.1 Upon due notice from the Contractor of presumptive completion of the entire project, the Project Manager or Construction Manager shall make a semi final inspection, and if all construction contemplated by the contract is found completed to his satisfaction, such inspection shall constitute final acceptance and the contractor shall be notified of such acceptance in writing ten (10) days or as soon as thereafter as practicable.
- 15.2 If, however, at any semi-final inspection, any work in whole or in part is found unsatisfactory, the Project Manager or Construction Manager shall give the contractor instruct which he shall forthwith comply with and execute. Another inspection shall be made which shall constitute the final inspection if the work has been found complete & satisfactorily implemented.

#### **SECTION 16 : SUPERINTENDENCE AND SUPERVISION**

- 16.1 The Contractor shall assign a competent Project Engineer and necessary assistants such as Architectural Draftsman, Engineers and Safety Engineer, satisfactory to the Construction Manager and Project Technical Group. The Superintendent shall represent the Contractor at his absence and all direct given to him by the construction shall be as binding as if given to the Contractor.

#### **SECTION 17 : AS-BUILT DRAWINGS**

- 17.1 The Contractor shall maintain at the jobsite two sets of full sized contract drawings showing any deviation which have been made from the contract drawings, including buried or concealed construction and utility features which are revealed during the course of construction special attention shall be given to recording the horizontal and vertical location of all buried utilities that differ from the contract drawings. These drawings shall be available for review by the Project Manager/Construction Manager (CM) at all times. Upon completion of the work the marked 5 sets of prints and one set of reproducible as-built drawings on Mylar or sepia prints shall be delivered to the Project Manager. Requests for partial payments will not be approved if the marked prints are delivered to the Project Manager/Construction Manager.

## **SECTION 18 : UAP DOCUMENT 301 / OTHER CONDITION**

- 18.1 All applicable articles and clauses of the general condition, which are not in conflict with the condition herein stated, shall form part of this document.
- 18.2 OTHER CONDITION
- 18.2.1 Coordinate with the Architect thru the construction manager for any discrepancies found in all drawings and specification before execution of work.
- 18.2.2 Coordinate with other trades to avoid conflict prior for final implementation of work.
- 18.2.3 Other materials not mentioned in all construction documents (drawings and specification) but are necessary for the proper completion of the work must be furnished and executed by the contractor without entailing any additional cost involved.
- 18.2.4 Verify actual condition and dimens in the field of work and fit detail accordingly. Submit shop drawings for Architects final approval prior for final execution and implementation of the work.

# **SAFETY, SANITATION AND SECURITY REQUIREMENTS**

## **SECTION 1 : CONTRACTOR'S ACCIDENT PREVENTION PLAN FORMAT**

1.1 The following guidance is provided for the preparation of contractor accident prevention plans. The accident prevention plan needs to address the following:

### **A. Administrative Section**

1. Administrative responsibilities for affecting the Accident Prevention Plan. (Identification and accountability of Contractor's Safety Engineer Responsible for accident prevention and enforcement of condition stipulated in this section).
2. Local requirements, if any, which must be complied with: i.e., noise control, traffic problems, etc.
3. Plans for layout of temporary construction buildings and facilities.
4. Plans for initial indoctrination, continued safety education, and training for the Contractor's employees.
5. Plans for traffic control and marking of hazards to cover haul roads, street intersect, utilities, restricted areas, etc.
6. Plans for maintaining continued job cleanup, safe access and egress.
7. Plans for fire protection and dealing with emergencies (ambulance service, fires, etc.).
8. Plans for inspection of the jobsite by competent persons including reports to be kept, results of the inspect, and corrective act taken.
9. Procedures to be used for accident investigation.
10. Details of fall protection systems
11. Procedure for security of site, personnel and materials.

### **B. Accident Reporting**

1. All accidents which occur shall be investigated and reported in accordance with requirements of agency having jurisdiction.

### **C. Prohibit**

1. Smoking shall not be allowed within work and storage premises.

2. Drinking of liquor of any kind shall not be allowed within the site.
3. Gambling of any type is strictly prohibited within the site.
4. Carrying of firearms, knives, blades, and other such instruments is strictly prohibited within the site.

## **SECTION 2 : SANITATION**

### 2.1 Water

1. Adequate supply of potable drinking water shall be supplied to workers.
2. Drinking water shall be dispensed by means which prevents contamination.

### 2.2 Toilets

1. Toilets shall be so construed that the occupants shall be protected against weather and falling objects.
2. Adequate ventilation and lighting shall be provided and all windows and vents screened.
3. Provision for routinely servicing and cleaning all toilets and disposing of the sewage shall be established before placing toilet facilities into operation. The method of sewage disposal and location selected shall be in accordance with local health regulation.

### 2.3 Washing Facilities

1. Washing facilities shall be provided to maintain healthful and sanitary condition.
2. Each washing facility shall be maintained in a sanitary condition.

### 2.4 Food Service

1. Mess facilities shall be operated and maintained in compliance with the health and sanitation authority.
2. An adequate number of sturdy waste receptacles shall be provided in the food service area. They shall be emptied at least daily and maintained in a sanitary condition. They shall be provided with solid tight fitting covers and plastic bag garbage liner.
3. All food service operation shall be carried out in a sanitary manner, kept uncontaminated throughout the storage, preparation, and serving process.

4. Workers shall not be allowed to eat within the project work area. Contractor shall provide a separate area for eating facilities.

#### 2.5 Mosquito and Pest Control

1. Regular mosquito fogging, fumigation and extermination of cockroaches, flies and rodents for workers sleeping quarters and work area shall be conducted once a month during the construction duration.

### **SECTION 3 : MEDICAL AND FIRST AID REQUIREMENTS**

#### 3.1 General

1. Prior to start of work, arrangements shall be made for medical facilities, ambulance service and medical personnel to be available for prompt attention to the injured and consultation on occupational health.
2. Communication and transportation to effectively care for injured workers shall be provided. A properly equipped emergency first aid unit shall be provided during work hours at site.
3. Identification and directional markers shall be provided to readily denote location of first aid stat.
4. When persons are expose to epoxy resins, hydrocarbons, solvents, cement, lime or other dermatitis- producing substances, ointment recommended by the manufacturer for the specific exposure shall be available.
5. First aid station shall be in accordance with the recommendation of a licensed physician.
6. The contents of first aid kits shall be checked by Contractor at least weekly when work is in progress to insure that expended items are replaced.
7. A qualified first aid attendant shall be on duty in the station at all hours when work is in progress.

### **SECTION 4 : PERSONAL PROTECTION APPAREL AND SAFETY EQUIPMENT**

#### 4.1 General

1. Personal protective devices shall be used as required.
2. Hard-hats and shoes shall be worn by all persons who are engaged in work.
3. Welding operation shall require goggles, face masks, shields, or helmets, suitable to the type of work.
4. Drop lines, lanyards and lifelines independently attached or attended, shall be used when performing such work on hazardous areas or other unguarded location.

5. Uniform: All works shall wear T-shirts, color coded and marked by company name per trade. All workers shall wear I.D.
6. Masks and suitable clothing shall be worn by persons, engaged in work using toxic or harmful substances or producing irritants such as dust or fumes. Gloves shall be provided to workers whose nature of work calls for such protection.

#### 4.2 Protective Headgear

- 1.1 All persons working on or visiting non-administrative activities (i.e., construction, operation, and maintenance) shall be provided with and required to wear protective headgear.

6.1.3 Flammable and combustible liquids in a storage building shall be in a NO SMOKING area and separated from combustible construction.

6.1.4 Unauthorized persons shall be prohibited from entering storage areas. All persons shall be in a safe position while materials are being loaded or unloaded.

6.1.5 Materials will not be moved over or suspended above personnel unless positive precaution have been taken to protect the personnel from falling objects.

6.1.6 Persons shall not work or pass under elevation work areas unless protected by overhead protection.

6.1.7 Where the movement of materials may be hazardous to persons, taglines or other devices shall be used to control the loads being handled by hoisting equipment. They shall be nonconductive when used near energized lines.

#### 6.2 Lumber

6.2.1 Lumber shall be stacked to be stable and self-supporting in dry areas.

6.2.2 Reusable lumber shall have all nails withdrawn before it is stacked for storage.

#### 6.3 Floor, Walls and Partition Blocks

6.3.1 Blocks shall be stacked in tiers on solid, level surfaces.

6.3.2 When masonry blocks are stacked higher than 6 feet, the stack shall be tapered back one-half block per tier above the 6-foot level.



- 6.4 Reinforcing, Sheet and Structural Steel
  - 6.4.1 Reinforcing steel shall be stored in orderly piles away from walkways and roadways.
  - 6.4.2 Structural steel shall be securely piled to prevent members sliding off or the pile toppling over.
  
- 6.5 Cylindrical Material
  - 6.5.1 Structural steel, poles, pipe, bar stock, and other cylindrical materials, unless racked shall be stacked and blocked so as to prevent spreading or tilting.
  
- 6.6 Sand, Gravel and Crush Stone Operation
  - 6.6.1 Standards for the safe sloping and control of pit walls shall be established and followed by the operation.
  - 6.6.2 Loose, unconsolidated material shall be stripped for a safety distance (at least 10 feet) from the top of pit or quarry walls, and shall be sloped to the angle of repose.
  - 6.6.3 Persons shall not work near or under dangerous banks. Overhanging banks shall be removed and unsafe ground condition shall be corrected, or the areas shall be barricaded and posted.
  - 6.6.4 Baffle boards, screens, cribbing, or other suitable barriers should be provided where movement of material into cuts constitutes a safety hazard.
  
- 6.7 Housekeeping
  - 6.7.1 All stairways, passageways, gangways, and accessways shall be kept free of materials, supplies and obstruct at all times.
  - 6.7.2 Loose or light material shall not be stored or left on floors that are not closed in, unless it is safely secured.
  - 6.7.3 Tools, materials, extension cords, hose, or debris shall not cause tripping or other hazard.

- 6.7.4 Tools, materials, and equipment subject to displacement or falling shall be adequately secured.
  - 6.7.5 Empty bags having contained lime, cement, and other dust-producing material shall be removed periodically as specified by the designated authority.
  - 6.7.6 Protruding nails in scrap boards, planks and timbers shall be removed, hammered in, or bent over flush with the wood unless placed in containers or trucks for removal.
  - 6.7.7 Walkways, runways and sideways shall be kept clear of excavation material or other obstruct and no sideways shall be undermined unless shored to carry a minimum live load of one hundred and twenty-five (125) pounds per square foot (610.3 kg/sm).
  - 6.7.8 Form and scrap lumber and debris shall be cleared from work areas, passageways and stairs in and around building storage yards and other structures.
  - 6.7.9 All storage and construction sites shall be kept free from the accumulation of combustible materials. Regular procedure shall be established for cleanup of the area as specified by the designated authority.
  - 6.7.10 Rubbish or combustible material shall be kept from areas where flammable and combustible liquids are stored, handled, or processed.
  - 6.7.11 Accumulation of flammable and combustible liquids on floors, walls, etc. is prohibited. All spills of flammable and combustible liquids shall be cleaned up immediately.
  - 6.7.12 Contractors shall provide sufficient personnel and equipment to insure compliance with all housekeeping requirements.
  - 6.7.13 Contractors will inspect the work area daily for adequate housekeeping and record unsatisfactory findings on the daily inspection report.
- 6.8 Waste Material Disposal
- 6.8.1 Scrap lumber shall be placed in piles or waste material and rubbish shall be placed in containers.

- 6.8.2 Chutes for debris shall be enclosed except for openings equipped with closures at or about floor level for the insertion of materials. Openings shall not exceed 48 inches (1.22m) in height measured along the wall of the chute. Openings at all stories below the top floor shall be kept closed when not in use.
- 6.8.3 Whenever materials are dropped to any point lying outside the exterior walls of the building, an enclosed chute shall be used.
- 6.8.4 When debris that cannot be handled by chutes is dropped, the area onto which the material is dropped shall be enclosed with barricades not less than 42 inches (1.07m) high and not less than 6 feet (1.83m) back from the projected edge of the opening above. Signs warning of the hazard of falling material shall be posted at each level.

## SECTION 7 : FIRE PREVENTION

- 7.1 Fire Protection
- 7.1.1 Recommendation of NFPA shall be complied within situation not covered in this Section. Where local building codes are established, the most stringent requirements shall apply.
- 7.1.2 Fires and open flame devices shall not be left unattended.
- 7.1.3 Smoking shall be prohibited in all areas where flammable combustible, or similar hazardous materials are stored, except in those location specifically designated by the authorities. NO SMOKING signs will be posted in all prohibited areas.
- 7.2 Flammable and Combustible Materials
- 7.2.1 All storage, handling, or use of flammable and combustible materials shall be under the supervision of qualified persons.
- 7.2.2 Electrical lighting shall be the only means used for artificial illumination in areas where flammable materials are present. All electrical equipment and installation shall

be in accordance with the National Electrical Code for hazardous location.

## SECTION 8 : FIRE PROTECTION

### 8.1 First Aid Fire Protection

8.1.1 Portable fire extinguishers shall be provided where needed and inspected and maintained in accordance with local Fire Department.

8.1.2 Fire extinguishers shall be suitably placed, distinctly marked, readily accessible, and maintained in a fully charged and operable condition. In accordance with National Fire Protection Association Standard No.10.

8.1.3 Fire barrels and buckets shall be painted red, marked "For Fire Only". Barrels shall be kept filled at all times.

### 8.2 Water Supply and Distribution

8.2.1 Water supply and distribution facilities for fire fighting shall be provided and maintained in accordance with recommendation of National Fire Protection Association.

8.2.2 Vehicles, equipment, materials, and supplies shall not be placed so that access to fire hydrants and other fire fighting equipment is obstructed.

### 8.3 Miscellaneous

8.3.1 When outside help is relied upon for fire protection, a written arrangement shall be made. Standpipe and hydrant connect must be compatible with the equipment of the local fire department.

8.3.2 Emergency Fire, Police and Hospital telephone numbers and reporting instruct shall be conspicuously posted.

## SECTION 9 : ROPES, SLINGS, CHAINS AND HOOKS

9.1 General

9.1.1 The use of ropes, slings, and chains shall be in accordance with the safe recommendation of their manufacturer and equipment manufacturer.

Rigging equipment shall not be loaded in excess of its recommended safe working load as prescribed in latest edition of ANSI B 30.9, Appendix C, and the table in 17.F.01.

9.1.2 All hooks used to support human loads or loads that pass over personnel shall be closed.

9.1.3 The use of open hooks is prohibited in rigging to lift any load where there is danger of relieving the tension on the hook due to the load or hook catching or fouling.

9.1.4 All equipment for material handling shall be inspected prior to use on each shift and as necessary during its use to insure that it is safe. Defective equipment shall be removed from service.

**SECTION 10 : MACHINERY AND MECHANIZED EQUIPMENT**

10.1 General

10.1.1 Contractor shall designate a competent person to be responsible for the inspection of all machinery and equipment daily and during use to make sure it is in safe operation condition. Tests shall be made at the beginning of each shift during which the equipment is to be used to determine that the brakes and operationsystems are in proper working condition.

10.1.2 Machinery or equipment shall not be operation in a manner that will endanger persons or property nor shall the safe operation speeds or loads be exceeded.

10.1.3 All mobile equipment and the area in which they are operational shall be adequately illuminated while work is in progress.

**SECTION 11 : RAMPS, RUNWAYS, PLATFORMS, SCAFFOLDS AND TOWERS**

11.1 General

- 11.1.1 Load-bearing structures shall be designed, constructed and maintained in accordance with safety standards and requirement specifically approved by the designated authority. If these structures, including such accessories as braces, brackets, trusses, screw legs and ladders, are damaged or weakened from any cause they shall be repaired or replaced immediately.
- 11.1.2 Planning shall be supported or braced to prevent excessive spring or deflection and secured and supported to prevent tipping or displacement.
- 11.1.3 Employees on ramps, scaffolds, roofs, floors, or other working surfaces from which they may fall 6 feet (1.8m) or more or working over dangerous operation shall be protected by guardrails with intermediate rail and toeboard, catch platforms, temporary floors, safety nets, safety belts, or equivalent.
- 11.1.4 Overhead protection shall be provided for area exposed to hazards from falling objects.

## 11.2 Standard Railing

- 11.2.1 A standard railing shall consist of top rail, intermediate rail, toeboard, and posts, and shall have a vertical height of approximately 42 inches (1.07m) from upper surface of top rail to floor, platform, runaway, or ramp level. The top rail shall be smooth-surfaced throughout the length of the railing. The intermediate rail shall be halfway between the top rail and the floor, platform, runaway, or ramp. The ends of the rails shall not overhang the terminal posts except where such overhang does not constitute a projection hazard.
- 11.2.2 Railings receiving heavy stresses from employees trucking or handling materials shall be provided additional strength by the use of heavier stock, closer spacing of posts, bracing, or by other means.
- 11.2.3 A stair railing shall be of construction similar to a standard guardrail but the vertical

height shall be not more than 34 inches (86.36 cm) nor less than 30 inches (76.2 cm) from upper surface of top rail to surface of tread in line with face of riser at forward edge of tread.

## **SECTION 12 :EXCAVATION**

### 12.1 General

12.1.1 The sides of all excavation in which employees are exposed to danger from moving ground shall be guarded by a shoring system, sloping of ground, or other equivalent means. All slopes except for solid rock, hard shale, or cemented sand and gravel shall be excavated to at least the angle of repose. The angle of repose shall be flattened when an excavation has water condition, silty materials, loose boulders, and areas where erosion and slide planes appear.

12.1.2 Diversion ditches, dikes, polyethylene sheets, or other means shall be used to prevent surface water entering an excavation and to provide drainage of the area adjacent to the excavation.

12.1.3 Boulders, stumps, or other materials that may slide or roll into the excavation shall be removed or made safe.

12.1.4 Guardrails, fences, or barricades and warning lights or other illumination maintained from sunset to sunup shall be placed at all excavation which are adjacent to paths, walkways, sidewalks, driveways, and other pedestrian or vehicle thoroughfares.

12.1.5 Walkways or bridges with guardrails shall be provided where people or equipment are required or permitted to cross over excavation.

## **SECTION 13 : WORK IN CONFINED SPACES**

### 13.1 General

13.1.1 Prior to entry into confined or enclosed spaces, a positive procedure to or control the hazards shall be established.

13.1.2 Enclosed spaces shall include water tanks, pits, vaults, shafts, or other confined spaces, or any place with limited ventilation.

- 13.1.3 Hazards considered shall include toxic material and vapors, flammable materials and vapors, asphyxiation, and lack of oxygen.
- 13.1.4 Mechanical exhaust ventilation sufficient to maintain a healthy working atmosphere shall be provided.
- 13.1.5 Persons working in confined or enclosed spaces shall have a safety harness and life line with an attendant if the atmosphere has oxygen deficiency or contamination sufficient to require respiratory protection. The attendant shall be assigned no other duties. A signal system shall be established.

## SECTION 14 : FLOOR AND WALL OPENINGS

### 14.1 General

- 14.1.1 All floor and roof holes, such as elevation or pits, sump pits, shafts, stairs, ramps another opening into which persons can accidentally fall shall be guarded by a securely anchored railing with intermediate rail, and toeboard.



## **TEMPORARY FACILITIES**

### **SECTION 1 : GENERAL**

#### 1.1 Summary

1.1.1 This Section specifies requirements for temporary services and facilities, including utilities, construction and support facilities, security and protection.

1.1.2 Temporary utilities required include but are not limited to:

1. Water service and distribution.
2. Temporary electric power and light.

1.1.3 Temporary construction and support facilities required include but are not limited to:

1. Field offices and storage sheds.
2. Temporary roads and paving.
3. Sanitary facilities, including drinking water.
4. Dewatering facilities and drains.
5. Temporary enclosures.
6. Hoists and temporary elevation or use
7. Temporary Project identification signs and bulletin boards.
8. Waste disposal services.
9. Rodent and pest control.
10. Construction aids and miscellaneous services and facilities.

1.1.4 Security and protection facilities required include but are not limited to:

1. Temporary fire protection.
2. Barricades, warning signs, lights.
3. Sidewalk bridge or enclosure fence for the site.
4. Environmental protection.

## 1.2 Submittals

1.2.1 Temporary Utilities: Submit a schedule indicating implementation and termination of each temporary utility within 15 days of the date established for commencement of the work.

## 1.3 Quality Assurance

1.3.1 Regulation: Comply with industry standards and applicable laws and regulation if authorities having jurisdiction, including but not limited to:

1. Building Code requirements.
2. Health and safety regulation.
3. Utility company regulation.
4. Police, Fire Department and Rescue Squad rules.
5. Environmental protection regulation.

1.3.2 Standards: Comply with NFPA Code 241, "Building Construction and Demolition Operation," ANSI-A10 Series standards for "Safety Requirements for Construction and Demolition," and NECA Electrical Design Library "Temporary Electrical Facilities."

1. Refer to "Guidelines for Bid Condition for "Temporary Job Utilities and Services," prepared jointly by AGC and ASC, for industry recommendation.

1.3.3 Electrical Services: Comply with NEMA, NECA and UL standards and regulation for temporary electric service. Install service in compliance with National Electric Code (NFPA 70).

1.3.4 Inspect : Arrange for authorities having jurisdiction to inspect and test temporary utility before use. Obtain required certificate and permits.

## 1.4 Project Condition

1.4.1 Temporary Utilities: Prepare a schedule indicating dates for implementation and termination of each temporary utility. At the earliest feasible time, when acceptable to the Owner, change over from use of temporary service to use of the permanent service.

1.4.2 Condition of Use: Keep temporary services and facilities clean and neat in appearance. Operation in a safe and efficient manner. Take necessary fire prevention measures. Do not overload facilities, or permit them to interfere with progress. Do not allow hazardous dangerous or unsanitary condition, or public nuisances to develop or persist on the site.

## SECTION 2 : PRODUCTS

### 2.1 Materials

- 2.1.1 General: Provide new materials; if acceptable to the Architect, undamaged previously used materials in serviceable condition may be used. Provide materials suitable for the use intended.
- 2.1.2 Lumber and Plywood: Comply with requirements as per manufacturer's standards.
- 2.1.3 Roofing Materials: Provide pre-formed metal roofing on roofs of job built temporary offices, shops and sheds, as approved by the Project Manager.
- 2.1.4 Paint: Comply with requirements based on manufacturer's standards.
1. For job-built temporary offices, shops, sheds, fences and other exposed lumber and plywood, provide exterior grade acrylic-latex emulsion over exterior primer.
  2. For sign panels and applying graphics, provide exterior grade alkyd gloss enamel over exterior primer.
  3. For interior walls of temporary offices, provide two coats interior latex flat wall paint.
- 2.1.5 Tarpaulins: Provide waterproof, Fire-resistant, UL labeled tarpaulins with flame-spread rating of 15 or less. For temporary enclosures provide translucent nylon reinforced laminated polyethylene or polyvinyl chloride fire retarding tarpaulins.
- 2.1.6 Water: Provide potable water approved by local health authorities.
- 2.1.7 Open-Mesh Fencing : Provide 11-gauge, galvanized 50mm, chain link fabric fencing 1800 mm high with galvanized barbed wire top strand and galvanized steel pipe posts, 38mm I.D. for line posts and 64mm I.D. for corner posts, when required by the Project Manager.

### 2.2 EQUIPMENT

- 2.2.1 General: Provide new equipment; if acceptable to the Architect, undamaged previously used equipment in serviceable condition may be used. Provide equipment suitable for use intended.
- 2.2.2 Water Hoses: Provide 200mm heavy-duty, abrasion-resistant, flexible rubber hoses 30000 mm long, with pressure rating greater than the maximum pressure of the water distribution system; provide adjustable shut-off nozzles at hose discharge.
- 2.2.3 Electrical Outlets: Provide properly configured NEMA polarized outlets to prevent insertion of 110-120 volt plugs into higher voltage outlets. Provide receptacle outlets equipped with ground-fault circuit interrupters, reset button and pilot light, for connection of power tools and equipment.

- 2.2.4 Electrical Power Cords: Provide grounded extension cords; use "hard-service" cords where exposed to abrasion and traffic. Provide waterproof connectors to connect separate lengths of electric cords, if single lengths will not reach areas where construction activities are in progress
- 2.2.5 Lamps and Light Fixtures: Provide general service incandescent lamps of wattage required for adequate illumination. Provide guard cages or tempered glass enclosures, where exposed to breakage. Provide exterior fixtures where exposed to moisture.
- 2.2.6 Temporary Offices: Provide prefabricated or mobile units or similar job-built construction with lockable entrances, operable windows and serviceable finishes. Provide heated and air-conditioned units on foundation adequate for normal loading.
- 2.2.7 Temporary Toilet Units: Provide self-contained single-occupant toilet units of the chemical, aerated recirculation, or combustion type, properly vented and fully enclosed with a glass fiber reinforced polyester shell or similar non-absorbent material.
- 2.2.8 First aid Supplies : Comply with governing regulation.
- 2.2.9 Fire Extinguishers: Provide hand-carried, portable UL-rated, class "A" fire extinguishers for temporary offices and similar spaces. In other locations provide hand-carried, portable, UL-rated, class "ABC dry chemical extinguishers or a combination of extinguishers of NFPA recommended classes for the exposures.
- 2.2.10 Comply with NFPA 10 and 241 for classification, extinguishing agent and size required by location and class of fire exposure.

### **SECTION 3 : EXECUTION**

#### 3.1 Installation

- 3.1.1 Use qualified personnel for installation of temporary facilities. Location facilities where they will serve the Project adequately and result in minimum interference with performance of the Work. Relocation and modify facilities as required.
- 3.1.2 Provide each facility ready for use when needed to avoid delay. Maintain and modify as required. Do not remove until facilities are no longer needed, or are replaced by authorized use of completed permanent facilities.

#### 3.2 Temporary Utility Installation

- 3.2.1 General : Engage the appropriate local utility company to install temporary service or connect to existing service. Where the company provides only part of the service, provide the remainder with matching, compatible materials and equipment; comply with the company's recommendation.
  - 1. Arrange with the company and existing users for a time when service can be interrupted, where necessary, to make connect for temporary services. Provide adequate capacity at each stage of construct. Prior to temporary utility availability, provide trucked-in services.

2. Obtain easements to bring temporary utilities to the site, where the Owner's easements cannot be used for that purpose.
  3. Use Charges: Cost or use charges for temporary facilities are not chargeable to the Owner or Architect, and will not be accepted as a basis of claims for a change order.
- 3.2.2 Water Service: Install water service and distribution piping of sizes and pressures adequate for construct until permanent water service is use.
1. Sterilization : Sterilize temporary water piping prior to use.
- 3.2.3 Temporary Electric Power Services: Provide weather-proof, grounded electric power service and distribution system of sufficient size, capacity, and power characteristics during construction period. Include meters, transformers, overload protected disconnects, automatic ground-fault interrupters and main switch gear.
1. Except where overhead service must be used, install electric power service underground.
  2. Power Distribution System: Install wiring overhead, and rise vertically where least exposed to damage. Where permitted, wiring circuits not exceeding 125 Volts, AC 20 ampere rating, and lighting circuits may be nonmetallic sheathed cable where overhead and exposed for surveillance.
- 3.2.4 Temporary Lighting : Whenever overhead floor or roof deck has been installed, provide temporary lighting with local switching.
1. Install and operation temporary lighting that will fulfill security and protection requirements, without operating the entire system, and will provide adequate illumination for construction operation and traffic.
- 3.2.5 Sewers and Drainage: If sewers are available, provide temporary connect to remove effluent that can be discharged lawfully. If sewers are not available or cannot be used, provide drainage ditches, dry wells, stabilization ponds and similar facilities. If neither sewers nor drainage facilities can be lawfully used for discharge of effluent, provide containers to remove and dispose of effluent off the site in a lawful manner.
1. Filter out excessive amounts of soil, construction debris, chemicals, oils and similar contaminants that might clog sewers or pollute waterways discharge.
  2. Connect temporary sewers to the municipal system as directed by the sewer department officials.
  3. Maintain temporary sewers and drainage facilities in a clean, sanitary condition. Following heavy use, restore normal condition promptly.
- 3.2.6 Provide earthen embankments and similar barriers in and around excavation and subgrade construction, sufficient to prevent flooding by runoff of stormwater from heavy rains.

### 3.3 Temporary Construction and Support Facilities Installation

3.3.1 Location field offices, storage sheds, sanitary facilities and other temporary construction and support facilities for easy access.

1. Maintain temporary construction and support facilities until near Substantial Completion. Remove prior to Substantial Completion. Personnel remaining after Substantial Completion will be permitted to use permanent facilities under condition acceptable to the Owner.

3.3.2 Provide incombustible construction for offices, shops and sheds location within the construction area, or within 30 feet of building lines. Comply with requirements of NFPA 241.

3.3.3 Field Offices : Provide weathertight temporary offices of sufficient size to accommodate required office personnel at the Project site. Keep the office clean and orderly for use for small progress meetings. Furnish and equip offices as follows:

1. Furnish with a desk and chairs, a 4-drawer file cabinet, plan table and plan rack and a 6-shelf bookcase.
2. Equip with a water cooler and private toilet complete with water closet, lavatory and mirror-medicine cabinet unit.

3.3.4 Storage and Fabrication Sheds: Install storage and fabrication sheds, sized, furnished and equipped to accommodate materials and equipment involved including temporary utility service. Sheds may be open shelters or fully enclosed spaces within the building or elsewhere on the site.

3.3.5 Temporary Paving: Construct and maintain temporary roads and paving to adequately support the indicated loading and to withstand exposure to traffic during the construction period. Location temporary paving for roads, storage areas and parking where the same permanent facilities will be location. Review proposed modification to permanent paving with the Architect.

1. Paving: Comply with manufacturer's standards.
2. Coordinate temporary paving development with subgrade grading compaction, installation and stabilization of subbase, and installation of base and finish courses of permanent paving.
3. Install temporary paving to minimize the need to rework the installation and to result in permanent roads and paved areas that are without damage or deterioration when occupied by the Owner.
4. Delay installation of the final course of permanent asphalt concrete paving until immediately before Substantial Completion. Coordinate with weather condition to avoid unsatisfactory results.

5. Extend temporary paving in and around the construction area as necessary to accommodate delivery and storage of materials, equipment usage, administration and supervision.

3.3.6 Sanitary Facilities include temporary toilets, wash facilities and drinking water fixtures. Comply with regulation and health codes for the type, number, location operation and maintenance of fixtures and facilities. Install where facilities will best service the Project's needs.

1. Provide toilet tissue, paper towels, paper cups and similar disposable materials for each facility. Provide covered waste containers for used material.
2. Toilets: Install self-contained toilet units. Shield toilets to ensure privacy. Use of pit-type privies will not be permitted.

3.3.7 Wash-Facilities: Install wash facilities supplied with potable water at convenient location for personnel involved in handling materials that require wash-up for a healthy and sanitary condition. Dispose of drainage properly. Supply cleaning compounds appropriate for each condition.

1. Provide safety shower, eye-wash fountains and similar facilities for convenience, safety and sanitary of personnel.

3.3.8 Drinking Water Fixtures: Provide drinking water fountains where indicated, including paper supply.

3.3.9 Drinking Water Facilities: Provide containerized tap-dispenser bottled-water type drinking water units, including paper supply.

1. Where power is accessible, provide electric water coolers to maintain dispensed water temperature at 45 to 55 deg F (7 to 13 deg C).

3.3.10 Dewatering Facilities and Drains: For temporary drainage and dewatering facilities and operation not directly associated with construction activities dewatering requirements of applicable Division-2 Sect. Where feasible, utilize the same facilities. Maintain the site, excavation and construction free of water.

3.3.11 Temporary Enclosures: Provide temporary enclosure for protection of construction in progress and completed, from exposure, foul weather, other construction operation and similar activities.

1. Where heat is needed and the permanent building enclosure is not complete, provide temporary enclosures where there is no other provision for containment of heat. Coordinate enclosure with ventilating and material drying or curing requirements to avoid dangerous condition and effects.

2. Install tarpaulins securely, with incombustible wood framing and other materials. Close openings of 200 square meters or less with plywood or similar materials.
3. Close openings through floor or roof decks and horizontal surfaces with load-bearing wood-framed construction.
4. Where temporary wood or plywood enclosure exceeds 9.00 square meters in area, use UL-labeled fire-retardant treated material for framing and main sheathing.

3.3.12 Temporary Lifts and Hoists: Provide facilities for hoisting materials and employees. Truck cranes and similar devices used for hoisting materials are considered "tools and equipment" and not temporary facilities.

3.3.13 Project Identification & Temporary Signs : Prepare project identification and other signs of the size indicated; install signs where indicated to inform the public and persons seeking entrance to the project. Support on posts or framing of preservative treated wood or steel. Do not permit installation of unauthorized signs.

1. Project Identification Signs: Engage an experienced sign painter to apply graphics. Comply with details indicated.
2. Temporary Signs: Prepare signs to provide directional information to construction personnel and visitors.

3.3.14 Temporary Exterior Lighting: Install exterior yard and sign lights so that signs are visible when work is being performed.

3.3.15 Collection & Disposal of Waste: Collect waste from construction areas and elsewhere daily. Comply with requirements of NFPA 241 for removal of combustible waste material and debris. Enforce requirements strictly. Do not hold materials more than 7 days requirements strictly. Do not hold materials more than 7 days during normal weather or 3 days when the temperature is expected to rise above 80 deg F (27 deg C). Handle hazardous, dangerous, or unsanitary waste materials separately from other waste by containerizing properly. Dispose of material in a lawful manner.

3.3.16 Rodent & Pest Control: Before deep foundation work has been completed, retain a local exterminator or pest control company to recommend practice to minimize attraction and harboring of rodents, roaches and other pests. Employ this service to perform extermination and control procedures at regular intervals so the Project will be relatively free of pests and their residues at Substantial Completion. Perform control operation in a lawful manner using environmentally safe materials.



3.3.17 Stairs: Until permanent stairs are available, provide temporary stairs where ladders are not adequate. Cover finished permanent stairs with a protective covering of plywood or similar material so finishes will be undamaged at the time of acceptance.

#### 3.4 Security and Protection Facilities Installation

3.4.1 Except for use of permanent fire protection as soon as available, do not change over from use of temporary security and protection facilities to permanent facilities until substantial completion, or longer as requested by the Architect.

3.4.2 Temporary Fire Protection: Until fire protection needs are supplied by permanent facilities, install and maintain temporary fire protection facilities of the types needed to protect against reasonably predictable and controllable fire losses. Comply with NFPA 10 "Standard for Portable Fire Extinguishers" and NFPA 241 "Standard for Safeguarding Construction, Alterat and Demolition Operation".

1. Location fire extinguishers where convenient and effective for their intended purpose, but not less than one extinguisher on each floor at or near each usable stairwell.
2. Store combustible materials in containers in fire-safe location.
3. Maintain unobstructed access to fire extinguishers, fire hydrants, temporary fire protection facilities, stairways and other access routes for fighting fires. Prohibit smoking in hazardous fire exposure areas.
4. Provide supervision of welding operation, combustion type temporary heating units, and similar sources of fire ignition.

3.4.3 Permanent Fire Protection: At the earliest feasible date in each area of the project, complete installation of the permanent fire protection facility, including connected services, and place into operation and use. Instruct key personnel on use of facilities.

3.4.4 Barricades, Warning Signs & Lights: Comply with standards and code requirements for erection of structurally adequate barricades. Paint with appropriate colors, graphics and warning signs to inform personnel and the public of the hazard being protected against. Where appropriate and needed provide lighting, including flashing red or amber lights.

3.4.5 Enclosure Fence: When excavation begins, install an enclosure fence with lockable entrance gates. Location where indicated, or enclose the entire site or the portion determined sufficient to accommodate construction operation. Install in a manner that will prevent people, dogs and other animals from easily entering the site, except by the entrance gates.

3.4.6 Covered Walkway : Erect a structurally adequate protective covered walkway for a passage of persons along the adjacent public street. Coordinate with entrance gates, other facilities and obstruct. Comply with regulation of authorities having jurisdiction.

1. Construct using scaffold or shoring framing, waterproofed wood plank overhead decking, protective plywood enclosure walls, handrails, barricades, warning signs, lights, safe and well drained walkways and similar provision for protection and safe passage. Extend the backwall beyond the structure to complete the enclosure fence. Paint and maintain in a manner acceptable to the Owner and Architect.

3.4.7 Security Enclosure & Lock-up: Install substantial temporary enclosure of partially completed areas of construction.

Provide locking entrances to prevent unauthorized entrance, vandalism, theft and similar violation of security.

1. Storage: Where materials and equipment must be stored, and are of value or attractive for theft, provide a secure lock-up. Enforce discipline in connection with the installation and release of material to minimize the opportunity for theft and vandalism.

3.4.8 Environmental Protection: Provide protection, operation temporary facilities and conduct construction in ways and by methods that comply with environmental regulation, and minimize the possibility that air, waterways and subsoil might be contaminated or diluted, or that other undesirable effects might result. Avoid use of tools and equipment which produce harmful noise. Restrict use of noise making tools and equipment to hours that will minimize complaints from persons or firms near the site.

### 3.5 Operation, Termination and Removal

3.5.1 Supervision: Enforce strict discipline in use of temporary facilities. Limit availability of temporary facilities to essential and intended uses to minimize waste and abuse.

3.5.2 Maintenance: Maintain facilities in good operation incondition until removal. Protect from damage by elements.

1. Maintain operation of temporary enclosures, heating, cooling, humidity control, ventilation and similar facilities on a 24 hour day basis where required to achieve indicated results and to avoid possibility of damage.
2. Protection: freezing. Maintain markers for underground lines. Protect from damage during excavationoperation.

3.5.3 Termination & Removal: Unless the Architect requests that it be maintained longer, remove each temporary facility when the need has ended, or when replaced by authorized use of a permanent facility, or no later than substantial completion. Complete or, if necessary, restore permanent construction that may have been delayed because of interference with the temporary facility. Repair damaged work, clean exposed surfaces and replace construction that cannot be satisfactorily repaired.

1. Materials and facilities that constitute temporary facilities are property of the Contractor. The Owner reserves the right to take possession of Project identification signs.
2. Remove temporary paving that is not intended for or acceptable for integration into permanent paving. Where the area is intended for landscape development remove soil and aggregate fill that does not comply with requirements for fill or subsoil in the areas. Remove materials contaminated with road oil, asphalt and other petrochemical compounds, and other substances which might impair growth of plant materials or lawns. Repair or replace street paving, curbs and sidewalks at the temporary entrances, as required by the governing authority.
3. At Substantial Completion, clean and renovate permanent facilities that have been used during the construction period, including but not limited to :
  - a. Replace air filters and clean inside of ductwork and housings.
  - b. Replace significantly worn parts and parts that have been subject to unusual operationing condition.

- c. Replace lamps that are burned out noticeably dimmed by substantial hours of use.

## **FINAL CLEANING**

### **SECTION 1 : GENERAL**

#### 1.1 Summary

1.1.1 This Section specifies administrative and procedural requirements for final cleaning at Substantial Completion.

1.2 Environmental Requirements: Conduct cleaning and waste disposal operation in compliance with local laws and ordinances. Comply fully with federal and local environmental and anti-pollution regulation.

- 1. Do not dispose of volatile wastes such as mineral spirits, oil or paint thinner in storm or sanitary drains.
- 2. Burning or burying of debris, rubbish or other waste material on the premises will not be permitted.

### **SECTION 2 : PRODUCTS**

2.1 Cleaning Agents: Use cleaning materials and agents recommended by the manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property, or that might damage finished surfaces.

### **SECTION 3: EXECUTION**

#### 3.1 Progress Cleaning

3.1.1 Retain all stored items in an orderly arrangement allowing maximum access, not impeding drainage or traffic, and providing the required protection of materials.

3.1.2 Do not allow the accumulation of scrap, debris, waste materials and other items not required for construction of this work.

- 3.1.3 At least twice each week, and more often if necessary, completely removes all scrap, debris, waste material from the jobsite.
- 3.1.4 Provide adequate storage for all items awaiting removal from the jobsite, observing all requirements for fire protection and protection of the ecology.
- 3.1.5 Weekly, and more if necessary, inspect all arrangement of materials stored on the site; restack, tidy, or otherwise service all arrangements to meet the requirements of subparagraph "1" above.
- 3.1.6 Weekly, and more often if necessary, sweep all areas clean, "Clean" for the purpose of this subparagraph, shall be interpreted as meaning free from dust and other material capable of being removed by use of reasonable effort and handheld broom.
- 3.1.7 As required preparatory to installation of succeeding materials, clean the structures or pertinent part thereof to the degree of cleanliness recommended by the manufacturer of the succeeding material, using all equipment and materials required to achieve the required cleanliness.
- 3.1.8 Following the installation of finish floor materials, clean the finish floor daily (and more often if necessary) at all times while work is being performed in the space in which finish materials have been installed. "Clean", for the purpose of this subparagraph, shall be interpreted as meaning free from all foreign material which, in the opinion of the Project Manager, may be injurious to the finish floor material.

### 3.2 Final Cleaning

- 3.2.1 General: Provide final cleaning operation when indicated. Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit of work to the condition expected from a commercial building cleaning and maintenance program. Comply with manufacturer's instruction.
  - 1. Comply the following cleaning operation before requesting inspection for Certification of Substantial Completion for the entire project or a portion of the project.
- 3.2.2 Complete the following cleaning operation before requesting inspection for Certification of Substantial Completion

for the entire project or a portion of the project.

1. Clean the Project site, yard and grounds, in areas disturbed by construction activities, including landscape development areas, of rubbish, waste materials, litter and foreign substances. Sweep paved areas broom clean. Remove petro-chemical spills, stains and other foreign deposits. Rake grounds that are neither planted nor paved, to a smooth even-textured surface.
2. Clean exposed exterior and interior hard-surfaced finishes to a dirt-free condition, free of stains, films and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition.
3. Remove debris and surface dust from limited access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics and similar spaces.
4. Broom clean concrete floors in unoccupied spaces.
5. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compounds and other substances that are noticeable vision-obscuring materials. Replace chipped or broken glass and other damaged transparent materials. Polish mirrors and glass, taking care not to scratch surfaces.
6. Remove labels that are not permanent labels.  
Touch-up and otherwise repair and restore marred exposed finishes and surfaces. Replace finishes and surfaces that can not be satisfactorily repaired or restored, or that shown evidence of repair or restoration.  
Do not paint over "UL" and similar labels, including mechanical and electrical name plates.
8. Wipe surfaces of mechanical and electrical equipment, elevation or equipment and similar equipment. Remove excess lubrication, paint and mortar droppings and other foreign substances.
9. Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.
10. Clean light fixtures, lamps, globes and reflectors to function with full efficiency. Replace burned out

bulbs, and defective and noisy starters in  
fluorescent and mercury vapor fixtures.

11. Leave the Project clean and ready for occupancy.

3.2.3 Pest Control: Engage an experienced licensed exterminator to make a final inspection, and rid the Project of rodents, insects, and other pests. Comply with regulation of local authorities.

3.2.4 Removal of Protection: Remove temporary protection and facilities installed during construction to protect previously completed installation during the remainder of the construction period.

3.2.5 Compliance: Comply with governing regulation and safety standards for cleaning operation. Remove waste materials from the site and dispose of in a lawful manner.

1. Where extra materials of value remain after completion of associated construction have become the Owner's property, dispose of these materials as directed.
2. Except as otherwise specifically provided, "clean", for the purpose of this Article, shall be interpreted as meaning the level of cleanliness generally provided by skilled cleaners using commercial quality building maintenance equipment and materials.

### 3.3 Cleaning During Owner's Occupancy

3.3.1 Should the Owner requires occupancy of the work or any portion thereof prior to its completion by the Contractor and acceptance by the Owner, responsibilities for interim and final cleaning of the occupied spaces shall be as determined by the Project Manager in accordance with the General Condition of the Contract.

## **ARCHITECTURAL WORKS TECHNICAL SPECIFICATION**

### **SECTION 1 : WALL WORKS**

- 1.1 Contractor to construct drywall partition using 12mm thick fiber cement board on both faces with 0.6mm thick x 100mm x 50mm metal studs on 100mm x 50mm x 0.6mm thick metal tracks. Metal stud framing shall be 400mm on center both ways (horizontal and vertical framing). Contractor to consider necessary consumables and accessories required for drywall construction.
- 1.2 Contractor to construct drywall partition using 12mm thick fiber cement board on both faces with 0.6mm thick x 100mm x 50mm metal studs on 100mm x 50mm x 0.6mm thick metal tracks; and 100mm thick blanket type sound insulation material (submit sample for approval). Metal stud framing shall be 400mm on center both ways (horizontal and vertical framing). Contractor to consider necessary consumables and accessories required for drywall construction. Contractor to verify plan for reference.
- 1.3 Contractor to use 150mm and 100mm thick concrete hollow blocks with cement plaster on both sides. Contractor to provide reinforcement deformed steel bar for Concrete Hollow Blocks (CHB) standard installation. For further reference, see structural plan and specification.
- 1.4 The contractor to construct walls subject for water utility lines embedding using 100mm thick and 150mm thk concrete hollow blocks with cement plaster on both sides. Contractor to provide reinforcement deformed steel bar for Concrete Hollow Blocks (CHB) standard installation. For further reference, see structural plan and specification.
- 1.5 The contractor to supply, deliver and install 100mm height x 25mm wood grained wood-plastic composite wood with 45 degrees chamfered edge, following manufacturer's standard for installation. Submit sample section for approval.
- 1.6 The contractor to supply and install 10mm thick x 600mm x 600mm glazed porcelain wall tiles for all existing toilets. Contractor to retain existing tile finish on walls and apply heavy duty tile adhesive and install new glazed porcelain tiles. New wall tiles shall be installed as per manufacturer's standard. Contractor to submit sample for approval. Contractor to apply non-fading, crack-free, antibacterial tile grout.



- 1.7 Decorative cladding. Supply, delivery and installation of natural wood veneer cladding and laminated cladding with 12mm thk machine-pressed natural wood veneer cladding on 12mm x 50mm wood spacers, with 25mm x 25mm aluminum corner guard and aluminum strip at 2100mm high from floor finish at elevation or lobby.
- 1.8 Supply, delivery and installation of 0.125mm thick x 25mm x 25mm anodized aluminum corner guard for natural wood veneer cladding and laminated cladding. Contractor to verify plans and submit sample for approval.
- 1.9 Exterior glass wall decorative accent band. Supply, delivery and installation of 4mm thick Aluminum non-combustible composite panel with 0.5mm thick aluminum cover sheet on both sides and 3mm thick non-combustible mineral filled core; complete with required framing, fasteners and accessories as per manufacturer's standard. Contractor to submit sample for approval.
- 1.10 Façade perimeter cladding. Supply, delivery and installation of 4mm thick Aluminum non-combustible composite panel with 0.5mm thick aluminum cover sheet on both sides and 3mm thick non-combustible mineral filled core; complete with required framing, fasteners and accessories as per manufacturer's standard. Contractor to submit sample for approval.

## **SECTION 2 : WALL FINISHES**

- 2.1 For all existing interior walls and column surfaces: contractor shall clean and plaster all damaged surfaces when necessary using skimcoat, following the manufacturer's standard, prior to application of one (1) coat flat latex paint primer and two (2) coats semi-gloss latex paint. Contractor to submit paint swatches for approval.
- 2.2 New CHB cement plastered walls painting. Contractor to apply skimcoat plaster on both sides and provide necessary preparation prior to final painting as per painting manufacturer's standards; apply one (1) coat acrylic latex flat paint primer and apply two (2) coats acrylic latex semi-gloss top coat paint. Contractor to submit sample swatches for approval.
- 2.3 Existing walls subject for repainting at ground floor parking area. Contractor to shall clean and plaster all damaged surfaces when necessary using skimcoat, following the manufacturer's standard, prior to application of 3 (three) coats self-priming flexible elastomeric paint coating. Contractor to submit sample swatches for approval.

- 2.4 New toilet wall tiles. Contractor to supply, deliver and install 10mm x 600mm x 600mm glazed porcelain tiles using heavy duty tile adhesive and with tile grout. Contractor to submit tile samples and tile grout swatches for approval.
- 2.5 Contractor to supply, deliver and install 6mm thick x 300mm x 300mm glazed white ceramic tiles using heavy duty tile adhesive and with tile grout for kitchen areas. Contractor to submit tile samples and tile grout swatches for approval.
- 2.6 New CHB wall painting finishes at ground floor parking area. Contractor to apply skimcoat plastering at all surfaces and sand as per required by the manufacturer's standard. Contractor to apply 3 (three) coats self-priming flexible elastomeric paint coating. Contractor to submit sample swatches for approval.
- 2.7 Fiber cement board drywall drop wall painting. Contractor to apply gauze at all joints, putty and sand to cover connect and surface imperfect prior to final application of one (1) coat acrylic latex flat paint primer and apply two (2) coats acrylic latex semi-gloss top coat paint with as per painting manufacturer's specification. Contractor to submit sample swatches for approval.
- 2.9 Wallpaper finish at Roofdeck Hallway. Contractor to supply, deliver and install vinyl fabric-backed contact wallpaper with 15oz. PLY, meets and exceeds federal specification CCC-W-408A physical characteristics for type II wall covering. Contractor to install the vinyl fabric-backed wallpaper on 6mm thick marine plywood backing installed to existing concrete wall complete with nailers and screws. Contractor to verify plans for location and submit samples for approval.
- 2.10 Contractor to retain, repair and crystallize existing marble wall finishes in elevation or lobby, verify plans for actual location. Contractor to submit methodology for review and approval prior to crystallization works.
- 2.11 Structural Steel framing painting works. Contractor to apply one (1) coat epoxy paint primer and two (2) coats epoxy top coat as per painting manufacturer's standard specification. Contractor to submit swatches for approval.

- 2.12 All exposed tubular steel structural members shall be enamel baked painted finish as per painting standards. Contractor to submit sample swatches for approval.
- 2.13 Driveway curb. Contractor to paint concrete curb with traffic paint (black and yellow) using epoxy paint as per manufacturer's standard.

### **SECTION 3 : FLOOR FINISHES**

- 3.1 Contractor to clean and plaster all damaged surfaces when necessary using skimcoat, following the manufacturer's standard, prior to application one coat, high quality, two-component, epoxy-polyamide system that has exceptional adhesion and high alkali-resistance epoxy primer; and two-component, water based acrylic epoxy top coat paint that has superior solvent, chemical and stain resistance. Contractor to follow manufacturer's standard regarding surface preparation and application and submit paint swatches for approval.
- 3.2 For areas with new epoxy painted cement floor finish, The contractor to provide a smooth concrete topping, apply two (2) coats epoxy sealer and two (2) coats high solid, heavy duty epoxy floor coating.
- 3.3 Contractor to retain, repair and crystallize existing marble floor finishes. Contractor to submit methodology for review and approval prior to crystallization works.
- 3.4 Office areas shall be 7mm thick x 500mm x 500mm integrated tufted pattern loop solution dyed 100% synthetic fiber with 4.0mm pile height. Primary carpet tile backing shall be polyester spunbonded and secondary backing shall be condensed vinyl with fiberglass reinforcement. Contractor to submit sample for approval.
- 3.5 Vinyl tiles shall be 300mm x 300mm x 3mm thick homogenous and resilient type. Contractor to apply self-levelling cement topping at areas subject for vinyl tiles installation as per manufacturer's standard specification. Verify architectural plans for actual location and submit sample for approval.

- 3.6 Contractor to supply, deliver and install 600mm x 600mm x 12mm non-skid, outdoor granite tiles with heavy-duty tile adhesive and tile grout between joints. Verify architectural plans for actual location and submit sample for approval.
- 3.7 Contractor to supply, deliver and install 600mm x 600mm x 12mm non-skid, indoor granite tiles, with heavy-duty tile adhesive and tile grout between joints. Verify architectural plans for actual location and submit sample for approval.
- 3.8 Contractor to supply, deliver and install 300mm x 300mm x 12mm non-skid outdoor granite tiles for pedestrian entry stairs, using heavy-duty tile adhesive and apply tile grout at joints. Contractor to verify plans and submit samples for approval.
- 3.9 Contractor to supply, deliver and install 50mm x 50mm brass stair nosing with rubber strip for pedestrian entry stairs. Contractor to submit sample section for approval.
- 3.10 Contractor to supply, deliver and install 100mm x 100mm x 14mm thick non-skid, homogenous and non-vitreous paver tiles for driveway ramp and executive parking area. Contractor to verify plan and submit samples for approval.
- 3.11 Contractor to supply, deliver and construct pigmented stamped concrete walkways as per manufacturer's standard. Contractor to verify plan and submit proposals for approval.
- 3.12 Contractor to construct 100mm x 200mm reinforced concrete curb along driveway ramp, to be painted with traffic (black and yellow) epoxy paint, following as per manufacturer's standard. Contractor to verify plans and submit shop drawing for approval.
- 3.13 Contractor to refurbish, repair cracked surfaces when necessary and clean existing epoxy floor finishes and podium parking finishes with pressurized water as per plan
- 3.14 Contractor to supply, deliver and install 10mm x 600mm x 600mm non-skid, non-vitreous porcelain tiles for toilet flooring. Contractor to use tile adhesive and apply tile grout at joints, submit tile sample and tile grout swatches for approval.

- 3.15 Contractor to supply, deliver and install prefabricated steel grating for trench drain cover at parking entry ramp. Contractor to fabricate and paint steel grating prior to delivery and installation on site. Contractor to apply epoxy primer and top coat based on manufacturer's standard.
- 3.16 Contractor to construct 75mm thk concrete slab topping with 50mm x 50mm welded wire mesh prior to pouring of concrete. Contractor to verify architectural plans and submit shop drawing for approval.
- 3.17 The contractor to supply, deliver and install aluminum 100mm wide door threshold at all doors with different floor elevation from entry point and interior area. Submit sample section and finishes for approval.
- 3.18 Kitchen floor finishes. Contractor to supply, deliver and install 100mm x 100mm x 14mm thick non-skid, homogenous and non-vitreous tiles. Contractor to verify plan and submit samples for approval.
- 3.19 Existing pebble washout finish at fire exit stairs for cleaning and repair of cracked surfaces and shall be painted with clear acrylic emulsion top coat.

#### **SECTION 4 : CEILING FINISHES**

- 4.1 General ceiling works. Ceiling shall be 12mm thick gypsum board on 0.40mm thick x 19mm x 50mm furring channel spaced every 400mm on center both ways and 0.80mm thick x 12mm x 38mm carrying channel spaced every 1200mm on-center both ways; connected to concrete slab. Contractor use steel angle, no.8 hanger rod, suspension clip and rod joiner system spaced every 600mm on center. Gypsum board surface shall be applied with gauze and to be applied with gypsum putty to cover screws and joints, following manufacturer's standards prior to application of one (1) coat acrylic latex flat p'primer and two (2) coats acrylic latex flat top coat paint as per painting manufacturer's standards. Contractor to submit sample swatches for approval.
- 4.2 For all toilet ceiling works. Ceiling shall be 12mm thick moisture resistant gypsum board on 0.40mm thick x 19mm x 50mm furring channel spaced every 400mm on-center with 0.80mm thick x 12mm x 38mm carrying channel spaced every 1200mm on-center both ways; connected to concrete slab. Contractor use steel angle, no.8 hanger rod, suspension clip and rod joiner system spaced every 600mm on center. Gypsum board surface shall be applied with gauze and to be applied with gypsum putty to cover screws and joints, following manufacturer's

standards prior to application of one (1) coat acrylic latex flat paint primer and two (2) coats acrylic latex flat top coat paint as per painting manufacturer's standards. Contractor to submit sample swatches for approval.

- 4.3 Kitchen and dining area ceiling. Supply, delivery and installation of 12mm thick x 600mm x 600mm acoustic mineral fiber ceiling board complete with powder coated aluminum tee and cross tee runner, and necessary hangers and accessories as per manufacturer's standards. Contractor to submit samples for approval.
- 4.4 Existing bottom of slab subject for repainting. Contractor to clean and plaster all damaged surfaces when necessary using skimcoat, following the manufacturer's standard, prior to application of 3 (three) coats self-priming flexible elastomeric paint coating. Contractor to submit sample swatches for approval.
- 4.5 Contractor to supply, deliver and install 50mm x 50mm W section bended steel sheet for 50mm x 50mm shadow gap between walls and ceiling as shown in the plan. Contractor to secure ceiling using black screws and apply gypsum putty to correct surface and connect as per manufacturer's standards. Shadow gap shall be painted using dark paint as per paint manufacturer's standards.
- 4.6 Podium walkway overhang ceiling. Contractor to supply, deliver and install corrosion resistant aluminum substrate ceiling with 300mm width, class A fire rated as per ASTM E84; complete with necessary hangers, accessories and clips as per manufacturer's standard. Contractor to submit sample for approval.

## SECTION 5 : INDOOR LIGHTING FIXTURES

- 5.1 Contractor to supply, deliver and install 18 watts daylight recessed type LED in 210mm diameter aluminum casing with glass frame down light fixture as per plan. Contractor to submit sample for approval.
- 5.2 Surface mounted LED light fixture. Supply, delivery and installation of 5.7W LED daylight bulb with E27 lamp base with 100mm diameter round aluminum surface mounted down light fixture with glass cover and E27 socket.
- 5.3 Contractor to supply, deliver and install 6 watts warm white recessed type LED in 110mm diameter aluminum casing with glass frame down light fixture as per plan. Contractor to submit sample for approval.
- 5.4 Contractor to supply, deliver and install 600mm x 600mm x 12mmH 39W daylight slim type LED panel ceiling light fixture with aluminum housing, 100-240Vac Input and 26-30Vdc Output and optical PMMA diffuser. Contractor to submit sample for approval.
- 5.5 Contractor to supply, deliver and install low bay lighting fixtures comprising of low bay reflector bracket with E27 socket, 400mm diameter sand blasted reflector and glass cover, and 15W LED PAR38 daylight bulb with E27 lamp base. Contractor to submit sample for approval.
- 5.6 Contractor to supply, deliver and install T5 electronic fluorescent lamp with slim type luminaire (14W, 21W, 28W), length varies depending on cove light length. Contractor to submit sample for approval.
- 5.7 Contractor to supply, deliver and install wall mounted 3P fluorescent waterproof luminaires with 2 pieces 40W fluorescent light at fan room; verify plan for location. Contractor to submit sample for approval.
- 5.8 Indoor recessed wall lamp. Contractor to supply, deliver and install recessed type aluminum die casting with tempered frosted

glass cover and E27 socket lamp fixture; with 5W  
LED warm white E27 lamp base candle type bulb. Contractor to  
submit samples for approval.

5.9 LED ceiling mounted signage. Supply, delivery and installation of acrylic type  
ceiling mounted signage with 4 x 1500mcd 110  
deg. LED, green letter color and 600mAh  
rechargeable Ni-Cd battery for fire exit and toilet signage.

5.10 Contractor to provide ceiling structural support for owner supplied decorative  
drop lights and chandeliers. Contractor to use 10mm  
thick 75mm x 75mm angular bar vertical hangers with  
10mm x 200mm x 200mm steel plate. Steel plate must be anchored at  
either bottom of slab or existing beam.  
Contractor to submit shop drawing of hanger  
supports for approval of the architect.

## **SECTION 6 : OUTDOOR LIGHTING FIXTURES**

6.1 Outdoor wall lamp for guard house. Aluminum die-cast casing with 2 E27 lamp  
base on top and bottom, and with glass cover;  
item to include 2 pieces 3W candle type LED  
warm white bulb with E27 base. Contractor to submit sample  
for approval.

6.2 Outdoor wall lamp at machine room. Aluminum die-cast casing with 2 E27 lamp  
base on top and bottom, and with glass cover;  
item to include 2 pieces 3W candle type LED  
daylight bulb with E27 base. Contractor to submit sample for  
approval.

6.3 Outdoor recessed wall lamp at signage area. Contractor to supply, deliver and  
install recessed type aluminum die casting with  
tempered frosted glass cover and E27 socket  
lamp fixture; with 5W LED warm white E27 lamp base candle  
type bulb. Contractor to submit samples for  
approval.

6.4 Outdoor underground LED lighting fixture at flag pole. Supply, deliver and  
install 3W LED warm white underground square type  
lighting fixture with aluminum frame, tempered  
glass cover, high temperature resistant silicone ring.



- 6.5 Surface mounted LED light fixture for pedestrian stair entry and guard house. Supply, delivery and installation of 5.7W LED daylight bulb with E27 lamp base with 100mm diameter round aluminum surface mounted down light fixture with glass cover and E27 socket.
- 6.6 Guard house and utility deck flood light. Supply, delivery and installation of 20 watts LED daylight flood light with aluminum and tempered glass casing and high temperature resistant silicone ring. Contractor to submit sample and shop drawing of mounting for approval.
- 6.7 Outdoor LED spot light for signage lighting. Supply, delivery and installation of 9 watts LED warm white outdoor spot light fixture with dark gray die-cast aluminum casing, glass cover, high temperature resistant silicone ring and 40mm dia. x 185mm height ground mounting bracket.

## **SECTION 7 : DOORS AND WINDOWS**

### **7.1 Glass doors**

- a. Glass panel shall be 12mm thick clear tempered glass.
- b. Top and bottom framing shall be powder coated aluminum FD100 framing fixed glass partition aluminum profile. Contractor to submit sample framing section and sample swatches for approval.
- c. Hardware. Supply, deliver and install recessed type double action floor spring hinge with hold open function and 1.5mm thick stainless steel universal cover plate; and top pivot hinge. Contractor to submit sample for approval.
- d. Door handles. 32mm diameter x 900mm height H-type stainless steel handle in satin finish complete with necessary accessories as per manufacturer's standard. Contractor to submit sample for approval.
- e. Accessories. Supply, deliver and install deadbolt lock at bottom glass rail in satin finish. Contractor to verify compatible lock in consideration of the glass manufacturer's standard. Submit sample of accessories for approval.
- f. Frosted sticker. Contractor to supply, deliver and install frosted sticker glass doors, 75% of surface area. Contractor to submit sample stickers and install to actual location as per designer's approval.

### **7.2 Metal doors (3 hour fire rating)**

- a. Door panel. Gauge 20 B.I. bended sheet panel, steel reinforced door with non-combustible heat insulation material.
- b. Door jamb. Gauge 16 50mm x 150mm bended steel standard door jamb

- c. Hardware.
- a. Hinges – 100mmH heavy duty steel loose-pin butt hinges, install 4 sets per door leaf. Submit sample for approval.
  - b. Lockset – use stainless steel standard-duty lever type entrance door lockset in satin nickel finish. Contractor to submit sample for approval.
- d. Accessories.
  - a. Door closer. Supply, deliver and install adjustable surface mounted door closer with snap on standard arm for 80kg weight door, in satin finish. Contractor to submit sample for approval.
  - b. Deadbolt – single cylinder standard duty deadbolt with thumb turn in satin finish. Contractor to submit sample for approval.
  - c. Door stopper. Supply, deliver and install stainless steel zinc alloy base door stopper in satin finish with block rubber per door. Contractor to submit sample for approval.
- e. Finish. Contractor to apply one (1) coat epoxy paint primer and two (2) coats epoxy top coat as per painting manufacturer's standard specification. Contractor to submit swatches for approval.

### 7.3 Metal double doors (3 hour fire rating)

- a. Door panel. Gauge 20 B.I. bended sheet panel, steel reinforced door with non-combustible heat insulation material.
- b. Door jamb. Gauge 16 50mm x 150mm standard steel door jamb.
- c. Hardware.
  - a. Hinges – 100mmH heavy duty weld-on rolled steel loose-pin door hinges, install 4 sets per door leaf. Submit sample for approval.
  - b. Lockset – use stainless steel standard-duty lever type entrance door lockset in satin nickel finish. Contractor to submit sample for approval.
- d. Accessories.
  - a. Door closer. Supply, deliver and install adjustable surface mounted door closer with snap on standard arm for 80kg weight door, in satin nickel finish. Contractor to install one (1) set per door. Contractor to submit sample for approval.
  - b. Deadbolt – single cylinder standard duty deadbolt with thumb turn in satin nickel finish. Contractor to submit sample for approval.

- c. Surface door bolt. Supply, deliver and install of 300mm brass surface door bolt in satin nickel finish. Contractor to install 1 set at base for 1 door leaf per double door set. Contractor to submit sample for approval.
- d. Door stopper. Supply, deliver and install stainless steel zinc alloy base door stopper in satin nickel finish with block rubber per door. Contractor to submit sample for approval.
- e. Finish. Contractor to apply one (1) coat epoxy paint primer and two (2) coats epoxy top coat as per painting manufacturer's standard specification. Contractor to submit swatches for approval.

#### 7.4 Metal doors with louvers

- a. Door panel. Gauge 20 B.I. bended sheet panel, with 600mm x 600mm GA 18 metal louver with u-shaped metal frame. Contractor to submit shop drawing of louver design prior to fabrication.
- b. Door jamb. Gauge 16 50mm x 150mm standard steel door jamb.
- c. Hardware.
  - a. Hinges – 100mmH heavy duty weld-on rolled steel loose-pin door hinges, install 4 sets per door leaf. Submit sample for approval.
  - b. Lockset – use stainless steel standard-duty lever type entrance door lockset in satin nickel finish. Contractor to submit sample for approval.
- d. Accessories.
  - a. Door closer. Supply, deliver and install adjustable surface mounted door closer with snap on standard arm for 80kg weight door, in satin nickel finish. Contractor to submit sample for approval.
  - b. Deadbolt – single cylinder standard duty deadbolt with thumb turn in satin nickel finish. Contractor to submit sample for approval.
  - c. Flush bolt. Supply, deliver and install manual flush bolt in stainless steel finish for 1 door panel for all steel double doors.
  - d. Door stopper. Supply, deliver and install stainless steel zinc alloy base door stopper in satin nickel finish with block rubber per door. Contractor to submit sample for approval.
  - e. Finish. Contractor to apply one (1) coat epoxy paint primer and two (2) coats epoxy top coat as per painting manufacturer's standard specification. Contractor to submit swatches for approval.

### 7.5 Metal double doors with louvers

- a. Door panel. Gauge 20 B.I. bended sheet panel, steel reinforced door. Contractor to provide 600mm x 600mm steel louvers using 6mm thk.X 50mmx 25mm standard steel framing with Gauge 18 G.I. bended louver blades. Contractor to submit shop drawing of louver design prior to fabrication.
- b. Door jamb. Gauge 16 50mm x 150mm standard steel door jamb.
- c. Hardware.
  - a. Hinges – 100mmH heavy duty weld-on rolled steel loose-pin door hinges, install 4 sets per door leaf. Submit sample for approval.
  - b. Lockset – use stainless steel standard-duty lever type entrance door lockset in satin nickel finish. Contractor to submit sample for approval.
- d. Accessories.
  - a. Door closer. Supply, deliver and install adjustable surface mounted door closer with snap on standard arm for 80kg weight door, in satin nickel finish. Contractor to install one (1) set per door. Contractor to submit sample for approval.
  - b. Deadbolt – single cylinder standard duty deadbolt with thumb turn in satin nickel finish. Contractor to submit sample for approval.
  - c. Surface door bolt. Supply, deliver and install of 300mm brass surface door bolt in satin nickel finish. Contractor to install 1 set at base for 1 door leaf per double door set. Contractor to submit sample for approval.
  - d. Door stopper. Supply, deliver and install stainless steel zinc alloy base door stopper in satin nickel finish with block rubber per door. Contractor to submit sample for approval.
  - e. Finish. Contractor to apply one (1) coat epoxy paint primer and two (2) coats epoxy top coat as per painting manufacturer's standard specification. Contractor to submit swatches for approval.

### 7.6 Existing fire exit doors (New hardwares and accessories shall be supplied by the general contractor)

- a. Existing steel door panels and door jamb to be retained and repainted. Existing steel door finishes shall be stripped and damaged surfaces are subject for repair, contractor to follow painting manufacturer's standard specification. Existing door shall be painted with one (1)

coat epoxy primer and two (2) coats epoxy top coat. Contractor to submit swatches for approval.

- b. Hardware. All existing hardware and accessories subject for replacement.
  - a. Hinges – 100mmH heavy duty weld-on rolled steel loose-pin door hinges, install 4 sets per door leaf. Submit sample for approval.
  - b. Panic device – Rim type panic exit device (full length push rail, non-handed door, lateral lock point, stainless steel latch bolt, stainless steel spring throughout and steel cap). Contractor to submit sample for approval.
- c. Accessories.
  - a. Pull Plate – 300mm x 100mm stainless steel pull plate complete with screws and accessories. Contractor to submit sample for approval.
  - b. Door closer. Supply, deliver and install adjustable surface mounted door closer with snap on standard arm for 80kg weight door, in satin nickel finish. Contractor to submit sample for approval.
  - c. Door stopper. Supply, deliver and install stainless steel zinc alloy base door stopper in satin nickel finish with block rubber per door. Contractor to submit sample for approval.

#### 7.7 New steel fire exit doors (3 hour fire rating)

- a. Door panel. Gauge 20 B.I. bended sheet panel, steel reinforced door with non-combustible heat insulation material.
- b. Door jamb. Gauge 16 50mm x 150mm standard steel door jamb.
- c. Hardware.
  - a. Hinges – 100mmH heavy duty weld-on rolled steel loose-pin door hinges, install 4 sets per door leaf. Submit sample for approval.
  - b. Panic device – Rim type panic exit device (full length push rail, non-handed door, lateral lock point, stainless steel latch bolt, stainless steel spring throughout and steel cap). Contractor to submit sample for approval.
- d. Accessories.
  - a. Pull Plate – 300mm x 100mm stainless steel pull plate complete with screws and accessories. Contractor to submit sample for approval.
  - b. Door closer. Supply, deliver and install adjustable surface mounted door closer with snap on standard arm for

80kg weight door, in satin nickel finish.  
Contractor to submit sample for approval.

- c. Door stopper. Supply, deliver and install stainless steel zinc alloy base door stopper in satin nickel finish with block rubber per door. Contractor to submit sample for approval.
- e. Finish. Contractor to apply one (1) coat epoxy paint primer and two (2) coats epoxy top coat in consideration with painting manufacturer's standards. Contractor to submit swatches for approval.

#### 7.8 Steel Grill Door (Workshop area and LPG area)

- a. Single swing metal grill door with 12 x 12 square tubular vertical grills spaced every 50mm on center welded on 6mm x 50mm x 100mm rectangular tubular frame and horizontal bracing.
- b. Hardware.
  - a. Hinges – 100mmH heavy duty fabricated rolled butt hinges installed directly to concrete wall; install 4 sets per door leaf. Submit sample for approval.
  - c. Accessories.
    - a. Provide horizontal barrel bolt with padlock
  - d. Finish. Contractor to apply one (1) coat epoxy paint primer and two (2) coats epoxy top coat in consideration with painting manufacturer's standards. Contractor to submit swatches for approval.

#### 7.9 Steel louvered folding door (for Genset area)

- a. 6mm thick x 50mm x 100mm B.I. tubular steel framed louvered panels with gauge 18 bended metal louver blades per door panel. Contractor to submit shop drawing for approval.
- b. Hardware.
  - a. Heavy duty track and roller hardware, complete with 1 carriages and carrier plates per door. Accessories shall include floor guide, rail buffers and door stop. Contractor to submit sample for approval.
  - b. Hinges – 100mmH heavy duty weld-on rolled steel loose-pin door hinges, install 4 sets per door leaf. Submit sample for approval.
- c. Accessories.

- a. Provide heavy duty steel door bolt with lock
- d. Finish. Contractor to apply one (1) coat epoxy paint primer and two (2) coats epoxy top coat in consideration with painting manufacturer's standards. Contractor to submit swatches for approval.

#### 7.10 Security Door

- a. Single-swing B.I. bended sheet panel, steel reinforced door with rockwool insulation
- b. Door jamb. Gauge 16 50mm x 150mm standard steel door jamb.
- c. Hardware.
  - a. Hinges – 100mmH heavy duty weld-on rolled steel loose-pin door hinges, install 4 sets per door leaf. Submit sample for approval.
  - b. Lockset – provide three-wheel two combination lock
- d. Accessories.
  - a. Door closer. Supply, deliver and install adjustable surface mounted door closer with snap on standard arm for 80kg weight door, in satin nickel finish. Contractor to install one (1) set per door. Contractor to submit sample for approval.
  - b. Deadbolt – single cylinder standard duty deadbolt with thumb turn in satin nickel finish. Contractor to submit sample for approval.
  - c. Surface door bolt. Supply, deliver and install of 300mm brass surface door bolt in satin nickel finish. Contractor to install 1 set at base for 1 door leaf per double door set. Contractor to submit sample for approval.
  - d. Door stopper. Supply, deliver and install stainless steel zinc alloy base door stopper in satin nickel finish with block rubber per door. Contractor to submit sample for approval.
- e. Finish. Contractor to apply one (1) coat epoxy paint primer and two (2) coats epoxy top coat in consideration with painting manufacturer's standards. Contractor to submit swatches for approval.

### 7.11 Kitchen Steel Door

- a. Door panel. Gauge 18 G.I. bended sheet panel, hollow core and steel reinforced door with 150mm x 300mm x 6mm thick view glass panel.
- b. Door jamb. Gauge 16 50mm x 150mm standard steel door jamb.
- c. Hardware.
  - a. Hinges – recessed type double action floor spring hinge with hold open function and 1.5mm thick stainless steel universal cover plate; and top pivot hinge.  
Contractor to submit sample for approval.
- d. Accessories.
  - a. Push plate – 2mm x 300mm x 100mm stainless steel pull plate complete with screws and accessories, both sides provision. Contractor to submit sample for approval.
  - b. Kick plate – 2mm x 300mm x 900mm stainless steel pull plate complete with screws and accessories, both sides provision. Contractor to submit sample for approval.
- e. Finish. Contractor to apply one (1) coat epoxy paint primer and two (2) coats epoxy top coat in consideration with painting manufacturer's standards. Contractor to submit swatches for approval.

### 7.12 Kitchen Steel Double Door

- a. Door panel. Gauge 18 G.I. bended sheet panel, hollow core and steel reinforced door with 150mm x 300mm x 6mm thick view glass panel.
- b. Door jamb. Gauge 16 50mm x 150mm standard steel door jamb.
- c. Hardware.
  - a. Hinges – recessed type double action floor spring hinge with hold open function and 1.5mm thick stainless steel universal cover plate; and top pivot hinge.  
Contractor to submit sample for approval.
- d. Accessories.
  - a. Push plate – 2mm x 300mm x 100mm stainless steel pull plate complete with screws and accessories, both sides provision. Contractor to submit sample for approval.



- b. Kick plate – 2mm x 300mm x 900mm stainless steel pull plate complete with screws and accessories, both sides provision. Contractor to submit sample for approval.
- e. Finish. Contractor to apply one (1) coat epoxy paint primer and two (2) coats epoxy top coat in consideration with painting manufacturer's standards. Contractor to submit swatches for approval.

### 7.13 Wood Panel Doors

- a. Panel door. 44mm thick kiln dried door panels with 35mm x 114 mm stiles and rails. Contractor to use kiln dried hardwood material for all wood doors.
- b. Door jamb. 50mm x 100mm kiln dried solid wood door jamb.
- c. Hardware.
  - a. Hinges. Use 90mm x 90mm x 4mm loose pin butt hinge. Contractor to provide 4 sets per door leaf for 2100mm height door leaves and 5 sets per door panel for 2400mm height door leaves.
  - b. Lockset – use stainless steel standard-duty lever type entrance door lockset in satin nickel finish. Contractor to submit sample for approval.
- d. Accessories.
  - a. Door closer. Supply, deliver and concealed door closer (overhead with slide channel and hold open) for 50kg in satin nickel finish. Contractor to submit sample for approval.
  - b. Door stopper. Supply, deliver and install stainless steel zinc alloy base door stopper in satin nickel finish with block rubber per door. Contractor to submit sample for approval.
- e. Finish. Contractor to apply water based wood stain color with clear gloss top coat lacquer; contractor to follow manufacturer's standards for wood stain and top coat application. Contractor to submit sample for approval.

### 7.14 Wood Panel Double Doors

- a. Panel door. 44mm thick kiln dried door panels with 35mm x 114 mm stiles and rails. Contractor to use kiln dried hardwood material for all wood doors.
- b. Door jamb. 50mm x 100mm kiln dried solid wood door jamb.
- c. Hardware.

- a. Hinges. Use 90mm x 90mm x 4mm loose pin butt hinge. Contractor to provide 4 sets per door lead for 2100mm height door leaves and 5 sets per door panel for 2400mm height door leaves.
- b. Lockset – use stainless steel standard-duty lever type entrance door lockset in satin nickel finish. Contractor to submit sample for approval.
- d. Accessories.
  - a. Door closer. Supply, deliver and concealed door closer (overhead with slide channel and hold open) for 50kg in satin nickel finish. Contractor to submit sample for approval.
  - b. Door stopper. Supply, deliver and install stainless steel zinc alloy base door stopper in satin nickel finish with block rubber per door. Contractor to submit sample for approval.
  - c. Flush bolt. Supply, delivery and installation of 25mm x 150mm stainless steel door flush bolt complete with necessary accessories. Contractor to install 2 sets (head and foot bolt) for 1 door leaf per double door set. Contractor to submit sample for approval.
- e. Finish. Contractor to apply water based wood stain color with clear gloss top coat lacquer; contractor to follow manufacturer's standards for wood stain and top coat application. Contractor to submit sample for approval.

#### 7.15 Wood Panel Doors with louver panel

- a. Panel door. 44mm thick kiln dried door panels with 35mm x 114 mm stiles and rails. Contractor to use kiln dried hardwood material for all wood doors. Contractor to supply and install 600mm x 600mm louver panel with wooden louver blades in 50mm x 50mm solid wood frame. Contractor to submit shop drawing for approval.
- b. Door jamb. 50mm x 100mm kiln dried solid wood door jamb.
- c. Hardware.
  - a. Hinges. Use 90mm x 90mm x 4mm loose pin butt hinge. Contractor to provide 4 sets per door panel for 2100mm height door leaves and 5 sets per door panel for 2400mm height door leaves.
  - b. Lockset – use stainless steel standard-duty lever type entrance door lockset in satin nickel finish. Contractor to submit sample for approval.
- d. Accessories.

- a. Door closer. Supply, deliver and concealed door closer (overhead with slide channel and hold open) for 50kg in satin nickel finish. Contractor to submit sample for approval.
- b. Door stopper. Supply, deliver and install stainless steel zinc alloy base door stopper in satin nickel finish with block rubber per door. Contractor to submit sample for approval.
- c. For toilets. Contractor to supply, deliver and install 3mm thick 100mm diameter stainless steel chrome plated sign plate as required. Contractor to submit sample for approval.
- e. Finish. Contractor to apply water based wood stain color with clear gloss top coat lacquer; contractor to follow manufacturer's standards for wood stain and top coat application. Contractor to submit sample for approval.

**7.16 Wood Panel Double Doors with louver panel**

- a. Panel door. 44mm thick kiln dried door panels with 35mm x 114 mm stiles and rails. Contractor to use kiln dried hardwood material for all wood doors. Contractor to supply and install 600mm x 600mm louver panel with wooden louver blades in 50mm x 50mm solid wood frame. Contractor to submit shop drawing for approval.
- b. Door jamb. 50mm x 100mm kiln dried solid wood door jamb.
- c. Hardware.
  - a. Hinges. Use 90mm x 90mm x 4mm loose pin butt hinge. Contractor to provide 4 sets per door panel for 2100mm height door leaves and 5 sets per door panel for 2400mm height door leaves.
  - b. Lockset – use stainless steel standard-duty lever type entrance door lockset in satin nickel finish. Contractor to submit sample for approval.
- d. Accessories.
  - a. Door closer. Supply, deliver and concealed door closer (overhead with slide channel and hold open) for 50kg in satin nickel finish. Contractor to submit sample for approval.
  - b. Door stopper. Supply, deliver and install stainless steel zinc alloy base door stopper in satin nickel finish with block rubber per door. Contractor to submit sample for approval.
  - c. Flush bolt. Supply, delivery and installation of 25mm x 150mm stainless steel door flush bolt complete with necessary

accessories. Contractor to install 2 sets  
(head and foot bolt) for 1 door leaf per double door set.  
Contractor to submit sample for approval.

- e. Finish. Contractor to apply water based wood stain color with clear gloss top coat lacquer; contractor to follow manufacturer's standards for wood stain and top coat application. Contractor to submit sample for approval.

#### 7.17 Wood louvered Doors

- a. Panel door. 44mm thick kiln dried door panels with 35mm x 114 mm stiles and rails. Contractor to use kiln dried hardwood material for all wood doors. Contractor to supply and install wooden louver blades. Contractor to submit shop drawing for approval.
- b. Door jamb. 50mm x 100mm kiln dried solid wood door jamb.
- c. Hardware.
  - a. Hinges. Use 90mm x 90mm x 4mm loose pin butt hinge. Contractor to provide 4 sets per door panel for 2100mm height door leaves and 5 sets per door panel for 2400mm height door leaves.
  - b. Lockset – use stainless steel standard-duty lever type entrance door lockset in satin nickel finish. Contractor to submit sample for approval.
- d. Accessories.
  - a. Door closer. Supply, deliver and install concealed door closer (overhead with slide channel and hold open function) for maximum 50 kg. door weight. Contractor to submit sample for approval.
  - b. Door stopper. Supply, deliver and install stainless steel zinc alloy base door stopper in satin nickel finish with block rubber per door. Contractor to submit sample for approval.
- e. Finish. Contractor to apply water based wood stain color with clear gloss top coat lacquer; contractor to follow manufacturer's standards for wood stain and top coat application. Contractor to submit sample for approval.

#### 7.18 Wood louvered double doors

- a. Panel door. 44mm thick kiln dried door panels with 35mm x 114 mm stiles and rails. Contractor to use kiln dried hardwood material for all wood doors. Contractor to supply and install wooden louver blades. Contractor to submit shop drawing for approval.

- b. Door jamb. 50mm x 100mm kiln dried solid wood door jamb.
- c. Hardware.
  - a. Hinges. Use 90mm x 90mm x 4mm loose pin butt hinge. Contractor to provide 4 sets per door panel for 2100mm height door leaves and 5 sets per door panel for 2400mm height door leaves.
  - b. Lockset – use stainless steel standard-duty lever type entrance door lockset in satin nickel finish. Contractor to submit sample for approval.
- d. Accessories.
  - a. Door closer. Supply, deliver and install concealed door closer (overhead with slide channel and hold open function) for maximum 50 kg. door weight.  
Contractor to submit sample for approval.
  - b. Door stopper. Supply, deliver and install stainless steel zinc alloy base door stopper in satin nickel finish with block rubber per door. Contractor to submit sample for approval.
  - c. Flush bolt. Supply, delivery and installation of 25mm x 150mm stainless steel door flush bolt complete with necessary accessories. Contractor to install 2 sets (head and foot bolt) for 1 door leaf per double door set.  
Contractor to submit sample for approval.
- e. Finish. Contractor to apply water based wood stain color with clear gloss top coat lacquer; contractor to follow manufacturer's standards for wood stain and top coat application. Contractor to submit sample for approval.

#### 7.19 Wood Panel Doors with view glass

- a. Panel door. 44mm thick kiln dried door panels with 35mm x 114 mm stiles and rails.  
Contractor to use kiln dried hardwood material for all wood doors. Contractor to provide 150mm x 300mm x 6mm thick view glass.
- b. Door jamb. 50mm x 100mm kiln dried solid wood door jamb.
- c. Hardware.
  - a. Hinges. Use 90mm x 90mm x 4mm loose pin butt hinge. Contractor to provide 4 sets per door panel for 2100mm height door leaves and 5 sets per door panel for 2400mm height door leaves.
  - b. Lockset – use stainless steel standard-duty lever type entrance door lockset in satin nickel finish. Contractor to submit sample for approval.
- d. Accessories.

- a. Door closer. Supply, deliver and concealed door closer (overhead with slide channel and hold open) for 50kg in satin nickel finish. Contractor to submit sample for approval.
- b. Door stopper. Supply, deliver and install stainless steel zinc alloy base door stopper in satin nickel finish with block rubber per door. Contractor to submit sample for approval.
- e. Finish. Contractor to apply water based wood stain color with clear gloss top coat lacquer; contractor to follow manufacturer's standards for wood stain and top coat application. Contractor to submit sample for approval.

#### 7.20 Operable partition

- a. Operable partition with fabric finish on both side, with STC rating of 50. 102mm thick panel with architectural grade aluminum alloy panel trim, 12mm MDF or 12mm gypsum board with Gauge 20 steel sheet with 50mm thick rockwool at 60kg/cu.m. Complete with retractable upper and floor seals, fixed sweep seals, single action spring loaded cam and spindle with compensating pressure seal mechanism; rail track shall be of architectural grade aluminum alloy with precision bearings. Supplier must have 5 years warranty on materials excluding panel finish. Contractor to submit fabric swatches for approval. Contractor to submit shop drawing prior to purchase for approval.

#### 7.21 Roll-up Doors.

- a. Roll-up Doors (Max width within 2.5m and 2.1m height). Supply delivery and installation of motorized roll-up door with gauge 18 galvanized shutter, gauge 18 galvanized sideposts, gauge 26 galvanized cover and 1/4 horse power motor with push button control. Contractor to locationswitch at fire command center. Contractor to submit shop drawing for approval.
- b. Roll-up Doors (Max width within 5.0m and 2.1m height). Supply delivery and installation of motorized roll-up door with gauge 18 galvanized shutter, gauge 18 galvanized sideposts, gauge 26 galvanized cover and 1/2 horse power motor with push button control. Contractor to location switch at fire command center. Contractor to submit shop drawing for approval.
- c. Roll-up Doors (Max width within 8.0m and 4.4m height). Supply delivery and installation of motorized roll-up door with gauge 18 galvanized shutter, gauge 18 galvanized sideposts, gauge 26 galvanized cover and 3/4 horse power motor with push button control. Contractor to location switch at fire command center. Contractor to submit shop drawing for approval.

7.22 Existing steel utility doors are to be retained and repainted with epoxy paint as per manufacturer's standard, existing hardware and accessories are subject for replacement. Contractor to submit sample of hardware and accessories, and paint swatches for approval.

7.23 Existing steel fire exit doors are to be retained and repainted with epoxy paint as per manufacturer's standard, existing hardware and accessories are subject for replacement. Contractor to submit sample of hardware and accessories, and paint swatches for approval.

## **SECTION 8 : GLASS WORKS**

8.1 Glass partition. Supply, delivery and installation of 12 thick tempered glass in powder coated aluminum FD100 frame. Contractor to submit sample section and powder coating swatches for approval.

8.2 Frosted sticker. Contractor to supply, deliver and install frosted sticker at all glass areas. Contractor to submit sample stickers for approval. Contractor to verify with interior designer frosted sticker design.

8.3 Facial Mirror. Contractor to supply, deliver and install new 6mm thick facial mirror with 6mm thick marine plywood backing, complete with black screw 6 x 1, S-5 tox, and dow corning non-acetic clear sealant for all toilets. Contractor to submit sample for approval.

8.4 Graphicote Glass Writing Board. Contractor to supply, deliver and install new 6mm thick tempered painted glass writing board with non-glare properties for projector purposes with 6mm thick marine plywood backing, complete with black screw 6 x 1, S-5 tox, and dow corning non-acetic clear sealant for all toilets. Contractor to submit sample for approval.

8.5 Fixed glass window for guard house. Supply, delivery and installation of 12mm thick tempered glass in powder coated aluminum frame. Contractor to verify architectural plans. Contractor to submit sample section and powder coating swatches for approval.

8.6 Glass roofing. Supply, delivery and installation of 12mm thick colored tempered glass roofing with heat insulation properties for and pedestrian walkway and guard house.

8.7 Perimeter fixed glass windows at roof deck floor. Contractor to supply, deliver and install 19mm thick clear tempered glass complete with necessary fittings, accessories and sealant; contractor to consider manufacturer's standards in glass installation. Contractor to submit shop drawing, sample section and powder coat swatches for approval.

8.8 16mm thick laminated low-e glass for executive garden café wall and roof skylight complete with necessary holders and accessories as per manufacturer's standard. Contractor to submit shop drawing for approval.

## **SECTION 9 : MASONRY WORKS**

9.1 Lavatory Counter shall be 25mm thick granite with 100mm height fascia. Subsurface shall be 20mm thick marine plywood with 50mm x 50mm kiln dried wood framing. Contractor to submit shop drawing and granite swatches for approval.

9.2 Lavatory Counter to be provided with 300mm height 25mm thick granite splash board along perimeter wall. Contractor to bevel splashboard edge and submit sample granite swatches for approval.

9.3 Pantry Counter. 100mm thick reinforced concrete with 10mm diameter deformed reinforcing bars spaced every 300mm O.C. both ways with dowels connected and welded to CHB wall partition reinforcing bars. Contractor to supply, deliver and install 25mm thick granite counter top with 300mm high granite splash board with bevelled edges. Contractor to submit shop drawing for approval and submit sample granite swatches for approval.

9.4 Pantry counter CHB wall sidings. Contractor to supply, deliver and install 100mm thick CHB wall partition with reinforcing bars (verify structural plans), plastered and painted finish. Contractor to submit paint swatches for approval.



- 9.5 Urinal granite ledges. Contractor to construct 100mm thick CHB wall partition with reinforcing bars (verify structural plans), plastered with toilet wall tiles to match new wall tiles as per wall works. Contractor to supply, deliver and install 25mm thick granite ledge on top of double wall, all exposed granite edges are to be fillet. Contractor to submit shop drawing and samples for approval.
- 9.6 Water closet ledges. Contractor to supply, deliver and install 25mm thick granite ledge with reinforced concrete subsurface; contractor to verify detail drawing for reference. Contractor to submit shop drawing and samples for approval.

## **SECTION 10 : TOILET PARTITION**

- 10.1 Contractor to use 12mm thick machine pressed laminated phenolic board substrate partition with high scratch and impact resistance. Contractor to submit sample of swatches for approval.
- 10.2 Contractor to use stainless steel indicators, rising hinges brackets, 150mmH adjustable foot, and stopper with hook and toilet paper holder. Contractor to submit samples for approval.
- 10.3 Contractor to supply, deliver and install aluminum edge and corner profile. Contractor to submit sample section for approval.

## **SECTION 11 : TOILET FIXTURES**

- 11.1 Water closet – 690mmL x 368mmW x 400mmH elongated, wash down, vitreous china made, and flush valve type, top inlet commercial toilet with s-trap. Toilet seat shall be soft-close with antibacterial properties. Contractor to submit sample or proposal for approval.
- 11.2 Water closet sensor type flush valve – Water closet flush valve shall be automatic sensor type. Submit sample for approval.
- 11.3 Bidet spray – shall be in stainless steel finish (0.25kg weight). Contractor to submit sample or proposal for approval.
- 11.4 Urinal – 475mm x 690mm x 370mm vitreous china/porcelain, wall hung, top-inlet urinal. Contractor to submit sample or proposal for approval.
- 11.5 Urinal flush valve – Urinal flush valve shall be automatic sensor type. Submit sample for approval.
- 11.6 Lavatory basin (Common toilets) – 600mm x 500mm x 177mm vitreous china/porcelain, vessel type wash basin with round overflow

ring, complete with all pipes and fittings. Contractor  
to submit sample or proposal for approval.

11.7 Basin faucet (Common toilets) – basin faucet shall be automatic sensor type. Contractor to submit sample for approval.

11.8 Wall mounted lavatory basin (PWD toilets) – vitreous china/porcelain, wall-hung basin with round overflow ring, complete with all pipes, brackets and fittings. Contractor to submit sample or proposal for approval.

11.9 Shower fixture. Contractor to supply, deliver and install stainless steel wall mounted shower pipe with overhead, hand shower and spout complete with brass fittings and accessories. Contractor to submit sample for approval.

11.10 Shower fixture. Contractor to supply, deliver and install stainless steel exposed bath/shower mixer with hand shower and spout with instantaneous single point water heater compatibility. Contractor to submit sample for approval.

11.11 Slop sink fixture. Contractor to dismantle all existing slop sink fixture. Supply, delivery and installation of baked enamel cast iron wall mounted slop sink feature with 450mm width x 600mm length. Complete with necessary accessories and requirements as per manufacturer's specification. Contractor to submit proposal for approval.

11.12 Slop sink faucet. Contractor to supply, deliver and install wall mounted stainless steel bib tap with hose union for slop sink fixture. Contractor to submit sample for approval.

11.13 PWD SS handrail – 32mm diameter x 100mm x 1200mm chrome plated stainless steel handrail, complete with flange cover and screws, with corrosion resistance property.

## **SECTION 12 : PANTRY FIXTURES AND ACCESSORIES**

12.1 Pantry sink – chrome finish stainless steel L760 x W460mm single bowl upper-counter kitchen sink with drain board with corrosion resistance property.

12.2 Pantry sink faucet mixer – stainless steel chrome finish faucet mixer faucet with brass fittings H121 x L222mm with minimal lead traces in waterways and corrosion resistance.

12.3 The contractor to supply, deliver and install 0.75HP – 220-240v food waste disposer with permanent magnet motor, stainless steel grind ring, EPDM rubber splash guard, polycarbonate 940 drain outlet, stainless steel accessories, permanently lubricated sleeve type bearings, corrosion resistance; complete with necessary accessories as required by manufacturer's standards. Contractor to submit proposal for approval.

### **SECTION 13 : ROOFING WORKS**

13.1 Roofing material. Contractor to supply, deliver and install gauge 26 pre-painted galvanized iron ribbed-type long span roofing, complete with necessary fasteners and accessories as per manufacturer's standard. Contractor to submit color swatches for approval.

13.2 Roof gutter. Contractor to supply, deliver and install gauge 26 pre-painted galvanized iron gutter, complete with necessary fasteners and accessories as per manufacturer's standard. Contractor to submit color swatches for approval.

13.3 Roof flashing. Contractor to supply, deliver and install gauge 26 bended sheet flashing as required, complete with necessary fasteners and accessories as per manufacturer's standard. Contractor to verify plans for location and reference, and submit color swatches for final painting and approval.

13.4 Roof insulation. Contractor to supply, deliver and install double aluminum with woven PE fabric insulation (aluminum foil, PE adhesive, PP woven cloth, PE adhesive, aluminum foil) with 7 micron foil, basic weight of 140 gsm and fire rating of class 1. Contractor to submit sample for approval.

### **SECTION 14 : WATERPROOFING WORKS**

14.1 Waterproofing for sewage treatment plant, retaining wall, sump pit and all recessed concrete storage flooring and perimeter wall, 1000mm from finish floor line. Contractor to use cementitious crystallization

waterproofing using crystalline formulation of selected blend of cement, fine quarts, sand active constituent, as per manufacturer's standards for application. Contractor to submit manufacturer's standard specification for approval prior to installation.

14.2 Roofdeck perimeter parapet wall and new concrete deck utility deck area floor and perimeter concrete zocallo waterproofing, including concrete gutter, driveway ramp and slab waterproofing. Contractor to strip existing waterproofing at roofdeck area perimeter wall from finish floor line up to top of existing concrete parapet wall, apply skimcoat plastering at all surfaces as per plan and apply flexible cementitious waterproofing with two-component acrylic modified cementitious coating as per Manufacturer's standard. Contractor to submit sample swatches for approval.

14.3 Existing, new toilets, slop sink, pantry areas, and kitchen areas, and its perimeter walls 300mm from finish floor line water proofing. Contractor to use cementitious crystallization waterproofing using crystalline waterproofing formulation of selected blends of cement, fine quartz sand and active chemical constituents; with excellent adhesion to all cement based substrates. Contractor to follow manufacturer's standards for application. Contractor to submit proposals for approval.

## **SECTION 15 : MISCELLANEOUS WORKS**

15.1 Decorative cladding at reception and elevation or lobby area. Supply, delivery and installation of 3mm thick natural wood veneer machine pressed to 12mm thick marine plywood substrate with 25mm x 50mm thick wood nailers spaced every 400mm on center both ways. Natural wood veneer cladding shall be wood stained. Contractor to submit sample for veneer and wood stain swatches for approval.

15.2 Contractor to retain, repair and re-polish existing stainless steel handrail at fire exit stairs.

15.3 Reception area vertical slats wall accent. Supply, delivery and installation of wood stained 25mm x 50mm S4S kiln dried solid wood spaced every 50mm on center bolted to wall partition. Contractor to submit wood stain swatches for approval.

15.4 Reception area accent lighting fixtures. Supply, delivery and installation of 6 watts warm white recessed type LED in 110mm diameter

aluminum casing with glass frame down light fixture. Contractor to submit sample for approval.

- 15.5 Pedestrian walkway stairs handrail. Contractor to supply, deliver and install 38mm diameter stainless steel tubular handrail connected to glass stainless steel tubular handrail with stainless steel bracket and wall plate connected to structural posts.
- 15.6 Supply, delivery and installation of 12mm thick x 1200mm height tempered glass railing complete with all required stainless steel balusters spaced every 1200mm on center, accessories, fittings and 38mm diameter stainless steel tubular handrail as per manufacturer's standard. Contractor to verify plans and details for reference.
- 15.7 Bollards. Contractor to supply, deliver and install 900mm height x 150mm diameter concrete reinforced bollard using schedule 40 B.I. tubular pipe with concrete filling in epoxy black and yellow stripes finish.
- 15.8 Fan room plenum louvers. Contractor to supply, deliver and install 1800mm x 900mm metal louver panels using bended B.I. sheet louver blade with gauge 16 tubular frame.  
Contractor to apply one (1) coat epoxy paint primer and two (2) coats epoxy top coat in consideration with painting manufacturer's standards. Contractor to submit swatches for approval.
- 15.9 Contractor to construct perimeter fence. Perimeter fence composing 300mm height x 100mm thick concrete hollow blocks with cement plastered sidings and steel rebars as per structural plans; with 6mm thick x 50mm x 50mm tubular steel posts and horizontal support, 6mm thick x 25mm x 50mm rectangular tubular vertical fence spaced every 150mm on center. Contractor to paint zocallo and steel members with epoxy paint as per manufacturer's standards.
- 15.10 Contractor to construct new driveway ramp at sidewalk area using reinforced concrete as per plan.
- 15.12 Driveway canopy cladding. Supply, delivery and installation of 4mm thick Aluminum non-combustible composite panel with 0.5mm thick aluminum

cover sheet on both sides and 3mm thick non-combustible mineral filled core for driveway canopy steel members; complete with required framing, fasteners and accessories as per manufacturer's standard. Contractor to submit sample for approval.

15.13 Re-polishing and reinstallation of dismantled existing signage. Contractor to re-polish existing signage and reinstall to structural façade framing with epoxy painted angular framing. Contractor to submit shop drawing and paint swatches for approval.

15.14 Supply, delivery and installation of X ray baggage scanner with alarm thru sound and light, high security standard. Contractor to submit proposal for approval.

15.15 Supply, delivery and installation of walkthrough metal detector, weatherproof/foreign object protection standard meets IP55, IEC standard. "Degrees of Protection provided by Enclosures", IEC 529. IP 65 optional. Target pinpointing lights – 33 distinct zones are displayed with two independent columns of LEDs, 2,300 selectable operating frequencies and advanced analog and digital filtering. Contractor to shoulder training and commissioning, materials required for installation and installation, mounting and termination of metal detectors.

End of Specification

## **ELECTRICAL WORKS TECHNICAL SPECIFICATION**

### **PART 1 - GENERAL (BASIC ELECTRICAL MATERIALS & METHODS**

#### **A. CODES, REGULATION AND STANDARDS**

The installation of the equipment shall conform to good engineering practice and in particular, comply with the requirements laid down in the following documents or its equivalent, which are mandatory and modified only by specific agreement.

Philippine Electrical Code	PEC	
National Electric Code	NEC	
Underwriters' Laboratory	UL	
American Standard Association		ASA
National Electrical Manufacturer's Association		NEMA
American Society for Testing Materials		ASTM
Local Utility Power Company	LUPC	

In addition to the requirements of the codes and specification referred to above, local regulation and suppliers' specification, if any, shall be followed.

#### **B. DRAWINGS AND SPECIFICATION**

The Drawings and Specification are meant to be complementary to each other and what is called for by one shall be called for by both.

Any apparent conflict between the Drawings and Specification and any controversial or unclear points in either shall be referred to the Electrical Engineer in Charge for final decision. On the plans, keep records showing all deviat occurring during construction. At the completion of the work, said copy of the plans shall be submitted to the LGU for its copy and file.

Upon completion of work as described herein the Contractor shall furnish the Owner, at his own expense, Five (5) copies of the "AS BUILT" plans for future reference and maintenance purposes.



**C. CORRELATION OF WORK**

The Electrical Contractor shall coordinate with the General Contractor and the LGU/Owner to determine how and where his work fits with that of other crafts, after familiarizing himself with the plans and specification. This shall be done at the beginning of construction. Should there be any existing doubt at any point, a ruling shall

be secured from the LGU/Owner and shall be given time to inspect the work covering this point and to prepare a detail in the form of Drawings and written instruct as required.

**D. PERMITS AND INSPECTION**

The contractor shall obtain, at his own expense, all the necessary permits and Certificate of Electrical Inspection from the proper government authorities required both for the performance of his work involved and the operation of the system upon completion of work.

The Contractor shall, at his own expense, reproduce the electrical plans for his work to the necessary scale and complete them with the necessary information and requirements as required by the Government approving authorities concerned in issuing permits and Certificate of Electrical Inspection.

**E. EXAMINATION OF PREMISES**

Perspective bidder is required to examine the Architectural, Structural, Mechanical and Electrical Plans of the Project, to visit the site and carefully take note all the condition thereat and to have informed himself thoroughly under which the electrical work is to be done. No allowance shall subsequently be made in his behalf because of any error on his part. He will be deemed to have done this before submitting his proposal and no subsequent claim on the ground of inadequate or inaccurate information will be entertained.

**F. LAYOUT OF WORK**

Electrical System layout, indicated on the drawings is generally diagrammatic and location of outlets, devices, apparatus, and equipment are approximate.

The exact routing of conduits, location of outlets, devices, apparatus and equipment shall be governed by structural and architectural condition and limitat.

Consult the LGU/Owner for exact location. This is not to be construed to permit redesigning of system; all outlets are to be interconnected as indicated in the drawings.

Locatione and install equipment-requiring maintenance where it will be readily accessible. Any equipment located without the approval of the LGU or Owner shall be done at the risk of the Contractor.

The Owner reserves the right to make any reasonable changes in location of outlets and equipment prior to roughing-in, without involving additional expense.

The Contractor shall be held responsible and pay charges for cutting and patching for piping where sleeves or slots were not installed or where incorrectly located.

#### **G. MATERIALS AND WORKMANSHIP**

All materials to be installed shall be unused, brand new and shall conform to the applicable standards.

Only skilled workmen using proper tools and equipment shall be employed during the entire course of installation work. All workmanship shall be of the best quality and all work shall be done in accordance with the best practices of the trade involved.

The same job foremen shall be assigned and maintained at the job site during the entire course of the job.

#### **1.1 SUMMARY**

- A. This Section includes the following:
  - 1. Safety considerat for outdoor substat.
  - 2. Raceways.

3. Building wire and connectors.
4. Supporting materials for electrical components.
5. Electrical identification.
6. Electric metering components.
7. Concrete equipment bases/pads.
8. Cutting and patching for electrical construction.
9. Touchup painting.

## **1.2 ACRONYMS & ABBREVIAT**

- A. EMT: Electrical metallic tubing.
- B. FMC: Flexible metal conduit.
- C. RSC: Rigid steel conduit.
- D. LFMC: Liquid tight flexible metal conduit.
- E. RNC: Rigid nonmetallic conduit, Unplasticized Polyvinyl Chloride.
- F. PEC: Philippine Electrical Code
- G. NFPA: National Fire Protection Association
- H. ANSI: American National Standards Institute
- I. IMC: Intermediate metal conduit

## **1.3 SUBMITTALS**

- A. Product Data: For each type of product indicated.

## **1.4 PRODUCT DELIVERY, STORAGE AND HANDLING**

- A. Deliver components in factory-fabricated water resistant packaging.
- B. Handle components carefully to avoid damage to components, enclosures and finish.
- C. Store components in a clean, dry space and protect from weather.

## **1.5 QUALITY ASSURANCE**

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in PEC 2009, Article 1.1, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- B. Compliant with the Latest Edition of Philippine Electrical Code and National Electrical Code.

## **1.6 WORK COORDINATION**

- A. Coordinate chase block-outs, sleeves, and openings with general construction work and arrange in building structure during progress of construction to facilitate the electrical installation that follow.
  - 1. Set inserts and sleeves in poured-in-place concrete, masonry, and other structural components as they are constructed.
- B. Sequence, coordinate, and integrate installing electrical materials and equipment for efficient flow of the Work. Coordinate installing large equipment requiring positioning before closing in the building.
- C. Coordinate electrical service connect to components furnished by utility companies.
  - 1. Coordinate installation and connection of underground or overhead utility and service, including provision for electric-metering facility.
  - 2. Comply with requirements of the local government and of the utility company.
- D. Coordinate location of access for electrical equipment that are concealed/recessed. Access doors and panels as specified Architectural Schedule.
- E. Where electrical identification devices are applied to field-finished surfaces, coordinate installation of identification devices with completion of finished surface.
- F. Where electrical identification markings and devices will be concealed by acoustical ceilings and similar finishes, coordinate installation of these items before ceiling installation.

## **PART 2 - PRODUCTS**

### **2.1 SAFETY CONSIDERAT FOR OUTDOOR SUBSTAT**

- A. Signage: Provide warning signage in English, and/or pictograph indicating "DANGER — HIGH VOLTAGE" according to signage requirements of Section 11.8.

- B. Metal Enclosures: Use metal enclosures around all live parts.
- C. Locks: Provide key interlocks on switchgear doors to prevent access to live parts.
- D. Clearances: Refer to the Latest Edition of the Philippine Electrical Code and National Electrical Safety Code (ANSI C.2) for adequate clearances.

## **2.2 RACEWAYS/CONDUITS & FITTINGS**

- A. EMT: ANSI C80.3, zinc-coated steel, with compression fittings.
- B. FMC: Zinc-coated steel. ,
- C. LFMC: Zinc-coated steel with sunlight-resistant and mineral-oil-resistant plastic jacket.
- D. RNC: NEMA TC 2, Schedule 40 PVC, with NEMA TC3 fittings.
- E. IMC: ANSI C80.6, UL safety standard 1242, coated in hot galvanized coating on exterior.
- F. Raceway Fittings: Specifically designed for the raceway type used.

## **2.3 CONDUCTORS**

- A. Conductors, 3.5mm<sup>2</sup> and Smaller: Stranded copper.
- B. Conductors, Larger Than 3.5mm<sup>2</sup>: Stranded copper.
- C. Insulation: Thermoplastic, rated at 75 deg. C minimum.
- D. Wire Connectors and Splices: Units of size, ampacity rating, material, type, and class suitable for service indicated.

## **2.4 SUPPORTING MATERIALS**

- A. Material: Cold-formed steel, with corrosion-resistant coating acceptable to authorities having jurisdiction.
- B. Metal Items for Use Outdoors or in Damp Location: Hot-dip galvanized steel.
- C. Slotted-Steel Channel Supports: Flange edges turned toward web, and 14-mm-diameter slotted holes at a maximum of 50 mm o.c., in webs.
- D. Slotted-Steel Channel Supports: Comply with "Metal Fabricat" for slotted channel framing.

1. Channel Thickness: Selected to suit structural loading.
  2. Fittings and Accessories: Products of the same manufacturer as channel supports.
- E. Nonmetallic Channel and Angle Systems: Structural-grade, factory-formed, glass-fiber-resin channels and angles with 14-mm- diameter holes at a maximum of 203 mm o.c., in at least one surface.
3. Fittings and Accessories: Products of the same manufacturer as channels and angles.
  4. Entire electrical system shall be fully rated.
- F. Raceway and Cable Supports: Manufactured clevis hangers, riser and strut clamps, straps, ceiling trapeze hangers, wall brackets, and spring-steel clamps or click-type hangers.
- G. Pipe Sleeves: ASTM A 53, Type E, Grade A, Schedule 40, galvanized steel, plain ends.
- H. Cable Supports for Vertical Conduit: Factory-fabricated assembly consisting of threaded body and insulating wedging plug for non-armored electrical cables in riser conduits. Plugs have number and size of conductor gripping holes as required to suit individual risers. Body constructed of malleable-iron casting with hot-dip galvanized finish.
- I. Expansion/Anchor: Carbon-steel wedge or sleeve type.
- J. Toggle Bolts: All-steel springhead type.
- K. Powder-Driven Threaded Studs: Heat-treated steel.

## **2.5 CONCRETE BASES**

- A. Concrete Forms and Reinforcement Materials:
- B. Concrete: 20.7-MPa, 28-day compressive

## **2.6 TOUCHUP PAINT**

- A. For Equipment: Equipment manufacturer's paint selected to match installed equipment finish.
- B. Galvanized Surfaces: Zinc-rich paint recommended by item manufacturer.
- C. Prevention of Corrosion: For all outdoor applicat and all indoor applicat in a harsh environment (salt air). Metallic materials shall be protected against

corrosion. Equipment enclosures shall have the standard finish and corrosion resistant coating by the manufacturer when used for most indoor installation.

- D. Panelboards: Ability to remove access covers is required for maintenance activities. No equipment shall be mounted within 900 mm of the front of the panel.
- E. Field Testing: Final test data shall be provided to the COR for forwarding to the Systems Engineer/Condition Monitoring Office/Predictive Testing Group for inclusion in the Maintenance Database.

## **2.7 SLEEVES FOR RACEWAYS AND CABLES**

- A. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, galvanized steel, plain ends.
- B. Cast-Iron Pipe Sleeves: Cast or fabricated "wall pipe," equivalent to ductile-iron pressure pipe, with plain ends and integral water stop, unless otherwise indicated.
- C. Sleeves for Rectangular Openings: Galvanized sheet steel with minimum 1.3- or 3.5-mm(0.052- or 0.138-inch) thickness as indicated and of length to suit application.
- D. Coordinate sleeve selection and application with selection and application of fire stopping.

## **2.8 SLEEVE SEALS**

- A. Description: Modular sealing device, designed for field assembly, to fill annular space between sleeve and raceway or cable.
  - 5. Sealing Elements: EPDM interlocking links shaped to fit surface of cable or conduit. Include type and number required for material and size of raceway or cable.
  - 6. Pressure Plates: Stainless steel. Include two for each sealing element.
  - 7. Connecting Bolts and Nuts: Stainless steel of length required to secure pressure plates to sealing elements. Include one for each sealing element.

## **PART 3 - EXECUTION**

### **3.1 COMMON REQUIREMENTS FOR ELECTRICAL INSTALLATION**

- A. Comply with NECA 1.
- B. Measure indicated mounting heights to bottom of unit for suspended items and to center/top of unit for wall-mounting items.
- C. Headroom Maintenance: If mounting heights or other location criteria are not indicated, arrange and install components and equipment to provide maximum possible headroom consistent with these requirements.
- D. Equipment: Install to facilitate service, maintenance, and repair or replacement of components of both electrical equipment and other nearby installation. Connect in such a way as to facilitate future disconnecting with minimum interference with other items in the vicinity.
- E. Right of Way: Give to raceways and piping systems installed at a required slope.
- F. Electrical equipment shall be designed and rated to operation in unusual environmental condition such as wind-blown sand, salt atmosphere, flooding, ultraviolet rays due to altitude, high winds, etc. Where standard ratings are not available to match environmental condition, equipment shall be derated as required to compensate for factors such as high altitude and ambient temperature. Equipment installed in conditioned spaces shall be designed and rated for the conditioned ambient.

### **3.2 RACEWAY APPLICATION**

- A. Use the following raceways for outdoor installation:
  - 1. Exposed: IMC or EMT (with corrosion resistant coating)
  - 2. Concealed: RNC
  - 3. Underground, Single Run: uPVC.
  - 4. Connection to Vibrating Equipment: LFMC.
  - 5. Boxes and Enclosures: NEMA 250 for boxes and Type 4x for enclosures. unless otherwise indicated.
- B. Use the following raceways for indoor installation:
  - 6. Exposed: IMC or EMT



7. Concealed: RNC
8. Connection to Vibrating Equipment: FMC; except in wet or damp location, use LFMC.
9. Damp or Wet Location: IMC.
10. Boxes and Enclosures: NEMA 250 for boxes, and Type 1 for enclosures, unless otherwise indicated.

### 3.3 RACEWAY AND CABLE INSTALLATION

- A. Conceal raceways and cables, unless otherwise indicated, within finished walls, ceilings, and floors.
- B. Install raceways and cables at least 150 mm away from parallel runs of water pipes. Location horizontal raceway runs above water piping.
- C. Use temporary raceway caps to prevent foreign matter from entering.
- D. Make conduit bends and offsets so ID is not reduced. Keep legs of bends in the same plane and straight legs of offsets parallel, unless otherwise indicated.
- E. Use raceway and cable fittings compatible with raceways and cables and suitable for use and location.
- F. Install raceways embedded in slabs in middle third of slab thickness where practical, and leave at least 25-mm-concrete cover.
  1. Secure raceways to reinforcing rods to prevent sagging or shifting during concrete placement/pouring.
  2. Space raceways laterally to prevent voids in concrete.
  3. Make bends in exposed parallel or banked runs from same centerline to make bends parallel. Use factory elbows only where elbows can be installed parallel; otherwise, provide field bends for exposed parallel raceways.
- G. Install pull string in empty raceways. Use monofilament/nylon plastic line with not less than (90-kg) tensile strength. Leave at least (300 mm) of slack at each end of the pull wire.
- H. Install telecommunication and signal system raceways, 50 mm and smaller, in maximum lengths of 45 m and with a maximum of two 90-degree bends or equivalent. Separate lengths with pull or junction boxes where necessary to comply with these requirements in addition to requirements above.

- I. Connect motors and equipment subject to vibration, noise transmission, or movement with a maximum of 1830-mm flexible conduit. Install LFMC in wet or damp location. Install separate ground conductor across flexible connect.
- J. Set floor boxes level and trim after installation to fit flush to finished floor surface.

### **3.4 WIRING METHODS FOR POWER, LIGHTING, AND CONTROL CIRCUITS**

- A. Feeders: Type THHN/THWN insulated conductors in raceway.
- B. Underground Feeders and Branch Circuits: Type THWN insulated conductors in raceway.
- C. Branch Circuits: Type THHN/THWN insulated conductors in raceway.
- D. Remote-Control Signaling and Power-Limited Circuits: Type THHN/THWN insulated conductors in raceway for Classes 1, 2, and 3, unless otherwise indicated.
- E. LVSG: Type THHN/THWN insulated conductors in raceway and Type "SIS" for control circuits.

### **3.5 WIRING INSTALLATION**

- A. Install splices and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than un-spliced conductors.
- B. Install wiring at outlets with at least 300 mm of slack conductor at each outlet. Pig tailing conductors is not permitted.
- C. Connect outlet and component connect to wiring systems and to ground. 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.

### **3.6 ELECTRICAL SUPPORTING MATERIALS APPLICATION**

- A. Damp Location and Outdoors: Hot-dip galvanized materials or nonmetallic, U-channel system components.
- B. Dry Location: Steel materials.
- C. Support Clamps for PVC Raceways: Click-type clamp system.

- D. Selection of Supports: Comply with manufacturer's written instruct.
- E. Strength of Supports: Adequate to carry present and future loads, times a safety factor of at least four; minimum of 90-kg design load.

### 3.7 SUPPORT INSTALLATION

- A. Install support devices to securely and permanently fasten and support electrical components.
- B. Install individual and multiple raceway hangers and riser clamps to support raceways. Provide Clamps, Attachments, and other hardware necessary for hanger assemblies and for securing hanger rods and conduits.
- C. Support parallel runs of horizontal raceways together on trapeze- or bracket-type hangers.
- D. Size supports for multiple raceway installation so capacity can be increased by a 25 percent minimum in the future.
- E. Support individual horizontal raceways with separate, malleable-iron pipe hangers or clamps.
- F. Install 6-mm diameter or larger threaded steel hanger rods, unless otherwise indicated.
- G. Spring-steel fasteners specifically designed for supporting single conduits or tubing may be used instead of malleable-iron hangers for 38-mm and smaller raceways serving lighting and receptacle branch circuits above suspended ceilings and for fastening raceways to slotted channel and angle supports.
- H. Arrange supports in vertical runs so the weight of raceways and enclosed conductors is carried entirely by raceway supports, with no weight load on raceway terminals.
- I. Simultaneously install vertical raceway supports with conductors.
- J. Separately support cast boxes that are threaded to raceways and used for fixture support. Support sheet-metal boxes directly from the building structure or by bar hangers. If bar hangers are used, attach bar to raceways on opposite sides of the box and support the raceway with an approved fastener not more than 610 mm from the box.
- K. Install metal channel racks for mounting cabinets, panelboards, disconnect switches, control enclosures, pull and junction boxes, transformers, and other devices unless components are mounted directly to structural elements of adequate strength.

- L. Install sleeves for cable and raceway penetration of concrete slabs and walls unless core-drilled holes are used. Install sleeves for cable and raceway penetration of masonry and fire-rated gypsum walls and of all other fire-rated floor and wall assemblies. Install sleeves during erection of concrete and masonry walls.
- M. Securely fasten electrical items and their supports to the building structure, unless otherwise indicated. Perform fastening according to the following unless other fastening methods are indicated:
  - 1. Masonry: Toggle bolts on hollow masonry units and expansion bolts on solid masonry units.
  - 2. New Concrete: Concrete inserts with machine screws and bolts.
  - 3. Existing Concrete: Expansion bolts.
  - 4. Instead of expansion bolts, threaded studs driven by a powder charge and provided with lock washers may be used in existing concrete.
  - 5. Steel: Welded threaded studs or spring-tension clamps on steel.
    - a. Field Welding: Comply with AWS D1.1.
  - 6. Welding to steel structure may be used only for threaded studs, not for conduits, pipe straps, or other items.
  - 7. Light Steel: Sheet-metal screws.
  - 8. Fasteners: Select so the load applied to each fastener does not exceed 25 percent of its proof-test load.

### **3.8 IDENTIFICATION MATERIALS AND DEVICES**

- A. Install at location for most convenient viewing without interference with operation and maintenance of equipment.
- B. Coordinate names, abbreviat, colors, and other designat used for electrical identification with corresponding designat indicated in the Contract Documents or required by codes and standards. Use consistent designat throughout Project.
- C. Self-Adhesive Identification Products: Clean surfaces before applying.
- D. Tag and label circuits designated to be extended in the future. Identify source and circuit numbers in each cabinet, pull and junction box, and outlet box. Color-coding may be used for voltage and phase identification.

- E. Install continuous underground detectable (WARNING tapes) during trench backfilling, for exterior underground power, control, signal, and communication lines located directly above power and communication lines. Location **150 to 200 mm** below finished grade. If width of multiple lines installed in a common trench or concrete envelope does not exceed **400 mm**, overall, use a single line marker.
- F. Color-code 480/230 Volts system secondary service, feeder, and branch-circuit conductors throughout the secondary electrical system as follows:
  - 1. Phase A: Black
  - 2. Phase B: Red
  - 3. Phase C: Yellow
  - 4. Neutral: White
  - 5. Ground: Green
- G. Install warning, caution, and instruction signs where required and needed to ensure safe operation and maintenance of electrical systems and associated systems. Install engraved plastic-laminated instruction signs where instruct are needed for system or equipment operation. Install metal-backed butyrate signs for outdoor items.
- H. Install engraved-laminated emergency-operation signs with white letters on red background with minimum **9-mm-high** lettering for emergency instruct on power transfer, load shedding, and other emergency operation.

### **3.9 UTILITY COMPANY ELECTRIC-METERING EQUIPMENT**

- A. Install equipment according to utility company's requirements. Provide grounding and empty conduits as required by utility company.

### **3.10 FIRESTOPPING**

- A. Apply fire stopping to cable and raceway penetration of fire-rated floor and wall assemblies to achieve fire-resistance rating of the assembly.

### **3.11 CONCRETE BASES/PADS**

- A. Construct concrete bases of dimens indicated, but not less than **100 mm (4 inches)** wider, in lateral direct, than supported unit. Follow supported equipment manufacturer's anchorage recommendation and setting templates for anchor-bolt and tie location, unless otherwise indicated. Use **20.7-MPa**, 28-day compressive-strength concrete and reinforcement as specified in Division Section "Cast-in-Place Concrete."

### **3.12 FIELD QUALITY CONTROL**

- A. Inspect installed components for damage and faulty work, including the following:
  - 1. Raceways.
  - 2. Building wire and connectors.
  - 3. Supporting materials for electrical components.
  - 4. Electrical identification.
  - 5. Electric-metering components.
  - 6. Concrete bases.
  - 7. Electrical demolition/dismantling.
  - 8. Cutting and patching for electrical construction.
  - 9. Touchup painting.

### **REFINISHING AND TOUCHUP PAINTING**

- A. Refinish and touch up paint. Paint materials and application requirements are specified in Division Section "Painting."
- 10. Clean damaged and disturbed areas and apply primer, intermediate, and finish coats to suit the degree of damage at each location.
- 11. Follow paint manufacturer's written instructions for surface preparation and for timing and application of successive coats.
- 12. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
- 13. Repair damage to PVC or paint finishes with matching touchup coating recommended by manufacturer.

**Electrical Contractor must submit short circuit calculation, load flow analysis, arch flash, protective coordination study with TCC diagram before energized the system.**

## **PART 4 - GENERAL (CONDUCTORS & CABLES)**

### **4.1 SUMMARY**

- A. This Section includes building wires and cables and associated connectors, splices, and terminations for wiring systems rated 600 V and less.

- B. Related Sect include the following:
  - 1. Division 26-series Sect for single-conductor and multi-conductor cables, cable splices, and terminat for electrical distribution systems with 2001 to 35,000 V.

#### **4.2 QUALITY ASSURANCE**

- A. Testing Agency Qualificat: Testing agency as defined by OSHA in 29 CFR 1910.7 or a member company of the International Electrical Testing Association and that is acceptable to authorities having jurisdiction.
  - 1. Testing Agency's Field Supervisor: Person currently certified by the International Electrical Testing Association or the National Institute for Certification in Engineering Technologies to supervise on-site testing specified in Part 3.
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in PEC 2009, Article 1.1, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- C. Comply with the Latest Edition of Philippine Electrical Code (PEC).

### **PART 5 - PRODUCTS**

#### **5.1 CONDUCTORS AND CABLES**

- A. Conductor Material: Copper only complying with NEMA WC 5 or 7; stranded conductor for 2.0 mm diameter only, stranded for 3.5 mm<sup>2</sup> and larger. Copper shall be 99 percent conductivity and hard drawn.
- B. Conductor Insulation Types: Type THHN-THWN, THW and XLPE.

#### **5.2 CONNECTORS AND SPLICES**

- A. Description: Factory-fabricated connectors and splices of size, ampacity rating, material, type, and class for application and service indicated.

### **PART 6 - EXECUTION**

#### **6.1 CONDUCTOR AND INSULATION APPLICAT**

- A. Exposed Feeders: Type THHN-THWN, single conductors in raceway.
- B. Feeders Concealed in Ceilings, Walls, and Partition: Type THHN-THWN and THW, single conductors in raceway.
- C. Feeders Concealed in Concrete, below Slabs-on-Grade, and in Crawlspace: Type THHN-THWN and THW, single conductors in raceway.

- D. Exposed Branch Circuits, including in Crawlspace: Type THHN-THWN and THW, group conductors in raceway.
- E. Branch Circuits Concealed in Ceilings, Walls, and Partition: Type THHN-THWN and THW, group conductors in raceway.
- F. Branch Circuits Concealed in Concrete and below Slabs-on-Grade: Type THHN-THWN and THW, group conductors in raceway.
- G. Underground Feeders and Branch Circuits: Type THHN-THWN and THW, group conductors in raceway.
- H. Fire Alarm Circuits: Fire Alarm Cable mineral insulation, in raceway.
- I. Class 1 Control Circuits: Type THHN-THWN, in raceway.
- J. Class 2 Control Circuits: Type THHN-THWN, in raceway.
- K. Neutral Conductor: Where a secondary distribution system requires a neutral conductor, a full-sized neutral conductor shall be used throughout the system, such that that neutral conductor is not shared with any other branch circuit or feeder. If the secondary distribution system supports computers or other equipment that generates harmonics, double size neutrals shall be run from the subpanel boards feeding this equipment back to the MDP or service entrance. Neutral buses shall be sized to accommodate these conductors. Insulated equipment grounding conductors run with branch circuits shall be installed such that that conductor is not shared with any other branch circuit.

## **6.2 INSTALLATION**

- A. Conceal cables in finished walls, ceilings, and floors, unless otherwise indicated.
- B. Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tens and sidewall pressure values.
- C. Use pulling means; including fish tape, cable, rope, and basket-weave wire/cable grips that will not damage cables or raceway.
- D. Install exposed cables parallel and perpendicular to surfaces of exposed structural members, and follow surface contours where possible.
- E. Support cables according to Section 26 00 00 "Basic Electrical Materials and Methods".
- F. Seal around cables penetrating fire-rated elements according to Section 26 00 00 Part 3.10 "Fire Stopping".



- G. Identify and color-code conductors and cables according to Section 26 00 00 Part 3.8 "Identification Materials and Devices".
- H. Install outdoor underground feeders in concrete encased duct bank.
- I. Each electronic equipment rack shall be fed by an individual circuit breaker protected branch circuit.

### **6.3 CONNECT**

- A. 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.
- B. Make splices and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than unspliced conductors.
  - 1. Use oxide inhibitor in each splice and tap conductor for aluminum conductors.
- C. Wiring at Outlets: Install conductor at each outlet, with at least 300 mm of slack.

### **6.4 FIELD QUALITY CONTROL**

- A. Testing: Perform the following field quality-control testing:
  - 1. After installing conductors and cables and before electrical circuitry has been energized, test for compliance with requirements.
  - 2. Perform each electrical test and visual and mechanical inspection stated in NETA ATS, Section 7.3.1. Certify compliance with test parameters.
- B. Test Reports: Prepare a written report to record the following:
  - 1. Test procedures used.
  - 2. Test results that comply with requirements.
  - 3. Test results that do not comply with requirements and corrective action taken to achieve compliance with requirements.

## **PART 7 - GENERAL (GROUNDING & BONDING)**

### **7.1 SUMMARY**

- A. This Section includes grounding of electrical systems and equipment. Grounding requirements specified in this Section may be supplemented by special requirements of systems described in other Sect.

- B. Standards and Code References:
  - 1. PEC – Philippine Electrical Code, Latest Edition

## **7.2 QUALITY ASSURANCE**

- A. Testing Agency Qualificat: Testing agency as defined by OSHA in 29 CFR 1910.7 or a member company of the International Electrical Testing Association and that is acceptable to authorities having jurisdiction.
  - 1. Testing Agency's Field Supervisor: Person currently certified by the International Electrical Testing Association to supervise on-site testing specified in Part 3.
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in PEC 2009, Article 1.1, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- C. Comply with PEC 2009, Article 2.90 when interconnecting with lightning protection system.

## **PART 8 - PRODUCTS**

### **8.1 GROUNDING CONDUCTORS**

- A. For insulated conductors, comply with Section 26 01 01 "Conductors and Cables."
- B. Material: Aluminum, copper-clad aluminum, and copper.
- C. Equipment Grounding Conductors: Insulated with green-colored insulation.
- D. Grounding Electrode Conductors: Stranded copper cable.
- E. Underground Conductors: Bare, tinned, stranded, unless otherwise indicated.
- F. Bare Copper Conductors: Comply with the following:
  - 1. Solid Conductors: ASTM B 3.
  - 2. Assembly of Stranded Conductors: ASTM B 8.
  - 3. Tinned Conductors: ASTM B 33.
- G. Copper Bonding Conductors: As follows:
  - 1. Bonding Cable: 100 mm<sup>2</sup> copper conductor.
  - 2. Bonding Conductor: 30 mm<sup>2</sup> or 16 mm<sup>2</sup>, stranded copper conductor.

3. Bonding Jumper: Bare copper tape, braided bare copper conductors, terminated with copper ferrules; 42 mm wide and 1.5 mm thick.
  4. Tinned Bonding Jumper: Tinned-copper tape, braided copper conductors, terminated with copper ferrules; 42 mm wide and 1.5 mm thick.
- H. Grounding Bus: Bare, annealed copper bars of rectangular cross section, with insulators as shown on drawings.

## 8.2 CONNECTOR PRODUCTS

- A. Comply with IEEE 837 and UL 467; listed for use for specific types, sizes, and combinat of conductors and connected items.
- B. Bolted Connectors: Bolted-pressure-type connectors, or compression type.
- C. Welded Connectors: Exothermic-welded type, in kit form, and selected per manufacturer's written instruct.

## 8.3 GROUNDING ELECTRODES

- A. Ground Rods: Copper
- B. Ground Rods
  1. Size: 21 mm diameter by 3000 mm long
- C. Test Wells: Provide handholes as shown in the drawings.

# PART 9 - EXECUTION

## 9.1 APPLICATION

- A. Use only copper conductors for both insulated and bare grounding conductors in direct contact with earth, concrete, masonry, crushed stone and similar materials.
- B. In raceways, use insulated equipment-grounding conductors.
- C. Exothermic-Welded Connect: Use for connect to structural steel and for underground connect, except those at test wells.
- D. Equipment Grounding Conductor Terminat: Use bolted pressure clamps.
- E. Ground Rod Clamps at Test Wells: Use bolted pressure clamps with at least two bolts.

- F. Grounding Bus: Install in electrical room and in rooms housing service equipment, and elsewhere as indicated.
  - 1. Use insulated spacer; space 25.4 mm from wall and support from wall 150 mm above finished floor, unless otherwise indicated.
  - 2. At doors, route the bus up to the top of the doorframe, across the top of the doorway, and down to the specified height above the floor.
- G. Underground Grounding Conductors: Use bare-copper conductor, 95 mm<sup>2</sup> minimum. Bury at least 600 mm below grade or bury 300 mm above duct bank when installed as part of the duct bank.

## 9.2 EQUIPMENT GROUNDING CONDUCTORS

- A. Comply with PEC, Article 2.50, for types, sizes, and quantities of equipment grounding conductors, unless specific types, larger sizes, or more conductors than required by PEC are indicated.
- B. Install equipment grounding conductors in all feeders and circuits.
- C. Install insulated equipment grounding conductor with circuit conductors for the following items, in addition to those required by PEC:
  - 1. Feeders and branch circuits.
  - 2. Lighting circuits.
  - 3. Receptacle circuits.
  - 4. Single-phase motor and appliance branch circuits.
  - 5. Three-phase motor and appliance branch circuits.
  - 6. Flexible raceway runs.
- D. Busway Supply Circuits: Install insulated equipment grounding conductor from the grounding bus in the switchgear, switchboard, or distribution panel to equipment grounding bar terminal on busway.
- E. Computer Outlet Circuits: Install insulated equipment grounding conductor in branch-circuit runs from computer-area power panels or power-distribution units.
- F. Isolated Grounding Receptacle Circuits: Install an insulated equipment grounding conductor connected to the receptacle grounding terminal. Isolate grounding conductor from raceway and from panelboard grounding terminals. Terminate at equipment grounding conductor terminal of the applicable derived system or service, unless otherwise indicated.

Isolated Equipment Enclosure Circuits: For designated equipment supplied by a branch circuit or feeder, isolate equipment enclosure from supply raceway with a nonmetallic raceway fitting listed for the purpose. Install fitting where raceway enters enclosure, and install a separate equipment grounding conductor. Isolate equipment grounding conductor from raceway and from panelboard grounding terminals. Terminate at equipment grounding conductor terminal of the applicable derived system or service, unless otherwise indicated.

- G. Nonmetallic Raceways: Install an equipment grounding conductor in nonmetallic raceways unless they are designated for communication cables.
- H. Air-Duct Equipment Circuits: Install an equipment grounding conductor to duct-mounted electrical devices operating at 230 V, 60 Hz and more, including air cleaners and heaters. Bond conductor to each unit and to air duct.
- I. Signal and Communication Systems: For alarm, voice, data, and other communication systems, provide insulated grounding conductor in raceway from grounding electrode system to each service location, terminal cabinet, telecommunication rooms, and central equipment location.
- J. Metal Poles Supporting Outdoor Lighting Fixtures: Provide a grounding electrode in addition to installing a separate equipment grounding conductor with supply branch-circuit conductors.
- K. Common Ground Bonding with Lightning Protection System: Bond electrical power system ground directly to lightning protection system grounding conductor at closest point to electrical service grounding electrode. Use bonding conductor sized same as system grounding electrode conductor, and install in conduit.

### 9.3 COUNTERPOISE

- A. Ground the steel framework of the building with a driven ground rod at the base of every corner column and at intermediate exterior columns at distances not more than 18 m apart. Provide a grounding conductor (counterpoise), electrically connected to each ground rod and to each steel column, extending around the perimeter of the building. Use tinned-copper conductor not less than 100 mm<sup>2</sup> for counterpoise and for tap to building steel. Bury counterpoise not less than 450 mm below grade and 600 mm from building foundation.

### 9.4 INSTALLATION

- A. Ground Rods: Install at least three rods spaced at least one-rod length from each other and located at least the same distance from other grounding electrodes.

1. Drive ground rods until tops are 305 mm below finished floor or final grade, unless otherwise indicated.
2. Interconnect ground rods with grounding electrode conductors. Use exothermic welds, except at test wells and as otherwise indicated. Make connect without exposing steel or damaging copper coating.

- B.** Grounding Conductors: Route along shortest and straightest paths possible, unless otherwise indicated. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.

Bonding Straps and Jumpers: Install so vibration by equipment mounted on vibration isolation hangers and supports is not transmitted to rigidly mounted equipment. Use exothermic-welded connectors for outdoor location, unless a disconnect-type connection is required; then, use a bolted clamp. Bond straps directly to the basic structure taking care not to penetrate any adjacent parts. Install straps only in location accessible for maintenance.

- C.** Metal Water Service Pipe: Provide insulated copper grounding conductors, in conduit, from building's main service equipment, or grounding bus, to main metal water service entrances to building. Connect grounding conductors to main metal water service pipes by grounding clamp connectors. Where a dielectric main water fitting is installed, connect grounding conductor to street side of fitting. Bond metal grounding conductor conduit or sleeve to conductor at each end.
- D.** Water Meter Piping: Use braided-type bonding jumpers to electrically bypass water meters. Connect to pipe with grounding clamp connectors.
- E.** Bond interior metal piping systems and metal air ducts to equipment grounding conductors of associated pumps, fans, blowers, electric heaters, and air cleaners. Use braided-type bonding straps.
- F.** Bond each aboveground portion of gas piping system upstream from equipment shutoff valve.
- G.** Install one test well for each service at the ground rod electrically closest to the service entrance. Set top of well flush with finished grade or floor.
- H.** Under Ground (Concrete-Encased Grounding Electrode): Fabricate according to PEC, using a minimum of 6 m of bare copper conductor not smaller than 30 mm<sup>2</sup>. If concrete foundation is less than 6 m long, coil excess conductor within the base of the foundation. Bond grounding conductor to reinforcing steel in at least four location and to anchor bolts. Extend grounding conductor below grade and connect to building grounding grid or to a grounding electrode external to concrete.

## 9.5 CONNECT

- I. General: Make connect so galvanic action or electrolysis possibility is minimized. Select connectors, connection hardware, conductors, and connection methods so metals in direct contact will be galvanically compatible.
  - 1. Use electroplated or hot-tin-coated materials to ensure high conductivity and to make contact points closer to order of galvanic series.
  - 2. Make connect with clean, bare metal at points of contact.
  - 3. Make aluminum-to-steel connect with stainless-steel separators and mechanical clamps.
  - 4. Make aluminum-to-galvanized steel connect with tin-plated copper jumpers and mechanical clamps.
  - 5. Coat and seal connect having dissimilar metals with inert material to prevent future penetration of moisture to contact surfaces.
- J. Exothermic-Welded Connect: Comply with manufacturer's written instruct. Welds that are puffed up or that show convex surface indicating improper cleaning are not acceptable.
- K. Equipment Grounding Conductor Terminat: For 10mm<sup>2</sup> and larger, use pressure-type grounding lugs. 10mm<sup>2</sup> and smaller grounding conductors may be terminated with winged pressure-type connectors.
- L. Noncontact Metal Raceway Terminat: If metallic raceways terminate at metal housings without mechanical and electrical connection to housing, terminate each conduit with a grounding bushing. Connect grounding bushings with a bare grounding conductor to grounding bus or terminal in housing. Bond electrically non-continuous conduits at entrances and exits with grounding bushings and bare grounding conductors, unless otherwise indicated.
- M. Connect at Test Wells: Use compression-type connectors on conductors and make bolted- and clamped-type connect between conductors and ground rods.
- N. Tighten screws and bolts for grounding and bonding 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.
- O. Compression-Type Connect: Use hydraulic compression tools to provide correct circumferential pressure for compression connectors. Use tools and dies recommended by connector manufacturer. Provide embossing die

code or other standard method to make a visible indication that a connector has been adequately compressed on grounding conductor.

- P. Moisture Protection: If insulated grounding conductors are connected to ground rods or grounding buses, insulate entire area of connection and seal against moisture penetration of insulation and cable.

## 9.6 UNDERGROUND DISTRIBUTION SYSTEM GROUNDING

- Q. Duct Banks: Install a grounding conductor with at least 50 percent ampacity of the largest phase conductor in the duct bank.
- R. Manholes and Handholes: Install a driven ground rod close to wall and set rod depth so 100 mm will extend above finished floor. If necessary, install ground rod before manhole is placed and provide an 80mm<sup>2</sup> bare, tinned-copper conductor from ground rod into manhole through a waterproof sleeve in manhole wall. Protect ground rods passing through concrete floor with a double wrapping of pressure-sensitive tape or heat-shrunk insulating sleeve from 50 mm above to 150 mm below concrete. Seal floor opening with waterproof, nonshrink grout.
- S. Connect to Manhole Components: Connect exposed-metal parts, such as inserts, cable racks, pulling irons, ladders, and cable shields within each manhole or handhole, to ground rod or grounding conductor. Make connect with 25mm<sup>2</sup> minimum, stranded, hard-drawn copper conductor. Train conductor's level or plumb around corners and fasten to manhole walls. Connect to cable armor and cable shields as recommended by manufacturer of splicing and termination kits.

Pad-Mounted Transformers and Switches: Install two ground rods and counterpoise circling pad. Ground pad-mounted equipment and noncurrent-carrying metal items associated with substat by connecting them to underground cable and grounding electrodes. Use tinned- copper conductor not less than 35mm<sup>2</sup> for counterpoise and for taps to equipment ground pad. Bury counterpoise not less than 450 mm below grade and 150 mm from the foundation.

## 9.7 FIELD QUALITY CONTROL

- A. Testing: Engage a qualified testing agency to perform the following field quality-control testing:
- B. Testing: Perform the following field quality-control testing:
  1. After installing grounding system but before permanent electrical circuitry has been energized, test for compliance with requirements.



2. Test completed grounding system at each location where a maximum ground-resistance level is specified, at service disconnect enclosure grounding terminal, and at ground test wells. Measure ground resistance not less than two full days after the last trace of precipitation, and without the soil being moistened by any means other than natural drainage or seepage and without chemical treatment or other artificial means of reducing natural ground resistance. Perform tests, by the fall-of-potential method according to IEEE 81.
3. Provide drawings locating each ground rod and ground rod assembly and other grounding electrodes, identify each by letter in alphabetical order, and key to the record of tests and observat. Include the number of rods driven and their depth at each location and include observat of weather and other phenomena that may affect test results. Describe measures taken to improve test results. Maximum valve of ground resistance is 5 ohms.
4. Excessive Ground Resistance: If resistance to ground exceeds specified values, drive additional ground rods until resistance meets specified values.

## **PART 10 - GENERAL (WIRING DEVICES)**

### **10.1 SUMMARY**

- A. This Section includes the following:
  1. Single and duplex receptacles, ground-fault circuit interrupters, and integral surge suppression units.
  2. Single- and double-pole snap switches and dimmer switches.
  3. Device wall plates.
  4. Floor service outlets and multioutlet assemblies.

### **10.2 ACRONYMS & ABBREVIAT**

- A. EMI: Electromagnetic interference.
- B. GFCI: Ground-fault circuit interrupter.
- C. PVC: Polyvinyl chloride.
- D. TVSS: Transient voltage surge suppressor.

### **10.3 SUBMITTALS**

- A.** Product Data: For each type of product indicated.
- B.** Shop Drawings: List of legends and description of materials and process used for premarking wall plates.
- C.** Field quality-control test reports.

### **10.4 QUALITY ASSURANCE**

- A.** Source Limitat: Obtain each type of wiring device through one source from a single manufacturer.
- B.** Electrical Components, Devices, and Accessories: Listed and labeled as defined in PEC 2009, Article 1.1 and marked for intended use.
- C.** Comply with the Latest Edition of Philippine Electrical Code (PEC).

## **PART 11 - PRODUCTS**

### **11.1 WIRING DEVICES, GENERAL**

- A.** Wiring Devices: Provide U.S. NEMA type wiring devices and associated devices, boxes, and covers. Receptacles other than 230-volt general-purpose convenience outlets shall be marked on the cover plates with voltage, amperage, phase, and frequency. Matching plugs shall be provided.
- B.** Wire and Cable: Select types of insulation according to the application. See the PEC for insulation types, operationing temperatures, ambient temperature, and voltage classes. Cable and wire sizes, types, and insulation shall be properly specified by the A/E using Philippine standards in order to obtain the highest quality transmission for security, data, and other signal cables. Provide solid conductors for conductors sized 5.5 mm<sup>2</sup> and smaller. Provide stranded conductors for conductors sized 8.0 mm<sup>2</sup> and larger. Provide copper branch circuits and feeder conductors sized at 125 percent of full load capacity. Use full-sized neutral conductor and a separate ground conductor for each circuit. Circuits and feeders that supply power for electronic equipment may require an oversized neutral to compensate for high harmonic neutral currents. Such feeders must be identified in the design and the neutral increased to a minimum of two times full rated size. Non-metallic sheathed cable ("Romex") is prohibited, and armored or metal clad cable, Types AC or MC is prohibited except as permitted in limited applicat by DE/EEB.
- C.** Overload Protection: Copper conductors shall be provided overload protection in accordance with NEC Table 310-6. Overload protection shall

not exceed 15A for 2.5 mm<sup>2</sup> conductors, 20A for 3.5 mm<sup>2</sup> conductors or 30A for 5.5 mm<sup>2</sup> conductors.

## 11.2 RECEPTACLES

- A. Receptacles, General: General-purpose receptacles shall be installed on 15 and 20-amp branch circuits, and shall be of the grounding type with effective grounding contacts. NEMA type 5-20R receptacles, 20A, 300 Volts rated shall be used in all spaces. Flexible arrangements, such as for floor outlets or cable trays in office areas shall be provided to allow for partition rearrangement. An under floor duct system shall not be used. G.F.C.I. protection shall be provided for receptacles in bathrooms, kitchen, and other wet areas and outdoors per PEC requirements. G.F.C.I. circuit breakers may be required in lieu of protection at the receptacle. Provide receptacle outlet as indicated in the plan.
- B. Straight-Blade and Twist Locking Receptacles: Heavy-Duty grade. NEMA 6-20R, 20A, 400 Volts rated.
- C. GFCI Receptacles shall not be used. Outlets designated for GFCI protection shall be fed from a GFCI circuit breaker. One GFCI breaker, rated for 10mA ground fault trip, 60Hz, 230V (line to neutral) shall be installed in an enclosure adjacent to the first receptacle in the branch circuit. This breaker will provide ground fault protection for all receptacles in the circuit.
- D. Provide one 20 A and one 15 A cord plug cap for each duplex receptacle, and two of each for each quadruplex receptacle. Plug caps shall be of the grounding type, utilizing only screw terminals for terminating conductors.

## 11.3 SWITCHES

- A. Single- and Double-Pole Switches: Comply with DSCC W-C-896F.
- B. Snap Switches: Heavy-Duty grade, quiet type.

## 11.4 WALL PLATES

- A. Single and combination types to match corresponding wiring devices.
  - 1. Plate-Securing Screws: Metal with head color to match plate finish.
  - 2. Material for Finished Spaces: 1-mm- thick, brushed stainless steel.
  - 3. Material for Unfinished Spaces: Galvanized steel

### **11.5 FLOOR SERVICE FITTINGS**

- A. Type: Modular, flush-type, dual-service units suitable for wiring method used.
- B. Power Receptacle: NEMA Configuration 5-20R, unless otherwise indicated. Colors to match interior color scheme approved by the Architect.
- C. Signal Outlet: Blank cover with bushed cable opening, unless otherwise indicated.

### **11.6 FINISHES**

- A. Color:
  - 1. All device faceplate shall be approved by the Architect.

## **PART 12 - EXECUTION**

### **12.1 INSTALLATION**

- A. Install devices and assemblies level, plumb, and square with building lines.
- B. Install wall dimmers to achieve indicated rating after derating for ganging according to manufacturer's written instruct.
- C. Install unshared neutral conductors on line and load side of dimmers according to manufacturers' written instruct.
- D. Arrangement of Devices: Unless otherwise indicated, mount flush, with long dimension vertical, and with grounding terminal of receptacles on top. Group adjacent switches under single, multi-gang wall plates where possible.
- E. Remove wall plates and protect devices and assemblies during painting.
- F. Adjust location of floor service outlets to suit arrangement of partition and furnishings.

### **12.2 CONNECT**

- A. Ground equipment according to Section 26 02 01 "Grounding and Bonding."
- B. Connect wiring according to Section 26 01 01 "Conductors and Cables."

- C. 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.

### **12.3 FIELD QUALITY CONTROL**

- A. Perform the following field tests and inspect and prepare test reports:
  - 1. After installing wiring devices and after electrical circuitry has been energized, test for proper polarity, ground continuity, and compliance with requirements.
  - 2. Test GFCI operation with both local and remote fault simulat according to manufacturer's written instruct.
- B. Remove malfunctioning units, replace with new units, and retest as specified above.

## **PART 13 - GENERAL (PANELBOARDS)**

### **13.1 SUMMARY**

- A. This Section includes load centers and panel boards, overcurrent protective devices, and associated auxiliary equipment rated 600 V and less for the following types:
  - 1. Lighting and appliance branch-circuit panel boards.
  - 2. Distribution panel boards.
  - 3. Transient voltage surge suppressor panel boards.

### **13.2 ACRONYMS & ABBREVIAT**

- B. Retain abbreviat that remain after this Section has been edited.
- C. EMI: Electromagnetic interference.
- D. GFCI: Ground-fault circuit interrupter.
- E. RFI: Radio-frequency interference.
- F. RMS: Root mean square.
- G. SPDT: Single pole, double throw.
- H. TVSS: Transient voltage surge suppressor.

### 13.3 SUBMITTALS

- I. Product Data: For each type of panel board, overcurrent protective device, transient voltage suppression device, accessory, and component indicated. Include dimensions and manufacturers' technical data on features, performance, electrical characteristics, ratings, and finishes.
- J. Shop Drawings: For each panel board and related equipment.
  - 1. Dimensioned plans, elevation, section, and details. Show tabular of installed devices, equipment features, and ratings. Include the following:
    - a. Enclosure types and details.
    - b. Bus configuration, current, and voltage ratings.
    - c. Short-circuit current rating of panel boards and overcurrent protective devices.
    - d. Features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.
  - 2. Wiring Diagrams: Power, signal, and control wiring.
- K. Qualification Data: For testing agency.
- L. Field quality-control test reports including the following:
  - 1. Test procedures used.
  - 2. Test results that comply with requirements.
  - 3. Results of failed tests and corrective action taken to achieve test results that comply with requirements.
- M. Panel board Schedules: For installation in panel boards. Submit final versions after load balancing.
- N. Operation and Maintenance Data: For panel boards and components to include in emergency, operation, and maintenance manuals. Include:
  - 1. Manufacturer's written instructions for testing and adjusting overcurrent protective devices.
  - 2. Time-current curves, including selectable ranges for each type of overcurrent protective device.

### 13.4 QUALITY ASSURANCE

- A. Testing Agency Qualificat: Testing agency that is a member company of the Inter National Electrical Testing Association and that is acceptable to authorities having jurisdiction.
- B. Electrical Components, Devices, and Accessories: labeled as defined in PEC 2009, Article 1.1, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- C. Comply with NEMA PB 1.

1.2 Comply with the Latest Edition of Philippine Electrical Code (PEC).

### 13.5 PROJECT CONDITION

- A. Environmental Limitat: Rate equipment for continuous operation under the following condition, unless otherwise indicated:
  - 1. Ambient Temperature: Not exceeding 40 deg C (104 deg F).
  - 2. Altitude: Not exceeding 2000 m (6600 feet).
- B. Service Condition: NEMA PB 1, usual service condition, as follows:
  - 1. Ambient temperatures within limits specified.
  - 2. Altitude not exceeding 2000 m (6600 feet).
- C. Interruption of Existing Electric Service: Do not interrupt electric service to facilities occupied by Post or others unless permitted under the following condition and then only after arranging to provide temporary electric service according to requirements indicated:
  - 1. Notify COR no fewer than two days in advance of proposed interruption of electrical service.
  - 2. Do not proceed with interruption of electrical service without COR's written permission.
- D. Unusual Service Condition: Engine generator equipment and installation shall operation under the following condition.
  - 1. High salt-dust content in the air due to sea-spray evaporation.

### 13.6 COORDINATION

- A. Coordinate layout and installation of panel boards and components with other construction that penetrations walls or is supported by them, including electrical and other types of equipment, raceways, piping and encumbrances to workspace clearance requirements.

### 13.7 EXTRA MATERIALS

D. Keys: Six spares of each type of panel board cabinet lock.

## 14 PRODUCTS

### 14.1 FABRICATION AND FEATURES

- A. Enclosures: Flush or surface-mounted cabinets. NEMA PB 1, Type 1, to meet environmental condition at installed location.
1. Outdoor Location: NEMA 250, Type 4X.
  2. Kitchen Areas: NEMA 250, Type 4X, stainless steel.
  3. Other Wet or Damp Indoor Location: NEMA 250, Type 3R.
  4. Hazardous Areas Indicated on Drawings: NEMA 250, Type 7C.
  5. Separate neutral and grounding buses for all panel boards.
- B. Front: Secured to box with concealed trim clamps. For surface-mounted fronts, match box dimens; for flush-mounted fronts, overlap box.
- C. Hinged Front Cover: Entire front trim hinged to box and with standard door within hinged trim cover.
- D. Finish: Manufacturer's standard enamel finish over corrosion-resistant treatment or primer coat Beige Color.
- E. Directory Card: With transparent protective cover, mounted inside metal frame, inside panel board door.
- F. Bus: Hard-drawn copper, 98 percent conductivity.
- G. Bus Bars of Power Distribution and Branch Circuit Panel boards: Provide hard drawn copper. The neutral bus shall be isolated from both the ground bus and the cabinet, except at the service entrance or at the output of separately derived systems and shall be grounded in accordance with the Latest Edition of PEC.
- H. Main and Neutral Lugs: Compression type suitable for use with conductor material.
- I. Equipment Ground Bus: Adequate for feeder and branch-circuit equipment ground conductors; bonded to steel enclosure.
- J. Service Equipment Label: UL labeled for use as service equipment for panel boards with main service disconnect switches.



- K. Future Devices: Mounting brackets, bus connect, and necessary appurtenances required for future installation of devices.
- L. Isolated Equipment Ground Bus: Adequate for branch-circuit equipment ground conductors; insulated from steel enclosure.
- M. Neutral Bus: Neutral bus rated 100 percent of phase bus and suitable for nonlinear loads.
- N. Split Bus: Vertical buses divided into individual vertical sect.
- O. Skirt for Surface-Mounted Panel boards: Same gage and finish as panel board front with flanges for attachment to panel board, wall, and ceiling or floor.
- P. Gutter Barrier: Arrange to isolate individual panel sect.
- Q. Column-Type/Free Standing Panel boards: Narrow gutter extension, with cover, to overhead pull box equipped with ground and neutral terminal buses. Feed-through Lugs: Compression type suitable for use with conductor material. Locatione at opposite end of bus from incoming lugs or main device.
- R. Provide 10 percent spare circuit breakers, 20 percent spaces for future breakers, and 20 percent overall spare current carrying capacity for future expansion.

#### **14.2 PANELBOARD SHORT-CIRCUIT RATING**

- A. Fully rated to interrupt symmetrical short-circuit current available at terminals.

#### **14.3 LOAD CENTERS**

- A. Overcurrent Protective Devices: Bolt-on, full-module circuit breaker.
- B. Conductor Connectors: Mechanical type for main, neutral, and ground lugs and buses.

#### **14.4 LIGHTING AND APPLIANCE BRANCH-CIRCUIT PANELBOARDS**

- A. Branch Circuit Panel boards: Branch protective devices in panel boards shall be of the bolt-on type circuit breakers. Locatione panel boards at the utility area nearest the center of the load. Pane boards shall have main circuit breakers. Where multiple section panel boards are required, each section shall have a main breaker. Size panels as noted above.
- B. Branch Overcurrent Protective Devices: Bolt-on circuit breakers, replaceable without disturbing adjacent units.

- C. Doors: Front mounted with concealed hinges; secured with flush latch with twist lock; keyed alike.

#### **14.5 DISTRIBUTION PANELBOARDS**

- A. Power Distribution Panel boards serving three-phase motors and other power equipment shall be of circuit breaker type. Size the panel bus, lugs, and circuit breakers to match the ratings indicated in the Overcurrent Protective device coordination system fault level.
- B. Doors: Front mounted, except omit in fused-switch panel boards; secured with vault-type latch with twist lock; keyed alike.
- C. Main Overcurrent Protective Devices: Circuit breaker.
- D. Branch overcurrent protective devices shall be one of the following:
  - 1. For Circuit-Breaker Frame Sizes 125 A and Smaller: Bolt-on circuit breakers.
  - 2. For Circuit-Breaker Frame Sizes Larger Than 125 A: Bolt-on circuit breakers; plug-in circuit breakers where individual positive-locking device requires mechanical release for removal.
  - 3. Fused switches.

#### **14.6 TRANSIENT VOLTAGE SURGE SUPPRESSION (TVSS)**

- A. Transient voltage disturbances from commercial power systems associated with lightning storms and switching surges externally, as well as harmonics generated by adjustable speed drives and SCR power supplies associated with UPS equipment internally may cause stress and damage to electrical equipment. Therefore, transient voltage surge protection is required at the service entrance to all buildings, at all main distribution panels and all secondary power panels. The TVSS protection shall be provided.

#### **14.7 OVERCURRENT PROTECTIVE DEVICES**

- A. Molded-Case Circuit Breaker: NEMA AB 1, with interrupting capacity to meet available fault currents.
  - 1. Thermal-Magnetic Circuit Breakers: Inverse time-current element for low-level overloads, and instantaneous magnetic trip element for short circuits. Adjustable magnetic trip setting for circuit-breaker frame sizes 800 A and larger.

2. Adjustable Instantaneous-Trip Circuit Breakers: Magnetic trip element with front-mounted, field-adjustable trip setting.
  3. Electronic Trip Unit Circuit Breakers: RMS sensing; field-replaceable rating plug; with the following field-adjustable settings:
    - a. Instantaneous trip.
    - b. Long- and short-time pickup levels.
    - c. Long- and short-time time adjustments.
    - d. Ground-fault pickup level, time delay, and  $I^2t$  response.
  2. Current-Limiting Circuit Breakers: Frame sizes 400 A and smaller; let-through ratings less than NEMA FU 1, RK-5.
  3. Integrally Fused Circuit Breakers: Thermal-magnetic trip element with integral limiter-style fuse listed for use with circuit breaker; trip activation on fuse opening or on opening of fuse compartment door.
  4. GFCI Circuit Breakers: Single- and two-pole configurations with 30-mA trip sensitivity.
- E. Molded-Case Circuit-Breaker Features and Accessories.** Standard frame sizes, trip ratings, and number of poles.
1. Lugs: Compression style, suitable for number, size, trip ratings, and material of conductors.
  2. Application Listing: Appropriate for application; Type SWD for switching fluorescent lighting loads; Type HACR for heating, air-conditioning, and refrigerating equipment.
  3. Ground-Fault Protection: Remote-mounted relay and trip unit with adjustable pickup and time-delay settings, push-to-test feature, and ground-fault indicator.
  4. Communication Capability: Circuit-breaker-mounted, Universal-mounted, Integral or Din-rail-mounted communication module with functions and features compatible with power monitoring and control system.
  5. Shunt Trip: 220 or 240 V trip coil energized from separate circuit, set to trip at 55 percent of rated voltage.
- F. Fused Switch:** NEMA KS 1, Type HD; clips to accommodate specified fuses; lockable handle.

## 14.8 CONTROLLERS

- A.** Motor Controllers: NEMA ICS 2, Class A combination controller equipped for panel board mounting and including the following accessories:
  - 1. Individual control-power transformers.
  - 2. Fuses for control-power transformers.
  - 3. Bimetallic-element overload relay.
  - 4. Melting-alloy overload relay.
  - 5. Indicating lights.
  - 6. Seal-in contact.
  - 7. Four convertible auxiliary contacts.
  - 8. Push buttons.
  - 9. Selector switches.
  
- B.** Contactors: NEMA ICS 2, Class A combination controller equipped for panel board mounting and including the following accessories:
  - 1. Individual control-power transformers.
  - 2. Fuses for control-power transformers.
  - 3. Indicating lights.
  - 4. Seal-in contact.
  - 5. One convertible auxiliary contacts.
  - 6. Push buttons.
  - 7. Selector switches.
  
- C.** Controller Disconnect Switches: Adjustable instantaneous-trip circuit breaker, integrally mounted and interlocked with controller.
  - 1. Auxiliary Contacts: Integral with disconnect switches to de-energize external control-power source.
  
- D.** Contactors in Main Bus: NEMA ICS 2, Class A, mechanically held general-purpose controller.
  - 1. Control-Power Source: Control-power transformer, with fused primary and secondary terminals, connected to main bus ahead of contactor connection.

2. Control-Power Source: 220 V branch circuit.

#### **14.9 ACCESSORY COMPONENTS AND FEATURES**

- A. Furnish accessory set including tools and miscellaneous items required for overcurrent protective device test, inspection, maintenance, and operation.
- B. Furnish portable test set to test funct of solid-state trip devices without removal from panel board.
- C. Fungus Proofing: Permanent fungicidal treatment for panel board interior, including overcurrent protective devices and other components.

### **15 EXECUTION**

#### **15.1 INSTALLATION**

- A. Install panel boards and accessories according to NEMA PB 1.1.
- B. Mounting Heights: Top of trim 1880 mm above finished floor, unless otherwise indicated.
- C. Mounting: Plumb and rigid without distortion of enclosure. Mount recessed panel boards with fronts uniformly flush with wall finish.
- D. Circuit Directory: Create a directory to indicate installed circuit loads after balancing panel board loads. Obtain approval before installing. Use a computer or typewriter to create directory; handwritten directories are not acceptable.
- E. Install filler plates in unused spaces.
- F. Provision for Future Circuits at Flush Panel boards: Stub four 25mm Ø empty conduits from panel board into accessible ceiling space or space designated to be ceiling space in the future. Stub four 25mm Ø empty conduits into raised floor space or below slab not on grade.
- G. Wiring in Panel board Gutters: Arrange conductors into groups and bundle and wrap with wire ties after completing load balancing.

#### **15.2 IDENTIFICATION**

- A. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs as specified in Section 26 00 00 Part 3.8 "Identification Materials and Devices".

- B. Panel board Nameplates: Label each panel board with engraved metal or laminated-plastic nameplate mounted with corrosion-resistant screws.

### **15.3 CONNECT**

- A. Install equipment grounding connect for panel boards with ground continuity to main electrical ground bus.
- B. 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.

### **15.4 FIELD QUALITY CONTROL**

- A. Prepare for acceptance tests as follows:
  - 1. Test insulation resistance for each panel board bus, component, connecting supply, feeder, and control circuit.
  - 2. Test continuity of each circuit.
- B. Testing: After installing panel boards and after electrical circuitry has been energized, demonstrate product capability and compliance with requirements.
  - 1. Procedures: Perform each visual and mechanical inspection and electrical test indicated in NETA ATS, Section 7.5 for switches and Section 7.6 for molded-case circuit breakers. Certify compliance with test parameters.
  - 2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.
- C. Balancing Loads: After Substantial Completion, but not more than 60 days after Final Acceptance, measure load balancing and make circuit changes as follows:
  - 1. Measure as directed during period of normal system loading.
  - 2. Perform load-balancing circuit changes outside normal occupancy/working schedule of the facility and at time directed. Avoid disrupting critical 24-hour services such as fax machines and online data-processing, computing, transmitting, and receiving equipment.
  - 3. After circuit changes, recheck loads during normal load period. Record all load readings before and after changes and submit test records.

4. Tolerance: Difference exceeding 20 percent between phase loads, within a panel board, is not acceptable. Rebalance and recheck as necessary to meet this minimum requirement.
- D.** Infrared Scanning: After Substantial Completion, but not more than 60 days after Final Acceptance, perform an infrared scan of each panel board. Remove panel fronts so joints and connect are accessible to portable scanner.
1. Follow-up Infrared Scanning: Perform an additional follow-up infrared scan of each panel board 11 months after date of Substantial Completion.
  2. Instrument: Use an infrared scanning device designed to measure temperature or to detect significant deviat from normal values. Provide calibration record for device.
  3. Record of Infrared Scanning: Prepare a certified report that identifies panel boards checked and describes scanning results. Include notation of deficiencies detected, remedial action taken, and observat after remedial action.

#### **15.5 ADJUSTING**

- A.** Set field-adjustable switches and circuit-breaker trip ranges.

#### **15.6 CLEANING**

- A.** On completion of installation, inspect interior and exterior of panel boards. Remove paint splatters and other spots. Vacuum dirt and debris; do not use compressed air to assist in cleaning. Repair exposed surfaces to match original finish.

**16**

### **GENERAL (GENERATOR SETS)**

#### **16.1 SUMMARY**

- A.** This Section specifies a package engine generator system for use as Stand-by electric power source. The generator set shall consist of a liquid-cooled compression ignition diesel engine which is directly connected through a flexible coupling to an alternating current generator with rotating exciter; solid-state voltage regulator; AC output circuit breaker; electronic governor; cooling system; day tank; air intake system; exhaust system, control panel; engine starting system; battery; battery cables; battery retainer; engine driven battery charger; rigid box type channel steel base; and all other components necessary to provide a complete self-contained generator set.

The package engine generator system, paralleling switchgear and control, overcurrent devices, automatic transfer switch, and low-voltage switchgear (LVSG) shall be provided by a single vendor. The vendor shall be given full system responsibility for an integrated package of equipment that the system will operation as intended in accordance with the indicated sequence of operation.

- B.** In addition, provide the following items:
1. An automatic transfer switch (ATS) with or without a built in battery charger for the genset batteries.
  2. A wall mounted static battery charger with AC input breaker.
  3. Spring isolator mounts with seismic restraints suitable for seismic zone 4.
  4. Critical-grade mufflers.
  5. An integral genset radiator.
  6. A skid-mounted sub-base fuel day tank.
  7. Fuel system and fuel monitoring and alarm system.
  8. Auxiliary fuel connection.
  9. Maintenance spare parts.
  10. Repair spare parts.

## **16.2 REFERENCES**

- C.** The following publicat form a part of this specification to the extent specified herein:
1. AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI).
  2. AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM).
  3. MANUFACTURERS ASSOCIATION (NEMA).
  4. NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)
    - a. NFPA 30 - Flammable and Combustible Liquids Code.



- b. NFPA 70 – National Electrical Code.
  - c. NFPA 110 - Standard for Emergency and Standby Power Systems.
- 2. UNDERWRITERS LABORATORIES INC (UL).
  - 3. PHILIPPINE ELECTRICAL CODE (PEC)

### 16.3 DEFINIT

- A. Accuracy/error: Accuracy is a ratio that defines the limit of error expressed as a percentage of full-scale value. Error is the difference between the indication and the true value of the quantity measured. It is the quantity that, when algebraically subtracted from the indication, gives the true value. A positive error denotes that the indication of the meter is greater than the true value.
- B. Damage: Damage is defined as any failure (see para. below) or degradation in life. The blowing (opening) of a replaceable fuse is not considered damage, provided it is performing its intended function.
- C. Dangerous flexural vibration: Dangerous flexural vibration is defined as a vibration that occurs at a speed at which maximum stress in the shaft from flexural vibration exceeds  $630 \text{ kg/cm}^2$  (9,000 psi).
- D. Dangerous torsional critical speed: Dangerous torsional critical speed is defined as the speed at which maximum vibrating stress in the shaft from torsional vibration exceed  $350 \text{ kg/cm}^2$  (5,000 psi).
- E. Dripproof enclosures/boxes: A dripproof enclosure/box is an enclosure/box so constructed that falling drop of liquid or solid particles striking the enclosure/box at angles from 0 to 15 degrees from the vertical cannot enter the enclosure/box, either directly or by striking and running along a horizontal or inwardly inclined surface.
- F. Failure: A failure is defined as the inability of an item to perform within specified limits.
- G. Fuel day tank: Fuel day tank is defined as the tank that is supplying fuel to the engine and is equipped with provision (float valve, electric pump, solenoid, etc.) for receiving fuel from an auxiliary source.
- H. Inspection/test: Inspection/test is the examination and testing of supplies or services including, when appropriate, raw materials, components, and

intermediate assemblies to determine conformance with contract requirements.

- I. Maximum power: Maximum power is defined as the largest load that the genset can carry for two minutes and remain at rated voltage and frequency without damage.
- J. Momentary overload: Momentary overload is defined as the loads between rated and the load required to trip the safety devices.
- K. Power exchange: Power exchange is the difference between the maximum and minimum power output delivered by one genset, for constant system load condition, as determined from oscillographic measurements.
- L. Rated frequency: Rated frequency is specified in Part 2 of this Section.
- M. Rated kW: Rated kW is the Stand-by Power rating shown on the genset name plate.
- N. Rated load: Rated load is rated kW at rated power factor, rated frequency and rated voltage.
- O. Rated power factor: Rated power factor (pf) is 0.8 lagging.
- P. Rated voltage: Rated voltage is the genset name plate voltage.
- Q. Stable (engine) operationing condition: Stable (engine) operationing condition are the condition specified for short-term, steady-state performance.
- R. Start: A genset is considered to have started when it is operationing at rated voltage and rated frequency without the further use of starting aids.
- S. Stop: A genset is considered to have stopped when all rotating members are at zero rpm, except for the turbo-charger, if used.
- T. Temperature and humidity damage: Temperature and humidity damage is defined as condition causing malfunction of any component or part, corrosion, breakage, deformation, or reduction of insulation resistance below 50,000 ohms.

#### **16.4 SUBMITTALS**

- A. Product data for system components. Include descriptive and technical literature, catalog cuts, and installation instruct. Provide dimensioned plans and elevation showing minimum clearances and installed features and devices. Include list of materials and UL listed data.
  - 1. Installation manual. Include the following:

- b. Genset noise levels at various distances from genset.
  - c. Allowable engine exhaust restriction if using an exhaust extension.
  - d. Allowable genset cooling air discharge restriction if cooling air is ducted away from genset.
  - e. Elevation and distance limits for location of external fuel supply.
  - f. Instruct for installation of all equipment, non-integral components, and accessories.
  - g. Instruct for aligning the genset before initial startup and after disassembly.
- B.** Shop drawings shall indicate fabrication details, dimensions, weights, loads, and required clearances, method of field assembly, components, and location and size of each field connection. Shop drawings shall not be smaller than 607 x 914 mm (24 x 36 inches) in size.
- 4. Location and identify each interface point (lube drain, exhaust outlet, fuel inlet etc.), GROUNDING terminal, etc.
  - 5. Indicate proper genset location such as allowable ground slope, clearance required for door opening, clearance required for engine exhaust, etc.
  - 6. Wiring Diagrams: Detail wiring for power and control connect and differentiate between factory-installed and field-installed wiring.
  - 7. Design Calculat and Vibration Isolation Base Details.
- C.** Administrative Data:
- 8. Field Test and Observation Reports: Indicate and interpret test results and inspection records relative to compliance with performance requirements.
  - 9. Test report for prototype unit, including separate test reports for components and accessories that are equivalent, but not identical, to those tested on prototype unit.
  - 10. Factory Test Reports: For units to be shipped for this Project, showing evidence of compliance with specified requirements.
- G.** Maintenance Data: For each genset, provide maintenance manual tailored for the genset. Manuals shall have cover with clear identification tying

manual to specific genset. All graphic symbols used on drawings shall conform to ANSI Y32.2.

1. Operator's Manual: The operator's manual shall accomplish and or contain the following information for minimally trained operators:
  - b. Permit the genset operator to identify and understand the function of each operator control.
  - c. Sufficient drawings and/or pictures to help the operator identify all the major genset components.
  - d. Properly instruct for the genset operator to determine if the genset voltage, frequency and kW rating is proper for the intended load.
  - e. Properly instruct for the genset operator to connect the genset ground terminal to an earth electrode (driven ground rod).
  - f. Properly instruct for the genset operator to safely connect the load cables to the genset output terminals. These instructions shall cover the load neutral connection and the phasing of the energized leads.
  - g. Step by step detailed instructions for the genset operator to thoroughly inspect the genset before attempting to start the genset for the first time.
  - h. Provide the genset operator a specific set of detailed instructions for STARTING, OPERATION and STOPPING the genset.
  - i. Provide the genset operator with a specific list of things to check EACH time the genset is started.
  - j. Provide the genset operator with a specific schedule of routine maintenance items such as lube oil changes, filter changes, etc.
  - k. Provide the genset operator with a complete list of acceptable lube oil, fuel oil, engine coolant, battery acid, etc.
  - l. Provide the genset operator with an explanation of what type of records he needs to keep for each genset and the importance of accurate records.
  - m. Provide the genset operator with all applicable cautions, warnings and dangers for operation of the genset.

- n. Provide the genset operation or specific instruction for connecting electrical power to the engine coolant heater, auxiliary fuel pump, external fuel tank level signal, and emergency stop and wall mounted battery charger including the location and identification of each interconnection point.
  - o. Provide detailed instruction for reconnection of the genset power leads. Also provide detailed instruction for any required changes to the voltage regulation or, governor, instrumentation and main circuit breaker to obtain the desired operating voltage and frequency.
  - p. Provide the value (fuel level, oil pressure, etc.) at which the warnings and shutdown devices will activate.
2. Parts Manual: The parts manual shall have sufficient drawings in a top down break down format to show each and every part in its relative position to the other parts. Each part, except standard hardware, shall have a unique part number and this part number shall be referenced to the part where it is shown on a drawing. In place of part numbers for standard hardware, the size of the hardware can be provided, such as "Machine Screw 4mm x 70 mm - 0.7mm pitch" or "Machine Screw 10-24 x 11/2". This manual shall also provide the source of supply for each part, including company name, address and phone number, and person to contact.
  3. Service Manual: The service manual shall provide in narrative form the theory of operation for each of the major subsystems (generator and excitation system, governor, etc.) of the genset. This manual shall contain all applicable wiring and schematic diagrams. The manual shall also contain trouble shooting procedures and detailed procedures for removing and/or replacing each component.

## 16.5 QUALITY ASSURANCE

- H. Single-Source Responsibility: Obtain generator components from a single source, which assumes responsibility for compatibility of system components.
- I. Inspection:
  1. Inspection system: The gensets, the generators, and the engines shall be manufactured in a facility that has quality control program certified to be in compliance with ISO 9000-1, ISO 9000-2, ISO 9000-3, ISO 9000-4, ISO 9001, ISO 9002, ISO 9003, ISO 9004-1, ISO 9004-2, ISO 9004-3 and ISO 9004-4.

2. Responsibility for Inspection: Unless otherwise specified, the Contractor is responsible for the performance of all inspection/test requirements as specified herein. Except as otherwise specified herein or in the Contract, the Contractor may use his own or any other facilities suitable for the performance of the inspection/test requirements specified herein. The Contractor is responsible for ensuring that all components and materials used are manufactured, examined, and inspected/tested in accordance with industry standard practices.

## **16.6 DELIVERY, STORAGE AND HANDLING**

- J. Packing for shipment:
  1. Export shipping: Each genset shall be enclosed in a wooden box on a wooden shipping skid. All manuals and spare parts if ordered shall be enclosed in the genset shipping box.
- K. Connection Tag: As a safety precaution, each genset shall have a tag tied to the output load terminals stating the voltage and frequency of the electrical output. The tag shall request the installer to verify that this voltage and frequency match his load requirements before he removes the tag and connects his load cables.
- L. Deliver engine generator set and system components to their final location in protective wrappings, containers, and other protection that will exclude dirt and moisture and will prevent damage from construction operation. Remove protection only after equipment is safe from such hazards.
- M. Handling: The genset skid base shall be equipped with towing and lifting provision for lifting and/or towing of the genset without damage using a forklift, crane, or hoist.

## **16.7 WARRANTY**

- N. Provide warranty covering genset and all optional components for one year warranty starting from the start-up date. The warranty shall cover defects in materials and workmanship. Coverage shall include parts, labor, travel expenses, and labor to remove/reinstall said failed equipment.
- O. Provide certification that the generator set complies with applicable codes and standards and with applicable provision of these Contract Documents.

## **16.8 MAINTENANCE PARTS**

- P. General parts: Provide one set of maintenance parts for each genset. An order of maintenance parts is defined as all the items necessary to perform the scheduled maintenance function specified in the Genset Manuals for one thousand operating hours plus replacement bulbs for

indicators, replacement fuses for each fuse used on the genset and any other like items the manufacturer deems desirable. These maintenance parts shall be packaged in a polyethylene bag, and packed inside the genset for which they were ordered. Should there be insufficient room inside the genset, the parts bag shall be enclosed in a protective package and attached to the shipping skid. This group of parts shall include but not be limited to the following:

1. Engine lubricating oil filters and filter gaskets, if separate from filter.
2. Fuel filters and filter gaskets, if separate from filter.
3. Engine intake air filters and filter gaskets, if separate from filter.
4. A minimum of five light bulbs of each size light bulb used in the genset.
5. A minimum of five electrical fuses of each size fuse used in the genset.
6. One engine lubrication oil system drain plug.

## **PART 17 - PRODUCTS**

### **17.1 GENERATOR SET**

- Q.** Generator: The AC generator shall be a synchronous, revolving field, brushless, single-bearing, air-cooled, self-ventilated alternator that is directly connected to the engine crankshaft through a flexible steel coupling. The generator shall be capable of operation at 60 Hertz, shall have twelve (12) legibly identified power leads, and shall be connectable for the voltages shown in Article 2.2. The generator shall conform to the applicable requirements of ANSI C50.10, and NEMA MG-I. The generator windings shall be copper and wound with 2/3 pitch. The generator shall have a Class H insulation system rated at 80 deg C above a 40 deg C ambient when operationing at rated load, and the generator shall have amortisseur windings to minimize slot harmonics. The generator windings shall have a protective overcoat for added protection in harsh condition. The generator shall have a drip-proof enclosure with ventilating openings covered by removable screens having a mesh opening not larger than 13 mm. The bearing shall be a double sealed, sealed for life, permanently lubricated, anti-friction type. The generator shall have adequate capacity to produce rated power plus overloads (see Article 1.4). The rotor assembly and fan assembly shall be balanced separately and shall be balanced in accordance with NEMA MG-I. When operationing at rated speed and voltage, and at any load from no load to rated load, the vibration amplitude (peak-to-peak) shall not exceed the value as specified in NEMA MG-I for the rated speed of the generator. The vibration amplitude shall be measured in all three axes (vertical, longitudinal, and

transverse) at the bearing housing or on the generator frame adjacent to the bearing housing.

**R. Materials and Components:** Materials and components required but, not specifically specified shall be selected by the contractor, shall be subject to all of the requirements of this specification and shall conform to accepted industry standards.

1. Hoses and hose fittings: Hoses and hose fittings shall be used with piping systems where there is relative motion between parts. Hoses and fittings shall be suitable for the pressure involved.
2. Hardware: Hardware shall be as follows with the number of different sizes and types kept to a minimum. All nuts, bolts and screws shall have standard metric or SAE threads.
  - b. Quick disconnect fasteners: Quick-disconnect fasteners shall be self-contained and corrosion resistant.
  - c. Pipe and fittings: Pipe and pipe fittings shall conform to SAE standards.
  - d. Fasteners (except electrical): Each fastener (screw, stud, bolt, pin, etc.) shall be equipped with a locking device to prevent loosening due to vibration. Locking shall be by locknuts, castellated nuts with cotter pins, lockwashers, lock wire, or lockplates. No swedging, peening or stacking of parts subject to removal or adjustment is permitted. Fasteners and associated hardware (nuts, locking devices, washers, etc.) shall be made of corrosion-resistant material or shall be provided with a corrosion-resistant treatment. Unused length of threads on studs (or screws used as studs) shall not exceed half the diameter of the stud.
  - e. Sheet metal screws: Sheet metal screws shall not be used.
  - f. Blind hardware: A nut located such that it cannot be grasped by the thumb and forefinger of one hand and a common tool shall be caged, or some equivalent means shall be used to obviate need for handling of the nut during removal and assembly.
  - g. Fasteners (electrical): Locking devices shall be provided for each fastener used in making electrical connect. Each fastener, locking device, and other hardware shall be made of corrosion-resistant material or treated to be corrosion-resistant. Fasteners (bolts, screws, studs, or other fasteners) shall not generally carry current; they shall serve to hold the current-carrying parts (lugs, terminals) in firm contact with each other. Where flow of



current through a stud cannot be avoided, the stud and the associated hardware (nuts, locking devices, washers and other hardware) shall be made of high conductive corrosion-resistant material. Positive means (such as pins or square shanks) shall be provided to prevent turning of studs in their mountings when nuts are tightened or loosened; lockwashers that depend on friction or spring action are not acceptable for this purpose. Unused length of studs (or screws used as studs) shall not exceed half the diameter of the stud.

3. Shunts: Shunts for instrumentation purposes shall have industry standard outputs.
4. Terminal lugs: Terminal lugs shall be used for all conductors. Terminal lugs shall be insulated, ring tongue style, compression, or crimp type lugs. Compression lugs shall be installed with the proper tools. All terminal lugs shall be the proper size for the conductor and the stud or bolt.

Connectors: Plugs and connectors shall be selected so that the energized member, when the connection is broken, is the female part of the connector. When more than one connector is used in the same general location, different shell sizes or pin configuration shall be used to prevent cross connection.

5. Capacitors: Electrolytic capacitors, when used, shall be of the tantalum type.
6. Toggle switches: Toggle switches shall be of the sealed toggle type with terminals marked. Toggle switches shall be mounted so that the "ON" position is "UP", "FORWARD", or "TO THE RIGHT".
7. Semiconductor devices: All semiconductor devices shall be of the hermetically sealed silicon type. Except for zener diodes, all semiconductor devices shall have a peak repetitive rating not less than three times the peak repetitive voltage to which they will be subject in the genset. Also, they shall have a current rating equal to or not less than 150 percent of the maximum rectified current (DC) which they will carry when installed in the genset, ignoring transients. Diodes or controlled rectifiers that supply DC power to the alternator main field shall have a peak inverse voltage rating of not less than ten times nominal alternator field voltage. The use of circuits that require semiconductor devices with matched or paired characteristics is prohibited.
8. Pushbuttons and limit switches: Limit switches shall be of the sealed type. Pushbuttons shall be of the sealed heavy-duty type.

Pushbuttons and limit switches shall be appropriately sized for both voltage and current.

9. Relays: Relays shall be totally enclosed or hermetically sealed. Control relays shall be firmly secured to their mounting using clips, spring retainers or screws.
10. Resistor and rheostats: Tapped resistors shall be used in preference to adjustable (slide wire) type. Where adjustable resistors are used and are of the wire wound type, wire shall be of sufficient size to preclude damage through tightening of the adjust device or through corrosion at the contact point. All rheostats and potentiometers shall be the wire wound type, preferably enclosed.
11. Hinges and latches: Hinges shall be made of stainless steel. Hinges or hinge pins shall be peened at the ends, or other means shall be provided to prevent workout of the pins. Latches shall require manual, not spring, action for closing. All parts of the latches having relative motion with each other shall be corrosion-resistant metal.
12. Drivebelts: Drivebelts shall be resistant to battery electrolyte, antifreeze and petroleum derivatives.
13. Printed circuit boards: Printed circuit boards shall be fabricated using copper clad laminate. The boards shall be electro-solder-plated 25 microns minimum thickness with solder. After etching, the boards shall be tin or solder immersed. Finished printed circuit boards shall be coated with a moisture-proof insulating compound.
14. Terminal boards and terminal strips: All terminal boards shall be made from material other than thermosetting plastic.
15. Wire and wire marking: Wire shall be multi-stranded copper conductor, flame retardant, and moisture/heat/oil resistant in accordance with the NFPA 70, but not smaller than 1.5 sq. mm (16 AWG). All wire shall be numbered for easy identification. The marking shall be permanently applied to the wire to withstand all specified operation condition herein throughout the life of the genset. Marking shall be within 75 mm of each end. The Contractor shall determine the wire numbering scheme.
16. Starting and control devices: All starting and DC control devices shall be rated 24 volts (nominal).

## **17.2 GENERATOR SET PERFORMANCE**

- S. The engine/generator set shall be Prime power rated.

1. Two (2) Standby power rated generator sets – 1000kVA/1250kW
- T. Voltage Connect:** The gensets shall be connectable for the following output voltages:
1. The generators shall be factory-wired for 480/230 volts, 3 phase, 4 wire, 60 Hertz operation. Provide generator output circuit breaker.
- U. Generator Performance:**
1. Voltage waveform
    - b. Deviation factor: The deviation factor for the line-to-line and the line-to-neutral voltages for each connection shall not be more than five percent, nor shall any single harmonic exceed 3 percent when the genset is operationing at no load and rated load. The voltage total harmonic distortion at full load shall not exceed 3 percent.
  2. Phase Balance (voltage): With the genset under the control of the exciter and voltage regulation, and operationing at rated voltage, frequency and no load, the maximum in the line-to-neutral voltage shall not be more than one percent of the rated line-to-neutral voltage.
  3. Voltage Regulation: The voltage regulation shall be less than or equal to one half of one percent of rated voltage.
  4. Voltage Drift: With the genset operationing at constant load and voltage, a change in ambient temperature of 15 deg C in an eight hour period shall not cause the voltage to change more than one percent of rated voltage. The genset shall be stabilized at both the initial and the final ambient condition
  5. Voltage Transient Performance:
    - b. With the genset operationing at rated frequency and voltage, the transient voltage change shall not be more than 12 percent when the load is suddenly increased from no load to 50 percent load, and not more than 15 percent when reduced from 50 percent load to no load. The voltage shall recover to 95 percent of rated voltage within 2 seconds, and recover to 100 percent within 5 seconds.
    - c. With the genset operationing at rated frequency and voltage, the voltage shall not decrease more than ten percent when a motor with a starting kVA equal to three times the rated kVA of the genset is suddenly applied. The voltage shall return to 95

percent of rated voltage within 3 seconds, and recover to 100 percent within 5 seconds.

- V.** Voltage Operationing Range: The voltage adjusting device shall be capable of adjusting the voltage to plus or minus five percent of rated voltage with the genset operationing at any load up to 110 percent rated load.
- W.** Short Circuit: The generator and/or excitation system shall not be mechanically and/or electrically damaged when temperature is stabilized at rated load and then subjected to faults at the genset load terminals that draw 300 percent rated current for 10 seconds.
- X.** Generator and Excitation System: The genset voltage performance shall conform to performance class G3 of ISO 8528.
- Y.** Starting and Operationing: The genset shall start (see Article 1.4) within 10 seconds after receiving a start signal under each and any combination of the following operationing condition. Immediately after starting, the genset shall operation without failure (see Article 1.4), at all loads, continuous and intermittent, up to and including rated load as specified herein.
  - 1. At all possible relative humidity, with ambient temperatures ranging from +50 degC to - 25 deg C, with an engine coolant at higher than + 20 deg C
  - 2. With the base of the set in planes from level to up to 15 degrees from level.
- Z.** Stopping: The genset shall stop (see Article 1.4) within 30 seconds after activation of any device intended to stop the set.
- AA.** Cool Down Period: Generators shall start and come on line automatically on loss of normal power. Before generators are shut down automatically on restoration of normal power, and after the load has been transferred to normal power, the generator shall run for at least 5 minutes to cool down.
- BB.** Operationing Speeds: The operationing speed for 60 Hz generator sets shall be 1800 revolut per minute (rpm).
  - 1. Overspeed: The sets shall be capable of operationing at 115 percent of rated speed for 5 minutes without damage (see Article 1.4). Rated speed of the sets shall be that required for the set to produce rated frequency.
  - 2. Flexural vibration and critical speeds: The set shall be free from dangerous flexural vibrat (see Article 1.4) and dangerous torsional critical speeds (see Article 1.4) between the minimum low idle speed and 115 percent of rated speed.

- CC.** Sound Pressure Levels: The genset shall have sound attenuating accessories to reduce the sound pressure level (SPL) at 7.00 meters (23 feet) from the surface of the genset and 1.20 meters (4 feet) above the genset base to an average "A" weighted sound pressure level as follows:
1. Style I (Unhoused gensets) - 90 dBA (for safe haven generator set)
  2. Style III (Weatherproof sound-attenuated housed gensets) – 72 dBA at 7-meters at full-load and 68 dBA at 14-meters at full-load.
- DD.** Fuels and Lubricants: The engine shall start, operation and meet all performance requirements of this specification using commercial #2 diesel fuel and API CF multi-grade lubricating oil.
- EE.** Smoke Limits: The set engine shall operation under all condition specified herein at all set loads up to and including rated load, with a smoke reading of not more than 2.0 when measured using a Robert Bosch EFAW 65 sampling pump and analyzed on a Robert Bosch EFAW 68 analyzing instrument. The above smoke limit is not required if the engine is EPA certified at the horsepower required to drive the generator at rated output.
- FF.** Life (Endurance) requirements: The genset shall have a life expectancy of 10,000 hours at loads up to and including rated load under ambient condition specified herein when maintained in accordance with manufacturer's instruct. (See manuals Article 1.5)
- GG.** Ease of Servicing, Operation, and Maintenance: The design and construction of the gensets shall permit routine service and maintenance under field condition. Parts that require adjustment or servicing shall be capable of being adjusted or serviced by personnel wearing heavy winter clothing or mittens. The genset shall be capable of being started and operationd by one operationor under all condition. Starting or stopping the set shall not require manipulation of more than one control or switch. Hardware that requires torquing shall be installed so that the nut, bolt, or screwhead is accessible for torque wrench application. In assemblies where both a bolt and nut are used, the nut shall be accessible for torque wrench application. The genset maintenance and repair shall be accomplished with common standard tools. Servicing, operation and maintenance requirements shall be met with the genset in its installed location.

### **17.3 SERVICECONDITION**

- HH.** Environmental Condition: Engine generator system withstands the following environmental condition without mechanical or electrical damage or degradation of performance capability:
1. Ambient temperature: 5 to 40 deg. C.

2. Relative Humidity: 0 to 95 percent.

#### **17.4 ENGINE**

- II. Engine: The engine shall be a heavy-duty standard commercial industrial diesel-fueled, liquid-cooled engine with sufficient power to drive the generator and connected accessories and to accept one step application of rated load.

#### **17.5 GOVERNOR**

- JJ. Governing: Engine speed shall be controlled by an isochronous load sensing electronic governor. The genset frequency performance shall conform to performance class G4 of ISO 8528.

1. Frequency regulation: The frequency regulation shall be adjustable from 0 to three percent of rated frequency.
2. Frequency stability: At any constant load from no load to 110 percent of rated load the frequency shall remain a bandwidth of 1/2 percent of rated frequency.
3. Frequency drift: With the genset operationing at constant load and voltage, a change in ambient temperature of 15 deg C in an eight hour period shall not cause the frequency to change more than one percent of rated frequency. Genset stabilization to be accomplished at both the initial and the final ambient condition
4. Frequency transient performance: Following any sudden load change between no load and rated load, or a sudden load change between rated load and no load, the frequency shall not dip or rise more than ten percent of rated frequency. The frequency shall recover to rated frequency within 2 seconds.
5. Frequency adjustment range: The frequency adjustment device shall be capable of adjusting the frequency to +/- 5 percent of rated frequency.

#### **17.6 ENGINE COOLING SYSTEM**

- KK. Cooling System: The cooling system shall have the capacity to limit the maximum coolant temperature from the engine to the value recommended by the engine manufacturer while the genset is operationing under any of the environmental condition specified herein for "Starting and Operationing." The engine shall have a block drain(s) as necessary to

completely drain all coolant from the block regardless of the type of cooling system.

1. Coolant: The cooling system shall operation under all condition specified in Article 2.2, para. on "Starting and Operationing" using a 50/50 commercial antifreeze and water mixture, which includes engine compatible corrosion preventive additives, and water mixture.
2. Integral radiator: The integral radiator cooling system shall consist of a liquid coolant to air heat exchanger (radiator) with an expansion tank and pressure cap, a pusher type engine driven fan, an engine thermostat, engine driven coolant pump, internal engine coolant passages, and coolant hoses. These components shall be interconnected to provide a completely closed and pressurized system. The radiator coils/fins shall be copper/copper, copper/aluminum, or copper/cupro-nickel material and the fin spacing shall be such that the resulting air passages do not clog from dust and dirt. The radiator shall be capable of withstanding an internal pressure of 0.352 kg/sq. cm greater than the pressure setting of the radiator cap. The radiator cap shall be captive and when removed shall not interfere with the radiator fan. There shall be a radiator drain valve located in the bottom tank to permit complete draining of the coolant. Genset radiators shall have a flange adequate for attaching a discharge airduct. The radiator shall be epoxy coated to minimize salt-air deterioration. Use of this coating shall not reduce performance as specified in Article 2.2, para. on Starting and Operationing."
3. Coolant jacket heater: The engine shall be equipped with thermostatically controlled electric immersion heater(s) in the engine coolant. The heater system shall be capable of maintaining a minimum temperature of 32 degC under all condition specified in Article 2.2, para. on "Starting and Operationing." If the heater(s) are located external to the engine water jacket and hoses are used for interconnection, isolation valves shall be provided to permit repair and removal of the heater and hoses without draining the cooling system. The heater(s) shall be rated for 480/230 Volts, 60 Hertz. The heater (s) shall be connected thru the thermostat then to terminals accessible for user connection to commercial power.

## **17.7 FUEL SUPPLY SYSTEM**

- LL. General: The fuel system, including piping, valves, filters, and connect shall prevent air from entering the system and shall prevent fuel flow from being restricted during operation under all condition in this specification. A permanently installed, manually operationd fuel pump capable of priming the engine fuel system after air has been allowed to enter the fuel system shall be provided.

- MM.** Electric Auxiliary Fuel Transfer Pump: When an auxiliary fuel transfer system is specified, the auxiliary pump shall operation on a 480V/230 Volts, 60 Hz power system. The pump shall be capable of delivering 200 percent of the maximum fuel consumption of the genset with a suction head of 5 meters. The pump must be capable of continuous dry operation or provision shall be made to permit user connection of an external control to prevent the pump from dry operation. The pump shall be connected through the fuel level controller and solenoid valve to terminals for auxiliary control, and then to terminals accessible for user connection to commercial power.
- NN.** Fuel Filters/Water Separator: The fuel filtering system shall have sufficient filtration capacity to allow for continuous genset operation on fuel containing up to 15 milligrams of fine test dust per liter of fuel for a minimum of 300 hours. The fuel filter, water separator and fuel strainer (if used) assemblies shall have inlet and outlet connect permanently marked. The water separator shall not be damaged by freezing of any water that is accumulated therein.
- OO.** Fuel Lines: Fuel lines projecting through metal apertures shall be protected by grommets and secured to framing members. Cushioned clips, braces, or brackets shall be used to securely fasten all piping between the tank and the engine. All high-pressure fuel lines shall be made of steel. Hose conforming to metric or SAE standards may be used for low-pressure fuel lines, except hose within a 250 mm distance to the engine exhaust system shall have a metal shield.
- PP.** Provide a hand operationd manual fuel transfer pump to allow the daytank to be filled in the event of failure of the primary electrical pump.

## **17.8 ENGINE EXHAUST SYSTEM**

- QQ.** Exhaust System: The engine exhaust system shall consist of the necessary critical or hospital grade muffler, piping, and rain cap to discharge the exhaust gas to the outside of the genset. The rain cap shall be made of corrosion resistant material as opposed to corrosion resistant treated material. A section of flexible pipe shall be provided between the engine and the muffler. The contractor shall provide the mechanical details and parts required to mount the muffler. The mounted muffler may be shipped unmounted but all brackets and hardware necessary to mount the muffler on the genset shall be provided. The design and components of the exhaust system shall be such that the genset sound level requirements of this Section can be met. The exhaust system shall be suitable for the muffler to be easily removed for external mounting.

## **17.9 COMBUSTION-AIR INTAKE SYSTEM**



- RR.** Combustion Intake Air System: The air intake shall include a heavy duty dry type air cleaner with disposable barrier-filter elements consisting of pleated paper. The air cleaner shall be equipped with an air cleaner restriction indicator. The restriction indicator shall be located so that it can be readily observed.

#### **17.10 STARTING SYSTEM**

- SS.** General: The engine starting system shall be negative ground 24 volt (nominal). The system shall consist of a cranking motor, battery(s), battery charging system, battery retainer, battery cables and other components required to make a complete system.
- TT.** Cranking Motor: Means shall be provided to prevent starting of the motor and engagement of the drive mechanism during running of the genset or when coming up to rated speed after the cranking motor disengages. If a single terminal cranking motor is used, the negative terminal of the battery shall be directly connected to the cranking motor case (housing) by a cable of sufficient size to carry the cranking current. If a two terminal (isolated case) cranking motor is used, the negative terminal of the cranking motor shall be directly connected to the negative terminal of the battery by a cable of sufficient size to carry the cranking current. If the engine assembly is electrically isolated by resilient mounts from the skid base, there shall be a flexible strap(s) provided to connect the engine to the skid base. The terminals on the cranking motor shall be the source of control power.
- UU.** Battery(s): The genset battery(s) shall be a commercially available dry type battery (s) that has the amp-hour rating, reserve capacity, and cold cranking amps necessary to permit fulfillment of all requirements specified herein. Insulated boots shall be installed over battery terminals. The batteries shall have a total cranking capacity of 15 minutes. The battery(s) shall have sufficient capacity to permit two consecutive cranking cycles in a one-hour period, each comprising 15 seconds of continuous cranking on an inactive set (engine shut-off solenoid deenergized) followed by a 15-second rest period, and still have sufficient reserve to permit starting of the set under all ambient condition specified in Paragraph "Starting and Operationing" in Part 2 of the Specification. A separate battery charger shall be provided and connected to the essential bus for each genset to maintain the battery charge when the generator is not running. It shall be current limiting, using a saturable reactor type transformer, so it will not overload during engine starting.
- VV.** Battery cable: The battery cable shall be flexible, low temperature, and oil and acid resistant. The positive cable shall have a non-conductive red sleeve at both ends. Battery terminal connectors shall be provided on one end of each cable.

- WW.** Battery Retainer: Means shall be provided to retain the battery within the genset during all transportation and handling, and shall be of a type that will permit easy removal of the battery. Means shall be provided to allow drainage of spilled electrolyte out of the genset without contact with any set component except the retainer. The retainer shall be resistant to battery electrolyte.
- XX.** Polarity Reversal: The genset shall not be damaged (see Article 1.4) in any manner in the event polarity of battery cables is reversed. It shall not be possible to crank the genset with battery polarity reversed.
- YY.** Battery Charging System: The engine mounted battery charging system shall have temperature compensating characteristics compatible with battery specified herein. The battery charging system shall not be damaged by continuous application of a short or open circuit to its output. The battery charging system shall be capable of maintaining the batteries after the starting cycle

stated in para. above on "Battery(s)" in a state of full charge after four hours of operation in addition to providing the required control power.

#### **17.11 LUBRICATION SYSTEM**

- ZZ.** Lubrication System: The set shall have a positive displacement gear-driven lubrication pump and a full-flow oil filtration system that meets all requirements herein using lubricants specified in Article 2.2. Oil temperature in the oil sump shall stabilize between 38 deg C and 130 deg C under all operationing condition specified herein. The lubrication system shall contain a permanently installed, manually operationd oil-sampling valve. The valve shall be connected to the pressurized oil gallery to permit taking samples while the engine is running at rated speed. An oil-drain assembly shall be provided and installed in such a manner to allow complete drainage of the crankcase/oil-sump outside of the skid base into a suitable container. External piping, valves, fittings, and tubing of the lubricating system shall be disconnectable and easily accessible for maintenance. The oil filler opening shall permit oil filling from a standard 7.5 liters (8 quarts) capacity can with spout and flow control valve. The oil-level bayonet gage shall be double-marked to accurately indicate full and low oil-level, with the set sitting or operationing in a level position. The bayonet gage shall be marked in accordance with SAE J614B. The bayonet gage shall be placed in a readily accessible location. A captive filler cap shall be provided except in the case where the cap and dipstick are of an integral design. The oil filter shall be of the spin-on type.

#### **17.12 CONTROL AND MONITORING**

**AAA.** Genset Control Panel: The genset control panel shall be one face of the control enclosure. The panel shall be hinged to provide access to the control components in the enclosure. The enclosure shall be mounted on vibration isolators to protect the control panel and control components from genset vibrat. The scale of all meters and gauges shall display genset rated values in the upper 1/3 of the scale.

**BBB.** Meters, Switches, and Gauges: Genset meters may be digital or analog (ANSI 39.1). Analog meters shall mount in a 65 mm or a 75 mm (2-1/2 inch or 3 inch) diameter hole and have a 90 degree scale. The accuracy of the frequency meter shall be plus or minus 0.6 Hz, and other meter accuracy shall be two percent of full scale. Gauges shall mount in a 50 mm (2 inch) diameter hole.

The meters and gauges shall be mounted on the control panel and properly connected for the required function, and shall include but not be limited to the items specified in the following paragraphs.

1. AC Ammeter: The ammeter shall be interconnected with the voltmeter/ammeter phase selector switch or interconnected with the ammeter selector switch to indicate the line (phase) current in the selected phase.
2. AC Voltmeter: The voltmeter shall be interconnected with the voltmeter/ammeter phase selector switch or interconnected with the voltmeter selector switch (see para. below on "Selector switches") to indicate the line (phase) to neutral voltage of the selected phase or the line to line (phase to phase) as selected.
3. Frequency Meter: The frequency meter shall be connected to indicate the genset operating frequency.
4. Kilowatt Meter: The kilowatt meter shall measure and indicate the power output of a 3-phase, 4 wire genset to an accuracy of three percent of full scale value under the following condition:
  - b. Balanced load at any power factor from unity to 0.80 lagging.
  - c. Unbalanced load, where the three phase voltages, currents, and power factor differ.
  - d. With the output of any one phase equal to zero.
5. Selector Switches: A voltmeter/ammeter phase selector switch or a voltmeter phase selector switch and an ammeter selector switch shall allow selection of any phase voltage and current.
  - b. Voltmeter/ammeter phase selector switch: The voltmeter/ammeter phase selector switch shall have seven

marked posit to allow selection of any phase voltage and current, or selection of any combination of phase-to-phase voltages, or selection of the "OFF" position (voltmeter and ammeter reads zero).

- c. Voltmeter phase selector switch: The voltmeter phase selector switch shall have seven marked posit to allow selection of any phase-to-neutral voltage, and any of phase-to-phase voltages or selection of the "OFF" position.
  - d. Ammeter selector switch: The ammeter selector switch shall have four marked posit to allow selection of any phase current or selection of the "OFF" position.
- 6. Oil Pressure Gauge: The oil pressure gauge shall be connected to indicate the engine lubricating oil pressure (wired to a sensor unit located on the engine).
  - 7. Coolant temperature gauge: The coolant temperature gauge shall be connected to indicate the engine coolant temperature (wired to a sensor unit located on the engine).
  - 8. Running time meter: The running time meter shall be connected to show only the operationing hours that genset is producing voltage. The meter shall be capable of indicating up and including 9999.9 hours.

**CCC. Genset Controls:**

- 1. Voltage Adjustment Control: The AC voltage adjust rheostat shall be a screw driver slot type rheostat with locknut, and shall be connected to allow the genset output voltage to be adjusted +/- 5 percent of nameplate voltage.
- 2. Frequency Adjustment Control: The AC frequency adjust rheostat shall be a screw driver slot type rheostat with locknut, and shall be connected to allow the genset frequency to be adjusted +/- 5 percent of nameplate frequency.
- 3. Monitor Lamp Test Switch: The lamp test switch shall be a momentary contact switch, and shall be connected to illuminate all monitor lights when the switch is in the "ON" position.
- 4. Fault light reset switch: The fault reset switch shall be connected to reset (extinguish) any monitor that is illuminated as a result of a fault after the fault has been corrected.

**DDD.** Genset Monitor Lights: The safety and shut down indicator system shall conform to NFPA-110, level 2 as a minimum. The monitor lights shall be connected to indicate the status of the following genset parameters. All the funct below that shut down the genset (indicated by a RED light) shall remain illuminated until reset. Each monitored parameter shall have the color of indicator shown below:

1. Green "RUN" light - illuminated when the genset is operationing.
2. Flashing red "SWITCH OFF" - flashes to indicate that genset is not in automatic start mode.
3. Yellow "WARNING FOR LOW OIL PRESSURE" - illuminated when oil pressure is below safe operationing pressure.
4. Yellow "WARNING FOR HIGH COOLANT TEMPERATURE" - illuminated when coolant temperature exceeds safe operationing temperature.
5. Yellow "LOW COOLANT TEMPERATURE" - illuminated when coolant temperature is too low for automatic start.
6. Yellow "LOW FUEL" - illuminated when fuel level in the day tank is less than 25 percent of full capacity.
7. Red "LOW OIL PRESSURE SHUTDOWN" - illuminated when the genset has stopped due to low oil pressure.
8. Red "HIGH COOLANT TEMPERATURE SHUTDOWN" - illuminated when the genset has stopped due to high coolant temperature.
9. Red "OVERCRANK SHUTDOWN" - illuminated when engine fails to start within the allowable crank cycle.
10. Red "OVERSPEED SHUTDOWN" - illuminated when the genset has stopped due to overspeed.
11. Red "Customer selected fault" - when genset has a dual wall fuel tank, this light shall illuminate when the fuel leaks into the secondary fuel containment tank, but shall not shutdown the genset.
12. Red "Customer selected fault" - not connected.

**EEE.** Protection Devices and Alarms: The genset shall be equipped with all the devices and circuitry necessary to provide inputs to accomplish all the monitoring funct in para. above on "Genset monitor lights."

1. Low oil pressure shutdown: This device shall activate when the engine oil pressure drops to minimum value specified by the engine manufacturer as being safe for operation of the engine.
2. High coolant temperature shutdown: This device shall activate when the coolant temperature increases to the temperature value specified by the engine manufacturer as being safe for operation of the engine.
3. Overspeed shutdown: This device shall trip when the genset speed is greater than 115 percent of rated speed. The overspeed shall not be activated from the exciter voltage, generator voltage, battery charger, battery voltage, fuel metering system, or from any linkage under control of the speed regulation governor. The device shall have manual reset. The actual setpoint shall be adjustable over a range of 100 percent to 125 percent of rated speed.

**FFF.** Automatic Transfer Switch (ATS) Interface: The genset shall have provision for connection of the ATS control cable.

### **17.13 GENERATOR OVERCURRENT AND FAULT PROTECTION**

**GGG.**Control Power Protection: The AC and DC control power wiring and components shall be protected by circuit breaker(s) or fuse(s).

**HHH.**Circuit Breaker: The genset shall be equipped with a heavy duty molded case thermal-magnetic circuit breaker. The circuit breaker shall be UL listed for this application, 100 percent rated. This breaker shall be rated to continuously carry 125 percent of the rated current of the genset.

The thermal trip elements shall be set to trip at 130 percent of rated current in not less than 10 seconds or more than 15 seconds. The magnetic trip elements shall trip instantaneously when the current in any phase exceeds 425 percent rated current. The breaker shall be of trip free design, and the trip mechanism shall open all phases simultaneously.

### **17.14 GENERATOR EXCITER AND VOLTAGE REGULATION**

#### **III. Excitation system:**

1. Exciter: The generator exciter shall be a rotating brushless type with a rectifier assembly integral with the main generator rotor. The rotating rectifier assemblies shall be mounted in a manner to provide ready access for inspection and replacement of rectifier diodes.
2. Voltage regulation: The voltage regulation shall be RMS sensing, 3 phase sensing solid state, and shall automatically control the output voltage of the genset thru action on the exciter field.

3. Exciter field power source: The power for the exciter field shall be provided by a permanent magnet generator (PMG) integrally mounted as a part of the generator and exciter assembly. The PMG and its controls shall be capable of sustaining and regulating current supplied to any combination of single or three phase faults at 300 percent of rated current for not more than 10 seconds.

#### **17.15 ACCESSORIES**

**JJJ.** Electrical Interfaces: A terminal strip(s) shall be provided and properly identified for connection to external devices as follows. These terminals shall be readily accessible thru the housing door(s).

1. Electric auxiliary fuel transfer pump power supply.
2. Fuel level signal from external fuel tank.
3. Coolant jacket heater power supply.
4. Automatic transfer switch (ATS). These terminals can also be used for a wall mounted battery charger (see para. below).

**KKK.** Wall Mounted Battery Charger: There shall be a wall mounted, solid state battery charger provided. This charger shall be mounted in a corrosion resistant ventilated steel enclosure to prevent any contact with any electrically energized component. This battery charger shall be the temperature compensated constant voltage type, rated to match the battery voltage of the genset with over current control to limit the output current to 10 amps even when connected to a dead battery. There shall be conduit knockouts for the AC input and the DC output. There shall be an input AC circuit breaker, and an indicating light to show that AC power is available. There shall also be an ammeter on the DC connected to show the charging current. A ground terminal electrically connected to the enclosure shall be provided. The charger shall be wired to accept an input AC voltage and frequency compliant with the line-to-neutral output voltage of the genset.

**LLL.** Skid Base: All rotating equipment of each set, including diesel-engine coupling and generator, shall be mounted and carefully aligned on a rigid structural steel or formed steel base capable of supporting all components, and permitting handling and lifting into position without effecting the alignment of the equipment. Instruct shall be attached to the control panel that informs the user to check alignment prior to first start-up and to refer to the installation manual (see Article 1.5) for alignment instruct. All parts of the genset shall be readily accessible for operation, routine servicing, periodic maintenance, and repair. Servicing and periodic maintenance shall be capable of accomplishment with conventional engine mechanics and electricians' tools and test equipment. Replacement and adjustment of components, assemblies, and accessories shall be possible with minimum

drainage requirements and disturbance to other elements. There shall be a split-bolt type grounding terminal permanently attached near the load cable entrance provision and electrically bonded to the skid base.

**MMM.** Spring Isolators: Normal spring type vibration isolators shall be provided in seismic zone 0, or seismic type isolators for zones 2B, 3 or 4 according to applicable seismic zone shall be provided for installation between the genset skid and the sub-base tank or the sub-base tank and the foundation. The spring isolators shall reduce the transmitted vibration from the genset to the foundation or sub-base tank to a maximum 40 microns total amplitude throughout the frequency ranges down to 66 cps during all phases of set operation.

**NNN.** Thermal and Sound Insulating Materials: Thermal and sound-insulating material shall be free from perceptible odors and noxious fumes; contain no asbestos; have a flame spread index of 25 or less and a smoke-developed index of 50 or less, as tested by ASTM E-84-96; be unaffected by battery electrolyte or petroleum derivatives; be capable of maintaining its shape, position, and consistency inherently or by suitable retaining methods; and be replaceable.

#### **17.16 FABRICATION**

**OOO.** Corrosion-Resisting Metals and Treatments: Gensets shall be fabricated from compatible metals and materials that are inherently corrosion resistant, or shall be treated to be resistant to the various forms of corrosion and deterioration that may be encountered in the storage and operation environments specified herein.

**PPP.** Dissimilar Metals: Dissimilar metals shall not be used in intimate contact with each other unless protected against galvanic corrosion.

**QQQ.** Assembly of Light-Metal Alloys: Attachment to aluminum and magnesium alloys shall be by:

1. Machine bolts with nuts.
2. Steel bushings with tapped holes.
3. Stud bolts with National Coarse Threads on the ends that screw into aluminum or magnesium.
4. Helical-coil-type inserts.

**RRR.** Welding: Surfaces to be welded shall be free of foreign matter that would be injurious to the weld. Welding procedures shall be in accordance with a nationally recognized welding code that is applicable to the materials being joined. Welds shall be of sufficient size and shape to develop the full design strength of the parts connected by the weld. Welds shall transmit imposed



stresses without permanent deformation or failure when subjected to proof or service testing. In addition the following shall apply:

1. Spray metalizing of shafts will not be permitted.
2. The strength of welded joints on rotating parts of the engine or generator shall be not less than 100 percent of the strength of the materials being joined.
3. The strength of welded joints on stationary parts of the engine or generator shall be not less than 80 percent of the strength of the materials being joined.
4. Any rotation part of welded construction shall be stress relieved after welding.

**SSS.** Wiring: All wire shall be secured neatly into harnesses. Wires in all harnesses shall be of the proper length, and shall be so run and secured (with insulated clamps) as to protect insulation against contact with sharp corners and edges, pinching, sharp bending and twisting, abrasion because of vibration or contact with moving parts, and exposure to engine fuel oil, lubricating oil, and parts at high temperatures. Conductors shall not be clamped to or supported by fuel or oil lines. Where a cable or wire is run between parts that move relative to each other (as a result of vibration, adjustment, inspection, or as a matter of normal operation), sufficient slack shall be left in the harness to allow repeated movement to take place without bending or twisting to the point of damaging the wire in any manner. Wires shall not be spliced. All wiring harnesses shall terminate in connectors or terminal lugs at each end or branch, except solder connect may be made to potentiometers, resistors, semiconductors, fuseholders, capacitors, and press-to-test indicator lights. A means shall be provided to prevent liquids from coming in contact with any electrical connection for all operating condition specified herein. Not more than two terminal lugs shall be attached with any one screw on screw type terminal boards, and not more than four terminal lugs shall be attached to any one stud on stud-type terminal boards. Terminals on electrical components shall not have more than one wire attached.

**TTT.** Soldering: Soldering shall be in accordance with standard commercial practice.

**UUU.** Manual Turning: Provision shall be made to permit manual turning of the engine crankshaft and associated parts so that inspection and maintenance of parts requiring reference to the crank angle can be made with the set fully assembled (removal of the starter is acceptable for timing purposes). Manual turning by barring on the flywheel ring gear, the generator coupling, or the generator fan is not permitted.

**VVV.** Safety: Exposed moving parts, parts that have exposed high operating temperatures, parts which may be electrically energized, and parts that are a hazard to operating personnel shall be insulated, fully enclosed, guarded, or fitted with other types of safety devices. The safety devices shall be installed in such a manner that proper operation of the equipment is not impaired and shall be in accordance with NEMA MG-2 requirements.

#### **17.17 SOURCE QUALITY CONTROL ( FACTORY TESTS )**

**WWW.** Tests (Gensets): All testing of the gensets shall be accomplished using coolant, fuel and lubricating oil as specified herein. Where paralleling switchgear is used, there shall be a system test at the factory. Where switchgear and generators are manufactured and tested by two different companies, arrangements shall be made for a system factory test.

**XXX.** Production Genset Tests: The production generator test shall include a dielectric strength (high pot) test. The generator test results shall be identified with the applicable generator model and serial number, and shipped with the generator to the genset assembler for inclusion with the genset test results that are shipped with the genset. Each genset shall be tested before delivery, and the test results shall be identified with the applicable genset model and serial number and be shipped with the genset. The production tests shall include the following as a minimum:

1. Start and Stop tests (local control).
2. Operation at rated load for two hours minimum.
3. Immediately after test above and before removing load, operation at 110 percent of rated load for one hour.
4. Application and dropping of rated load in one step (minimum of 5 times).
5. Check for proper operation of all indicators and controls.
6. Simulate each abnormal condition associated with each protective device to verify proper operation of shutdown protective system wiring.
7. Record voltage and frequency transients on a time based plot for step loads of 0 percent -50 percent, 50 percent - 0 percent, 50 percent - 100 percent, 100 percent - 0 percent, and 0 percent - 100 percent of rated load.

C. General Contractor will witness all required factory tests. Notify general contractor at least 14 days before tests and indicate their approximate duration.

## **PART 18 - EXECUTION**

### **18.1 EXAMINATION**

**YYY.** Examine areas, equipment foundation, and condition, with Installer present, for compliance with requirements for installation and other condition affecting packaged engine generator performance. Proceed with installation only after unsatisfactory condition have been corrected.

**ZZZ.** Examine roughing-in of cooling-system piping systems and electrical connect. Verify actual location of connect before packaged engine generator installation.

### **18.2 STEEL BASE**

**AAAA.** Skid Base: All rotating equipment of each set, including diesel-engine coupling and generator, shall be mounted and carefully aligned on a rigid structural steel or formed steel base capable of both supporting all components and permitting handling/lifting into position without effecting the alignment of the equipment. Instruct shall be attached to the control panel that informs the use to check alignment prior to first start-up and to refer to the installation manual for alignment instruct. All parts of the genset shall be readily accessible for operation, routine servicing, periodic maintenance, and repair. Servicing and periodic maintenance shall be capable of accomplishment with conventional engine mechanics and electricians' tools and test equipment. Replacement and adjustment of components, assemblies, and accessories shall be possible with minimum drainage requirements and disturbance to other elements. There shall be a split bolt type grounding terminal permanently attached near the load cable entrance provision and electrically bonded to the skid base.

### **18.3 INSTALLATION**

**BBBB.** Comply with packaged engine generator manufacturers' written installation and alignment instruct, and with NFPA 110.

**CCCC.** Equipment Grounding: All non-energized metal parts of the genset shall be electrically bonded together and connected to the genset ground stud. The generator neutral shall be connected to the ground stud; this shall be the only generator neutral connection to ground. See Article 2.10 for DC grounding.

## 18.4 CONNECT

**DDDD.** Hoses and Hose Fittings: Hoses shall be installed with no sharp bend or twisting, and shall not contact any adjacent structures (to avoid rubbing).

**EEEE.** Piping Installation: Drawings indicate general arrangement of piping and specialties. The following are specific connection requirements:

1. Install piping adjacent to packaged engine generator to allow service and maintenance.
2. Connect water supply to cooling system.
3. Connect exhaust-system piping to diesel engines.

## 18.5 IDENTIFICATION

**FFFF.** Nameplates: The genset shall have a permanently attached nameplate in accordance with ISO 8528-5 mounted in a visible location on the outside of the genset. Nameplate shall include the winding wound with 2/3 pitch.

## 18.6 FIELD QUALITY CONTROL

Pretesting: Upon completing installation of system, align, adjust, and balance system, and perform complete start-up and pretesting. Determine, through pretesting, conformance of system to requirements of Contract Drawings and Specification. Correct deficiencies observed in pretesting. Replace malfunctioning and damaged items with new, and retest (at no cost to client) until satisfactory performances and condition are achieved. Prepare forms for systematic recording of acceptance test results.

1. Battery Equalization: Equalize charging of battery cells according to manufacturer's written instruct. Record individual cell voltages.

**GGGG.** Report of Pretesting: After pretesting is complete, provide letter certifying installation is complete and fully operable; include names and titles of witnesses to pretests.

## 18.7 COMMISSIONING

**HHHH.** Manufacturer's Field Service: Engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including piping and electrical connect, and to assist in testing. Report results in writing.

**IIII.** Testing: Perform field quality-control testing under the supervision of the manufacturer's factory-authorized service representative.

**JJJJ.** Tests: Include those identified above in 2.20.C and the following:

1. Tests recommended by manufacturer.
2. International Electrical Testing Association Tests: Perform each visual and mechanical inspection and electrical and mechanical test in NETA ATS for emergency generator sets, except omit vibration baseline test. Certify compliance with test parameters for tests performed.
3. NFPA 110 Acceptance Tests: Perform tests required by NFPA 110 that are additional to those specified here including, but not limited to, single-step full-load pickup test.
4. Battery Tests: Measure charging voltage and voltages between available battery terminals for full-charging and float-charging condition. Check electrolyte level and specific gravity under both condition. Test for contact integrity of all connectors. Perform an integrity load test and a capacity load test for the battery. Verify acceptance of charge for each element of battery after discharge. Verify measurements are within manufacturer's specification.
5. Battery-Charger Tests: Verify specified rates of charge for both equalizing and float-charging condition.
6. System Integrity: Methodically verify proper installation, connection, and integrity of each element of engine generator system before and during system operation. Check for air, exhaust, and fluid leaks.
7. Exhaust-System Back-Pressure Test: Use a manometer with a scale exceeding 120 kPa (40 inches wg). Connect to exhaust line close to engine exhaust manifold. Verify back pressure at full-rated load is within manufacturer's written allowable limits for the engine.
8. Exhaust Emiss Test: Comply with applicable standard test criteria.
9. Voltage and Frequency Transient Stability Tests: Use recording oscilloscope to measure voltage and frequency transients for 50 and 100 percent step-load increases and decreases, and verify that performance is as specified.
10. Harmonic-Content Tests: Measure harmonic content of output voltage under 25 percent and at 100 percent of rated linear load. Verify that harmonic content is within specified limits.

**KKKK.** Coordinate tests with tests for transfer switches and run them concurrently.

**LLLL.** Retest: Correct deficiencies identified by tests and observat, and retest until specified requirements are met.

**MMMM.** Report results of tests and inspect in writing. Record adjustable relay settings and measured insulation resistances, time delays, and other values and observat. Attach a label or tag to each tested component indicating satisfactory completion of tests.

**NNNN.** Test instruments shall have been calibrated within the last 12 months, traceable to standards of the National Institute for Standards and Technology, and adequate for making positive observation of test results. Make calibration records available for examination on request.

## **18.8 CLEANING**

**OOOO.** Cleaning: On completion of installation, inspect system components. Remove paint splatters and other spots, dirt, and debris. Repair damaged finish to match original finish. Clean components internally using methods and materials recommended by manufacturer.

## **18.9 DEMONSTRATION**

**PPPP.** Provide the services of Manufacturer's factory-authorized service representative to demonstrate and train admin maintenance personnel as specified below:

1. After completion of commissioning responsibilities train admin maintenance personnel in procedures and schedules involved in operationing, troubleshooting, servicing, and preventive maintenance of system. Provide minimum of 8 hours' training.
2. Schedule training with COR at least 21 days in advance.
3. Provide 6 copies of Manufacturer's standardized and comprehensive system operation and user's manuals covering equipment.
4. Provide 6 copies of instruct listing routine maintenance procedures and noting possible breakdowns. Provide repair and troubleshooting guide that lists common causes for breakdowns, malfunct, and recommended repairs.

## **PART 19 - GENERAL (PARALLELING SWITCHGEAR)**

### **19.1 SUMMARY**

- A.** This Section includes metal-clad, low-voltage, circuit-breaker switchgear rated 600 Volts and less, and associated control systems, for paralleling generators on an isolated bus and for distributing power in ac systems.
- B.** Related Sect include the following:
  - 1. Division 26 Section "Generator Sets".
  - 2. Division 26 Section "Switchgear"
- C.** Where requirements herein are in conflict with those in section "Generator Sets", the requirements herein shall govern.

### **19.2 ACRONYMS& ABBREVIAT**

- D.** ATS: Acceptance Testing Specification.
- E.** GFCI: Ground-fault circuit interrupter.
- F.** HMI: Human machine interface.

### **19.3 SUBMITTALS**

- A.** Product Data: For each type of switchgear and related equipment, include the following:
  - 1. Technical data on features, performance, electrical characteristics, ratings, and finishes.
  - 2. Rated capacities, operationing characteristics, furnished specialties, and accessories for individual circuit breakers.
  - 3. Features, characteristics, ratings, factory settings, and time-current characteristic curves for individual relays and overcurrent protective devices.
  - 4. Description of sequence of operation for paralleling controls.

- B. Shop Drawings:** For each type of switchgear and related equipment, include the following:
1. Dimensioned plans, elevation, sect, and details, including required clearances and service space around equipment. Include the following:
    - a. Tabulation of installed devices with features and ratings.
    - b. Enclosure types and details.
    - c. Outline and general arrangement drawing showing dimens, shipping sect, and weights of each assembled section.
    - d. Floor plan drawing showing location for anchor bolts and leveling channels.
    - e. Bus configuration with current rating, size, and number of conductors in each bus run, including phase, neutral, and ground conductors of main and branch buses.
    - f. Short-time and short-circuit current rating of switchgear assembly.
    - g. Features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.
    - h. Nameplate legends.
    - i. Mimic-bus diagram.
    - j. UL listing for series rating of installed devices.
  2. Wiring Diagrams: For switchgear, paralleling control system, and related equipment, include the following:
    - a. Power, signal, and control wiring.
    - b. Schematic control diagrams.
    - c. Diagrams showing connect of component devices and equipment.
    - d. Three-line diagrams of current and future circuits showing device terminal numbers and internal diagrams.
    - e. Schematic diagrams showing connect to remote devices.



3. Design Calculat: Signed and sealed by a qualified professional engineer. Calculate requirements for selecting seismic restraints.
- C. Coordination Drawings: Floor plans showing dimensioned layout, required working clearances, and required area above and around switchgear where pipe and ducts are prohibited. Show switchgear layout and relationships between components and adjacent structural and mechanical elements. Show support location, type of support, and weight on each support. Indicate field measurements.
  - D. Samples: Representative portion of mimic bus with specified finish. Manufacturer's color charts showing colors available for mimic bus.
  - E. Manufacturer Seismic Qualification Certification: Submit certification that switchgear, overcurrent protective devices, accessories, and components will withstand seismic forces. Include the following:
    1. Basis of Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
      - a. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified and the unit will be fully operational after the seismic event."
    2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and location and describe mounting and anchorage provision.
    3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.
  - F. Qualification Data: For testing agency.
  - G. Source quality-control test reports.
  - H. Field quality-control test reports.
  - I. Updated mimic bus diagram reflecting field changes after final switchgear load connect have been made, for record.
  - J. Operation and Maintenance Data: For switchgear and components to include in emergency, operation, and maintenance manuals. Include the following:
    1. Manufacturer's written instruct for sequence of operation.
    2. Manufacturer's sample system checklists and log sheets.
    3. Manufacturer's written instruct for testing and adjusting relays and overcurrent protective devices.

4. Time-current curves, including selectable ranges for each type of relay and overcurrent protective device.

#### **19.4 QUALITY ASSURANCE**

- K. If an independent testing agency is required, see Division 1 Section "Quality Requirements" for general testing and inspecting agency qualification requirements. If additional control is needed, use one of first two paragraphs below to specify 29 CFR 1910.7 or other more specific criteria (e.g., NETA). 29 CFR 1910.7 defines a nationally recognized testing laboratory as it applies to testing and inspecting for safety, and lists, labels, or accepts equipment and materials that meet certain OSHA criteria.
- L. Testing Agency Qualificat: An independent agency, with the experience and capability to conduct the testing indicated, that is a member company of the Inter National Electrical Testing Association or is a nationally recognized testing laboratory (NRTL) as defined by OSHA in 29 CFR 1910.7, and that is acceptable to authorities having jurisdiction.
  1. Testing Agency's Field Supervisor: Person currently certified by the Inter National Electrical Testing Association or the National Institute for Certification in Engineering Technologies to supervise on-site testing specified in Part 3.
- M. Source Limitat: Obtain switchgear through one source from a single manufacturer.
- N. Product Opt: Drawings indicate size, profiles, and dimensional requirements of switchgear and are based on the specific system indicated.
- O. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- P. Comply with Latest Edition of Philippine Electrical Code (PEC).

#### **19.5 DELIVERY, STORAGE, AND HANDLING**

- Q. Deliver switchgear in sect of lengths that can be moved past obstruct in delivery path.
- R. Store switchgear indoors in clean dry space. Protect switchgear from exposure to dirt, fumes, water, corrosive substances, and physical damage.

- S. If stored in areas subjected to weather, cover switchgear to provide protection from weather, dirt, dust, corrosive substances, and physical damage. Remove loose packing and flammable materials from inside switchgear.

#### **19.6 PROJECT CONDITION**

- T. Revise paragraph below to describe specific requirements for moving switchgear into place. Where appropriate, indicate alteration to existing facilities that may be required to accommodate an indicated delivery path. Coordinate with Drawings.
- U. Installation Pathway: Remove and replace building components and structures to provide pathway for moving switchgear into place.
- V. Product Selection for Restricted Space: Drawings indicate maximum dimensions for switchgear, including clearances between switchgear and adjacent surfaces and other items. Comply with indicated maximum dimensions.
- W. Environmental Limitation: Rate equipment for continuous operation at indicated ampere ratings for the following condition:
  - 1. Ambient temperature not exceeding 50 deg C (122 deg F).
  - 2. Altitude of 1000 meters above sea level.

#### **19.7 COORDINATION**

- A. Coordinate layout and installation of switchgear and components with other construction that penetrates ceilings or is supported by them, including conduit, piping, equipment, and adjacent surfaces. Maintain required clearances for workspace and equipment access doors and panels.
- B. Coordinate size and location of concrete bases. Concrete, reinforcement, and formwork requirements are specified in its specified division.

#### **19.8 EXTRA MATERIALS**

- X. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
  - 1. Fuses: Six of each type and rating used. Include spares for potential transformers, control power circuits and fusible devices.

2. Indicating Lights: Six of each type installed.
  3. Touchup Paint: Three containers of paint matching enclosure finish, each 250 mL.
- Y. Maintenance Tools: Furnish tools and miscellaneous items required for switchgear test, inspection, maintenance, and operation. Include the following:
1. Traveling-type hoisting facilities, rail mounted on top of switchgear and all other items necessary to remove circuit breaker from housing and transport to remote location.
  2. Racking handle to move circuit breaker manually between connected and disconnected posit, and a secondary test coupler to permit testing of circuit breaker without removal from switchgear.

## **PART 20 – PRODUCTS**

### **20.1 MANUFACTURERS**

- Z. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, and accredited manufacturers.
  2. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

### **20.2 GENERATOR PARALLELING MONITOR AND CONTROL SYSTEM**

A. Available Manufacturers:

1. Caterpillar; Engine Div.
2. Emerson; ASCO Power Technologies, LP.
3. GE Zenith Controls.
4. Kohler Co.; Generator Division.
5. Onan Corp.; Cummins Inc.; Industrial Business Group.
6. Russelectric.

**B. Individual Generator Control and Monitoring Panel:** Provide each generator with a control and monitoring panel that allows the operator to view status and control operation of respective generator. Provide panel with the following features and characteristics:

1. Generator Metering: 1 percent accuracy class or better.
  - a. Ammeter, Voltmeter, Frequency Meter, Wattmeter, Kilowatt-Hour Meter, and Power Factor Meter:
    - 1) For three-phase and four-wire systems, indicate line-to-line and line-to-neutral condition on voltmeter.
    - 2) Provide switches or other provision to allow reading of both generator and bus voltages and frequencies from this metering set.
  - b. Synchroscope and "Generator Set Synchronized" Indication:
    - 1) Provide lamp or LED indication of synchronization.
    - 2) Provide 360-degree analog movement synchroscope.
    - 3) Provide ComAp inteliGen NTC synch controller.
  - c. Engine run-time meter, start counter, rpm meter, and battery voltage meter.
  - d. Engine oil temperature gage and engine coolant temperature gage.
2. Generator Protective and Control Switches: Provide oil tight, industrial-grade switches in generator control and monitoring panel.
  - a. Mode Selector Switch (Run/Off/Auto):
    - 1) "Run" mode to start and accelerate unit to rated speed and voltage, but not close paralleling circuit breaker.
    - 2) "Off" mode to prevent generator from starting or to immediately shutdown generator if running.
    - 3) "Auto" mode to allow generator to start on receipt of remote start signal.
  - b. Circuit-Breaker Trip/Close Switch: Interlocked with system control so that circuit-breaker closure is impossible unless the following occurs:
    - 1) Mode selector switch is in "Run" position.

- 2) Generator set is synchronized with system bus.
  - c. Control/reset push button with flashing lamp to indicate generator is locked out due to fault condition.
  - d. Lamp test push button to simultaneously test all lamps on panel.
  - e. Control Panel Illumination: DC lamps to illuminate panel when lighting from surrounding environment is not available.
  - f. Emergency Stop Push Button: Red mushroom-head switch maintaining its position until manually reset.
  - g. Voltage and Frequency Raise/Lower Switches:
    - 1) Allow plus/minus 5 percent adjustment when generator set is operating but not paralleled.
3. Generator Protective and Control Devices: Solid-state industrial relays, integrated microprocessor-based control devices, and other accessories and devices located either in generator control and monitoring panel or in switchgear control section to provide the following features and funct:
- a. Kilowatt Load Sharing Control:
    - 1) Operations engine governors during synchronizing and provides isochronous load sharing when paralleled.
    - 2) Allows generator set to ramp up to kilowatt load level signaled by system master controller.
  - b. Load-Demand Governing Control:
    - 1) Causes generator set to ramp down to zero load when signaled to shut down in load-demand mode.
    - 2) Causes generator set to ramp up to a proportional share of total bus load.
  - c. Kilovolt Ampere Rating Load Sharing Control:
    - 1) Operations alternator excitation system while generator set is paralleled.
    - 2) Causes sharing of reactive load among all generator sets to within 1 percent of equal levels without voltage drop.
  - d. Sync-Check and Paralleling Monitor and Control:

- 1) Monitors and verifies that generator set has reached 90 percent of nominal voltage and frequency before closing to bus.
  - 2) Prevents out-of-phase paralleling if two or more generator sets reach operationing condition simultaneously, by sending "inhibit" signal to sets not designated by system as "first to close to bus."
  - 3) Recognizes failure of "first-to-close" generator set and signals system paralleling to continue.
  - 4) Prevents out-of-phase closure to bus due to errant manual or automatic operation of synchronizer.
- e. Synchronizer Control:
- 1) Adjusts engine governor to match voltage, frequency, and phase angle of paralleling bus.
  - 2) Maintains generator-set voltage within 1 percent of bus voltage, and phase angle within 20 electrical degrees of paralleling bus for 0.5 seconds before circuit-breaker closing.
  - 3) Provides "fail-to-synchronize time delay" adjustable from 10 to 120 seconds; with field selectivity to either initiate alarm or shut down generator set on failure condition.
- f. Reverse Power Monitor and Control:
- 1) Prevents sustained reverse power flow in generator set.
  - 2) Trips generator circuit breaker and initiates generator set shutdown when reverse power condition exceeds 10 percent of generator set kilowatt for three seconds.
- g. Phase Rotation Monitor and Control:
- 1) Verifies generator set and paralleling bus phase rotation match prior to closing paralleling circuit breaker.
- h. Electronic Alternator Overcurrent Alarm and Shutdown Control:
- 1) Monitors current flow at generator-set output terminals.
  - 2) Initiates alarm when load current on generator set is more than 110 percent of rated current for more than 60 seconds.

- 3) Provides overcurrent shutdown function matched to thermal damage curve of alternator. Provide without instantaneous-trip function.
  
- i. Electronic Alternator Short-Circuit Protection:
  - 1) Provides shutdown when load current is more than 175 percent of rated current and combined time/current approaches thermal damage curve of alternator. Provide without instantaneous-trip function.
  
- j. Loss of Excitation Monitor:
  - 1) Initiates alarm when sensing loss of excitation to alternator while paralleled to system bus.
  
- k. Generator-Set Start Contacts: Redundant system, 10 A at 32-V dc.
  
- l. Cool-Down Time-Delay Control: Adjustable, 0 to 600 seconds.
  
- m. Start Time-Delay Control: Adjustable, 0 to 300 seconds.
  
- n. Paralleling Circuit-Breaker Monitor and Control:
  - 1) Monitors circuit-breaker auxiliary contacts.
  - 2) Initiates fault signal if circuit breaker fails to close within adjustable time-delay period (0.5 to 15 seconds).
  - 3) Trips open and locks out paralleling circuit breaker upon paralleling circuit breaker failure to close, until manually reset.
  
4. Engine Protection and Local Annunciation:
  - a. Provide annunciation and shutdown control modules for alarms indicated.
  - b. Provide visual alarm status indicator and alarm horn with silence/acknowledge push button on generator control and monitoring panel.
  - c. Annunciate the following condition:
    - 1) Status, Light Only (Nonlatching):
      - a) Generator engine control switch not in auto (red).



- b) Generator engine control switch in auto (green).
  - c) Emergency mode (red).
  - d) Generator circuit breaker closed (red).
  - e) Generator circuit breaker open (green).
  - f) Engine stopped (green).
  - g) Engine running (red).
  - h) Engine cool-down (amber).
- 2) Pre-Alarm, Light and Horn (Nonlatching):
- a) Pre-high coolant temperature (amber).
  - b) Pre-low oil pressure (amber).
  - c) Low coolant temperature (amber).
  - d) Engine low battery (amber).
  - e) Engine low fuel (amber).
  - f) Generator fails to synchronize (amber).
- 3) Shutdown Alarm, Light and Horn (Latching):
- a) Engine overcrank (red).
  - b) Engine overspeed (red).
  - c) Engine low oil pressure (red).
  - d) Engine high coolant temperature (red).
  - e) Engine low coolant level (red).
  - f) Engine remote emergency shutdown (red).
  - g) Generator circuit breaker tripped (red).
  - h) Generator loss of field (red).
  - i) Generator reverse power (red).
  - j) Generator undervoltage (red).
  - k) Generator overvoltage (red).

- l) Generator underfrequency (red).
- m) Generator overfrequency (red).

**C. Master Control System and Monitoring Equipment:** Paralleling and monitoring equipment, components, and accessories for multiple generators with the following features and characteristics:

- 5. Components and devices shall be mounted in the switchgear control section of the switchgear lineup.
- 6. Paralleled System Metering: 1 percent accuracy class or better to monitor total output of generator bus.
  - a. Ammeter, voltmeter, frequency meter, wattmeter, kilowatt-hour meter, power factor meter, kilovolt ampere, kilovolt ampere rating, and kilowatt demand meters.
    - 1) For three-phase/four-wire systems, indicate line-to-line and line-to-neutral condition on voltmeter.
    - 2) Display all funct on the HMI device.
- 7. Full-Color HMI Device: Touchscreen with minimum viewing area of 60 square inches.
  - a. Allows operationor to monitor and control the complete system of paralleled generator sets.
  - b. Screens shall include the following:
    - 1) Main Menu: Include date, time, and system status messages with screen push buttons to access one-line diagram, system controls, load controls, alarms, bus metering, and individual generator-set data.
    - 2) One-Line Diagram Screen: Depicting system configuration and system status by screen animation, screen colors, text messages, or pop-up indicators. Indicate the following minimum system condition:
      - a) Generator sets, buses, and paralleling circuit breakers energized/de-energized.
      - b) Generator-set mode (run/off/auto).
      - c) Generator-set status  
(normal/warning/shutdown/load-demand stop).

- d) Paralleling circuit-breaker status (open/closed/tripped).
  - e) Bus condition (energized/de-energized).
  - f) Provide access to other screens.
- 3) AC Metering Screen: Displays the following minimum meter data for the paralleling bus:
- a) Phase volts and amperes, kilowatt, kilovolt ampere, kilovolt ampere rating, power factor, frequency, kilowatt hour, and kilowatt demand.
  - b) Real-time trend chart for system kilowatts and volts updated on not less than one-second intervals.
  - c) A minimum of one historical trend chart for total system loads with intervals no shorter than five minutes and a minimum duration of four hours.
- 4) Generator-Set Control Screen: Provides control over individual generator sets from master system control panel. Includes the following minimum funct:
- a) Generator manual start/stop control (functional only when generator-set mounted control switch is in "Auto" position).
  - b) Generator-set alarm reset.
  - c) Manual paralleling and circuit-breaker controls.
- 5) Generator-Set Data Display Screen: Provide the following minimum parameters:
- a) Engine speed, oil pressure and temperature, coolant temperature, and engine operationing hours.
  - b) Three-phase voltage and current, kilowatt, power factor, and kilowatt hour.
  - c) Generator control switch position and paralleling circuit-breaker position.
  - d) All generator-set alarms.
- 6) System Control Screen: Password protected and with the following minimum funct:

- a) System Test Modes: Test with load/test without load/normal/retransfer time-delay override.
  - b) Test with Load: Starts and synchronizes generator sets on paralleling bus; all loads are transferred to bus.
  - c) Test without Load: Starts and synchronizes generator sets on paralleling bus but does not transfer loads to bus.
  - d) Time adjustments for retransfer time delay, transfer time delay, system time delay on stopping, and system time delay on starting.
- 7) Load-Demand Control Screen: Monitors total load on system bus and controls number of generator sets running so that capacity tracks load demand.
- a) Load-Demand Control: On/off.
  - b) Load-Demand Pickup Set Point: Adjustable from 90 to 40 percent in 5 percent increments.
  - c) Load-Demand Dropout Set Point: Adjustable from 20 to 70 percent in 5 percent increments.
- 8) Manual Load Control Screen: Allows operationor to manually add or delete generator sets from paralleled system in response to system load parameters.
- a) Indication of system available in kilowatts and amperes.
  - b) Control funct allow manual addition/removal of generator sets on system, and activation of load-shed/load-restore funct.
- 9) Load-Add/Load-Shed Sequence Screen: Password protected and with the following minimum funct:
- a) Assigns "load-add sequence priority" to each load control relay with designation for relay operation after a set number of generator sets are online.
  - b) Assigns "load-shed sequence priority" to each load control relay with designation for relay operation depending on number of generator sets online.
- 10) Alarm Summary and Run Report Screen:

- a) Lists most recent alarm condition and status changes.
  - b) Lists a minimum of the most recent 32 alarm condition by name and time/date; acknowledges alarm condition with time/date.
  - c) For each start signal, lists start time and date, stop time and date, maximum kilowatt and ampere load on system during run time, and start and stop times of individual generator sets.
8. Solid-State System Status Panel:
- a. Provides visual alarm status indicator and alarm horn with silence/acknowledge push button.
  - b. Annunciates the following condition:
    - 1) Status, Light Only:
      - a) Running Status: Display generator set number and "green" running-status light.
      - b) Load demand mode (green).
      - c) Priority Load Status: Display load number and "green" on-status light.
      - d) System test (green).
      - e) Remote system start (red).
      - f) Normal source available (green).
      - g) Connected to normal (green).
      - h) Generator source available (green).
      - i) Connected to generator source (green).
    - 2) Status, Light and Alarm:
      - a) Load-Shed Level Status: Displays load number and red load-shed, status light.
      - b) Generator Alarm Status: Displays generator number and red "Check Generator" status light.
      - c) Controller malfunction (red).
      - d) Check station battery (red).

- e) Bus overload (red).
- f) System not in auto (red).

**CC. Description of System Operation:**

1. Loss of Normal Power:
  - a. System receives "start" signal; all generator sets start and achieve rated voltage and frequency. Note: PSGU shall open upon loss of input power and shall be locked open when "PSGU" is closed.
  - b. System closes the first generator set achieving 90 percent of rated voltage to paralleling bus.
  - c. "Priority load add" controls prevent overloading of system.
  - d. Remaining generator sets switched to synchronizers that control and then allow closure of generator sets to paralleling bus.
  - e. On closure to paralleling bus, each generator set assumes its proportional share of total load.
2. Failure of a Generator Set to Start or Synchronize:
  - a. After expiration of overcrank time delay, generator set shuts down and alarm is initiated.
  - b. Priority controller prevents overload of system bus.
  - c. Manual override of priority controller at HMI allows addition of low-priority load to bus.
  - d. Bus overload monitor protects bus from manual overloading.
3. Bus Overload:
  - a. On bus overload, load-shed control initiates load shedding.
  - b. If bus does not return to normal frequency within adjustable time period, additional load continues to be shed until bus returns to normal frequency.
  - c. Loads shed can be reconnected to bus only by manual reset at HMI.
4. Load-Demand Mode:
  - a. With "load-demand" function activated, controller continuously monitors total bus load.

- b. If bus load is below preset limits for 15 minutes, demand controller shuts down generator sets in predetermined order until minimum number of sets are operating.
  - c. On sensing available bus capacity diminished to set point, controller starts and closes generator sets to bus to accommodate load.
5. Return to Normal Power:
- a. Process starts on removal of start signals from system.
  - b. When no load remains on paralleling bus, all generator breakers open, go through cool-down period, and shut down.
  - c. If start signal is received during cool-down period, one generator set is reconnected to bus, and system operation follows that of "loss of normal power."

### 20.3 SWITCHGEAR

**DD.** Refer to Section "SWITCHGEAR" for requirements for low voltage, metal-clad, circuit breaker and associated components. Provide additional features as indicated below.

**EE.** Control Battery System:

1. System Requirements: Battery shall have number of cells and ampere-hour capacity based on an initial specific gravity of 1.210 at 25 deg C with electrolyte at normal level and minimum ambient temperature of 13 deg C. Cycle battery before shipment to guarantee rated capacity on installation. Arrange battery to operation ungrounded.
2. Battery: Lead-calcium type in sealed, clear plastic or glass containers, complete with electrolyte, fully charged, and arranged for shipment with electrolyte in cells. Limit weight of each container to not more than 70 lb (32 kg) and cells per container to not more than 3. System batteries shall be suitable for service at an ambient temperature ranging from minus 10 to 40 deg C.
3. Rack: Two-step rack with electrical connect between battery cells and between rows of cells; include two flexible connectors with bolted-type terminals for output leads. Rate battery rack, cell supports, and anchorage for seismic requirements.
4. Accessories:

- a. Thermometers with specific-gravity correction scales.
  - b. Hydrometer syringes.
  - c. Set of socket wrenches and other tools required for battery maintenance.
  - d. Wall-mounting, nonmetallic storage rack fitted to store above items.
  - e. Set of cell numerals.
5. Charger: Static-type silicon rectifier equipped with automatic regulation and provision for manual and automatic adjustment of charging rate. Unit shall automatically maintain output voltage within 0.5 percent from no load to rated charger output current, with ac input-voltage variation of plus or minus 10 percent and input-frequency variation of plus or minus 3 Hz. Other features of charger include the following:
- a. DC ammeter.
  - b. DC Voltmeter: Maximum error of 5 percent at full-charge voltage; operations with toggle switch to select between battery and charger voltages.
  - c. Ground Indication: Two appropriately labeled lights to indicate circuit ground, connected in series between negative and positive terminals, and with midpoint junction connected to ground by normally open push-button contact.
  - d. Capacity: Sufficient to supply steady load, float-charge battery between 2.20 and 2.25 V per cell and equalizing charge at 2.33 V per cell.
  - e. Charging-Rate Switch: Manually operationd switch provides for transferring to higher charging rate. Charger operations automatically after switch operation until manually reset.
  - f. AC power supply is 120 V, 60 Hz, subject to plus or minus 10 percent variation in voltage and plus or minus 3-Hz variation in frequency. After loss of ac power supply  
  
for any interval, charger automatically resumes charging battery. Charger regulationes rate of charge to prevent damage due to overload and to prevent fuses or circuit breakers from opening.
  - g. Protective Feature: Current-limiting device or circuit, which limits output current to rating of charger but does not



disconnect charger from either battery or ac supply; protects charger from damage due to overload, including short circuit on output terminals.

- h. Electrical Filtering: Reduces charger's audible noise to less than 26 dB.

## **PART 21 - EXECUTION**

### **21.1 EXAMINATION**

**FF.** Examine elements and surfaces where switchgear will be installed for compliance with installation tolerances, required clearances, and other condition affecting performance.

1. Proceed with installation only after unsatisfactory condition have been corrected.

### **21.2 INSTALLATION**

**GG.** Comply with applicable part in NECA 400 (Standard for Installing and Maintaining Switchboards).

**HH.** Anchor switchgear assembly to 100-mm channel-iron embedded in concrete base and attach by bolting.

1. Sills: Select to suit switchgear; level and grout flush into concrete base.
2. Design each fastener and support to carry load indicated by seismic requirements and according to seismic-restraint details. See Division 26 Section "Seismic Controls for Electrical Works" for seismic-restraint requirements.
3. Concrete Bases: 100 mm high, reinforced, with chamfered edges. Extend base no more than 75 mm in all direct beyond the maximum dimens of switchgear, unless otherwise indicated or unless required for seismic anchor support. Construct concrete bases according to Division 26 Section "Seismic Controls for Electrical Works."

- II. Temporary Lifting Provision: Remove temporary lifting eyes, channels, brackets, and temporary blocking of moving parts from switchgear units and components.

### **21.3 IDENTIFICATION**

JJ. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs as specified in Division 26 Section "Electrical Identification."

KK. Diagrams and Instruct:

1. Frame and mount under clear acrylic plastic on front of switchgear.
  - a. Operationing Instruct: Printed basic instruct for switchgear, including control and key-interlock sequences and emergency procedures.
  - b. System Power Riser Diagrams: Depict power sources, feeders, distribution components, and major loads.
2. Storage for Maintenance: Include a rack or holder, near the operationing instruct, for a copy of maintenance manual.

### **21.4 CONNECT**

LL. Ground equipment according to Division 26 Section "Grounding and Bonding."

MM. Connect wiring according to Division 26 Section "Conductors and Cables."

### **21.5 FIELD QUALITY CONTROL**

A. Prepare for acceptance tests as follows:

1. Test insulation resistance for each switchgear bus, component, connecting supply, feeder, and control circuit.
2. Test continuity of each circuit.

B. Manufacturer's Field Service: Engage a factory-authorized service representative to perform the following:

1. Inspect switchgear installation, including wiring, components, connect, and equipment. Test and adjust components and equipment.

2. Verify that electrical control wiring installation complies with manufacturer's submittal by means of point-to-point continuity testing. Verify that wiring installation complies with requirements in Division 26 Sect.
3. Complete installation and startup checks according to manufacturer's written instruct.
4. Assist in field testing of equipment including pretesting and adjusting of equipment and components.
5. Report results in writing

**C. Testing Agency:** Engage a qualified independent testing and inspecting agency to perform field tests and inspect and prepare test reports.

**D. Perform the following field tests and inspect and prepare test reports:**

1. Perform each visual and mechanical inspection and electrical test stated in NETA ATS. Certify compliance with test parameters. Perform NETA tests and inspect for each of the following NETA categories:
  - a. Switchgear.
  - b. Circuit breakers.
  - c. Protective relays.
  - d. Instrument transformers.
  - e. Metering and instrumentation.
  - f. Ground-fault systems.
  - g. Battery systems.
  - h. Surge arresters.
  - i. Capacitors.

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

**E. Infrared Scanning:** After Substantial Completion, but not more than 60 days after Final Acceptance, perform an infrared scan of each switchgear. Remove front and rear panels so joints and connect are accessible to portable scanner.

3. Follow-up Infrared Scanning: Perform an additional follow-up infrared scan of each switchgear 11 months after date of Substantial Completion.
4. Instrument: Use an infrared scanning device designed to measure temperature or to detect significant deviat from normal values. Provide calibration record for device.
5. Record of Infrared Scanning: Prepare a certified report that identifies switchgear checked and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observat after remedial action.

#### **21.6 ADJUSTING**

- A. Set field-adjustable, protective-relay trip characteristics according to results in Division 26 Section "Overcurrent Protective Device Coordination."
- B. Set field-adjustable, protective-relay trip characteristics.

#### **21.7 CLEANING**

- RR. On completion of installation, inspect interior and exterior of switchgear. Vacuum dirt and debris; do not use compressed air to assist in cleaning. Repair damaged finishes.

#### **21.8 PROTECTION**

- SS. Temporary Heating: Apply temporary heat to switchgear, according to manufacturer's written instruct, throughout periods when switchgear environment is not controlled for temperature and humidity within manufacturers' stipulated service condition.

#### **21.9 DEMONSTRATION**

- A. Engage a factory-authorized service representative to train Owner Representative's maintenance personnel to adjust, operation, and maintain switchgear. Refer to Division 1 Section "Demonstration and Training."

### **PART 22 - GENERAL (TRANSFER SWITCH)**

## 22.1 SUMMARY

**A.** This Section includes transfer switches rated 600 V and less, including the following:

1. Automatic transfer switch.
2. Automatic open-transition transfer switch.
3. Remote annunciation system.

**B.** Field Test Reports: Indicate and interpret test and inspection results for compliance with.

## 22.2 SUBMITTALS

**C.** Product Data: For each type of product indicated. Include rated capacities, weights, operationing characteristics, furnished specialties, and accessories.

**D.** Shop Drawings: Dimensioned plans, elevation, sect, and details showing minimum clearances, conductor entry provision, gutter space, installed features and devices, and material lists for each switch specified.

1. Single-Line Diagram: Show connect between transfer switch, bypass/isolation switch, power sources, and load; and show interlocking provision for each combined transfer switch and bypass/isolation switch.

**E.** Manufacturer Seismic Qualification Certification: Submit certification that transfer switches accessories, and components will withstand seismic forces defined in Division Section "Electrical Supports and Seismic Restraints." Include the following:

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
  - a. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified."
  - b. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified and the unit will be fully operational after the seismic event."

2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and location and describe mounting and anchorage provision.
  3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.
- F.** Qualification Data: For manufacturer and testing agency.
- G.** Field quality-control test reports.
- H.** Operation and Maintenance Data: For each type of product to include in emergency, operation, and maintenance manuals. In addition to items specified in Division 1 Section "Operation and Maintenance Data," include the following:
1. Features and operationing sequences, both automatic and manual.
  2. List of all factory settings of relays; provide relay-setting and calibration instruct, including software, where applicable.

### **22.3 QUALITY ASSURANCE**

- A.** Manufacturer Qualificat: Maintain a service center capable of providing emergency maintenance and repairs at Project site with an eight-hour maximum response time.
- B.** Testing Agency Qualificationfs: Testing agency as defined by OSHA in 29 CFR 1910.7 or a member company of the International Electrical Testing Association and that is acceptable to authorities having jurisdiction.
1. Testing Agency's Field Supervisor: Person currently certified by the International Electrical Testing Association or the National Institute for Certification in Engineering Technologies (Level 3 or higher), to supervise on-site testing specified in Part 3.
- C.** Source Limitat: Obtain automatic transfer switch, bypass/isolation switch, non automatic transfer switch, remote annunciators, and remote annunciator and control panels through one source from a single manufacturer.
- D.** Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, for emergency service under UL 1008, by a testing agency acceptable to authorities having jurisdiction.
- E.** Comply with NEMA ICS 1.

- F. Comply with NFPA 70.
- G. Comply with NFPA 99.
- H. Comply with NFPA 110.
- I. Comply with UL 1008, unless requirements of these Specification are stricter.
- J. Comply with the latest Philippine Electrical Code (PEC)

#### **22.4 EXTRA MATERIALS**

- A. Furnish extra parts described in Division 1 at Substantial Completion. Extra parts shall package with protective covering for storage and identified with labels describing contents.

### **PART 23 - PRODUCTS**

#### **23.1 AUTOMATIC TRANSFER SWITCHES**

- A. Comply with Level 1 equipment according to NFPA 110/UL 1008 for Fire pump.
- B. Switching Arrangement: Double-throw type, incapable of pauses or intermediate position stops during normal functioning, unless otherwise indicated.
- C. Manual Switch Operation: Under load, with door closed and with either or both sources energized. Transfer time is the same as for electrical operation. Control circuit automatically disconnects from electrical operationor during manual operation.
- D. Manual Switch Operation: Unloaded. Control circuit automatically disconnects from electrical operationor during manual operation.
- E. Signal-before-Transfer Contacts: A set of normally open/normally closed dry contacts operations in advance of retransfer to normal source. Interval is adjustable from 1 to 30 seconds.
- F. Digital Communicat Interface: Matched to capability of remote annunciator or annunciator and control panel.

- G.** Automatic Open-Transition Transfer Switches: Include the following functions and characteristics:
1. Fully automatic make-before-break operation.
  2. Load transfer without interruption, through momentary interconnection of both power sources not exceeding 100 mts.
  3. Initiation of No-Interruption Transfer: Controlled by in-phase monitor and sensors confirming both sources are present and acceptable.
    - a. Initiation occurs without active control of generator set.
    - b. Controls ensure closed-transition load transfer closure occurs only when the two sources are within plus or minus 5 electrical degrees, maximum and plus or minus 5 percent maximum voltage difference.
  4. Failure of the power source serving the load initiates automatic break-before-make transfer.
- H.** Motor Disconnect and Timing Relay: Controls designate starters so they disconnect motors before transfer and reconnect them selectively at an adjustable time interval after transfer. Control connection to motor starters is through wiring external to automatic transfer switch. Time delay for reconnecting individual motor loads is adjustable between 1 and 60 seconds, and settings are as indicated. Relay contacts handling motor-control circuit inrush and seal currents are rated for actual currents to be encountered.

### **23.2 AUTOMATIC TRANSFER-SWITCH FEATURES**

- A.** Under voltage Sensing for Each Phase of Normal Source: Senses low phase-to-ground voltage on each phase. Pickup voltage is adjustable from 85 to 100 percent of nominal, and dropout voltage is adjustable from 75 to 98 percent of pickup value. Factory set for pickup at 90 percent and dropout at 85 percent. Provide over/under voltage and frequency sensing for all generator transfer switches to initiate generator start and transfer of power.
- B.** Time delay for override of normal-source voltage sensing delays transfer and engine start signals. Adjustable from 0.50 to six seconds, and factory set for one second.
- C.** Voltage/Frequency Lockout Relay: Prevents premature transfer to generator set. Pickup voltage is adjustable from 85 to 100 percent of nominal. Factory set for pickup at 90 percent. Pickup frequency is



adjustable from 90 to 100 percent of nominal. Factory set for pickup at 95 percent.

- D.** Time Delay for Retransfer to Normal Source: Adjustable from 0 to 30 minutes; factory set for 10 minutes. Provides automatic defeat of delay on loss of voltage or sustained under voltage of emergency source, provided normal supply has been restored.
- E.** Test Switch: Simulates normal-source failure.
- F.** Switch-Position Pilot Lights: Indicate source to which load is connected.
- R.** Source-Available Indicating Lights: Supervise sources via transfer-switch, normal- and emergency-source sensing circuits.
  - 1. Normal Power Supervision: Green light with nameplate engraved "Normal Source Available."
  - 2. Emergency Power Supervision: Red light with nameplate engraved "Emergency Source Available."
- S.** Unassigned Auxiliary Contacts: Two normally open single-pole, double-throw contacts for each switch position, rated 10 A at 240-V ac.
- T.** Transfer Override Switch: Overrides automatic retransfer control so automatic transfer switch will remain connected to emergency power source regardless of condition of normal source. Pilot light indicates override status.
- U.** Engine Starting Contacts: One isolated, normally closed and one isolated, normally open, rated 10 A at 32-V dc minimum.
- V.** Engine Shutdown Contacts: Instantaneous. Initiates shutdown sequence at remote engine-generator controls after retransfer of load to normal source.
- W.** Engine Shutdown Contacts: Time delay adjustable from zero to five minutes; factory set for five minutes. Initiates shutdown at remote engine-generator controls after retransfer of load to normal source.
- X.** Engine-Generator Exerciser: Solid-state, programmable-time switch starts engine-generator set and transfers load to it from normal source for a preset time, then retransfers and shuts down engine after a preset cool-down period. Initiates exercise cycle at preset intervals adjustable from 7 to 30 days. Running periods are adjustable from 10 to 30 minutes. Factory settings are for 7-day exercise cycle, 20-minute running period, and 5-minute cool-down period. Exerciser features include the following:
  - 1. Exerciser Transfer Selector Switch: Permits selection of exercise with and without load transfer.

2. Push-button programming control with digital display of settings.
3. Integral battery operation of time switch when normal control power is not available.

### **23.3 REMOTE ANNUNCIATOR SYSTEM**

- Y.** Functional Description: Remote annunciator panel annunciates condition for indicated transfer switches. Annunciation includes the following:
1. Sources available, as defined by actual pickup and dropout settings of transfer-switch controls.
  2. Switch position.
  3. Switch in test mode.
  4. Failure of communicat link.
  5. Remote control.
- Z.** Annunciator Panel: LED, LCD or vacuum fluorescent type with audible signal and silencing switch.
1. Indicating Lights: Grouped for each transfer switch monitored.
  2. Label each group indicating transfer switch it monitors, location of switch, and identity of load it serves.
  3. Mounting: Flush, modular, steel cabinet, unless otherwise indicated.
  4. Lamp Test: Push-to-test or lamp-test switch on front panel.
  5. Remote control.

### **23.4 FINISHES**

- AA.** Enclosures: Manufacturer's standard enamel over corrosion-resistant pretreatment and primer.

### **23.5 SOURCE QUALITY CONTROL**

- BB.** Factory Test Components, Assembled Switches, and Associated Equipment: Ensure proper operation. Check transfer time and voltage, frequency, and

time-delay settings for compliance with specified requirements. Perform dielectric strength test complying with NEMA ICS 1.

## **PART 24 - EXECUTION**

### **24.1 APPLICATION**

- A.** Four-Pole Switches: Where four-pole switches are indicated, install neutral switching.

### **24.2 INSTALLATION**

- A.** Comply with mounting and anchoring requirements specified in Division 26 Section "Seismic Controls for Electrical Work."
- B.** Floor-Mounted Switch: Anchor to floor by bolts.
  - 1. Concrete Bases: 100 mm (4 inches) high, reinforced, with chamfered edges. Extend base no more than 50 mm (2 inches) in all direct beyond the maximum dimens of switch, unless otherwise indicated. Cast anchor-bolt inserts into bases. Comply with Division Section "Cast-in-Place Concrete."
- C.** Annunciator and Control Panel Mounting: Flush in wall, unless otherwise indicated.
- EE.** Identify components according to Division 26 Section "Electrical Identification."

### **24.3 WIRING TO REMOTE COMPONENTS**

- A.** Match type and number of cables and conductors to control and communicat requirements of transfer switches as recommended by manufacturer. Increase raceway sizes at no additional cost to Owner Representative if necessary to accommodate required wiring.

### **24.4 CONNECT**

- FF.** Ground equipment according to Division 26 Section "Grounding and Bonding."

**GG.** Connect wiring according to Division 26 Section "Conductors and Cables."

**HH.** 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.

#### **24.5 FIELD QUALITY CONTROL**

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

**JJ.** Testing Agency: Engage a qualified testing and inspecting agency to perform the following field tests and inspect and prepare test reports:

**KK.** Perform the following field tests and inspect and prepare test reports:

1. After installing equipment and after electrical circuitry has been energized, test for compliance with requirements.
2. Perform each electrical test and visual and mechanical inspection stated in NETA ATS, Section 7.22.3. Certify compliance with test parameters.
3. Measure insulation resistance phase-to-phase and phase-to-ground with insulation-resistance tester. Include external annunciation and control circuits. Use test voltages and procedure recommended by manufacturer. Comply with manufacturer's specified minimum resistance.
  - a. Check for electrical continuity of circuits and for short circuits.
  - b. Inspect for physical damage, proper installation and connection, and integrity of barriers, covers, and safety features.
  - c. Verify that manual transfer warnings are properly placed.
  - d. Perform manual transfer operation.
4. After energizing circuits, demonstrate interlocking sequence and operational function for each switch at least three times.
  - a. Simulate power failures of normal source to automatic transfer switches and of emergency source with normal source available.

- b. Simulate loss of phase-to-ground voltage for each phase of normal source.
  - c. Verify time-delay settings.
  - d. Verify pickup and dropout voltages by data readout or inspection of control settings.
  - e. Test bypass/isolation unit functional modes and related automatic transfer-switch operation.
  - f. Perform contact-resistance test across main contacts and correct values exceeding 500 microhms and values for 1 pole deviating by more than 50 percent from other poles.
  - g. Verify proper sequence and correct timing of automatic engine starting, transfer time delay, retransfer time delay on restoration of normal power, and engine cool-down and shutdown.
5. Ground-Fault Tests: Coordinate with testing of ground-fault protective devices for power delivery from both sources.
- a. Verify grounding connect and location and ratings of sensors.
  - b. Observe reaction of circuit-interrupting devices when simulated fault current is applied at sensors.
- LL.** Coordinate tests with tests of generator and run them concurrently.
- MM.** Report results of tests and inspect in writing. Record adjustable relay settings and measured insulation and contact resistances and time delays. Attach a label or tag to each tested component indicating satisfactory completion of tests.
- NN.** Remove and replace malfunctioning units and retest as specified above.

## 24.6 CLEANING

- OO.** After completing equipment installation, inspect unit components. Remove paint splatters and other spots, dirt, and debris. Repair damaged finish to match original finish.
- PP.** Clean equipment internally, on completion of installation, according to manufacturer's written instruct.

## **24.7 DEMONSTRATION**

- QQ.** Engage a factory-authorized service representative to train Owner's Representative Maintenance personnel to adjust, operation, and maintain transfer switches and related equipment as specified below.
1. Coordinate this training with that for generator equipment.

## **PART 25 - GENERAL**

### **25.1 SUMMARY**

**RR.** This Section includes the following:

1. Interior lighting fixtures with lamps and ballasts.
2. Lighting fixtures mounted on exterior building surfaces.
3. Emergency lighting units.
4. Exit signs.
5. Accessories, including occupancy sensors.

**SS.** Related Sect include the following:

1. Division 26 Section "Wiring Devices" for manual wall-box dimmers for incandescent lamps.
2. Division 26 Section "Seismic Controls for Electrical Work".

**TT.** Special lighting fixtures under the scope of works of the Lighting Consultant, Interior Designer, and Landscape Architect Consultant shall be handled by these specialty Consultants.

### **25.2 DEFINIT, ACRONYMS & ABBREVIAT**

- A.** BF: Ballast factor. Ratio of light output of a given lamp(s) operationd by the subject ballast to the light output of the same lamp(s) when operationd on an ANSI reference circuit.
- B.** CRI: Color rendering index.
- C.** CU: Coefficient of utilization.

- D.** LER: Luminaire efficiency rating, which is calculated according to NEMA LE 5. This value can be estimated from photometric data using the following formula:
  - 1. LER is equal to the product of total rated lamp lumens times BF times luminaire efficiency, divided by input watts.
- VV.** RCR: Room cavity ratio.
- WW.** LLD: Lamp Lumen Depreciation, reflect the overall performance of a lamp over its life (mean lumens/rated lumens). Value can be found from lamp manufacturer data.
- XX.** LDD: Luminaire Dirt Depreciation, it is the light loss prior to cleaning dust. LDD is estimated from tables in IESNA lighting handbook.

### **25.3 SUBMITTALS**

- YY.** Product Data: For each type of lighting fixture, arranged in order of fixture designation. Include data on features, accessories, finishes, and the following:
  - 1. Physical description of lighting fixture including dimens.
  - 2. Emergency lighting units including battery and charger.
  - 3. Ballast.
  - 4. Energy-efficiency data.
  - 5. Air and Thermal Performance Data: For air-handling lighting fixtures. Furnish data required in "Submittals" Article in Division 23 Section "Diffusers, Registers, and Grilles."
  - 6. Sound Performance Data: For air-handling lighting fixtures. Indicate sound power level and sound transmission class in test reports certified according to standards specified in Division 23 Section "Diffusers, Registers, and Grilles."
  - 7. Life, output, and energy-efficiency data for lamps.
  - 8. Photometric data, in IESNA format, based on laboratory tests of each lighting fixture type, outfitted with lamps, ballasts, and accessories identical to those indicated for the lighting fixture as applied in this Project.
    - a. For indicated fixtures, photometric data shall be certified by a qualified independent testing agency. Photometric data for remaining fixtures shall be certified by the manufacturer.

- b. Photometric data shall be certified by a manufacturer's laboratory with a current accreditation under the National Voluntary Laboratory Accreditation Program (NVLAP) for Energy Efficient Lighting Products.

**ZZ.** Shop Drawings: Show details of nonstandard or custom lighting fixtures. Indicate dimens, weights, methods of field assembly, components, features, and accessories.

1. Wiring Diagrams: Power and control wiring.

**AAA.** Coordination Drawings: Reflected ceiling plan(s) and other details, drawn to scale, on which the following items are shown and coordinated with each other, based on input from installers of the items involved:

1. Lighting fixtures.
2. Suspended ceiling components.
3. Structural members to which suspension systems for lighting fixtures will be attached.
4. Other items in finished ceiling including the following:
  - a. Air outlets and inlets.
  - b. Speakers.
  - c. Sprinklers.
  - d. Smoke and fire detectors.
  - e. Occupancy sensors
  - f. Access panels
5. Perimeter moldings.

**BBB.** Samples for Verification: Interior lighting fixtures designated for sample submission in Interior Lighting Fixture Schedule. Each sample shall include the following:

1. Lamps: Specified units installed.
2. Accessories: Cords and plugs.

**CCC.** Product Certificates: For each type of ballast for bi-level and dimmer-controlled fixtures, signed by product manufacturer.

**DDD.** Qualification Data: For agencies providing photometric data for lighting fixtures.



**EEE.** Field quality-control test reports.

**FFF.** Operation and Maintenance Data: For lighting equipment and fixtures to include in emergency, operation, and maintenance manuals.

**GGG.** Warranties: Special warranties specified in this Section.

## **25.4 QUALITY ASSURANCE**

**HHH.** Testing Agency Qualification: An independent agency, with the experience and capability to conduct the testing indicated, that is a member company of the International Electrical Testing Association or is a nationally recognized testing laboratory (NRTL) as defined by OSHA in 29 CFR 1910.7, and that is acceptable to authorities having jurisdiction.

1. Testing Agency's Field Supervisor: Person currently certified by the International Electrical Testing Association or the National Institute for Certification in Engineering Technologies to supervise on-site testing specified in Part 3.

**III.** Electrical Components, Devices, and Accessories: Listed and labeled as defined in Latest Edition of the PEC, Article 5.0, "Hazardous Location." or BS EN 60079:2004 "Electrical Apparatus for Explosive Gas Atmospheres" by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

**JJJ.** Comply with Latest Edition of the PEC.

**KKK.** FMG Compliance: Fixtures for hazardous location shall be listed and labeled for indicated class and division of hazard by FMG.

**LLL.** NFPA 101 Compliance: Comply with visibility and luminance requirements for exit signs.

**MMM.** Mockups: Provide lighting fixtures for room or module mockups. Install fixtures for mockups with power and control connect.

1. Obtain Owner Representative's approval of fixtures for mockups before starting installation.
2. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
3. Approved fixtures in mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

**NNN.**Energy Efficiency: Comply with National Energy Policy Act and Energy Star requirements for lighting products. Submit data indicating lumens per watt efficiency and (CRI) Color Rendering Index of light source.

## **25.5 COORDINATION**

- A.** Coordinate layout and installation of lighting fixtures and suspension system with other construction that penetrations ceilings or is supported by them, including HVAC equipment, fire-suppression system, and partition assemblies.

## **25.6 WARRANTY**

**PPP.** Special Warranty for Emergency Lighting Unit Batteries: Manufacturer's standard form in which manufacturer of battery-powered emergency lighting unit agrees to repair or replace components of rechargeable batteries that fail in materials or workmanship within specified warranty period.

1. Warranty Period: 2 years from date of Substantial Completion. Full warranty shall apply for first year, and prorated warranty for the remaining nine years.

**QQQ.** Special Warranty for Fluorescent Ballasts: Manufacturer's standard form in which ballast manufacturer agrees to repair or replace ballasts that fail in materials or workmanship within specified warranty period.

1. Warranty Period for Electronic Ballasts: Five years from date of Substantial Completion.
2. Warranty Period for Electromagnetic Ballasts: Three years from date of Substantial Completion.

**RRR.** Manufacturer's Special Warranty for T8 Fluorescent Lamps: Manufacturer's standard form, made out to Owner Representative and signed by lamp manufacturer agreeing to replace lamps that fail in materials or workmanship, f.o.b. the nearest shipping point to Project site, within specified warranty period indicated below.

1. Warranty Period: Two years from date of Substantial Completion.

## **25.7 EXTRA MATERIALS**

- A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
  - 1. Lamps: 10 for every 100 of each type and rating installed. Furnish at least one of each type.
  - 2. Plastic Diffusers and Lenses: 10 for every 100 of each type and rating installed. Furnish at least one of each type.
  - 3. Battery and Charger Data: One for each emergency lighting unit.
  - 4. Ballasts: 5 for every 100 of each type and rating installed. Furnish at least one of each type.
  - 5. Globes and Guards: 1 for every 20 of each type and rating installed. Furnish at least one of each type.

## **PART 26 - PRODUCTS**

### **26.1 FIXTURES AND COMPONENTS, GENERAL**

- B. Recessed Fixtures: Comply with NEMA LE 4 for ceiling compatibility for recessed fixtures.
- C. Incandescent Fixtures: Comply with UL 1598. Where LER is specified, test according to NEMA LE 5A.
- D. Fluorescent Fixtures: Comply with UL 1598. Where LER is specified, test according to NEMA LE 5 and NEMA LE 5A as applicable.
- E. HID Fixtures: Comply with UL 1572. Where LER is specified, test according to NEMA LE 5B.
- F. Metal Parts: Free of burrs and sharp corners and edges.
- G. Sheet Metal Components: Steel, unless otherwise indicated. Form and support to prevent warping and sagging.
- H. Doors, Frames, and Other Internal Access: Smooth operationing, free of light leakage under operationing condition, and designed to permit relamping without use of tools. Designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during relamping and when secured in operationing position.

- I. Reflecting surfaces shall have minimum reflectance as follows, unless otherwise indicated:
  - 1. White Surfaces: 85 percent.
  - 2. Specular Surfaces: 83 percent.
  - 3. Diffusing Specular Surfaces: 75 percent.
  - 4. Laminated Silver Metallized Film: 90 percent.
  
- J. Plastic Diffusers, Covers, and Globes:
  - 1. Acrylic Lighting Diffusers: 100 percent virgin acrylic plastic. High resistance to yellowing and other changes due to aging, exposure to heat, and UV radiation.
    - a. Lens Thickness: At least 3.175 mm minimum unless different thickness is scheduled.
    - b. UV stabilized.
  - 2. Glass: Annealed crystal glass, unless otherwise indicated.
  
- K. Air-Handling Fluorescent Fixtures: For use with plenum ceiling for air return and heat extraction and for attaching an air-diffuser-boot assembly specified in Division 23 Section "Diffusers, Registers, and Grilles."
  - 1. Air Supply Units: Slots in one or both side trims join with air-diffuser-boot assemblies.
  - 2. Heat Removal Units: Air path leads through lamp cavity.
  - 3. Combination Heat Removal and Air Supply Unit: Heat is removed through lamp cavity at both ends of the fixture door with air supply same as for air supply units.
  - 4. Dampers: Operable from outside fixture for control of return-air volume.
  - 5. Static Fixtures: Air supply slots are blanked off, and fixture appearance matches active units.

## **26.2 BALLASTS FOR LINEAR FLUORESCENT LAMPS**

- A. Electronic Ballasts: Comply with ANSI C82.11; instant-start type, unless otherwise indicated, and designed for type and quantity of lamps served. Ballasts shall be designed for full light output unless dimmer or bi-level control is indicated.

1. Sound Rating: A.
  2. Total Harmonic Distortion Rating: Less than 10 percent.
  3. Transient Voltage Protection: IEEE C62.41, Category A or better.
  4. Operationing Frequency: 20 kHz or higher.
  5. Lamp Current Crest Factor: 1.7 or less.
  6. BF: 0.85 or higher.
  7. Power Factor: 0.95 or higher.
  8. Parallel Lamp Circuits: Multiple lamp ballasts shall comply with ANSI C 82.11 and shall be connected to maintain full light output on surviving lamps if one or more lamps fail.
  9. Starting and Maintaining Operation: Minimum of -17°C (0°F) unless otherwise indicated.
- B. Ballasts for Low Electromagnetic-Interference Environments: Comply with 47 CFR, Chapter 1, Part 18, Subpart C, for limitat on electromagnetic and radio-frequency interference for consumer equipment.

### **26.3 BALLASTS FOR COMPACT FLUORESCENT LAMPS**

- A. Description: Electronic programmed rapid-start type, complying with ANSI C 82.11, designed for type and quantity of lamps indicated. Ballast shall be designed for full light output unless dimmer or bi-level control is indicated:
1. Lamp end-of-life detection and shutdown circuit.
  2. Automatic lamp starting after lamp replacement.
  3. Sound Rating: A.
  4. Total Harmonic Distortion Rating: Less than 20 percent.
  5. Transient Voltage Protection: IEEE C62.41, Category A or better.
  6. Operationing Frequency: 20 kHz or higher.
  7. Lamp Current Crest Factor: 1.7 or less.
  8. BF: 0.95 or higher, unless otherwise indicated.
  9. Power Factor: 0.95 or higher.

10. Interference: Comply with 47 CFR, Chapter 1, Part 18, Subpart C, for limitat on electromagnetic and radio-frequency interference for nonconsumer equipment.
11. Ballast Case Temperature: 75 deg C, maximum.

#### **26.4 BALLASTS FOR HID LAMPS**

- A. Auxiliary Instant-On Quartz System: Factory-installed feature automatically switches quartz lamp on when fixture is initially energized and when power outages occur. System automatically turns quartz lamp off when HID lamp reaches approximately 60 percent light output.
- B. High-Pressure Sodium Ballasts: Electromagnetic type, with solid-state igniter/starter. Igniter-starter shall have an average life in pulsing mode of 10,000 hours at an igniter/starter-case temperature of 90 deg C.
  1. Instant-Restrike Device: Integral with ballast, or solid-state potted module, factory installed within fixture and compatible with lamps, ballasts, and mogul sockets up to 150 W.
    - a. Restrike Range: 105- to 130-V ac.
    - b. Maximum Voltage: 250-V peak or 150-V ac RMS.
  2. Minimum Starting Temperature: Minus 40 deg C.
  3. Open-circuit operation shall not reduce average lamp life.
- C. Low-Noise Ballasts: Manufacturers' standard epoxy-encapsulated models designed to minimize audible fixture noise.

#### **26.5 EXIT SIGNS**

- A. Description: Comply with UL 924, NFPA 70 and NFPA 101; for sign colors, visibility, luminance, and lettering size, comply with authorities having jurisdiction.
- B. Internally Lighted Signs:
  6. Lamps for AC Operation: Fluorescent, 2 for each fixture, 20,000 hours of rated lamp life.
  7. Lamps for AC Operation: LEDs, 70,000 hours minimum rated lamp life.
  8. Self-Powered Exit Signs (Battery Type): Integral automatic charger in a self-contained power pack.

- a. Battery: Sealed, maintenance-free, nickel-cadmium type.
  - b. Charger: Fully automatic, solid-state type with sealed transfer relay.
  - c. Operation: Relay automatically energizes lamp from battery when circuit voltage drops to 80 percent of nominal voltage or below. When normal voltage is restored, relay disconnects lamps from battery, and battery is automatically recharged and floated on charger.
  - d. Test Push Button: Push-to-test type, in unit housing, simulates loss of normal power and demonstrates unit operability.
  - e. LED Indicator Light: Indicates normal power on. Normal glow indicates trickle charge; bright glow indicates charging at end of discharge cycle. Retain subparagraph below to permit periodic test required by codes for emergency equipment to be performed using a hand-held remote device to trigger simulation of loss of normal power in the tested unit.
  - f. Remote Test: Switch in hand-held remote device aimed in direction of tested unit initiates coded infrared signal. Signal reception by factory-installed infrared receiver in tested unit triggers simulation of loss of its normal power supply, providing visual confirmation of either proper or failed emergency response.
  - g. Integral Self-Test: Factory-installed electronic device automatically initiates code-required test of unit emergency operation at required intervals. Test failure is annunciated by an integral audible alarm and flashing red LED.
4. Master/Remote Sign Configurati:
- a. Master Unit: Comply with requirements above for self-powered exit signs, and provide additional capacity in LED power supply for power connection to remote unit.
  - b. Remote Unit: Comply with requirements above for self-powered exit signs, except omit power supply, battery and test features. Arrange to receive full power requirements from master unit. Connect for testing concurrently with master unit as a unified system.

## 26.6 EMERGENCY LIGHTING UNITS

- L. Description: Self-contained units complying with UL 924, NFPA 70 and NFPA 101.

1. Battery: Sealed, maintenance-free, nickel-cadmium type with minimum seven-year nominal life, capable of 90 minutes illumination time.
2. Charger: Fully automatic, solid-state type with sealed transfer relay.
3. Operation: Relay automatically turns lamp on when power supply circuit voltage drops to 75 percent of nominal voltage or below. Lamp automatically disconnects from battery when voltage approaches deep-discharge level. When normal voltage is restored, relay disconnects lamps from battery, and battery is automatically recharged and floated on charger.
4. Test Push Button: Push-to-test type, in unit housing, simulates loss of normal power and demonstrates unit operability.
5. LED Indicator Light: Indicates normal power on. Normal glow indicates trickle charge; bright glow indicates charging at end of discharge cycle.
6. Wire Guard: Heavy-chrome-plated wire guard protects lamp heads or fixtures.
7. Integral Time-Delay Relay: Holds unit on for fixed interval of 15 minutes when power is restored after an outage.
8. Remote Test: Switch in hand-held remote device aimed in direction of tested unit initiates coded infrared signal. Signal reception by factory-installed infrared receiver in tested unit triggers simulation of loss of its normal power supply, providing visual confirmation of either proper or failed emergency response.
9. Integral Self-Test: Factory-installed electronic device automatically initiates code-required test of unit emergency operation at required intervals. Test failure is annunciated by an integral audible alarm and flashing red LED.

## **26.7 FLUORESCENT EMERGENCY LIGHTING FIXTURES**

- A. Internal Type: Self-contained, modular, battery-inverter unit factory mounted within fixture body. Comply with UL 924, NFPA 70 and NFPA 101.
9. Emergency Connection: Operation one fluorescent lamp continuously. Connect unswitched circuit to battery-inverter unit and switched circuit to fixture ballast.
10. Night Light Connection: Operation one fluorescent lamp continuously.



11. Test Switch and Light-Emitting-Diode Indicator Light: Visible and accessible without opening fixture or entering ceiling space.
  12. Battery: Sealed, maintenance-free, nickel-cadmium type with minimum seven-year nominal life, capable of 90 minutes illumination time.
  13. Charger: Fully automatic, solid-state, constant-current type.
- M.** Central Type: Factory installed, full light output, fluorescent emergency ballast to operation lamps indicated from a remote emergency power source.
- N.** External Type: Self-contained, modular, battery-inverter unit, suitable for powering one or more fluorescent lamps, remote mounted from light fixture. Comply with UL 924, NFPA 70 and NFPA 101.
1. Emergency Connection: Operation one fluorescent lamp continuously. Connect unswitched circuit to battery-inverter unit and switched circuit to fixture ballast.
  2. Night Light Connection: Operation one fluorescent lamp in a remote fixture continuously.
  3. Battery: Sealed, maintenance-free, nickel-cadmium type with minimum seven-year nominal life.
  4. Charger: Fully automatic, solid-state, constant-current type.
  5. Housing: NEMA 250, Class 1 enclosure.

## 26.8 FLUORESCENT LAMPS

- A. Low-Mercury Lamps: Comply with EPA's toxicity characteristic leaching procedure (TCLP) test; shall yield less than 0.2 mg of mercury per liter when tested according to NEMA LL 1.
- B. T8 rapid-start low-mercury lamps, rated 32 W maximum, nominal length of 48 inches (1220 mm), 2800 initial lumens (minimum), CRI 75 (minimum), color temperature 3500 K, and average rated life 20,000 hours, unless otherwise indicated.
- C. T8 rapid-start low-mercury lamps, rated 17 W maximum, nominal length of 24 inches (610 mm), 1300 initial lumens (minimum), CRI 75 (minimum), color temperature 3500 K, and average rated life of 20,000 hours, unless otherwise indicated.

- O. Compact Fluorescent Lamps: CRI 80 (minimum), color temperature 3500 K, average rated life of 10,000 hours at 3 hours operation per start unless otherwise indicated.
  - 1. 13 W: T4, double tube, rated 900 initial lumens (minimum).
  - 2. 18 W: T4, double tube, rated 1200 initial lumens (minimum).
  - 3. 26 W: T4, double tube, rated 1800 initial lumens (minimum).
  - 4. 32 W: T4, triple tube, rated 2400 initial lumens (minimum).
  - 5. 42 W: T4, triple tube, rated 3200 initial lumens (minimum).
  - 6. 55 W: T4, triple tube, rated 4300 initial lumens (minimum).
  - 7. 25W: T5, rated 2900 initial lumens.
  - 8. 54W: T5HO, rated 5000 initial lumens.

## 26.9 HID LAMPS

- P. High-Pressure Sodium Lamps: ANSI C78.42, CRI 21 (minimum), color temperature 1900 K, and average rated life of 24,000 hours, minimum.
  - 1. Dual-Arc Tube Lamps: Arranged so only one of two arc tubes is lighted at one time and, when power is restored after an outage, the cooler arc tube, with lower internal pressure, lights instantly, providing an immediate 8 to 15 percent of normal light output.
- B. Low-Pressure-Sodium Lamps: NEMA C78.41.
- C. Metal-Halide Lamps: ANSI C78.1372, with a minimum CRI 65, and color temperature 4000 K.

## 26.10 LIGHTING FIXTURE SUPPORT COMPONENTS

- A. Comply with Division 26 Section "Seismic Control for Electrical Work" for channel- and angle-iron supports and nonmetallic channel and angle supports.
- B. Single-Stem Hangers: 1/2-inch (13-mm) steel tubing with swivel ball fittings and ceiling canopy. Finish same as fixture.
- C. Twin-Stem Hangers: Two, 1/2-inch (13-mm) steel tubes with single canopy designed to mount a single fixture. Finish same as fixture.

- D. Wires:
  - 1. ASTM A 641/A 641M “Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire, Class 3, soft temper, zinc-coated steel, 12 gage (2.68 mm).
  - 2. BS EN 10244-2:2001 “Steel Wire & Wire Products- Non-Ferrous Metallic Coatings on Steel Wire – Part 2 Zinc or Zinc Alloy”
  - 3. ISO 7989:1988 “Zinc Coatings for Steel Wire”
- S. Wires for Humid Spaces: ASTM A 580/A 580M, Composition 302 or 304, annealed stainless steel, 12 gage (2.68 mm).
- T. Rod Hangers: 3/16-inch (5-mm) minimum diameter, cadmium-plated, threaded steel rod.
- U. Hook Hangers: Integrated assembly matched to fixture and line voltage and equipped with threaded attachment, cord, and locking-type plug.
- V. Aircraft Cable Support: Use cable, anchorages, and intermediate supports recommended by fixture manufacturer.

## **PART 27 - EXECUTION**

### **27.1 INSTALLATION**

Electrical Installation shall conform to IEEE C2, NFPA 70, and to the requirements specified herein.

- W. Fixtures: Set level, plumb, and square with ceilings and walls. Install lamps in each fixture.
- X. Support for Fixtures in or on Grid-Type Suspended Ceilings: Use grid for support.
  - 1. Install a minimum of four ceiling support system rods or wires for each fixture. Location not more than 150 mm from fixture corners.
  - 2. Support Clips: Fasten to fixtures and to ceiling grid members at or near each fixture corner with clips that are UL listed for the application.
  - 3. Fixtures of Sizes Less Than Ceiling Grid: Install as indicated on reflected ceiling plans or center in acoustical panel, and support

fixtures independently with at least two 20-mm metal channels spanning and secured to ceiling tees.

4. Install at least one independent support rod or wire from structure to a tab on lighting fixture. Wire or rod shall have breaking strength of the weight of fixture at a safety factor of 3.

**Y.** Suspended Fixture Support: As follows:

1. Pendants and Rods: Where longer than 1200 mm, brace to limit swinging.
2. Stem-Mounted, Single-Unit Fixtures: Suspend with twin-stem hangers.
3. Continuous Rows: Use tubing or stem for wiring at one point and tubing or rod for suspension for each unit length of fixture chassis, including one at each end.
4. Continuous Rows: Suspend from cable.

**Z.** Air-Handling Fixtures: Install with dampers closed and ready for adjustment.

**AA.** Adjust amiable fixtures to provide required light intensities.

## **27.2 FIELD QUALITY CONTROL**

- A.** Inspect each installed fixture for damage. Replace damaged fixtures and components.
- B.** Verify normal operation of each fixture after installation.
- C.** Test for Emergency Lighting: Interrupt power supply to demonstrate proper operation. Verify normal transfer to battery power source and retransfer to normal.
- D.** Prepare a written report of tests, inspect, observat, and verificat indicating and interpreting results. If adjustments are made to lighting system, retest to demonstrate compliance with standards.
- E.** Corroded Fixtures: During warranty period, replace fixtures that show any signs of corrosion.

## **PART 28 – GENERAL (COMMUNICATION CABINETS, RACKS, FRAMES AND ENCLOSURES)**

### **28.1 SUMMARY**

- A.** This Section includes cable management materials, equipment and installation practices

required for a fully operational, certified telecommunication cabling system compliant with all applicable codes and standards.

- B. Standard and Codes References:
  1. ANSI/TIA/EIA – 568B.1 and all for Commercial Building Telecommunication Cabling Standard Part 1: General Requirements.
  2. ANSI/TIA/EIA – 569-B and all addenda for Commercial Telecommunication Pathway and Spaces.
  3. ANSI/NECA/BICSI 569-2001 - Standard for Installation Commercial Building Telecommunication Cabling.
  4. PEC – Philippine Electrical Code, Latest Edition.
  5. ANSI/J-STD -607A“ Commercial Building Grounding (Earthing) and Bonding Requirements for telecommunication”

## **28.2 SUBMITTAL**

- A. Shop drawings: include the following:
  1. Provide detail elevation drawings of each equipment cabinet in the TR's, ER's. Drawing shall be in scale not less than 1.20.
  2. On the drawing include a material schedule of telecom equipment that will be used at each TRs and ERs including manufacture, part number, quantities and function.
- B. Provide manufacturer's literature and sample of telecommunication installation materials.
- C. Provide resumes and or copies of certificate for field personnel a minimum of six months prior to installation of communication equipment and cabling in accordance with the Quality Assurance section of this specification.

## **28.3 QUALITY ASSURANCE**

- A. Contractor Qualification: Contractor shall have on staff a Registered Communication Distribution Designer (RCDD) certified by Building Industry Consulting Service International (BICSI). The RCDD shall have inspect the work at the completion of the project. Installation field supervisor must be certified by BICSI at the installer level and certified by the manufacturer to install or test the cable. Untrained technician assigned to this project shall be trained and certified at no cost to the Owner Representative.
- B. Comply with PEC, ANSI TIA/EIA and BICSI Installation Manual.

## **28.4 COORDINATION**

- A. Coordinate the layout and installation of cabinet, racks, frames and enclosures with communication cabling installation, data switches, termination fields and

- patch panels, and all other equipment to mount inside cabinets, enclosure, racks, etc.
- B. Adjust arrangements and location of equipment in ERs and TRs to accommodate and optimize arrangement and space requirements as approved by the Owner representative.
  - C. Coordinate with other sect as required ensuring that the entire work will be carried out in orderly, complete, and organized fashion.

## **PART 29 - PRODUCT**

### **29.1 GENERAL**

- A. Open freestanding equipment rack shall not be permitted.

### **29.2 EQUIPMENT**

- A. Equipment cabinet shall be either freestanding or wall mounting equipment cabinet/ enclosures and size as required in the drawings. Equipment cabinet shall be modular steel unit and equipped with the following:
  - 1. Fans for ventilation.
  - 2. Hinged doors with reversible swing and lock for protection.
  - 3. Contain rail conforming to EIA rs-310-D standard for mounting standard 482- mm equipment Grounding busbar kit inside equipment rack.
  - 4. Transparent front door and vented rear door.
  - 5. Power strip with surge protection and have minimum of 6- receptacle outlets on the power strip.
  - 6. Vertical wire management extending the full height of the rack including both sides: front and back.
  - 7. Contain knockouts for cable accessed along the top, bottom, or rear panels.
  - 8. Wall mount Equipment cabinets shall be accessible from both front and back access.
  - 9. Freestanding cabinets shall be accessible front and back.

## **PART 30- EXECUTION**

### **30.1 INSTALLATION**

- A. Verify the installation method specified by the manufacturer prior to installation.
- B. Ensure the cabinets will fit to the footprint allocationed prior to attempting installation.
- C. Connect ground busbar in cabinet/rack to TBB or TMGB.

- D. Securely fasten floor mounted cabinet/racks to the floor with anchors, expansion bolt, etc. coordinate with structural engineer for the proper type and use of bolts.
- E. Plan for the space needed for the installation of both equipment and cable.
- F. Support the top of the floor mounted cabinet/ racks by bracing it to the wall, support barrier, or ladder rack. Consult a seismic engineer when seismic bracing is required.
- G. Plan for the equipment to be installed in the cabinet/rack. Ensure that the open space recommendation are adhere to for airflow between electronic equipment. Also ensure that is adequate space for cable so that bend radius and separation requirements are met.

**PART 31 –GENERAL**

**31.1 SUMMARY**

- A. This Section includes cable management materials, equipment and installation practices required for a fully operational, certified telecommunication cabling system compliant with all applicable codes and standards.
- B. Standard and Codes References:
  - 6. ANSI/TIA/EIA – 568B.1 and all for Commercial Building Telecommunication Cabling Standard Part 1: General Requirements.
  - 7. ANSI/TIA/EIA – 569-B and all addenda for Commercial Telecommunication Pathway and Spaces.
  - 8. ANSI/NECA/BICSI 569-2001 - Standard for Installation Commercial Building Telecommunication Cabling.
  - 9. PEC – Philippine Electrical Code, Latest Edition.
  - 10. ANSI/J-STD -607A“ Commercial Building Grounding (Earthing) and Bonding Requirements for telecommunication”

**31.2 SUBMITTAL**

- A. Shop drawings: include the following:
  - 3. Provide detail elevation drawings of each equipment cabinet in the TR’s, ER’s. Drawing shall be in scale not less than 1.20.
  - 4. On the drawing include a material schedule of telecom equipment that will be used at each TRs and ERs including manufacture, part number, quantities and function.
- B. Provide manufacturer’s literature and sample of telecommunication installation materials.

- C. Provide resumes and or copies of certificat for field personnel a minimum of six months prior to installation of communicat equipment and cabling in accordance with the Quality Assurance section of this specification.

### **31.3 QUALITY ASSURANCE**

- A. Contractor Qualificat: Contractor shall have on staff a Registered Communication Distribution Designer (RCDD) certified by Building Industry Consulting Service International (BICSI). The RCDD shall have inspect the work at the completion of the project. Installation field supervisor must be certified by BICSI at the installer level and certified by the manufacturer to install or test the cable. Untrained technician assigned to this project shall be trained and certified at no cost to the Owner Representative.
- B. Obtain cable management and ladder rack and all accessories through one single manufacture.
- C. Match the components and interconnection for optimum future performance.
- D. Comply with PEC, ANSI TIA/EIA and BICSI Installation Manual.

### **31.4 COORDINATION**

- A. Coordinate the work in this section with this section as required ensuring that the entire work will be carried out in orderly, complete and organizes fashion.

## **PART 32- PRODUCT**

### **32.1 CABLE MANAGEMENT AND LADDER RACKS**

- A. General Equipment and components shall not be intern=mixed between different manufacturers.
- B. Manufacturers: Provide equipment and components from the following manufacturer or manufacturer approved by the Project Director.
- C. Ladder rack shall have a maximum load and minimal deflection is 433lb/mm when supported every 1.5 meters.
- D. Ladder rack shall be constructed of rectangular steel tubing.
- E. All accessories shall be one single manufacturer.
- F. Field constructed accessories such as transit, splices, bends, etc are prohibited.
- G. Provide radii and bends for smooth cable transit for turns and drops.
- H. Radii and bends shall be constructed of the same material as the ladder rack.
- I. Provide junction splices to join pieces of ladder rack.
- J. Junct for ladder rack shall be used to allow transit in various direct.
- K. Junct for ladder rack shall be constructed of solid tubular steel



- L. Junct for ladder rack shall be UL listed.
- M. Metal D-rings may be used to route and cable inside telecommunication room and equipment rooms.
- N. Minimal size of D-rings shall be 50mm.
- O. D-ring edges shall be rolled to prevent scratches and nicks of cable jacket.
- P. Metal D-rings shall be corrosion resistant and fire resistant.
- Q. Cable straps shall be manufactured for the specific use of bundling cable.

### **32.2 J-HOOKS**

- A. Provide equipment from the following manufacturer or manufacturer approved by the Project Director.
- B. J-hooks shall have a wide base.
- C. J-hooks shall have galvanized finish.

## **PART 33- EXECUTION**

### **33.1 EXAMINATION**

- A. Examine pathway elements intended for cables. Check raceways, cable trays, and other elements for the compliance with space allocation, installation tolerances, hazards to cable installation, and other condition affecting installation. Proceed with the installation only after unsatisfactory condition have been corrected.

### **33.2 INSTALLATION**

- A. Comply with all requirements ANSI/TIA/EIA 568-B.1-B.2 and B.3 and EIA 569-B standards.
- B. Provide sufficient support for the ladder racks and installed cables.
- C. Install J-hook at 1.22 m or 1.5 m interval.
- D. Bridle rings are not allowed.
- E. Installation of J-hooks is limited to transit from cable tray to conduit drops. Any other application must be approved by USG.
- F. Allowance for change and expansion:
- G. Horizontal Distribution Expansion: Provide 25 percent minimum for pathways, number of outlets and termination devices in TR.
- H. Backbone Expansion: Provide 50 percent minimum of pathways.
- I. Provide horizontal wire management above and below patch panel (copper and fiber) and switches.
- J. Provide horizontal wire management on the back of each copper patch panel.
- K. For equipment cabinets/enclosures provide vertical cable management extending the full height of the rack including both sides.
- L. Cable ties shall be installed loosely, so they do not damage or deform the cable. They shall be able to spin around the bundled cable.
- M. Cables may not be bundled with tape, rope, rubber bands, etc.

### **33.3 GROUNDING**

- A. Bond all ladder rack and other metallic hardware used for communication distribution to the nearest grounding busbar. Ensure that bonding breaks through paint to bare metallic surface of all painted metallic hardware.

## **PART 34 - GENERAL (PUBLIC ADDRESS SYSTEM)**

### **34.1 SUMMARY**

- A. This Section includes building background music and public address system and installation of system components and equipment conforming to applicable codes and standards.
- B. Related Sect include the following:
  - 1. Consumer Electronics Association (CEA)  
CEA-310-E (2005) Racks, Panels, and Associated equipment
  - 2. Institute of Electrical and Electronics Engineers (IEEE)  
IEEE C62.41 (1991; R1995) Recommended Practice for Surge Voltages in Low-Voltage AC Power Circuits
  - 3. Underwriters Laboratories (UL)  
UL 1449 (2006) Surge Protective Devices

### **34.2 SUBMITTALS**

- C. Make submittals for the background music and public address system in accordance with the requirements of this specification.
- D. The Contractor shall submit a fully technical and mechanical description of every piece of equipment and cables to be used, including manufacturer's technical literature.
- E. The Contractor shall provide a description of the methods proposed to show that the actual performance will be in accordance with the specification for technical performance, including necessary test methods, procedures, and equipment that will be used.
- F. Submit shop drawings to include the following:
  - 1. System Diagram.
  - 2. Floor plan layouts, sectional view and installation details.

- G. Submit samples of cables and other components as required.
- H. Submit as-built drawings to include the following:
  - 1. Floor plan layouts, sectional view and installation details.
  - 2. List of major components and their place in the system.
  - 3. Synopsis of the numbering scheme and cross connect log.
- I. Submit O&M manuals, including test results.

### **34.3 QUALITY ASSURANCE**

- J. Electronic Components: Comply with latest applicable standards of EIA; PEC; standard industry grade; types and ratings commonly available in local distributor without prior written approval from the Project Manager.
- K. Entire system, including mounting, installing, connecting, aligning, testing and adjusting, to be the responsibility of one contractor.
- L. Engineer in-charged shall be a duly Registered Electronics Engineer supervised by a Professional Electronics Engineer as required by R.A. 9292 and the IRR of revised National Building Code.
- M. Electrical Components, Devices, and Accessories: Listed and labeled as defined in PEC 2009, Article 1.1, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

## **PART 35 - PRODUCTS**

### **35.1 STANDARD PRODUCTS**

Material and Equipment to be provided shall be the standard products of a manufacturer regularly engaged in the manufacture of such products, and shall essentially duplicate material and equipment that have been in satisfactory use at least 2 years. All components used in the system shall be commercial designs that comply with the requirements specified.

- N. Identical Items
  - 1. Items of the same classification shall be identical. This requirement includes equipment, modules, assemblies, parts, and components.

**O. Nameplates**

1. Each major component of equipment shall have the manufacturer's name, address, model and catalog number, and serial number on a plate secured to the equipment.

**35.2 Mixer-Preamplifier**

Mixer-preamplifier shall as a minimum conform to the following specification:

Rated Output:	18 dB
Frequency Response:	Plus or Minus 1 dB, 20 Hz – 20 kHz
Distortion:	Less than 0.5%, 20 Hz – 20 kHz
Signal to noise:	Microphone – 60 dB Aux – 70 dB
Inputs:	5 independent balanced low-impedance transformer-isolated
Input Sensitivity:	Microphone – 0.003V Aux – 0.125V Magnetic Cartridge – 0.0005V
Input Channel Isolation:	80 dB
Tone Controls:	Plus or minus 10 dB range at 50 and 15kHz
Power Requirement:	230Vac 60Hz

**35.3 Power Amplifiers**

Power amplifiers as a minimum conform to the following specification:

Rated Power Output (RPO):	480watts RMS
Frequency Response:	Plus or Minus 3dB, 20Hz – 20 kHz
Distortion:	Less than 2% at RPO, 600Hz – 13 kHz
Input Impedance:	50k ohm unbalanced
Output Impedance:	Balanced 4 and 8 ohms
Output Voltage:	70V or 100V
Power Requirement:	230Vac 60Hz

### 35.4 Mixer Amplifiers

Mixer amplifier shall as a minimum conform to the following specification:

Rated Power Output (RPO):	(35) (60) (125) watts RMS
Frequency Response:	Plus or Minus 3dB, 20Hz – 20 kHz
Distortion:	Less than 1% at RPO, 60 – 13 kHz
Inputs:	2 microphones (high impedance or Low-impedance unbalanced 2 Aux. (high-impedance)
Output Impedance:	Balanced 4 and 8 ohms
Output Voltage:	70V or 100V
Power Requirement:	230Vac 60Hz

### 35.5 Microphone Input Modules

Microphone input modules shall as a minimum conform to the following specification:

Rated Power Output (RPO):	0.25V into 10k ohms 1.0V into 10k ohms
Frequency Response:	Plus or Minus 2dB, 20Hz – 20 kHz
Distortion:	Less than 0.5% at RPO, 20Hz – 20 kHz
Inputs:	4 transformer – coupled balanced 150 ohm
Input Sensitivity:	0.003V
Input Channel	
Isolation:	70 dB minimum

### 35.6 Microphones

#### P. Desk Microphone

Microphones shall as a minimum conform to the following specification:

Element:	Dynamic
Pattern:	Cardioid
Frequency Response:	50 – 12 kHz
Impedance:	Low Impedance mic (150 – 400 ohms)
Front – to – back Ratio:	20 dB

Selector Switches: Selector switches for zone shall be (integral microphone) or (separate console adjacent to microphone)

**Q. Gooseneck Microphone**

Gooseneck microphone shall meet the minimum requirements of the desk microphone.

**R. Microphone Jack**

Each outlet for microphones shall consist of a standard outlet box, flush mounted, and fitted with a three-pole, polarized, locking type, female microphone jack and a corrosion resistant-steel device plate.

**35.7 Loudspeakers**

**S. Cone Speaker**

The cone speaker shall as a minimum conform to the following specification:

Application: (Waffle Baffle) (Ceiling)  
Frequency Range: 60 – 12 kHz  
Power Rating: Normal – (7) Watts  
Peak – (10) Watts  
Voice Coil Impedance: 8 ohms  
Line Matching  
Transformer Type: 100V  
Capacity: 4 watts  
Magnet: 10 ounces or greater  
Primary Taps: 0.5, 1, 2 and 4 watts  
Primary Impedance: 25V – 1250, 625, and 312 ohms  
70.7V – 10k, 5k, and 2.5k ohms

**T. Horn Speaker**

The horn speaker shall as a minimum conform to the following specification:

Application: (Indoor) (Outdoor) (Weatherproof)  
Frequency Response: 400 – 14 kHz

Power Taps:	100V line – 2.5, 5, 10, 15, and 20 watts
Impedance:	5000, 2500, 1300, 670, 330, 90, and 45 ohms
Power rating:	Normal – 7 Watts
	Peak – 15 Watts

**U. Dual Horn Speaker**

The dual horn speaker shall meet the minimum requirements of horn speaker except the dispersion shall be 100 degrees.

**V. High Output Speaker Enclosures**

1. High output speaker enclosures shall be of the tuned-port design for precise balancing and tuning of the speaker. The enclosures shall be constructed throughout of 19.1mm 3/4 inch high density board, with screwed and glued joints, durably braced, and padded with fiberglass where acoustically required.

**W. Waffle Baffle Speaker Enclosures**

1. The waffle baffle speaker shall be of particle board construction covered with (walnut laminate) and complete with (black) cloth grille. Baffle shall feature 9.5 degree slope to provide directional sound dispersion offset in the direction of radiation. Wall baffle enclosure shall come equipped with a wall mounting bracket designed to assure a rigid mounting to any flat surfaces.

**X. Ceiling Speaker Enclosures**

1. Ceiling speaker enclosure shall be constructed of heavy gauge cold steel with interior undercoating and 38mm 1 1/2 inch thick high density fiberglass 24kg per cubic meter 1- 1/2lbs per cu. ft. the unit shall be (round) (square) and designed for (recessed) (surface) installation which will be accomplished via (standard screw) (torsion spring) (flange mount) mounting. Recessed models shall have a rust-preventive, (textured black coating) and the surface mount unit finished in textured (white). Enclosure shall include four triple compound conduit knockouts.

**35.8 Speaker Switching Panel**

- Y. Selector Switches**
- Z. System Power Supply**

**35.9 AM/FM Equipment**

**AA. AM/FM Tuner**

AM/FM tuner shall be rack-mounted and shall as a minimum conform to the following characteristics:

Tuning Range:	AM – 540 to 1605 kHz FM – 88 to 108 MHz
Selectivity:	60 dB on FM 40 dB on AM
Sensitivity:	FM – 1.5 microvolts AM – 2.0 microvolts
Capture Ratio:	1.0 dB
Readout/selection:	Digital
Other Features:	Phased Lock Loop (PLL)
Power Requirement:	230Vac, 60 Hz

**35.10 Compact Disc Player**

Player shall have three beam laser pickup, dual Digital – to – Analog converters, random access and random mode programmable playback. The CD player shall be a six (6) disc CD player with three (3) Playback Modes (Single Disc, All Disc, Custom), three (3) Random Play Modes (Single Disc, All Disc, Custom) and eight (8) Repeat Modes. Player shall as a minimum conform to the following:

Frequency:	10 – 20 kHz plus or minus 1 dB
Signal-to-noise:	Minimum of 100 dB
Dynamic Range:	Minimum of 96 dB
Total Harmonic Distortion:	Maximum of 0.005% at 1 kHz
Channel Separation:	Minimum of 100 dB at 1 kHz
Quantization:	Minimum of 18 bits linear per channel
Conversation Rate:	Minimum 8 x oversampling
Disc Size:	5 inch
Disc Player Type:	Multi-disc
Power Requirement:	230Vac, 60 Hz

**35.11 Priority Relays and Controls**



Priority relays and controls required to accomplish operation specified shall be provided. Relays shall be completely enclosed with a plastic dust cover for maximum protection against foreign matter, and shall be plug-in type. Relays shall be provided with a diode wired across the relay coil for transient suppression and shall be installed utilizing factory-rewired, rack-mounted receptacle strips. Coil shall be maximum 24V dc.

### **35.12 Switches and Controls**

#### **BB. Radio System Control Switch**

The loudspeaker in each room, or group of speakers in a room, shall be provided with a flush program channel selector rotating-switch knob. A volume control shall be installed with a switch at each station and shall be of the auto transformer type and set so that the maximum volume is sufficient for the area while not disturbing adjacent areas. If music is turned down or off, the paging signal shall override controls except speakers designated for music only. (Each device plate shall be satin-finished, corrosion-resisting steel permanently marked to indicate the channel selected.)

#### **CC. Remote Loudspeaker ON/OFF Switches**

Remote switches shall be (key-operation) (toggle switch) 2-pole, wall-mounted, single gang type with engraved switch plates finished to match the approved finish of electrical wall switches. Low-voltage priority override relays shall be provided as part of the switches with all wiring to the racks to allow override of the ON/OFF switches for priority announcements.

#### **DD. Remote Loudspeaker Volume Controls**

Remote volume controls shall be an auto transformer type with demented 3 dB steps and an OFF position. The controls shall be wall-mounted in single-gang outlet boxes and furnished with engraved switching plates finished to match approved finish of electrical wall switches

### **35.13 Equipment Racks**

Equipment shall be mounted on 482.6mm and 9 inch racks in accordance with CEA-310-E and located as shown on drawings. Ventilated rear panels, solid side panels, and solid top panels shall be provided. Equipment racks shall be provided with lockable front panels that limit access to equipment. The lockable front shall not cover items that require operation or access such as am/fm tuner, CD player, or tape player. Rack cooling shall be through (perforat or louvers in front panels to ensure adequate ventilation of equipment) (top rack mounted fan.) The racks and panels shall be factory finished with a uniform baked enamel over rust inhibiting primer.

### **35.14 Cables**

#### **EE. Speaker Cable**

Cables shall be of the gauge required depending upon the cable run length. In no case shall cable be used which is smaller than 18 AWG. Insulation on the conductors shall be Rigid Non-metallic Conduit (RNC) or an equivalent synthetic thermoplastic not less than 0.2 mm 0.009 inch. Cable shall be jacketed with Rigid Non-metallic Conduit (RNC) (Fluoropolymer) compound. The jacket thickness shall be 0.5mm 0.02 inch minimum.

#### **FF. Microphone Cable**

Cables conductor shall be stranded copper 20 AWG. Insulation on the conductors shall be Rigid Non-metallic Conduit (RNC) or an equivalent synthetic thermoplastic not less than 0.2 mm 0,009 inch. Cable shall be shielded 100% of aluminum polyester foil with a bare 22 gauge stranded soft copper drain conductor. The jacket thickness shall be 0.5mm 0.02 inch minimum.

#### **GG. Antenna Cable**

Antenna coaxial cable shall have 75 ohm plus or minus 2 ohm. Attenuation of the coaxial cable span between the antenna and amplifier shall not exceed 2.5 dB at 108MHz.

### **35.15 Terminals**

**HH.** Terminals shall be (solderless, tool-crimped pressure) type.

### **35.16 Surge Power**

#### **A. Power Line Surge Protection**

Major components of the system such as power amplifiers, mixer-preamplifiers, and tuners, shall have a device, whether internal or external, which provides protection against voltage spikes and current surges originating from commercial power sources per IEEE C62.41 B3 combination waveform. Fuses shall not be used for surge protection. The surge protector shall be rated for a maximum let thru voltage of 350V ac (neutral-to-ground). Surge protection device shall be UL listed and labeled as having been tested in accordance with UL 1449.

#### **B. Signal Surge Protection**

Major components of the system shall have internal protection circuits which protects the component from mismatched loads, direct current, and shorted output lines. Communication cables/conductors shall have surge protection installed at each point where it exits or enters a building.

### 35.17 Telephone Interface Module

Telephone Interface module shall provide one way all call paging access from telephone to PA system. Paging shall be accomplished by the building telephone system instruments interconnected to the PA system via an interface module to allow telephone dial up access to the paging amplifier. Interface module shall produce an alert tone in the associated speakers on activation. Telephone interface module shall as a minimum to conform to the following specification:

Impedance:	600 ohms
Frequency Response:	100 Hz to 10 kHz
70V Input Impedance:	200k ohms
Output Level:	400mV rms
Input Power Requirement:	12 – 24V dc (from power supply)
Access requirement:	Electronic (analog) or IA2 line key (line card required) PABX loop or ground-start trunk port, or dedicated single-line phone.

## PART 36 - EXECUTION

### 36.1 INSTALLATION

#### A. General:

Install all system components and appurtenances in accordance with the manufacturer's instruct and as specified herein.

#### B. Equipment Racks:

Racks shall be mounted side-by-side and bolted together. Items of the same function shall be grouped together, either vertically or side-by-side. Controls shall be symmetrically arranged at a height as shown. Audio input and interconnect shall be made with

approved shielded cable and plug connectors; output connect may be screw terminal type. All connect to power supplies shall utilize standard male plug and female receptacle connectors with the female receptacle being the source side of the connection.

Inputs, outputs, interconnect, test points, and relays shall be accessible at the rear of the equipment rack for maintenance and testing. Each item shall

be removable from the rack without disturbing other items or connect. Empty space in equipment racks shall be covered by blank panels so that the entire front of the rack is occupied by panels.

**JJ. Wiring:**

Wiring shall be installed in rigid metallic conduit, intermediate metal conduit, cable tray, or electric metallic tubing. Wiring for signal circuits shall terminate on identified terminal blocks in cabinets and master station enclosures. Terminate audio circuits on identified terminal blocks in cabinets and master stat. Cable shield shall be grounded at all points of termination.

a. Signal Wiring and Control Wiring

Type of signal and control wires and number of conductors shall be provided as recommended by the intercommunication system manufacturer, and as necessary to provide a complete and operable system.

**KK. Grounding:**

All grounding practices shall comply with PEC article 2.50. The antenna mast shall be separately grounded. Equipment shall be grounded to the serving panelboard ground bus through a green grounding conductor. Metallic conduits serving the equipment shall be isolated on the equipment end with an insulating bushing to prevent noise from being transferred to the circuit. Equipment racks shall be grounded to the panelboard ground bus utilizing a #8 conductor. Grounding conductor shall be terminated to the rack using connector suitable for that purpose.

**36.2 SYSTEM CONFIGURATION & OPERATION**

**LL.** The system shall be able to broadcast the alarm status as detected by the Semi Addressable Fire Detection System status to the affected area/s so that the building occupants can be properly apprised of the existing situation. The different alarm status and the corresponding messages that are to be broadcast are as follows:

1. Pre Alarm Mode

This is the mode that the Fire Detection System goes into when a single detector is triggered and sends a signal to its Zone Monitor Unit of the Semi Addressable Fire Detection System. In this mode, the Fire Detection System sends a signal to the Voice Evacuation System to automatically broadcast the Pre Alarm Mode Warning Message over the speaker zones in the floor where the triggered detector is located.

The message continuously cycles until the system upgrades to Confirmed Alarm Mode or the system is manually reset after it is verified to be a false alarm or when the fire has been contained.

2. Confirmed Alarm Mode

This is the mode of the Fire Detection System goes into when another detector connected to a different Zone Monitor Unit is again triggered in the same floor of the building after the system goes into Pre Alarm Mode or when a manual call point anywhere in the system is activated or the Confirmed Alarm Mode countdown time expires. In this mode, the system automatically generates the broadcast of the confirmed Alarm Mode Message on all speakers in the affected floor of the building. The message gives an instruction to the building occupants in the affected floor only to evacuate the area. The message continuously cycles until the Fire Detection System goes into the General Evacuation Mode or it is manually reset when the fire has been contained.

3. General Evacuation Mode

This is the mode that the entire Fire Detection System enters into when the responding fire brigade decides that the fire is out of control and the building has to be evacuated. The General Evacuation Message is activated manually and broadcast on all speakers inside the building using the fireman's microphone. The message gives an instruction to all building occupants in all areas of the building to immediately leave the building premises. When the detected fire alarm condition has been contained, an All Clear Message shall be manually broadcast over all speaker zones in the building.

### **36.3 FIELD QUALITY CONTROL**

**MM. Acceptance Tests:**

1. After installation has been completed, contractor shall conduct an acceptance test in the presence of contracting officer or its representative, to demonstrate that the equipment operations in accordance with specification requirements. Contractor shall notify the contracting officer (2 weeks) prior to performance of tests. The acceptance tests shall include originating and accepting messages at specified stat, at proper volume levels, without cross-talk or noise from other links or non-designated units.
2. Retesting:

Rectify deficiencies indicated by tests and completely reset work affected by such deficiencies at contractor's expense.

#### **36.4 IDENTIFICATION**

- NN.** All audio/visual system provision shall be clearly identified to indicate their intended use. Identification in finished areas shall be concealed inside boxes.

### **PART 37 - GENERAL**

#### **37.1 GENERAL REQUIREMENTS**

- A.** The intent of this specification is to provide a complete security system, (CCTV). All equipment, devices and installation materials required to for the completion of the project shall be furnished whether or not specifically enumerated herein or on the electronic plans. The specification covers minimum requirements and is not intended to preclude provision of equipment or methods that exceeds the requirements.
- B.** The Contractor or Installer shall review all project plans and specification completely and be familiar with the requirements of the system.
- C.** The Contractor or Installer shall furnish and install a complete Closed Circuit Television (CCTV) system as shown in the plans and drawings. All installation to be done shall be in accordance with the applicable codes and standards and governed by existing rules and regulation of the locality and Local Government Unit (LGU) and other concerned agencies.
- D.** CCTV system to be installed shall be IP based and comply with the requirements of Ayala Management Corporation (APMC). The system shall be wired as Structured Cabling System (UTP Cabling).
- E.** The Contractor or Installer shall be responsible for ensuring that a complete, satisfactory and working system is provided.

#### **37.2 QUALITY ASSURANCE**

- F.** Manufacturer: Regularly engaged in the production of CCTV equipment and recording devices, of types, sizes and electrical characteristics required whose products have been in satisfactory use in similar service for not less than 5 years.
- G.** Installer: Qualified with at least 5 years of successful installation experience on projects with CCTV systems installation work similar to the requirement of this project. The installer shall be an authorized factory representative of the supplied equipment, and employ full time, factory trained technicians.

- H. Electrical Components, Devices, and Accessories: Listed and labeled as defined in PEC 2009, Article 1.1, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- I. Comply with the Latest Edition of Philippine Electrical Code (PEC).

### **37.3 SUBMITTALS**

- J. Product Data: Submit manufacturer's data on all equipment, and cable, including but not limited to, roughing-in diagrams and instruct for installation, operation and maintenance, suitable for inclusion in maintenance manuals.
- K. Shop drawings for the system provided under this section of the specification shall contain but not limited to the following:
  - 1. Specification data sheets on each individual system component.
  - 2. Complete wiring diagrams for all devices and control panels.
  - 3. Conduit layouts on project floor plans, including wire and cable types and count in each conduit run.
  - 4. Mounting details and location of cameras.
  - 5. Battery calculation that substantiate requirement for a minimum standby operation of all CCTV systems and devices for a minimum of 4 hours.
  - 6. Voltage Drop calculat for any voltage outputs to ensure proper operationing voltage at the device.
  - 7. Test Plans for all devices.
- L. Manuals: Submit simultaneously with the shop drawings, complete operationing & maintenance manuals, including technical data sheets. Provide a clear and concise description of operation that gives, in detail, the information required to properly operation the equipment and system. Wiring diagram shall indicate internal wiring for each device and the interconnection between the items of equipment.
- M. Provide complete sets of as-built drawing to the owner including any deviat from the submittal data and shop drawings, complete programming, installation, operation and maintenance information including all access codes and user data bases.

## **PART 38 - PRODUCTS**

### **38.1 SERVER PC**

- Dual xenon CPU 3.0 GHz
- 4gb DDR2 RAM
- 2x500gb HDD (for every 17 cameras) @ 7000 rpm
- 512 MB DDR2 video card
- 100/1000 Mbps network card
- 22-inch CIF LCD monitor

### **38.2 WORKSTATION PC**

- Dou Core 1.8 GHz
- 2gb DDR2 RAM
- 160gb HDD @ 7200 rpm
- 512 MB DDR2 video card
- 10/100/1000 Mbps network card
- DVD/RW internal drive
- Windows XP SP2 Professional
- 22-inch CIF LCD monitor w/ 9 screens

### **38.3 DOME CAMERA**

- Vandal proof
- 30 fps dual stream
- Hi-resolution, MPEG-4 video
- 470 TVL color/ 550 TVL

### **38.4 WIRES AND CONDUIT**

#### **N. Wires**

- Wiring shall be in accordance to the Philippine Electrical Code (PEC).
- Wiring for CCTV shall be category cables
- Wiring shall be listed or approved by a recognized testing agency.

#### **O. Conduit**

- Wiring shall be in accordance to the Philippine Electrical Code (PEC).
- Number of conductors in conduit or raceway shall not exceed to percentage fill specified in Philippine Electrical Code.
- RNC conduit shall be schedule 40 and shall be embedded.

## **PART 39 - EXECUTION**

### **39.1 INSTALLATION**



- A. The Contractor shall carefully follow instruction in documentation provided by the manufacturer to insure all steps have been taken to provide a reliable, easy-to-operation system.
- B. The Contractor shall be responsible for provision and installation of all system components, conduit and wiring.
- C. All equipment shall be tested and configured in accordance with the instruction provided by the manufacturer prior to installation.
- Q. All firmware found in products shall be the latest and most up-to-date provided by the manufacturer.
- R. Installation of equipment devices that pertain to other work in the contract shall be closely coordinated.
- S. All installation shall be in strict accordance with the Contract Documents, Manufacturers installation and wiring recommendation and comply with Philippine Electrical Code (PEC).

### **39.2 FIELD QUALITY CONTROL**

- T. Recommend the Contractor to perform preliminary walkthrough to check for installation quality, accurate performance of work and to verify engineering diagrams.

### **39.3 COMMISSIONING**

- U. Manufacturer's Field Service: Engage a manufacturers' authorized representative to inspect final system connection, perform complete functional test of the system and submit a written report to the designer attesting to satisfactory operation of the system.
- V. Testing: The owner representative will procure the services of an independent test firm to perform acceptance testing of each section or the infrastructure and inspect the installation to ensure all work has been performed in accordance with all contract document.
  1. All testing will be witnessed by the designer and owner's maintenance representative.
  2. The Contractor shall be present during acceptance testing to replace/repair all work that fails
  3. Contractor is financially responsible for all cost incurred to the Owner Representative's testing firm due to repair/replacement of failed cable, terminat, equipment, etc during acceptance testing

4. Acceptance testing shall not begin until all work is complete.

#### **39.4 TRAINING**

- W.** Training shall be provided by the installer or product manufacturer free of charge to the assigned personnel for proper operation of equipment.
- X.** All training shall be conducted during normal business hours at a date and time of mutual convenience.
- Y.** Training shall be conducted by a trainer who is factory certified in installation, programming, maintenance and operation of all supplied components.

### **PART 40 – GENERAL (FIRE ALARM AND FIRE DETECTION SYSTEM)**

#### **40.1 GENERAL REQUIREMENTS**

- A.** The work to be done in this Technical Specification consists of the Electrical and Auxiliary Systems and related works, such as but not limited to fabrication, supply, delivery, and installation – complete in all aspects. All works and materials incidental to the completion of the project shall be included herein, except part of works explicitly stated to be done by others. All works shall be in accordance with the latest edition of the Philippine Electrical Code, the regulation of the locality, the manufacturer's standards, the requirements of the utility company and this Specification. This specification provides a broad outline of the required system and associated equipment, but not includes all details of equipment's design and construction.
- B.** Standards and Codes References:
  - 1. Philippine Electrical Code (PEC)
  - 2. National Building Code of the Philippines (NBCP)
  - 3. Fire Code of the Philippines (RA 9514)
  - 4. Building Industries Consulting Services International (BICSI)
- C.** A semi-addressable, "open protocol" FDAS shall be provided.

#### **40.2 SUBMITTALS**

- A.** Shop Drawing Include the following:
  - 1. The Electrical Contractor shall prepare and submit for approval to the Design Engineer shop drawings, samples, and cuts of all equipment, wires, wiring devices, and fixtures to be supplied. After final approval by the Engineer, a sufficient number of copies as directed shall be furnished for distribution.

- B. Product Data: Provide manufacturer's literature and sample of telecommunication installation materials
- C. Qualification: Qualified personnel include individuals who can demonstrate experience on similar system and have the following qualifications:
  1. Factory trained and certified in fire alarm system design.
  2. Licensed or certified by a local authority.

#### **40.3 QUALITY ASSURANCE**

- A. Installation personnel shall be supervised by persons who are qualified and experienced in the installation, inspection, and testing of fire alarm systems.
- B. Comply with PEC, and RA 9514.

#### **40.4 COORDINATION**

- A. Coordinate the work in this section with other sections as required ensuring that the entire work will be carried out in orderly, complete, and organized fashion.

#### **40.5 SYSTEM REQUIREMENTS**

- A. **Positive alarm sequence** provides a timed delay of general alarm signal in a building and at a supervising station. This gives a trained responder up to 3 minutes to investigate the cause of an alarm signal. The time limits to acknowledge the alarm signal and reset the system are designed to assure all alarm system functions are actuated in the event personnel are not available to acknowledge, investigate and reset the alarm. The presignal feature is usually used only in special occupancies where fire does not necessarily pose an immediate threat to the occupants.
- B. The signal from an automatic fire detection device selected for positive alarm sequence operation shall be acknowledged at the control unit by trained personnel within 15 seconds of annunciating in order to initiate the alarm investigation phase. If the signal is not acknowledged within 15 seconds, notification signals in accordance with the building evacuation or relocation plan and remote signals shall be automatically and immediately activated.
- C. Trained personnel shall have up to 180 seconds during the alarm investigation phase to evaluate the fire condition and reset the system. If the system is not reset during the investigation phase, notification signals in accordance with the building evacuation or relocation plan and remote signals shall be automatically and immediately activated.

- D. If a second automatic fire detector selected for positive alarm sequence is actuated during the alarm investigation phase, notification signals in accordance with the building evacuation or relocation plan and remote signals shall be automatically and immediately activated.
- E. The system shall provide means for bypassing the positive alarm sequence.

## **PART 41 – PRODUCT**

### **41.1 EQUIPMENT**

- A. Equipment constructed and installed in conformity with the Code shall be listed for the purpose for which it is used. Fire alarm system components shall be installed in accordance with manufactures installation instruction. In accordance with PEC 2009, Article 7.60 fire alarm products must be listed for the specific fire alarm system application for which they are used.

### **41.2 Fire Alarm Control Panel (FACP)**

- A.A system component that receives inputs from automatic and manual fire alarm devices and might supply power to detection devices and to a transponder(s) or off premises transmitter(s).
- B. FACP shall be properly protected in any possibility of damage by induced transients in accordance with the requirements of Latest Edition of PEC.
- C. The FACP shall be key operationd, located within a locked enclosure, or arranged to provide equivalent protection against unauthorized use.

### **41.3 System Components**

- A. Heat Sensing Fire Detector. (Rate of Rise)
  - 1. Heat detector shall initiate an alarm when the temperature rise greater than 135°F.
  - 2. Heat detector shall be ceiling type for semi flush mounted. Provide LED lamp indicator showing that the detector is activated.
- B. Smoke Sensing Fire Detector. (Photoelectric)
  - 1. Photoelectric Smoke Detector (Light-Scattering). When smoke particles enter the light path, some of the light is scattered by reflection and refraction onto the sensor. The light signal is processed and used to convey an alarm condition when it meets preset criteria.
- C. Manual Fire alarm Box.

1. A manually operationd device used to initiate an alarm signal.

#### **41.4 Wires and Conduits.**

##### **A. Wires**

###### **GENERAL**

In the event of fire the cables shall maintain the active safety of electrical circuit integrity at the operating voltage. They shall also have passive safety of flame retardation with a Limiting Oxygen Index of more than 40%, low toxicity, low fire load, low smoke and zero halogen.

Cables shall be suitable for installation in wet or dry location, in conduits, concealed, free on the air, on cable trays or supports and direct underground. Cables that pass the system integrity tests shall be preferred.

The cables shall be tested with LPCB and DIN 4102: Part 12 which assesses the ability of enclosure systems in maintaining the function a cable performance, for a period of time when exposed to a fully developed external fire according to ISO 834 time-temperature curve.

###### **CABLE CONSTRUCTION**

Flexible Mineral Insulated Copper Cables shall be manufactured according to relevant standards similar to BETAflam FR-MI 110 from Leoni Studer Cables, Switzerland or equivalent.

Flexible cables shall have the copper conductors wrapped with glass mica composite tape flame barrier (with special resin bonding material) and be insulated with a non-melt cross linked flexible mineral insulation and mineral sheath, similar to Betaflam Flexible MI cables from Leoni Studer, Switzerland.

##### **1. Mechanical properties and termite repellent**

Metal Armouring (where necessary for stronger mechanical protection, harmonics /EMC screening and rodent/termite resistant).

- The armour shall consist of two overlapping steel tapes for multicore cables. For single core cables copper or aluminum tape armour shall be used.

- The armour shall be designed to total enclose the cable maintaining 30% overlapping. This is to prevent termites from penetrating any armouring gap.
- Non toxic hard coating materials shall be used for the purpose of termite or rodent resistance.

The cables shall have bending radius of no less than 8 times of the cable diameter for single core cable and 6 times for multicore cable. Insulation materials shall be suitable for continuous operation at 110 °C for 20'000 hours according to IEC 216 or VDE 0304 Pt 21 and all cables shall be tested to the following international standards. 3<sup>rd</sup> party test certificates and reports shall be submitted to substantiate the compliance to the following international standards.

## 2. Electrical Fire Performance Standards

### • **Electrical Circuit Integrity**

BS 6387 Category CW and Z  
 DIN VDE 4102 E30 Part 12  
 IEC 60331-11/-21  
 EN 50200

- ***Electrical System Integrity Test***

DIN VDE 4102 E30 Part 12

- ***Flame Retardant Test***

IEC 60332-1  
 EN 60332-1  
 VDE 0482 p.332-1

- **No Flame Propagation Test**

IEC 60332-3-21,22,23,24 Category A,B,C,D

EN 50266-2-4

VDE 0482 p.266-2-4

- **Limiting Oxygen Index**

ASTM D 2863          Insulation           $\geq 40\% O_2$

                                 Sheathing           $\geq 40\% O_2$

- **Smoke Obscuration**

DIN VDE 0482 – 1034

EN 61034

IEC 61034 the light transmission value of greater than 84% shall be maintained

- **Halogen Content and Toxicity**

The cables shall be halogen free and do not release any corrosive emission when subjected to fire.

Naval Engineering Standards NES 713 with the toxicity index lower than 2

NFC 20 - 454    ITC  $\leq 5$     INC  $\leq 95$

Cables shall comply to IEC 60754-1 and 60754-2, and also shall not emit toxic gases and contain very low organic contents. Complying to DIN VDE 0472 - 813 and NES 713 NFC 20 - 454.

EN 50267-2-1

EN 50267-2-2

VDE 0482 p 267-2-1

VDE 0482 p 267-2-2

- ***Fuel Element***

To minimise the generation of heat if subjected to fire, the insulation and sheathing material must not have a heat of combustion greater than 7,700 Btu/lbor 13 kg/gram.

- ***Short Circuit and Overload Resistant***

Cables shall be able to withstand a short circuit temperature of 280°C for 5 seconds.

- ***Quality Control***

Companies manufacturing cables shall be accredited to the ISO 9001 quality assurance standards and is listed with VDE Testing and Certificate Institute. Thus all the products supplied must carry VDE Certification mark.

- ***Environmental Control***

Companies manufacturing cables shall be accredited to the ISO 14001:2004 environmental accredited and do not supply or use any material that does not fulfil the requirements of RoHS-guideline 2002/95/EC. Neither do use any of the PAH's described in Directive 2005-69-EC. Neither the products contain Perfluorooctanesulphonate (PFOS) or Directive 2006/122/EC, nor are such substances used in the manufacture of products.

### **3. TESTING & CERTIFICATION**

The manufacturer shall provide a Third Party certification from an International Recognized Testing Institute or Fire Laboratory (e.g. LPCB, VDE, ELECTROSUIESS) to ensure that the all fire resistant(FR) cable comply which include the lists above.

The manufacturer of the FR cables shall be certified to ISO 9001 & 14001:2004 International Quality Standard and Environmental Management System. The manufacturer shall have



third party certification verifying quality assurance in design/development, production, installation and servicing in accordance with ISO 9001 & 14001:2004.

#### **4. INSTALLATION**

Cables must be securely fixed with steel or copper cable clips or ties (non-magnetic steel for single core cables) to inclined or vertical trays or fixed with steel fasteners to the fire resistant parts of building structure. Steel expanding securing bolts or percussion fastening systems are recommended.

Termination by crimping is recommended. Joints or tap-off in cable runs should be made in folded steel junct or cast iron junction boxes with porcelain terminals.

Flame proof glands are not necessary unless dictated by the class of hazardous location.

Metal glands or close fitting metal bushes are recommended for all cable entries. All joints in cables should be made in such a way as to maintain the fire circuit integrity and the manufacturer shall have a tested jointing system with test reports indicating compliance. Standard applicable include DIN VDE 4102.

Should cables be installed in areas where they maybe subjected to mechanical damage then suitable mechanical protection shall be provided. Steel conduit or metal tray covers are recommended.

##### **A. On Cable Tray/Ladder**

Cables should be secured with \*metal fixings such as stainless steel cable ties, strapping or cable clamps with the following minimum recommended fixing distances:

*Vertical, Inclined or Unsupported*

For cables or cable bunches of diameter  $\leq 25\text{mm}$  fix every 600 mm

For cables or cable bunches of diameter  $> 25\text{mm}$  fix every 300 mm

Horizontal where supported by the ladder or tray - Fix every 1,000mm. Trays/ladders should be fixed to the fire rated elements of the building structure using steel expanding bolts or similar system not incorporating flammable materials such as nylon. Trays and bolts should only be loaded to 50% of the manufacturers recommended maximum.

B. Direct fixing to walls, ceilings and in PVC conduits

Cables/conduits should be secured with \*metal saddles (generally galvanised steel) using steel expanding bolts or similar system not incorporating flammable materials such as nylon.

Minimum recommended fixing distances are as follows:-

Vertical, Inclined or Unsupported fix every 600mm

For cables, cable bunches or PVC conduits containing cable bunches of diameter  $\leq$  25mm fix every 600 mm.

For cables, cable bunches or PVC conduits containing cable bunches of diameter  $\geq$  25mm fix every 300 mm.

Horizontal, where supported by a fire rated surface  
Fix every 1,000 mm.

C. Steel Conduits

Conduits should be secured with \*metal saddles (generally galvanised steel) using steel expanding bolts or similar system not incorporating flammable materials such as nylon.

*Vertical, Inclined or Unsupported*

Fix every 600 mm

Horizontal where supported by a fire rated surface

Fix every 1,000 mm

D. Catenary Wire

Cables must be secured to catenary wires using \*metal fixings such as stainless steel cable ties or strapping with the following minimum fixing distance.

For cables or cable bunches of diameter  $\leq$  25 mm fix every 600 mm

For cables or cable bunches of diameter  $\geq$  25 mm fix every 300 mm

Catenary wires should be secured to fire rated elements of the building structure and should be only loaded to 50% of the manufacturers recommended maximum.

## E. Unsupported Spans

No unsupported span over 600 mm for cable or cable bunches diameter  $\leq$  25 mm.

No unsupported span over 300 mm for cable or cable bunches diameter  $\geq$  25 mm.

\*Metals such as steel and copper are deemed suitable. Brass is not suitable due to its lower melting point.

These recommendation are considered minimum requirements and should be read in conjunction with local statutory requirements

### B. Conduit

1. Conduit shall be in accordance to Philippine Electrical Code (P.E.C.).
2. Number of conductors in conduit or raceway shall not exceed to percentage fill specified in Philippine Electrical Code.
3. RNC conduit shall be scheduled 40 and shall be embedded.

## PART 42 - GENERAL

### 42.1 SUMMARY

- A. This Section includes building access control system and installation of system components and equipment conforming to applicable codes and standards.
- B. Related Sect include the following:
  1. Consumer Electronics Association (CEA)  
CEA-310-E (2005) Racks, Panels, and Associated equipment
  2. Institute of Electrical and Electronics Engineers (IEEE)  
IEEE C62.41 (1991; R1995) Recommended Practice for Surge Voltages in Low-Voltage AC Power Circuits
  3. Underwriters Laboratories (UL)  
UL 1449 (2006) Surge Protective Devices

### 42.2 SUBMITTALS

- C. Make submittals for the access control system in accordance with the requirements of this specification.

- D. The Contractor shall submit a fully technical and mechanical description of every piece of equipment and cables to be used, including manufacturer's technical literature.
- E. The Contractor shall provide a description of the methods proposed to show that the actual performance will be in accordance with the specification for technical performance, including necessary test methods, procedures, and equipment that will be used.
- F. Submit shop drawings to include the following:
  - 1. System Diagram.
  - 2. Floor plan layouts, sectional view and installation details.
- G. Submit samples of cables and other components as required.
- H. Submit as-built drawings to include the following:
  - 1. Floor plan layouts, sectional view and installation details.
  - 2. List of major components and their place in the system.
  - 3. Synopsis of the numbering scheme and cross connect log.

### **42.3 QUALITY ASSURANCE**

- I. Electronic Components: Comply with latest applicable standards of EIA; PEC; standard industry grade; types and ratings commonly available in local distributor without prior written approval from the Project Manager.
- J. Entire system, including mounting, installing, connecting, aligning, testing and adjusting, to be the responsibility of one contractor.
- K. Engineer in-charged shall be a duly Registered Electronics Engineer supervised by a Professional Electronics Engineer as required by R.A. 9292 and the IRR of revised National Building Code.
- L. Electrical Components, Devices, and Accessories: Listed and labeled as defined in PEC 2009, Article 1.1, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

## **PART 43 - PRODUCTS**

### **43.1 STANDARD PRODUCTS**

Material and Equipment to be provided shall be the standard products of a manufacturer regularly engaged in the manufacture of such products, and shall essentially duplicate material and equipment that have been in satisfactory use at least 2 years. All components used in the system shall be commercial designs that comply with the requirements specified.

**M. Identical Items**

1. Items of the same classification shall be identical. This requirement includes equipment, modules, assemblies, parts, and components.

**N. Nameplates**

1. Each major component of equipment shall have the manufacturer's name, address, model and catalog number, and serial number on a plate secured to the equipment.

**43.2 Work Station PC**

Work Station PC shall as a minimum conform to the following specification:

CPU:	4GHz
SERVER:	20GB free disk space
RAM:	4GB RAM
Video Card:	2 GB
Network Card:	10/100/1000 Mbps
CD ROM:	DVD/RW Internal Drive
Operationing System:	Windows 7
Monitor:	22-inches CIF LCD monitor with 9 screens

**43.3 Door IP Access Controller**

Door IP Access Controller as a minimum conform to the following specification:

CPU:	32-bits, 60 MHz
Card Holder:	150k users
Event:	80k events
Controlled Doors:	1 door
Communication:	10/100 Mbits/s
Tamper Detection:	Yes
Card Holder Photo:	Yes
Floor Plan:	Yes

Power source: 14.5 VAC, 12VC

#### 43.4 Card Reader

Card Reader shall as a minimum conform to the following specification:

Read range: 10 cm

Reading Time: less than 300ms

Input port: 2ea (External LED Control, External Buzzer Control)

LED Indicator: 2 Colors LED Indicator (Red & Green)

Beeper: Yes

Waterproof: Yes

Index of Protection: IP65

Output Voltage: 14V

Current: Max. 70mA

#### 43.5 Magnetic Door Contact

Magnetic Door Contact input modules shall as a minimum conform to the following specification:

Power requirement: 28V @ 1.0A

Resistance: 0.30 Ohm

Gap: 35mm

Installation: Recessed Mount

#### 43.6 Electromagnetic Lock

Electromagnetic lock shall as a minimum conform to the following specification:

LED Indicator: Yes

Input Voltage: 12VDC

Mounting Type: Surface

Anti-Risidual Magnetism	
Kick off:	Yes
Silence Operation:	Yes
Anti-Tamper	
Jam nuts:	Yes

### 43.7 Wires & Conduit

#### A. Wires

- Wiring shall be in accordance to the Philippine Electrical Code (PEC).
- Wiring for Electromagnetic Lock & Door Contact shall be #16 TF Twisted Pair Wire
- Wiring for Card Reader shall be Category 5e UTP Cable
- Wiring shall be listed or approved by a recognized testing agency.

#### B. Conduit

- Wiring shall be in accordance to the Philippine Electrical Code (PEC).
- Number of conductors in conduit or raceway shall not exceed to percentage fill specified in Philippine Electrical Code.
- RNC conduit shall be schedule 40 and shall be embedded.

## PART 44 - EXECUTION

### 44.1 INSTALLATION

- The Contractor shall carefully follow instruction in documentation provided by the manufacturer to insure all steps have been taken to provide a reliable, easy-to-operation system.
- The Contractor shall be responsible for provision and installation of all system components, conduit and wiring.
- All equipment shall be tested and configured in accordance with the instruction provided by the manufacturer prior to installation.
- All firmware found in products shall be the latest and most up-to-date provided by the manufacturer.
- Installation of equipment devices that pertain to other work in the contract shall be closely coordinated.

- F. All installation shall be in strict accordance with the Contract Documents, Manufacturers installation and wiring recommendation and comply with Philippine Electrical Code (PEC).

#### **44.2 FIELD QUALITY CONTROL**

- A. Recommend the Contractor to perform preliminary walkthrough to check for installation quality, accurate performance of work and to verify engineering diagrams.

#### **44.3 COMMISSIONING**

- A. Manufacturer's Field Service: Engage a manufacturers' authorized representative to inspect final system connection, perform complete functional test of the system and submit a written report to the designer attesting to satisfactory operation of the system.
- B. Testing: The owner representative will procure the services of an independent test firm to perform acceptance testing of each section or the infrastructure and inspect the installation to ensure all work has been performed in accordance with all contract document.
  - 1. All testing will be witnessed by the designer and owner's maintenance representative.
  - 2. The Contractor shall be present during acceptance testing to replace/repair all work that fails
  - 3. Contractor is financially responsible for all cost incurred to the Owner Representative's testing firm due to repair/replacement of failed cable, terminat, equipment, etc during acceptance testing
  - 4. Acceptance testing shall not begin until all work is complete.

## **2. TRAINING**

- a. Training shall be provided by the installer or product manufacturer free of charge to the assigned personnel for proper operation of equipment.
- b. All training shall be conducted during normal business hours at a date and time of mutual convenience.



- c. Training shall be conducted by a trainer who is factory certified in installation, programming, maintenance and operation of all supplied components.

End of Specification

## **MECHANICAL WORKS TECHNICAL SPECIFICATION**

### **SECTION 1500 MECHANICAL GENERAL REQUIREMENTS**

#### **1.01 GENERAL DESCRIPTION:**

**A.** The work to be done under this Specification consists of the fabrication, furnishing, delivery and installation, complete in all details, testing and commissioning of this contract, at the subject premises and all work materials incidental to the proper completion of the installation, except those where same shall conflict with Codes, etc., which latter shall then govern. The requirements with regard to materials and workmanship specify the required standard for the furnishing of all labor, materials, and appliances necessary for complete installation of the work specified herein and indicated in the drawings. The Specification are intended to provide a broad outline of the required equipment, but are not intended to include all details of design and construction.

#### **B. DRAWINGS AND SPECIFICATION**

The Drawings and Specification are meant to be complementary to each other and what is called for by one shall be called for by both.

Any apparent conflict between the Drawings and Specification and any controversial or unclear points in either shall be referred to the Mechanical Engineer in Charge for final decision. On the plans, keep records showing all deviation occurring during construction. At the completion of the work, said copy of the plans shall be submitted to the LGU for its copy and file.

Upon completion of work as described herein the Contractor shall furnish the Owner, at his own expense, Five (5) copies of the "AS BUILT" plans for future reference and maintenance purposes.

#### **C. CORRELATION OF WORK**

The Mechanical Contractor shall coordinate with the General Contractor and the LGU/Owner to determine how and where his work fits with that of other crafts, after familiarizing himself with the plans and specification. This shall be done at the beginning of construction. Should there be any existing doubt at any point, a ruling shall

be secured from the LGU/Owner and shall be given time to inspect the work covering this point and to prepare a detail in the form of Drawings and written instruct as required.

#### **D. PERMITS AND INSPECTION**

The contractor shall obtain, at his own expense, all the necessary permits and Certificate of Mechanical Inspection from the proper government authorities required both for the performance of his work involved and the operation of the system upon completion of work.

The Contractor shall, at his own expense, reproduce the electrical plans for his work to the necessary scale and complete them with the necessary information and requirements as required by the Government approving authorities concerned in issuing permits and Certificate of Electrical Inspection.

#### **E. EXAMINATION OF PREMISES**

Perspective bidder is required to examine the Architectural, Structural, Mechanical and Electrical Plans of the Project, to visit the site and carefully take note all the condition thereat and to have informed himself thoroughly under which the electrical work is to be done. No allowance shall subsequently be made in his behalf because of any error on his part. He will be deemed to have done this before submitting his proposal and no subsequent claim on the ground of inadequate or inaccurate information will be entertained.

#### **F. LAYOUT OF WORK**

Mechanical System layout, indicated on the drawings is generally diagrammatic and location of ducts, pipes, fans, blowers and equipment are approximate.

The exact routing of ducts, pipes, fans, blowers and equipment shall be governed by structural and architectural condition and limitat.

Consult the LGU/Owner for exact location. This is not to be construed to permit redesigning of system; all outlets are to be interconnected as indicated in the drawings.

Locatione and install equipment-requiring maintenance where it will be readily accessible. Any equipment locationed without the approval of the LGU or Owner shall be done at the risk of the Contractor.

The Owner reserves the right to make any reasonable changes in location of outlets and equipment prior to roughing-in, without involving additional expense.

The Contractor shall be held responsible and pay charges for cutting and patching for piping where sleeves or slots were not installed or where incorrectly located.

#### **G. MATERIALS AND WORKMANSHIP**

All materials to be installed shall be unused, brand new and shall conform to the applicable standards.

Only skilled workmen using proper tools and equipment shall be employed during the entire course of installation work. All workmanship shall be of the best quality and all work shall be done in accordance with the best practices of the trade involved.

The same job foremen shall be assigned and maintained at the job site during the entire course of the job.

#### **H. WORK NOT INCLUDED:**

1. All builder's work,
2. All cutting and patching of concrete openings.
3. Electric power terminating to disconnect.
4. Water supply to equipment connection.

#### **I. BUILDING PROVISION**

Certain provisions have been made in the Building for the accommodation of the installation. These provision include space allocation, holes through beams and structural slabs, etc. the provision so made are shown on the Drawings. Before proceeding with the Works, the General Contractor is to check and confirm that the provision are satisfactory for the Works, and where necessary, additional information and requirements is to be furnished.

It is the General Contractor's responsibility to be informed regarding all holes and any other provision requested in the structure.

Any subsequent structural openings required due to negligence in providing sleeves beforehand shall be at the expense of the General Contractor unless they are covered on a duly authorized variation order issued by the Project Manager.

All pipe sleeves shall be supplied and installed by the General Contractor. The Main Contractor shall ensure that the fixing is good and the sleeves will not be shifted or moved by concreting or by the trades.

It is also the General Contractor's responsibility to check and ensure that all holes, openings etc., are provided correctly during construction of the building.

## **PART 2.00**

### **2.01 OTHER APPLICABLE STANDARD OR CODE FOR TGIS CONTRACT:**

#### **A. CODE:**

1. Applicable local ordinances of Municipal Government.
2. Philippine Society of Mechanical Engineer's Code.
3. Philippine Plumbing Code.
4. National Electrical Code.
5. Philippine Electrical Code.

#### **B. STANDARD:**

1. Underwriters Laboratories (UL)
2. American Society of Testing and Material (ASTM)
3. American National Standard Institute (ANSI)
4. National Electrical Manufacturer's Association (NEMA)

5. American Society of Mechanical Engineers (ASME)
6. Factory Material Engineering Corporation (FM)
7. National Fire Protection Association (NFPA)
8. American Society of Heating, Refrigerating and Air Conditioning Engineers (ASHRAE)
9. Cool Tower Institute (CTI)
10. American Refrigeration Institute (ARI)

Proof of conformance shall be submitted to the Project Manager for approval.

Nothing contained in these specification or shown on the drawings shall be constructed as to conflict with national and local ordinances or laws of the Philippines. All such laws and ordinance form part of this specification.

## **2.02 SERVICE AND MAINTENANCE DURING DEFECTS: LIABILITY PERIOD:**

- A.** During the Defects Liability Period, in addition to requirements included in applicable specification, the general contractor shall be entirely responsible for:
  1. Carrying out regular inspect and full servicing of all plant installed under this specification.
  2. Providing a “call-out” service for breakdowns, at any time during the “Plant Operationing Hours” specified below.
- B.** If, during the Defects Liability Period any item of equipment should fail as a result of lack of proper servicing, faulty materials or workmanship, or defective equipment design, then promptly replace all such equipment at no cost and with minimum inconvenience to the Owner.
  1. Allow to work overtime to meet the requirements.
  2. Where overseas equipment is involved, allow to airfreight any parts needed.
  3. If, during the Defects Liability Period, system and/or equipment cease to operation within the design parameters for the Work, then promptly attend to such deficiencies and rectify them without delay.

4. The cost of providing the above service shall be included in the bid.
- C. The general contractor's order for all equipment shall include the warranty service for same, for the duration of the specified Defects Liability Period. This is to ensure that the manufacturer or supplier's agent is responsible for the servicing of his own equipment.

**D. PLANT OPERATIONING HOURS:**

For the purposes of establishing a cost of servicing, it is anticipated that the building services plant could be operationd continuously for 24 hours daily throughout the year.

**E. MAINTENANCE WORK – GENERAL**

Perform the minimum maintenance work specified herein, and any additional work needed to keep the plant and systems in sound condition and operationing satisfactorily, including work recommended by the manufacturers of items of plant and accessories, leaving all of the plant and system installed under this specification in perfect operationing condition at the end of the Maintenance Period.

**F. MAINTENANCE SCHEDULE**

1. Prepare a specifically-formulated Maintenance Schedule for this Project which shall be used for each maintenance visit and present a complete record of the work carried out during the visit and the condition of the plant at the time. The latter shall be detailed by special remarks and listed readings of all pressure gauges, thermometers, filter gauges, ammeters and kilowatt meters.
2. It shall be based on the minimum requirements detailed in the pursuing clauses.
3. The schedule shall be headed by the visit number, the month for which it is prepared.
4. From here on, the schedule shall go into the detailed funct of the maintenance routine listing in the preferred sequence of plant rooms and

plant areas each and every item of mechanical service plant contained in those areas or places the necessary inspection, adjustment or service function for each individual item of equipment.

Example: Should there be 4 fans in one room, each fan shall be listed by name (duty) followed by the maintenance function to be carried out on the fan. The next fan is listed, together and backwards between areas.

5. It is suggested that the sequence of plant areas be arranged in a logical manner avoiding lengthy walks forward and backwards between areas.
6. The schedule shall also indicate visit numbers at certain types of equipment, electrical systems, controls, etc. which are not serviced monthly, but at 3, 6 or 12 months intervals and at which number these services should occur.
7. Separate reports for specialist services shall be submitted directly to the Owner with copies to the Superintendent.
8. At the end of the Schedule, provision shall be made for the serviceman's signature, departure time, Owner's representative signature sought at departure time and a list of items deferred for attention at another time prior to the next visit.
9. Submit a draft copy of this Schedule prior to the date of practical completion for approval.
10. Provide a copy of each signed service sheet as the service is completed. Before Final Completion is granted, and all retention monies are released, it will be necessary to have provided the requisite number of service sheets as determined by the length of the Defects Liability Period specified.
11. The Defects Liability Period for this project shall be 12 calendar months from the date of Practical Completion.
12. A copy of each signed service sheet shall be submitted immediately after each service is completed. If the requisite number of service sheets are not presented, then the Defects Liability Period shall be extended by the number of months that the sheets have not been presented for.



## **G. MINIMUM MAINTENANCE**

1. Obtain from the Owner a report on the system operation and problems incurred. List the main items.
2. Lubricate all bearing other than those running in oil baths or provided with forced lubrication, or those not requiring regular lubrication, such as packed ball bearings and nylon bearings.
3. Check oil levels in all oil baths, crab-cases and the like, and add oil as necessary to restore correct oil level.
4. Check all belt drives, adjust belt tension and restore correct alignment if and as necessary.
5. Ensure that drains from drip-pans, pump glands, etc. are clear.
6. Read all filter manometers and record on Maintenance check list. When the reading indicates a resistance at which the filter manufacturer recommends cleaning, or greater, clean or replace the filter medium.

## **H. MONTHLY:**

1. Clean all condenser coils and any other coils unprotected by filters.
2. Check all pump glands and adjust when necessary. Check mechanical seals for leaks.
3. Clean all water strainers (first month only; quarterly thereafter).
4. Check all fans for unusual noises or vibration.
5. Refrigeration Compressor: Check and record on maintenance checklists:
  - a. Suction and discharge pressures.
  - b. Oil pressure.
  - c. Oil temperature.
  - d. Operation of oil heater.
  - e. Operation of crank-case heater.
  - f. Operation of high and low pressure cut-outs.
6. Refrigerant Condenser: Check and record on maintenance checklists:
  - a. Water entering and leaving temperature.

- b. Water pressure drop across condenser.
- 7. Check vibration mountings and flexible piping connect.

**I. QUARTERLY**

- 1. Clean all water strainers.
- 2. Clean all oil and fuel filters.
- 3. Service all controls. Systematically check all the action of and adjust, calibrate and clean, if necessary, all system components.
- 4. Examine all motors for damage and check for overheating.
- 5. Remove dust from all components inside switchboard and clean switchboard.

**J. ANNUALLY**

- 1. Drain lubricating oil from all air and/or refrigerant compressors and refill to correct level with new oil in accordance with manufacturing recommendation based on hours of operation.
- 2. Take oil samples from all compressors and have them analyzed by a recognized chemical laboratory for acidity and water content.
- 3. Investigate and report on causes for all acidic and hydrated oils.
- 4. Clean out all air-cooled condenser coils to manufacturer's recommendation.

**2.03 SPARE PARTS LIST:**

**A. SPARE PARTS INFORMATION:**

In addition to requirements included in applicable specification, provide spare parts as specified hereinafter and spare parts information for all equipment furnished under this contract. The information shall be complete, legible, organized, and submitted by system in five (5) copies, and shall include:

- 1. All list of spare parts, special tools, and supplies, for each item of equipment, which are either normally furnished at no extra cost for the

purchase of the equipment, or specified hereinafter to be furnished as part of the contract.

2. A complete list of spare parts and supplies recommended by the manufacturer to assure efficient and continuous operation of each item of equipment for a period of one (1) year after final completion and acceptance of the entire work under this contract. The list shall show the recommended minimum stockage level for reordering and shall identify all long lead items. A long lead item is defined as any item of equipment which cannot be ready for delivery in less than six (6) months after receipt of order. The list shall include the following information for each recommended spare parts:

- a. Manufacturer's Part Name.
- b. Manufacturer's Name of Address.
- c. Manufacturer's Part Number.
- d. Manufacturer's Drawing Number Showing Part.
- e. Next Higher Assembly.
- f. Equipment Symbol Keyed to Contract Drawings.
- g. Recommended Number of Spares.
- h. Net Unit Price.
- i. Quantity Installed Per Assembly.
- j. Lead Time
- k. Shelf Life.
- l. Peculiar Cleaning, Calibration, Packaging and Preservation Requirements.
- m. Name and Address of the Authorized Spare Parts Representative and Spare Parts Stocking Source Nearest to the Project Site.
- n. Alternate Source of Procurement.

3. All parts and components data identify shall be based upon the true manufacturer. Nameplates of other manufacturers or fabricator are

acceptable providing the true source identity remains intact and unobliterated. Any deviation from true source identify shall be subject to the written approval of the Owner. When spare parts are recommended and established by the manufacturer in the form of kits, these repair kits shall be listed in the recommended part list.

4. Special Tool and Test Equipment List: Submit five (5) copies of recommended list of all special tools and test equipment. The special tool and test equipment shall cover all items required for the successful operation and maintenance during a 10-year equipment life. In compiling the special tools and test equipment list, indicate all special tools and test equipment items that require calibration, including frequency and method. Necessary standard shall be listed immediately after each item that requires calibration and they must be traceable to the National Bureau of Standards or other reference satisfactory to the Architect. Tool lists shall include all tools required. Test equipment lists shall include equipment required for acceptance, testing and calibration. Provide five (5) copies of all vendor supplied catalogs and instruct for operation and maintenance of the tools and test equipment furnished under this contract.
5. Submission of Preliminary Parts Lists: Submit one (1) copy of the Preliminary Parts List with recommendation for spare within the time frame set forth above. This list is subject to the Owner's review and approval. The Owner may revise the listing as to quantities of recommended spares as a condition of approval. The Owner deserves the right to order all, non, or any portion of additional spare parts from the manufacturer's complete list and the Preliminary Part List.
6. Resubmittals: Any resubmittals or additional submittals of Equipment List, Spare Parts Lists or associated information shall be made within thirty (30) calendar days and all costs associated with the submiss shall be borne by the Contractor.

7. Final Parts List: The Final lists shall be submitted not later than one hundred twenty (120) calendar days prior to contract completion date, in five (5) copies and shall be annotated "Final" on each sheet.

B. Spare Parts: Provide the following spare parts in addition to those included in applicable specification:

1. VRF: (One set for each type of VRF unless otherwise specified)
  - a. Set of bearings.
  - b. Control and protector relays and switches for temperature, refrigeration and oil pressures and water flow.
  - c. Set of gaskets, one set for each chiller type.
  - d. Compressor motor oil change kit.
  - e. Oil sump heaters.
  - f. Vane motor actuator.
  - g. Oil pump.
  - h. Purge assembly.
  - i. Vane motor.
  - j. Set of motor bearings.
  - k. Motor starter components
    1. Contact – two (2) sets of each type.
    2. Solenoid coil – two (2) sets of each size.
    3. Heaters – two (2) sets each size
    4. Arch Shields – one (1) set each type.
    5. Conductors lugs – one (1) set of each size.
    6. Time delay control – one (1) set of each type.
2. Fans and Blowers: (one set for each type)
  - a. Set of bearings.
  - b. Pulleys.
  - c. Belts.

- d. Set of motor bearings for each motor size.
  - e. Motors.
  - f. Starter controllers.
3. Air Handling Units and Air Conditioning Units: (one set for each type unless otherwise stated)
- a. Set of bearings.
  - b. Belts (only for belt drive motors)
  - c. Motors.
  - d. Starter controllers.
  - e. Washable filters – 100% spare.
  - f. Disposable filters – 200% spare.
  - g. Motorized damper actuators – 5%, min. one for each type.
  - h. Motorized valve actuator – 2%, for each type, but minimum of one.
4. Terminal Units:
- a. Three (3) VAV boxes for each type of VAV box specified on mechanical drawings.
5. Electric Controls:
- a. Two (2) sets of each type of controllers.
  - b. Four (4) sets of each type of sensors.
  - c. Two (2) sets each type of valve and damper operationor.
6. Fan Coil Units:
- a. Control valves – 8% each size of control valve.
  - b. Thermostat – 10%for each type.
  - c. Complete Fan Coil Unit – 4% for each type, minimum of 1.
  - d. Fan and motor assembly – 5% for each type, minimum of 1.
  - e. Filters – 10% for each type.
  - f. Isolation valve and glove valves – 5% for each type, minimum of 1.

- 7. Central Control Panel
  - indicating lights - 100%
  - lenses - 10%
  - switches and push buttons - 20%

**2.04 PAINTING:**

1. All works except steel with chrome plated finish, aluminum, copper or stainless steel shall be primed and painted unless otherwise approved by the Project Manager.
2. Before painting, the surface of the metal works shall be completely clean and free from rust, scale and grease.
3. Non galvanized surfaces other than nuts, bolts and washers that may have to be removed for maintenance purpose, shall receive painting comprising the primary coat of rust inhibiting paint, three coats of the finished color. If the Project Manager consider painting not satisfactory, more coating shall be applied without extra cost.
4. Painting of cased electrical equipment, electrical accessories, and electrical fittings to meet the color requirements, stipulated in this specification, is not allowed.
5. All exposed metal parts such as cover plates for any pipe fittings, conduit and accessories, etc. shall be painted with a suitable color to match the interior finish of a particular location as approved by the Project Manager.
6. Submit color samples and material of the finishing coats to the Project Manager for approval prior to any painting.
7. Paints of synthetic material such as PVC or plastic shall be chemically compatible with the material being painted.
8. Paints of synthetic materials shall be as recommended by the material manufacturers.
9. Paints for special materials shall be as recommended by the material manufacturers.

10. Rubber and neoprene products shall not be painted.
11. Non-galvanized metal work fabricated on site inside false ceiling and pipe duct shall be painted with minimum two (2) coats of primer and rust inhabiting coat. Overcoat finish is not required. Manufacture Product in false ceiling and pipe duct such as pipes, air handling unit, fan coil unit, light fittings, electrical panels shall be painted as specified unless it is complete with galvanized surface.

**2.05 LONG-TERM GUARANTEES:**

- A. All long-term guarantees extending beyond Defects Liability Period shall be turned over to Owner at Final Completion. These shall be assigned in favor of the Owner.

**2.06 BASIC SUBMITTAL ITEMS:**

The following states the basic submittal which shall be included in additional to these specified elsewhere:

**A. MANUFACTURER'S DATA:**

1. VRF
2. AHU
3. Fan Coil Unit
4. Electric Motor Controls
5. Motors
6. Automatic Control
7. Insulation
8. Valves
9. Fittings
10. Water Treatment
11. Electrical switchgear, cables, starters, etc.
13. Motor control centers and control panels.
14. Filters
15. Diffusers and air fittings



16. Valves and water side fitting and gas side fitting
17. Automatic temperature controls (Direct Digital Controls)
18. Fire rated sealant

**B. SHOP DRAWINGS:**

1. VRF outdoor unit installation
2. VRF indoor unit installation
3. Air handling unit installation
4. Fan coil unit installation
5. Fuel and gas installation
6. Automatic Control Schematic
7. Mimic Supervisory panel
8. Plans related to latest false ceiling plans
9. Ductwork and pipe work installation

**C. CERTIFICATE OF COMPLIANCE:**

1. Insulation
2. Adhesive
3. Sheet metal
4. Pipe material
5. Electrical Accessories
6. Controls
7. Fire rated sealant

**D. TYPE TEST CERTIFICATE:**

1. All motor control centers
2. Electrical switchgears and starters

**E. CALCULATION:**

1. Control valves selection
2. Acoustic calculation for systems
3. Fan, AHU, fan coil unit system pressures
4. Vibration eliminators
5. Supporting I-Beams for other equipment
6. Electrical selection for equipment

**END OF SECTION**

## **SECTION 15100 AIR HANDLING AND DISTRIBUTION EQUIPMENT**

### **1.01 GENERAL REQUIREMENTS**

Section 15000, "General Requirements, Mechanical," with the addit and modification specified herein, applies.

### **1.02 SUBMITTALS: SUBMIT THE FOLLOWING:**

#### **A. MANUFACTURERS DATA**

1. Fans and Blowers

#### **B. STANDARD COMPLIANCE AND MANUALS**

1. Fans and Blowers

#### **C. CERTIFIED TEST REPORT**

Provide for corrosion protection

1. Corrosion Protection

The affected equipment shall be protected by the manufacturer with corrosion-inhibiting coating or paint system that has proved capable of satisfactorily withstanding corrosion in accordance with ASTM B 117. Test period shall be 125 hours for equipment installation indoors and 500 hours for equipment installed outdoors or otherwise subjected to a marine atmosphere. Each specimen shall have a standard scratch as defined in ASTM D 1654. Electro-plated zinc coating shall not be less than 0.0127 mm average.

2. Corrosion Criteria

Upon completion of exposure, coating or paint shall show no indication of deterioration or loss of adhesion nor, shall there be indication of rust or corrosion extending further than 3mm on either side of original scratch.

3. Thickness of Coating :

Thickness of coating or paint system on the actual equipment shall be identical to that on the test specimen with respect to materials, condition of application, and dry film thickness.

## **2.01 FANS:**

All fans shall be complete with motor and vibration elimination mounting and for centrifugal fans, with belt drive, pulleys, guards, starter panels of type approved by the Project Manager.

AMCA 99 statically and dynamically balanced, with air capacities, brake horsepower, fan types, fan arrangement, noise level (sound power level) and pressure ratings as indicated. Fans shall sound-rated in accordance with AMCA 300. Fan bearing life shall be minimum 200,000 hours at operating condition. Provide bird screens for outdoor inlet and outlets. Equip backdraft dampers (for connection to outdoor louvers and at location as shown on drawings. Wire guards shall be provided for exposed pulleys and belts (i.e not inside air duct or housing mounting). Have thermal overload protection in the operating disconnect switches starter, etc. for centrifugal fans and 3-phase motor within the building. Housing and fan wheel shall be aluminum or steel except as specified otherwise. Explosion proof fans shall have non-metallic blower.

Motor speed shall not exceed 1750rpm. Fan shall be of highly efficiency at duty point and low noise.

The fan resistances indicated on equipment schedule and drawings are for reference only. The General Contractor shall check the exact resistance with calculation submitted for approval before ordering. Any required modification to the system (e.g fan size, motor, switchgears, and cables) to meet the specified duty and space condition shall be entirely at the General Contractor's expenses.

### **A. CENTRIFUGAL FANS-FORWARD CURVE, AIRFOIL AND BACKWARDLY INCLINED:**

Centrifugal type fan units complete with motors and drive equipment shall be installed where shown on the drawings. Fan wheels for the kitchen exhaust fan and fans having air flow rate exceeding 10,000 cfm shall have backwardly-inclined or airfoil continuous welded blades. For fan having airflow rate not exceeding 10,000 cfm shall have forward curved with belt drive as scheduled unless otherwise specified. Impellers are to be hot dipped galvanized after fabrication. For small fans less than 2,000 cfm, blades may be of extruded aluminum riveted to the rim. All fans shall be driven by means of multiple "vee" belts. Each drive shall be enclosed in a suitable guard approved by the Project Manager. Belt speed shall not exceed 5,000 fpm. The fans shall be of bright steel

and shall be of ample proportion so that outlet velocities will not exceed those indicated, and shall be equipped with removable angles and bolts for attaching canvas or other flexible connect. All large fans scrolls shall be provided with drain plugs and access panel.

All pulleys shall be variable pitch pulleys.

## **B. PROPELLER FANS**

Propeller fans shall furnished complete with single or and belt drive motor (as scheduled) drive equipment and fan guards. Fans and motor shall be mounted on resilient supports and a heavy metal frame. Provide angles/or plates required to mount the fans and dampers in the openings provided.

Belt driven fans shall have pitch pulley.

Motor shall be totally enclosed construction with permanently lubricated ball bearings. Impeller shall be made of steel while hub is made of steel aluminum.

## **C. IN-LINE TUBULAR/CABINET TYPE CENTRIFUGAL FANS:**

AMCA 210 tested and rated, with welded tubular steel casings, tubular centrifugal backward-inclined blades, stationary discharged conversion vanes, belt guards, and adjustable motor-mounts and variable pitch pulleys for belt driven fans. Provide slip-fit or flanged connection between fan casings and ductwork. Air shall enter and leave fans axially. Inlet shall be streamlined with conversion vanes and bell mouth. Enclose and isolate fan bearings and drive shafts from air stream. Treatment and painting shall be manufacturer's standard. TEAO motors shall be direct drive. Drip proof motors mounted out of air stream shall be guarded V-belt drives. Provide fan supports an vibration isolators as indicated.

## **D. CENTRIFUGAL FAN FOR KITCHEN EXHJAUST:**

The centrifugal fan for kitchen exhaust shall have the following features:

1. Suitable for discharge of hot greasy moist kitchen range hood exhaust air up to 200°C which is slightly laden with detergent vapour.
2. The fan shall be SISW or DIDW, as specified backward curve with continuous welded, impeller construction guide inlet vane controller capable of automatic reduction of fan capacity to 45% of the specified duty. The inlet guide vane shall be suitable for the gases to be handled.

3. Fan belts, pulley and bearing shall be rated for duty up to 200°C. Pulley shall be variable pitch.
4. Fan and belts shall be continuously welded heavy gauge, with internal duct flanges to prevent grease and moisture leakage.
5. The fan wheel shall be of the non-overloading backward incline centrifugal type. Wheels shall be statically and dynamically balanced grade. Wheels shall be constructed with half-welded and half riveted aluminum with a maximum pressure capability of 2 inches W.G.
6. Motors to be NEMA frame, 1,800 or 3600 rpm, Open Drip Proof, Totally Enclosed Fan Cooled (TEFC).
7. Due to limited ceiling void space for the location of ventilating fans, it is advisable that the contractors take note of the dimension of the fans to be installed.

## **2.02 FACTORY FABRICATED AIR HANDLERS (AIR HANDLING UNIT):**

ARI 430, single zone draw thru type with arrangement and pressure rating as indicated. Air handler shall be sound-rated in accordance with ASHRAE 68. Sound rating shall not exceed specified dBA ratings. Submit sound power data in all octave-band center frequencies. Such data shall apply to the minimum noise area of the performance curve. Units shall consist of damper section, supply blower section, filter box, and coil section. All bolts, screws and washers shall be cadmium plated steel.

### **A. CASING:**

Construct casings of double skinned galvanized steel. Provide removable panels securely bolted or locked on independent structural frame and reinforced to avoid drumming to form rigid and durable construction and access doors for inspection and access for internal parts. Surface of steel parts which are not zinc-coated and all surfaces exposed to the weather shall be protected against corrosion by paint or coating system. Reinforce point of support for mounting units. Make airtight joints. Insulate casing with 50mm polyurethane foam insulation meeting NFPA 90 requirements. All panel joints and connection shall be gasketed to prevent cold bridges.

### **B. DAMPER SECT:**

Permanently secure damper blades on a single shaft with sintered bronze or nylon bearings. Connect damper shafts together by one continuous linkage bar, which may be cut in field to separate the damper openings, with grouping as required. Discharge air vertically or horizontally.

**C. DIDW SUPPLY BLOWER (FAN) SECT:**

Centrifugal fan of backward-inclined for duty exceeding 10,000 cfm, forward curve or airfoil Type for duty less than 10,000 cfm and VAV air handling units unless otherwise specified with V-belt drives motor, adjustable motor base, with internal and external belt guards as specified. Bearings shall be grease-lubricated ball bearings type, with minimum 200,000-hour life. Grease fittings will be extended to the casing.

Fan wheel shall be electro-galvanized after fabrication. Fan shall be solid or hallow construction. Fan shafts with intermediate bearings are not acceptable. Extend drain pan to the blower section to catch any carry-over of moisture.

Fan resistances indicated on equipment schedules and drawings are for reference only. The General Contractor shall check the exact resistance with calculation submitted for approval before ordering. Any required modification to the system (e.g. fan size, motor, switchgear, cables silencers, etc.) to meet the specified duty and space condition shall be entirely at the GeneralContractor's expense.

All fans shall be provided with variable pitch pulleys. Pulleys shall be multiple sheaves and belts selected such that full fan bhp is handled with one belt broken.

**D. FILTER BOXES:**

Design airtight filter boxes to hold filters conforming to requirements of Section 15200 "Ductwork and Accessories".

**E. FILTER DRAFT GAUGES - DIAL TYPE:**

Gauge shall be 100mm dial type, diaphragm actuated with a range of 0 to 500 Pa with 12.5 Pa division, installed with filter gauge accessory package. Provide a draft gauge at each filter bank. Filter gauge shall have a dial indicator and dry alarm contact for connection to a Building Management System (BMS).

**F. MIXING BOXES:**

Include equally sized flanged openings, sized to handle full airflow capacity. Provide automatic dampers as indicated. Arrange dampers in such a way that when one starts to close from its opened position the other starts to open from its closed position.

**G. OUTSIDE AIR INTAKE:**

The outside air intake, if ducted to the air handling shall be complete with unit volume dampers or automatic dampers, if the latter is specified.

**H. COIL SELECT:**

Coils shall be removable and shall contain cooling coils in common or individual casing as manufacturer's standard. Cooling coils shall have insulated drain pans with piping connect to remove condensate. Seal coils to casing to prevent leakage of air around coils. Coils shall be seamless copper, to be mechanically bonded to aluminum plate fins by expansion of tube in fin collars. Unless otherwise specified, cooling coils shall not have more than 8 rows. Rows and fins shall be as specified in the schedule. By pass factor of the coil shall have a range of 0.08 to 0.15. Cooling coil shall be ARI certified. Headers for coil shall have a range of up to 900mm height shall be cast iron and copper headers shall be used for more than 900mm. Ample space shall be allowed at both sides of coil to facilitate periodic cleaning. Drain shall be provided to all coils for complete draining of water and vent for manual air venting.

Coils shall be designed for 250 psi working pressure or higher and water velocity shall be between 120 fpm to 360 fpm. Air face velocity through coil shall not be greater than 500 fpm. Maximum fin space shall be 12 per inch.

**2.03 FAN COIL UNIT:**



Fan Coil Unit shall be provided where shown, complete with all necessary components, including coils, drip pans, motors, etc. Size and type of unit shall be as scheduled on the drawings. The casing shall be lined with 25mm rigid glass fiber sound and thermal insulating board. Units shall be ceiling suspended and wall mounted unless otherwise specified. Filters shall be washable type. Coils shall be seamless copper tubing expanded into aluminum plate fins, for 1670 kPa working pressure rated tested at 2500 kPa air. Fans shall be aluminum forwardly-curved centrifugal; type, belt or direct driven. Motors shall be single phase, long life high efficiency permanent split capacitor type with built in impedance protection and permanently lubricated ball bearings with 100,000 hour life. Direct-connected motor shall be 3 speed type. Provide fusestat overload device for motor protection, disconnect switch and permanent greenfield connection to motors. The drip pan shall be constructed of galvanized steel with bituminous coating. The outside shall be insulated with 20mm polystyrene insulation or approved equivalent. Drip pan shall extend below the 2-way control valve.

**A. COILS**

Single chilled water coil with aluminum fins and copper tubes. Coil duty shall satisfy both specified total cooling load and total sensible load.

**B. FAN:**

Fan motor shall be premium efficiency rating.

**C. HOUSING:**

1. Exposed unit shall be 1.3mm (minimum) steel, phosphate treated, prime coated and finish with baked enamel.
2. The return air plenum shall be large enough to remove the blower section.

**D. DRIP TRAYS:**

Fan coil unit shall be provided with drip trays insulated with pipe connection to condensate drain.

**E. CONTROLS:**

Electric type as indicated. Interlock valves with fans so that the valves shall be de-energized and fluid flow stopped when fans are turned off.

1. FANS:

Manual with three-speed fan switch

2. VALVES:

Unless otherwise specified control valves for fan coil units shall be of two-way modulating type normally closed.

Two-way motor operation valves.

3. THERMOSTAT:

Valve operation shall be of the silent operation electric type that closes or opens the valve to control the room temperature.

**2.04 MOTOR AND MOTOR STARTERS:**

Motors shall be totally enclosed fan cooled and drip proof. Motor starters shall be magnetic across the line for 3.8 KW and below. Motor 5.5 KW above shall be reduced voltage wye delta type.

**2.05 BELT DRIVES**

1. Fans shall be V-belt driven as specified in the schedules. Sheaves shall be of the adjustable ratio type, and of approved make. They shall be sized to give the required fan speed with the motor sheave at about the middle of its range of adjustment. There shall be at least two belts, capable of carrying the entire load with one belt broken. Furnish and install belt guards perforated metal for all sheaves and belts. Belts shall have grommeted openings at the fan and motor shafts to facilitate tachometer readings. All belt connected motors shall have adjustable bases and set screws to maintain proper belt tension.
2. The fan wheel shall be statically and dynamically balanced and overhung on a steel shaft running on heavy duty ball bearings. Bearings shall be self-aligning. To prevent leakage of oil and grease; cups or oil chambers must be provided in accessible position outside of the duct connection for easy lubrication. All bearings within the air stream shall be sleeve bearings. Brackets must be cast iron and mounted on side of the blower.

3. Fan housing shall be constructed of galvanized steel or aluminum and rigidly built and braced. The fan scroll shall be of galvanized steel. Where fan scroll is 480mm or more in width, an access door shall be provided. The door shall be of the panel type set in a raised frame by hand tight bolts, and shall be provided with lift handles. Fan and their motor drives shall be supported on vibration absorbing bases. Provide a 12mm drain valve in the housing for fan wheel diameter of 480mm or more.

### **3.01 INSTALLATION:**

Install air distribution equipment as indicated and in accordance with the manufacturer's instructions. Provide clearance for inspection, repair, replacement and service. Electrical work shall conform with NFPA 70. Provide conduits for wirings. Equip motors with un-fused safety disconnect switches mounted under or near fan housings. Provide overload protection in the operating disconnect switches and magnetic starters.

### **3.02 FIELD INSPECTION AND TESTS:**

Schedule and administer the specified tests. Provide personnel, instruments, and equipment for such tests. Correct defects and repeat the respective inspection tests. Give the Engineer ample notice of the dates and times scheduled for tests and trial operation. Conduct inspection and testing in the presence of the Engineers. Submit test data certified by the equipment manufacturer's representative.

### **3.03 FIELD INSPECTION:**

Prior to initial operation, inspect equipment installation for conformance with drawings and specification.

### **3.04 FIELD TESTS:**

1. Preliminary Tests:

For each air handling and distribution equipment and its components, perform an operational test for a minimum period of 24 hours.

**END OF SECTION**

**SECTION 15200      DUCTWORK AND ACCESSORIES**

## **1.01 GENERAL REQUIREMENTS**

Section 15000, "General Requirements, Mechanical," with the addit and modification specified herein, applies.

### **A. SCOPE OF WORK**

The work involves the supply and installation of ductworks and its accessories including dampers, fire dampers, hangers, diffusers, registers, grilles, troffers, flexible ducts, sound attenuators, filters, louvers, access panels flow and pressure test ports.

## **1.02 SMACNA DUCT CONSTRUCTION MANUALS:**

The SMACNA recommendation shall be considered as mandatory requirements. Substitute the word "shall" for the world "should" in these manuals.

## **1.03 CORROSION PREVENTION**

Special protection is not required for equipment that has a zinc coating conforming to ASTM A 386 or a duplex coating of zinc and paint. Where expressly stipulated in equipment requirements paragraph below, the affected equipment item shall be protected by the manufacturer with a corrosion inhibiting coating or paint system that has been proved capable of satisfactorily withstanding the following test. Test method shall be ASTM B 117. Period of test shall be 125 hours for equipment intended for installation indoors; test period shall be 500 hours for equipment which will be installed outdoors or which will be otherwise subjected to marine atmosphere. Each specimen shall have a standard scratch as defined ASTM D 1654.

### **A. CRITERIA:**

Upon completion of exposure, coating or paint shall show no indication of deterioration or loss of adhesion. Nor shall there be indication of rust or corrosion extending further than 3mm on either side of original scratch.

### **B. THICKNESS OF COATING**

Thickness of coating or paint system on the actual equipment shall be identical to that on the test specimens with respect to materials, condition of application, and dry film thickness.

#### **1.04 DIMENS**

Duct sizes given in the drawings are clear internal dimens and allowance shall be made for both internal and external insulation and/or acoustic linings where applicable.

#### **2.01 SHEET METAL MATERIALS:**

##### **A. GALVANIZED STEEL SHEET**

ASTM A52 designation G.90 galvanized and lock forming quality. Thickness and weight shall not be less than that specified in Chapter "DUCT CONSTRUCTION" of ASHRAE HANDBOOK.

##### **C. GALVANIZED STEEL HOT DIPPED AFTER FABRICATION:**

ASTM A23

Galvanized steel shall be as manufactured by Philsteel, APO/Puyat Steel

#### **2.02 SHEET METAL WORK:**

**A.** All sheet metal work for the air conditioning and ventilation system shall be furnished, installed, completely connected, cleaned, tested and, adjusted by the General Contractor. This shall include the following major items of work.

##### **B. DUCTWORK FOR CONVENTONAL SYSTEMS:**

1. All sheet metal work exposed to the weather and elsewhere as indicated on the drawings, shall be built substantially as shown, of galvanized steel or aluminum steel sheet properly braced and supported and secured to the building construction and/or equipment. Wherever not otherwise specified thickness shall be as follows:

<u>Larger Dimension (US)</u>	<u>Galvanized</u>	<u>Aluminum</u>
Up to 600mm	No. 26 US Gauge	No. 24 US Gauge
600mm to 1200mm	No. 18 US Gauge	No. 20 US Gauge
1200mm and larger	No. 16 US Gauge	No. 18 US Gauge

2. All other ductwork for conventional system, except where otherwise specified, shall be built of best bloom galvanized iron or aluminum of the following thicknesses.

<u>Larger Dimension (US)</u>	<u>Galvanized</u>	<u>Aluminum</u>
Up to 300mm	No. 26 US Gauge	No. 24 US Gauge
325mm to 750mm	No. 24 US Gauge	No. 22 US Gauge
775mm and 1350mm	No. 22 US Gauge	No. 20 US Gauge
1375mm to 2100mm	No. 20 US Gauge	No. 18 US Gauge
Above 2100mm	No. 18 US Gauge	No. 16 US Gauge

3. All exhaust ductwork securing kitchen shall be formed from 304 stainless steel sheet ductworks shall have soldered seams and low points shall have a drain sump. Air tight access door shall be provided every bend and 4m length of minimum size 450 x 450mm. Thickness is similar to that for galvanized iron but with one commercial size larger. Accessories, e.g. damper splitter etc. shall be of stainless steel.

4. Duct shall be braced as follows:

Larger Dimension of Duct (mm)	Size of Brazing Angles (mm)	Distance Between Bracing (mm)
65 – 100	25 x 25 x 3	1.20m
Above	38 x 38 x 3	0.60m

Angle bracing shall be carried around all four sides of duct.

5. kitchen exhaust duct shall be black iron steel US Gauge#16 with fully welded connection.

### **2.03 FLEXIBLE DUCTS**

UL 181, Class 1. Use to connect between rigid ducts and outlets or terminals. There shall be no erosion, delamination, loose fibers, or odors from the ducts into the air stream. Minimum working pressure shall be 350mm water positive and 40mm negative for low velocity flexible ducts. Flexible ducts shall be maximum 2.40 meters in length. Minimum bend radius shall be twice of the duct diameter.

#### **A. MATERIALS:**

Interlocking spiral or helical corrugated type constructed of aluminum.

#### **B. INSULATION AND VAPOR BARRIER:**

ASTM C 553; 25mm nominal thickness and 32 kg/m<sup>3</sup> density. The insulation shall be sheathed with vapor barrier having a maximum permeability of 0.02 perm per ASTM E96, Procedure C. THERMOBREAK or approved equal.

#### **C. JOINTS**

Make airtight slip-joints sealed with pressure-sensitive vapor seal adhesive tape or duct sealer and secured with sheet metal screws. To prevent insulation compression, place 50mm wide by 25mm thick closed cell foam plastic spacers over the joints under vapor barriers. To provide a vapor tight joint, use a corrosion-resistant steel aluminum clamp over such spacers.

### **2.04 DUCTWORK INSULATION**

Use in low pressure ducting particularly on branch ducts. It can operate at 996 Pascal (4") water column static pressure and velocities of 25.4 m/sec (5000 fpm).

#### **A. MATERIALS:**

Closed Cell Crosslinked Polyolefin Insulation, made of material such as Polyethylene based Crosslinked, factory applied reinforced aluminum foil and acrylic adhesive backing, 25 kg/cu.m density, maximum 0.32 w/mK at 20°C, non-

hydrosopic, water vapor permeability better than 0.8gm/02/24 hours (90% RG, 38°C), -80 to 100 °C service temperature. Class 1 or better fire ratings.

**B. VAPOR BARRIER:**

The exterior surface shall be fire resistant foil scrim kraft facing. The interior shall be coated with thermosetting acrylic polymer.

**C. JOINTS:**

Joints are pre-molded double density slip-joint edges.

**2.05 ACOUSTICAL DUCT LINING**

Flexible or rigid mineral fiber lining. Lining shall not be less than 25mm and where applicable shall be of sufficient thickness to be thermally equivalent to the thickness of insulation of ductwork. Duct sizes indicated shall be increased to compensate for the thickness of lining.

**2.06 CASINGS AND PLENUMS:**

**A. FIELD-FABRICATED COMPONENTS:**

Unless otherwise indicated, metal thickness, reinforcements, joint sealing, and fabrication and erection of equipment casings and plenums shall conform to ASHRAE STANDARD.

**B. FACTORY-FABRICATED COMPONENTS:**

Factory-fabricated and insulated sheet metal may be used if conforming to paragraph "Field-Fabricated Components." The panels shall be of modular design pretested for structural strength, thermal control, condensation control, and acoustical control. The panel joints shall be sealed and access doors shall be gasketed to prevent air leakage. Insulate access doors. Fasteners shall be corrosion resistant.



## **2.07 DRIP PANS:**

Each cooling coil section in both field and factory assembled casings shall be provided with a stainless or galvanized steel drip pan not less than 18-gauge with drain connect. Drip pan shall collect, confine, and disposed of all condensate from cooling coils and attachments, including headers, return bends, distributors, and un-insulated pipe and fittings. Where individual eliminator blades are in section (not in one piece from top to bottom of coil bank), provide auxiliary drip through bottom of each section with drains to drip pans. Insulate drip pans with water impervious insulation of sufficient thickness to prevent condensation formation on the exterior at ambient condition to be encountered.

## **2.08 DIFFUSERS, REGISTERS, AND GRILLES**

### **A. MATERIAL AND FINISHES:**

Construct diffusers, registers and grilles of steel unless otherwise specified. Exterior and exposed edges shall be rolled, or otherwise stiffened and rounded.

Steel part shall factory zinc-phosphate treated prior to priming and painting or have a baked-on enamel finish. Linear diffuser shall be colored anodized aluminum and outdoor air fitting shall be stainless steel. Colors shall be selected or approved by the architect.

## **2.09 DAMPERS AND DIFFUSERS**

### **A. CEILING DIFFUSERS**

Equip with baffles or other devices required to provide air distribution pattern. Provide factory fabricated, single key, volume dampers. Except linear air diffusers, interna; parts shall be removable through the diffuser neck for access to the duct and without the use of special tools.

### **B. CIRCULAR, SQUARE AND RECTAGULAR DIFFUSER:**

Each ceiling diffuser shall consist of four or more concentric circular elements designed to deliver air radially in a generally horizontal direction without excess

smudging of the ceiling. The interior elements of the square and rectangular ceiling diffusers may be circular, square or rectangular as manufacturer's standard.

**C. PERFORATED PLATE DIFFUSER:**

Provide adjustable one-way, two-way, three-way or four-way air patten controls as indicated. Mount perforated diffuser plates flush with finished ceiling. Diffuser face-plates shall not sag or deflect when operationing under design condition.

**D. LINEAR AIR DFFUSERS:**

Joints between diffuser sect shall appear as hairline cracks. Provide alignment slots for insertion of key strips or other concealed means to align exposed butt edges of diffusers. Equip with plaster frames when mounted in plaster ceiling. Do not use screws and bolts in exposed face of frames or flanges. Metal-fill and ground smooth corner-joints of steel frame and flanges exposed below ceiling. Furnish separate pivoted or hinged adjustable air volume-damper and separate deflection blades. Volume and deflection blades shall be structurally rigid.

**E. REGISTERS:**

Supply register shall be double-deflection type. Provide volume dampers furnished by the manufacturer. Volume damper shall be of the group operationd, opposed blade type and key adjustable by inserting key through face of register. Operationing mechanism shall not project through any part of the register face.

**F. GRILLES:**

Construct and finish as specified above for registers, except that volume dampers shall be omitted.

**2.10 DUCT SLEEVES AND PREPARED OPENINGS**

**A. DUCT SLEEVES AND CLOSURE COLLARS:**

Fabricate from 20 gage galvanized steel. Where sleeves are installed in bearing walls or partition use black steel pipe, standard weight, instead.

**B. PREPARED OPENINGS:**

Provide 25mm clearance between the ducts and the sleeve.

**C. ACCESS DOORS**

Door frame shall be welded in place airtight or bolted with air tight foam rubber gasket. Door shall be rigid and airtight with foam rubber gaskets and two or more galvanized steel hinges and tension fasteners. Provide doors as large as practical. Mount doors, if possible, so that air pressure holds them closed.

**2.11 DAMPERS AND LOUVERS:**

Shall be 2-gauge heavier than ducts in which installed. Dampers shall be opposed-blade type. The construction shall be aluminum or galvanized steel with interlocking edges and maximum 10 inch blade width. Conform to ASHRAE STANDRDS.

**A. BACKDRAFT DAMPER (GRAVITY DAMPERS OR SHUTTERS):**

Factory fabricated, with delicately balanced blades that open automatically when the fan starts and closed by gravity when the fan stops. Provide the edges of blades with felt or rubber strips to prevent rattling.

**B. MANUAL VOLUME DAMPERS:**

Balancing, factory-fabricated type. Equip dampers with accessible mechanism such as quadrant operationors or 5mm rods brought through the side of ducts with locking set screw and airtight bushings. All air fittings shall be chrome plated with all volume control dampers in both supply and exhaust systems. Quadrants operationors and rods will be marked to indicated damper position.

**C. LOUVERS:**

Fixed type. Fold or bead the edges of the louver blades to exclude driving rain. Louver frame shall be made of 16 gauge aluminum. Provide insect screen constructed of the same type metal as the louvers. Louver depth shall be as indicated.

1. Bird Screens:

With 12mm by 12mm mesh, 1.6mm diameter aluminum wire or 0.33 diameter stainless steel wire. Insect screen frames shall be grooved type with vinyl or neoprene spline insert for securing screen cloth.

2. External Louvers:

Weather proof external louver shall be supplied and installed by the Mechanical Contractor unless otherwise specified.

**END OF SECTION**

**SECTION 15300 CHILLED WATER PIPING**

**1.01 GENERAL REQUIREMENTS**

Section 15000, "General Requirements, Mechanical," with the addit and modification specified herein, applies.

**1.02 DESCRIPTION OF WORK:**

1. Provide the piping system as specified in this section including chilled water, condenser water, and condensate piping, flanges, bolting, gaskets, valves, fittings, pressure containing assemblies, flow measuring equipment and flow control equipment, pressure gauge, thermometers, air release vents, expansion tank, flexible connection, hangers supports, seismic restraints.
2. Miscellaneous piping such as drain pipes bleed off, make-up and vent pipes.
3. Hydrostatic and radiographic testing of pipes.
4. Cleaning, flushing and painting.

**1.03 PRESSURE RATING:**

In this Section, all components for chilled water and condenser water pipes including pipes, fittings, flanges, valves of all types, strainer, non-return valves etc., shall have working pressure rated at 150 psi unless otherwise stated.

**PART 2.00 – PRODUCTS**

**2.01 WATER PIPING, FITTINGS AND ACCESSORIES:**

Materials and dimensions in accordance with ANSI B31.1 Water Piping Systems as used in this paragraph include Chilled Water, Condensing Water piping systems. Piping system shall be suitable for specified herein shall be compatible with system fluids, and capable of the pressures and temperatures indicated or specified.

**A. CHILLED WATER PIPING**

Provide Seamless or welded Schedule 40 black steel pipe conforming to ASTM A53, grade A, standard weight.

**B. CONDENSATE WATER PIPING AND CONDENSING WATER MAKE-UP WATER PIPING**

Provide galvanized mild steel pipe.

**C. FITTING FOR STEEL CHILLED WATER PIPING**

Malleable iron conforming to ANSI B16.3, Class 150. Fittings sized 40mm and smaller shall be threaded. For pipe sized larger than 50mm the fittings shall be butt-welding type. Flanges shall be welding neck type. All fittings shall be suitable for 1380 kPa (200 psi) hot and cold water service for floors subjected to medium pressure it shall be 210 kpa. working pressure for floors subjected to high pressure. Convuluted steel flanges conforming to ASME Code Section 8 may be used in lieu of ANSI B16.5 flanges.

**D. UN:**

1. Un (threaded) for Steel Pipe:

Class 150 50mm and smaller, malleable iron, ground joint and brass seat.

2. Dielectric Union:

Provide insulated union of galvanized steel and female threaded on end. Union shall have water impervious insulation barrier capable of limiting galvanic current to one percent of the short circuit current in a corresponding bimetallic joint. When dry, insulation shall be able to withstand a 600 volt breakdown test.

**E. FLANGES:**

The raised faces shall be removed when used with flanges having a flat face.

1. Steel flanges:

ANSI B16.5 forged steel, welding type or convoluted stud type conforming to ASME Code Section 8.

2. Cast Iron Screwed Flanges: ANSI B16.1.

3. Bronze Screwed Flanges: ANSI B16.24.

Pipes of 65mm bore and larger connection to valves, equipment and pipe run in plant lower AHU room shall be jointed with flanges unless with the prior approval of the Project Manager. All bolts shall be cadmium plated steel for steel and cast iron flange. Galvanized steel flange shall be applied for galvanized pipe.

**F. END CONNECT:**

1. Steel Piping

50mm and smaller shall be screwed, socket welded, or grooved; steel piping 65mm and larger shall be flanged, buttwelded, or grooved.

- a. Screwed Joints

Thread in accordance with ANSI B2.1

- b. Bolting of Flanges:

Material used for bolts and studs shall conform to ASTM A307, grade B, and material for nuts shall conform to ANSI B18.2.1 and ANSI B18.3.2 with threads conforming to ANSI B.1. coarse type with class 2A fit for bolts and studs, and class 2B fit for nuts. Bolts or studs shall extend completely through the nuts and may have reduced shanks of a diameter less than the diameter at root threads. Carbon steel bolts shall have American Standard regular square or heavy hexagon heads and shall have American Standard heavy semi-finished hexagonal nuts.

c. Gaskets:

Fluorinated elastomers, suitable for the pressure and temperature ranges encountered, and compatible with grooves in flanges faces.

d. Branch and Main Pipe Connection:

When branch pipe of 40mm and smaller (galvanized or black steel) is connected to 100mm diameter or smaller main pipe sweep butt weld tee, screw reducing tee or standard tee with reducing bushing shall be applied. For branch pipes or 40mm and smaller to 125mm and larger main pipe or 50mm and larger to 150mm and larger main pipe, direct butt weld to main pipe wall using weld-lets are acceptable.

## **2.02 VALVES:**

Gate, Globe, Angle, Check, Special, and Related Equipment: Shall conform to the following paragraphs. End connect shall conform to paragraph "End Connect" Valves shall have rising stems and shall open when turned counterclockwise.

### **A. GATE VALVES:**

1. Bronze Gate Valves, 50mm and Smaller:

Bronze gate valves, 50mm and smaller, shall be of the wedge disc, rising stem, inside screw type, shall have solder joint ends when used with copper tubing.

2. Steel Gate Valves:

Valves shall be of the open stem and yoke type with solid wedge or flexible wedge disc, with trim of heat and corrosion-resistant steel as recommended by the manufacturer for condition indicated.

3. Cast Iron Gate Valves, 65mm up to and including 150mm.

Valves shall be open stem and yoke type with valve trim of bronze.

#### **B. GLOBE AND ANGLE VALVES:**

1. Bronze type, 50mm and Smaller:

Shall be class specified and screw joint.

2. Steel Type:

Shall have heat and corrosion resistant trim as recommended by the manufacturer for the condition indicated and provided with tapped drains and brass plugs.

3. Cast Iron Type, 65mm and Larger

Shall have bronze trim, and shall be provided with tapped drains and brass plugs.

#### **C. CHECK VALVES**

1. Bronze Type, 50mm and Smaller:

Shall be of the regrinding swing check valve type, and shall be of the 200 pound class.

2. Shall have heat and corrosion-resistant trim as recommended by the manufacturer for the condition indicated.

3. Swing Check Valves: Shall have bolted caps.

4. Lift Check Valves, 50mm and Smaller: Shall have bolted caps:

5. Cast Iron Check Valves 500mm and Larger:

Shall have bronze trim, and shall be of the non-slam, eccentric disc type for centrifugal pump discharge service. Swing (recoil type) for size from 100 and larger.

#### **D. BALANCING VALVES:**



Manual Type:

1. Up to 50mm = Bronze body, regrinding renewable seat ring area plug, rising stem, union bonnet.
- 2.
3. 65mm to 150mm = Iron body, regrinding renewable seat ring and plug, stainless steel trimmed rising stem.
4. Valves shall have connection for pressure drop measurement and protective caps.
5. Valves shall have concealed presetting and the presetting value shall have readable graduation. There shall be a memory stop to allow closing of the valve and reopened to set point without disturbing the balance.
6. Provide and turnover to the Owner two (2) sets of calibrated direct reading meter for the balancing valves provided. Balancing valves shall be Bell & Gossett, Taco, Armstrong or approved equal.

Automatic Flow Control

1. Automatic flow control valve shall be factory set to limit water flow rate within plus or minus 5% of calibrated rate. Provide duct tile iron body for 65mm dia. and bigger and bronze body for 50mm dia. and below.
2. Internal working parts shall be passivated stainless steel, shall have body pressure tapping for flow measurement.
3. Provide a meter kit supplied by the manufacturer with indicating gauge, quick connector and conversion charts and operationing manuals.
4. The automatic flow control valves shall be as manufactured by the Griswold Controls, Flow Con, W.A. Kates Co. or approved equivalent.

**E. CONTROL VALVES**

- A. Valves used for fan coil shall be modulating type. Valve body and seat materials shall be bronze. The inner valve and stem materials shall be stainless steel. The valve shall be of the 2-way types. Valve shall be of the

spring return type that will return to their normal position in the absence of control power. The valve shall close upon loss of power. The valve shall have rangeability of 100 to 30, a pressure drop of 42 kPa at full opening and leakage of 0.03% of the flow in cubic meters per hour per every 100 kPa pressure drop.

- B. Valve size 50mm and smaller shall be screwed and supplied with union fittings.

**F. BALL VALVES:**

Valve design shall permit inspection and repair of seats and seals without removing the valve body from the line.

**G. DRAIN VALVES:**

Shall be gate valves and shall not be smaller than 20mm nominal pipe size, shall have threaded ends, and shall be provided with hose nipple adapters for connecting a hose to lead to a convenient floor drain. The valves shall be manually operationd.

**H. AIR VENT VALVES:**

Shall be manually operationd general service type. The valve shall be provided with bronze bodies for size of 12mm and cast iron for size 30mm and above 300 series corrosion resistant steel float, linkage and removable seat of hardened corrosion resistant steel. Air vent valves on water coil shall have not less than 3mm threaded end connect. Valves shall be suitable for hot or cold water service. The valves shall be 30mm pipe size for water mains and 12mm pipe size, minimum for all other applicat. Air vent valves shall be provided at all highpoints in the water piping system, at all water coils, and as indicated.

### **2.03 THERMOMETERS:**

- A. Thermometer shall be of the mercury-in-glass, red reading type, with 225mm Celcius scale of proper range for the service, accurate to ½ a scale division, enclosed in metal, glass covered case, with magnified mercury columns, stainless steel separable socket connection, straight or angle-mounted as required, and installed in piping systems in such a manner as to be easily read. Provide thermometer wells extension necks where required to clear insulation.
  
- B. INSTALL WHERE INDICATED ON PLANS AND/OR SCHEMATIC DIAGRAMS AS FOLLOWS:**
  - 1. In supply and return of each chilled water coil and coil assembly in air handling units.
  
  - 2. Inlet and outlet of fan coil units, provide thermometer wells.

### **2.04 PRESSURE GAUGES:**

- A. Pressure gauge shall be Grade A, accurate within 1%, of the Bourdon Tube, spring type, with 100mm~150mm dials (unless otherwise indicated) and with calibrating screws. Gauges shall have plain cases with screwed rings and be finished in black enamel. Each gauge shall be installed with necessary piping, including a shut-off cock and pressure snubber. Gauges shall not be installed until systems are cleaned. Pressure gauge ranged shall be such that the position of the pointer during normal operation will be 50% of dial range.

#### **B. PRESSURE GAUGE SHALL BE PROVIDED WHERE INDICATED AND AS FOLLOWS:**

- 1. Discharge and suction side of each chilled water incoming main line.
  
- 2. Supply and return of each main chilled water coil.
- 3.

### **2.05 PIPE HANGERS AND SUPPORTS**

Black Steel and Galvanized Steel Pipes

Nominal Bore of Pipe (mm)	Spacing (m)
15	1.8
20	2.1
25	2.4
32	2.4
40	2.7
50	3.0
65	3.4
80	3.4
100	3.7
125	4.0
150	4.0

Steel hanger rods minimum sizes or equivalent shall not be less than the following:

- 12mm rod : up to and including 100mm pipe
- 19mm rod : Over 100mm and including 200mm pipe

## 2.06 PIPE SLEEVES

Pipes and tubing which penetration the building structure shall be provided with pipe sleeves. Materials of pipe sleeves shall be the same as the material of pipe work. Sleeves shall be securely retained in position and location before and during construction. Space between pipe and sleeve, or between insulation of pipe sleeves, shall not be less than 6mm between outside of pipe or insulation, and inside wall sleeves. Pack the annular space with hemp or fiberglass, and seal with elastic cement. Sleeves for un-insulated pipes shall have ends flush with finished wall surfaces and pipe or tubing with outside perimeter of pipe caulked to the sleeve. Sleeves for insulated pipes shall extend from 12mm from concrete or masonry ceiling or wall faces and outside perimeter of the insulation shall be caulked to the sleeve on both sides of the faces. Terminal ends of pipes insulation shall be sealed with mastic. Sleeves for lines passing through floors shall extend 75mm above finished floor slab, and shall be caulked to the slab. Lines passing through exterior walls and

roof areas shall be equipped with flashing and counter flashing as indicated or as approved to for a watertight roof seal.

**2.07 FLEXIBLE CONNECT:**

Install flexible connectors or bellow expansion joints as shown on drawings. Flexible section shall consist of rubber, tetraflouroethylene resin, corrosion resistant steel, bronze, monel or galvanized steel. The material used and the configuration shall be suitable for pressure, temperature and circulation medium. The flexible connection shall be suitable for the service intended. The flexible connection may be reinforce with metal retaining rings, with built-in braided wire reinforcement and restriction bolts or with wire braid cover suitable for the service intended.

**2.08 PIPING INSULATION:**

CLOSED CELL FLEXIBLE RUBBER

Preformed or sheet foam closed cell flexible rubber insulation fire and smoke rated and maximum K factor of  $3.7 \times 10^{-2}$  W/mK at 20°C.

<u>ITEM</u>	<u>NOMINAL SIZE (MM)</u>	<u>THICKNESS OF INSULATION (MM)</u>
Chilled Water Supply and Return Pipes	Up to 40mm	40
	50mm and above	50
	Located Outdoor	65

**END OF SECTION**

## **SECTION 15400 – VARIABLE REFRIGERANT (FLOW / VOLUME) SYSTEM**

### **1.0 GENERAL REQUIREMENTS**

Section 15000, “General Requirements, Mechanical,” with the addit and modification specified herein, applies. The contract drawings indicate the extent and general arrangement of the air conditioning system. Equipment, ductwork, and piping arrangement shall fit into space allotted and shall allow adequate acceptable clearances for installation, replacement, entry, servicing, and maintenance.

#### **A. STANDARD PRODUCTS:**

Materials and equipment shall be standard products of a manufacturer regularly engaged in the manufacture of such products, which are of similar material, design and workmanship. The standard products shall have been in satisfactory use for at least 2 years prior to bid opening. The 2-year use shall include application of equipment and materials under similar circumstances and similar size. The 2-years

#### **B. SCOPE OF WORK**

The work involves the supply and installation of Variable Refrigerant Flow (VRF) / Variable Refrigerant Volume (VRV) system, consists of an outdoor unit equipped with inverter and dual compressor(s), one or more indoor units integrated system controls, and interconnecting field-provided refrigerant pipe containing various fittings including factory supplied “Branch Kits”.

## **2.0 VARIABLE REFRIGERANT FLOW (VRF) SYSTEM**

### **2.01 OUTDOOR UNIT**

1. Unit shall be air cooled, VRF / VRV multi split system consisting of one, two or three outdoor units (combined as one) and multiple indoor units, each having capability to cool the area or room independently.
2. Inverter compressor shall have multi discharge port for optimized pressure control and better balancing. The compressor should have concentrated winding motor and vector control to achieve higher output and better efficiency.
3. Total piping length should be up to 1000 meters, must also have a maximum pipe run of 160 meters and 70m level difference without any oil traps. The 70m level difference is based on the case where the outdoor unit is located above the indoor unit. The level difference is of a maximum of 40m when outdoor unit is located below the indoor unit. The level difference between indoor units in one refrigerant circuit shall be within 18m. Both indoor unit and outdoor unit are factory assembled and tested.
4. Outdoor coils shall be blue-finned coated for extra protection against harsh environment and corrosion.

#### **A. REFRIGERANT CIRCUIT**

1. The refrigerant circuit shall include an accumulator, plural electronic expansion valves, one or two oil separators, a receiver and liquid and gas shutoff valves. Filter drier and crankcase heaters are also built in.
2. The outdoor unit shall have scroll type compressor. The indoor unit shall be equipped with an electronic control valve to control refrigerant flow individually.
3. Heat exchanger coil must be three rows and it should have distributor for better heat transfer.

4. Safety Devices: The following safety devices shall be part of the outdoor unit; high pressure switch, fused crankcases heater, fusible plug, thermal protectors for compressor and fan motor, over current protection for inverters, short recycling protection timer.
5. Oil recovery system: Unit shall be equipped with an oil recovery system to ensure stable operation with long refrigerant piping.
6. Oil Equalized System: The outdoor unit with two compressors shall be equipped with an oil equalized system to avoid unbalance oil level.

## **B. CONTROLS**

1. Outdoor unit shall have a minimum of 12 capacities steps to meet load fluctuation and indoor unit individual control in case of inverter series.
2. VTCC or Variable Temperature and Capacity control shall be used to maintain a correct room temperature.
3. Unit shall be equipped with a self-diagnosis circuit for easy maintenance and service
4. The unit shall be operationd individually and each having a remote controller with an on/off switch, a fan speed selector, a timer, a thermostat setting button and LCD which indicates temperature setting, operation mode, malfunct code and filter cleaning timing etc.
5. The remote controller shall memorize the latest malfunction code for easy maintenance.
6. Up to 16 indoor units can be controlled by a single wired remote controller. Group controller must be capable to connect and control 128 indoor units.

## **C. ACCESSORIES**

The following accessories shall be provided:

1. Branch pipe with insulation for quick work and smooth refrigerant flow



2. Wired or wireless remote control.

#### **D. CASING**

The outdoor case shall be constructed with galvanized steel finished with powder coat baked enamel paint. Each unit should have removable inspection panel with enough space clearance to allow access to service tool connection, dip switches, auto addressing and error codes. The outdoor unit frame should be completely factory assembled, piped and wired. Should there be dual and triple frame outdoor unit, the pipes should be field connected with factory designed and supplied Y-branch kits to manifold them together into a single refrigerant circuit.

#### **E. REFRIGERANT SYSTEM**

The refrigeration system shall consist of a single refrigeration circuit and uses R410A or approved equal refrigerant. The outdoor unit is provided with factory installed components, including refrigerant strainer, check valves, oil separator, accumulator, reversing valve, electronic controlled expansion valve, high and low side charging ports, high pressure safety switch, service valves and interconnecting piping.

#### **F. COMPRESSORS**

The outdoor unit shall be equipped with digitally controlled inverter-driven hermetically scroll compressor to modulate capacity from a variable of 15 to 150 Hz in 0.5 Hz increments.

#### **G. OUTDOOR UNIT COILS**

The outdoor unit coils shall be of the nonferrous construction with louvers fins on copper tubing, and are protected with an integral metal guard. Coil fins should have factory applied corrosion resistant material with hydrophilic coating.

#### **H. FANS AND MOTORS**

The outdoor unit shall include two direct drives, variable speed propeller type fans. The fan motors should have inherent protection, permanently lubricated bearings, and are variable speed with a maximum speed of up to 1,100 rpm. Raised guard should be provided to limit contact with moving parts. The outdoor unit should be vertical discharge type airflow with static pressure capability of up to 0.32" WG.

#### **I. ELECTRICAL**

The outdoor unit shall be rated at 480V, 60Hz, 3-phase and should be capable of operating within voltage limits of ( $\pm 10\%$ ) rated voltage with overcurrent protection.

## **2.02 INDOOR UNIT**

The indoor units shall be factory assembled, wired, piped, and provided with an internally factory mounted electronic expansion valve, control circuit board, fan, and motor. Each should be designed to operation using 208~230V / 60Hz / 1 Ph power with voltage variation of ( $\pm 10\%$ ). The refrigeration circuit should be pressure-tested at the factory and shipped with a holding charge of dry nitrogen gas. The indoor unit shall also be equipped of non-metallic condensate drain pan with insulated flexible condensate drain hose to connect the unit drain pan nipple to a field-provided condensate drain pipe.

The unit coils should be minimum of two rows and are composed of copper tubes with mechanically bonded aluminum fins pressure tested at a minimum of 550 psig.

### **A. MICROPROCESSOR CONTROLS**

The unit shall be provided with an integrated microprocessor-based controller. The controller shall be capable of performing funct necessary to operation the system without the use of a wall mounted controller. The unit shall have temperature thermistor factory mounted in the return air stream. The field supplied communication cable between the indoor units and the outdoor unit shall be of the minimum of 18 AWG, 2-conductor, stranded, ad shielded cable, terminated via screw terminals on the control boards. The microprocessor control boards shall provide the following funct: self-diagnostics, auto restart following power restoration, test run, and will operation the indoor unit using one of five operationing modes:

A single indoor unit shall be capable of being controlled by up to two local wired controllers. The microprocessor controls space temperature using the value provided by the temperature senor sensing a space temperature that is farthest away from the temperature set-point.

If the unit is provided with an optional wall mounted local or central controller, displayed diagnostic codes shall be specific, alpha-numeric, and provide the service technician with a reason for the code displayed.

## **B. INDOOR UNIT COIL**

Indoor unit coils shall have minimum of two rows and are composed of copper tubes with mechanically bonded aluminum fins. Coils are pressure tested at a minimum of 551 psig. Units are provided with either a 45° flare or brazed refrigerant pipe connect.

Indoor coils shall be blue-finned coated for extra protection against harsh environment and corrosion.

## **C. CASING**

The unit casing shall be designed to mount on a vertical surface and come complete with an installation mounting template guide and a separate hanging bracket. The unit case is manufactured with coated metal. Cold surfaces are covered with a coated polystyrene insulating material. The unit case is manufactured using ABS polymeric resin and comes with a light matte finish color. The front surface of the unit has an architectural flat panel smoked mirror finish.

## **D. FAN ASSEMBLY AND CONTROL**

The unit should have a single, direct-drive, cross flow tangential Sirocco fan made of high strength polymeric resin material. The fan motor should be brushless, digitally-controlled, design with permanently lubricated and sealed ball bearings. The fan/motor assembly is mounted in vibration attenuating rubber grommets. The fan speed shall be controlled using a microprocessor-based direct digital control algorithm that provides pre-programmed fan speeds and Fan Only modes and four speeds in the Cooling mode. Fan settings are high, medium, and low. The fan speed algorithm provides a field-selectable fixed-speed or auto-speed setting that changes the fan speed based on the difference between the controller set-point and space temperature.

## **A. AIR FILTER**

Return air is filtered shall have a removable, washable pre-filter equipped with a plasma filter. Filter access is from the front of the unit without the use of tools.

**END OF SECTION**

## **1.01 GENERAL REQUIREMENTS**

The contract drawings indicate the extent and general arrangement of the air conditioning system. Equipment, ductwork, and piping arrangements shall fit into the space allotted and shall allow adequate acceptable clearances for installation, replacement, entry, serving and maintenance.

## **1.02 PACKAGE AIR CONDITIONING UNITS:**

### **A. TYPE**

Unit shall be of indicated capacity, factory fabricated assembled, and pre-charged. Unit shall be ready for full operation after terminal point connection. Unit shall conform to the requirements of UL 484 and produce an EER as indicated when rated in accordance with ARI 440 not less than in the equipment schedule. Unit shall provide year round cooling funct. Function and temperature control shall be integral to unit.

### **B. WALL SLEEVE:**

Louver shall be storm-proof type, constructed of anodized stamped aluminum. Sleeve shall be a water and airtight assembly, with weather-resistant protective coating.

### **C. ROOM CABINETS:**

Cabinet shall be free of visible fasteners, sharp protuberances and edged. Enclosure sheet metal shall be a minimum of 18-gage steel with a protective coating. Face panels shall be removable and shall provide full access to unit appurtenances. Access to control shall be without removal of the face panel. Conditioned air shall discharge through adjustable louvers. Cabinet shall be thermally and acoustically insulated with material which conform to NFPA 90A.

### **D. COOLING SYSTEM:**

#### **1. Compressor**

Compressor shall be hermetically sealed reciprocating type. Compressor shall be fitted with permanent split capacitor motor, overload protection, and vibration isolators. Compressor shall be protected against high discharge pressure, loss of charge, low voltage and short cycling.

**2. Cooling Section**

Cooling section shall include self-contained, pre-charged, slide-in or removable chassis-mounted, air cooled refrigeration system. Unit shall be suitable for rated capacity cooling operation with 95°F outdoor air temperature. Cooling section shall be equipped with a filter-drier on the section line.

**3. Condenser and Evaporator coil**

Coils shall be nonferrous tubes of 3/8-inch minimum diameter with copper or aluminum fins mechanically bond or soldered to the tubes. A condensate removal system shall be provided.

**4. Fans**

Room air fans shall be centrifugal type, dynamically and direct driven. Condenser fans shall be manufacturer's standard type. Fan motors shall be inherently protected, permanent split-capacity type.

**5. Filters**

Filter shall be of the sectional or panel cleanable type, and shall filter the entire air supply.

**6. Function Control**

Controls shall include and off-coil switch, high and low cool and high, and low heat selector switch, multiple speed fan cooling mode, room air fan switch, outside air damper control, and an adjustable thermostat.

**1.03 AIR COOLED PACKAGE SPLIT SYSTEM:**

**1. CONDENSING UNIT:**

1. Compressor:

The compressor shall be

- a) Reciprocating rotary of semi-hermetic type.
- b) Refrigerant-gas cooled.
- c) complete with internal motor protection against motor overload and motor winding overheat, high pressure cut-out, low pressure cut-out, oil failure switch, crankcase heater, discharge and suction

stop valves, mufflers, automatically reversible oil pump for pressurized lubrication, time delay to prevent short-cycling, and mounted on external spring isolators.

2. Condensing Coil

The coil shall be

- a) Made of copper tubes arranged in staggered rows mechanically expanded into aluminum fins.
- b) Integrated with sub-cooling coil.
- c) Leak tested, dehydrated and refrigerant charged at factory.
- d) Matched with the capacity of the compressor.

3. Condenser Fan

The condenser fan shall be

- a) Either propeller type, aerofoil axial flow type or centrifugal type.
- b) Belt-driven or directly driven by a totally enclosed fan cooled inherently protected motor.
- c) Capable to start and stop automatically in response to the heat rejection requirements.
- d) Capable to start and stop automatically in response to the heat rejection requirements of the compressor under full/partial load condition and outside ambient temperature.

4. Casing

The casing of the condensing unit or condenser shall be:

- a) Constructed of steel sheets galvanized after fabrication.
- b) Rigidly braced to eliminate casing vibration.
- c) Painted with anti-corrosion primer and finishing coats to the architect's approval and shall be suitable for outdoor installation.
- d) The housing shall be treated with sound insulation.

**2. EVAPORATOR BLOWER:**

1. Blower

The blower of the air handling unit shall be

- a) Centrifugal type and belt-driven.
- b) Selected with an outlet velocity of not more than 9 m/s unless otherwise specified.

The impeller of the blower shall be

- a) D.I.D.W type or S.I.S.W. as required.
- b) Statically and dynamically balanced at works.

- c) Securely fixed to stainless steel shaft adequately sized and proportioned to ensure that the maximum operating speed is not more than 60% of the first critical speed.

The motor shall be

- a) Rated at least 15% above normal calculated fan horsepower.
- b) Suitable for cool/hot and humidified cooling condition.
- c) Rated at a speed not exceeding 1750 rpm synchronous speed.

2. Evaporator Coil

The coil shall be

- a) Made of copper tubes arranged in staggered row mechanically expanded into aluminum fins for direct expansion operation.
- b) Leak tested. Dehydrated and refrigerant charged at factory.
- c) Matched with the capacity of the compressor.
- d) Equipped with a separate thermal expansion valve.

3. Casing

The casing shall be

- a) Heavy steel sheets galvanized filter frame shall be provided. Air filter shall be of the cleanable type and shall be constructed of aluminum at least 25mm thick. Air filters shall be easily removable for cleaning and replacement.
- b) Adequately factory insulated to prevent sweating.

- 4. Heavy steel sheets galvanized filter frame shall be provided. Air filters shall be of the cleanable type and shall be constructed of aluminum at least 25mm thick. Air filters shall be easily removable for cleaning and replacement.

- 5. Access door(s) shall be provided to allow for the following.

- a) Removal of air filters.
- b) Cleaning of cooling coils and drain tray.
- c) Inspection of fans and bearings.
- d) Inspection of damper mechanism and bearings

- 6. Temperature control and wiring shall be complete and pre-wired at the factory.

- 7. Refrigerant pipes shall be copper type L insulated with 50mm fiberglass with aluminum foil. Exposed (i.e. not in false ceiling) pipe shall be clad with galvanized sheet. Alternate insulation shall be flexible closed all rubber insulation with 32~40mm thickness.

**END OF SECTION**

**SECTION 15600 - CARBON MONOXIDE DETECTION AND CONTROL**

## **PART 1 – GENERAL**

### **1.1 WORK INCLUDED**

- A. Comply with Division 1, General Requirements and all documents referred to therein.
- B. Provide all labor, materials, products, equipment and services to provide the carbon monoxide and hydrocarbon detection and control systems indicated in the Drawings and specified in the Section of the Specification.

## **PART 2 – PRODUCTS**

### **2.1 PARKING GARAGE SYSTEM**

- A. Packaged, self contained instrument for sensing carbon monoxide CO.
- B. Sensors shall be solid state, 3 wire to meet the following requirements;
  - 1. Range 0 to 100 ppm CO in air.
  - 2. Temperature – 5 deg C to 40 deg C.
  - 3. Maximum response time to set point 1 minute
  - 4. 220V/60Hz.
  - 5. Control signal 4-20mA for each sensor loop, wired to BMS.
  - 6. Replaceable Sensors.
- C. Set up the following operation modes:
  - 1. Actuate exhaust and/or supply fans in the event of the carbon monoxide concentration reaching 50 ppm at any sample point of this zone. Refer to plans for zoning requirements.

Exhaust and/or supply fans shall be two-speed. Activation of these two speed fans in conjunct with multiple induction fans and zoned CO sensors shall be in accordance with car park CO monitoring and control matrix to be issued to the successful bidder.



2. Actuate an audible and visual alarm common to all sample points when the carbon monoxide reaches 100 ppm CO. Provide a pushbutton switch to silence the horn. Provide dry contacts for BMS high alarm indication.
  3. Automatically reset the system if the carbon monoxide falls below the preset limits. Provide a selector switch to override the timer to select individual sample points, automatic mode as well as zero and span.
- D. Provide free standing cabinet(s) to contain all above components, completely wired. Provide louvered rear door which opens from left to right. Cabinet dimensions not to exceed 2035 mm high x 740 mm wide x 660 mm depth.
- E. Power Requirement: 220V AC, 60 Hz, 10 amp single phase.
- F. Provide calibration equipment.
- G. Provide sample lines using soft copper in exposed location and 10 mm (3/8") dia. fire retardant polytubing for concrete embedded installation.

### **PART 3 – EXECUTION**

#### **3.1 Installation**

- A. Meet manufacturer's requirement.
- B. Embed sample lines in concrete structure.

#### **3.2 Start up**

- A. Provide complete commissioning service by manufacturer's authorized representative and include:
  1. Physical and electrical checkout.
  2. Start-up, test and calibrate equipment.
  3. Functional checkout.
  4. Operator training
- B. Adjust times to the allowable fan motor starts per hour.

- C. Provide calibration curves and maintenance manuals for inclusion in operation maintenance manual.

**END OF SECTION**

**SECTION 15700 - CONTROL SYSTEMS**

**1.01 GENERAL DESCRIPTION:**

Section 1500, "Mechanical General Requirements" applies to this section, with the addit and modification specified herein.

**1.02 DESCRIPTION OF WORK**

Provide and install an automatic temperature control system including temperature, flow and pressure sensors, control valves, controllers, automatic damper actuator, control power wiring, inter-phasing and all required accessories for the fan coil units, air handling units and chilled water and condenser water system.

**1.03 APPLICABLE STANDARDS:**

The standard listed below form a part of this specification to the extent referenced.

- A. American National Standards Institute (ANSI)
- B. American Society of Mechanical Engineers (ASME)
- C. American Society of Testing and Materials (ASTM)
- D. Factory Mutual Engineering Corps (FM)
- E. National Electrical Manufacturers Association (NEMA)
- F. National Fire Protection Association (NFPA)

**1.04 SUBMITTALS REQUIRED**

**A. MANUFACTURER'S DATA**

- 1. Valves and operationors.
- 2. Controllers, including complete wiring and connection diagrams.
- 3. Temperature sensors, including complete wiring and connection diagrams.

4. Temperature flow and pressure indicators.
5. Pressure sensors, including complete wiring and connection diagrams.
6. Flow sensors including complete wiring and connection diagrams.
7. Switches, relays, transducers, including complete wiring and connection diagrams.
8. Smoke detection devices.
9. Control and data terminal cabinets.

**B. SHOP DRAWINGS**

1. Temperature control schematic and wiring diagrams.
2. Sequence of operation for each system and function.
3. Control panels.
4. Equipment interlocks.
5. Panel and sensor installation and mounting.

**C. CERTIFICATES OF COMPLIANCE**

1. Pipe and Fittings.
2. Valves.
3. Electrical components

**1.05 OPERATION AND MAINTENANCE MANUALS:**

Furnish an operation and maintenance manual for each item of equipment listed under "Manufacturer's Data". The manuals shall contain full hardware support documentation, which shall include, without being limited to, the following:

- A. General description and specification.
- B. Installation and initial checkout procedures.
- C. Principles and theory of operation.
- D. Detailed electrical and logic description.
- E. Complete trouble-shooting procedures, diagrams and guidelines.
- F. Complete alignment and calibration procedures for all components.
- G. Preventive maintenance requirements.
- H. Detailed schematics and assembly drawings.
- I. Complete spare parts list.
- J. Interface requirements and capabilities.
- K. Signal identification and timing diagrams.

**2.01 GENERAL**

- A. Provide complete stand alone DIRECT DIGITAL CONTROL (DDC) temperature control system that can be interfaced with or upgraded into a Building Management System.

- B. The building control system specified herein shall be a direct control system which will perform all the automatic temperature control functions as required in this specification. Direct Digital Control shall be defined as a control technique through which the process variable is continuously monitored by a distributed local loop controller.
- C. The system, as specified, shall independently control the building's HVAC equipment to maintain a comfortable environment in an energy efficient manner. The space temperature shall be maintained with the tolerance of  $\pm 1.5^\circ\text{C}$ .
- D. The building control system shall consist of a network of independent, stand-alone control units, each stand-alone control unit must be able to two-way communicate with both the Central Processing Unit and Micro Processors Interface subpanels of the BMS.
- E. The Contractor shall have a minimum of five years experience in the manufacture and installation of system similar to those specified and shall provide a list on no less than five (5) similar projects which have building control systems as specified herein. The control system shall be electronic distributed local loop control type, complete with all necessary sensors, controllers, valves dampers and operationers required to maintain the condition desired, together with thermometers, panels, programming, all necessary accessories, and wiring for the inter-connection of all parts of the system.

## **2.02 ELECTRICAL WIRING**

- A. The Contractor shall provide all wiring work and electrical devices and material necessary to complete the Controls and Instrumentation Systems. Complete metal raceways or enclosures shall be provided for conductors throughout all systems specified. Equipment and devices which are not constructed with housings for mounting and enclosing all live parts, shall be installed in metal cabinets. All equipment, enclosures, raceways, etc., shall be appropriate for the atmosphere and hazards encountered within the associated areas.
- B. Low and line voltage wiring shall be done in strict accordance with prevailing local electrical code. Conduit shall be concealed in building construction in all finished spaces. Conduit run exposed shall be run in a parallel manner to building surfaces. All conduits shall be supported in approved manner. Intermediate metallic conduit shall be used in all concrete pours and in all installation. All conductors from instruments shall terminate on terminal strips, properly tagged for ease of identification, located in control centers. No splices or junctions will be permitted in the field.
- C. Provide all interlock wiring required to make system operation per plans and specification. All wiring diagrams, etc, required shall be made and coordinated.

Wiring shall begin on terminals of control device and terminate on terminals of controlled device.

- D. The term “wiring” shall include wire, conduit, terminal blocks, wiring devices and miscellaneous material and labor required or mounting and wiring electrical control devices and services.

### **2.03 SENSORS:**

- A. Temperature sensors shall be of the thermistor (NTC) type with a high resistance change versus temperature change insure good resolution and accuracy. Sensors shall be available for room, duct or well mounting. Sensor shall connect to remote controller by means of a two-wire unshielded cable. Room type sensors will be available with a built-in setpoint potentiometer. Sensors shall be available in various ranges to properly suit in the application.
- B. Duct mounted averaging type temperature sensor shall utilize a nickel resistance sensing element incorporated in a copper capillary of 8 m. The sensor shall vary the output voltage with a change in temperature. Sensor shall connect to the remote controller by means of a three-wire unshielded cable.
- C. Differential pressure sensor shall vary to the output voltage with a change in differential pressure. The sensor shall connect to the remote controller by means of a three-wire unshielded cable.
- D. Outdoor air sensor shall be thermistor (NTC) type with a high resistance change versus temperature change. Sensor shall be available for outdoor or duct mounting. Sensor shall connect to remote controller by means of a two-wire unshielded cable.

### **2.04 CONTROLLERS**

The Local Controller (TLC) shall be a user programmable, all electronic, direct digital controller. The controller shall meet all requirements of this specification. The controller shall control valve actuators, damper motors, relays, contractors and receive inputs from sensors and other signals either analog or digital.

#### **A. INPUTS**

The LC inputs shall provide for normal mode noise rejection of 30 db at 60 HZ. All inputs shall withstand continuous direct shorting to 120VAC or 120VDC referenced to earth ground without failure. All inputs shall further be protected to + or – 1400 volts to 50 microsecond transients. All inputs shall have an

accuracy of at least + or – 4Mv and a resolution of at least 2Mv from 0 to 55 degrees centigrade. All inputs shall be software assigned and changeable, from one type to another, without hardware modification or addit.

- a. Analog Inputs (AI): The AI function shall monitor each analog input, perform a/d conversion, and hold the digital value in a buffer for interrogation. AI shall be within the range of 0-8VDC.
- b. Digital Inputs (DI): The DI function shall accept dry contact closures.
- c. Temperature Inputs: Temperature inputs originating from a 30,000 OHM (nominal thermistor stainless steel probe sensor shall be monitored and buffered as an AI, except that automatic conversion to degrees Fahrenheit shall occur without any additional signal conditioning.
- d. Pulse Accumulators: The pulse accumulator function shall have the same characteristics as the DI, except that, in addition, a buffer shall be required to totalize pulses between interrogat. The pulse accumulator shall accept rated up to 2 pulses/second.

## **B. OUTPUTS**

Each LC output shall provide both Digital Outputs (DO) AND Pulse Width Modulator (PWM). Each PWM output shall be at least 1.0 second resolution. All outputs shall be software assigned and changeable without hardware modification. An illuminated indicator shall be provided to show the state of each output.

### **2.05 AUTOMATIC DAMPERS:**

- A. Automatically operationd dampers shall have frames of minimum 3.5mm galvanized steel not less than 50 mm in width and aerodynamically formed blades of 1.5 mm galvanized steel. Dampers shall be adequately braced to form a rigid assembly. No damper shall have blades more than 200mm wide. Length of blades shall be not more than 1220 mm. Blades shall be secured to 12mm diameter zinc plated axles by zinc plated bolts and nuts. All blade bearings shall be nylon or bronze. Teflon coated thrust bearings shall be provided at each end of every blade to minimize torque requirements and insure smooth operation. All blade linkage hardware shall be constructed of corrosion resistant, zinc plated steel and brass.
- B. The control manufacturer shall submit leakage and flow characteristics plus a size schedule for all controlled dampers. Supply and exhaust dampers for major building systems, and where indicated, shall be low leakage type. control dampers shall be of the types described below.

1. Standard Application:

Dampers shall be of the parallel or opposed blade design (as selected by the manufacturer's application techniques) with replaceable butyl, spring stainless steel or closed cell neoprene edging.

2. Two –Position Control Dampers:

Size for minimum pressure drop at the indicated duct size.

3. Modulating and Proportioning Dampers:

Sized for an effective linear airflow control characteristics within the angle of rotation and maximum pressure drops specified.

4. Damper at Louvers:

Dampers located immediately adjacent to intake and exhaust louvers shall be furnished in sizes indicated because of reduced free area at louvers.

5. Isolation Dampers:

Dampers shall provide tight shut-off with negligible leakage, and shall withstand the applied pressure, velocities and turbulence in the open position.

**2.06 DAMPER ACTUATORS**

- A. Actuators shall be of the push-pull type of either modulating or two-positioning control. Actuators shall stroke by a rotating motion of an overload-proof motor as required by the application. Damper actuators shall be matched with the dampers torque and stroke requirements.

**2.07 INTERPHASE TO BMS**

The automatic control system shall be provided with auxiliary contracts and signal connect that can be interphased with a BMS system. The BMS system shall connect to all AHU systems to operation the start stop of the fan, temperature adjustments, smoke detection, smoke mode operation and monitoring and chilled water bypass. Interphase modules will be provided by the BMS contractor.

**3.01 INSTALLATION:**

Provide wiring, and conduit to connect the ATC components for an operational ATC system Wiring and installation shall conform to NFPA 70.

**A. IDENTIFICATION:**

Label or code each field wire at each end. Permanently label or code each point of field terminal strips to show the instrument or item served. Color-coded cable with annotated cable diagrams may be used to accomplished cable identification.

**B. TEMPERATURE SENSORS:**

Stabilize sensors to permit on-the-job installation that will require minimum field adjustment or calibration. Temperature sensor assemblies shall be readily available to each type of application to allow quick, easy replacement and servicing without special tools or skills. Provide NEMA 4 enclosures for outdoor installation.

**C. DUCT SENSORS:**

Provide sensors in ductwork in general location as indicated; specific location within duct shall be selected to accurately sense air properties. Do not locate sensors in dead air spaces or position obstructed by ducts or equipment. Provide separate duct flanges for each sensing elements; securely seal ducts where elements or connection penetration duct. Seal penetration of duct insulation vapor barrier with vapor barrier coating compound to provide a vapor-tight covering. Mount sensor enclosures to allow easy removal and servicing without disturbance or removal of duct insulation or vapor barrier. On downstream side of each sensor, provide access doors.

**D. INDICATORS:**

Mount temperature and pressure indicators to allow readability when standing at floor level; provide remote indicators where necessary.

**E. ADJUSTMENTS:**

Adjust controls and equipment to maintain the condition indicated, to perform the function indicated, and to operation in the sequence specified.

**F. INSTRUCTING OPERATING PERSONNEL:**

Upon completion of the work and when designated by the Contracting Officer, furnish the services of a competent technician regularly employed by the control manufacturer for the instruction of the Owner's personnel in the operation and maintenance of each automatic space control system.

**END OF SECTION**



## **SECTION 15900      VARIABLE SPEED DRIVE (VSD)**

### **1.0      GENERAL PRODUCT DESCRIPTION**

- 1.1      This section describes the type of Variable Speed Drive (VSD) to be supplied for fan speed control.
- 1.2      The VSD must be designed with rectifier in the input circuit, which converts the incoming AC-voltage to DC-voltage. The DC voltage will be converted to AC-voltage with insulated gate bipolar transistor (IGBT's) in the output circuit.
- 1.3      The VSD shall not be a general purpose product but dedicated and specially developed for fan application.

### **2.0      SUPPLIER PROFILE**

- 2.1      The manufacturer shall demonstrate a period of continuous period of manufacture development for at least 15 years.
- 2.2      The VSD shall be supported locally in the Philippines by the manufacturer, who shall provide technical support, holding of spare parts and stand by units from his own local facility. A training course shall be provided by the manufacturer to the contractor and maintenance engineer.
- 2.3      The VSD must be manufactured according to ISO 9001, BS 5750 part a and 2.
- 2.4      The VSD must be UL approved and CE marked.

### **3.0      PROTECTION OF SURROUNDING EQUIPMENT**

- 2.5      The VSD must be equipped within its enclosure with a harmonic filter to reduce harmonic distortion on the main supply. The power of the VSD must be higher than 0.9 and the 5th harmonic must be reduced to 35%.
- 2.6      External AC or DC line reactors for power factor improvement are not allowed.
- 2.7      The VSD must have internal galvanic isolation to protect connected PLC's or BAS/BMS against damage.

- 2.8 The VSD must be equipped with RFI-filter (Radio Frequency Interface) to prevent interference and malfunction from PC's, PLC's, TV monitors, and other sensitive electrical equipment. The RFI filter must fulfill the EMC norm: EN 55011, class A.

#### **4.0 MOTOR PROTECTION**

- 4.1 To protect the motor against overheat, the VSD must be designed to supply full rated voltage to the motor.
- 4.2 The VSD must have "output voltage" compensation to ensure that full rated motor voltage is supplied to the motor, even at 10% under voltage at the VSD's input. That means that even if the supply voltage is – 10% (396 Vac), then the VSD must compensate and supply 100% (460 Vac) output voltage to the motor.
- 4.3 No motor derating is allowed e.g. the motor must be able to supply 100% rated torque at the shaft without overheating the motor at full speed.
- 4.4 Maximum motor current must be limited to 110% of rated motor current to prevent motor damage.
- 4.5 To protect the windings and insulation foil in the motor the du/dt from the VSD must be limited to 400V/μSec for small motors (below 37 kW). For motors bigger and above the du/dt must be below 2.100V/μSec.
- 4.6 The VSD must model the motor in its software to predict motor overheating without the use of thermistor in the motor. If overheat is predicted an alarm or automatic shutdown shall be initiated.

#### **5.0 GENERAL SPECIFICATION**

- 5.1 The VSD must be able to work full load in ambient temperatures ranging from 0 to 40°C (According to VDE 0160). Humidity up to 95% (According to VDE 0160, 5.2.1.2)
- 5.2 Output frequency from the VSD shall be adjustable from 0 to 120 Hz.
- 5.3 Input voltage: 460V (+/-) 10%, 60 Hz.
- 5.4 Minimum VSD efficiency at full load must be minimum 96%. At 20% load, the VSD efficiency must be 92% or higher.

- 5.5 The VSD shall accept 0-10 Vc, 0/4-20 mA Vdc (digital) as contrl signal.
- 5.6 Serial communication using the standard RS 485 must be build in.
- 5.7 In case of main failure and voltage drops the VSD must be reset automatically when the voltage remains. It must also be able to “catch” a rotating (in boh direct) fan or pump without requiring the motor to stop.
- 5.8 It must be possible to control several motors (connected in parallel) by one VSD, as long as the total motor currents are not over rated output from the VSD.
- 5.9 The V/f (voltage/frequency) ratio from the VSD shall be suitable for pump and fan control. Therefore it must not be possible to set a constant V/F ratio which may damage connected equipment.
- 5.10 To maintain constant pressure/flow etc., a PID controller must be built in for close loop control.

#### **END OF SECTION**

### **SECTION 151000 FUEL GAS PIPING**

#### **1.01 GENERAL REQUIREMENTS**

Section 15000, “General Requirements, Mechanical,” with the addit and modification specified herein, applies.

#### **1.02 SCOPE OF WORK**

1. Provide fuel gas piping, valves, supports, accessories, LPG container foundation and all appurtenances.
2. Supply and installation of gas meters and automatic main line shut-off valves activated during earthquake and fires.

#### **2.01 GENERAL**

Pipe and fittings shall be as follows with sizes as indicated:

Aboveground and Within Buildings and Vaults. Pipe Black steel per ASTM A53 or seamless schedule 40, threaded ends for Sizes 50mm and smaller, otherwise, plain end bevelled for butt welding.

Butt Welding           ANSI B16.9, with backing rings of Fittings compatible material  
NFGS-15355

## **2.02 VALVES, ABOVEGROUND**

Valves shall be as follows with sizes as indicated:

### **A. SHUT-OFF VALVE, SIZES LARGER THAN 50MM**

Cast-iron body ball valve with flanged ends per ANSI B16.36. Seals shall be PTFE rated at 300 psi.

### **B. SHUT-OFF VALVE, SIZES 50MM AND SMALLER:**

Bronze body ball valve, per ANSI B16.33, full port pattern, reinforced PTFE seals, threaded ends, PTFE seat rated at 300 psi.

### **C. PRESSURE REGULATIONOR**

Spring-loaded diaphragm pressure regulationion, pressure operationing range as required for the pressure reduction indicated, volume capacity not less than indicated, and threaded ends for sizes 2 inches and smaller, otherwise flange.

### **D. EARTHQUAKE AUTOMATIC GAS SHUT-OFF VALVE:**

ANSI Z21.70 fabricated and UL listed or AGA (American Gas Association) listed or IAPMO (International Association of Plumbing and Mechanical Officials) listed. The valve may be either pendulum or ball type with electric actuator.

## **2.03 GAS METER:**

Pipe mounted diaphragm style cast-iron, and a resettable counter. Furnish combined register-totalizer, water escape hole housing, and means for scaling against tampering.

## **2.04 GAS EQUIPMENT CONNECTORS**

- A. Flexible Connector: ANZI Z21.45.
- B. Quick Disconnect Couplings: ANZI Z21.41.
- C. Semi-rigid Tubing and Fittings: ANZI Z21.69.

## **2.05 GAS VENTS AND GAS-VENT ROOF JACKS**

UL 441 galvanized steel (G90 Coating Class).

## **2.06 LIQUID-PETROLEUM GAS (LPG) CONTAINERS AND ACCESSORIES**

NFPA, DOT Department of Transportation or ASME containers with appurtenances, system working pressure, minimum design pressure (LPG vapor at 100 Degrees F), and water capacity indicated. Provide containers with piping and fittings, fuse plugs, hose and hose connectors, strainer, and marking. Containers shall be provided by Gas Company.

### **END OF SECTION**

## **SECTION 151100 NOISE, VIBRATION AND SEISMIC CONTROL**

### **1.01 GENERAL REQUIREMENTS:**

The provision of Section 15000, "General Requirements, Mechanical", apply to this section.

### **1.02 DESCRIPTION OF WORK:**

Provide and install noise, vibration and seismic control as part of supplied equipment or independently from them as specified in this section.

### **1.03 MACHINERY VIBRATION CRITERIA**

Mechanical and electrical machinery and associated piping and ductwork shall be mounted on vibration isolators and seismic snubbers as indicated as indicated or

specified and required to minimize transmission of vibrat and structure borne to the building structure or spaces of from the building structure to the machinery.

Minimum isolation efficiencies shall be as follow:

- |    |  |                    |
|----|--|--------------------|
| a) | Centrifugal fans with over 900mm wheel and unspecified equipment         | 95% at rotor speed |
| b) | Equipment installed at plantroom. Guestroom floors except fan coil units | 90% at rotor speed |
| c) | Screw compressors in roof  | 98% at rotor speed |
| d) | Fan coil unit  | 90% at rotor speed |
| e) | Pumps at basement and centrifugal fan less 900mm wheel                   | 90% at rotor speed |

**A. VIBRATION CLASSES**

Rotating and reciprocating machinery shall be balanced statically and dynamically. The machinery supporting structure shall not have any natural frequencies within plus or minus 20 percent of the operationing speeds. The machinery, when mounted and in operation shall not exceed self-excited vibration velocities given in Table 1 at the points of measurement, operationing condition, and vibration sensitivity range of 10 to 100 Hz specified in ISO 2372. Note, vibration classes in Table 1 are not the same stated in ISO Standard 2372.

**TABLE 1**

Vibration Classes	
Root Mean Square (RMS) Vibration Limit	
Velocities in Inches Per Second	
Rotating Machinery	Reciprocating Machinery

Vibration Class	Rigid & Heavy			Rigid & Heavy		
	Foundation (1)	Soft (2)	Mounted	Foundation (1)	Soft (2)	Mounted
I	0.11		0.18	0.28	0.44	
II	0.28		0.44	0.70	1.11	

(1) Isolator static deflection less than 0.1 inch

(2) Isolator static deflection greater than 0.3 inch

**B. VIBRATION LIMITS:**

The RMS vibration limit velocities Table 1 apply to measurements with a filter turned to the operationing speed in series with the vibration measuring instrument on the machinery mounted in the vertical, horizontal, and axial direct. These measurements shall be taken at the lowest operationing speeds of the components generating self-excited vibration velocities.

**C. VIBRATION ANALYZER:**

Use a portable analyzer conforming with ISO 954, and with testing equipment and calibration standard referenced to the National Bureau of Standards. The vibration pick up and connecting cable and indicator set shall be operable without damage between -18°C and 44°C temperature range at a maximum relative humidity of 95 percent. Analyzer shall be complete with battery pack or 120 volt AC, 60Hz cord, manual, scope jack, DC recorder outlets, and necessary accessories. Analyzer shall contain a tunable filter over the range of one to 10,000 Hz with a maximum 5 percent load band width at 3dB down points.

**D. VIBRATION ISOLATION APPLICATION:**

The type of isolation, base, and minimum static Deflection shall be as required for each specific equipment application, but not less than that given in the Vibration Isolation Schedule, when supported on a solid, minimum 2406 kg per cubic meter, concrete structural floor slab having a thickness of not less than 100mm. Should vibration isolators installed for the machinery prove inadequate to prevent transmission of machinery vibrat to the building structure or limit machinery vibration originated noise in the building spaces to their specific noise criteria levels and, if the specific limits of Table 1 are exceeded, the isolators shall be replaced with units having the largest deflection that can be practically installed, not less than 25mm greater than the functioning isolators up to a total unit deflection of 125 mm.

**E. VIBRATION ISOLATION SCHEDULE AND SELECTION CRITERIA:**

The minimum vibration isolation materials and equipment required for each piece of vibration isolated machinery shall be as indicated and selected for the lowest speed of the operating machinery as specified in clause 1.03.

The following correction shall be added to the selection based on massive floor on grade for the concrete slab of this building.

Operationing Speed	Allowance
600	25 mm
900	12 mm
1200	11 mm
1500	8 mm
3600	5 mm

**F. VIBRATION ISOLATOR PROCUREMENT:**

For each piece of machinery to be isolated from vibration, the machinery base, vibration isolators, seismic snubbers, and other associated materials and equipment shall be supplied as coordinated package by a single manufacturer or by the machinery manufacturer. Procure isolators selected to provide a uniform loading and deflection even when the machinery weight



is not evenly distributed. This requirement does not include the flexible connectors or the hangers for the associated piping and ductwork.

**1.04 SUBMITTALS: Submit the following:**

**A. MANUFACTURER'S VIBRATION ISOLATION MATERIALS AND EQUIPMENT DATA:**

1. Vibration Isolators
2. Seismic Snubber
3. Vertical Stops
4. Flexible Connectors
5. Flexible Duct Connectors
6. Silencers
7. Acoustic Wall Lining

For each type and size of spring type isolators, the spring outside diameter, deflection, operating spring height, solid spring height, the ratio of the outside diameter to the spring height, the load to deflection ratio of the springs, and weight and sizes of structural steel members.

**B. CERTIFICATE OF COMPLIANCE:**

1. Neoprene
2. Flexible Pipe and Duct Connectors

**C. ACOUSTIC TREATMENT:**

1. Submit complete catalogue information and shop drawings for sound attenuators including Octave band mid-frequency curves, dynamic insertion loss, pressure drop, materials, etc.
2. Submit noise level curves at octave band mid-frequency for Air Handling Unit, Fans, and Fan Coil Unit for approval.

3. Pressure loss thru the duct lining, acoustic silencers shall be allowed for in the estimation of fan pressure.
4. The General Contractor shall submit calculation supporting selection of air side equipment such as diffuser, opposed blade damper. This calculation has to be prepared and signed by an approved acoustic specialist.
5. Galvanized perforated sheet catalogue.
6. All acoustic treatment calculation and proposal shall be prepared by an approved acoustic specialist.

## **2.01 MATERIALS AND EQUIPMENT:**

Vibration isolators, flexible connectors and seismic snubbers, their components and materials shall be designed for replacement.

### **A. CORROSION PROTECTION:**

Steel parts of vibration isolators and seismic snubber, except springs, shall be hot dipped galvanized in accordance with ASTM A123. Where steel parts are exposed to the wether, galvanized coating shall be at least 2 ounces of zinc per square foot of surface. Springs shall be neoprene coated.

### **B. NEOPRENE:**

Neoprene material used in vibration isolators and seismic snubbers shall be oil resistant in ccordance with ASTM D 471.

### **C. FLOOR MOUNTED ISOLATORS:**

1. Neoprene Isolation Pads:

Provide neoprene pads at least 6mm thick with cross-ribbed or waffle design. For concentrated loads, provide steel bearing plates bonded or cold cemented to the pads. Size pads for not more than 345 kPa (50 psi) or as recommended by the pad manufacturer.

2. Neoprene Isolator

Provide molded neoprene isolators having steel base plates with mounting holes and at the top, steel mounting plates with mounting holes or threaded insert. Neoprene element shall be designed for operationing on a straight line deflection curve abd loaded so that deflection does not exceed 15 percent of the free height of the elements. Elements shall be type and size coded with molded letters or numbers or color coded for capacity identification. Metal parts of neoprene elements shall be completely embedded in neoprene.

**D. SPRING ISOLATORS AND PROTECTED SPRING ISOLATORS:**

Provide spring isolators or protected spring isolators that are adjustable including laterally stable free standing springs with horizontal stiffness at least 80 percent of the vertical (axial) stiffness. If included, machine attached and floor attached restraining elements shall be separated from metal-to-metal contact by neoprene cush 3mm thick minimum. Neoprene acoustic friction pads at least 6mm thick shall be provided.

1. Springs:

Springs shall be securely fastened to base and compression plates and designed so spring ends remain parallel during and after deflection to operationing height. Outside coil diameter shall be at least 0.8 of the operationing height. At operationing height, spring shall have additional travel to complete (solid) compression equal to at least 50 percent of the operationing deflection to control (solid) compression equal to at least 50 percent of the operationing deflection.

2. Mounting and Adjustments:

Provide base and compression plates with mounting holes or threaded fittings. Adjustment leveling bolts shall be rigidly bolted to match machinery or base.

**E. SUSPENSION TYPE ISOLATORS:**

Provide hangers with suspension type isolators encased in open steel brackets. Isolate hanger rods from isolator steel brackets with neoprene grommets.

1. Suspension Type Neoprene Isolators:

Provide hangers with molded neoprene elements which conform with requirements for "Neoprene Isolators" except that elements shall be double deflection type with at least 9mm deflection.

2. Suspension Type Spring Isolators:

Provide hangers with springs and molded neoprene elements in series. Spring shall conform with requirements for "Neoprene Isolators". Provide isolators with adjustable spring preloading devices where required to maintain constant pipe elevation during installation and when pipe operational loads are transferred to the spring.

**F. VERTICAL STOPS:**

Stops shall be designed to be out of contact during machinery operation and to act as blocking devices during erection.

**G. STEEL EQUIPMENT BASES, PLATFORMS, RAILS AND SADDLES:**

Fabricate equipment bases, platforms, rails in accordance with AISC Manual of Steel Construction with AISC structural steel shapes of ASTM A36 steel. Welding shall conform to AWS D1.1. Design and sizes shall be as recommended by the machinery manufacturer and as indicated. Provide

machinery bases, platform, rails and saddles of sufficient strength to resist distortion during construction and when machinery is in operation. Design calculat shall show that the maximum stress in any structural steel member will not exceed that allowed by AISC Manual of Steel Construction during machinery operation. Beams shall have a minimum depth of 1/12<sup>th</sup> of the longest dimension of the base and of the corresponding width and weight given in Table 3.

## **END OF SECTION**

### **SECTION 151200 TESTING, ADJUSTING AND BALANCING OF VENTILATING AND COOLING SYSTEM**

#### **1.01 GENERAL REQUIREMENTS**

The provision of Section 15000, "Mechanical General Requirements," apply to this section except as modified by this section. In the references referred to herein, the advisory or recommended provision shall be considered to be mandatory, as though the word "shall" had been substituted for the words "should" or "could" or "may" wherever they appear; reference to the "authority having jurisdiction," the Administrative Authority, the Owner, or the Design Engineer shall be interpreted to mean the Contracting Officer.

#### **1.02 DESCRIPTION OF WORK:**

Upon completion of the installation and factory start-up field testing, adjusting, and balancing of air systems and water systems in order to provide the heating, ventilating and air conditioning (HVAC) system indicated or specified. The system requiring the specified testing, adjusting and balancing of work are listed in the paragraph: "Procedures." Accomplish all work in accordance with referenced standards of AABC or NEBB or commissioning procedures issued by Character Institute of Building Services (U.K.) except as modified by this specification section.

#### **1.03 SUBMITTALS:**

Submit to the Project Manager for approval:

##### **A. QUALIFICAT OF TAB ENGINEER:**

Submit within 90 calendar days after the date of contract award.

**B. TAB AGENDA:**

Submit agenda for TAB work for entire project within 90 calendar days after the date of the approval of the TAB engineer's qualificat.

**C. REPORT FORMS:**

**D. INSTRUMENTS:**

**E. TESTING, ADJUSTING AND BALANCING PROCEDURE**

**F. PREREQUISITE WORK CHECKLISTS:**

Submit at least 30 calendar days prior to the approved date for start date of TAB engineer's associated field work.

**G. TAB CERTIFIED TEST REPORTS:**

**1.04 DEFINIT**

**A. VENTILLATING EQUIPMENT:**

Units which are designed to accomplish air changes in a building indoor environmental air.

**B. COOLING EQUIPMENT:**

Units which are designed to take away heat from building indoor environment air. Note that some cooling equipment has heating equipment associated with them.

**C. TAB:**

Testing, adjusting and balancing.

**D. TAB'd:**

Tested, adjusted and balanced.

**E. TAB DATA:**

TAB measurements reported on the submitted TAB reports, measurements taken from the HVAC systems at the equipment installation site by TAB measuring instruments. TAB data also includes equipment descriptive data taken from manufacturer's labels and name plates.

**1.05 INSTRUMENTS:**

Application, accuracy and calibration requirements should be as required by Section II NEBB Procedural Standards for testing and balancing of environmental systems; latest edition.

**1.06 TESTING AND BALANCING REPORTS:**

Format and applicable contents should be similar to those of NEBB and AABC Forms.

- a. Certification
- b. Instrument Calibration Report
- c. System Diagram
- d. Air Apparatus Test Report
- e. Static Pressure Profile
- f. Apparatus Coil Test Report
- g. Exhaust Fan Test Report
- h. Air Outlet/Air Inlet Test Report
- i. Return Air and Outside Air Test Report
- j. Chiller Test Report

- k. Cooling Tower Test Report-include drift loss
- l. Pump Test Report
- m. Boiler Plant Test Report
- n. Calorifier Test Report
- o. Chemical analysis of flue exhaust from the boiler chimney. (Three samples taken on different days when boilers at full load).
- p. Chemical analysis of chilled water and condensing water (Three samples taken in three different months) after trial run for one month.

**1.07 A. TAB ENGINEER'S QUALIFICATION REQUIREMENTS:**

- 1. Required Experience:
  - a. Engineer shall have acceptably accomplished TAB work meeting the requirements specified herein on at least two similar systems of centralized chilled water capacity similar to this project.
- 2. Experience Verification Information Required
  - a. Submit the AABC or NEBB TAB Report form accepted by the owner for the two projects offered as experience. Project TAB report forms with formats other than AABC or NEBB forms may be approved if determined to be equivalent by the Engineers.
  - b. Name and address of buildings in which the two systems are located.
  - c. Name and telephone number of the existing maintenance manager of each system.

**B. OWNER SELECTION:**

If the General Contractor fails to submit the name of an acceptable TAB engineer, the



Owner may select a TAB engineer who meets the requirements of this specification to accomplish the work. The selection shall be binding upon the General Contractor at no additional cost to the Owner.

**1.08 TAB ENGINEER’S ROLE:**

**A. REPORTING WORK:**

The TAB agenda, and the TAB certified test reports shall be prepared, signed , and dated by the TAB engineer and certified by Professional Mechanical Engineer.

**B. FIELD WORK:**

The TAB engineer shall be present full time at the project site when TAB work is being accomplished and shall be responsible for the conduct, supervision, and management of the TAB work.

**1.09 PREREQUISITE WORK REQUIRED:**

The General Contractor shall be responsible for the completion of all HVAC equipment start-up and debugging prior to the TAB engineer arriving at the project site to begin the TAB work. Prior to TAB engineer’s arrival, the Contractor shall, at a minimum, ensure completion of the applicable inspect and work items listed in the NEBB Procedural Standards, Section III, “Preliminary TAB Procedures.” Under paragraphs “Air Distribution System Inspection” and “Hydronic Distribution System Inspection.” Submit to the Engineers at the time specified for review and approval of the checklists which list the applicable work items and verify in writing that the items have been acceptably completed.

**1.10 COORDINATION OF SUPPORTING PERSONNEL:**

The General Contractor shall provide the technical personnel, such as factory representatives or control installer or equipment mechanics, required by the TAB engineer to support his TAB field measurement work during each work session.

### **1.11 WRITTEN NOTICE OF TAB FIELD WORK SCHEDULE**

The General Contractor shall provide notice to the Project Manager at the commencement of TAB field measurement work.

### **1.12 DEADLINES:**

The entire TAB work shall be completed at least 60 calendar days prior to the date of completion of work under this contract.

## **PART 2.00 – EXECUTION**

### **2.01 SITE VISIT:**

The TAB engineer shall visit the project site and survey each HVAC system installation prior to his preparation of the TAB agenda. The date of the site visit shall be reported on the submitted TAB agenda.

### **2.02 SIMULATED LOADS:**

When simulated loads or false control inputs to HVAC systems are required to accomplish the specified TAB work, indicate complete procedures to accomplish this.

### **2.03 SEASONAL RESTRICT:**

In spite of the use of simulated loadings and false control inputs, the TAB engineer shall visit the project site for at least two TAB work sessions for field measurements. At a minimum, one week session shall be in the season of maximum cooling load, the goal being to TAB cooling systems under their maximum outdoor environment-caused loading. Ventilating equipment may be TAB'd in either of the two seasons.

### **2.04 SUPPORT REQUIRED:**

Specify what technical support personnel is required from the Contractors other than TAB agency, i.e., factory representatives for temperature controls or for complex equipment. Specify on which TAB testing workday each technical support personnel is needed. The TAB engineer shall be responsible for informing the Contractor in writing of these support requirements, i.e., what support personnel is needed and

when they are needed. The General Contractor shall ensure these support personnel requirements are met.

**A. CERTIFICATION:**

The TAB reports shall be certified by a Registered Professional Mechanical Engineer (PME) who is versed in the field of air and water balancing and who is legally independent of any firm involved in the design or construction phases of the project. This certification shall include checking adherence to agenda and procedures, and a written evaluation of the report's compliance with the approved agenda and the specified procedures. Additionally, the certification shall include the PME's name, typed, his signature, the date of his signature, and the PE shall stamp the report with his registered PE seal.

**2.05 PROCEDURES:**

**A. SUPPLY AIR SYSTEMS:**

**1. OUTLETS:**

- 1.1 The system shall be balanced so that the total supply air quantity to each space should be within -5% TO + 10% of the design amount.
- 1.2 Each outlet within the same space as related to 1.1 above should be adjusted within the following:
  - a. single outlet -5% + 10%
  - b. two outlets - +- 10%
  - c. three outlets - +- 15% & more
- 1.3 All final quantities should be obtained without generating noise.
- 1.4 If, during total system balance, the tab engineer detects any outlet condition that will not allow proper balancing to be performed, the facts should be reported immediately.
- 1.5 At completion of balancing, at least one outlet damper should be fully open on every branch dust and at least one branch damper should be fully open.

1.6 Final position of volume dampers should be marked and noted at the system diagram.

2. SUPPLY FAN:

2.1 Set the fan RPM to provide design total CFM and/or required static pressure to operation the system, with wet cooling coils (if applicable) and with the filter artificially restricted to simulate 50% loading.

2.2 Fan speed should not exceed the maximum allowable RPM as established by the fan manufacturer.

2.3 Verify that the fan motor will not be over-loaded when the system is operationing with un-restricted, clean filters in place.

2.4 Determine and record all data required by air apparatus test report form.

**B. RETURN AND EXHAUST SYSTEMS:**

1. AIR INLETS:

1.1 Air inlets on system should be adjusted to the required quantities with a tolerance of +- 10%.

1.2 At completion of balancing, at least one inlet volume damper of every branch should be fully open and at least one branch balancing damper in the system should be fully open.

1.3 If, during balancing, the tab engineer encounters any condition that will not allow proper balancing, the facts should be reported immediately.

1.4 Return air inlets installed in ceilings where the space above the ceiling is used as a return air plenum are not be measured or adjusted.

2. FANS:

2.1 Set the fan rpm to provide total cfm within acceptable tolerance.

2.2 Fan speed should not exceed the maximum allowable rpm as established by the manufacturer.

2.3 Final setting of fan should not rest in overloading the fan motor in any mode of operation.

2.4 After the total system balance, determine and record all data required by the air apparatus test report form.

**C. HYDRONIC SYSTEM:**

1. The system should not be balanced so that the flow tolerance is within  $\pm 10\%$ .

2. The final position of each balancing valve should be clearly marked. Any memory devices should be set to permit closing and reopening the valve at its balancing setting.

3. At completion of balancing, at least one branch pipe balancing valve should be fully open.

4. At completion of balancing, at least one terminal unit balancing valve in each piping branch shall be fully open.

5. To compensate for any stratification of air temperature or uneven air velocity across the coil bank, the water flow through banks of multiple coil sect should be balanced thermally so that the return water temperature of each coil shall be fully open.

6. Where parallel pump operation is provided, motor amperes should be measured with one pump operationing to insure there is no overload.

7. If, during hydronic balancing, the tab engineer determines any condition that will not permit proper balancing, the fact shall be reported immediately.

**D. TEMPERATUE CONTROL SYSTEMS**

1. Verify that all control devices are properly connected.
2. Verify that all dampers, valves and other controller devices are operationd by the intended controller.
3. Verify that all dampers and valves are in the position indicated by the controller.
4. Verify the integrity of valves and automatic dampers in terms of tightness of close-off and full-open position.
5. Verify the proper application of normally open and normally closed valves.
6. Check the sequence of operation for any control mode is in accordance with shop drawing.
7. Verify that all controllers set point meet the design intent.
8. Verify the operation of all interlock systems.

**E. PUMPS:**

1. Flow measurement.
2. Pressure at Suction and discharge.
3. Motor ampere load.
4. Pump speed.

5. Checking of data against the manufacturer's pump curve

**F. COOLING TOWERS:**

1. Measure flow of condenser water.
2. Measure air flow.
3. Record operationing temperatures.
4. Measure drift loss.
5. Measure make-up water flow.
6. Conduct manufacturer's procedures.

**G. CHILLERS:**

1. Measure flow through evaporator and condenser.
2. Record operationing temperatures and pressures.
3. Measure motor amperes.
4. Conduct manufacturer's test procedures.

**2.06 INSPECTION:**

At a time after submittal of the certified TAB report, but not more than 45 days after this submittal, the TAB engineer shall check for accuracy, in the presence of the Owner's representative, the listed random select of data recorded in the certified TAB report. Since each seasonal work session requires from the TAB engineer a TAB report, an inspection meeting the requirements specified herein shall be conducted after each seasonal work session to data check the submitted TAB report. Checked

data, which shall be measured by instruments, shall fall within tolerance of plus or minus 10 percent of the data tabulated in the report. Data found to be out-of-tolerance shall be corrected by reworking the TAB work on each out-of-tolerance. In addition, all data that would change as a result of the TAB rework shall be retested, readjusted, and rebalanced. The corrected TAB work, including readjustment, retesting, recording data, submitting new certified TAB reports, and new inspection shall be accomplished in compliance with the requirements specified in this section. Compliance with these inspection requirements are a prerequisite to approval of the submitted TAB report.

**A. RANDOM SELECTION FOR DATA CHECKING**

1. Air Systems Inspection Group:

- a. Air Handling Unit Systems Inspection Group: Check all data entries for any 10 of these air system.
- b. Fan Coil Unit Systems Inspection Group: Check all data entries for any 100 of these air systems.

2. Water System Inspection Groups:

- a. Chilled Water System Inspection Group:

Check all data entries for any one on the water chillers. Check all data entries for the chilled water systems serving the air handling units and fan coil units, which are selected to be data checked under paragraph, "Air System Inspection Group"

**B. ADDITIONAL TAB DATA CHECKING:**

If during random TAB data checkings, any of the data entered on any report form for a particular equipment system in an inspection group to be out-of-tolerance, then all data entries on all report forms submitted for one or more system of that inspection group (randomly selected and not previously checked) shall be data checked by the TAB engineer in the presence of the Engineer's representative. If the data on the TAB report forms for the one additionally checked system is out-of-tolerance, then all data entries on all



report forms submitted for another one system of that inspection group (randomly selected and not previously checked) shall be data checked by the TAB engineer in the presence of the Engineer's representative. This added data checking therefore increases by one number of randomly selected system reports for an inspection group checked each time a report form in group system is found to have data which is out-of-tolerance.

**2.07 MARKING OF SETTINGS:**

Following final acceptance of certified reports by the Engineers, the settings of all HVAC adjustment devices including valves, splitters, and dampers shall be permanently marked by the TAB engineer so that adjustment can be restored if disturbed at any time. Do not mark devices until after final acceptance.

**2.08 MARKING OF TEST REPORTS:**

The TAB engineer shall permanently and legibly marked and identify the location points of the duct test ports. If the ductwork has exterior insulation, these markings shall be made on the exterior side of the ductwork insulation.

End of Specification

## **FIRE PROTECTION WORKS TECHNICAL SPECIFICATION**

### **FPS 100 : GENERAL CONDITION**

A. The General Condition form a part of these specification and contract.

#### **B. DRAWINGS AND SPECIFICATION**

The Drawings and Specification are meant to be complementary to each other and what is called for by one shall be called for by both.

Any apparent conflict between the Drawings and Specification and any controversial or unclear points in either shall be referred to the Mechanical Engineer in Charge for final decision. On the plans, keep records showing all deviat occurring during construction. At the completion of the work, said copy of the plans shall be submitted to the LGU for its copy and file.

Upon completion of work as described herein the Contractor shall furnish the Owner, at his own expense, Five (5) copies of the "AS BUILT" plans for future reference and maintenance purposes.

#### **C. CORRELATION OF WORK**

The Fire Protection Contractor shall coordinate with the General Contractor and the LGU/Owner to determine how and where his work fits with that of other crafts, after familiarizing himself with the plans and specification. This shall be done at the beginning of construction. Should there be any existing doubt at any point, a ruling shall

be secured from the LGU/Owner and shall be given time to inspect the work covering this point and to prepare a detail in the form of Drawings and written instruct as required.

#### **D. PERMITS AND INSPECTION**

The contractor shall obtain, at his own expense, all the necessary permits and Certificate of Mechanical Inspection from the proper government authorities required both for the performance of his work involved and the operation of the system upon completion of work.

The Contractor shall, at his own expense, reproduce the electrical plans for his work to the necessary scale and complete them with the necessary information and requirements as required by the Government approving authorities concerned in issuing permits and Certificate of Electrical Inspection.

E. EXAMINATION OF PREMISES

Perspective bidder is required to examine the Architectural, Structural, Mechanical and Electrical Plans of the Project, to visit the site and carefully take note all the condition thereat and to have informed himself thoroughly under which the electrical work is to be done. No allowance shall subsequently be made in his behalf because of any error on his part. He will be deemed to have done this before submitting his proposal and no subsequent claim on the ground of inadequate or inaccurate information will be entertained.

F. LAYOUT OF WORK

Fire Protection System layout, indicated on the drawings is generally diagrammatic and location of sprinkler heads, pumps, pipes and equipment are approximate.

The exact routing of sprinkler heads, pumps, pipes and equipment shall be governed by structural and architectural condition and limitat.

Consult the LGU/Owner for exact location. This is not to be construed to permit redesigning of system; all outlets are to be interconnected as indicated in the drawings.

Locatione and install equipment-requiring maintenance where it will be readily accessible. Any equipment located without the approval of the LGU or Owner shall be done at the risk of the Contractor.

The Owner reserves the right to make any reasonable changes in location of outlets and equipment prior to roughing-in, without involving additional expense.

The Contractor shall be held responsible and pay charges for cutting and patching for piping where sleeves or slots were not installed or where incorrectly located.

**G. MATERIALS AND WORKMANSHIP**

All materials to be installed shall be unused, brand new and shall conform to the applicable standards.

Only skilled workmen using proper tools and equipment shall be employed during the entire course of installation work. All workmanship shall be of the best quality and all work shall be done in accordance with the best practices of the trade involved.

The same job foremen shall be assigned and maintained at the job site during the entire course of the job.

**FPS 200 : WORK NOT INCLUDED**

A. The following items of works will be supplied and done by others.

1. All cutting and patching shall be made by the General Contractor, except as specifically noted and modified herein.
2. All electric power wirings, except that are furnished as an integral part of factory assembled equipment, except as otherwise specified herein shall be by Electrical Contractor.
3. Supply and installation of fire doors shall be by General Contractor.
4. Fire alarm and fire station for the alarm system shall be by Electrical Contractor.

**FPS 300: APPLICABLE SPECIFICATION CODES, ORDINANCES, PERMITS AND FEES**

A. The work covered in this contract is to be installed according to the specification, codes, ordinances and requirements of the following:

1. Fire Code of the Philippines
2. National Building Code of the Philippines
3. Fire Department Ordinances of concerned municipality.
4. NFPA Codes References:
  - NFPA NO. 10 - latest edition
  - NFPA NO. 13 - latest edition
  - NFPA NO. 14 - latest edition
  - NFPA NO. 20 - latest edition
  - NFPA NO. 01 - latest edition
  - NFPA NO. 75 - latest edition
  - NFPA NO. 101 - latest edition

B. All construction permit and fees required for the work shall be obtained by and at the expense of the Contractor. The Contractor's shall furnish the Architect, the Engineer and the Owner final certificates of inspection and approval from the government authorities having jurisdiction after the completion of the work.

C. The Contractor's shall obtain all necessary allowances, pays, royalties, etc. In connection with the use of any patented device or system and shall save the Owner harmless from any claim or lawsuit arising from such use.

**FPS 400 : SHOP DRAWINGS, SAMPLES AND OTHER SUBMITTALS**

A. The Contractor's shall prepare and submit for approval the following:

1. Manufacturer's catalog, sheets, marked as necessary to indicate materials or equipment being furnished for the following items :
  - a. Sprinkler heads, sprinkler wrench and spare cabinets
  - b. Valves, flow controls, test and drain assembly.
  - c. Mechanical grooved couplings and flexible connectors.
  - d. Riser Supports and sleeves
2. List of miscellaneous materials proposed, including pipe, fittings, valves, etc.

3. Field test reports
4. Such other similar information the Engineer may require.

**FPS 500 SUBSTITUTION AND TESTING OF MATERIALS**

- A. Materials intended to be substituted for these originally specified shall be accepted only after a formal request for substitution, accompanied by:
  1. Reasons for substitut;
  2. Certificate of test indicating quality, compared to those originally specified.
  3. Cost comparisons with material originally specified. Requests shall be submitted to the Architect/or Engineer subject for evaluation at least fifteen (15) working days before installation of subject material.
- B. Cost of testing of materials, whether on originally specified items or on substitut, shall be to the account of the Contractor.
- C. Results of tests shall be submitted to the Architect /or Engineer for evaluation at least fifteen (15) days before the material is due for installation on the Jobsite.

**FPS 600 NOTES ON DRAWINGS :**

- A. The Drawings show the general arrangement of all piping. However, where local and/or actual condition at the Jobsite necessitate a deviation or rearrangement, the Contractor's shall prepare and submit the new arrangement/shop drawings for the Architect's and/or Engineers final approval.
- B. Small scale drawings do not possibly indicate all offset, fittings and other parts of the system required. The Contractor shall arrange such work accordingly, furnishing such valves, hangers, supports, fittings, trims and its accessories as may be required to complete the system in accordance to NFPA-13 Standard Installation of Sprinkler System.

**FPS 700 : WORKMANSHIP AND COORDINATION OF WORK WITH OTHERS**

- A. The Contractor shall be held fully responsible for the work of any manufacturer or sub - contractor supplying materials to or performing work for; as it is intended that the entire Fire Protection System shall be ready in every respect for satisfactory and efficient operation when finally delivered to the Owners.
- B. The Contractor shall assume full responsibility and shall provide the services of a qualified Engineer to supervise the complete installation of equipment and to conduct the final acceptance tests.
- C. The work throughout shall be executed in the most thorough and satisfactory manner in accordance with the best practices of the trade.

**FPS 800 : SPRINKLER HEADS**

- A. Type :

Automatic.Quick response. Standard 15 mm Ø diameter orifice, bulb type, upright, pendent or sidewall heads. Pendent heads (recessed type) shall be provided with aluminum escutcheon or approved equivalent to fit into ceiling boards or ceiling runners. Flush or concealed type pendent units shall be accepted as substitute. Heads shall be UL Inc. listed or FM approved.

- B. Head Rating and Type :

Common Area	Standard quick response, pendent, semi-recessed type sprinkler heads rating @ 135 <sup>0</sup> F to 165 <sup>0</sup> F (for use in maximum ceiling temp. of 100 <sup>0</sup> F)	Chrome finish
Kitchen Area	Standard quick response, pendent, semi-recessed type sprinkler heads rating @ 212 <sup>0</sup> F	Chrome finish

- C. Pipe Thread and Valve Seat - 15 mm diameter nominal (Conventional).

- 20 mm diameter nominal (extended).

D. Spare Sprinkler Heads:

Furnished spare heads as required in the code and maintenance service part list for a period of at least one (1) year reckoned from the date after termination of warranty.

			(165 °F)
	(212 °F)		
	1. Upright Type	- 24 pcs.	
6 pcs.			
	2. Semi Recessed Pendent Type	- 24 pcs.	6
pcs.			
	3. Sidewall Type		
	3.1 Standard Type	- 24 pcs.	6 pcs.
	3.2 Extended Coverage Type	- 24 pcs.	6
pcs.			
	4. Flushed / Concealed Type	- 12 pcs.	6
pcs			

E. Sprinkler Tong - 3 pcs. required

F. Sprinkler Wrench - 3 pcs. required

**FPS 900 : FIRE HOSE CABINETS**

A. Fire hose valve and cabinets assembly as shall be UL listed and FM approved and to match Bureau of Fire Protection requirement.

Hose - 40 mm Ø X 30.00 meter single jacketed rubber-lined finish.



Nozzle - combination fog and solid stream, 40 mm Ø chrome plated.

Rack - semi-automatic, chrome plated.

Angle Valve type, Pressure Reducing /or restricting Valve

- 40 mm Ø chrome plated polished trim provided with nipple and union patent for exceeding 100 PSI upstream working pressure and set at 70 PSI downstream working pressure. Use ordinary Angle valve for upstream working pressure below 100 PSI.

Hose Nipple - for components, shall be chrome plated. Provide two (2) universal spanner wrenches.

- B. Cabinet - full flush mounting door with anodized cal-colored aluminum for all glass plate, frame and box shall be No.18 gauge steel with white interior baked enamel finishes over primer. Cabinet size shall contain the above components.

#### **FPW 1000 : WALL HYDRANTS (FIRE HOSE VALVES)**

- A. Shall be UL listed straight globe female x male assembly provided with valves, caps and chains or approved equal and to match Fire Department requirements/or Bureau of Fire Protection.
- B. Type : - Single outlet connection 65 mmØ x 150 mmØ.
- C. Finish: - Cast brass valve with red hand-wheel  
- Polished brass caps and chains.
- D. Shall be female NPT inlet x male hose thread outlet provided with caps and chains.

#### **FPS 1100 : PORTABLE FIRE EXTINGUISHERS**

- A. Furnish and install as indicated on the drawings. Units shall be approved by the Fire Department having jurisdiction and UL listed. Mounting shall be

inside fire hose cabinets and as shown on drawings.

B. Types and Location

1. 10 lbs. PFE, FE-36 - Common areas
2. 50 lbs. PFE, FE-36 Wheeled Type - Utility areas

C. Types and quantity of portable fire extinguisher shall be as per final approval and recommendation of Local Fire Department having jurisdiction.

D. A metal name plate indicating indelible letters of the correct specification and/or

standard catalog product of the Portable Fire Extinguisher and the reputable manufacturer brand name and UL Listing shall be properly attached to the assembly at a location such that the information written thereon can be conveniently read by all concerned.

**FPS 1200 : PIPINGS - GENERAL**

A. Where American Standards are specified, other approved national or local standards may be acceptable, provided copies of these standard Specification are forwarded to the Engineer for his approval.

B. Black iron, schedule 40 standards, conforming to ASTM A-53 for pipe sizes 150 mm Ø and above only.

C. Black iron, schedule 40 standards, conforming to ASTM A-120 for inside building installation (feed mains, cross mains and branch lines).

C. All side piping shall be installed by means of screwed or flanged fittings. Flanged joint shall be used at all sprinkler risers and provided with 1.6 mm thick long fiber asbestos, cross laminated gasket “cranite”.

D. Torch cutting shall not be permitted as means of modifying or repairing sprinkler system.

E. All welding shall be “shop welding” only and shall be done by electric arc welding process.

F. Teflon type shall be used for screwed joints.

**FPS 1300 : FITTINGS - GENERAL**

- A. Sprinkler system fitting shall be extra heavy pattern. Whenever a change in pipe size is made, one piece of reducing fitting shall be used. Provide mechanical grooved couplings at riser pipes of every floor.
- B. All fittings shall be of malleable iron fittings.
- C. Steel pipe flangers mating with steel equipment flangers shall have the same facing as mating flange.
- D. Screwed union shall not be used on pipes larger than 50 mm (2"). Coupling and un of pipes other than screwed type shall be of types approved specifically for sprinkler used.

**FPS 1400 : VALVES - GENERAL**

- A. All valves shall be of the same manufacture for each class of piping and as such as possible, for the entire Project. Valves shall permanently bear affixed stamp or tag indicating manufacturer, catalog number, pressure and temperature ratings of isolation gate valve, OS & Y gate valves, angle valves, check valves, fire alarm check valve, pressure relief valves with all cast iron body with bronze trim.
- B. Furnish all valves and accessories material necessary for piping not shown on drawings as follows :
  - 1. Vents and drains for equipment to which piping connect are made.
  - 2. Connect to metering instruments and controls including pressure gauges, thermometer, controllers, traps and appurtenances required for proper functioning on instruments in controls.
  - 3. Temporary valves and accessories required for placing equipment into initial service.
  - 4. Piping 50 mm (2") and smaller required for proper operation of piping system and equipment, including drain valves required to drain all low points in piping.
- C. Valve seats shall be renewable except for forged steel and high pressure cast steel valves where Manufacturer's standard is integral seats.

- D. All valves shall be approved by Factory Manual and Underwriters Laboratories, Inc. (UL listed) in accordance with ANSI B 16.1, class 125.
- E. Where required and not noted, provided chain - wheel operationors, extending chain for chain operationd valves to which 1.2 meters of nearest floor or operationing platform of valves.
- F. Provide floor stand with flanged faces for bolting to floor or platforms and other special devices where specified or noted on drawings.
- G. Provide extension stems, universal joints stem guide bearings and other accessories required to locatione floor stands in convenient location with interference with other equipment, piping or building parts.
- H. Floor control valves within the building shall be approved indicating wedge gate with electrical contact and which will open when valve is partially or totally put in close position.

**FPS 1500 : SWAY BRACES, HANGERS, SUPPORTS AND SEISMIC BRACINGS**

- A. Sway Bracing: Steel flat bars, structural grade 7 mm minimum thickness, with corrosion protection; shape /or type as shown on plans.
  - 1. Sway Bracings Installation;
    - 1.1 Adequate sway bracing shall be provided to oppose longitudinal or transverse pipe movements.
    - 1.2 Lateral bracings shall withstand a force equal to 50% of the weight of the water contained in piping, valves and fittings. Spacing shall be 40 ft. (12m) maximum distances along main lines.
    - 1.3 Longitudinal bracing shall with stand a force equal to 50% of the weight of crossmain and feedmain within the zone of water contained in piping, valves and fittings. Spacing shall be 80 ft. (24 m) maximum distances along main lines.
    - 1.4 Piping anchorages shall not be scured on two (2) dissimilar parts of the building which will move differently.

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

1. Hangers Installation;

1.1 Approved inserts may be used for the support of hangers, anchorages in concrete. Expansion shield should be used in a horizontal position on the sides of concrete beams and shall be above the bottom reinforcements.

1.2 Increaser couplings shall be attached immediately adjacent to the expansion shields.

1.3 When pipes 100 mm diameter and larger are supported in the vertical position, the supports shall be at a minimum spacing of 3.0 meters (10') on center. Holes in concrete for expansion shield shall be made of the proper size and depth, as specified for the type of shield used, to provide a uniform contact with the shield over its entire length and circumference.

1.4 Maximum distance between hangers shall be 3.65 meters (12') for size 25mm (1"). Provide at least one hanger for each length of branch line, one between each two cross main branches, one hanger for each 4.75 meters (15') length of feed mains. The distance between the hanger and the center line of upright sprinkler shall be not less than 76 mm (3").

C. Support on Risers (Four Way Bracing)

Risers shall be adequately supported either by attachments directly to the riser or by hangers located on the horizontal connect close to the risers. Supports shall be provided at the ground level and at each every second floor level and at the top most level of the riser.

D. Seismic Separation Bracing

Seismic separation assembly shall provided at every piping crosses at every construction joints of the building separation assembly shall composed of fittings, pipe and approved victaulic coupling that permits movement in all direct and sufficient to withstand differential motion during earthquake. For

nominal 4"Ø (100 mmØ) and above sizes of pipes the separation distances shall not exceed 8 inches (203 mm) maximum. For other separation distances and pipe sizes, length and distances should be modified proportionally.

#### **FPS 1600 : PIPES SLEEVES**

##### **A. MATERIALS :**

1. Through fittings - cast iron
2. Below Grade-cast iron or standard weight iron pipe
3. Above Grade - steel pipe

##### **B. INSTALLATION :**

1. Minimum clearance between the pipe & sleeve shall not be less than 25 mm (1") for pipes, 25 mm (1") to 89 mm (3-½") and 50 mm (2") clearance between pipes 100 mm (4") and larger. The clearance between pipes and sleeves shall be filled with non - combustible flexible materials such as asbestos rope and furnished with semi-hardening mastic flush.
2. Floor sleeves shall extended at least 76 mm (3") above the top of the wearing surface.
3. Drains, fire department connect, test manifolds and other auxiliary pipings connected to risers shall not be cemented into walls or floors.

#### **FPS 1700 : FIRESTOPPING MATERIALS**

##### **A. Materials :**

1. Firestop compounds and damning materials shall be UL listed and shall conform to the requirements of qualified designers or Manufacturers approved modification, as supported by engineering reports.
2. The penetration seal materials must be unaffected by moisture and must maintain the integrity of the wall or floor assembly for its rated time period when tested in accordance with ASTM E814 (UL 1479). The system shall be UL listed classified for up to and including three (3) hours.

3. Fire stopping materials shall be asbestos and lead free and shall not incorporate oil not require the use of hazardous solvents.
4. All fire stopping materials shall be manufactured by one manufacturer thru out the completion of the project.
5. Do not proceed with installation of fire stop materials when temperatures exceeded the Manufacturer recommendation limitat for installation.

B. PREPARATION

1. Clean substrate of dirt, dust, grease, oil, loose materials, rust or other matter that may affect proper fittings or adhesion of the firestopping materials.
2. Clean metal and glass surfaces with a non-alcohol solvent.

E. INSTALLATION

1. Installation of firestops shall be performed by an applicator / installer qualified and trained by the manufacturer. Installation be performed in strict accordance with manufacturer's detail installation procedures.
2. Apply firestops in accordance with fire test reports, fire resistance requirements, acceptable sample installation and Manufacturer's recommendation.
3. Unless specified and approved all insulation used in conjunction with through penetration shall remain intact and undamaged and may not be removed.
4. Seal holes and penetration to ensure an effective smoke seal.
5. In areas of high traffic, protect firestopping materials from damaged. If the opening is large, install firestopping materials capable of supporting the weight of a human load.
6. Insulation types specified in other sect shall not be installed in lieu of firestopping materials specified herein.
7. All combustible penetrants (e.g. non-metallic or insulated metallic pipes) shall have firestopping using products and system tested in a configuration representative of the field condition.

8. When required to properly contain firestopping materials within opening, damming or packing materials may utilized. Combustible damming material must be move after appropriate curing. Non-combustible damming materials may be left as a permanent components of the firestop system.

#### D. CLEANING

1. Remove spilled and excess materials adjacent to firestopping without damaging adjacent surface.
2. Leave finished work in neat, clean condition with on evidence of spillovers or damage to adjacent surfaces.

#### **FPS 1800 : PIPE PAINTING**

- A. Sprinkler heads, valve stems and the like shall not be painted.
- B. After installation and test and before the installation of ceiling fixtures or boards, all pipings shall be prime painted and coated with two coats of gloss red quick drying enamel.
- C. Paint to be used shall be of low VOC type as specified by the Architect/Engineer.

#### **FPS 1900 : ALARM AND SUPERVISORY SYSTEM**

The supervisory and alarm system shall be integrated with the building Fire Alarm System. The Fire Alarm System annunciator shall indicate the flow valves, and the valve supervisory switches.

#### **FPS 2000 : MARKERS, INSTRUCTION AND IDENTIFICATION SIGNBOARD**

These signboards shall be made of gauge No. 14 black iron sheet with baked enamel finish and letter instruction as shown on the plans. Additional signboards shall be mounted on the unobstructed area for easy identification reading. Paints shall be basically gloss fire red and white.



## **FPS 2100 : ACCEPTANCE TESTS**

- A. The Contractor shall conduct tests in the presence of inspector or authority having jurisdiction (The Philippine Fire Protection Association of Fire Protection Associates).
- B. Isolated leak tests or partial tests of areas may be performed prior to installation of ceiling materials in the area to preclude any damage and during the total system final tests.
- C. To remove foreign materials which may have entered the piping during installation of same, flushing or underground connection is required before sprinkler piping is connected.
- D. Hydrostatic Tests :
  - 1. Minimum tests pressure shall not be less than to 200PSI on the system pressure. Exceeding System pressure requirements to the minimum test pressure shall be tested applying additional test pressure of 50PSIG on the system for at least twenty four (24) hours minimum.
  - 2. No visible leakage for inside sprinkler piping will be allowed. For underground mains and laid - ins, exceeding the permissible leakage or joints necessary repair shall be made.
  - 3. All control valve water pressure to ensure proper operation tests. Use clean, non - corrosive water.
  - 4. Fire connection shall be tested (part of base building works).
- E. The Contractor shall furnish the Owner a written statement to the effect that the work covered by the Contract has been completed and tested, before requesting for final approval of the installation from the Fire Department Authority.
- F. Testing of drainage facilities shall be made by opening the main drain valve while the control valve is wide open.
- G. Test certificate shall be filled out and signed by the Owner's and Contractor's representative.

- H. System operation and maintenance chart shall be submitted to the Owners upon completion of the Contract. This shall include, among others, the location of the control valves and care of the new equipment.

**FPS 2200 : MINOR MODIFICATION AND TIME COMPLETION**

- A. The plans as drawn should show condition as accurately as it is possible to indicate them in scale. The plans are diagrammatically and do not necessarily show all fittings, etc. necessary to fit the building condition. The location of valves, fittings and the fixture shown on the plans are approximately. The Contractor shall be responsible for the proper location in order to make them in compliance with Architectural details and instruct.
- B. The Contractor shall complete the work herein described in accordance with the specific schedules set by the Owners in accordance with General Contractor's Schedule of Work.

**FPS 2300 : GUARANTEE**

The Contractor shall guarantee that the installed sprinkler system complies with the requirements of the authorities and free from all defective workmanship and materials and will remain so, for a period of one (1) year from the date to final inspection and acceptance of the work. Any defect appearing within one year shall be corrected by the Contractor at no additional cost to the Owner.

**FPS 2400 : CONTRACTOR'S RESPONSIBILITY**

- A. The Contractor shall provide temporary fire protection system during the construction period. This shall be of sufficient capacity to put any fire that may break out due to construction operation. This is in addition to temporary fire extinguisher required.
- B. The Contractor shall identify and save the Owner, the Architect and the Consulting Engineer Harmless from and against all liabilities for damage to property occasioned by any or omission of this Contractor's expenses, legal or otherwise which may be insured by the Owner, the Architect or the Consulting Engineer, in the defense of any claims, action or suits.
- C. The General Contractor shall be responsible for the coordination among the different trades on the Jobsite in order to finish the Works in the least possible time, in strict compliance and in accordance with the Plans and Specification.

- D. Throughout the construction period open ends of all installed fire lines, crossmain, branch lines, riser nipples, drop nipples and other related pipings shall be kept closed by temporary plugs.
- E. All installed fire lines risers, dry stand pipes, FCV and ITC drain line stack and other related pipings shall not be used to conduct dirty construction wash water especially those with cement mixes to avoid possible clogging.
- F. Temporary potable water supply shall be made available to construction workers as construction progresses.
- G. A temporary human excreta disposal system shall be provided by the Contractor to serve the Workers during the construction period.

End of Specification

## **PLUMBING WORKS TECHNICAL SPECIFICATION**

### **SECTION 1: GENERAL**

- A. The General Condition form a part of these Specification and Contract.
- B. The Contractor shall submit sample of materials for use for the approval of the owner prior to the acquisition, delivery and installation. The contractor shall assume the cost of and the entire responsibility for any change in the work as shown on the contract drawings, which may be occasioned by approval of materials other than those specified.

C. Drawings and Specification

The Drawings and Specification are meant to be complementary to each other and what is called for by one shall be called for by both.

Any apparent conflict between the Drawings and Specification and any controversial or unclear points in either shall be referred to the Owner and architect for final decision. On the plans, keep records showing all deviation occurring during construction. At the completion of the work, said copy of the plans shall be submitted to the owner its copy and file. Upon completion of work as described herein the Contractor shall furnish the Owner, at his own expense, Five (5) copies of the "AS BUILT" plans for future reference and maintenance purposes.

D. Correlation of Work

The Plumbing and sanitary Contractor shall coordinate with the Architect and the Owner to determine how and where his work fits with that of other crafts, after familiarizing himself with the plans and specification. This shall be done at the beginning of construction. Should there be any existing doubt at any point, a ruling shall be secured from the Owner and shall be given time to inspect the work covering this point and to prepare a detail in the form of Drawings and written instruction as required.

E. Permits and Inspection

The contractor shall obtain, at his own expense, all the necessary permits and Certificate of Plumbing and Sanitary Inspection from the proper government authorities required both for the performance of his work involved and the operation of the system upon completion of work.

The Contractor shall, at his own expense, reproduce the Plumbing and sanitary plans for his work to the necessary scale and complete them with the necessary information

and requirements as required by the Government approving authorities concerned in issuing permits and Certificate of Plumbing and Sanitary Inspection.

F. Examination of Premises

Perspective bidder is required to examine the Architectural, Civil and Structural, Mechanical, Electrical, Plumbing and Sanitary Plans of the Project, to visit the site and carefully take note all the condition thereat and to have informed himself thoroughly under which the plumbing and sanitary work is to be done. No allowance shall subsequently be made in his behalf because of any error on his part. He will be deemed to have done this before submitting his proposal and no subsequent claim on the ground of inadequate or inaccurate information will be entertained. All cost implicat shall be borne by the contractor.

G. Layout of Work

Plumbing and sanitary System layout, indicated on the drawings is generally diagrammatic and location of equipment, fixtures, others are approximate.

The exact routing of pipes, equipment and others shall be governed by structural and architectural condition and limitat.

Consult the Owner for exact location. This is not to be construed to permit redesigning of system.

Locatione and install equipment-requiring maintenance where it will be readily accessible. Any equipment locationed without the approval of the Owner shall be done at the risk of the Contractor.

The Owner reserves the right to make any reasonable changes in location of equipment and piping, without involving additional expense.

The Contractor shall be held responsible and pay charges for cutting and patching for piping where sleeves or slots were not installed or where incorrectly locationed.

**SECTION 2: WORK NOT INCLUDED**

A. Construction of the domestic water tank shall be by General/Specialty Contractor.

B. All electrical power wirings, except that furnished as an integral part of factory assembled equipment except otherwise specified herein, shall be by Electrical Contractor.

- C. Painting except as required by the Plumbing Code and as specified herein shall be by General Contractor.

### **SECTION 3: NOTES ON DRAWINGS**

- A. The Drawings show the general arrangement of all piping. However, where local and/or actual condition at the jobsite necessitate a deviation or rearrangement, the Contractor shall prepare and submit the new arrangement / shop drawing for the Architect's / Engineers approval.
- B. Small scale drawings do not possibly indicate all offset, fittings and other parts of the system required. The Contractor shall arrange such work accordingly, furnishing such fittings, traps valves and accessories as may be required to meet such condition.

### **SECTION 4: APPLICABLE SPECIFICATION CODES, ORDINANCES, PERMITS AND FEES**

- A. The work covered in this contract it to be installed according to the specification codes, ordinances and requirement of the following:
  - 1. National Plumbing Code of the Philippines
  - 2. The Code on Sanitation of the Philippines
  - 3. Rules and Ordinances of Concerned City or Municipality
- B. All construction permits and fees required for the work shall be obtained by and at the expense of the contractor. The contractor shall furnish the Owner final certificates of inspection after the completion of the work.

### **SECTION 5 : WORKMANSHIP AND COORDINATION WITH TRADES**

- A. All work shall be performed in first class and neat workmanship by mechanics skilled in their work shall be satisfactory to the Engineer.
- B. The Plumbing Contractor is required to refer to the General Condition and to all architectural, structural, electrical, mechanical and fire protection plans and specification and shall investigate all possible interferences and condition affecting his Work.

## SECTION 6 : PRODUCT

### A. GENERAL

1. Except as specified, the Contractor shall submit for the Engineers approval, four (4) copies of complete materials he proposes to use, within thirty (30) days after award of contract.
2. The Contractor shall assume the cost of and the entire responsibility for any change in the work as shown on contract drawings, which may be occasioned by approval of materials other than those specified.

### B. PIPES AND FITTINGS SCHEDULE

1. Cold Water lines – All main distribution lines shall be galvanized steel /or iron, (G.I.) pipe, Schedule 40 standard, conforming to ASTM A-53, with class 300 fittings, flanged connection for 65Ø and larger sizes for all joints connection. For 50Ø and below shall be Schedule 40 standard, conforming to ASTM A-120-69, with class 250 fittings, screwed / threaded for all joints connection. Fittings shall be malleable iron, conforming to ASTM-A197/A, 197M-87 or approved equal.

All horizontal and lateral water distribution lines and roughing-ins of toilet and shall be high density PPRC (Polypropylene Random Copolymer) class PN-20 Polypropylene pipe material. Fittings shall be fusion weld type, imported conforming to German technology DIN 8077-8078 and ASTM 1281-93.

For Pumps Piping Layout – shall be galvanized steel /or iron, (G.I.) pipe, Schedule 40 standard, conforming to ASTM A-53, with class 300 fittings, flanged connection for 65Ø and larger sizes for all joints connection. For 50Ø and below shall be Schedule 40 standard, conforming to ASTM A-120-69, with class 250 fittings, screwed / threaded for all joints connection. Fittings shall be malleable iron, conforming to ASTM-A197/A, 197M-87 or approved equal.

For Submerged pipe at cistern tank – shall be stainless steel pipe (304), Schedule 40 standard, conforming to ASTM A-53, with class 300 fittings, flanged connection for 50Ø and larger sizes for all joints connection. For 50Ø and below shall be Schedule 40 standard, conforming to ASTM A-120-69, with class 250 fittings, screwed / threaded for all joints connection. Fittings shall be malleable iron, conforming to ASTM-A197/A, 197M-87.

2. Hot Water lines – All main distribution lines shall be high density PPRC (Polypropylene Random Copolymer) class PN-20 Polypropylene pipe material.

Fittings shall be fusion weld type, imported conforming to German technology DIN 8077-8078 and ASTM 1281-93.

3. Sewer and Kitchen Waste Lines – All new stacks, collectors lateral and branch waste lines shall be polyvinyl chloride pipes (PVC) series 1000.
4. Vent Lines – All new stacks, collectors lateral and branch waste lines shall be polyvinyl chloride pipes (PVC) series 1000.
5. AHU/ACU/FCU Waste Lines -All lateral & branch waste lines from 25 to 40 mmØ shall be polyvinyl chloride class 150 and 50 mmØ and larger, shall be polyvinyl chloride pipes (PVC) series 1000 II. All exposed FCU/AHU drains lines shall be provided with ½” thick elastomeric thermal insulation.

All Waste Stack and Main Collector Lines - shall be polyvinyl chloride pipes (PVC) series 1000 II. Provide with ½” thick elastomeric thermal insulation. (Provide UV Resistant paint all around for all pipes exposed to weather).

6. Drainage Lines and Downspouts - All new downspouts, collectors lateral and branch waste lines shall be polyvinyl chloride pipes (PVC) series 1000.
7. Sump Pump Discharge Riser – Shall be Black Iron (B.I.) pipe, schedule 40, standard conforming to ASTM A-53/120.

#### C. VALVES

1. Gate Valve - 50 mm and larger, shall be rising stem outside screw and yoke (OS & Y) flanged connection and shall be iron body with bronze trim, minimum of 200 psig working pressure. For 40 mm and smaller sizes, shall be rising stem /or non-rising stem inside screw female threaded and shall be bronze finished minimum of 200 psig working pressure.
2. Check Valve for CPS Pump - 50 mm Ø & larger shall be iron body lift type check valve has a center guided, spring loaded valve disc with resilient seal bronze or stainless steel removable valve seat with bronze trim, flanged connection, minimum of 200 psig working pressure. 40 mm and smaller, same except female threaded connection.
3. Check Valve for Transfer Pumps – shall be cast iron body ASTM A126 class B, non-slam type with opening and closing speed controls, stainless steel main valve trim and actuator combination water hammer shock absorber or approved equal.



4. Float Valve - shall be hydraulically operational, diaphragm actuated valve with the pilot control and float mechanism mounted on the cover of the main valve. The float posit the pilot control to close the valves when float contacts the upper stop and to open the valve when the float contacts the lower stop.
5. Pressure Reducing and Pressure Sustaining Valve – shall be single seated, hydraulically operated pilot controlled, diaphragm type globe valve. The control system shall consist of a reducing control sensitive to diaphragm pressure changes and pressure sustaining control that is sensed to the main valve inlet.
6. Pressure Relief Valve for Transfer Pumps – shall be a diaphragm type valve to maintain constant upstream pressure to close limits. The valve shall be hydraulically-operational, pilot controlled modulating type, main body at cover to cast iron ASTM A4 with adjustment ranges, 20 to 200 PSIG.
7. Angle Valve Strainer - strainer pattern shall be “Y” or angle strainer body and cover shall be cast iron, nuts and bolts shall be galvanized steel, basket and basket latch shall be stainless steel, body and plug O-Ring-Buna N or Piston.

#### C. OTHER MATERIALS

1. Drains - as indicated on drawings:
  - a. Gutter Drain (GD)
    - Stainless Steel 304, Basket Type Strainer
  - b. Deck Drain (DD)
    - Dome type
    - Gray Cast Iron Body, Brass Dome
  - c. Parking Slot Drain (PSD)
    - Brass floor with strainer with square/slotted/perforated openings.
  - d. Floor Drain @ T&B and common area (FD)
    - Brass floor or/ Stainless 304 with strainer with square/slotted openings.
  - e. Floor Drain @ Utility area (FD)
    - Brass floor or/ Stainless 304 with strainer with square/slotted openings.
  - f. Floor/Wall Cleanout (FCO/WCO)

- Gray Cast Iron with Brass or/ Stainless cleanout/plug

g. Trench Grating

- Gray Cast Iron or/ Steel grating with Frame

h. Area Drain

(300mm x 300mm)

- Gray Cast Iron or/ Brass

#### E. OUTDOORS PLUMBING APPURTENANCES:

1. Drainage Junction Boxes – 140 kg/cm<sup>3</sup> reinforced concrete with pre - cast reinforced concrete cover.
2. Drainage Manhole - 140 kg/cm<sup>3</sup> reinforced concrete with pre-cast reinforced concrete cover.
3. Oil Interceptor/Grease Tank - 210 kg/cm<sup>3</sup> reinforced concrete with pre-cast reinforced concrete cover.
4. Sewer Manhole – 140 kg/cm<sup>3</sup> reinforced concrete with C.I. grating cover.
5. Street Inlet/Catch Basin - 140 kg/cm<sup>3</sup> reinforced concrete with C.I. side inlet grating.
6. Area Drain - 140 kg/cm<sup>3</sup> reinforced concrete with C.I. grating cover model U 923 for traffic area and model U 822 for pedestrian area.
7. Catch Basin - 140 kg/cm<sup>3</sup> reinforced concrete with pre-cast reinforced concrete cover.
8. Cistern - 210 kg/cm<sup>3</sup> reinforced concrete with stainless steel access manhole cover.
9. Thrust Blocks - 140 kg/cm<sup>3</sup> plain concrete.

#### F. JOINTING / FITTINGS

1. Flanged Joint Gasket – Garlock
2. Screwed Joints - U.S. Federal Specification GG-P-251.
3. PVC Pipes and Fittings - PVC cement or as per the Manufacture's.
4. Hubless CISP – sleeve type coupling.
5. Bell and Spigot – Lead and Oakum
6. Polypropylene Random Copolymer Polypropylene Pipe – fusion welded type.
7. Polyethylene Composite Pipes – compression type (push on type) brass coated fittings.
8. Dissimilar Pipes - Adaptor fittings shall be used.

## **SECTION 7 : IDENTIFICATION AND APPROVAL OF MATERIALS**

- A. Each length pipe, fittings, traps, fixtures and device used in the Plumbing System shall have cast, tamped or marked on it, the manufacturer's trade mark or name, the weight, type and classes of product when so required by the Standard.
- B. Within thirty (30) days after award of the Contract, the Contractor shall submit for the Architect's approval, the names of suppliers and materials proposed including trade names and/or samples of the materials if deemed necessary.
- C. Brand names mentioned in these Specification are only for the purposes of indicating the desired quality and design.

## **SECTION 8 : SUBSTITUTION AND TESTING OF MATERIALS**

- A. Materials intended to be substituted for these originally specified shall be accepted only after a formal request for substitution, accompanied by:
  - 1. Reasons for substitution.
  - 2. Certificate of test indicating quality, compared to those originally specified.
  - 3. Cost comparisons with material originally specified. Requests shall be submitted to the Architect for evaluation at least 15 working days.
- B. Cost of testing of materials, whether on originally specified items or on substitution, shall be to the account of the Contractor.
- C. Results of tests shall be submitted to the Architect for evaluation at least 15 days before the material is due for installation on the Jobsite.

## **SECTION 9 : SEWER, WASTE, DRAIN AND VENT PIPES**

- A. GENERAL
  - 1. Underground sewer, waste and drain pipes and fittings shall be polyvinyl chloride (PVC) pipes, unless specifically noted. Soil and waste pipe above ground be polyvinyl chloride pipes for laterals, stacks and main collector pipes.

Waste pipes above ground shall be PVC pipes. Fittings for soil and waste pipings above ground shall be sleeve type coupling and gasket joints and PVC fitting or as specified.

2. All sewer, soil & drainage pipes shall be pitched 6 mm per 300 mm but in no case flatter than 3 mm per 300 mm.

#### B. SUPPORTS

1. Horizontal lines shall be supported by well secured length heavy duty strap hangers or floor chairs as required. Vertical lines shall be secured strongly by hooks to the building frame and a suitable bracket or chairs shall be provided at the floors from which they start.
2. PVC pipes in trenches under the ground shall be laid true to line and grade on a stable and suitably prepared foundation, each section of the pipe being properly bedded.
3. In soft ground liable to settlement, a gravel base 300 mm deep and twice the width of the pipe shall be rolled or tamped. Backfilling shall be carefully placed and tamped for the purpose, in such a manner that the pipe lines or connect are not disturbed.

#### C. TRAPS

1. Every plumbing fixtures shall be separately trapped by a vented water sealed trap as close to the fixture outlets as the condition allow, but in no case at a distance greater than 600 mm. In case of the upper or the only fixture on a soil extended full size through the roof, a vent shall not be required when said fixture has its center stack. Traps shall be of the same diameter as the waste pipes from the fixtures, which they shall serve, all traps shall have a water seal of at least 32 millimeters with a brass thumbscrew cleanout at the bottom of the seal.

#### D. VENT

1. Vent shall be taken from the crown of the fixtures, except for water closet traps, in which case, the branch line shall be vented below and trap and above all small waste inlets, so connected as to prevent obstruct. Each vent pipe shall be run separately above the fixtures into the adjacent soil pipes, a distance not more than 1.50 meters. If more than this distance, the vent shall run independently through the roof.
2. A vent line shall be wherever practicable, directs extension of a soil or waste line.
3. Main vent risers at 4.5 meters along or more shall be connected at the roof with the main water or soil pipes below the lowest vent outlet with a forty-five degree (45d) connection.
4. All vertical soil or vent pipes shall be carried up at least 600 mm above the roof of the building and the open side ends are to be entirely and securely covered with gals. 16 mesh copper cloth.
5. Vent pipes in roof spaces shall be run as close as possible to the underside of roof with horizontal piping pitched down to stacks without forming traps. Where an end or circuit vent pipe from fixtures it shall be connected into the main vent or vent stack.

#### E. ROUGHING-IN

1. Roughing-in for pipes and fixtures shall be carried along with the building construction. Correctly located openings of proper sizes shall be provided where required in the walls and floors for the passage of pipes all items to be embedded in concrete shall be thoroughly clean and free from all rust, scale and paint.

#### F. FITTINGS

1. All changes in pipes sizes on sewer, waste and drain lines shall be made with reducing fittings or reducers. All changes in direction shall be made by the appropriated use of forty-five degrees (45d) wyes, or long sweep bends, except that sanitary tees may be used on vertical stacks. Short quarter bends or elbows may be used in soil and waste lines where the change in direction is from the horizontal to the vertical and on the discharge from the water closet.

#### G. JOINTS AND CONNECT

- A. All joints shall be air and water tight. For joining pipes, the following shall be used:
  1. Hubless cast iron soil and waste pipes and fittings, sleeve coupling gasket joints. Bell and spigot shall be oakum and lead
  2. Galvanized wrought iron or steel pipe, screwed or threaded joints, use Teflon tape.
  3. Lead to cast iron pipes : Adaptor fittings, screwed and hubless coupling gasket joints.
  4. Concrete pipes : bell and spigot or tongue and groove.
  5. Polyvinyl chloride (PVC) pipes, socket type with PVC cement.
  6. Polypropylene pipes, fusion weld type.
  7. Cross-link composite aluminum pipe- compression type (push-on type) brass coated fittings.

### **SECTION 10: WATER DISTRIBUTION SYSTEM**

#### A. INSTALLATION

1. The pipings shall be extended to all fixtures, outlets and equipment from the gate valves installed in the branch near the riser.
2. Un shall be provided where required for disconnection.
3. All pipes shall be cut accurately to measurements and shall be worked into place without springing or facing. Care shall be taken so as not to weaken the structural part of the building.

4. All service pipes valves and fittings shall be kept at sufficient distance from work permit finished covering not less than 15 mm from such work or from finished covering on the different service.
5. Changes in pipes shall be made with reducing fittings.
6. Accessible Contraction-expansion joints shall be made wherein necessary. Horizontal runs of pipe over 15 m. in the length shall be anchored to wall or the supporting structure midway on the run to force expansion and contraction equally towards the ends.

#### B. HOSE BIBBS

1. All hose bibbs general area shall be 15mmØ with male tapered threads standard hose connection brass finished.

#### C. WATER DISTRIBUTION LINES

##### 1. Installation

- a. The hot and cold water piping system shall be pitched toward fixtures and riser for proper air relief. Provide drain cocks at low points for drainage system. Pitch line 25 mm x 7.6 m.
- b. Horizontal runs of pipe 15 m in length shall be anchored to the supporting structure midway on the run to give allowances for equal expansion and contraction of pipes.
- c. Un and approved threaded connector shall be provided where required or connection and tapping for other types of hot and cold waterlines materials to main distribution lines and risers.

### **SECTION 11 : EXCAVATION, PIPE LAYING AND BACKFILLING**

#### A. EXCAVATION / TRENCHES

1. Trenches for all underground pipe lines shall be excavated to the required depths and grades. Bell holes shall be provided so that pipe will rest on well-tamped solid ground for its entire length. Where rock is encountered, excavation shall extend to a depth 150 mm below the pipe bottom and other approved filling materials.

##### 2. Materials

##### a. Pipe Laying

Do not lay damaged or defective pipe. Laying of pipe shall proceed upgrade beginning at lower end of the pipeline. Pipe shall not laid in water or when the trench condition or weather is unsuitable for such works. Remove water from trenches by sump pumping or other approved methods. Lay pipe to be established grade line. Orient perforat on the bottom half of the pipe. Lay bell and spigot or tongue and groove type pipe with the bell or groove end upstream. Obtain approval for pipe in place before backfilling.

- b. Jointing - Porous Concrete Pipes installed with mortar joints.
- c. Materials for backfilling shall be free of debris or big rocks. Backfill shall be placed in horizontal layers, properly moistened and compacted to an optimum density that will prevent excessive settlement and shrinkage.

**B. COMPACTION**

Compact each layer or lift of material specified so that the in-place density tested is not less than percentage of maximum density.

<b>TABLE 1</b>		
	<b>Percent ASTM D1557 Maximum Density</b>	
<b>FILL, EMBANKMENT and BACKFILL</b>	Cohesive Material	Cohesionless Material
General Fill and General backfill	85	90
Under sidewalks and grease areas	85	90
General Backfill and General Fill besides structures	90	95
Under Roadway, top 300 mm Sub- grade (Top of fill backfill or cut)	95	100
Under sidewalks to 300 mm	93	98

**C. CONCRETE PROTECTION**

All pipes layed and installed underground at 1.0 ft (300 mm) and below natural grade level shall be protected with Class B concrete casing, a minimum of 100 mm around the pipe perimeter and 250 mm below the finish grade.

C. FINISH OPERATION (SITE GRADING)

Grade to finish indicated within 30 mm grade areas to drain water away from structures and to provide suitable surfaces for moving machines. Existing grades which are to remain but are disturbed by the Contractor's operation shall be restored as specified herein.

**SECTION 12 : MISCELLANEOUS**

A. CLEANOUTS

Cleanouts shall be of the same size as the pipe, the location of which is extended to an easily accessible place.

B. TRAPS

1. Every plumbing fixtures of equipment requiring connect to the drainage system shall be equipped with a trap.
2. Each trap shall be placed as near as possible to the fixture. No fixture shall be double - trapped.

C. VALVES AND HOSE BIBBS

1. Valves shall be provided on all water supplies to fixtures as specified.
2. Hose bibbs shall be made of brass with 15 mm male inlet thread hexagon shoulders and 20 mm connect.

D. PIPE HANGERS INSERTS AND SUPPORTS

1. Horizontal runs of pipe shall be hung with adjustable wrought iron or malleable iron pipe hangers spaced not over 3 m apart, except hub and spigot soil pipes which shall have hangers spaced not over 1.52 m apart and located near the hub.
2. Hangers shall have short turn buckles or other approved means of adjustment.
3. Inserts shall be of cast steel and shall be of type to received machine bolt or nut after installation.
4. Vertical runs of pipes shall be supported by wrought iron clamps or collars spaced not more than 9 m apart.
5. Water and Vent Pipes - 65 mm and larger; band type 6.4 mm x 25 mm flat mild steel or black iron with 15 mm round rod with plates and nuts; 50 mm and smaller



split ring type with 10 mm iron rods with inserts plates; toggle bolts, clamps or expansion shield.

#### E. PIPES SLEEVES

1. Pipes sleeves shall be installed and properly secured in place at all points where pass through masonry or concrete.
2. Pipe sleeves shall be of sufficient diameter to provide approximately 6.1 mm clearance around the pipe of insulation.
3. Pipe sleeves in walls and partition shall be of cast iron, wrought iron or steel pipe. Pipes sleeves in concrete beams or concrete slabs shall be wrought iron or steel pipe.
4. Pipe sleeves on footings shall be cast iron or steel and shall be not less than 100 mm larger in diameter than the pipe to be installed.
5. Where pipes pass through waterproofing membrane, the sleeves shall be provided with an integral flange or clamping device to which a flashing shield can be soldered.
6. The space between the pipes and sleeves shall be made water tight by inserting and filling approved filler material and the remaining void space shall provided with approved fire rated sealer /or fire stopping materials thoroughly.

### **SECTION 13 : FIRESTOPPING MATERIALS**

#### A. MATERIALS

1. Firestop compounds and damning materials shall be UL listed and shall conform to the requirements of qualified designers or manufacturers approved modification, as supported by engineering reports.
2. The penetration seal materials must be unaffected by moisture and must maintain the integrity of the wall or floor assembly for its rated time period when tested in accordance with ASTM E814 (UL 1479). The system shall be UL listed classified for up to and including 3 hours.
3. Fire stopping materials shall be asbestos and lead free and shall not incorporate oil nor require the use of hazardous solvents.
4. All fire stopping materials shall be manufactured by one manufacturer thru out the completion of the project.
5. Do not proceed with installation of fire stop materials when temperatures exceeded the manufacturer recommendation limitat for installation.

#### B. PREPARAT

1. Clean subtrate of dirt, dust, grease, oil, loose materials, rust or other matter that may affect proper fittings or adhesion of the firestopping materials.
2. Clean metal and glass surfaces with a non-alcohol solvent.

### C. INSTALLATION

1. Installation of firestops shall be performed by an applicator / installer qualified and trained by the manufacturer. Installation be performed in strict accordance with manufacturer's detail installation procedures.
2. Apply firestops in accordance with fire test reports, fire resistance requirements, acceptable sample installation and manufacturer's recommendation.
3. Unless specified and approved all insulation used in conjunction with through penetration shall remain intact and undamaged and may not be removed.
4. Seal holes and penetration to ensure an effective smoke seal.
5. In areas of high traffic, protect firestopping materials from damaged. If the opening is large, install firestopping materials capable of supporting the weight of a human load.
6. Insulation types specified in other sect shall not be installed in lieu of firestopping materials specified herein.
7. All combustible penetrants (e.g. non-metallic or insulated metallic pipes) shall be firestopping using products and system tested in a configuration representative of the field condition.
8. When required to properly contain firestopping materials within opening, damming or packing materials may utilized. Combustible damming material must be move after appropriate curing. Non-combustible damming materials may be left as permanent components of the firestop system.

### D. CLEANING

1. Remove spilled and excess materials adjacent to firestopping without damaging adjacent surface.
2. Leave finished work in neat, clean condition with on evidence of spill over or damage to adjacent surfaces.

## **SECTION 14 : PLUMBING FIXTURES, FITTINGS, AND ACCESSORIES**

Refer to Architectural Specification.

## **SECTION 15 : PUMPS**

A. GENERAL

1. All equipment shall be supplied from reputable firms engaged in the manufacture of each particular item similar. The entire assembly as installed shall be given a start - up and test run to prove that all the specification have been met before acceptance by the Owner. The test duration shall be 24 hours. Submittal of the Certificate of Test to the Owners shall be a condition of payment.
2. The Specification herein stated are basic guide only. Other items not so indicated but which are obviously necessary for the proper operation of system as intended shall be supplied in accordance with accepted engineering standards.
3. The equipment shall be guaranteed for a period of at least one (1) year of trouble free operation. The supplier of equipment shall certify to the availability of spare parts locally and service in case of system breakdowns within a period of at least three (3) years. Manuals of operation and maintenance & lists of spare parts shall be supplied together with the equipment. Submittal of Warranty Certificate shall be on condition to the final payment.
4. The supplier shall submit at least two (2) copies of pumps performances curves showing among others, the pump rating and pump efficiency, properly marked thereon.
5. Accessories to be supplied for each group shall include one non- slam typecheck valve, and two (2) gate valves, of size equal to the size of pump discharge and suction and rated minimum of 300 psig for transfer pump and 150 psig forbooster pumps. Also, one pressure gauge for each set of pumps and pipe fittings necessary for complete installation shall provided. The pressure gauge shall be 100 mm face diameter and shall be reading from 0 psi (or 0 kg/cm) to 100 psi (or 7 kg/cm).
6. Price quoted shall include cost delivery of all quoted items to the jobsite. Pump and motor installation dimension drawings shall be submitted together with the quotation.
7. The brands, names and place of manufacture of pump, motor, valves, controls &all accessories where applicable shall be indicated in the quotation. Also, a description of pump impellers being offered shall be included.
8. A metal nameplate indicating in indelible letters the correct specification of the pump and motor shall be properly attached to the assembly at a location such that the information written thereon can be conveniently read by all concerned.
9. A separate price shall be quoted for installation work and preparation submittal of as installed drawings.

B. TRANSFER PUMPS (TP 4-6):

1. Number of Units : Three (3) units identical
2. Capacity : 90 GPM vs. 35 Ft. (TDH), 1.5 HP each.
3. Type : Shall be Vertical In-line or/ Horizontal Centrifugal Pump with electric motor on a common base (skid mounted type), suitable for pumping domestic

water supply, by positive suction from the water tank complete with valves, control and accessories.

4. Electric Motor Drive : 230V, 1-Phase, 60 cycles, 1750 rpm, open drip proof 1.5 HP.
5. Motor Controls : Reduced wye delta voltage magnetic starter, H-O-A switches, overload relays, and alternators.
6. Accessories : Vibration insulation at pump base, flexible connector /or victaulic coupling, y-strainer, non- slam type with opening and closing speed controls check valves, diaphragm type surge pressure relief valves, pressure gauges and gate valves at discharge lines, electrode type water level control at cistern or equal to prevent pumps from running dry and electrode type water level switch at elevated tank to pump's controller.

7. Operation :

The lead pump TP-1 shall fill the two (2) overhead water tanks to 50% of its storage capacity. As the water exceeds the mid water level, the level electrode shall send signal to the pump controller activating TP-2 to start. TP-1 and TP-2 shall run in tandem to fill the overhead tanks in 100% capacity, and TP-3 shall be on stand-by mode. When the water level reaches the high water level, the liquid electrode shall send signal to duty pump (TP-1 and TP-2) to stop.

On the next operation cycle, TP-2 shall operation to fill at 50% capacity and TP-3 shall operation as the water exceeds the mid water level to fill at 100% capacity, and TP-1 shall be on stand-by mode. The operation cycle is intended to avoid wear and tear of the pumping equipment.

C. BOOSTER PUMPS (BP 4-6):

1. Numbers of Units: Three (3) units identical

1.1 System Requirements:

- |            |                                  |
|------------|----------------------------------|
| Pump No. 1 | : 50 GPM vs. 125 FT. TDH, 2.5 HP |
| Pump No. 2 | : 50 GPM vs. 125 FT. TDH, 2.5 HP |
| Pump No. 3 | : 50 GPM vs. 125 FT. TDH, 2.5 HP |

2. Type of Pump: The pump and motor shall be horizontal end suction type / vertical in-line, closed or flexi-coupled to the electric motor, or a common base (skid mounted type).

3. Electric Motor Drive : shall be variable speed motor for variable frequency drive operation, 230 volts, 1-phase, 60 cycles.
4. Motor Controls : There shall be factory wired and programmed UL labeled panel with NEMA I enclosure. Components within the panel shall include; molded case circuit breaker per motor, magnetic starters with three-coil thermal overload protection, H-O-A switches, one control circuit protection thermal detection test button, control circuit relays, standby pumps relay, flow switch indicating light, pump failure light, duty pump reset & pump alternator components mounted in gauge, one suction-pressure gauge & two discharge pressure gauge. The relovermeter flow switch shall be factory mounted for approval prior to installation.
5. Operation :

Automatic Start/Stop operation through alarm signal from hydropneumatic tank pressure switch. BP-1 shall handle the demand load of 0-50%. BP-2 shall operation the demand load exceeded 50%. BP-1 and BP-2 shall run in tandem to supply 50-100% demand, and BP-3 shall be on stand-by mode.

On the next operationing cycle, BP-2 will operation to handle 0-50% of the demand, and BP-3 shall operation as the demand load exceeded 50% to supply up to 100% demand, and BP-1 shall be on stand-by mode.

The operationing cycle is intended to avoid wear and tear of the pumpingquipment.

A 38 mm Auxiliary Control Valve shall be furnished with 250 lbs., ASA screwed connection for each pump. The pressure reducing and non-slam check type with adjustable flow control device for modulating valve action at flows; have a cast iron body with bronze trim; have a range adjustment suitable to the system and be present by the manufacturer for the desired system pressure.

A thermal sensing and thermal purge system detector shall be furnished to prevent overheating of the pump. The thermal purge mounting in the discharge line between the pumps and the control valve. Either temperature switch shall automatically open the purge valve at approximately 1000 F and purge the pump of all warm water. Upon sufficient pipe in temperature, the temperature switch shall be connected through the control and operation of the purge valve. The purge valve shall be screwed connect and designed for 400 volts, 60 hertz, A.C. operation.

The system shall also be furnished with an automatically start to provide water at constant pressure.

6. Accessories: Vibration insulating hose connect at suction and discharge line, electrode type water level control or equal to prevent pumps from running dry.

**D. EMERGENCY SUMP PUMP (SP 1-3):**

1. Number of Units : One (1) set Triplex Pump
2. Capacity of Pump : 140 GPM vs. 40 FT. (TDH), 3 to 5 HP.
3. Type : The pumps shall be submersible non-clog cutter type.
4. Mounting : Submersible, inside sump pit located at ground floor parking as shown on plans.
5. Electric Motor : 480 Volts, 3-phase, 60 hertz, 3 to 5 HP.
6. Motor Controls : Weather proof full voltage magnetic starter, H-level controls, relays and alternators, for operation and to alternate the service and start the second pump if pump cannot handle the load, soft start and stop. O-A switches, float liquid overload current automatic pumps in one
7. Accessories : Access manhole, guide rails, lifting chains, Flexible connector /or coupling, swing type victaulic check valves, gate valves at discharge lines, electrode type water level control or equal to starts and stops pumps alternately and run simultaneously in case of high water level and trigger emergency alarm in case excessive high water level occur.

**SECTION 16 : WATER RESERVOIR**

**A. DOMESTIC WATER TANK**

1. Specification and requirements

storage structural details.

a. Fiberglass Reinforced Plastic (FRP) modular domestic water tank, refer to Structural Consultant Engineer for

required

b. Furnish necessary piping and equipment and perform all labor for the satisfactory completion of the system.

c. Domestic water storage tank capacity;

Domestic

Water Tank = 19,300 U.S. Gallons

Two (2) compartments

Location : Ground Floor Pumproom

d. All structural design analysis shall conform to the latest Building Codes and National Structural Codes for Building (NSCB) or refer to the Structural Consultant Engineer.

2. Pippings, Fittings. And Miscellaneous metal works

a. Furnish and install all pipes fittings, valves, specials, pipe supports, miscellaneous metal work and all required appurtenances. All materials installed shall be stainless steel unless otherwise noted and a product of a reputable Manufacturer all through out the project and shall be installed as shown on the plans complete with its accessories for the satisfactory completion of the entire system.

guaranteed free workmanship.

b. All materials furnished and installed shall be new and from defect in design, materials and

pipes, injury during

c. Adequate protective measures shall be provided to protect fittings, valves and all other materials from damage or storage and installation.

3. Flanges, Gaskets and Bolts

through out conform in dimens

a. Flanges shall be a product of a reputable Manufacturer all the Project. Material shall be stainless steel and and drilling to ASA B-16.1 Class 125.

through

b. Gaskets shall be a product of a reputable Manufacturer all out the project.

hot,  
1.1, coarse

c. Bolts shall be standard square head machine bolts with heavy, pressed hexagon nuts. Threads shall conform to ASA B-thread series, Class 2 fit.

4. Manholes, Frames and Cover

a. All casting for manhole frames shall be a product of a reputable Manufacturer all through out the Project. Material shall be stainless steel free from warps, cracks, holes, swells and cold shuts and approximately 3 mm thick.

b. All casting shall conform to the requirements of AWWA-D-100-67 or approved equal standard requirements.

5. Ladder Rungs

a. Ladder Rungs shall be a product of a reputable Manufacturer's all through out the project. Material shall be of 20 mm diameter round stainless steel bar mounted on the walls or as shown on drawings or as specified.

B. INSTALLATION

1. All pipes shall be carefully placed and supported at the proper lines and grade draining. where possible shall be sloped to permit complete

2. Piping runs shown on Drawing shall be followed as closely as possible, except and/or structural subjected to the for minor adjustments to avoid adverse-effect on architectural features. If major relocation are required, they shall be approval of the Architect.

3. Carefully inspect all pipe and fittings before installation. Inspection of pipe shall include light tapping with a hammer to detect cracks of defects. No pipe fittings or valves which are cracked or shown defects shall be used.

4. Piping shall be properly supported by suitable anchors, brackets, or hangers. Vertical pipes shall be anchored by suitable galvanized steel straps. Pipe supports shall be provided as shown on the Plans and whenever else necessary to prevent stain on joints or to facilitate taking down pipe.



5. Piping through the Walls - Where the pipe pass through walls, care shall be exercised to insure this joints are watertight.

C. TEST FOR WATER

1. Tightness of Completed Tank - The completed reinforced concrete ground and elevationed water tanks shall be tested for water-tightness by filling it up with clean water after cleaning out all dirt and debris inside the tank. The water shall be allowed to stand for a minimum period of twenty four (24) hours reckoned from the time the free -board line was reached during filling up. After the 24 hours period there shall be no drop in water level in the tank more than 40 mm, otherwise, the leaks shall be located and plugged properly and test for water - tightness be repeated.

D. DEFECTIVE WORK

1. If the inspection or test shows any defect, such defective work or material shall be replaced and the test shall be repeated until satisfactory to the Owner.

2. All repairs to piping shall be made with new material at the expense of the Contractor.

3. No caulking of screwed joints of holes will be accepted.

E. TEST CERTIFICATE

Test Certificate shall be filled out and signed by the Owner's representative.

**SECTION 17 : CENTRAL OIL INTERCEPTOR (FOR GENSET ROOM)**

A. Furnish and install where indicated on the drawing. Central oil interceptor shall be complete with oil interceptor system, venting system, intake and discharge piping, test and suction line, oil storage tank and all fittings and accessories necessary for complete oil intercepting system, ready for use.

B. The oil interceptor for Genset shall be reinforced concrete construction with inlet and outlet size shall be both 100 mmØ.

**SECTION 18 : CENTRAL GREASE INTERCEPTORS**

A. Furnish and install where indicated on the drawing. Central grease interceptor shall be complete with grease interceptor system, venting system, intake and discharge piping, test and suction line, grease storage tank and all fittings and accessories necessary for complete grease intercepting system, ready for use.

B. The grease interceptor shall be reinforced concrete construction with a flow rate capacity of 1,000 gals/day. Inlet and outlet size shall be both 150 mmØ.

**SECTION 19 : WATER HEATERS**

A. Type of Water Heater

1. Instantaneous Single-point electric water heater (EWH) specified herein shall be rated at 230 volts, single phase, 3.5 kW as specified on drawings.

B. A metal name plate indicating indelible letters of the correct specification and/or standard catalog product of the water heater and the reputable manufacturer brand name shall be properly attached to the assembly at a location such that the information written thereon can be conveniently read by all concerned.

C. Accessories: stainless steel all bracket support check valve relief valve, union patentee gate valve and drain valve.

**SECTION 20 : SITE PLUMBING UTILITIES**

A. GENERAL

1. The entire site plumbing utilities system shall be laid out and installed consistent throughout with the given slopes in the plans. Pipe joints and connect to area drains, catch basin and junction boxes shall possess such leak proof and seepage proof integrity achievable with the works called for under this particular section of the Specification.

- the  
cast
2. Junction Boxes for storms and sanitary (sewer) drainage lines outside building shall be cast-in place reinforced concrete sect and pre-concrete cover.
- trenching
3. Trench excavation and backfilling shall be as specified in excavation, and backfilling for utility system.
4. Exterior Drainage Pipe
- a. Installation:
- shaped thru
- Bedding surfaces shall provide a firm foundation, carefully to line and grade.

**B. EXCAVATION FOR STORM AND SANITARY (SEWER DRAINAGE SYSTEM)**

1. General: The Contractor shall do all excavation of whatever substances encountered below depth shown on drawings. Excavated materials not required for fill or backfill shall be removed of by the Contractor. Excavation for accessories to have 300 mm minimum and 60 mm maximum clearance in all side. Excavation shall not carried below the required depth. Excess excavation below required level shall be backfilled at the Contractor's expense with earth, sand, gravel, or concrete, as directed by Engineer, and thoroughly tamped unstable soil shall be removed and replaced with gravel or crushed stone, which shall be thoroughly tamped.

The Engineer shall determine the depth of removal of unstable soil. Ground adjacent to all excavation shall be graded to prevent water running. The Contractor shall remove by pumping or other means approved by the Engineer any water accumulated in excavation and keep trench unwatered until the bedding is complete.

2. Trench Excavation: Banks of trenches shall be vertical. Soft materials shall be reported to the Engineer. In rock, excavation shall be carried 200 mm below bottom of pipe. Loose earth or gravel shall be used for backfill, and tamped thoroughly and rounded to received pipe as above.

3. Rock Excavation: Rock excavation shall include removal of boulders larger than 1/2 m<sup>3</sup> in volume and ledge rock concrete or masonry

structures that required  
concrete.

drilling in volume and ledge rock

4. Bracing and Shoring: The Contractor shall do all bracing sheathing and shoring necessary to perform and protect all excavation as indicated on the plans, as required for safety, as directed by the Engineer, or to conform to governing laws.

#### C. TESTING

Test: Test for workmanship on utility lines shall be conducted in accordance with the applicable utility specification before backfilling.

#### D. BACKFILLING

1. Backfilling: After pipes have been tested and approved, backfilling shall be done with approved material free for large clods or stones.

a. Trenches Backfill material; shall be placed evenly and carefully around and over pipe in 150 mm maximum layers. Each layer shall be thoroughly and carefully tamped until 300 mm of cover exists over pipe. The remainder of backfill material shall be placed, moistened and compacted. Water settling will not be permitted in clay soils. it may be required at the option of the Engineer in sandy soils.

b. Trench under areas to be paved; Material shall be placed in 200 mm maximum layer after filling 300 mm above pipe as previously described. Each layer shall be compacted to density equal to that of adjacent original material so that pavement can be placed immediately.

c. Structures; All forms, trash, and debris shall be removed and cleared away. Approved backfill material may be from excavation or borrow, it shall be free form rock, lumber or debris. Backfill material shall be placed symmetrically on all side in eight inch maximum layers. Each layer shall be moistened and compacted with mechanical or brand tampers. In area to be paved, each layer shall be compacted to density equal to that of adjacent materials so that pavement can be placed immediately.

2. Maintenance: The Contractor shall refill for settlement of all backfilled areas.

3. Clean-up: The Contractor shall clean-up and dispose of all excess materials, trash wood forms and other debris.

## **SECTION 21 : TESTING AND DISINFECT**

### **A. DRAINAGE SYSTEM TEST**

1. The entire sewer, waste and storm drainage and venting systems shall have all necessary openings which can be plugged to permit the entire system to be filled with water to the level of the highest stack vent/or vent stack above the roof.

2. The system shall hold this water for a full sixty (60) minutes during which time there shall be no drop more than 100 mm.

3. Each section of pipeline shall be slowly be filled with water and the specified test pressure, measured at the point of lowest elevationion shall be supplied by means of satisfactory to the Engineers. During the filling of the pipe in and before applying the test pressure, all air shall be expelled from the pipe line. To accomplish this type shall be made, if necessary, at point of highest elevation, and after completion of the test the taps shall be tightly plugged unless otherwise specified.

During the test; all expose pipes, fittings, valves joints and couplings will be carefully examined. If found to be cracked or detective, they shall be removed and replaced by the contractor with sound materials at his own expense. The test shall be repeated until satisfactory results have been obtained.

### **B. PRESSURE TESTS FOR WATER LINES**

1. After the pipe have been installed, the joints completed and with joints exposed for examination, all newly installed pipe or any valve section therefore, shall be subjected to hydrostatic pressure 1 ½ the designed working pressure of the system or as specified by the Engineer.

2. The duration of each pressure test shall be at least two (2) hours unless otherwise specified by the Engineer.

3. Each section of pipeline shall be slowly filled water and the specified test pressure, measured at the point of lowest elevationion, shall be applied by means of a pump connected to the pipe in a manner

satisfactory to the Engineer. During the filling of the pipe and before applying the test pressure, all air shall be expelled from the pipe line. To accomplish this type shall be made, if necessary, at point of highest elevation, and after completion of the test the taps shall be tightly plugged unless otherwise specified. During the test, all exposed pipes, fittings, valves, joints and couplings will be carefully examined. If found to be cracked or defective, they shall be removed and replaced by the Contractor with sound materials at his expense. The test shall then be repeated until satisfactory results are obtained.

### C. DEFECTIVE WORK

1. If the inspection or test shows any defect, such defective work or material shall be replaced and the test shall be repeated until satisfactory to the Architect /or Engineer.
2. All repairs to piping shall be made with new material at the expense of the contractor.
3. No caulking of screwed joints of holes will be accepted.

### D. DISINFECTION OF WATER DISTRIBUTION SYSTEM AND WATER TANKS (as per AWWA C-601)

1. The entire water system shall be thoroughly flushed and disinfected with chlorine before it is placed on operation. Water tanks shall be washed and swabbed.
2. Chlorination materials shall be liquid chlorine or hypochlorite, as specified and shall be introduced into the water line in a manner approved by the Engineer. Tanks shall be thoroughly cleaned of all debris, dirt or dust before swabbing.
3. The chlorine dosage shall be such as to provide not less than fifty parts per million (50 PPM) or available chlorine.
4. Following a contact period of not less than sixteen (16) hours, the heavily chlorinated water shall be flushed from the system with clean water until the residual chlorine content is not greater than two tenths (.20 PPM). All valves in water lines being sterilized shall be opened and closed several times during the sixteen (16) hour chlorinating period.

**SECTION 22 : CLEANING**

- A. All exposed metal surface shall be free of grease dirt or other foreign materials.
- B. Chrome or nickel plated pipings, fittings and trimmings shall be polished upon completion.
- C. All plumbing fixtures shall be properly protected from use and damage during the construction stage. The fixtures shall be cleaned to the satisfaction of the Architect /or Engineer upon completion and prior to acceptance of work.
- D. All equipment, pipes, valves and fittings shall be cleaned of grease and sludge which may have accumulated. Any clogging, discoloration or damage to other parts of the building due to the system shall be repaired by the Contractor.

**SECTION 23 : PAINTING AND PROTECT**

- A. All exterior of pipings to be installed in or through concrete floor fill or fill floors and underground shall be given one coat of acid resisting paint having a bituminous base.
- B. Pipe hanger supports an all other iron work in concealed spaces shall be painted with one coat of asphalt.
- C. Exposed galvanized iron pipes and fittings that are asphalt coated shall be given two coats of shellac prior to application of two coats of all paint as directed by the Architect of his authorized representative.

**SECTION 24 : COLOR CODE FOR EXPOSED PIPES**

- A. All exposed pipings shall be adequately and durably identified by distinctive colored paints as follows:

<b>ITEM</b>	<b>COLOR CODE</b>
-------------	-------------------

O.C.	Cold water pipe	Blue
	Hot water pipe	Blue w/red band @1.0m
	Storm water pipe	Aluminum
	Sewage pipe	Black
	Vent pipe	Green
	Waste pipe	Gray
	FCU/AHU drain pipe	Gray w/white band @1.0m O.C.

**SECTION 25 : WARRANTY AND “AS-BUILT” PLANS**

- A. All works, equipment and fixtures shall be guaranteed by the Contractor for satisfactory service for a minimum period for one (1) year.
- B. The Contractor shall submit to the Owner, in reproducible form plus three (3) sets of white prints, the complete plans of the entire system as actually built. The cost of those shall be borne by the Contractor. Submittal of “AS-BUILT” Plans shall be a condition to final payment.
- C. Equipment that should have the Owner (s) your minimum guaranteed against defective designs, materials and workmanship.

**SECTION 26 : RESPONSIBILITY**

- A. The Contractor’s shall provide temporary fire protection system during the construction period. This shall be of sufficient capacity to put any fire that may break out due to construction operation. This is in addition to temporary fire extinguisher required.
- B. The Contractor’s shall identify and save the Owner, the Architect and the Consulting Engineer Harmless from and against all liabilities for damage to property occasioned by any or omission of this Contractor’s expenses, legal or otherwise which may be insured by the Owner, the Architect or the Consulting Engineer, in the defense of any claims, action or suits.
- C. The General Contractor shall be responsible for the coordination among the different trades on the jobsite in order to finish the Works in the least possible time, in strict compliance and in accordance with the Plans and Specification.



D. Throughout the construction period open ends of all installed drainage, sewer and vents lines, water lines and other related pipings shall be kept closed by temporary plugs.

E. All installed drainage, sewer and vents lines, water lines and other related pipings shall not be used to conduct dirty construction wash water especially those with cement mixes to avoid possible clogging.

F. A temporary potable water supply shall be made available to construction workers as construction progresses.

G. A temporary human excreta disposal system shall be provided by the Contractor to serve the Workers during the construction period.

End of Specification

## **STRUCTURAL SPECIFICATION**

### **GENERAL REQUIREMENTS:**

#### **A. DRAWINGS AND SPECIFICATION**

The Drawings and Specification are meant to be complementary to each other and what is called for by one shall be called for by both.

Any apparent conflict between the Drawings and Specification and any controversial or unclear points in either shall be referred to the Electrical Engineer in Charge for final decision. On the plans, keep records showing all deviat occurring during construction. At the completion of the work, said copy of the plans shall be submitted to the LGU for its copy and file.

Upon completion of work as described herein the Contractor shall furnish the Owner, at his own expense, Five (5) copies of the "AS BUILT" plans for future reference and maintenance purposes.

#### **B. CORRELATION OF WORK**

The Structural Contractor shall coordinate with the General Contractor and the LGU/Owner to determine how and where his work fits with that of other crafts,

after familiarizing himself with the plans and specification. This shall be done at the beginning of construction. Should there be any existing doubt at any point, a ruling shall be secured from the LGU/Owner and shall be given time to inspect the work covering this point and to prepare a detail in the form of Drawings and written instruct as required.

C. EXAMINATION OF PREMISES

Perspective bidder is required to examine the Architectural, Structural, Mechanical and Electrical Plans of the Project, to visit the site and carefully take note all the condition thereat and to have informed himself thoroughly under which the electrical work is to be done. No allowance shall subsequently be made in his behalf because of any error on his part. He will be deemed to have done this before submitting his proposal and no subsequent claim on the ground of inadequate or inaccurate information will be entertained.

D. MATERIALS AND WORKMANSHIP

All materials to be installed shall be unused, brand new and shall conform to the applicable standards.

Only skilled workmen using proper tools and equipment shall be employed during the entire course of installation work. All workmanship shall be of the best quality and all work shall be done in accordance with the best practices of the trade involved.

The same job foremen shall be assigned and maintained at the job site during the entire course of the job.

METHODS OF MEASUREMENTS

The Subproject Manager shall in accordance with the dimension in the plan or as otherwise direct the measurement of completed work. The quantities to be paid for under this section shall be measured as follows:

The volume to be paid for under this item shall be the number of cubic meters of concrete placed and accepted. Payment for concrete shall be construed to include the cost of forms, falseworks, curing, fasteners and accessories necessary to complete this item of work.

The quantities for reinforcing steel to be paid for shall be deemed to be included in the final quantity of concrete placed and accepted in the completed structure. No allowance will be given for tie wires separators, wire chairs and other materials used in fastening the reinforcing steel in place. No measurement for

payment shall be made for splices added by the Contractor for his convenience. Payment for the accepted quantities for reinforcing steel shall be deemed to include the cost of tie wires, separators, wire, supports, hangers, chairs and other materials necessary to complete the work.

The quantities measured as provided above shall be paid for at the contract price for each of the pay item, which price and payment shall be full compensation for furnishing and placing all materials, labor, equipment, tools and incidentals necessary to complete the work.

## **SECTION 1 : EARTHWORK**

### **1.1 SCOPE OF WORK**

The work to be undertaken under this section shall the furnishing of all labor, equipment and materials and performing all operation in connection with the excavation and the removal from the site of all surplus excavated materials and debris, in strict accordance with the requirements of the drawings, or as specified herein.

### **1.2 STAKES AND BATTER BOARDS**

1.2.1 The Contractor shall stake out the building accurately and shall establish grades, after which the approval by the Owner or the Project Manager shall be secured before any excavation work is commenced.

1.2.2 Basic batter boards and basic reference marks as directed by the Project Manager shall be erected at such places where they will not be disturbed during construction.

### **1.3 EXCAVATION**

1.3.1 All excavation shall be unclassified and shall include clay, silt, sand, gravel, hardpan, loose shale, loose stone in masses and any other materials of any character found within the excavation area.

1.3.2 The Contractor shall make the necessary excavation for foundation to lines and grades indicated in the drawings. Structural excavation shall be to be depths indicated, reckoned either from the natural ground line or the finished grade, whichever is lower. The indicated depth is the minimum requirement for excavation. However, if in the opinion of the Engineer, the soil bearing pressure not attained at the indicated depth, the Contractor shall extend the excavation until the required soil bearing pressure is obtained. All excavation extended down to two (2) feet or less from the indicated depths shall be at the Contractor's

expense. Excavation in excess of the two (2) feet limit shall be considered as extra work, whereby equitable adjustment in the contract price shall be made on the unit bid price of the item involved. No extra excavation shall be done w/o the written approval of the Engineer. In no case shall footings rest on fill.

- 1.3.3 Machine foundat shall rest on compacted base coarse conforming to the requirements of DPWH StandardSpecification, 2004 or as per details indicated on the plans and specification.
- 1.3.4 Where concrete for walls, or footings is to be placed without forms, trench sides shall be sharp and true.
- 1.3.5 If soil condition necessitates installation of side forms, all structural excavation shall be to a sufficient distance from walls and footings to allow for the proper erection and dismantling of forms, installation of service lines and for inspection.
- 1.3.6 In case suitable materials are encountered at elevation other than those specified or shown in the drawings, the Engineer at his discretion may direct in writing the variation of excavation depth above or below those indicated in the drawings. All excavation shall be inspected and approved by the Engineer or his representative before pouring any concrete, laying underground services or placing back fill materials.
- 1.3.7 The Contractor shall control the grading in the vicinity of all excavated areas to prevent surface drainage running into excavation. Adequate provision shall be made for the prompt removal of water accumulated from any source whatsoever in the excavated port of the site by the installation of adequate pumping facilitates during the entire course of the Contract. Water which accumulates in excavated areas shall be removed before filling or pouring concrete.
- 1.3.8 Shoring and sheet piling, if required during excavation to protect banks, adjacent paving, structures and utilities shall be installed by the Contractor. Sketches of proposed shoring shall be submitted for approval to the Project Manager and no shoring work shall proceed until the Project Manager has granted approval of such sketches. Approval by the Project Manager, however, shall not be construed as to relieve the Contractor of the responsibility for the adequacy of the shoring and sheeting. It shall be the responsibility of the Contractor to ensure that the adjacent properties are not in any way damaged by these excavation. It shall be the Contractor's responsibility to repair any damage and/or compensate the owner of the adjacent properties should they suffer any damage what so ever.
- 1.3.9 Trenches excavation for utilities shall be along the alignments and grade indicated on the drawings. Width of trenches shall be adequate to permit proper installation of utility lines. Where rock or any undesirable materials are encountered, it shall be removed to a depth of not less than 6 inches below trench bottom and the space filled with select material tamped and graded until uniformity is obtained.

- 1.3.10 Excavation for underground tanks, manholes and other similar structures shall be sufficient to leave between their outer surfaces and the embankment or shoring which may be used. Whenever unsuitable soil that is incapable of supporting the structure is encountered at the bottom of the excavation, such soil shall be removed to the depth necessary to obtain proper bearing. Unauthorized over excavation in unsuitable soil shall be filled with specified back fill materials to be supplied at the contractor's cost.

#### 1.4 BACKFILLING AND GRADING

- 1.4.1 After the forms have been removed from the footings, piers, foundation walls, etc., and when the concrete is hard enough to resist pressure from resulting fill, all trash, wood chips and other debris shall be removed from areas to be back filled.
- 1.4.2 No back fill shall be placed until proper inspection and authorization has been obtained from the Engineer. Trenches shall not be back filled until lines have been tested and approved by the Engineer.
- 1.4.3 Back fill materials shall consist of approved materials and shall be free from brush, roots, adobe and other undesirable materials which would be detrimental to compaction requirements. The material from excavation may be used for back filling provided they are of approved granular materials.
- 1.4.4 Before placing fill materials, the surface upon which it will be placed shall be cleared of all bushes, roots, vegetable matters and debris, scarified and thoroughly wetted to insure good bonding between the ground and the fill materials. Fill in contact with the new concrete work shall not be placed until at least 48 hours after removal of forms, or as directed by the Engineer.
- 1.4.5 The filling shall be placed in horizontal layers not exceeding 200 mm in thickness, each layer being thoroughly compacted and rammed by wetting, tamping or rolling until at least 95% of maximum density at optimum moisture as the determined by modified AASTHO method is reached.
- 1.4.6 The Contractor shall fill and grade the whole area around the structure to the indicated sub-grade elevation as directed by the Engineer. The contractor shall verify the finish grade elevation of the proposed pavements around the structure. Prior to grading operation, the area shall be cleared of all heavy growth of vegetation stumps, roots, cables, wires, rocks and other debris. The finished sub-grade shall be reasonably smooth and compacted and ready to receive the base course for the proposed pavements.

#### 1.5 DEMOLITION AND DISPOSITION

All obstruction shall be demolished as specified by the Engineer. All existing structures which need to be demolished and visible through ocular inspection shall be conducted at the expense of the Contractor following safe procedures approved by the Engineer. Underground structures which are predetermined through available plans or record shall likewise be conducted at the expense of the Contractor.

## 1.6 DISPOSAL OF EXCESS MATERIALS

Any excess material resulting from the finish grading and demolition operation, not required or unsuitable for fill or back fill shall be disposed by the Contractor at his expense.

## **SECTION 2 : REINFORCED CONCRETE**

### 2.1 SCOPE OF WORK

2.1.1 The work to be undertaken under this section shall comprise the furnishing of all labor, materials, equipment, plant and other facilities and the satisfactory performance of all work necessary to complete all concrete works indicated on the drawings and specified herein.

2.1.2 Unless otherwise indicated on the drawings or specified herein, all concrete work shall be done in accordance with the "SPECIFICATION FOR CONCRETE AND REINFORCED CONCRETE" as adopted by the National Structural Codes for Buildings, latest edition, and the current American Concrete Institute's "BUILDING CODE REQUIREMENTS FOR REINFORCED CONCRETE" (ACI-318-89) insofar as they do not conflict, or are not inconsistent with the specified provision herein.

### 2.2 MATERIAL

2.2.1 Cement: Portland Cement shall conform to the "SPECIFICATION FOR PORTLAND CEMENT" (ASTM C150 Latest Revision) for Type I Portland Cement.

2.2.2 Admixture: Admixture to be used in concrete, when required or permitted shall conform to the "SPECIFICATION FOR CHEMICALS ADMIXTURES FOR CONCRETE" (ASTM C494) for water-reducing, retarding and accelerating admixture or to the SPECIFICATION FOR FLY ASH AND RAW OR CALCINED NATURAL POZZOLANS FOR USE IN PORTLAND CEMENT (ASTM C618) for Pozzolan admixtures.

- 2.2.3 Concrete Aggregates: Concrete aggregates shall be well graded, clean, hard particles of gravel, or crushed rock conforming to the "SPECIFICATION FOR CONCRETE AGGREGATES" (ASTM -C33 Latest Revision).
- 2.2.4 Water: Mixing water for concrete shall be free, clean and free from injurious amount of oil, acids, alkali, organic materials or other substances that maybe deleterious to concrete or steel.
- 2.2.5 Storage of Materials:
1. Cement shall be stored in weather tight buildings, bins, or silos which will exclude moisture and contaminants.
  2. Aggregate stockpiles shall be arranged and used in a manner to avoid excessive segregation and to prevent contamination with other materials or with other sizes of like aggregates. To ensure that this condition is meet, any test for determining conformance to requirements for cleanliness and grading shall be performed on samples secured from the aggregates at the point of batching.
  3. Natural or manufactured sand shall be allowed to drain until had reached a relatively uniform moisture content before it is used.
  4. Admixture shall be stored in such a manner as to avoid contamination evaporation, or danger. For those use in the form of suspension or non-stable solut, agitating equipment shall be provided to assure thorough distribution of the ingredients. Liquid admixture shall be protected from freezing and from temperature changes which would adversely affect their characteristics.

## 2.3 PROPORTIONING

- 2.3.1 General: Concrete for all parts of the work shall be of the specified quality capable of being placed without excessive segregation.
- 2.3.2 Strength: The specified compressive strength of the concrete for each portion of the structure shall be as tabulated on S-1 of the construction drawings.
- 2.3.3 Durability:
1. Concrete of normal for port of structures to be Water tight shall have a water-cement ration not exceeding 0.48.
  2. For pre-stressed concrete, it shall be demonstrated by test that the mixing water of the concrete including that contributed by the aggregates and any admixture used, will not contain a deleterious amount of chloride ion.
- 2.3.4 Slump: Unless otherwise permitted in specified the concrete shall be proportional to have following maximum slump.

100 mm for  $f_c' = 21$  MPa or less

75 mm for  $f_c' = 28$  MPa to 35 MPa

50 mm for  $f_c' > 35$  MPa but not more than 42 MPa

A tolerance of up to 25mm above the indicated maximum shall be allowed for individual batches provided the average for all batches or the most recent 10 batches tested, whichever is fewer, does not exceed the maximum limit. Concrete of lower than usual slump may be used provided it is properly placed and consolidated. The slump shall be determined by the "TEST FOR SLUMP OR PORTLAND CEMENT" (ASTM C143).

2.3.5 Maximum size of concrete aggregates: The nominal size of the aggregates shall not be more than the following:

25 mm $\emptyset$  for footing and tie beams

20 mm $\emptyset$  for slabs, beams, and columns

2.3.6 Admixtures: If required or permitted, admixtures used shall be subject to the following limitat:

1. The amount of calcium chloride shall not exceed 2% by weight of cement.
2. All admixtures shall be used in accordance with the manufacturer's instruct except as otherwise specified herein.

2.3.7 Selection of Proport: The proport of ingredients shall be such as to produce a mixture which will work readily into the corners and angles of the firms and around reinforcements by the methods of placing and consolidation employed on the work, but without permitting the materials to segregate in excessive free water to collect on the surface.

The proport of ingredients shall be selected to produce the proper placeability, durability strength and other required properties.

To method of measuring concrete materials shall be such that the proport can be accurately controlled and checked at any time during the work. Measurements of materials for ready mixed concrete shall conform to the "STANDARD SPECIFICATION FOR READY MIXED CONCRETE (ASTM C194, Latest Revision) above applicable.

2.3.8 Method of Determination Concrete Strength:

The Contractor shall submit design mixes from sample made in accordance with 'STANDARD METHOD OF MAKING AND CURING CONCRETE COMPRESSION AND FLEXURE TEST SPECIMENS IN THE LABORATORY" (ASTM C192, Latest Revision) for each strength required, stating the proposed slump and the proportional weight of cement, saturated surface-dry aggregates and water.

Sample shall be tested after 7, 14, and 28 days.



## 2.4 FORMWORKS

2.4.1 General: Forms shall be used wherever necessary to confine the concrete and shape it to the required dimensions. Forms shall have sufficient strength to withstand the pressure resulting from placement and vibration of the concrete, and shall have sufficient rigidity to maintain specified tolerances.

Earth cuts not be used as forms for vertical surfaces unless required or permitted.

2.4.2 Design and Installation of Formworks:

1. The design and engineering of the formworks, as well as its construction, shall be the responsibility of the Contractor.
2. The formwork shall be designed for the loads, lateral pressure and allowable stresses outlined in the "RECOMMENDED PRACTICE FOR CONCRETE FORMWORK (ACI 347)" and for design consideration, wind load, allowable stresses and other applicable requirements of the local building code.
3. Forms shall be sufficiently tight to prevent loss of mortar from the concrete.
4. To maintain specified tolerances, the formwork shall be cambered to compensate for anticipated deflection in the formworks prior to hardening of concrete.
5. Temporary openings shall be provided at the base of column forms and wall forms and at other points where necessary to facilitate cleaning and observation immediately before concrete is placed.
6. Form accessories to be partially or wholly embedded in the concrete such as ties and hangers shall be of commercially manufactured type.

Form ties shall be constructed so that the ends or end fasteners can be removed without causing appreciable spalling at faces of concrete.

After the ends or end fasteners of form ties have

been removed, the embedded portion of the ties shall terminate not less than 2 diameters or twice the minimum dimension of the tie from the form surfaces of concrete to be permanently exposed to view except that in no case shall this distance be less than 20 mm. When the formed face of concrete is not permanently exposed to view, form ties may be cut-off flush with formed surfaces.

7. At construction joints, contact surface of the form sheathing for flush surfaces exposed to view shall overlap the hardened concrete in the previous placement by not more than 25 mm. The forms shall be held against the hardened concrete to

prevent offsets or loss of mortar at the construction joint and to maintain a true surface.

8. Formworks shall be so anchored to shore or other supporting surfaces or members that upward or lateral movement of any part of the formwork system during concrete placement is prevented.
9. All formworks shall be made of sheet metal or “Penolic Board” and supported by steel acrow post or equivalent.

2.4.3 Tolerances: Unless otherwise specified, formwork shall be constructed so that the concrete surfaces shall conform to the following tolerance limits

1. Variation from plumb
  - a. In the lines and surface of columns and walls.

In any 3 meters in length	-	6 mm
In any story of 6.0 m max	-	10 mm
In 12.0 meters or more	-	12 mm
2. Variation from the level or from the grades indicated on the drawings
  - a. In slab soffits, coding, beam soffit and in arises (measured before removal of supporting shows)

In any 3.0 length	-	6 mm
In any bay or in any 6.0 meter length	-	10 mm
Max for the entire length	-	20 mm
  - b. For exposed lintels, sills, parapets, horizontal, grooves, and other conspicuous line.

In any bay of 6.0 m (max)	-	6 mm
Max. for the entire length	-	12 mm
3. Variat of the linear building lines from established position in plan and related position of columns, walls and partition.

In any bay	-	6 mm
In any 6.0 meter of length	-	6 mm
Max. for the entire length	-	25 mm
4. Variation in the size and location of sleeves floors openings and wall openings - 6 mm
5. Variat in cross sectional dimens of columns, beams, and thickness of slab and walls.

Minus	-	6 mm
-------	---	------

	Plus	-	12 mm
6.	Footings		
	A.	Variation in dimension in plan	
		Minus	- 12 mm
		Plus	- 50 mm
	B.	Misplacement or eccentricity:	
		Two (2) percent of the footing width in the direction of misplacement but not more than - 50 mm	
	C.	Thickness	
		Decrease in specified thickness	- 5 %
		Increase in specified thickness	- No Limit
7.	Variation in Steps:		
	A.	In flight of stairs	
		Rise	- + 3 mm
		Tread	- + 6 mm
	B.	In consecutive steps	
		Rise	- + 1.5mm
		Tread	- + 6 mm

#### 2.4.4 Preparation of Form Surfaces :

1. All surfaces of forms and embedded materials shall be cleaned of any accumulated mortar in great from previous concreting and of all other foreign materials before concrete is placed in them.
2. Before placing of other the reinforcing steel or the concrete, the surfaces of the forms shall be covered with an approved coating materials that will effectively prevent absorption of moisture and prevent bond with the concrete, and will not stain the concrete surface.

#### 2.4.5 Removal of forms :

1. When repair of surface defects or finishing is required at an early stage, forms shall be removed as same as the concrete has hardened sufficiently to resist damage from removal operation.
2. Formworks for columns, walls, sides of beams and other part not supporting the weight of the concrete has hardened sufficiently to resist damages form removal operation.
3. Forms and shoring in the formwork used to support the weight of concrete in beams slabs and other structural members shall remain in place until the concrete has reached the minimum

strength specified in the structural drawings for removal of forms and shoring.

#### 2.4.6 Reshoring :

1. When reshoring is permitted or required the operation shall be planned in advance and shall be subject to the approval of the Engineer while reshoring is underway, no live load shall be permitted on the new construction.
2. In no case during reshoring shall concrete in beam, slab, column or any other structural member be subjected to combined dead and construction loads in excess of the loads permitted by the engineer for the developed concrete strength at the time of reshoring.

Reshores shall be placed as same as practicable after stripping operation are complete but in no case later than the end of the working day on which stripping occurs.

Reshores shall be tightened to carry their respective loads without overstressing the construction.

Reshores shall remain in place until the concrete being supported have reached the specified strength.

3. Floors supporting shores under newly places concrete shall have their original supporting shores left in place or shall be reshored. The reshoring system shall have a capacity sufficient to resist the anticipation loads and in all cases shall have a capacity equal to at least one half of the capacity of the shoring system above. The reshores shall be located directly under a shore position above unless other location are permitted.
4. The reshoring shall extend over a sufficient number of stories (at least 2 floors) to distribute the weight of the newly placed concrete, forms and construction live loads in such a manner that the design super imposed loads of the floors supporting shores are not excluded.

2.4.7 Removal strength: Formworks or reshoring can be removed when test cylinders, field cured along with the concrete they represent have reached the required strength as specified in the construction notes. (S-1)

## 2.5 REINFORCEMENT

2.5.1 General: Shop drawings showing are fabrication dimens and location for placing of reinforcing steel and accessories shall be submitted for approval by the Structural Engineer. Approval shall be obtained before fabrication.

Details of concrete reinforcement accessories not covered herein shall be in accordance with “Manual Standard Practice for Detailing Reinforced Concrete Structures.” (ACI 315)

- 2.5.2 Reinforcing Steel : All reinforcement shall be weldable deformed bars, new and free from rust, oil, defect, grease or kinks. They shall conform to the latest revision of ASTM A615 “SPECIFICATION FOR BILLET STEEL FOR CONCRETE REINFORCEMENT.”

For Ø12 bars or small, use grade 40 of  $F_y = 275$  Mpa (40,000 psi) and for bars greater than Ø12, use grade 60 with  $F_y = 413$  Mpa (60,000 psi)

Welded wire fabric for concrete reinforcement shall conform to ASTM A185 “SPECIFICATION S FOR WELDED STEEL WIRE FABRIC FOR CONCRETE REINFORCEMENT.

To attest to the good quality of reinforcing bars, a Mill Certificate from the Manufacturer shall be submitted to the Project Manager.

- 2.5.2 Welding : When required or approved, welding of reinforcing steel shall conform to “REINFORCING STEEL WELDING CODE (AWS D12.1). No welding shall be done at the bend in a bar welding of crossing bars (tack welding) shall not be permitted except as authorized or directed by the Structural Engineer: The ASTM Specification s shall be supplemented by requirements assuming satisfactory weldability by this procedure.

- 2.5.3 Fabricating and Placing Tolerances : Bars used for concrete reinforcement shall meet the following requirements for fabricating tolerances:

- |    |  |   |             |
|----|--|---|-------------|
| 1. | Sheared length                               | - | $\pm 12$ mm |
| 2. | Depth of truss bars                          | - | 0, -12 mm   |
| 3. | Overall dimens of stirrups, ties and spirals | - | $\pm 12$ mm |
| 4. | All other bend                               | - | $\pm 12$ mm |

Bars shall be placed to the following tolerances

- |    |   |   |            |
|----|---|---|------------|
| 1. | Clear distance to formed surfaces                       | - | $\pm 6$ mm |
| 2. | Minimum Spacing between bars                            | - | $\pm 6$ mm |
| 3. | Top bars in slabs and beams Members 200 mm deep or less | - | $\pm 6$ mm |
|    | Members more than                                       |   |            |

- 200mm but not over  
600 mm deep - ± 12 mm
- Members more than  
600 mm deep - ± 20 mm
4. Crosswise of members: spaced evenly within 50 mm.
  5. Lengthwise of members - ± 50 mm

Bars maybe moved as necessary to avoid interface with other reinforcing steel conducts or embedded items. If bars are moved more than one bars shall be subject to approval by the Structural Engineer.

2.5.4 Placing: Minimum concrete protective covering for reinforcement shall be as follows:

1. Concrete deposited against ground - 75mm
2. Formed surfaces exposed to weather or in contact with ground.
  - Bars >  $\phi$  20 - 50 mm
  - Bars <  $\phi$  20 - 35 mm
3. Interior surfaces
  - Beams, girder and columns - 35 mm
  - Slab and walls - 20 mm

All reinforcement shall be supported and fastened together to prevent displacement b, construction loads or the placing of concrete beyond the tolerances of Section 2.5.3. On ground, where necessary, supporting blocks maybe used. Over formwork, concrete, metal, or other approved bars chairs and spacers shall be used.

Vertical bars in columns shall be offset at least one bar diameter at lap splices. To ensure proper placement, templates shall be furnished for all column. All splices not shown in the plans shall be subject to approval by the Structural Engineer. Mechanical connectors for reinforcing bars maybe used subject to approval of the Structural Engineer.

Unless permitted by the Structural Engineer reinforcement shall not be bent after being embedded in hardened concrete.

## 2.6 JOINTS AND EMBEDDED ITEMS

- 2.6.1 Construction Joints: Joints not shown on plans shall be so made and locationed as least impair the strength of the structure and shall be

approved by the Structural Engineer. In general, they shall be located near the quarter spans of slabs, beams and girder unless a beam intersects in a girder at this point, in which case the joint in the girder shall be offset a distance equal to twice the width of the beam. Joints in walls and columns shall be at the underside of floors, slabs, beams, girders and at the top of footings or floor slab. Beams, girder, brackets column capitalize haunches and drop panels shall be placed at the same time as slabs. Joint shall be perpendicular to main reinforcements. All reinforcements shall be continued across joints. Keys and inclined dowels be provided as directed by the Structural Engineer.

The surface of the concrete at all joints shall be thoroughly cleaned and all laitance removed prior to placing adjoining concrete.

- 2.6.2 Waterstop: The material, design and location of waterstop in joints shall be as indicated in the plans.

Each piece of pre-molded water stop shall be of maximum practicable length in order that the number of end joints will be held to a minimum.

- 2.6.3 Other embedded items : All sleeves , inserts, anchors and embedded items required for adjoining worked or for is support shall be placed prior to concreting.

- 2.6.4 Placing embedded items: Expansion joint material, waterstop and other embedded items shall be positioned accurately and supported against displacement. Voids in sleeves, inserts and anchor slots shall be filled temporarily with readily available material to prevent the entry of concrete into the voids.

## 2.7 PRODUCTION OF CONCRETE:

- 2.7.1 Ready-mixed concrete: Except as otherwise provided in this section, ready mixed concrete shall be batched, mixed and transported in accordance with “SPECIFICATION FOR READY-MIXED CONCRETE” (ASTM C94). Plant equipment and facilities shall conform to the “check list for Certification of Ready-Mixed Concrete Production Facilities” of the National Ready-Mixed Concrete Association.

- 2.7.2 Site Mixed Concrete No hand mixing shall be allowed except in case of emergency, such as mixer breakdown during concreting operation and shall stop at the first allowed construction joints. All concrete shall be machine mixed for at least 1-1/2 minutes after all materials including water are in mixing drums.

The mixer shall be of an approved size and type which will be uniform distribution of material throughout the mass.

- 2.7.3 Retempering of Concrete shall not be permitted.

Concrete shall be mixed only in quantities for immediate use. Concrete which has set shall not be retempered but shall be discarded.

When concrete arrived at the project with slump below that suitable for placing, as indicated by specification, water may be added only if neither maximum permissible water-cement ratio nor the maximum slump is exceeded. The water shall be incorporated by additional mixing equal to at least half of the total mixing required. An addition of water above that permitted by the limitation on water-cement ratio shall be accompanied by a quantity of cement sufficient to maintain the proper water-cement ratio. Such addition shall be authorized by the Engineer.

## 2.8 PLACING

2.8.1 Preparation before placing. Hardened concrete and foreign materials shall be removed from the inner surfaces of the conveying equipment.

Semiporous subgrades shall be sprinkled sufficiently to eliminate suction or porous subgrade shall be sealed in an approved manner.

2.8.2 Conveying.

Concrete shall be handled from the mixers to the place of final deposit as rapidly as practicable by methods which will prevent segregation or loss of ingredients and in “ a manner which will assure that the required quality of the concrete is maintained.

Conveying equipment shall be approved and shall be of size and design such that detachable setting concrete shall not occur before adjacent concrete is placed. Conveying equipment shall be cleaned at the end of each operation or work day. Conveying equipment and operation shall conform to the following additional requirements.

1. Truck mixer's, agitators, and non-agitating units and their manner of operation shall conform to the applicable requirements of 'SPECIFICATION FOR READY-MIXED CONCRETE' (ASTM C94).
2. Chutes shall be metal or metal-lined and shall have a slope not exceeding 1 vertical to 2 vertical and not less than 1 vertical to 3 horizontal. Chutes more than 6.0 m long and chutes not meeting the before distribution.
3. Pumping or pneumatic conveying equipment shall be of suitable kind with adequate pumping capacity. Pneumatic placement shall be controlled so that segregation is not apparent in the discharge of concrete.

The loss of slump in pumping or pneumatic conveying equipment shall not exceed 50 mm. Concrete shall not be conveyed through pipe made of aluminum or aluminum alloy.



### 2.8.3 Depositing

Concrete shall be deposited continuously, or in layers of such thickness that no concrete will be deposited on concrete which has hardened sufficiently to cause the formation of seams or planes of weakness within the section. If a section cannot be placed continuously construction joints shall be located as approved by the Structural Engineer. Placing shall be carried on at such a rate that the concrete which is being integrated with fresh concrete is still plastic. Concrete which has partially hardened or has been contaminated by foreign materials shall not be deposited. Temporary spreader in forms shall be removed when the concrete placing has reached an elevation rendering their service unnecessary. They may be received embedded in the concrete only if made of metal or concrete and if prior approval has been obtained.

Placing of concrete in supported elements shall not be started until the concrete previously placed in columns and walls is no longer plastic and has been in place at least two hours.

Concrete shall be deposited as nearly as practicable in its final position to avoid segregation due to rehandling or flowing. Concrete shall not be subjected to any procedure which will cause segregation.

All concrete shall be consolidated by vibration, spading, rodding or forking so that the concrete is thoroughly worked around the reinforcement, around embedded items, and into corners of forms, eliminating all air or stone pockets which may cause honeycombing, pitting or planes of weakness.

Unless adequate protection is provided and approved by the Project Manager is obtained, concrete shall not be placed during rain.

### 2.8.4 Bonding

The hardened concrete of construction joints and of joints between footings and walls or columns, between walls or columns and beams or flows they supported, joint in unexposed walls and all others not mentioned below shall be dampened (but not saturated) immediately prior to placing of fresh concrete.

The hardened concrete of joints in exposed work; joints in the beams, girders, joints, and slabs; and joints in works designed to contain liquid shall be dampened (but not saturated) and then thoroughly covered with a coat of cement grout of similar proportion to the mortar in the concrete. The grout shall be as thick as possible in vertical surfaces and least 12 mm thick in horizontal surfaces. The fresh concrete shall be placed before the grout has attained its initial sets.

Joint receiving an adhesive shall have been prepared and adhesive applied in accordance with the Manufacturer's recommendation prior to placing of fresh concrete.

## 2.9 REPAIR OF SURFACE DEFECTS

- i. General: Surface defect, including, holes, unless otherwise specified by the contract documents shall be repaired immediately after from removed.

Repair of Defective Areas: All honeycombed and defective concrete shall be removed down to sound concrete. If chipping is necessary the edges shall be perpendicular to the surface or slightly undercut. No feathered edges shall be permitted. The area to be patched and an area at least 150 mm wide surrounding it shall be dampened to prevent absorption of water from the patching mortar. A bonding grout shall be prepared using a mix of approximately 1 part cement to 1 part fine sand passing a No 30 mesh, mixed to the consistency of thick cream and then were brushed into the surface.

The patching mixture shall be made of the same materials and of approximately the same proportion as used for concrete, except that the coarse aggregate shall be omitted and the mortar shall consist of not more than 1 part cement to 2 1/2 part sand by sand loose volume. White portland cement shall be substituted for a part of the gray portland cement in exposed concrete in order to produce a color matching the color of the surrounding concrete, as determined by trial patch. The quantity of mixing water shall be no more than necessary for handling in advances and allowed to stand with frequent manipulation with a trowel, without addition of water, until it has reached the stiffest consistency.

After surface water has evaporated from the area to be patched, the bond coat shall be will brushed onto the surface. When the bond coated begins to lose the water sheen, the provided patching mortar shall be applied. The mortar shall be thoroughly consolidated into place and struck off so as to leave the patch slightly higher than the surrounding surface. To permit initial shrinkage, it shall be left undisturbed for at least 1 hour before being finally finished. The patched area shall be kept damp for 7 days. Metal trowel shall not be used in finishing a patch in formed wall which will be exposed.

## SECTION 3 : STRUCTURAL STEEL

### 3.1 SCOPE OF WORK

The work to be undertaken in this section shall comprise the furnishing, fabrication, painting when required, delivery, erection, and installation of all materials including anchor bolts, base plates, erection bolts, bracing, beams, girders, steel buoys and all other structural steel work indicated in the plans or specified herein.

### 3.2 REFERENCES

The work under this section shall comply with the applicable requirements of the following codes, Specification and Regulation:

- 3.2.1 Handbook of Structural Steel Shapes and Section, 1987
- 3.2.2 National Structural Codes of the Philippines (NSCP), 2010
- 3.2.3 Specification for the Design, Fabrication and Erection of Structural Steel, American Institute of Steel Construction (AISC), 1989
- 3.2.4 Structural Welding Code, American Welding Society AWS), 2004
- 3.2.5 American Society for Testing and Material, (ASTM)

### 3.3 MATERIALS

- 3.3.1 All structural steel required for this structure shall conform to "Specification for Structural Steel" (ASTM A-36, latest revision) for rolled and built-up sect.
- 3.3.2 All arc-welding electrodes shall conform to the requirements of American Welding Society SPECIFICATION FOR IRON AND STEEL ARC-WELDING ELECTRODES", latest revision.
- 3.3.3 Unless otherwise indicated, bolts for connect shall conform to ASTM designation A325 high strength bolts. For erection or for connect not requiring high strength bolts as shown in the plans, use ASTM A307 bolts.

### 3.4 WORKMANSHIP AND FABRICATION

Workmanship and fabrication shall be in accordance with AISC Specification for the Design, Fabrication and Erection of Structural Steel, Latest Revision.

### 3.5 CONNECT

- 3.5.1 All shop and field connect shall be welded unless otherwise indicated in the plans or on the approved fabrication drawings.

- 3.5.2 When high strength bolting is specified, only friction type connect shall be used unless noted on the drawings.
- 3.5.3 All areas of contact surfaces of friction type connect shall be free of oil, paint, burrs, and loose scale.
- 3.5.4 Field bolted connect for main structural members carrying design stresses shall be a minimum of 22mm (7/8") diameter high strength bolts, except where otherwise noted on the drawings. Field connect for members not carrying design stresses, such as girts hand rails, etc. shall be a minimum 16mm (5/8") diameter bolts with washers.
- 3.5.5 Holes for base plates supported by concrete shall be oversized by the following amounts to allow for erection clearance.
  - .15mm (3/16") for 12mm (1/2") to 22mm (7/8") diameter bolts.
  - .28mm (5/16") for 25mm (1") to 35mm (1-3/8") diameter bolts.
  - .310mm (3/8") for 38mm (1 1/2") to 70mm (2- 3/4") diameter bolts.
  - .412mm (1/2") for 76mm (3") to 102mm (4") diameter bolts.
- 3.5.6 A minimum of 2 bolts for each bolted connection shall be used (minimum 5 metric tons) per connect.
- 3.5.7 One sided connect shall not be used unless explicitly indicated on the drawings.
- 3.5.8 End distance unless shown otherwise shall conform to AISC Specification, Table 4.16.5
- 3.5.9 The Contractor shall furnish and install erection angles for fit-up of welded connect.
- 3.5.10 Ample clearance shall be provided for field erection.

### 3.6 SPLICES

- 3.6.1 Field splices shall not be made in main structural steel members unless extreme length, depth, or weight would make shipment in one place impossible or undesirable.
- 3.6.2 Shop splices of main members or parts thereof shall be made with complete penetration butt welds.

### 3.7 WELDING

- 3.7.1 The technique of welding, the workmanship appearance and quality of welds used, and the methods used in correcting non-conforming work shall be in accordance with the

Structural Welding Code, AWS D1.1-77, of American Welding Society.

- 3.7.2 The electrode shall be of classification number ASTM E70 xx and shall be suitable for welding position, recommended power supply, type of coating, and other condition of intended use in accordance with the instruction in each container.
- 3.7.3 The welding equipment shall be of the type that will produce proper current so that the operationor may produce satisfactory welds. The welding machine shall be NEMA rated at 400 AMPS, 25-40 arc-volt capacity.
- 3.7.4 All field welding shall be done by direct current.
- 3.7.5 Surface to be welded shall be free from loose scale, rust, grease. paint, and other foreign material except that mill scale which stands vigorous wire brushing may remain. A light film of linseed oil maylikewise be disregarded. Joint surfaces shall be free from fins and tears.
- 3.7.6 Finished members shall be true to line and free from twists, bends and open joints.
- 3.7.7 Welded connect shall be randomly tested by an independent testing company using non-destructive test (ultrasonic or radiographic testing). All expenses for the testing shall be for the account of the contractor.
- 3.7.8 Welds that do not pass the non-destructive test may be redone at most twice. Should the same weld fail for the third time, the structural members should be replaced.
- 3.7.9 The owner reserves the right to remove test specimens from any portion of the work to verify the quality of welding. The Contractor, at his expense, shall repair or replace any base metal or filler metal found to be defective. When a defective area is found, the OWNER reserves the right to remove test specimens from both sides of the defective area at the Contractor's expense.
- 3.7.10 Structural welds shall be either as defined by AISC or regarded as any weld necessary for the development of strength between adjoining pieces of steel. Structural welds shall be made as shown or noted on the Drawings.
- 3.7.11 When required by AWS D4.1, Section 5, Paragraph 4.2, The Contractor shall develop and submit authorization to proceed by the Project Manag-er, welding procedure designed to produce welds in accordance with the intent of this  
Specification. In developing these procedures, the Contractor shall show that consideration has been given to selection of type and size of the electrode, heat input, interpass temperature, preheat, bead deposition, technique, and welder qualification.
- 3.7.12 Welding procedure specification for pre-qualified joints, AWS D4.1 Appendix "F" Form, shall be submitted by the Contractor, when requested by the Project Manager, for authorization to proceed prior to start of fabrication.

- 3.7.13 In addition, records of the procedures shall be made available by the Contractor in the shop and/or in the field for the OWNER. One Appendix "E" Form, or equivalent, shall be made for each welding process used. Under joint detail, list all prequalified joint that will be used with the specified welding process.
- 3.7.14 Requested welding procedures submitted to the OWNER shall be identified with the specified Item and Purchase Order number.
- 3.7.15 In addition to meeting the above requirements, the Contractor shall show the applicable welding procedures and non-destructive examination (NDE) on shop drawings. NDE and welding procedure number or identification may be shown either in the fabrication drawing notes or on the applicable weld joint prior to the start of fabrication.
- 3.7.16 Welder's qualification records (AWS D4.1, Appendix "E") shall be made available for the Owner's authorization to proceed, upon request. All welders and welding operationors shall be qualified per AWS D4.1 Section 5, and shall have certificates on file for the OWNER'S review any time during fabrication. The OWNER reserves the right to require the testing and re-testing of welders for qualification in accordance with the AWS Code, Section 6.4. All costs and material required for the qualification of welders shall be at the Contractor's expense.
- 3.7.17 Welds made by welders that are not pre-qualified or that have not been properly qualified and had no authorization to proceed shall be rejected and completely removed.

### 3.8 WELDER'S QUALIFICATION

All welders, welding operationor and trackers to be employed shall have been qualified by test as prescribed in Section 5 of AWS D4.1-77 of the American Welding Society.

### 3.9 SHOP PAINTING AND COATING

- 3.9.1 Paint shall be delivered to the shop and job site in original sealed containers, which shall be clearly marked with the manufacturer's name and identifying brand or name. The paint shall be used as prepared by the manufacturer without thinning or other admixture.
- 3.9.2 All painting shall be done on dry surfaces, free from rust, scale and grease. Steel shall be prepared by following SSPC-SP 9 procedure (Near-White Blast Cleaning) or as per paint manufacturer's specification.
- 3.9.3 All steel, except where it is to be encased in concrete, shall receive one coat Amercoat 71 epoxy primer 3 mils thick followed by two coats of Amercoat 78-HB at 8 mils each and shall be followed by a top coat of

Amerlock 400 with color as per owner's specification. Paint specification shall not be revised without approval of the Project Manager.

- 3.9.4 Preparation and painting shall preferably be conducted at shop with each coat of different color than the previous coat. Transfer of painted items from shop to job site shall be done in such manner as to avoid abrasion. All field rivets, bolts, field welds, and serious abrasion to the shop coat shall be spot painted, with the same materials used for the shop coat.

### 3.10 DIMENSIONAL TOLERANCES

3.10.1 Mill tolerances shall conform to ASTM A36.

3.10.2 Length: A variation of 0.8mm (1/32") is permissible in the overall length of members with both ends finished for contact bearing.

3.10.3 The tolerances of welded structural members shall conform to AWS Standards.

### 3.11 ERECTION

#### 3.11.1 General:

The erection of all structural steel shall conform to the applicable requirements of the AISC Specification and AISC Code of Standard Practice.

All structural steel work shall be erected accurately to the lines and levels shown on the Drawings. All columns and other vertical members shall be plumb and horizontal members level before permanent connect are made.

All temporary bracing, guys and bolts as may be necessary to ensure the safety of the structure until the permanent connect have been made shall be provided by the Contractor. Members shall be connected, as erection progresses, to resist all dead load, wind and erection stresses.

#### 3.11.2 Bolted Connect

Meeting faces of friction connect shall be cleaned to bare steel, free from paint, grease or foreign matter. Field connect shall be accurately fitted up before the bolts are taken up. Drifting shall be only such as will bring the parts into position and shall not be sufficient to enlarge the hole or to distort the metal. All unfair holes shall be drilled or,

reamed. After joints are fitted up, bolts shall be tightened by the turn of nut method.

Beveled washers shall be installed under the heads of bolts or nuts bearing on the tapered flange of structural members or when such bolts are employed to support equipment. Beveled washers shall also be used where necessary to provide flat bearing for diagonal tie rod bracing. Quantities of both common and high strength bolts shall include 5% extra per size and length, to cover requirements for fit up and erection. The threaded portion of each bolt shall project through the nut at least two threads.

End of Specification

**PROJECT : PODIUM LEVEL**  
**RENOVATION OF THE DEPARTMENT OF FINANCE**  
**BUILDING OFFICES – PACKAGE 2**

**LOCATION : P.Ocampo Corner Roxas Boulevard, Manila, Metro Manila**

#### **BACKGROUND OF THE PROJECT**

1. The Philippines' Department of Finance (DOF) (Filipino: KagawaranngPananalapi) is the executive department of the Philippine government responsible for the formulation, institutionalization and administration of fiscal policies, management of the financial resources of the government, supervision of the revenue operations of all local government units, the review, approval and management of all public sector debt, and the rationalization, privatization and public accountability of corporations and assets owned, controlled or acquired by the government.
2. The proposed building renovation aims to improve the whole aspects of the office building for the betterment of its employees.
3. The proposed renovation aims to modernize the building fully, office area utilization, upgrading of utilities and office systems and provide employees with a modern and beautiful office environment to improve their overall working environment.

#### **GENERAL REQUIREMENTS**

1. The contractor shall follow and deliver all requirements as stated in the “*General Requirements*” of the Technical Specifications
2. The contractor shall follow and deliver all requirements as stated in the “*Safety, Sanitation and Security Requirements*” of the Technical Specifications



3. The contractor shall follow and deliver all requirements as stated in the “*Temporary Facilities*” of the Technical Specifications
4. The contractor shall follow and deliver all requirements as stated in the “*Final Cleaning*” of the Technical Specifications
5. The contractor shall provide as-built drawings for all disciplines as required in the “*General Requirements*” of the Technical Specifications
6. The podium floor renovation project is part of the DOF building renovation and facilities improvement package 2.
7. The project scope of work encompasses all civil and utility works including all facilities located or situated at the said floor level.
8. All utility lines such as electrical, sanitary and plumbing, and mechanical lines leading up to succeeding floors shall be properly terminated at the utility riser line locations, contractor to verify actual on site.
9. All utility lines leading to the riser or main distribution line shall be properly terminated so as to accommodate the supply, delivery and installation of new main distribution lines included in package 2 of the said renovation.
10. The contractor shall provide necessary scaffolding, tools, equipment and machineries required for the renovation of the project.
  - a. The contractor to provide the use of building hoist, inclusive of mobilization and demobilization, installation, mechanical permits and documentations, dismantling and insurances with the following specifications:
    - i. Type : Twin cage building hoist
    - ii. Height : 30.5 meters
    - iii. Fixed Speed : 33 meters per minute
    - iv. Max. Load : 2000 kg. per cage
    - v. Cage Dimensions : 3.0mL x 1.5mW x 2.5mH
    - vi. Motor : 3 Motor drive (3 x 11kw motors)
    - vii. Power Supply : 440 volts 60 hertz 3Phase
11. The contractor to provide necessary board-ups, safety nets and protective partitions as required for the renovation.
12. The contractor to submit shop drawings of construction details prior to material procurement for approval of the architect/ owner.
13. All repair works for roughing-ins of utility works (sanitary, electrical and mechanical), shall be covered by the general contractor. E.g. all rough-ins for piping works below reinforced concrete slab shall be restored and repaired back to original condition by the general contractor.
14. Contractor to submit product catalogues, brochures and specifications for all materials for approval of the designer/ project manager/ owner.
15. The contractor shall submit all necessary finishing materials, hardware and fixtures for approval of the owner and architect prior to purchasing. Failure of approval of the said items gives the architect/ owner the right to reject items without any cost implications.
16. Contractor to submit fire rating certificates of steel doors for documentation and filing purposes.
17. Demolition works:
  - a. Contractor to demolish all existing walls and partitions as stated in the plan. Contractor to verify actual based on issued plans.
  - b. Contractor to strip all existing wall finishes affected with the renovation. Contractor to verify plans and wall finishes in relation with the existing site condition.

- c. Contractor to dismantle existing ceiling finishes except for bottom of slab ceiling.
- d. Contractor to dismantle all existing doors, door jambs, hardware and accessories and turnover all items to the owner for proper handling except for doors to be retained, contractor to verify plans for reference.
- e. Contractor to dismantle all existing glass partition and accessories and turnover all items to the owner for proper handling.
- f. Contractor to dismantle all existing lighting fixtures and electrical devices on site and all items are subject for turnover to the owner for proper handling.
- g. Contractor to dismantle all existing AC equipment on site subject for replacement and turnover all items to the over for proper handling.
- h. Contractor to dismantle all existing utility lines, conduits, pipes and ductworks subject for replacement as per plan.
- i. Contractor to demolish and dismantle all existing floor finishes as per plan.
- j. Contractor to demolish and dismantle all existing wall cubicle partition and floor tiles at existing toilets.
- k. Contractor to demolish all existing CHB toilet partitions at common toilets.
- l. Contractor to demolish existing lavatory counter at existing toilets.
- m. Contractor to dismantle all existing toilet fixtures and accessories for replacement.
- n. Contractor to dismantle existing wall mounted facial mirror at existing toilets.
- o. Contractor to demolish existing walls and slab affected for the accommodation of new elevator shaft.
- p. Contractor to demolish affected slab for all areas to be converted to pipe chase.
- q. Contractor to demolish existing slab affected for the accommodation of new elevator shaft.

## **ARCHITECTURAL SCOPE OF WORKS**

1. The contractor to conduct actual site inspection and verify actual site dimensions in relation with the issued plans, any discrepancies with the actual site dimensions and the plans shall be relayed to the architect for verification.
2. The contractor to secure all required bonds as required by the end user.
3. The contractor to construct necessary temporary facilities required for the renovation.
4. The contractor to construct necessary board-up area for areas not affected during renovation, BSP satellite bank.
5. The contractor to maintain a clean work area at all times, ready to accommodate on-site inspection by the end user and consultants.
6. Supply, delivery and installation of carpet tiles on top of existing marble flooring as per plan. Contractor to verify plans and specifications for reference.
7. Supply, delivery and installation of porcelain floor tiles for toilet areas.
8. Supply, delivery and installation of porcelain wall tiles cladding for toilet areas.
9. Supply, delivery and installation of homogenous and resilient vinyl flooring as per manufacturer's standard; contractor to verify plans and specifications.
10. Supply, delivery and installation of paver tiles for outdoor walkway area.
11. Supply, delivery and installation of aluminium door threshold for all carpet to existing marble flooring finish. Contractor to verify plans and specifications for reference.
12. Supply, delivery and installation of partitions as per plan and specifications.

13. Supply, delivery and installation of wood-plastic composite baseboard as per plan and specifications.
14. Supply, delivery and installation of doors as per plan and specifications.
15. Supply, delivery and installation of operable partition complete with necessary tracks, hangers and accessories as per manufacturer's standard.
16. Supply, delivery and installation of glass partitions as per plan and specifications.
17. Supply, delivery and installation of facial mirror with plywood backing as per plan and specifications.
18. Supply, delivery and installation of phenolic board partition complete with stainless steel hardware and accessories for toilets as per plan and specifications.
19. Supply, delivery and installation of granite counter top for pantry and lavatory counters as per plans and specifications.
20. Supply, delivery and installation of toilet fixtures and accessories as per plans and specifications.
21. Supply, delivery and installation of pantry fixtures and accessories as per plans and specifications.
22. Supply, delivery and installation of food waste disposers for all pantry sinks as per plan and specifications.
23. Supply, delivery and installation of new ceiling as per architectural plans and specifications.
24. Supply, delivery and installation of new perimeter decorative band using non-combustible aluminium cladding complete with framing, brackets and accessories as per manufacturer's standard.
25. Supply, delivery of suspended aluminium ceiling at outdoor walkway ceiling area complete with necessary hangers, accessories and brackets as per manufacturer's standard. Contractor to verify architectural plans and specifications.
26. Supply, delivery and installation of automated and manually controlled roll-up door as per plans and specifications.
27. Supply, delivery and installation of ceiling works as per manufacturer's standard based on plans and specifications.
28. Supply, delivery and installation of all lighting fixtures as per plan and specifications.
29. Supply, delivery and installation of steel hanger for chandelier at podium lobby as per plan and specifications.
30. Existing marble floor finish subject for refurbishing and crystallization works as per plan and specifications.
31. Supply, delivery and installation of decorative marble wall cladding at façade entry portal as per plans and specifications.
32. Contractor to supply, deliver and install veneer cladding at elevator lobby and reception area as per plans and specifications.
33. Contractor to re-stain existing decorative wood panel at podium lobby area.
34. Contractor to supply, deliver and install decorative vertical wood slats as per plan and specifications.

End of Architectural Scope of Works

## **ELECTRICAL SCOPE OF WORKS**

The work under this Division consist of furnishing all materials, equipment tools, labor and all other services necessary to complete and make ready for operation the Electrical Power and Lighting System, Fire Detection & Alarm System, Public Address/ Background Music System described below and or indicated in the Electrical Plans & Auxiliary Plans in accordance with the latest edition of the National Building Code, Philippine Electrical Code Part 1 and Part 2, National Electrical Code (NFPA 70) , Fire Code of the Philippines, National Fire Alarm Code (NFPA 72), Life Safety Code (NFPA 101), Illuminating Engineering Society (IES), National Electrical Manufacturers Association (NEMA), American National Standards Institute (ANSI), Under Writers Laboratories (UL) and this Specifications and General Conditions of the Contract.

### **1. WORK INCLUDED:**

The work shall include the following furnishing and installation, each complete and in proper operation condition, unless otherwise stated in these specifications:

- a. Panel boards at various locations including circuit breakers/synchronizing switchgears, automatic transfer switch and all its accessories as indicated in the electrical riser diagram.
- b. Feeder and branch circuit conductors with necessary conduits approved type of fittings and devices as indicated on the electrical plans.
- c. All types of utilization devices, outlets and wall switches with proper cover plates.
- d. All lighting fixtures, wiring devices and necessary wiring of the building.
- e. ACCU and cable outlets including conduits and fittings, conductors as indicated on the plans; and
- f. All other items as stated, specified and as shown in these specifications and plans.
- g. Complete conduit system, boxes and faceplates, telephone terminal cabinet blocks including the cable of telephone and intercom system and telephone service entrance cable.
- h. Complete grounding system and lightning protection and TVSS.
- i. Perform terminations for all electrical system and complete testing.
- j. Automatic Transfer Switch, Genset& Synchronizing switchgear installations.
- k. Preparation of As-Built: plans and drawings.
- l. If anything has been omitted in any item of work or materials, usually furnished which are necessary for the completion of the Electrical Work as outlined

herein before, then such items must be and are hereby included in this Division of the work.

- m. The Electrical contractor must have a PCAB licensed on their field of specifications. The electrical contractor must submit short circuit calculation, load flow analysis, arc flash & protection coordination study of the whole system of the building.
- n. Existing Transformer for Data Center shall be used, Contractor shall provide feeder wires & conduit from LVSB (See Power Single Line Diagram for reference) to data center room at 4th Floor for the tapping point of the Transformer. DOF

## 2. CODES & INSPECTIONS:

The work under this contract is to be installed according to the requirements of the latest edition of the National Building Code, Philippine Electrical Code, National Electrical Code (NFPA 70) , Fire Code of the Philippines, National Fire Alarm Code (NFPA 72), Life Safety Code (NFPA 101), Illuminating Engineering Society (IES), National Electrical Manufacturers Association (NEMA), American National Standards Institute (ANSI), Under Writers Laboratories (UL) and the rules and regulations of the United States Authorities.

- a. Electrical Service Application including drawings for this work shall be obtained by and at the expense of the contractor. The contractor shall comply with all the requirements of the utility companies with regards to the service applications.

## 3. MATERIALS & METHODS:

### 3.1 Wires & Cables:

- a. All wires shall be copper, stranded type wire. It shall be smooth and true and of cylindrical form and shall be within 1% of the actual size called for.
- b. All wires shall comply within the requirements of the Underwriters Laboratories and as they apply to the particular usage.
- c. Wires and cables for lighting and power systems shall be plastic insulated for 600 Volts working pressure, type “THHN/THWN” unless otherwise noted on plans or specified below.
- d. All wires shall be stranded copper.
- e. For lighting and power system, no wire smaller than 3.5 mm<sup>2</sup> shall be used except otherwise noted.

### 3.2 Conduits:

- a. Conduits for interior systems shall be standard Electrical Metallic Tubing (EMT) for 50MM (2") below & Intermediate Metallic Conduit (IMC) for 65MM (2 1/2") above and shall be UL Listed.
- b. No conduit shall have more than four (90) degree bends in any one run and where necessary, pull boxes shall be provided as directed.
- c. No wire shall be pulled into any conduit until the conduit system is complete in all details, in the case of concealed work until all rough plastering or masonry has been completed and in the case of exposed work until the conduit work has been completed in every detail.
- d. The ends of all conduits shall be tightly plugged to exclude plaster, dust and moisture while in progress of construction. All conduits shall be reamed to remove all burrs.
- e. All pipes and fittings on exposed work shall be secured by means of metal clips, which shall be held in place by means of machine screws. When running over concrete surfaces, the screws shall be held in place by means of expansion sleeves. All pipes on exposed work shall be run at right angles to and parallel with the surrounding walls and shall conform to the form of the ceiling. No diagonal runs shall be allowed and all bends and offsets shall be avoided as much as possible. Where necessary conduit fittings shall be used. Piping in all cases, it shall be run perfectly straight and true, satisfactory to the Consultant on record (COR) Conduits shall be supported at 3M intervals maximum, or per PEC requirements.
- f. Intermediate metallic conduits installed outside building in contact with the soil shall be coated with asphalt paint and wrapped with asphalt/rubber tape. An additional cost of asphalt paint shall be applied over the asphalt/rubber tape.

### 3.3 Junction & Pull Boxes:

- a. All outlets of whatever kind, for all systems, there shall be provided a suitable fitting, which shall be either a box or other device especially designed to receive the type of fitting to be mounted thereon;
- b. The Contractor shall consult the COR as to the nature of the various fittings to be used before installing the outlet fittings, and shall conform strictly in the use of fittings, to the nature of the appliance to be mounted on them so that the work, when completed will be of finished design.
- c. All outlets on concealed conduit work provide galvanized pressed steel outlet boxes of standard make. These boxes shall be in all cases standard and where such boxes are not available on the market special boxes shall be secured by the Contractor at his own expense.
- d. Junction and pull boxes, of Code gauge steel, galvanized shall be provided as indicated or as required for facilitating the pulling of wires and cables. Pull boxes in finished places shall be located and installed with the permission and to the satisfaction of both COR.
- e. All junction and pull boxes on exposed conduit work shall be provided with hubs for threaded pipe entry and covers provided with neoprene gaskets.

### 3.4 Wall Switches:

- a. Wall switches shall be rated at 16 amperes, 230 volts AC. Switches shall be of the quiet type. The type of switch shall be tumbler operation and the color, plating and appearance of wall plates shall be as selected by the COR/ Architect. Appropriate samples shall be submitted prior to the purchases of wall switches and faceplates.

### 3.5 Wall Receptacles / Convenience Outlets:

- a. Receptacle outlets, in general, shall be for flush mounting, duplex type rated at 16 ampere, 230 volts parallel slots grounding type unless otherwise indicated on drawings. Type and color of receptacle outlet and plates shall be as selected by the COR/Architect. Appropriate samples of outlets and plates shall be submitted prior to purchase of devices.

### 3.6 Plates:

- a. All switches and receptacle plates shall be of stainless satin finish or as directed by the COR/Architect.

### 3.7 Panels & Cabinets:

- a. Standard panels and cabinets, as far as possible, shall be used and assembled on job. All panels shall be of dead front construction, furnish with trims for flush or surface mounting as provide. Cabinets shall be of Code gauge steel with gutters at least 4-inch wide and wider if necessary. The trim for all panels shall be finished in industrial beige color over a coat of rust inhibitor;
- b. Panels and cabinets shall be beige color powder coated.
- c. Power panel & breakers shall be approved by COR, circuit breakers of sizes voltage rating and interrupting capacity as called for a plans and bolt-on type, center main.  
Submit Short Circuit Analysis and Voltage Drop Calculation prior to the purchase of the Panel board. And after securing the Short circuit analysis the Electrical contractor must submit a protective coordination study and apply to the electrical system facilities.
- d. Power Panel's main bus work shall be rated in amperes equal to or exceed over-current protective device immediately ahead of it. All bus works shall be properly secured to withstand available short circuit forces at the location.

### 3.8 INDIVIDUAL BREAKERS AND SWITCHES:

- a. Provide individual circuit breakers, safety switches, and disconnect switches where indicated on plans, voltage ratings shall be suitable in each case of service application.
- b. All protective devices shall meet NEMA, Underwriters Laboratories, Inc.
- c. Circuit breakers shall consists of a quick-make, quick-break type entirely trip-free operating mechanism with contacts, interrupter, and thermal-magnetic trip unit for each pole, all enclosed in a molded-phenolic case. The thermal-magnetic trip units shall provide time-delayed overload protection and instantaneous short circuit protection, and shall operate a common trip bar which open all pole in case of overload or short-circuit current in any one pole. Circuit breaker shall be trip indicating, with the tripped position or breaker handle midway between "ON" and "OFF" position.
- d. Circuit breakers rated above 100 amperes shall have interchangeable trip units.
- e. All circuit breaker with a rating of 1000 ampere shall be Molded case type and 1200 ampere shall be Power breaker type.

### 3.9 LOCATION OF WIRING AND OUTLETS:

- a. The Contractor shall coordinate his work with all parties involved so that exact locations may be obtained for all outlets, apparatus, appliances and wiring.
- b. The location of outlets shown on diagrammatic wiring plans shall be considered as approximate and it shall be incumbent upon the Contractor, before installation of outlets/boxes, to study all pertinent drawings and obtain precise information from the architectural schedules, scale drawings, large scale and full size details of finished rooms, approved shop drawings of other parties involved or from the COR. It shall be understood that any outlet may be relocated a distance not exceeding 4.5M from the location shown on the drawings, if so directed by the COR. Contractor shall make any necessary adjustment of his work to fit conditions for recessed fixtures and for outlets occurring in glazed tile, block, terra cotta, marble, wood paneling, or other special finish materials, in order that all boxes may register flush with finish and shall be centered properly. In centering outlets, due allowance shall be made for overhead piping ducts, windows, and door trim variations in thickness of furring, plastering, etc., as erected, regardless of conditions which may be otherwise shown on small scale drawings. Outlets incorrectly located shall be properly relocated at the



Contractor's expense. Local switches which are shown near doors shall be located at the strike side of the door as finally hung, regardless of swing shown on the drawings.

- c. The center line of wall, outlets, socket outlets, switches, telephone outlets, pilot lights, indicating lights, and fan outlets, shall be installed at heights above finished floor or as specified on the Architect's drawings. Where mounting heights are specified on the Electrical drawings, they shall be verified with Architect's drawings before installation. Where glazed tile, block, terra cotta occur, outlets shall be centered on the nearest joint to the height given.

#### 4. INSPECTION AND TEST:

- a. The COR shall have access to all parts of the work at all times and shall be furnished such information and assistance by the contractor. All installation shall be subjected to test and any damage done during testing shall be borne by the contractor.
- b. The DOF proponent must hire an electrical engineer third party for the testing of existing LVSG, transformer, LVSB, circuit boards & main & feeder conductor.

#### 5. STANDARD OF WORKMANSHIP:

The contractor shall execute all work in neat and workmanlike manner and shall do all necessary work whether it is clearly specified in this specification or shown in the drawing or not. Best practice in modern electrical installation shall be employed. Submit Methodology of construction and approved by COR.

End of Electrical Scope of Works

## **SANITARY AND PLUMBING SCOPE OF WORKS**

- I. Unless otherwise specified, the Contractor or his sub-contractor shall furnish all materials, tools, equipment, apparatus, appliances, accessories, transportation, labor and supervision required for the complete installation and testing of the Plumbing System ready for use in accordance with the best practice of the Plumbing Trade for the satisfactory completion of the works:
  
- II. The works essentially shall include, but shall not necessarily be limited to the following items:

### **A. General**

1. The Plumbing Contractor is required to refer to all architectural, structural, mechanical, fire protection and electrical plans and investigate all possible interference and conditions affecting his work.
  
2. All work shall comply with the pertinent provisions of the National Plumbing Code of the Philippines, the Code on Sanitation of the Philippines and/or the rules and regulations of concerned city or municipality.
  
3. Supply and installation of plumbing equipment complete with controller, breakers, starters, pressure switch and its appurtenances including trims and its accessories to complete the system of the following:
  - 3.1 New Transfer Pumps complete with controllers. Accessories to include electrical wiring from pumps to motor controllers.
  
  - 3.2 New Booster Pumps complete with controllers. Accessories to include electrical wiring from pumps to motor controllers.
  
  - 3.3 New Sump Pump with accessories to include electrical wiring from pumps to motor controller.
  
  - 3.4 Start-up, testing and commissioning.
  
4. Miscellaneous stainless steel metal works of the plumbing utilities and its appurtenances including, ladder rungs, sleeves, manhole cover, vents, drains trims and its accessories of the following:

- 4.1 Domestic Water Storage tank /or Cistern.
- 4.2 Central Oil Interceptor
- 4.3 Central Grease Tank
5. Testing for leakages of all building drains, waste, sewer, venting system including pressure testing and disinfection of the water supply and distribution system. Also leak test and disinfection of domestic and fire storage water tanks.
6. Excavation, trenching and backfilling including provision of pipe sleeves and block-outs pipe line punches / cross thru walls, beams and slabs provided with firestopping materials for the satisfactory completion of the works shall be included.
7. Miscellaneous items and other accessories required for the satisfactory completion of the plumbing works.
8. Securing and payments of all permits, licenses and bonds construction purposes as required.
9. Contingency to include furnishing of written one (1) year warranty on the plumbing system.
10. Preparation and submission of as-built drawings in producible sheets including five (5) white prints copies at no cost to the Owner(s).
11. Securing and payments of all contractor's taxes, VAT, etc.

#### **B. Site Utilities**

Site Utilities of plumbing works, complete with appurtenances and accessories for the satisfactory completion of the system:

1. Supply and installation of new water service from existing main water connection line up to the proposed new domestic water tank.
2. Domestic waste and sewage collection system including discharge/tapping to the proposed Sewage Treatment Plant.

3. Exterior storm drainage system of the building including supply and installation of Drainage Pipe, Drainage Junction Box (DJB), Drainage manholes, including tapping of drainage line up to existing main public drainage line at site.
4. Supply and installation of condensate drainage system of the building equipment and facilities including fan coil units (FCU) and air conditioning units (ACU) separate piping with insulation up to the drainage junction box / manhole.

### **C. Podium Floor**

1. Supply and installation of new cold water distribution system connect from existing water line up to new pantry sinks unit including roughing-in of isolation/gate valves, cold water lines, fittings, hangers, support trim and its accessories.
2. Supply and installation of new sewer and vent system for new pantry sinks including roughing-in floor/ceiling cleanout, p-traps, stacks, fittings, hangers, trims and its accessories.
3. Supply and installation of grease trap at new pantry sinks
4. Replacement of existing plumbing fixtures at existing male and female toilets. Roughing-ins to be replaced with new water, sewer and vent lines, connect from existing main downfeed/collectors at pipe chase. Water closets shall have bidet sprays.
5. Supply and installation of condensate drainage system of the building equipment and facilities including fan coil units (FCU) and air conditioning units (ACU), with insulation and separate piping from storm drainage system.
6. Removal of all existing pipes not necessary at site.

End of Sanitary and Plumbing Scope of Works

### **MECHANICAL SCOPE OF WORKS**

- I. Under this section of the specifications, provide all labor, materials and equipment and perform all the work necessary for the complete execution of all the work as shown on Drawings and Specified in this specification.
- II. Scope of work shall include but not be limited to the following principal items of work for Air-Conditioning and Mechanical Ventilation System, Smoke Extraction System, Pressurization System, Fresh Air System, Gas Piping System and Carbon Monoxide Monitoring System.

### III. Podium Floor

1. Supply and installation of VRF (Outdoor and Indoor Unit), Ventilating Fans.
2. Supply and installation of air conditioning ductwork and accessories such as dampers, diffusers, test holes, access panels.
3. Supply and installation of ventilation ductwork and accessories such as dampers access panel diffusers. This includes staircase pressurization and smoke extraction system.
4. Supply and installation of insulation for ductwork, chilled water piping and air conditioning equipment.
5. Supply and installation of air conditioning and ventilation equipment including air handling units, fan coil units, variable refrigerant flow units, split units, motor controls and starters, fans and blowers.
6. Supply and installation of automatic control for both air conditioning and mechanical ventilation systems including automatic temperature controls, chilled water plant controls, vrf system control, fans and blower flow control.
7. Supply and installation of refrigerant piping system.

### IV. Others:

1. Testing balancing and commissioning
2. Free maintenance for a period of 12 months after practical completion
3. Supply of manufacturer's recommended spare parts.
4. Furnishing and installation of instruction and identifications boards, charts, signs and markers, to include operating methods and instructions.
5. Priming and finish painting of cladded and exposed piping and other part of chilled water and refrigerant piping.

6. Miscellaneous items and other related materials required for the satisfactory completion of the air conditioning and ventilation system to include metal works, hangers, supports, anchors, bolts, bracing, vibration isolators, equipment concrete pads, and its accessories.
7. Securing and payment of permits, licenses and bonds for the construction purposes, including approval from local government unit.
8. Contingency to include the furnishing of written one (1) year warranty upon completion works.
9. Securing and payments of all Contractor's taxes, VAT, etc.
10. Furnishing and installation of instruction and identifications boards, charts, signs and markers, to include operating methods and instructions.
11. Priming and finish painting of cladded and exposed piping and other part of chilled water and refrigerant piping.
12. Miscellaneous items and other related materials required for the satisfactory completion of the air conditioning and ventilation system to include metal works, hangers, supports, anchors, bolts, bracing, vibration isolators, equipment concrete pads, equipment structural support and its accessories.
13. Preparation and submission of Shop-Drawings based on actual site condition.
14. Preparation and submission of As-Built drawings in reproducible sheets including five (5) white prints copies at no cost to the Owner(s).

End of Mechanical Scope of Works

## **FIRE PROTECTION SCOPE OF WORKS**

- I. Furnishing of all materials, labor, tools, equipment and accessories for the complete installation, testing and adjustment, ready for use of the proposed automatic fire sprinkler system.
- II. The works essentially shall include, but shall not necessarily be limited to the following items:
  1. All openings through which fire may spread from one floor to the other, such as holes
  2. through floors made for the passage of plumbing pipes and electrical circuits shall be sealed with fire resistant / or fire stopping materials.
  3. Furnishing and installation of instruction and identifications boards, charts, signs and markers, to include operating methods and instructions.
  4. Priming and finish painting (red) of cladded and exposed piping and other part of sprinkler system except for sprinkler heads.
  5. Complete testing and commissioning, start-up of the floor Automatic Fire Sprinkler System in accordance with NFPA-13, to include cleaning, draining, adjusting and inspecting.
  6. Miscellaneous items and other related materials required for the satisfactory completion of the sprinkler system to include metal works, hangers, supports, anchors, bolts, bracing and its accessories.
  7. Securing and payment of permits, licenses and bonds for the construction purposes, including approval from the Fire Department having jurisdictions.
  8. Contingency to include the furnishing of written one (1) year warranty upon completion works of sprinkler system.
  9. Preparation and submission of As-Built drawings in reproducible sheets including five (5) white prints copies at no cost to the Owner(s).
  10. Securing and payments of all Contractor's taxes, VAT, etc.
- III. General
  1. All openings through which fire may spread from one floor to the other, such as holes
  2. through floors made for the passage of plumbing pipes and electrical circuits shall be sealed with fire resistant / or fire stopping materials.
  3. Furnishing and installation of instruction and identifications boards, charts, signs and markers, to include operating methods and instructions.
  4. Priming and finish painting (red) of cladded and exposed piping and other part of sprinkler system except for sprinkler heads.
  5. Complete testing and commissioning, start-up of the floor Automatic Fire Sprinkler System in accordance with NFPA-13, to include cleaning, draining, adjusting and inspecting.
  6. Miscellaneous items and other related materials required for the satisfactory completion of the sprinkler system to include metal works, hangers, supports, anchors, bolts, bracing and its accessories.
  7. Securing and payment of permits, licenses and bonds for the construction purposes, including approval from the Fire Department having jurisdictions.
  8. Contingency to include the furnishing of written one (1) year warranty upon completion works of sprinkler system.
  9. Preparation and submission of As-Built drawings in reproducible sheets including five (5) white prints copies at no cost to the Owner(s).
  10. Securing and payments of all Contractor's taxes, VAT, etc.
- IV. Podium Floor
  1. Supply/relocate and install complete with the sprinkler heads including spares and cabinet for sprinkler system tools and stocks, trims and its accessories required to complete the system.
  2. Supply/relocate and install complete with the portable fire extinguishing system consisting of mounting support, bracket, trims and its accessories required to complete the system.
  3. Supply and install complete with the new Fourth Floor Data Center Fire Suppression system (NOVEC 1230) consisting of mounting support, bracket,

- trims and its accessories required to complete the system.
4. All existing (relocated and retained/not relocated) pendent, upright and sidewall sprinkler heads shall be replaced with new.

End of Fire Protection Scope of Works

**PROJECT : THIRD FLOOR  
RENOVATION OF THE DEPARTMENT OF  
FINANCE BUILDING OFFICES – PACKAGE 2**

**SUBJECT : SCOPE OF WORKS**

**BACKGROUND OF THE PROJECT**

1. The Philippines' Department of Finance (DOF) (Filipino: KagawaranngPananalapi) is the executive department of the Philippine government responsible for the formulation, institutionalization and administration of fiscal policies, management of the financial resources of the government, supervision of the revenue operations of all local government units, the review, approval and management of all public sector debt, and the rationalization, privatization and public accountability of corporations and assets owned, controlled or acquired by the government.
2. The proposed building renovation aims to improve the whole aspects of the office building for the betterment of its employees.
3. The proposed renovation aims to modernize the building fully, office area utilization, upgrading of utilities and office systems and provide employees with a modern and beautiful office environment to improve their overall working environment.

**GENERAL REQUIREMENTS**

1. The contractor shall follow and deliver all requirements as stated in the “*General Requirements*” of the Technical Specifications
2. The contractor shall follow and deliver all requirements as stated in the “*Safety, Sanitation and Security Requirements*” of the Technical Specifications
3. The contractor shall follow and deliver all requirements as stated in the “*Temporary Facilities*” of the Technical Specifications
4. The contractor shall follow and deliver all requirements as stated in the “*Final Cleaning*” of the Technical Specifications
5. The contractor shall provide as- built drawings for all disciplines as required in the “*General Requirements*” of the Technical Specifications
6. The third floor renovation project is part of the DOF building renovation and facilities improvement package 2.
7. The project scope of work encompasses all civil and utility works including all facilities located or situated at the said floor level.



8. All utility lines such as electrical, sanitary and plumbing, and mechanical lines leading up to succeeding floors shall be properly terminated at the utility riser line locations, contractor to verify actual on site.
9. All utility lines leading to the riser or main distribution line shall be properly terminated so as to accommodate the supply, delivery and installation of new main distribution lines included in package 2 of the said renovation.
10. The contractor shall provide necessary scaffolding, tools, equipment and machineries required for the renovation of the project.
  - a. The contractor to provide the use of building hoist, inclusive of mobilization and demobilization, installation, mechanical permits and documentations, dismantling and insurances with the following specifications:
    - i. Type : Twin cage building hoist
    - ii. Height : 30.5 meters
    - iii. Fixed Speed : 33 meters per minute
    - iv. Max. Load : 2000 kg. per cage
    - v. Cage Dimensions : 3.0mL x 1.5mW x 2.5mH
    - vi. Motor : 3 Motor drive (3 x 11kw motors)
    - vii. Power Supply : 440 volts 60 hertz 3Phase
11. The contractor to provide necessary board-ups, safety nets and protective partitions as required for the renovation.
12. The contractor to submit shop drawings of construction details prior to material procurement for approval of the architect/ owner.
13. All repair works for roughing-ins of utility works (sanitary, electrical and mechanical), shall be covered by the general contractor. E.g. all rough-ins for piping works below reinforced concrete slab shall be restored and repaired back to original condition by the general contractor.
14. The contractor shall submit all necessary finishing materials, hardware and fixtures for approval of the owner and architect prior to purchasing. Failure of approval of the said items gives the architect/ owner the right to reject items without any cost implications.
15. Contractor to submit fire rating certificates of steel doors for documentation and filing purposes.
16. Demolition works:
  - a. Contractor to demolish all existing walls and partitions as stated in the plan. Contractor to verify actual based on issued plans.
  - b. Contractor to strip all existing wall finishes affected with the renovation. Contractor to verify plans and wall finishes in relation with the existing site condition.
  - c. Contractor to dismantle existing ceiling finishes except for bottom of slab ceiling.
  - d. Contractor to dismantle all existing doors, door jambs, hardware and accessories and turnover all items to the owner for proper handling except for doors to be retained, contractor to verify plans for reference.
  - e. Contractor to dismantle all existing glass partition and accessories and turnover all items to the owner for proper handling.
  - f. Contractor to dismantle all existing lighting fixtures and electrical devices on site and all items are subject for turnover to the owner for proper handling.
  - g. Contractor to dismantle all existing AC equipment on site subject for replacement and turnover all items to the owner for proper handling.

- h. Contractor to dismantle all existing utility lines, conduits, pipes and ductworks subject for replacement as per plan.
- i. Contractor to demolish and dismantle all existing floor finishes as per plan.
- j. Contractor to demolish and dismantle all existing wall cubicle partition and floor tiles at existing toilets.
- k. Contractor to demolish all existing CHB toilet partitions at common toilets.
- l. Contractor to demolish existing lavatory counter at existing toilets.
- m. Contractor to dismantle all existing toilet fixtures and accessories for replacement.
- n. Contractor to dismantle existing wall mounted facial mirror at existing toilets.
- o. Contractor to demolish affected slab for all areas to be converted to pipe chase.
- p. Contractor to demolish existing walls and slab affected for the accommodation of new elevator shaft.
- q. Contractor to demolish existing walls at executive toilets as per plan.  
Contractor to verify architectural plans for reference.

### **ARCHITECTURAL SCOPE OF WORKS**

1. The contractor to conduct actual site inspection and verify actual site dimensions in relation with the issued plans, any discrepancies with the actual site dimensions and the plans shall be relayed to the architect for verification.
2. The contractor to secure all required bonds as required by the end user.
3. The contractor to construct necessary temporary facilities required for the renovation.
4. The contractor to construct necessary board-up area for areas not affected during renovation, BSP satellite bank.
5. The contractor to maintain a clean work area at all times, ready to accommodate on-site inspection by the end user and consultants.
6. Supply, delivery and installation of carpet tiles as per plan. Contractor to verify plans and specifications for reference.
7. Supply, delivery and installation of porcelain floor tiles for toilet areas.
8. Supply, delivery and installation of porcelain wall tiles cladding for toilet areas.
9. Supply, delivery and installation of homogenous and resilient vinyl flooring as per manufacturer's standard; contractor to verify plans and specifications.
10. Supply, delivery and installation of paver tiles for outdoor walkway area.
11. Supply, delivery and installation of aluminium door threshold for all carpet to existing marble flooring finish. Contractor to verify plans and specifications for reference.
12. Supply, delivery and installation of partitions as per plan and specifications.
13. Supply, delivery and installation of wood-plastic composite baseboard as per plan and specifications.
14. Supply, delivery and installation of doors as per plan and specifications.
15. Supply, delivery and installation of operable partition complete with necessary tracks, hangers and accessories as per manufacturer's standard.
16. Supply, delivery and installation of glass partitions as per plan and specifications.
17. Supply, delivery and installation of facial mirror with plywood backing as per plan and specifications.
18. Supply, delivery and installation of phenolic board partition complete with stainless steel hardware and accessories for toilets as per plan and specifications.

19. Supply, delivery and installation of granite counter top for pantry and lavatory counters as per plans and specifications.
20. Supply, delivery and installation of toilet fixtures and accessories as per plans and specifications.
21. Supply, delivery and installation of pantry fixtures and accessories as per plans and specifications.
22. Supply, delivery and installation of food waste disposers for all pantry sinks as per plan and specifications.
23. Supply, delivery and installation of new ceiling as per architectural plans and specifications.
24. Supply, delivery and installation of automated and manually controlled roll-up door as per plans and specifications.
25. Supply, delivery and installation of ceiling works as per manufacturer's standard based on plans and specifications.
26. Supply, delivery and installation of all lighting fixtures as per plan and specifications.
27. Existing marble floor finish subject for refurbishing and crystallization works as per plan and specifications.
28. Contractor to supply, deliver and install veneer cladding at elevator lobby as per plans and specifications.

End of Architectural Scope of Works

### **ELECTRICAL SCOPE OF WORKS**

The work under this Division consist of furnishing all materials, equipment tools, labor and all other services necessary to complete and make ready for operation the Electrical Power and Lighting System, Fire Detection & Alarm System, Public Address/ Background Music System described below and or indicated in the Electrical Plans & Auxiliary Plans in accordance with the latest edition of the National Building Code, Philippine Electrical Code Part 1 and Part 2, National Electrical Code (NFPA 70) , Fire Code of the Philippines, National Fire Alarm Code (NFPA 72), Life Safety Code (NFPA 101), Illuminating Engineering Society (IES), National Electrical Manufacturers Association (NEMA), American National Standards Institute (ANSI), Under Writers Laboratories (UL) and this Specifications and General Conditions of the Contract.

#### **1. WORK INCLUDED:**

The work shall include the following furnishing and installation, each complete and in proper operation condition, unless otherwise stated in these specifications:

- a. Panel boards at various locations including circuit breakers/synchronizing switchgears, automatic transfer switch and all its accessories as indicated in the electrical riser diagram.

- b. Feeder and branch circuit conductors with necessary conduits approved type of fittings and devices as indicated on the electrical plans.
- c. All types of utilization devices, outlets and wall switches with proper cover plates.
- d. All lighting fixtures, wiring devices and necessary wiring of the building.
- e. ACCU and cable outlets including conduits and fittings, conductors as indicated on the plans; and
- f. All other items as stated, specified and as shown in these specifications and plans.
- g. Complete conduit system, boxes and faceplates, telephone terminal cabinet blocks including the cable of telephone and intercom system and telephone service entrance cable.
- h. Complete grounding system and lightning protection and TVSS.
- i. Perform terminations for all electrical system and complete testing.
- j. Automatic Transfer Switch, Genset& Synchronizing switchgear installations.
- k. Preparation of As-Built: plans and drawings.
- l. If anything has been omitted in any item of work or materials, usually furnished which are necessary for the completion of the Electrical Work as outlined herein before, then such items must be and are hereby included in this Division of the work.
- m. The Electrical contractor must have a PCAB licensed on their field of specifications. The electrical contractor must submit short circuit calculation, load flow analysis, arc flash & protection coordination study of the whole system of the building.
- n. Existing Transformer for Data Center shall be used, Contractor shall provide feeder wires & conduit from LVSB (See Power Single Line Diagram for reference) to data center room at 4th Floor for the tapping point of the Transformer. DOF

## 2. CODES & INSPECTIONS:

The work under this contract is to be installed according to the requirements of the latest edition of the National Building Code, Philippine Electrical Code, National Electrical Code (NFPA 70) , Fire Code of the Philippines, National Fire Alarm Code (NFPA 72), Life Safety Code (NFPA 101), Illuminating Engineering Society (IES), National Electrical Manufacturers Association (NEMA), American National Standards Institute (ANSI), Under Writers Laboratories (UL) and the rules and regulations of the United States Authorities.

- a. Electrical Service Application including drawings for this work shall be obtained by and at the expense of the contactor. The contractor shall comply with all the requirements of the utility companies with regards to the service applications.

### 3. MATERIALS & METHODS:

#### 3.1 Wires & Cables:

- a. All wires shall be copper, stranded type wire. It shall be smooth and true and of cylindrical form and shall be within 1% of the actual size called for.
- b. All wires shall comply within the requirements of the Underwriters Laboratories and as they apply to the particular usage.
- c. Wires and cables for lighting and power systems shall be plastic insulated for 600 Volts working pressure, type "THHN/THWN" unless otherwise noted on plans or specified below.
- d. All wires shall be stranded copper.
- e. For lighting and power system, no wire smaller than 3.5 mm<sup>2</sup> shall be used except otherwise noted.

#### 3.2 Conduits:

- a. Conduits for interior systems shall be standard Electrical Metallic Tubing (EMT) for 50MM (2") below & Intermediate Metallic Conduit (IMC) for 65MM (2 1/2") above and shall be UL Listed.
- b. No conduit shall have more than four (90) degree bends in any one run and where necessary, pull boxes shall be provided as directed.
- c. No wire shall be pulled into any conduit until the conduit system is complete in all details, in the case of concealed work until all rough plastering or masonry has been completed and in the case of exposed work until the conduit work has been completed in every detail.
- d. The ends of all conduits shall be tightly plugged to exclude plaster, dust and moisture while in progress of construction. All conduits shall be reamed to remove all burrs.
- e. All pipes and fittings on exposed work shall be secured by means of metal clips, which shall be held in place by means of machine screws. When running over concrete surfaces, the screws shall be held in place by means of expansion sleeves. All pipes on exposed work shall be run at right angles to and parallel with the surrounding walls and shall conform to the form of the ceiling. No diagonal runs shall be allowed and all bends and offsets shall be avoided as much as possible. Where necessary conduit fittings shall be used. Piping in all cases, it shall be run perfectly straight and true, satisfactory to the Consultant on record (COR) Conduits shall be supported at 3M intervals maximum, or per PEC requirements.
- f. Intermediate metallic conduits installed outside building in contact with the soil shall be coated with asphalt paint and wrapped with asphalt/rubber tape. An additional cost of asphalt paint shall be applied over the asphalt/rubber tape.

#### 3.3 Junction & Pull Boxes:

- a. All outlets of whatever kind, for all systems, there shall be provided a suitable fitting, which shall be either a box or other device especially designed to receive the type of fitting to be mounted thereon;
- b. The Contractor shall consult the COR as to the nature of the various fittings to be used before installing the outlet fittings, and shall conform strictly in the use of fittings, to the nature of the appliance to be mounted on them so that the work, when completed will be of finished design.
- c. All outlets on concealed conduit work provide galvanized pressed steel outlet boxes of standard make. These boxes shall be in all cases standard and where such boxes are not available on the market special boxes shall be secured by the Contractor at his own expense.
- d. Junction and pull boxes, of Code gauge steel, galvanized shall be provided as indicated or as required for facilitating the pulling of wires and cables. Pull boxes in finished places shall be located and installed with the permission and to the satisfaction of both COR.
- e. All junction and pull boxes on exposed conduit work shall be provided with hubs for threaded pipe entry and covers provided with neoprene gaskets.

#### 3.4 Wall Switches:

- a. Wall switches shall be rated at 16 amperes, 230 volts AC. Switches shall be of the quiet type. The type of switch shall be tumbler operation and the color, plating and appearance of wall plates shall be as selected by the COR/ Architect. Appropriate samples shall be submitted prior to the purchases of wall switches and faceplates.

#### 3.5 Wall Receptacles / Convenience Outlets:

- a. Receptacle outlets, in general, shall be for flush mounting, duplex type rated at 16 ampere, 230 volts parallel slots grounding type unless otherwise indicated on drawings. Type and color or receptacle outlet and plates shall be as selected by the COR/Architect. Appropriate samples of outlets and plates shall be submitted prior to purchase of devices.

#### 3.6 Plates:

- a. All switches and receptacle plates shall be of stainless satin finish or as directed by the COR/Architect.

#### 3.7 Panels & Cabinets:

- a. Standard panels and cabinets, as far as possible, shall be used and assembled on job. All panels shall be of dead front construction, furnish with trims for flush or surface mounting as provide. Cabinets shall be of Code gauge steel with gutters at least 4-inch wide and wider if necessary. The trim for all panels shall be finished in industrial beige color over a cost of rush inhibitor;
- b. Panels and cabinets shall be beige color powder coated.
- c. Power panel & breakers shall be approved by COR, circuit breakers of sizes voltage rating and interrupting capacity as called for a plans and bolt-on type, center main.  
Submit Short Circuit Analysis and Voltage Drop Calculation prior to the purchase of the Panel board. And after securing the Short circuit analysis the Electrical contractor must submit a protective coordination study and apply to the electrical system facilities.
- d. Power Panel's main bus work shall be rated in amperes equal to or exceed over-current protective device immediately ahead of it. All bus works shall be properly secured to withstand available short circuit forces at the location.

### 3.8 INDIVIDUAL BREAKERS AND SWITCHES:

- a. Provide individual circuit breakers, safety switches, and disconnect switches where indicated on plans, voltage ratings shall be suitable in each case of service application.
- b. All protective devices shall meet NEMA, Underwriters Laboratories, Inc.
- c. Circuit breakers shall consists of a quick-make, quick-break type entirely trip-free operating mechanism with contacts, interrupter, and thermal-magnetic trip unit for each pole, all enclosed in a molded-phenolic case. The thermal-magnetic trip units shall provide time-delayed overload protection and instantaneous short circuit protection, and shall operate a common trip bar which open all pole in case of overload or short-circuit current in any one pole. Circuit breaker shall be trip indicating, with the tripped position or breaker handle midway between "ON" and "OFF" position.
- d. Circuit breakers rated above 100 amperes shall have interchangeable trip units.
- e. All circuit breaker with a rating of 1000 ampere shall be Molded case type and 1200 ampere shall be Power breaker type.

### 3.9 LOCATION OF WIRING AND OUTLETS:

- a. The Contractor shall coordinate his work with all parties involved so that exact locations may be obtained for all outlets, apparatus, appliances and wiring.
- b. The location of outlets shown on diagrammatic wiring plans shall be considered as approximate and it shall be incumbent upon the Contractor, before installation of outlets/boxes, to study all pertinent drawings and obtain precise information from the architectural schedules, scale drawings, large scale and full size details of finished rooms, approved shop drawings of other parties involved or from the COR. It shall be understood that any outlet may be relocated a distance not exceeding 4.5M from the location shown on the drawings, if so directed by the COR. Contractor shall make any necessary adjustment of his work to fit conditions for recessed fixtures and for outlets occurring in glazed tile, block, terra cotta, marble, wood paneling, or other special finish materials, in order that all boxes may register flush with finish and shall be centered properly. In centering outlets, due allowance shall be made for overhead piping ducts, windows, and door trim variations in thickness of furring, plastering, etc., as erected, regardless of conditions which may be otherwise shown on small scale drawings. Outlets incorrectly located shall be properly relocated at the Contractor's expense. Local switches which are shown near doors shall be located at the strike side of the door as finally hang, regardless of swing shown on the drawings.
- c. The center line of wall, outlets, socket outlets, switches, telephone outlets, pilot lights, indicating lights, and fan outlets, shall be installed at heights above finished floor or as specified on the Architect's drawings. Where mounting heights are specified on the Electrical drawings, they shall be verified with Architect's drawings before installation. Where glazed tile, block, terra cotta occur, outlets shall be centered on the nearest joint to the height given.

#### 4. INSPECTION AND TEST:

- a. The COR shall have access to all parts of the work at all times and shall be furnished such information and assistance by the contractor. All installation shall be subjected to test and any damage done during testing shall be borne by the contractor.
- b. The contractor must provide protective coordination study at existing LVSB from upstream to downstream circuit breakers before energization of the system.

#### 5. STANDARD OF WORKMANSHIP:

The contractor shall execute all work in neat and workmanlike manner and shall do all necessary work whether it is clearly specified in this specification or shown in the drawing or not. Best practice in modern electrical installation shall be employed. Submit Methodology of construction and approved by COR.

### **SANITARY AND PLUMBING SCOPE OF WORKS**



II. Unless otherwise specified, the Contractor or his sub-contractor shall furnish all materials, tools, equipment, apparatus, appliances, accessories, transportation, labor and supervision required for the complete installation and testing of the Plumbing System ready for use in accordance with the best practice of the Plumbing Trade for the satisfactory completion of the works:

II. The works essentially shall include, but shall not necessarily be limited to the following items:

**A. General**

1. The Plumbing Contractor is required to refer to all architectural, structural, mechanical, fire protection and electrical plans and investigate all possible interference and conditions affecting his work.

2. All work shall comply with the pertinent provisions of the National Plumbing Code of the Philippines, the Code on Sanitation of the Philippines and/or the rules and regulations of concerned city or municipality.

3. Supply and installation of plumbing equipment complete with controller, breakers, starters, pressure switch and its appurtenances including trims and its accessories to complete the system of the following:

3.1 New Transfer Pumps complete with controllers. Accessories to include electrical wiring from pumps to motor controllers.

3.2 New Booster Pumps complete with controllers. Accessories to include electrical wiring from pumps to motor controllers.

3.3 New Sump Pump with accessories to include electrical wiring from pumps to motor controller.

3.4 Start-up, testing and commissioning.

4. Miscellaneous stainless steel metal works of the plumbing utilities and its appurtenances including, ladder rungs, sleeves, manhole cover, vents, drains trims and its accessories of the following:

4.1 Domestic Water Storage tank /or Cistern.

4.2 Central Oil Interceptor

4.3 Central Grease Tank

5. Testing for leakages of all building drains, waste, sewer, venting system including pressure testing and disinfection of the water supply and distribution system. Also leak test and disinfection of domestic and fire storage water tanks.
6. Excavation, trenching and backfilling including provision of pipe sleeves and block-outs pipe line punches / cross thru walls, beams and slabs provided with firestopping materials for the satisfactory completion of the works shall be included.
7. Miscellaneous items and other accessories required for the satisfactory completion of the plumbing works.
8. Securing and payments of all permits, licenses and bonds construction purposes as required.
9. Contingency to include furnishing of written one (1) year warranty on the plumbing system.
10. Preparation and submission of as-built drawings in producible sheets including five (5) white prints copies at no cost to the Owner(s).
11. Securing and payments of all contractor's taxes, VAT, etc.

**B. Third Floor**

1. Supply and installation of new cold water distribution system connect from existing water line up to new pantry sinks unit including roughing-in of isolation/gate valves, cold water lines, fittings, hangers, support trim and its accessories.
2. Supply and installation of new sewer and vent system for new pantry sinks including roughing-in floor/ceiling cleanout, p-traps, stacks, fittings, hangers, trims and its accessories.
3. Supply and installation of grease trap at new pantry sinks

4. Replacement of existing plumbing fixtures at existing male and female toilets. Roughing-ins to be replaced with new water, sewer and vent lines, connect from existing main downfeed/collectors at pipe chase. Water closets shall have bidet sprays.
5. Supply and installation of condensate drainage system of the building equipment and facilities including fan coil units (FCU) and air conditioning units (ACU), with insulation and separate piping from storm drainage system.
6. Removal of all existing pipes not necessary at site

End of Sanitary and Plumbing Scope of Works

### **MECHANICAL SCOPE OF WORKS**

- V. Under this section of the specifications, provide all labor, materials and equipment and perform all the work necessary for the complete execution of all the work as shown on Drawings and Specified in this specification.
- VI. Scope of work shall include but not be limited to the following principal items of work for Air-Conditioning and Mechanical Ventilation System, Smoke Extraction System, Pressurization System, Fresh Air System, Gas Piping System and Carbon Monoxide Monitoring System.
- VII. Third Floor
  1. Supply and installation of VRF (Outdoor and Indoor Unit), Ventilation Fans.
  2. Supply and installation of air conditioning ductwork and accessories such as dampers, diffusers, test holes, access panels.
  4. Supply and installation of ventilation ductwork and accessories such as dampers access panel diffusers. This includes staircase pressurization and smoke extraction system.
    5. Supply and installation of insulation for ductwork, chilled water piping and air conditioning equipment.

7. Supply and installation of air conditioning and ventilation equipment including air handling units, fan coil units, variable refrigerant flow units, split units, motor controls and starters, fans and blowers.
8. Supply and installation of automatic control for both air conditioning and mechanical ventilation systems including automatic temperature controls, chilled water plant controls, vrf system control, fans and blower flow control.
9. Supply and installation of refrigerant piping system.

VIII. Others:

1. Testing balancing and commissioning
2. Free maintenance for a period of 12 months after practical completion
3. Supply of manufacturer's recommended spare parts.
4. Furnishing and installation of instruction and identifications boards, charts, signs and markers, to include operating methods and instructions.
5. Priming and finish painting of cladded and exposed piping and other part of chilled water and refrigerant piping.
6. Miscellaneous items and other related materials required for the satisfactory completion of the air conditioning and ventilation system to include metal works, hangers, supports, anchors, bolts, bracing, vibration isolators, equipment concrete pads, and its accessories.
7. Securing and payment of permits, licenses and bonds for the construction purposes, including approval from local government unit.
8. Contingency to include the furnishing of written one (1) year warranty upon completion works.
9. Securing and payments of all Contractor's taxes, VAT, etc.

10. Furnishing and installation of instruction and identifications boards, charts, signs and markers, to include operating methods and instructions.
11. Priming and finish painting of cladded and exposed piping and other part of chilled water and refrigerant piping.
12. Miscellaneous items and other related materials required for the satisfactory completion of the air conditioning and ventilation system to include metal works, hangers, supports, anchors, bolts, bracing, vibration isolators, equipment concrete pads, equipment structural support and its accessories.
13. Preparation and submission of Shop-Drawings based on actual site condition.
14. Preparation and submission of As-Built drawings in reproducible sheets including five (5) white prints copies at no cost to the Owner(s).

End of Mechanical Scope of Works

### **FIRE PROTECTION SCOPE OF WORKS**

- V. Furnishing of all materials, labor, tools, equipment and accessories for the complete installation, testing and adjustment, ready for use of the proposed automatic fire sprinkler system.
- VI. The works essentially shall include, but shall not necessarily be limited to the following items:
  11. All openings through which fire may spread from one floor to the other, such as holes
  12. through floors made for the passage of plumbing pipes and electrical circuits shall be sealed with fire resistant / or fire stopping materials.
  13. Furnishing and installation of instruction and identifications boards, charts, signs and markers, to include operating methods and instructions.
- VII. General

14. Priming and finish painting (red) of clad and exposed piping and other part of sprinkler system except for sprinkler heads.
15. Complete testing and commissioning, start-up of the floor Automatic Fire Sprinkler System in accordance with NFPA-13, to include cleaning, draining, adjusting and inspecting.
16. Miscellaneous items and other related materials required for the satisfactory completion of the sprinkler system to include metal works, hangers, supports, anchors, bolts, bracing and its accessories.
17. Securing and payment of permits, licenses and bonds for the construction purposes, including approval from the Fire Department having jurisdictions.
18. Contingency to include the furnishing of written one (1) year warranty upon completion works of sprinkler system.
19. Preparation and submission of As-Built drawings in reproducible sheets including five (5) white prints copies at no cost to the Owner(s).
20. Securing and payments of all Contractor's taxes, VAT, etc.

### VIII. Third Floor

5. Supply/relocate and install complete with the sprinkler heads including spares and cabinet for sprinkler system tools and stocks, trims and its accessories required to complete the system.
6. Supply/relocate and install complete with the portable fire extinguishing system consisting of mounting support, bracket, trims and its accessories required to complete the system.
7. Supply and install complete with the new Fourth Floor Data Center Fire Suppression system (NOVEC 1230) consisting of mounting support, bracket, trims and its accessories required to complete the system.
8. All existing (relocated and retained/not relocated) pendent, upright and sidewall sprinkler heads shall be replaced with new.

End of Fire Protection Scope of Works

**PROJECT :       FOURTH FLOOR**  
**RENOVATION OF THE DEPARTMENT OF FINANCE**  
**BUILDING OFFICE – PACKAGE 2**

**BACKGROUND OF THE PROJECT**

1. The Philippines' Department of Finance (DOF) (Filipino: KagawaranngPananalapi) is the executive department of the Philippine government responsible for the formulation, institutionalization and administration of fiscal policies, management of the financial resources of the government, supervision of the revenue operations of all local government units, the review, approval and management of all public sector debt, and the rationalization, privatization and public accountability of corporations and assets owned, controlled or acquired by the government.
2. The proposed building renovation aims to improve the whole aspects of the office building for the betterment of its employees.
3. The proposed renovation aims to modernize the building fully, office area utilization, upgrading of utilities and office systems and provide employees with a modern and beautiful office environment to improve their overall working environment.

**GENERAL REQUIREMENTS**

1. The contractor shall follow and deliver all requirements as stated in the “*General Requirements*” of the Technical Specifications
2. The contractor shall follow and deliver all requirements as stated in the “*Safety, Sanitation and Security Requirements*” of the Technical Specifications
3. The contractor shall follow and deliver all requirements as stated in the “*Temporary Facilities*” of the Technical Specifications
4. The contractor shall follow and deliver all requirements as stated in the “*Final Cleaning*” of the Technical Specifications
5. The contractor shall provide as- built drawings for all disciplines as required in the “*General Requirements*” of the Technical Specifications
6. The fourth floor renovation project is part of the DOF building renovation and facilities improvement package 2.
7. The project scope of work encompasses all civil and utility works including all facilities located or situated at the said floor level.
8. All utility lines such as electrical, sanitary and plumbing, and mechanical lines leading up to succeeding floors shall be properly terminated at the utility riser line locations, contractor to verify actual on site.
9. All utility lines leading to the riser or main distribution line shall be properly terminated so as to accommodate the supply, delivery and installation of new main distribution lines included in package 2 of the said renovation.
10. The contractor shall provide necessary scaffolding, tools, equipment and machineries required for the renovation of the project.
  - a. The contractor to provide the use of building hoist, inclusive of mobilization and demobilization, installation, mechanical permits and documentations, dismantling and insurances with the following specifications:

- i. Type : Twin cage building hoist
- ii. Height : 30.5 meters
- iii. Fixed Speed : 33 meters per minute
- iv. Max. Load : 2000 kg. per cage
- v. Cage Dimensions : 3.0mL x 1.5mW x 2.5mH
- vi. Motor : 3 Motor drive (3 x 11kw motors)
- vii. Power Supply : 440 volts 60 hertz 3Phase

11. The contractor to provide necessary board-ups, safety nets and protective partitions as required for the renovation.
12. The contractor to submit shop drawings of construction details prior to material procurement for approval of the architect/ owner.
13. All repair works for roughing-ins of utility works (sanitary, electrical and mechanical), shall be covered by the general contractor. E.g. all rough-ins for piping works below reinforced concrete slab shall be restored and repaired back to original condition by the general contractor.
14. Contractor to submit product catalogues, brochures and specifications for all materials for approval of the designer/ project manager/ owner.
15. Contractor to ensure cleanliness at all times in the construction premises.
16. The contractor shall submit all necessary finishing materials, hardware and fixtures for approval of the owner and architect prior to purchasing. Failure of approval of the said items gives the architect/ owner the right to reject items without any cost implications.
17. Contractor to submit fire rating certificates of steel doors for documentation and filing purposes.
18. Demolition works:
  - a. Contractor to demolish all existing walls and partitions as stated in the plan. Contractor to verify actual based on issued plans.
  - b. Contractor to strip all existing wall finishes affected with the renovation. Contractor to verify plans and wall finishes in relation with the existing site condition.
  - c. Contractor to dismantle existing ceiling finishes except for bottom of slab ceiling.
  - d. Contractor to dismantle all existing doors, door jambs, hardware and accessories and turnover all items to the owner for proper handling except for doors to be retained, contractor to verify plans for reference.
  - e. Contractor to dismantle all existing glass partition and accessories and turnover all items to the owner for proper handling.
  - f. Contractor to dismantle all existing lighting fixtures and electrical devices on site and all items are subject for turnover to the owner for proper handling.
  - g. Contractor to dismantle all existing AC equipment on site subject for replacement and turnover all items to the owner for proper handling.
  - h. Contractor to dismantle all existing utility lines, conduits, pipes and ductworks subject for replacement as per plan.
  - i. Contractor to demolish and dismantle all existing floor finishes as per plan.
  - j. Contractor to demolish and dismantle all existing wall cubicle partition and floor tiles at existing toilets.
  - k. Contractor to demolish all existing CHB toilet partitions at common toilets.
  - l. Contractor to demolish existing lavatory counter at existing toilets.
  - m. Contractor to dismantle all existing toilet fixtures and accessories for replacement.



- n. Contractor to dismantle existing wall mounted facial mirror at existing toilets.
- o. Contractor to demolish affected slab for all areas to be converted to pipe chase.
- p. Contractor to demolish existing walls and slab affected for the accommodation of new elevator shaft.
- q. Contractor to demolish existing walls at executive toilets as per plan.  
Contractor to verify architectural plans for reference.

## **ARCHITECTURAL SCOPE OF WORKS**

1. The contractor to conduct actual site inspection and verify actual site dimensions in relation with the issued plans, any discrepancies with the actual site dimensions and the plans shall be relayed to the architect for verification.
2. The contractor to secure all required bonds as required by the end user.
3. The contractor to construct necessary temporary facilities required for the renovation.
4. The contractor to construct necessary board-up area for areas not affected during renovation, BSP satellite bank.
5. The contractor to maintain a clean work area at all times, ready to accommodate on-site inspection by the end user and consultants.
6. Supply, delivery and installation of carpet tiles as per plan. Contractor to verify plans and specifications for reference.
7. Supply, delivery and installation of porcelain floor tiles for toilet areas.
8. Supply, delivery and installation of porcelain wall tiles cladding for toilet areas.
9. Supply, delivery and installation of homogenous and resilient vinyl flooring as per manufacturer's standard; contractor to verify plans and specifications.
10. Supply, delivery and installation of paver tiles for outdoor walkway area.
11. Supply, delivery and installation of aluminium door threshold for all carpet to existing marble flooring finish. Contractor to verify plans and specifications for reference.
12. Supply, delivery and installation of partitions as per plan and specifications.
13. Supply, delivery and installation of wood-plastic composite baseboard as per plan and specifications.
14. Supply, delivery and installation of doors as per plan and specifications.
15. Supply, delivery and installation of operable partition complete with necessary tracks, hangers and accessories as per manufacturer's standard.
16. Supply, delivery and installation of glass partitions as per plan and specifications.
17. Supply, delivery and installation of facial mirror with plywood backing as per plan and specifications.
18. Supply, delivery and installation of phenolic board partition complete with stainless steel hardware and accessories for toilets as per plan and specifications.
19. Supply, delivery and installation of granite counter top for pantry and lavatory counters as per plans and specifications.
20. Supply, delivery and installation of toilet fixtures and accessories as per plans and specifications.
21. Supply, delivery and installation of pantry fixtures and accessories as per plans and specifications.
22. Supply, delivery and installation of food waste disposers for all pantry sinks as per plan and specifications.
23. Supply, delivery and installation of new ceiling as per architectural plans and specifications.
24. Supply, delivery and installation of automated and manually controlled roll-up door as per plans and specifications.
25. Supply, delivery and installation of ceiling works as per manufacturer's standard based on plans and specifications.
26. Supply, delivery and installation of all lighting fixtures as per plan and specifications.

27. Existing marble floor finish subject for refurbishing and crystallization works as per plan and specifications.
28. Contractor to supply, deliver and install veneer cladding at elevator lobby as per plans and specifications.

End of Architectural Scope of Works

### **ELECTRICAL SCOPE OF WORKS**

The work under this Division consist of furnishing all materials, equipment tools, labor and all other services necessary to complete and make ready for operation the Electrical Power and Lighting System, Fire Detection & Alarm System, Public Address/ Background Music System described below and or indicated in the Electrical Plans & Auxiliary Plans in accordance with the latest edition of the National Building Code, Philippine Electrical Code Part 1 and Part 2, National Electrical Code (NFPA 70) , Fire Code of the Philippines, National Fire Alarm Code (NFPA 72), Life Safety Code (NFPA 101), Illuminating Engineering Society (IES), National Electrical Manufacturers Association (NEMA), American National Standards Institute (ANSI), Under Writers Laboratories (UL) and this Specifications and General Conditions of the Contract.

#### **1. WORK INCLUDED:**

The work shall include the following furnishing and installation, each complete and in proper operation condition, unless otherwise stated in these specifications:

- a. Panel boards at various locations including circuit breakers/synchronizing switchgears, automatic transfer switch and all its accessories as indicated in the electrical riser diagram.
- b. Feeder and branch circuit conductors with necessary conduits approved type of fittings and devices as indicated on the electrical plans.
- c. All types of utilization devices, outlets and wall switches with proper cover plates.
- d. All lighting fixtures, wiring devices and necessary wiring of the building.
- e. ACCU and cable outlets including conduits and fittings, conductors as indicated on the plans; and
- f. All other items as stated, specified and as shown in these specifications and plans.

- g. Complete conduit system, boxes and faceplates, telephone terminal cabinet blocks including the cable of telephone and intercom system and telephone service entrance cable.
- h. Complete grounding system and lightning protection and TVSS.
- i. Perform terminations for all electrical system and complete testing.
- j. Automatic Transfer Switch, Genset & Synchronizing switchgear installations.
- k. Preparation of As-Built: plans and drawings.
- l. If anything has been omitted in any item of work or materials, usually furnished which are necessary for the completion of the Electrical Work as outlined herein before, then such items must be and are hereby included in this Division of the work.
- m. The Electrical contractor must have a PCAB licensed on their field of specifications. The electrical contractor must submit short circuit calculation, load flow analysis, arc flash & protection coordination study of the whole system of the building.
- n. Existing Transformer for Data Center shall be used, Contractor shall provide feeder wires & conduit from LVSB (See Power Single Line Diagram for reference) to data center room at 4th Floor for the tapping point of the Transformer. DOF

## 2. CODES & INSPECTIONS:

The work under this contract is to be installed according to the requirements of the latest edition of the National Building Code, Philippine Electrical Code, National Electrical Code (NFPA 70) , Fire Code of the Philippines, National Fire Alarm Code (NFPA 72), Life Safety Code (NFPA 101), Illuminating Engineering Society (IES), National Electrical Manufacturers Association (NEMA), American National Standards Institute (ANSI), Under Writers Laboratories (UL) and the rules and regulations of the United States Authorities.

- a. Electrical Service Application including drawings for this work shall be obtained by and at the expense of the contractor. The contractor shall comply with all the requirements of the utility companies with regards to the service applications.

## 3. MATERIALS & METHODS:

### 3.1 Wires & Cables:

- a. All wires shall be copper, stranded type wire. It shall be smooth and true and of cylindrical form and shall be within 1% of the actual size called for.
- b. All wires shall comply within the requirements of the Underwriters Laboratories and as they apply to the particular usage.

- c. Wires and cables for lighting and power systems shall be plastic insulated for 600 Volts working pressure, type “THHN/THWN” unless otherwise noted on plans or specified below.
- d. All wires shall be stranded copper.
- e. For lighting and power system, no wire smaller than 3.5 mm<sup>2</sup> shall be used except otherwise noted.

### 3.2 Conduits:

- a. Conduits for interior systems shall be standard Electrical Metallic Tubing (EMT) for 50MM (2”) below & Intermediate Metallic Conduit (IMC) for 65MM (2 1/2”) above and shall be UL Listed.
- b. No conduit shall have more than four (90) degree bends in any one run and where necessary, pull boxes shall be provided as directed.
- c. No wire shall be pulled into any conduit until the conduit system is complete in all details, in the case of concealed work until all rough plastering or masonry has been completed and in the case of exposed work until the conduit work has been completed in every detail.
- d. The ends of all conduits shall be tightly plugged to exclude plaster, dust and moisture while in progress of construction. All conduits shall be reamed to remove all burrs.
- e. All pipes and fittings on exposed work shall be secured by means of metal clips, which shall be held in place by means of machine screws. When running over concrete surfaces, the screws shall be held in place by means of expansion sleeves. All pipes on exposed work shall be run at right angles to and parallel with the surrounding walls and shall conform to the form of the ceiling. No diagonal runs shall be allowed and all bends and offsets shall be avoided as much as possible. Where necessary conduit fittings shall be used. Piping in all cases, it shall be run perfectly straight and true, satisfactory to the Consultant on record (COR) Conduits shall be supported at 3M intervals maximum, or per PEC requirements.
- f. Intermediate metallic conduits installed outside building in contact with the soil shall be coated with asphalt paint and wrapped with asphalt/rubber tape. An additional cost of asphalt paint shall be applied over the asphalt/rubber tape.

### 3.3 Junction & Pull Boxes:

- a. All outlets of whatever kind, for all systems, there shall be provided a suitable fitting, which shall be either a box or other device especially designed to receive the type of fitting to be mounted thereon;
- b. The Contractor shall consult the COR as to the nature of the various fittings to be used before installing the outlet fittings, and shall conform strictly in the use of fittings, to the nature of the appliance to be mounted on them so that the work, when completed will be of finished design.

- c. All outlets on concealed conduit work provide galvanized pressed steel outlet boxes of standard make. These boxes shall be in all cases standard and where such boxes are not available on the market special boxes shall be secured by the Contractor at his own expense.
- d. Junction and pull boxes, of Code gauge steel, galvanized shall be provided as indicated or as required for facilitating the pulling of wires and cables. Pull boxes in finished places shall be located and installed with the permission and to the satisfaction of both COR.
- e. All junction and pull boxes on exposed conduit work shall be provided with hubs for threaded pipe entry and covers provided with neoprene gaskets.

#### 3.4 Wall Switches:

- a. Wall switches shall be rated at 16 amperes, 230 volts AC. Switches shall be of the quiet type. The type of switch shall be tumbler operation and the color, plating and appearance of wall plates shall be as selected by the COR/ Architect. Appropriate samples shall be submitted prior to the purchases of wall switches and faceplates.

#### 3.5 Wall Receptacles / Convenience Outlets:

- a. Receptacle outlets, in general, shall be for flush mounting, duplex type rated at 16 ampere, 230 volts parallel slots grounding type unless otherwise indicated on drawings. Type and color of receptacle outlet and plates shall be as selected by the COR/Architect. Appropriate samples of outlets and plates shall be submitted prior to purchase of devices.

#### 3.6 Plates:

- a. All switches and receptacle plates shall be of stainless satin finish or as directed by the COR/Architect.

#### 3.7 Panels & Cabinets:

- a. Standard panels and cabinets, as far as possible, shall be used and assembled on job. All panels shall be of dead front construction, furnish with trims for flush or surface mounting as provide. Cabinets shall be of Code gauge steel with gutters at least 4-inch wide and wider if necessary. The trim for all panels shall be finished in industrial beige color over a coat of rust inhibitor;
- b. Panels and cabinets shall be beige color powder coated.

- c. Power panel & breakers shall be approved by COR, circuit breakers of sizes voltage rating and interrupting capacity as called for a plans and bolt-on type, center main.  
Submit Short Circuit Analysis and Voltage Drop Calculation prior to the purchase of the Panel board. And after securing the Short circuit analysis the Electrical contractor must submit a protective coordination study and apply to the electrical system facilities.
- d. Power Panel's main bus work shall be rated in amperes equal to or exceed over-current protective device immediately ahead of it. All bus works shall be properly secured to withstand available short circuit forces at the location.

### 3.8 INDIVIDUAL BREAKERS AND SWITCHES:

- a. Provide individual circuit breakers, safety switches, and disconnect switches where indicated on plans, voltage ratings shall be suitable in each case of service application.
- b. All protective devices shall meet NEMA, Underwriters Laboratories, Inc.
- c. Circuit breakers shall consists of a quick-make, quick-break type entirely trip-free operating mechanism with contacts, interrupter, and thermal-magnetic trip unit for each pole, all enclosed in a molded-phenolic case. The thermal-magnetic trip units shall provide time-delayed overload protection and instantaneous short circuit protection, and shall operate a common trip bar which open all pole in case of overload or short-circuit current in any one pole. Circuit breaker shall be trip indicating, with the tripped position or breaker handle midway between "ON" and "OFF" position.
- d. Circuit breakers rated above 100 amperes shall have interchangeable trip units.
- e. All circuit breaker with a rating of 1000 ampere shall be Molded case type and 1200 ampere shall be Power breaker type.

### 3.9 LOCATION OF WIRING AND OUTLETS:

- a. The Contractor shall coordinate his work with all parties involved so that exact locations may be obtained for all outlets, apparatus, appliances and wiring.
- b. The location of outlets shown on diagrammatic wiring plans shall be considered as approximate and it shall be incumbent upon the Contractor, before installation of outlets/boxes, to study all pertinent drawings and obtain precise information from the architectural schedules, scale drawings, large scale and full size details of finished rooms, approved shop drawings of other parties involved or from the COR. It shall be

understood that any outlet may be relocated a distance not exceeding 4.5M from the location shown on the drawings, if so directed by the COR. Contractor shall make any necessary adjustment of his work to fit conditions for recessed fixtures and for outlets occurring in glazed tile, block, terra cotta, marble, wood paneling, or other special finish materials, in order that all boxes may register flush with finish and shall be centered properly. In centering outlets, due allowance shall be made for overhead piping ducts, windows, and door trim variations in thickness of furring, plastering, etc., as erected, regardless of conditions which may be otherwise shown on small scale drawings. Outlets incorrectly located shall be properly relocated at the Contractor's expense. Local switches which are shown near doors shall be located at the strike side of the door as finally hung, regardless of swing shown on the drawings.

- c. The center line of wall, outlets, socket outlets, switches, telephone outlets, pilot lights, indicating lights, and fan outlets, shall be installed at heights above finished floor or as specified on the Architect's drawings. Where mounting heights are specified on the Electrical drawings, they shall be verified with Architect's drawings before installation. Where glazed tile, block, terra cotta occur, outlets shall be centered on the nearest joint to the height given.

#### 4. INSPECTION AND TEST:

- a. The COR shall have access to all parts of the work at all times and shall be furnished such information and assistance by the contractor. All installation shall be subjected to test and any damage done during testing shall be borne by the contractor.
- b. The contractor must provide protective coordination study at existing LVSB from upstream to downstream circuit breakers before energization of the system.

#### 5. STANDARD OF WORKMANSHIP:

The contractor shall execute all work in neat and workmanlike manner and shall do all necessary work whether it is clearly specified in this specification or shown in the drawing or not. Best practice in modern electrical installation shall be employed. Submit Methodology of construction and approved by COR.



## **SANITARY AND PLUMBING SCOPE OF WORKS**

III. Unless otherwise specified, the Contractor or his sub-contractor shall furnish all materials, tools, equipment, apparatus, appliances, accessories, transportation, labor and supervision required for the complete installation and testing of the Plumbing System ready for use in accordance with the best practice of the Plumbing Trade for the satisfactory completion of the works:

II. The works essentially shall include, but shall not necessarily be limited to the following items:

### **A. General**

1. The Plumbing Contractor is required to refer to all architectural, structural, mechanical, fire protection and electrical plans and investigate all possible interference and conditions affecting his work.

2. All work shall comply with the pertinent provisions of the National Plumbing Code of the Philippines, the Code on Sanitation of the Philippines and/or the rules and regulations of concerned city or municipality.

3. Supply and installation of plumbing equipment complete with controller, breakers, starters, pressure switch and its appurtenances including trims and its accessories to complete the system of the following:

3.1 New Transfer Pumps complete with controllers. Accessories to include electrical wiring from pumps to motor controllers.

3.2 New Booster Pumps complete with controllers. Accessories to include electrical wiring from pumps to motor controllers.

3.3 New Sump Pump with accessories to include electrical wiring from pumps to motor controller.

3.4 Start-up, testing and commissioning.

4. Miscellaneous stainless steel metal works of the plumbing utilities and its appurtenances including, ladder rungs, sleeves, manhole cover, vents, drains trims and its accessories of the following:

- 4.1 Domestic Water Storage tank /or Cistern.
- 4.2 Central Oil Interceptor
- 4.3 Central Grease Tank
5. Testing for leakages of all building drains, waste, sewer, venting system including pressure testing and disinfection of the water supply and distribution system. Also leak test and disinfection of domestic and fire storage water tanks.
6. Excavation, trenching and backfilling including provision of pipe sleeves and block-outs pipe line punches / cross thru walls, beams and slabs provided with firestopping materials for the satisfactory completion of the works shall be included.
7. Miscellaneous items and other accessories required for the satisfactory completion of the plumbing works.
8. Securing and payments of all permits, licenses and bonds construction purposes as required.
9. Contingency to include furnishing of written one (1) year warranty on the plumbing system.
10. Preparation and submission of as-built drawings in producible sheets including five (5) white prints copies at no cost to the Owner(s).
11. Securing and payments of all contractor's taxes, VAT, etc.

## **B. FourthFloor**

1. Supply and installation of new cold water distribution system connect from existing water line up to new pantry sinks unit including roughing-in of isolation/gate valves, cold water lines, fittings, hangers, support trim and its accessories.
2. Supply and installation of new sewer and vent system for new pantry sinks including roughing-in floor/ceiling cleanout, p-traps, stacks, fittings, hangers, trims and its accessories.

3. Supply and installation of grease trap at new pantry sinks
4. Replacement of existing plumbing fixtures at existing male and female toilets. Roughing-ins to be replaced with new water, sewer and vent lines, connect from existing main downfeed/collectors at pipe chase. Water closets shall have bidet sprays.
5. Supply and installation of condensate drainage system of the building equipment and facilities including fan coil units (FCU) and air conditioning units (ACU), with insulation and separate piping from storm drainage system.
6. Removal of all existing pipes not necessary at site

End of Sanitary and Plumbing Scope of Works

### **MECHANICAL SCOPE OF WORKS**

- IX. Under this section of the specifications, provide all labor, materials and equipment and perform all the work necessary for the complete execution of all the work as shown on Drawings and Specified in this specification.
- X. Scope of work shall include but not be limited to the following principal items of work for Air-Conditioning and Mechanical Ventilation System, Smoke Extraction System, Pressurization System, Fresh Air System, Gas Piping System and Carbon Monoxide Monitoring System.
- XI. Fourth Floor
  1. Supply and installation of VRF (Outdoor and Indoor Unit), Ventilating Fans.
  2. Supply and installation of air conditioning ductwork and accessories such as dampers, diffusers, test holes, access panels.
  3. Supply and installation of ventilation ductwork and accessories such as dampers access panel diffusers. This includes staircase pressurization and smoke extraction system.

4. Supply and installation of insulation for ductwork, chilled water piping and air conditioning equipment.
5. Supply and installation of air conditioning and ventilation equipment including air handling units, fan coil units, variable refrigerant flow units, split units, motor controls and starters, fans and blowers.
6. Supply and installation of automatic control for both air conditioning and mechanical ventilation systems including automatic temperature controls, chilled water plant controls, vrf system control, fans and blower flow control.
7. Supply and installation of refrigerant piping system.

XII. Others:

1. Testing balancing and commissioning
2. Free maintenance for a period of 12 months after practical completion
3. Supply of manufacturer's recommended spare parts.
4. Furnishing and installation of instruction and identifications boards, charts, signs and markers, to include operating methods and instructions.
5. Priming and finish painting of cladded and exposed piping and other part of chilled water and refrigerant piping.
6. Miscellaneous items and other related materials required for the satisfactory completion of the air conditioning and ventilation system to include metal works, hangers, supports, anchors, bolts, bracing, vibration isolators, equipment concrete pads, and its accessories.
7. Securing and payment of permits, licenses and bonds for the construction purposes, including approval from local government unit.
8. Contingency to include the furnishing of written one (1) year warranty upon completion works.
9. Securing and payments of all Contractor's taxes, VAT, etc.

10. Furnishing and installation of instruction and identifications boards, charts, signs and markers, to include operating methods and instructions.
11. Priming and finish painting of clad and exposed piping and other part of chilled water and refrigerant piping.
12. Miscellaneous items and other related materials required for the satisfactory completion of the air conditioning and ventilation system to include metal works, hangers, supports, anchors, bolts, bracing, vibration isolators, equipment concrete pads, equipment structural support and its accessories.
13. Preparation and submission of Shop-Drawings based on actual site condition.
14. Preparation and submission of As-Built drawings in reproducible sheets including five (5) white prints copies at no cost to the Owner(s).

End of Mechanical Scope of Works

### **FIRE PROTECTION SCOPE OF WORKS**

- IX. Furnishing of all materials, labor, tools, equipment and accessories for the complete installation, testing and adjustment, ready for use of the proposed automatic fire sprinkler system.
- X. The works essentially shall include, but shall not necessarily be limited to the following items:
- XI. General
  21. All openings through which fire may spread from one floor to the other, such as holes
  22. through floors made for the passage of plumbing pipes and electrical circuits shall be sealed with fire resistant / or fire stopping materials.
  23. Furnishing and installation of instruction and identifications boards, charts, signs and markers, to include operating methods and instructions.

24. Priming and finish painting (red) of clad and exposed piping and other part of sprinkler system except for sprinkler heads.
25. Complete testing and commissioning, start-up of the floor Automatic Fire Sprinkler System in accordance with NFPA-13, to include cleaning, draining, adjusting and inspecting.
26. Miscellaneous items and other related materials required for the satisfactory completion of the sprinkler system to include metal works, hangers, supports, anchors, bolts, bracing and its accessories.
27. Securing and payment of permits, licenses and bonds for the construction purposes, including approval from the Fire Department having jurisdictions.
28. Contingency to include the furnishing of written one (1) year warranty upon completion works of sprinkler system.
29. Preparation and submission of As-Built drawings in reproducible sheets including five (5) white prints copies at no cost to the Owner(s).
30. Securing and payments of all Contractor's taxes, VAT, etc.

## XII. Fourth Floor

9. Supply/relocate and install complete with the sprinkler heads including spares and cabinet for sprinkler system tools and stocks, trims and its accessories required to complete the system.
10. Supply/relocate and install complete with the portable fire extinguishing system consisting of mounting support, bracket, trims and its accessories required to complete the system.
11. Supply and install complete with the new Fourth Floor Data Center Fire Suppression system (NOVEC 1230) consisting of mounting support, bracket, trims and its accessories required to complete the system.
12. All existing (relocated and retained/not relocated) pendent, upright and sidewall sprinkler heads shall be replaced with new.

End of Fire Protection Scope of Works

**PROJECT : FIFTH FLOOR  
RENOVATION OF THE DEPARTMENT OF FINANCE  
BUILDING OFFICES – PACKAGE 2**

### **BACKGROUND OF THE PROJECT**

1. The Philippines' Department of Finance (DOF) (Filipino: KagawarannngPananalapi) is the executive department of the Philippine government responsible for the formulation, institutionalization and administration of fiscal policies, management of the financial resources of the government, supervision of the revenue operations of all local government units, the review, approval and management of all public sector debt, and the rationalization, privatization and public

- accountability of corporations and assets owned, controlled or acquired by the government.
2. The proposed building renovation aims to improve the whole aspects of the office building for the betterment of its employees.
  3. The proposed renovation aims to modernize the building fully, office area utilization, upgrading of utilities and office systems and provide employees with a modern and beautiful office environment to improve their overall working environment.

## **GENERAL REQUIREMENTS**

1. The contractor shall follow and deliver all requirements as stated in the “*General Requirements*” of the Technical Specifications
2. The contractor shall follow and deliver all requirements as stated in the “*Safety, Sanitation and Security Requirements*” of the Technical Specifications
3. The contractor shall follow and deliver all requirements as stated in the “*Temporary Facilities*” of the Technical Specifications
4. The contractor shall follow and deliver all requirements as stated in the “*Final Cleaning*” of the Technical Specifications
5. The contractor shall provide as- built drawings for all disciplines as required in the “*General Requirements*” of the Technical Specifications
6. The fifth floor renovation project is part of the DOF building renovation and facilities improvement package 2.
7. The project scope of work encompasses all civil and utility works including all facilities located or situated at the said floor level.
8. All utility lines such as electrical, sanitary and plumbing, and mechanical lines leading up to succeeding floors shall be properly terminated at the utility riser line locations, contractor to verify actual on site.
9. All utility lines leading to the riser or main distribution line shall be properly terminated so as to accommodate the supply, delivery and installation of new main distribution lines included in package 2 of the said renovation.
10. The contractor shall provide necessary scaffolding, tools, equipment and machineries required for the renovation of the project.
  - a. The contractor to provide the use of building hoist, inclusive of mobilization and demobilization, installation, mechanical permits and documentations, dismantling and insurances with the following specifications:
 

i. Type	:	Twin cage building hoist
ii. Height	:	30.5 meters
iii. Fixed Speed	:	33 meters per minute
iv. Max. Load	:	2000 kg. per cage
v. Cage Dimensions	:	3.0mL x 1.5mW x 2.5mH
vi. Motor	:	3 Motor drive (3 x 11kw motors)
vii. Power Supply	:	440 volts 60 hertz 3Phase
11. The contractor to provide necessary board-ups, safety nets and protective partitions as required for the renovation.
12. The contractor to submit shop drawings of construction details prior to material procurement for approval of the architect/ owner.
13. All repair works for roughing-ins of utility works (sanitary, electrical and mechanical), shall be covered by the general contractor. E.g. all rough-ins for

- piping works below reinforced concrete slab shall be restored and repaired back to original condition by the general contractor.
14. Contractor to submit product catalogues, brochures and specifications for all materials for approval of the designer/ project manager/ owner.
  15. Contractor to ensure cleanliness at all times in the construction premises.
  16. The contractor shall submit all necessary finishing materials, hardware and fixtures for approval of the owner and architect prior to purchasing. Failure of approval of the said items gives the architect/ owner the right to reject items without any cost implications.
  17. Contractor to submit fire rating certificates of steel doors for documentation and filing purposes.
  18. Demolition works:
    - a. Contractor to demolish all existing walls and partitions as stated in the plan. Contractor to verify actual based on issued plans.
    - b. Contractor to strip all existing wall finishes affected with the renovation. Contractor to verify plans and wall finishes in relation with the existing site condition.
    - c. Contractor to dismantle existing ceiling finishes except for bottom of slab ceiling.
    - d. Contractor to dismantle all existing doors, door jambs, hardware and accessories and turnover all items to the owner for proper handling except for doors to be retained, contractor to verify plans for reference.
    - e. Contractor to dismantle all existing glass partition and accessories and turnover all items to the owner for proper handling.
    - f. Contractor to dismantle all existing lighting fixtures and electrical devices on site and all items are subject for turnover to the owner for proper handling.
    - g. Contractor to dismantle all existing AC equipment on site subject for replacement and turnover all items to the owner for proper handling.
    - h. Contractor to dismantle all existing utility lines, conduits, pipes and ductworks subject for replacement as per plan.
    - i. Contractor to demolish and dismantle all existing floor finishes as per plan.
    - j. Contractor to demolish and dismantle all existing wall cubicle partition and floor tiles at existing toilets.
    - k. Contractor to demolish all existing CHB toilet partitions at common toilets.
    - l. Contractor to demolish existing lavatory counter at existing toilets.
    - m. Contractor to dismantle all existing toilet fixtures and accessories for replacement.
    - n. Contractor to dismantle existing wall mounted facial mirror at existing toilets.
    - o. Contractor to demolish affected slab for all areas to be converted to pipe chase.
    - p. Contractor to demolish existing walls and slab affected for the accommodation of new elevator shaft.
    - q. Contractor to demolish existing walls at executive toilets as per plan. Contractor to verify architectural plans for reference.

## **ARCHITECTURAL SCOPE OF WORKS**



1. The contractor to conduct actual site inspection and verify actual site dimensions in relation with the issued plans, any discrepancies with the actual site dimensions and the plans shall be relayed to the architect for verification.
2. The contractor to secure all required bonds as required by the end user.
3. The contractor to construct necessary temporary facilities required for the renovation.
4. The contractor to construct necessary board-up area for areas not affected during renovation.
5. The contractor to maintain a clean work area at all times, ready to accommodate on-site inspection by the end user and consultants.
6. Supply, delivery and installation of carpet tiles as per plan. Contractor to verify plans and specifications for reference.
7. Supply, delivery and installation of porcelain floor tiles for toilet areas.
8. Supply, delivery and installation of porcelain wall tiles cladding for toilet areas.
9. Supply, delivery and installation of homogenous and resilient vinyl flooring as per manufacturer's standard; contractor to verify plans and specifications.
10. Supply, delivery and installation of paver tiles for outdoor walkway area.
11. Supply, delivery and installation of aluminium door threshold for all carpet to existing marble flooring finish. Contractor to verify plans and specifications for reference.
12. Supply, delivery and installation of partitions as per plan and specifications.
13. Supply, delivery and installation of wood-plastic composite baseboard as per plan and specifications.
14. Supply, delivery and installation of doors as per plan and specifications.
15. Supply, delivery and installation of operable partition complete with necessary tracks, hangers and accessories as per manufacturer's standard.
16. Supply, delivery and installation of glass partitions as per plan and specifications.
17. Supply, delivery and installation of facial mirror with plywood backing as per plan and specifications.
18. Supply, delivery and installation of phenolic board partition complete with stainless steel hardware and accessories for toilets as per plan and specifications.
19. Supply, delivery and installation of granite counter top for pantry and lavatory counters as per plans and specifications.
20. Supply, delivery and installation of toilet fixtures and accessories as per plans and specifications.
21. Supply, delivery and installation of pantry fixtures and accessories as per plans and specifications.
22. Supply, delivery and installation of food waste disposers for all pantry sinks as per plan and specifications.
23. Supply, delivery and installation of new ceiling as per architectural plans and specifications.
24. Supply, delivery and installation of automated and manually controlled roll-up door as per plans and specifications.
25. Supply, delivery and installation of ceiling works as per manufacturer's standard based on plans and specifications.
26. Supply, delivery and installation of all lighting fixtures as per plan and specifications.
27. Existing marble floor finish subject for refurbishing and crystallization works as per plan and specifications.
28. Contractor to supply, deliver and install veneer cladding at elevator lobby as per plans and specifications.
29. Construction and painting of necessary works required for the pipe chase construction at 6th floor as per plan and specifications.

## End of Architectural Scope of Works

### **ELECTRICAL SCOPE OF WORKS**

The work under this Division consist of furnishing all materials, equipment tools, labor and all other services necessary to complete and make ready for operation the Electrical Power and Lighting System, Fire Detection & Alarm System, Public Address/ Background Music System described below and or indicated in the Electrical Plans & Auxiliary Plans in accordance with the latest edition of the National Building Code, Philippine Electrical Code Part 1 and Part 2, National Electrical Code (NFPA 70) , Fire Code of the Philippines, National Fire Alarm Code (NFPA 72), Life Safety Code (NFPA 101), Illuminating Engineering Society (IES), National Electrical Manufacturers Association (NEMA), American National Standards Institute (ANSI), Under Writers Laboratories (UL) and this Specifications and General Conditions of the Contract.

#### 1. WORK INCLUDED:

The work shall include the following furnishing and installation, each complete and in proper operation condition, unless otherwise stated in these specifications:

- a. Panel boards at various locations including circuit breakers/synchronizing switchgears, automatic transfer switch and all its accessories as indicated in the electrical riser diagram.
- b. Feeder and branch circuit conductors with necessary conduits approved type of fittings and devices as indicated on the electrical plans.
- c. All types of utilization devices, outlets and wall switches with proper cover plates.
- d. All lighting fixtures, wiring devices and necessary wiring of the building.
- e. ACCU and cable outlets including conduits and fittings, conductors as indicated on the plans; and
- f. All other items as stated, specified and as shown in these specifications and plans.
- g. Complete conduit system, boxes and faceplates, telephone terminal cabinet blocks including the cable of telephone and intercom system and telephone service entrance cable.
- h. Complete grounding system and lightning protection and TVSS.
- i. Perform terminations for all electrical system and complete testing.
- j. Automatic Transfer Switch, Genset& Synchronizing switchgear installations.

- k. Preparation of As-Built: plans and drawings.
- l. If anything has been omitted in any item of work or materials, usually furnished which are necessary for the completion of the Electrical Work as outlined herein before, then such items must be and are hereby included in this Division of the work.
- m. The Electrical contractor must have a PCAB licensed on their field of specifications. The electrical contractor must submit short circuit calculation, load flow analysis, arc flash & protection coordination study of the whole system of the building.
- n. Existing Transformer for Data Center shall be used, Contractor shall provide feeder wires & conduit from LVSB (See Power Single Line Diagram for reference) to data center room at 4th Floor for the tapping point of the Transformer. DOF

## 2. CODES & INSPECTIONS:

The work under this contract is to be installed according to the requirements of the latest edition of the National Building Code, Philippine Electrical Code, National Electrical Code (NFPA 70) , Fire Code of the Philippines, National Fire Alarm Code (NFPA 72), Life Safety Code (NFPA 101), Illuminating Engineering Society (IES), National Electrical Manufacturers Association (NEMA), American National Standards Institute (ANSI), Under Writers Laboratories (UL) and the rules and regulations of the United States Authorities.

- a. Electrical Service Application including drawings for this work shall be obtained by and at the expense of the contractor. The contractor shall comply with all the requirements of the utility companies with regards to the service applications.

## 3. MATERIALS & METHODS:

### 3.1 Wires & Cables:

- a. All wires shall be copper, stranded type wire. It shall be smooth and true and of cylindrical form and shall be within 1% of the actual size called for.
- b. All wires shall comply within the requirements of the Underwriters Laboratories and as they apply to the particular usage.
- c. Wires and cables for lighting and power systems shall be plastic insulated for 600 Volts working pressure, type “THHN/THWN” unless otherwise noted on plans or specified below.
- d. All wires shall be stranded copper.

- e. For lighting and power system, no wire smaller than 3.5 mm<sup>2</sup> shall be used except otherwise noted.

### 3.2 Conduits:

- a. Conduits for interior systems shall be standard Electrical Metallic Tubing (EMT) for 50MM (2") below & Intermediate Metallic Conduit (IMC) for 65MM (2 1/2") above and shall be UL Listed.
- b. No conduit shall have more than four (90) degree bends in any one run and where necessary, pull boxes shall be provided as directed.
- c. No wire shall be pulled into any conduit until the conduit system is complete in all details, in the case of concealed work until all rough plastering or masonry has been completed and in the case of exposed work until the conduit work has been completed in every detail.
- d. The ends of all conduits shall be tightly plugged to exclude plaster, dust and moisture while in progress of construction. All conduits shall be reamed to remove all burrs.
- e. All pipes and fittings on exposed work shall be secured by means of metal clips, which shall be held in place by means of machine screws. When running over concrete surfaces, the screws shall be held in place by means of expansion sleeves. All pipes on exposed work shall be run at right angles to and parallel with the surrounding walls and shall conform to the form of the ceiling. No diagonal runs shall be allowed and all bends and offsets shall be avoided as much as possible. Where necessary conduit fittings shall be used. Piping in all cases, it shall be run perfectly straight and true, satisfactory to the Consultant on record (COR) Conduits shall be supported at 3M intervals maximum, or per PEC requirements.
- f. Intermediate metallic conduits installed outside building in contact with the soil shall be coated with asphalt paint and wrapped with asphalt/rubber tape. An additional cost of asphalt paint shall be applied over the asphalt/rubber tape.

### 3.3 Junction & Pull Boxes:

- a. All outlets of whatever kind, for all systems, there shall be provided a suitable fitting, which shall be either a box or other device especially designed to receive the type of fitting to be mounted thereon;
- b. The Contractor shall consult the COR as to the nature of the various fittings to be used before installing the outlet fittings, and shall conform strictly in the use of fittings, to the nature of the appliance to be mounted on them so that the work, when completed will be of finished design.
- c. All outlets on concealed conduit work provide galvanized pressed steel outlet boxes of standard make. These boxes shall be in all cases standard and where such boxes are not available on the market special boxes shall be secured by the Contractor at his own expense.

- d. Junction and pull boxes, of Code gauge steel, galvanized shall be provided as indicated or as required for facilitating the pulling of wires and cables. Pull boxes in finished places shall be located and installed with the permission and to the satisfaction of both COR.
- e. All junction and pull boxes on exposed conduit work shall be provided with hubs for threaded pipe entry and covers provided with neoprene gaskets.

#### 3.4 Wall Switches:

- a. Wall switches shall be rated at 16 amperes, 230 volts AC. Switches shall be of the quiet type. The type of switch shall be tumbler operation and the color, plating and appearance of wall plates shall be as selected by the COR/ Architect. Appropriate samples shall be submitted prior to the purchases of wall switches and faceplates.

#### 3.5 Wall Receptacles / Convenience Outlets:

- a. Receptacle outlets, in general, shall be for flush mounting, duplex type rated at 16 ampere, 230 volts parallel slots grounding type unless otherwise indicated on drawings. Type and color of receptacle outlet and plates shall be as selected by the COR/Architect. Appropriate samples of outlets and plates shall be submitted prior to purchase of devices.

#### 3.6 Plates:

- a. All switches and receptacle plates shall be of stainless satin finish or as directed by the COR/Architect.

#### 3.7 Panels & Cabinets:

- a. Standard panels and cabinets, as far as possible, shall be used and assembled on job. All panels shall be of dead front construction, furnish with trims for flush or surface mounting as provide. Cabinets shall be of Code gauge steel with gutters at least 4-inch wide and wider if necessary. The trim for all panels shall be finished in industrial beige color over a coat of rust inhibitor;
- b. Panels and cabinets shall be beige color powder coated.
- c. Power panel & breakers shall be approved by COR, circuit breakers of sizes voltage rating and interrupting capacity as called for a plans and bolt-on type, center main.

Submit Short Circuit Analysis and Voltage Drop Calculation prior to the purchase of the Panel board. And after securing the Short circuit analysis the Electrical contractor must submit a protective coordination study and apply to the electrical system facilities.

- d. Power Panel's main bus work shall be rated in amperes equal to or exceed over-current protective device immediately ahead of it. All bus works shall be properly secured to withstand available short circuit forces at the location.

### 3.8 INDIVIDUAL BREAKERS AND SWITCHES:

- a. Provide individual circuit breakers, safety switches, and disconnect switches where indicated on plans, voltage ratings shall be suitable in each case of service application.
- b. All protective devices shall meet NEMA, Underwriters Laboratories, Inc.
- c. Circuit breakers shall consists of a quick-make, quick-break type entirely trip-free operating mechanism with contacts, interrupter, and thermal-magnetic trip unit for each pole, all enclosed in a molded-phenolic case. The thermal-magnetic trip units shall provide time-delayed overload protection and instantaneous short circuit protection, and shall operate a common trip bar which open all pole in case of overload or short-circuit current in any one pole. Circuit breaker shall be trip indicating, with the tripped position or breaker handle midway between "ON" and "OFF" position.
- d. Circuit breakers rated above 100 amperes shall have interchangeable trip units.
- e. All circuit breaker with a rating of 1000 ampere shall be Molded case type and 1200 ampere shall be Power breaker type.

### 3.9 LOCATION OF WIRING AND OUTLETS:

- a. The Contractor shall coordinate his work with all parties involved so that exact locations may be obtained for all outlets, apparatus, appliances and wiring.
- b. The location of outlets shown on diagrammatic wiring plans shall be considered as approximate and it shall be incumbent upon the Contractor, before installation of outlets/boxes, to study all pertinent drawings and obtain precise information from the architectural schedules, scale drawings, large scale and full size details of finished rooms, approved shop drawings of other parties involved or from the COR. It shall be understood that any outlet may be relocated a distance not exceeding 4.5M from the location shown on the drawings, if so directed by the COR. Contractor shall make any necessary adjustment of his work to fit conditions for recessed fixtures and for outlets

occurring in glazed tile, block, terra cotta, marble, wood paneling, or other special finish materials, in order that all boxes may register flush with finish and shall be centered properly. In centering outlets, due allowance shall be made for overhead piping ducts, windows, and door trim variations in thickness of furring, plastering, etc., as erected, regardless of conditions which may be otherwise shown on small scale drawings. Outlets incorrectly located shall be properly relocated at the Contractor's expense. Local switches which are shown near doors shall be located at the strike side of the door as finally hang, regardless of swing shown on the drawings.

- c. The center line of wall, outlets, socket outlets, switches, telephone outlets, pilot lights, indicating lights, and fan outlets, shall be installed at heights above finished floor or as specified on the Architect's drawings. Where mounting heights are specified on the Electrical drawings, they shall be verified with Architect's drawings before installation. Where glazed tile, block, terra cotta occur, outlets shall be centered on the nearest joint to the height given.

#### 4. INSPECTION AND TEST:

- a. The COR shall have access to all parts of the work at all times and shall be furnished such information and assistance by the contractor. All installation shall be subjected to test and any damage done during testing shall be borne by the contractor.
- b. The contractor must provide protective coordination study at existing LVSB from upstream to downstream circuit breakers before energization of the system.

#### 5. STANDARD OF WORKMANSHIP:

The contractor shall execute all work in neat and workmanlike manner and shall do all necessary work whether it is clearly specified in this specification or shown in the drawing or not. Best practice in modern electrical installation shall be employed. Submit Methodology of construction and approved by COR.

End of Electrical Scope of Works

### **SANITARY AND PLUMBING SCOPE OF WORKS**

- IV. Unless otherwise specified, the Contractor or his sub-contractor shall furnish all materials, tools, equipment, apparatus, appliances, accessories, transportation,

labor and supervision required for the complete installation and testing of the Plumbing System ready for use in accordance with the best practice of the Plumbing Trade for the satisfactory completion of the works:

II. The works essentially shall include, but shall not necessarily be limited to the following items:

**A. General**

1. The Plumbing Contractor is required to refer to all architectural, structural, mechanical, fire protection and electrical plans and investigate all possible interference and conditions affecting his work.
2. All work shall comply with the pertinent provisions of the National Plumbing Code of the Philippines, the Code on Sanitation of the Philippines and/or the rules and regulations of concerned city or municipality.
3. Supply and installation of plumbing equipment complete with controller, breakers, starters, pressure switch and its appurtenances including trims and its accessories to complete the system of the following:
  - 3.1 New Transfer Pumps complete with controllers. Accessories to include electrical wiring from pumps to motor controllers.
  - 3.2 New Booster Pumps complete with controllers. Accessories to include electrical wiring from pumps to motor controllers.
  - 3.3 New Sump Pump with accessories to include electrical wiring from pumps to motor controller.
  - 3.4 Start-up, testing and commissioning.
4. Miscellaneous stainless steel metal works of the plumbing utilities and its appurtenances including, ladder rungs, sleeves, manhole cover, vents, drains trims and its accessories of the following:
  - 4.1 Domestic Water Storage tank /or Cistern.
  - 4.2 Central Oil Interceptor



#### 4.3 Central Grease Tank

5. Testing for leakages of all building drains, waste, sewer, venting system including pressure testing and disinfection of the water supply and distribution system. Also leak test and disinfection of domestic and fire storage water tanks.
6. Excavation, trenching and backfilling including provision of pipe sleeves and block-outs pipe line punches / cross thru walls, beams and slabs provided with firestopping materials for the satisfactory completion of the works shall be included.
7. Miscellaneous items and other accessories required for the satisfactory completion of the plumbing works.
8. Securing and payments of all permits, licenses and bonds construction purposes as required.
9. Contingency to include furnishing of written one (1) year warranty on the plumbing system.
10. Preparation and submission of as-built drawings in producible sheets including five (5) white prints copies at no cost to the Owner(s).
11. Securing and payments of all contractor's taxes, VAT, etc.

#### **B. FifthFloor**

1. Supply and installation of new cold water distribution system connect from existing water line up to new pantry sinks unit including roughing-in of isolation/gate valves, cold water lines, fittings, hangers, support trim and its accessories.
2. Supply and installation of new sewer and vent system for new pantry sinks including roughing-in floor/ceiling cleanout, p-traps, stacks, fittings, hangers, trims and its accessories.
3. Supply and installation of grease trap at new pantry sinks
4. Replacement of existing plumbing fixtures at existing male and female toilets. Roughing-ins to be replaced with new water, sewer and vent lines, connect from

existing main downfeed/collectors at pipe chase. Water closets shall have bidet sprays.

5. Supply and installation of condensate drainage system of the building equipment and facilities including fan coil units (FCU) and air conditioning units (ACU), with insulation and separate piping from storm drainage system.
6. Removal of all existing pipes not necessary at site

End of Sanitary and Plumbing Scope of Works

### **MECHANICAL SCOPE OF WORKS**

- XIII. Under this section of the specifications, provide all labor, materials and equipment and perform all the work necessary for the complete execution of all the work as shown on Drawings and Specified in this specification.
- XIV. Scope of work shall include but not be limited to the following principal items of work for Air-Conditioning and Mechanical Ventilation System, Smoke Extraction System, Pressurization System, Fresh Air System, Gas Piping System and Carbon Monoxide Monitoring System.
- XV. Fifth Floor
  8. Supply and installation of VRF (Outdoor and Indoor Unit), Ventilating Fans.
  9. Supply and installation of air conditioning ductwork and accessories such as dampers, diffusers, test holes, access panels.
  10. Supply and installation of ventilation ductwork and accessories such as dampers access panel diffusers. This includes staircase pressurization and smoke extraction system.
  11. Supply and installation of insulation for ductwork, chilled water piping and air conditioning equipment.
  12. Supply and installation of air conditioning and ventilation equipment including air handling units, fan coil units, variable refrigerant flow units, split units, motor controls and starters, fans and blowers.

13. Supply and installation of automatic control for both air conditioning and mechanical ventilation systems including automatic temperature controls, chilled water plant controls, vrf system control, fans and blower flow control.

14. Supply and installation of refrigerant piping system.

XVI. Others:

1. Testing balancing and commissioning
2. Free maintenance for a period of 12 months after practical completion
3. Supply of manufacturer's recommended spare parts.
4. Furnishing and installation of instruction and identifications boards, charts, signs and markers, to include operating methods and instructions.
5. Priming and finish painting of cladded and exposed piping and other part of chilled water and refrigerant piping.
6. Miscellaneous items and other related materials required for the satisfactory completion of the air conditioning and ventilation system to include metal works, hangers, supports, anchors, bolts, bracing, vibration isolators, equipment concrete pads, and its accessories.
7. Securing and payment of permits, licenses and bonds for the construction purposes, including approval from local government unit.
8. Contingency to include the furnishing of written one (1) year warranty upon completion works.
9. Securing and payments of all Contractor's taxes, VAT, etc.
10. Furnishing and installation of instruction and identifications boards, charts, signs and markers, to include operating methods and instructions.

11. Priming and finish painting of cladded and exposed piping and other part of chilled water and refrigerant piping.
12. Miscellaneous items and other related materials required for the satisfactory completion of the air conditioning and ventilation system to include metal works, hangers, supports, anchors, bolts, bracing, vibration isolators, equipment concrete pads, equipment structural support and its accessories.
13. Preparation and submission of Shop-Drawings based on actual site condition.
14. Preparation and submission of As-Built drawings in reproducible sheets including five (5) white prints copies at no cost to the Owner(s).

End of Mechanical Scope of Works

### **FIRE PROTECTION SCOPE OF WORKS**

- XIII. Furnishing of all materials, labor, tools, equipment and accessories for the complete installation, testing and adjustment, ready for use of the proposed automatic fire sprinkler system.
- XIV. The works essentially shall include, but shall not necessarily be limited to the following items:
  - XV. General
    31. All openings through which fire may spread from one floor to the other, such as holes
    32. through floors made for the passage of plumbing pipes and electrical circuits shall be sealed with fire resistant / or fire stopping materials.
    33. Furnishing and installation of instruction and identifications boards, charts, signs and markers, to include operating methods and instructions.
    34. Priming and finish painting (red) of cladded and exposed piping and other part of sprinkler system except for sprinkler heads.
    35. Complete testing and commissioning, start-up of the floor Automatic Fire Sprinkler System in accordance with NFPA-13, to include cleaning, draining, adjusting and inspecting.
    36. Miscellaneous items and other related materials required for the satisfactory completion of the sprinkler system to include metal works, hangers, supports, anchors, bolts, bracing and its accessories.
    37. Securing and payment of permits, licenses and bonds for the construction purposes, including approval from the Fire Department having jurisdictions.

38. Contingency to include the furnishing of written one (1) year warranty upon completion works of sprinkler system.
39. Preparation and submission of As-Built drawings in reproducible sheets including five (5) white prints copies at no cost to the Owner(s).
40. Securing and payments of all Contractor's taxes, VAT, etc.

XVI. Fifth Floor

13. Supply/relocate and install complete with the sprinkler heads including spares and cabinet for sprinkler system tools and stocks, trims and its accessories required to complete the system.
14. Supply/relocate and install complete with the portable fire extinguishing system consisting of mounting support, bracket, trims and its accessories required to complete the system.
15. Supply and install complete with the new Fourth Floor Data Center Fire Suppression system (NOVEC 1230) consisting of mounting support, bracket, trims and its accessories required to complete the system.
16. All existing (relocated and retained/not relocated) pendent, upright and sidewall sprinkler heads shall be replaced with new.

End of Fire Protection Scope of Works

*Section VII. Drawings*

*Section VIII. Bill of Quantities*

PODIUM FLOOR						
Architectural Bill of Quantities						
Package 2 (Podium Floor)						
ITEM NO.	ITEM DESCRIPTION AND LOCATION	QUANTITY	UNIT	DIRECT UNIT COST	TOTAL COST	REMARKS
<b>I.</b>	<b>GENERAL REQUIREMENTS</b>					
1.01	All insurances such as bonds and guarantee performance bonds, third party insurance and surety bond against down payment and retention bond, building permit and occupancy permit.	1.00	lot			
1.02	Mobilization and demobilization of workers, tools and equipment	1.00	lot			
1.03	Temporary facilities and temporary utilities	1.00	lot			
1.04	Safety and security, daily cleaning and maintenance works	1.00	lot			
1.05	Demolition, dismantling and hauling of debris (verify architectural technical specifications)	1.00	lot			
	Demolish all existing walls and partitions as stated in the plan.					
	Strip all existing wall finishes affected with the renovation					
	Dismantle existing ceiling finishes except for bottom of slab ceiling.					
	Dismantle all existing doors, door jambs, hardware and accessories and turnover all items to the owner for proper handling except for doors to be retained					
	Dismantle all existing glass partition and accessories and turnover all items to the owner for proper handling.					
	Dismantle all existing lighting fixtures and electrical devices on site and all items are subject for turnover to the owner for proper handling.					
	Dismantle all existing AC equipment on site subject for replacement and turnover all items to the over for proper handling.					
	Dismantle and relocation of all necessary existing utility lines, conduits, pipes, ductworks and sprinkler heads subject for replacement as per plan. i					
	Demolish and dismantle all existing floor finishes as per plan					



ITEM NO.	ITEM DESCRIPTION AND LOCATION	QUANTITY	UNIT	DIRECT UNIT COST	TOTAL COST	REMARKS
	Demolish and dismantle all existing wall cubicle partition and floor tiles at existing toilets.					
	Demolish all existing CHB toilet partitions at common toilets.					
	Demolish existing lavatory counter at existing toilets.					
	Dismantle all existing toilet fixtures and accessories for replacement.					
	Dismantle existing wall mounted facial mirror at existing toilets.					
	Demolish existing walls and slab affected for the accommodation of new elevator shaft. p					
	Demolish affected slab for all areas to be converted to pipe chase.					
	Demolish existing slab affected for the accommodation of new elevator shaft.					
1.06	As-buit drawings. Including all disciplines	1.00	lot			
1.08	H-frame scaffolding complete with necessary things and accessories; and formworks	1.00	lot			
	<b>SUBTOTAL COST:</b>					
<b>II.</b>	<b>FLOOR WORKS</b>					
2.01	200mm x 200mm non-skid vitrified paver block finish with 100mm wide concrete curb border for walkway and other areas as shown in the plans	706.37	sq.m.			
2.02	500mm x 500mm integrated tufted pattern loop solution dyed 100% synthetic fiber with 4.00mm pile height carpet tiles with Polyester spunbonded primary backing and condensed vinyl with fiberglass reinforcement secondary backing at offices and other areas shown in the plans	256.29	sq.m.			
2.03	10mm thk. x 600mm x 600mm non-skid, non-vitreous porcelain tiles for toilets and other areas shown in the plans	340.46	sq.m.			
2.04	3mm thk. x 300mm x 300mm homogenous and resilient type Vinyl tiles, with primer and water-based acrylic floor adhesive at security, pantry, storage and other areas shown in the plans	10.00	sq.m.			
2.05	Exisiting marble floor finish subject for crystallization for areas shown in the plans	682.93	sq.m.			

ITEM NO.	ITEM DESCRIPTION AND LOCATION	QUANTITY	UNIT	DIRECT UNIT COST	TOTAL COST	REMARKS
	<b>SUBTOTAL COST:</b>					
<b>III.</b>	<b>WALL WORKS</b>					
3.01	Drywall partition using 12mm thk. fiber cement board using 100mm thk. Using 400mm x 400mm metal studs vertical and horizontal on center	187.96	sq.m.			
3.02	150mm thick concrete hollow blocks with 25mm thick plaster on both sides complete with steel bars for Ground floor walls as shown in the plans	62.65	sq.m.			
3.03	100mm thick concrete hollow blocks with 25mm thick plaster on both sides complete with steel bars for Ground floor walls as shown in the plans	30.65	sq.m.			
3.03	25mm thk x 100mm. Wood plastic composite baseboard installed on both sides of all drywall and CHB wall partitions	270.68	l.m			
3.04	Existing grille band to be cladded with ACP for Podium glass perimeter wall	80.69	sq.m.			
3.05	Decorative stone at main entrance portal	15.57	sq.m.			
3.06	Existing marble wall finish subject for crystallization for areas shown in the plans	74.10	sq.m.			
0.00	<b>SUBTOTAL COST:</b>					
<b>IV.</b>	<b>WALL FINISHES</b>					
4.01	10mm thick x 600mm x 600mm glazed porcelain wall tiles for all toilets and other areas shown in the plans	123.55	sq. m			
	<b>SUBTOTAL COST:</b>					
<b>V.</b>	<b>CEILING WORKS</b>					
5.01	12mm thk. Gypsumboard on 400mm x 400mm furring channel horizontal and vertical with 1200mm x 1200mm hanger both ways with 50mm shadow gap between walls and ceiling as per plan	980.64	sq.m.			
5.02	12mm thk. Moisture Resistant Gypsumboard on 400mm x 400mm furring channel both ways with 1200mm x 1200mm hanger both ways with 50mm shadow gap between walls and ceiling as per plan	32.65	sq.m.			
5.03	10mm thick 75mm x 75mm angular bar vertical hangers with 10mm x 200mm x 200mm steel plate ceiling structural support for owner supplied decorative drop lights and chandeliers at lobby and other areas shown in the plans	1.00	set			

ITEM NO.	ITEM DESCRIPTION AND LOCATION	QUANTITY	UNIT	DIRECT UNIT COST	TOTAL COST	REMARKS
5.04	Corrosion Resistant Aluminum metal suspended ceiling panel for walkway as shown in the plans	530.36	sq.m.			
0.00	SUBTOTAL COST:					
VI.	PAINTING WORKS					
6.01	Existing walls and columns shall be repainted for areas indicated in the plans	365.00	sq.m.			
6.02	New CHB wall and drywall partitions shall be painted with latex paint for interior wall surfaces as shown in the plans	281.25	sq.m.			
6.03	Epoxy paint for all utility floor areas as per plan; for fire exit existing pebble wash out floor finish to be painted with chemical emulsion	83.38	sq.m.			
6.04	All ceiling works shall be painted with latex paint as shown in the plans	1,013.29	sq.m.			
6.05	All existing bottom of slab shall be painted with latex paint at utility areas as shown in the plans	146.72	sq.m.			
VII.	DOORS AND WINDOWS					
7.01	D10. 2.1m x 0.9m; 12mm thk tempered single-swing glass on FD-100 aluminum frame complete with hardwares and accessories as per plan.	1.00	set			
7.02	D11. 2.10m x 0.90m; 44mm thick kiln dried mahogany wood panel single-swing door with 50mm x 100mm kiln dried mahogany wood door jamb in wood stain finish with clear gloss top coat lacquer, complete with hardwares, and accessories as per plan.	12.00	set			
7.03	D16. 2.10m x 0.9m; GA 20 B.I. bended sheet steel single swing louvered with GA. 16 standard steel jamb painted with epoxy paint finish complete with hardwares and accessories as per plan	3.00	set			
7.04	D17. 2.10m x 0.70m; 44mm thick kiln dried louvered mahogany wood panel door with 50mm x 100mm kiln dried mahogany wood door jamb in wood stain finish with clear gloss top coat lacquer, complete with hardwares and accessories as per plan.	1.00	set			

ITEM NO.	ITEM DESCRIPTION AND LOCATION	QUANTITY	UNIT	DIRECT UNIT COST	TOTAL COST	REMARKS
7.05	D22. 2.10m x 8.30 m; Automatic door mechanism with 5 position program switch (auto/ exit/ half open/ close/ open), presence detector with 12mm thick tempered clear glass panel complete with hardware and accessories as per plan.	1.00	set			
7.06	D23. 2.1m x 8.3m. Combination of 12mm thk fixed tempered glass on FD-100 aluminum frame and 2.10 mx 1.80m double-swing glass door, complete with hardwares and accessories as per plan.	1.00	set			
7.07	D24. 2.1m x 10.68m. Combination of 12mm thk fixed tempered glass on FD-100 aluminum frame and 2.10 m x 1.80m double-swing glass door, complete with accessories as per plan.	2.00	set			
7.08	D25. 2.5m x 7.7m. Equally- divided operable partition with fabric finish on both side, with STC rating of 50, complete with hardwares and accessories as per plan.	1.00	set			
7.09	D26. 2.5m x 1.0m; 44mm thick kiln dried louvered mahogany wood panel double-swing door with 50mm x 100mm kiln dried solid wood door jamb in wood stain finish with clear gloss top coat lacquer, complete with hardwares and accessories as per plan.	1.00	set			
7.10	D27. 2.1m x 1.2m; 44mm thick kiln dried louvered mahogany wood panel double-swing door with 50mm x 100mm kiln dried solid wood door jamb in wood stain finish with clear gloss top coat lacquer, complete with hardwares and accessories as per plan.	1.00	set			
7.11	D28. 2.1m x 0.7m; 44mm thick kiln dried louvered mahogany wood panel single-swing door with 50mm x 100mm kiln dried mahogany wood door jamb in wood stain finish with clear gloss top coat lacquer, complete with hardwares and accessories as per plan.	1.00	set			
7.12	D29. 2.1m x 0.90m; 44 mm thick kiln dried louvered mahogany wood panel single-swing door with 50mm x 100mm kiln dried mahogany wood door jamb in wood stain finish with clear gloss top coat lacquer, complete with hardwares and accessories as per plan.	1.00	set			

ITEM NO.	ITEM DESCRIPTION AND LOCATION	QUANTITY	UNIT	DIRECT UNIT COST	TOTAL COST	REMARKS
7.13	D30. 2.1m x 5.1m. Combination of 12mm thk fixed tempered glass on FD-100 aluminum frame and 2.10 m x 0.90m single-swing glass door, complete with accessories as per plan.	1.00	set			
7.14	D31. 2.1m x 4.1m. Combination of 12mm thk fixed tempered glass on FD-100 aluminum frame and 2.10 m x 0.90m single-swing glass door, complete with accessories as per plan.	1.00	set			
7.15	D32. 2.1m x 6m. Combination of 12mm thk fixed tempered glass on FD-100 aluminum frame and 2.10 m x 0.90m single-swing glass door, complete with hardwares accessories as per plan.	1.00	set			
7.16	D33. 2.1m x 1.3m. Combination of 12mm thk fixed tempered glass on FD-100 aluminum frame and 2.10 mx 0.90m single-swing glass door, complete with hardwares and accessories as per plan.	1.00	set			
7.17	D34. 2.10m x 5.0m. Combination of 12mm thk fixed tempered glass on FD-100 aluminum frame and 2.10 m x 0.90m single-swing glass door, complete with hardwares and accessories as per plan.	2.00	set			
7.18	DR. Existing fire exit doors to be retained and repainted. Hardwares and accessories including panic device to be replaced	3.00	set			
7.19	100mm wide door theshold at all doors with different floor elevations from entry point and area interior	12.20	l.m			
	<b>SUBTOTAL COST:</b>					
<b>VIII.</b>	<b>GLASS WORKS</b>					
8.01	12mm thick tempered glass in FD 100 powder-coated aluminum framing including sealant application and frosted sticker for all glass partitions as shown in the plans	38.43	sq.m.			
8.02	Facial Mirror with 6mm thick marine plywood backing for toilets as shown in the plans	4.42	sq.m			
8.03	Graphicote with 6mm thick marine plywood backing for meeting rooms as shown in the plans	22.97	sq.m			
	<b>SUBTOTAL COST:</b>					

ITEM NO.	ITEM DESCRIPTION AND LOCATION	QUANTITY	UNIT	DIRECT UNIT COST	TOTAL COST	REMARKS
<b>IX.</b>	<b>MASONRY WORKS</b>					
9.01	25mm thk. granite countertop including 300mm high splashboard on concrete slab sub-counter at all pantry areas.	5.40	sq.m			
9.02	25mm thk. granite countertop including 300mm high splashboard in 50mm x 50mm solid wood k.d. tanguile framing on 3/4" thk marine plywood counter support for toilet counters	3.93	sq.m			
9.03	25mm thk. X 200mm granite ledge installed on top of concrete ledge.	0.63	sq.m			
9.04	25mm thk. Granite ledge on reinforced concrete support embedded to walls at 1400mm above floor finish for water closet	1.20	sq.m			
	<b>SUBTOTAL COST:</b>					
<b>X.</b>	<b>LIGHTING FIXTURES</b>					
10.01	18 watts daylight recessed type LED in 210mm diameter aluminium casing with glass frame down light fixture general ceiling areas and other areas shown in the plans	200.00	set			
10.02	Surface mounted LED light fixture. Supply, delivery and installation of 5.7W LED daylight bulb with E27 lamp base with 100mm diameter round aluminium surface mounted down light fixture with glass cover and E27 socket for existing slab ceiling works and other areas shown in the plans	20.00	set			
10.03	6 watts warm white recessed type LED in 110mm diameter aluminium casing with glass frame down light fixture located above toilet sink and other areas shown in the plans	6.00	set			
10.04	600mm x 600mm x 12mmH 39W daylight slim type LED panel ceiling light fixture with aluminium housing, 100-240Vac Input and 26-30Vdc Output and optical PMMA diffuser for offices, elevator lobby and other areas as shown in the plans	73.00	set			

ITEM NO.	ITEM DESCRIPTION AND LOCATION	QUANTITY	UNIT	DIRECT UNIT COST	TOTAL COST	REMARKS
10.05	Low bay lighting fixtures comprising of low bay reflector bracket with E27 socket, 400mm diameter sand blasted reflector and glass cover, and 15W LED PAR38 daylight bulb with E27 lamp base for storages, utility areas and other areas as shown in the plans	12.00	set			
10.06	Indoor recessed wall lamp: recessed type aluminium die cast with glass lens wall light fixture with 60W E27 compact fluorescent lamp for hallways and other areas as shown in the plans	13.00	set			
10.06	T5 electronic fluorescent lamp with slim type luminaire (14W, 21W, 28W), for mirror lighting and other areas for cove lighting as shown in the plans	102.00	set			
	<b>SUBTOTAL COST:</b>					
<b>XI.</b>	<b>TOILET FIXTURES</b>					
11.01	Water closet	6.00	set			
11.02	Water Closet Sensor	6.00	set			
11.03	Bidet spray	6.00	set			
11.04	Urinal	3.00	set			
11.05	Urinal Sensor	3.00	set			
11.06	Countertop porcelain basin	6.00	set			
11.07	Basin Faucet (Sensor)	6.00	set			
11.08	Slop sink faucet	1.00	set			
11.09	Enamel cast iron slop sink complete with accessories	1.00	set			
11.10	Stainless steel grab bar for PWD toilet	2.00	set			
	<b>SUBTOTAL COST:</b>					
<b>XII.</b>	<b>TOILET PARTITION</b>					
12.01	12mm thick machine pressed laminated phenolic board substrate partitions with high scratch and impact resistance with aluminium edge and corner profile, complete with indicator and accessories for water closet and shower	5.00	set			
12.02	12mm thick machine pressed laminated phenolic board substrate partitions with high scratch and impact resistance with aluminium edge and corner profile for urinal partition	1.00	set			
	<b>SUBTOTAL COST:</b>					

ITEM NO.	ITEM DESCRIPTION AND LOCATION	QUANTITY	UNIT	DIRECT UNIT COST	TOTAL COST	REMARKS
<b>XIII.</b>	<b>PANTRY FIXTURES AND ACCESSORIES</b>					
13.01	Pantry sink – chrome finish stainless steel L760 x W460mm single bowl upper-counter sink with drain board with corrosion resistance property for pantry	3.00	set			
13.02	Pantry sink faucet mixer – stainless steel chrome finish faucet mixer faucet with brass fittings H121 x L222mm with minimal lead traces in waterways and corrosion resistance for pantry	3.00	set			
13.03	0.75HP – 225v food waste disposer, with 3 grind stages, stainless steel grind elements and 1180mL stainless steel grind chamber for pantry	3.00	set			
	<b>SUBTOTAL COST:</b>					
<b>XIV.</b>	<b>MISCELLANEOUS WORKS</b>					
14.01	Existing veneer cladding to be retained and re-stained and new 3mm thk. Natural wood veneer cladding on 6mm thk plywood substrate (machine-pressed) with 25mm x 25mm aluminum corner guard and aluminum strip at 2100mm high above floor finish at elevator lobby	19.83	sq.m.			
14.02	12mm thk machine-pressed natural wood veneer cladding on 12mm x 50mm wood spacers, with 25mm x 25mm aluminum corner guard and aluminum strip at 2100mm high from floor finish at elevator lobby. Provide 1" x 2" x10" wood slats on wood stain finish at the back of the issuance counter (Verify drawing)	1.00	lot			
14.03	2.1m x 3.5m; Galvanized steel panel roll-up door, manual and motor operated. Size of motor 1/2 HP single phase including electronic device push button switch at 5 seconds located in areas shown in the plans	4.00	set			
14.04	4.4m x 7.0m; Galvanized steel panel roll-up door, manual and motor operated. Size of motor 3/4 HP single phase including electronic device push button switch at 5 seconds located in areas shown in the plans	11.00	set			



ITEM NO.	ITEM DESCRIPTION AND LOCATION	QUANTITY	UNIT	DIRECT UNIT COST	TOTAL COST	REMARKS
14.05	4.4m x 6.4m; Galvanized steel panel roll-up door, manual and motor operated. Size of motor 3/4 HP single phase including electronic device push button switch at 5 seconds located in. areas shown in the plans	8.00	set			
	<b>SUBTOTAL COST:</b>					
<b>XV.</b>	<b>WATER PROOFING WORKS</b>					
15.01	Cementitious crystallization waterproofing using crystalline waterproofing formulation for all pantry and toilets	115.00	sqm			
	<b>SUBTOTAL COST:</b>					
	<b>ARCHITECTURAL TOTAL COST:</b>					
<b>Sanitary/Plumbing Works Bill of Quantities</b>						
<b>XVI.</b>	<b>FACILITY STORM DRAINAGE PIPING</b>					
	<b>Storm Line (Collectors/Downspouts)</b>					
	Supply and installation of Polyvinyl Chloride (PVC) pipes, Series 1000 II or approved equal, including fittings, painting, sleeves, supports, hangers and other miscellaneous items as shown and as required to complete the system					
16.01	250mm diameter x 3m	24.00	l.m.			
16.02	150mm diameter x 3m	114.00	l.m.			
16.03	100mm diameter x 3m	204.00	l.m.			
	Supply and installation of Cast Iron Pipe, Service weight or approved equal, including fittings, painting, sleeves, supports, hangers and other miscellaneous items as shown and as required to complete the system					
16.04	250mm diameter x 3m	3.00	l.m.			
16.05	150mm diameter x 3m	3.00	l.m.			
	<b>Clean-out</b>					
	Supply and installation of Ceiling Clean-out					
16.06	250mm diameter jointing to PVC Pipe	4.00	pc/s			
16.07	150mm diameter jointing to PVC Pipe	9.00	pc/s			
	<b>Drains</b>					
	Supply and installation of drains including adaptors and p-trap as required, setting in concrete, making good around with approved grouting					
	<b>Gutter Drain</b>					
16.08	150mm diameter jointing to PVC Pipe	4.00	pc/s			
16.09	75mm diameter jointing to PVC Pipe	4.00	pc/s			
	<b>Podium Balcony Drain</b>					

ITEM NO.	ITEM DESCRIPTION AND LOCATION	QUANTITY	UNIT	DIRECT UNIT COST	TOTAL COST	REMARKS
16.10	100mm diameter jointing to PVC Pipe	4.00	pc/s			
	<b>Deck Drain</b>					
16.11	75mm diameter jointing to PVC Pipe	1.00	pc/s			
	<b>AIRCON DRAINAGE PIPING</b>					
<b>XVII.</b>	<b>Aircon Drain Line (Collectors and risers)</b>					
	Supply and installation of Polyvinyl Chloride (PVC) pipes, Series 1000 II or approved equal, including fittings, painting, sleeves, supports, hangers and other miscellaneous items as shown and as required to complete the system					
17.01	150mm diameter x 3m	153.00	l.m.			
17.02	100mm diameter x 3m	39.00	l.m.			
17.03	50mm diameter x 3m	51.00	l.m.			
17.04	25mm diameter x 3m	57.00	l.m.			
	<b>Plumbing Insulation</b>					
	Supply and installation of 20mm thick, pre- molded elastomeric closed cell rubber insulation, wrapped with polyethylene tape and clad with GA-26 aluminum sheets, including vapor barrier and other miscellaneous items as shown and as required to complete the system					
17.05	Condensate Insulation					
17.06	150mm diameter	153.00	m			
17.07	100mm diameter	39.00	m			
17.08	50mm diameter	51.00	m			
	25mm diameter	57.00	m			
	<b>Clean-out</b>					
	Supply and installation of Ceiling Clean-out					
17.09	150mm diameter jointing to PVC Pipe	8.00	pc/s			
<b>XVIII.</b>	<b>FACILITY SANITARY SEWERAGE</b>					
	Sanitary Sewer Line (Collectors and Risers)					
	Supply and installation of Polyvinyl Chloride (PVC) pipes, Series 1000 II or approved equal, including fittings, painting, sleeves, supports, hangers and other miscellaneous items as shown and as required to complete the system					
18.01	200mm diameter x 3m	24.00	l.m.			
18.02	150mm diameter x 3m	18.00	l.m.			
18.03	100mm diameter x 3m	195.00	l.m.			
18.04	75mm diameter x 3m	9.00	l.m.			
18.05	50mm diameter x 3m	51.00	l.m.			

ITEM NO.	ITEM DESCRIPTION AND LOCATION	QUANTITY	UNIT	DIRECT UNIT COST	TOTAL COST	REMARKS
	Supply and installation of Cast Iron Pipe, Service weight or approved equal, including fittings, painting, sleeves, supports, hangers and other miscellaneous items as shown and as required to complete the system					
18.06	200mm diameter x 3m	3.00	l.m.			
18.07	100mm diameter x 3m	3.00	l.m.			
	Vent Line (Horizontal and Vertical)					
	Supply and installation of Polyvinyl Chloride (PVC) pipes, Series 1000 II or approved equal, including fittings, painting, sleeves, supports, hangers and other miscellaneous items as shown and as required to complete the system					
18.08	75mm diameter x 3m	39.00	l.m.			
18.09	50mm diameter x 3m	21.00	l.m.			
	Supply and installation of Cast Iron Pipe, Service weight or approved equal, including fittings, painting, sleeves, supports, hangers and other miscellaneous items as shown and as required to complete the system					
18.10	75mm diameter x 3m	3.00	l.m.			
18.11	50mm diameter x 3m	3.00	l.m.			
	<b>Clean-out</b>					
	Supply and installation of Ceiling Clean-out					
18.12	200mm diameter jointing to PVC Pipe	6.00	pc/s			
18.13	150mm diameter jointing to PVC Pipe	2.00	pc/s			
18.14	100mm diameter jointing to PVC Pipe	6.00	pc/s			
18.15	50mm diameter jointing to PVC Pipe	4.00	pc/s			
	<b>Supply and installation of Floor Clean-out</b>					
18.16	100mm diameter jointing to PVC Pipe	5.00	pc/s			
18.17	75mm diameter jointing to PVC Pipe	3.00	pc/s			
	<b>Drains</b>					
	Supply and installation of drains including adaptors and p-trap as required, setting in concrete, making good around with approved grouting					
	<b>Floor Drain</b>					
18.18	50mm diameter jointing to PVC Pipe	11.00	pc/s			

ITEM NO.	ITEM DESCRIPTION AND LOCATION	QUANTITY	UNIT	DIRECT UNIT COST	TOTAL COST	REMARKS
	Supply and installation of grease trap, complete with removable stainless wire basket, 6mm thick hot dipped checkered steel plate cover, round bar lifting handle and all other necessary accessories and connections					
18.19	Grease trap; stainless steel Capacity: 4 GPM	3.00	pc/s			
<b>XIX.</b>	<b>FACILITY WATER DISTRIBUTION</b>					
	Cold Water Line (Main line,Horizontal and Vertical)					
	High Density Polypropylene Random Copolymer (PPR) pipes, Class PN-20 including fittings, painting, sleeves, support, hangers, and other miscellaneous items as shown and as required to complete the system. (Including connection of new PPR to existing GI main)					
19.01	100mm diameter x 4m	8.00	l.m.			
19.02	50mm diameter x 4m	12.00	l.m.			
19.03	40mm diameter x 4m	8.00	l.m.			
19.04	20mm diameter x 4m	24.00	l.m.			
19.05	15mm diameter x 4m	32.00	l.m.			
	<b>Cold Water Line (Roughing-ins)</b>					
	High Density Polypropylene Random Copolymer (PPR) pipes, Class PN-20 including fittings, painting, sleeves, support, hangers, and other miscellaneous items as shown and as required to complete the system.					
19.06	32mm diameter x 4m	36.00	l.m.			
19.07	25mm diameter x 4m	4.00	l.m.			
19.08	20mm diameter x 4m	20.00	l.m.			
19.09	15mm diameter x 4m	64.00	l.m.			
	<b>Gate Valves</b>					
	Supply and Install					
19.10	50mm diameter Screwed	1.00	pc/s			
19.11	32mm diameter Screwed	6.00	pc/s			
19.12	20mm diameter Screwed	1.00	pc/s			
19.13	15mm diameter Screwed	3.00	pc/s			
	<b>The following are in respect of the whole of the Plumbing installations</b>					
19.15	Sealing, packing and fire proofing wherever required where pipes, conduits, cables or trunking pass through slabs, walls, beams and the like	1.00	item			
19.16	providing identification, color coding and labelling	1.00	item			

ITEM NO.	ITEM DESCRIPTION AND LOCATION	QUANTITY	UNIT	DIRECT UNIT COST	TOTAL COST	REMARKS
19.17	providing operation and maintenance manuals consisting of five (5) sets	1.00	item			
19.18	testing and commissioning including making good all defects and re-testing as necessary and leaving all in sound and perfect working order on completion	1.00	item			
	Supply and installation of grease trap, complete with removable stainless wire basket, 6mm thick hot dipped checkered steel plate cover, round bar lifting handle and all other necessary accessories and connections					
19.19	instructing the Owner's representatives in operation, maintenance and service of completed installation; a period of twelve (12) months from the date of issuance of Certificate of Completion	1.00	item			
19.20	maintenance including labor and parts replacement; a period of twelve (12) months from the date of issuance of Certificate of Completion	1.00	item			
19.24	disinfecting the whole water distribution system issuing of the certificate of insurance that the whole system is free from contamination	1.00	item			
	<b>SANITARY / PLUMBING TOTAL COST:</b>					
<b>Fire Protection Works Bill of Quantities</b>						
XX.	<b>Fire Protection Lines (Horizontal Pipes)</b>					
	Supply and installation of Black Iron Pipes, Schedule 40, or approved equal, including fittings, painting, sleeves, supports, hangers and other miscellaneous items as shown and as required to complete the system					
21.01	65mm diameter x 6m	72.00	pc/s			
21.04	40mm diameter x 6m	18.00	pc/s			
21.07	32mm diameter x 6m	36.00	pc/s			
21.10	25mm diameter x 6m	2,874.00	pc/s			
XXII.	<b>Sprinkler Heads</b>					
	Supply and installation of sprinkler heads and other miscellaneous items as shown and as required to complete the system (All existing and relocated sprinkler heads to be replaced with new)					
22.01	Pendent	128.00	pc/s			
22.02	Upright	5.00	pc/s			
22.03	Sidewall	2.00	pc/s			
	<b>SUBTOTAL COST:</b>					
	<b>SUNDRIES</b>					

ITEM NO.	ITEM DESCRIPTION AND LOCATION	QUANTITY	UNIT	DIRECT UNIT COST	TOTAL COST	REMARKS
	<b>The following are in respect of the whole of the Fire Protection installations</b>					
23.01	Sealing, packing and fire proofing wherever required where pipes, conduits, cables or trunking pass through slabs, walls, beams and the like	1.00	item			
23.02	providing identification, color coding and labelling	1.00	item			
23.03	providing operation and maintenance manuals consisting of five (5) sets	1.00	item			
23.04	testing and commissioning including making good all defects and re-testing as necessary and leaving all in sound and perfect working order on completion	1.00	item			
23.05	instructing the Owner's representatives in operation, maintenance and service of completed installation; a period of twelve (12) months from the date of issuance of Certificate of Completion	1.00	item			
23.06	maintenance including labor and parts replacement; a period of twelve (12) months from the date of issuance of Certificate of Completion	1.00	item			
23.07	disinfecting the whole water distribution system issuing of the certificate of insurance that the whole system is free from contamination	1.00	item			
	<b>SUBTOTAL COST:</b>					
	<b>FIRE PROTECTION WORKS TOTAL COST:</b>					
<b>Mechanical Works Bill of Quantities</b>						
XXIV.	AIR CONDITIONING UNIT					
24.01	ACCUV-2-03, 14HP Variable Refrigerant Flow Air Cooled Condensing Unit. Coil Blue Fin Coated	1.00	set			
24.02	ACCUV-2-04, 14HP Variable Refrigerant Flow Air Cooled Condensing Unit. Coil Blue Fin Coated	1.00	set			
24.03	ACCUV-2-05, 14HP Variable Refrigerant Flow Air Cooled Condensing Unit. Coil Blue Fin Coated	1.00	set			
24.04	ACUV 2-01, 2.0HP Ceiling Cassette Unit, c/w signals wires and local thermostat. Coil Blue Fin Coated	1.00	set			
24.05	ACUV 2-02, 2.0HP Ceiling Cassette Unit, c/w signals wires and local thermostat. Coil Blue Fin Coated	1.00	set			
24.06	ACUV 2-03, 2.0HP Ceiling Cassette Unit, c/w signals wires and local thermostat. Coil Blue Fin Coated	1.00	set			

24.07	ACUV 2-04, 1.0HP Wall Mounted Unit, c/w signals wires and local thermostat. Coil Blue Fin Coated	1.00	set			
<b>ITEM NO.</b>	<b>ITEM DESCRIPTION AND LOCATION</b>	<b>QUANTITY</b>	<b>UNIT</b>	<b>DIRECT UNIT COST</b>	<b>TOTAL COST</b>	<b>REMARKS</b>
24.08	ACUV 2-05, 1.5HP Ceiling Cassette Unit, c/w signals wires and local thermostat. Coil Blue Fin Coated	1.00	set			
24.09	ACUV 2-06, 4.0HP Ceiling Cassette Unit, c/w signals wires and local thermostat. Coil Blue Fin Coated	1.00	set			
24.10	ACUV 2-07, 4.0HP Ceiling Cassette, c/w signals wires and local thermostat. Coil Blue Fin Coated	1.00	set			
24.11	ACUV 2-08, 2.0HP Ceiling Cassette, c/w signals wires and local thermostat. Coil Blue Fin Coated	1.00	set			
24.12	ACUV 2-09, 4.0HP Ceiling Cassette, c/w signals wires and local thermostat. Coil Blue Fin Coated	1.00	set			
24.13	ACUV 2-10, 4.0HP Ceiling Cassette, c/w signals wires and local thermostat. Coil Blue Fin Coated	1.00	set			
24.14	ACUV 2-11, 2.0HP Ceiling Cassette, c/w signals wires and local thermostat. Coil Blue Fin Coated	1.00	set			
24.15	ACUV 2-12, 2.0HP Ceiling Cassette, c/w signals wires and local thermostat. Coil Blue Fin Coated	1.00	set			
24.16	Refrigerant Pipes, Pipe Insulation and Special Pipe Connectors for VRF. Coil Blue Fin Coated	1.00	lot			
24.17	Electrical Wirings, Panel Boards and other signal wires	1.00	lot			
24.18	Podium Floor VRF Central Control and Monitoring System	1.00	set			
	<b>SUBTOTAL COST:</b>					
<b>XXV.</b>	<b>FANS AND BLOWERS</b>					
25.01	EF 2-01, Ceiling Mounted Type at 120 Lps	1.00	set			
25.02	EF 2-02, Ceiling Mounted Type at 120 Lps	1.00	set			
25.03	EF 2-02, Ceiling Mounted Type at 120 Lps	1.00	set			
25.04	TEF 2-01, Ceiling Mounted Type at 75 Lps	1.00	set			
25.05	TEF 2-02, Ceiling Mounted Type at 75 Lps	1.00	set			
25.06	TEF 2-03, Ceiling Mounted Type at 120 Lps	1.00	set			
25.07	TEF 2-04, Ceiling Mounted Type at 120 Lps	1.00	set			
25.08	AC 1-01, Air Curtain	4.00	set			

<b>SUBTOTAL COST:</b>						
<b>ITEM NO.</b>	<b>ITEM DESCRIPTION AND LOCATION</b>	<b>QUANTITY</b>	<b>UNIT</b>	<b>DIRECT UNIT COST</b>	<b>TOTAL COST</b>	<b>REMARKS</b>
<b>XXVI.</b>	<b>DUCTWORK AND ACCESSORIES</b>					
26.01	Galvanized Iron Sheet					
	US Ga. # 26	140.00	sq.m.			
	US Ga. # 24	70.00	sq.m.			
	US Ga. # 22	20.00	sq.m.			
26.02	Flexible Duct c/w insulation and vapor barrier					
	250 dia.	255.00	lm			
	200 dia.	30.00	lm			
26.03	25mm thk. Crosslinked Polyolefin Insulation c/w vapor barrier and adhesive	210.00	sqm			
	Volume Control Dampers, Damper Splitter	1.00	lot			
	<b>SUBTOTAL COST:</b>					
<b>XXVII.</b>	<b>AIR DIFFUSERS</b>					
27.01	1200x50mm Linear Bar Grille c/w Opposed Blade Damper, Aluminum Type	10.00	pcs			
27.02	1200x75mm Linear Bar Grille c/w Opposed Blade Damper, Aluminum Type	100.00	pcs			
27.03	250x250 4-way ceiling diffuser c/w obd	1.00	pcs			
27.04	200x200 4-way ceiling diffuser c/w obd	1.00	pcs			
27.05	1200x75mm Continuous Linear Bar Grille	1.00	lot			
	<b>SUBTOTAL COST:</b>					
<b>XXVIII.</b>	<b>OTHERS</b>					
28.01	Duct and Pipe Hangers, equipment Support, noise and vibration isolators	1.00	lot			
28.02	<b>Consumables</b>	1.00	lot			
28.03	Testing and Commissioning and Miscellaneous Items other miscellaneous items to complete the system	1.00	lot			
	<b>SUBTOTAL COST:</b>					
	<b>MECHANICAL WORKS WORKS TOTAL COST:</b>					
<b>Electrical Works Budgetary Estimates</b>						
<b>XXIX.</b>	<b>PANEL BOARDS, TRANSFORMERS &amp; CIRCUIT BREAKERS</b>					
29.01	<b>PP-RUD, 230V, 3P+G, NEMA 1</b>	1.00	assy			
	Main: 1 - EZC F 100AT, 100AF, 3P, 25KAIC, 230V, MCCB					
	Brs: 19 - iC60 N 50AT, 63AF, 2P, 20KAIC, 230V, MCB					
	1 - iC60 N 32AT, 63AF, 2P, 20KAIC, 230V, MCB					



ITEM NO.	ITEM DESCRIPTION AND LOCATION	QUANTITY	UNIT	DIRECT UNIT COST	TOTAL COST	REMARKS
29.02	<b>2L2 (NEW) 230V, 3P+G, NEMA 1, SURFACE MOUNTED</b>	1.00	assy			
	Main: 12 - EZC F 70AT, 100AF, 3P, 25KAIC, 230V, MCCB					
	Brs: 12 - iC60 N 20AT, 63AF, 2P, 10KAIC, 230V, MCB					
	Spare: 24- iC60 N 20AT, 63AF, 2P, 20KAIC, 230V, MCB					
	Space: 2 - 63AF, 2P					
29.03	<b>PPGH 230V, 3P+G, NEMA 1, SURFACE MOUNTED</b>	1.00	assy			
	Main: 1 - EZC F 100AT, 100AF, 3P, 25KAIC, 230V, MCCB					
	Brs: 22 - iC60 N 20AT, 63AF, 2P, 10KAIC, 230V, MCB					
	Spare: 2 - iC60 N 20AT, 63AF, 2P, 10KAIC, 230V, MCB					
29.04	<b>PACU-PF (NEW) 480V, 3P+G</b>	1.00	assy			
	Main: 1 - EZC N 250AT 250AF, 3P, 36KAIC, 480V					
	6 - EZC F 70AT, 100AF, 3P, 25KAIC, 480V, MCCB					
	8 - EZC H 60AT, 100AF, 3P, 25KAIC, 480V, MCCB					
29.05	<b>R2 230V, 3P+G, NEMA 1, SURFACE MOUNTED</b>	1.00	assy			
	Main: 12 - EZC F 50AT, 100AF, 3P, 25KAIC, 230V, MCCB					
	Brs: 6 - iC60 N 20AT, 63AF, 2P, 20KAIC, 230V, MCB					
	Spare: 3 - iC60 N 20AT, 63AF, 2P, 20KAIC, 230V, MCB					
	Space: 3 - 63AF, 2P					
29.06	<b>2UP2 230V, 3P+G, NEMA 1, SURFACE MOUNTED</b>	1.00	assy			
	Main: 1 - iC60 N 50AT, 100AF, 3P, 20KAIC, 230V, MCB					
	Brs: 12 - iC60 N 20AT, 63AF, 2P, 20KAIC, 230V, MCB					
	Spare: 3 - iC60 N 20AT, 63AF, 2P, 20KAIC, 230V, MCB					
	Space: 3 - 63AF, 2P					
29.10	<b>PP-2 230V, 3P+G, NEMA 1, SURFACE MOUNTED</b>	1.00	assy			
	Main: 1 - iC60 N 50AT, 100AF, 3P, 20KAIC, 230V, MCB					
	Brs: 23 - iC60 N 20AT, 63AF, 2P, 20KAIC, 230V, MCB					

ITEM NO.	ITEM DESCRIPTION AND LOCATION	QUANTITY	UNIT	DIRECT UNIT COST	TOTAL COST	REMARKS
	Spare: 1 - iC60 N 20AT, 63AF, 2P, 20KAIC, 230V, MCB					
29.11	<b>25kVA 480V/ 230 DRY TYPE TRANSFORMER</b>	1.00	assy			
	<b>SUBTOTAL COST:</b>					
	<b>WIRING DEVICES</b>					
30.01	one gang switch					
	two gang switch	7.00	set			
	three gang switch	11.00	set			
	Three-way switch - one gang	1.00	set			
30.02	<b>CONDUITS</b>					
	15mmØ EMT conduits					
	15mmØ EMT elbow	297.00	pcs			
	15mmØ EMT coupling	594.00	pcs			
	15mmØ EMT connector	652.00	pcs			
	15mmØ EMT Locknut & Bushing	652.00	pcs			
	15mmØ flexible metal conduit	489.00	lm			
	15mmØ straight connector	326.00	pcs			
	15mmØ angle connector	326.00	pcs			
30.03	<b>BOXES</b>					
	4" x 4" x 2" Octagonal Box, Gauge 16, Zinc-Chromate	326.00	pcs			
	2" x 4" Utility Box, Gauge 16, Zinc-Chromate	30.00	pcs			
	6" x 6" x 4" Pull Box, Gauge 16, Zinc-Chromate	1.00	pcs			
	4-11/16" x 4-11/16" Square Box, Gauge 16, Zinc-Chromate	131.00	pcs			
30.05	<b>WIRES &amp; CABLES</b>					
	3.5mm <sup>2</sup>	7,192.00	lm			
	<b>SUBTOTAL COST:</b>					
XXXI.	<b>POWER SYSTEM</b>					
31.01	<b>WIRING DEVICES</b>					
	<b>Duplex Convenience Outlet</b>	157.00	sets			
	<b>Refrigerator Outlet, Grounding Type</b>	3.00	sets			
	<b>Microwave oven Outlet, Grounding Type</b>	4.00	sets			
	Food waste disposal outlet, Grounding Type	5.00	sets			
	Plate Cover WEG 6801W-1	16.00	sets			
31.02	<b>CONDUITS</b>					
	15mmØ EMT conduits	234.00	lghts			
	15mmØ EMT elbow	78.00	pcs			
	<b>15mmØ EMT coupling</b>					
	15mmØ EMT connector	261.00	pcs			
	15mmØ EMT Locknut & Bushing	261.00	pcs			

31.03	<b>BOXES &amp; PULL BOXES</b>					
ITEM NO.	ITEM DESCRIPTION AND LOCATION	QUANTITY	UNIT	DIRECT UNIT COST	TOTAL COST	REMARKS
	4" x 4" Octagonal Box, Gauge 16, Zinc-Chromate	53.00	pcs			
	4-11/16" x 4-11/16" Square Box, Gauge 16, Zinc-Chromate	59.00	pcs			
	2" x 4" Utility Box, Gauge 16, Zinc-Chromate					
31.04	<b>WIRES &amp; CABLES</b>					
	3.5mm <sup>2</sup>	2,115.00	lm			
	<b>SUBTOTAL COST:</b>					
<b>XXXII.</b>	<b>TELEPHONE SYSTEM</b>					
32.01	<b>CONDUIT &amp; FITTINGS</b>					
	25mmØ EMT conduits	16.00	pcs			
	25mmØ EMT elbow	8.00	pcs			
	25mmØ EMT coupling	16.00	pcs			
	25mmØ EMT connector	17.00	pcs			
	25mmØ Locknut & Bushing	17.00	pcs			
	25mmØ flexible metal conduit	14.00	pcs			
	25mmØ straight connector	9.00	pcs			
	25mmØ angle connector	9.00	pcs			
	32mmØ EMT conduits	159.00	lghts			
	32mmØ EMT elbow	80.00	pcs			
	32mmØ EMT coupling	159.00	pcs			
	32mmØ EMT connector	175.00	pcs			
	32mmØ Locknut & Bushing	175.00	pcs			
	32mmØ flexible metal conduit	14.00	pcs			
	32mmØ straight connector	9.00	pcs			
	32mmØ angle connector	9.00	pcs			
32.02	<b>BOXES &amp; PULL BOXES</b>					
	4" x 4" x 2" Octagonal Box, Gauge 16, Zinc-Chromate	30.00	pcs			
	2" x 4" Utility Box, Gauge 16, Zinc-Chromate	30.00	pcs			
32.03	<b>WIRES &amp; CABLES</b>					
	Cat5e Cable	2,280.00	l.m.			
32.04	<b>EQUIPMENTS &amp; DEVICES</b>					
	Socket	19.00	pcs			
	<b>SUBTOTAL COST:</b>					
<b>XXXIII.</b>	<b>FIRE DETECTION ALARM SYSTEM</b>					
33.01	<b>CONDUIT &amp; FITTINGS</b>					
	20mmØ EMT conduits	143.00	lghts			
	20mmØ EMT elbow					
	20mmØ EMT coupling	143.00	pcs			
	20mmØ EMT connector					
	20mmØ Locknut & Bushing	124.00	pcs			

ITEM NO.	ITEM DESCRIPTION AND LOCATION	QUANTITY	UNIT	DIRECT UNIT COST	TOTAL COST	REMARKS
	15mmØ flexible metal conduit	93.00	lghts			
	15mmØ straight connector	62.00	pcs			
	15mmØ angle connector	62.00	pcs			
33.02	BOXES & PULL BOXES					
	4" x 4" x 2" Octagonal Box, Gauge 16, Zinc-Chromate	62.00	pcs			
	2" x 4" Utility Box, Gauge 16, Zinc-Chromate	23.00	pcs			
	4-11/16" x 4-11/16" Square Box, Gauge 16, Zinc-Chromate	20.00	pcs			
33.03	WIRES & CABLES					
	Twisted Pair #16 (MINERAL INSULATION FRC)	441.00	pcs			
33.04	EQUIPMENT & DEVICES					
	manual pull station	5.00	pcs			
	horn with strobe light					
	smoke detector	39.00	pcs			
	<b>SUBTOTAL COST:</b>					
	<b>ELECTRICAL WORKS TOTAL COST:</b>					
	<b>PODIUM TOTAL COST (A, S/P, FP, M, E,)</b>					

THIRD FLOOR						
Architectural Works Bill of Quantities for Third Floor						
Package 2 (Third Floor)						
ITEM NO.	ITEM DESCRIPTION AND LOCATION	QTY	UNIT	DIRECT UNIT COST	TOTAL COST	REMARKS
I.	<b>GENERAL REQUIREMENTS</b>					
1.01	All insurances such as bonds and guarantee performance bonds, third party insurance and surety bond against down payment and retention bond, building permit and occupancy permit.	1.00	lot			
1.02	Mobilization and demobilization of workers, tools and equipment	1.00	lot			
1.03	Temporary facilities and temporary utilities	1.00	lot			
1.04	Safety and security, daily cleaning and maintenance works	1.00	lot			
1.05	Demolition, dismantling and hauling of debris (verify architectural technical specifications)	1.00	lot			
	Demolish all existing walls and partitions as stated in the plan.					
	Strip all existing wall finishes affected with the renovation					
	Dismantle existing ceiling finishes except for bottom of slab ceiling.					
	Dismantle all existing doors, door jambs, hardware and accessories and turnover all items to the owner for proper handling except for doors to be retained					
	Dismantle all existing glass partition and accessories and turnover all items to the owner for proper handling.					
	Dismantle all existing lighting fixtures and electrical devices on site and all items are subject for turnover to the owner for proper handling.					
	Dismantle all existing AC equipment on site subject for replacement and turnover all items to the over for proper handling.					
	Dismantle all existing utility lines, conduits, pipes and ductworks subject for replacement as per plan. i					
	Demolish and dismantle all existing floor finishes as per plan					

ITEM NO.	ITEM DESCRIPTION AND LOCATION	QTY	UNIT	DIRECT UNIT COST	TOTAL COST	REMARKS
	Demolish and dismantle all existing wall cubicle partition and floor tiles at existing toilets.					
	Demolish all existing CHB toilet partitions at common toilets.					
	Demolish existing lavatory counter at existing toilets.					
	Dismantle all existing toilet fixtures and accessories for replacement.					
	Dismantle existing wall mounted facial mirror at existing toilets.					
	Demolish existing walls and slab affected for the accommodation of new elevator shaft.					
	Demolish affected slab for all areas to be converted to pipe chase.					
	Demolish existing walls at executive toilets as per plan					
1.06	As-buit drawings. Including all disciplines	1.00	lot			
1.07	equipment Rental using twin cage building hoist (total of 4T capacity)	1.00	lot			
1.08	H-frame scaffolding complete with necessary things and accessories; and formworks	1.00	lot			
<b>II.</b>	<b>FLOOR WORKS</b>					
2.01	500mm x 500mm integrated tufted pattern loop solution dyed 100% synthetic fiber with 4.00mm pile height carpet tiles with Polyester spunbouned primary backing and condensed vinyl with fiberglass reinforcement secondary backing at offices and other areas shown in the plans	1,275.13	sq.m.			
2.02	12mm thk. x 600mm x 600mm non-skid, indoor granite tiles at hallways and other areas shown in the plans	231.15	sq.m.			
2.03	10mm thk. x 600mm x 600mm non-skid, non-vitreous porcelain tiles for toilets and other areas shown in the plans	42.42	sq.m.			
2.04	3mm thk. x 300mm x 300mm homogenous and resilient type Vinyl tiles, with primer and water-based acrylic floor adhesive at pantry, storage and other areas shown in the plans	151.53	sq.m.			
2.05	Exisiting marble floor finish subject for crystallization at elevator lobby and other areas shown in the plans	87.00	sq.m.			
	<b>SUBTOTAL COST:</b>					
<b>III.</b>	<b>WALL WORKS</b>					

ITEM NO.	ITEM DESCRIPTION AND LOCATION	QTY	UNIT	DIRECT UNIT COST	TOTAL COST	REMARKS
3.01	Drywall partition using 12mm thk. fiber cement board using 100mm thk. Using 400mm x 400mm metal studs vertical and horizontal on center	391.86	sq.m.			
3.02	100mm thick concrete hollow blocks with 25mm thick plaster on both sides complete with steel bars for Ground floor walls as shown in the plans	29.70	sq.m.			
3.03	25mm thk x 100mm. Wood plastic composite baseboard installed on both sides of all drywall and CHB wall partitions	270.68	l.m			
3.04	Existing marble wall finish subject for crystallization for areas shown in the plans	87.87	sq.m.			
	<b>SUBTOTAL COST:</b>					
<b>IV.</b>	<b>WALL FINISHES</b>					
4.01	10mm thick x 600mm x 600mm glazed porcelain wall tiles for all toilets and other areas shown in the plans	174.63	sq. m			
	<b>SUBTOTAL COST:</b>					
<b>V.</b>	<b>CEILING WORKS</b>					
5.01	12mm thk. Gypsumboard on 400mm x 400mm furring channel horizontal and vertical with 1200mm x 1200mm hanger both ways with 50mm shadow gap between walls and ceiling as per plan	1,477.32	sq.m.			
5.02	12mm thk. Moisture Resistant Gypsumboard on 400mm x 400mm furring channel both ways with 1200mm x 1200mm hanger both ways with 50mm shadow gap between walls and ceiling as per plan	37.29	sq.m.			
	<b>SUBTOTAL COST:</b>					
<b>VI.</b>	<b>PAINTING WORKS</b>					
6.01	Existing walls and columns shall be repainted for areas indicated in the plans	450.80	sq.m.			
6.02	New CHB wall and drywall partitions shall be painted with latex paint for interior wall surfaces as shown in the plans	738.83	sq.m.			
6.03	Epoxy paint for all utility floor areas as per plan; for fire exit existing pebble wash out floor finish to be painted with chemical emulsion	175.60	sq.m.			
6.04	All ceiling works shall be painted with latex paint as shown in the plans	1,499.61	sq.m.			
6.05	All existing bottom of slab shall be painted with latex paint at utility areas as shown in the plans	169.39	sq.m.			
	<b>SUBTOTAL COST:</b>					
<b>VII.</b>	<b>DOORS AND WINDOWS</b>					

7.01	D07. 2.1m x 1.8m;12mm thk tempered double-swing glass on FD-100 aluminum frame and 2.10 m x 1.80m double-swing glass door, complete with hardwares and accessories as per plan.	1.00	set			
<b>ITEM NO.</b>	<b>ITEM DESCRIPTION AND LOCATION</b>	<b>QTY</b>	<b>UNIT</b>	<b>DIRECT UNIT COST</b>	<b>TOTAL COST</b>	<b>REMARKS</b>
7.11	D11. 2.10m x 0.90m; 44mm thick kiln dried mahogany wood panel single-swing door with 50mm x 100mm kiln dried mahogany wood door jamb in wood stain finish with clear gloss top coat lacquer, complete with hardwares, and accessories as per plan.	11.00	set			
7.16	D16. 2.10m x 0.9m; GA 20 B.I. bended sheet steel single swing louvered with GA. 16 standard steel jamb painted with epoxy paint finish complete with hardwares and accessories as per plan	1.00	set			
7.17	D17. 2.10m x 0.70m; 44mm thick kiln dried louvered mahogany wood panel door with 50mm x 100mm kiln dried mahogany wood door jamb in wood stain finish with clear gloss top coat lacquer, complete with hardwares and accessories as per plan.	2.00	set			
7.18	D18. 2.10m x 1.00m; 44mm thick kiln dried louvered mahogany wood panel single-swing door with 50mm x 100mm kiln dried mahogany wood door jamb in wood stain finish with clear gloss top coat lacquer, complete with hardwares and accessories as per plan.	1.00	set			
7.23	D28. 2.1m x 0.7m; 44mm thick kiln dried louvered mahogany wood panel single-swing door with 50mm x 100mm kiln dried mahogany wood door jamb in wood stain finish with clear gloss top coat lacquer, complete with hardwares and accessories as per plan.	1.00	set			
7.24	D29. 2.1m x 0.90m; 44mm thick kiln dried louvered mahogany wood panel single-swing door with 50mm x 100mm kiln dried solid wood door jamb in wood stain finish with clear gloss top coat lacquer, complete with hardwares and accessories as per plan.	1.00	set			
7.08	D30. 2.1m x 5.1m. Combination of 12mm thk fixed tempered glass on FD-100 aluminum frame and 2.10 m x 0.90m single-swing glass door, complete with accessories as per plan.	1.00	set			



7.09	D31. 2.1m x 4.1m. Combination of 12mm thk fixed tempered glass on FD-100 aluminum frame and 2.10 m x 0.90m single-swing glass door, complete with accessories as per plan.	1.00	set			
ITEM NO.	ITEM DESCRIPTION AND LOCATION	QTY	UNIT	DIRECT UNIT COST	TOTAL COST	REMARKS
7.10	D32. 2.1m x 6m. Combination of 12mm thk fixed tempered glass on FD-100 aluminum frame and 2.10 m x 0.90m single-swing glass door, complete with hardwares and accessories as per plan.	1.00	set			
7.11	D34. 2.1m x 5.0m. Combination of 12mm thk fixed tempered glass on FD-100 aluminum frame and 2.10 m x 0.90m single-swing glass door, complete with hardwares and accessories as per plan.	1.00	set			
7.12	D35. 2.1m x 6.70m. Combination of 12mm thk fixed tempered glass on FD-100 aluminum frame and 2.10 m x 1.80m double-swing glass door, complete with hardwares and accessories as per plan.	2.00	set			
7.13	D36. 2.1m x 7.30m. Combination of 12mm thk fixed tempered glass on FD-100 aluminum frame and 2.10 m x 0.90m single-swing glass door, complete with hardwares and accessories as per plan.	3.00	set			
7.14	D37. 2.10m x 4.75m. Combination of 12mm thk fixed tempered glass on FD-100 aluminum frame and 2.10 m x 0.90m single-swing glass door, complete with accessories as per plan.	3.00	set			
7.15	D38. 2.10m x 3.30m. Combination of 12mm thk fixed tempered glass on FD-100 aluminum frame and 2.10 m x 0.90m single-swing glass door, complete with hardwares and accessories as per plan.	1.00	set			
7.16	D39. 2.10m x 8.20m. Combination of 12mm thk fixed tempered glass on FD-100 aluminum frame and 2.10 m x 0.90m single-swing glass door, complete with hardwares and accessories as per plan.	1.00	set			
7.17	D40. 2.10m x 7.90m. Combination of 12mm thk fixed tempered glass on FD-100 aluminum frame and 2.10 m x 0.90m single-swing glass door, complete with hardwares and accessories as per plan.	1.00	set			

7.18	DR.Existing single swing steel door panels and door jamb jamb to be retained and repainted. Existing door shall be painted with one (1) coat epoxy primer and two (2) coats epoxy top coat. All existing hardware and accessories subject for replacement.	3.00	set			
<b>ITEM NO.</b>	<b>ITEM DESCRIPTION AND LOCATION</b>	<b>QTY</b>	<b>UNIT</b>	<b>DIRECT UNIT COST</b>	<b>TOTAL COST</b>	<b>REMARKS</b>
7.19	DR. Existing fire exit doors to be retained and repainted. Hardwares and accessories including panic device to be replaced.	2.00	set			
7.20	DR. Existing vault doors to be retained and repainted. Hardwares and accessories to be replaced.	1.00	set			
7.21	100mm wide door threshold at all doors with different floor elevations from entry point and area interior	17.50	l.m			
	<b>SUBTOTAL COST:</b>					
<b>VIII.</b>	<b>GLASS WORKS</b>					
8.01	12mm thick tempered glass in FD 100 powder-coated aluminum framing including sealant application and frosted sticker for all glass partitions as shown in the plans	161.28	sq.m.			
8.02	Facial Mirror with 6mm thick marine plywood backing for toilets as shown in the plans	7.83	sq.m			
8.03	Graphicote with 6mm thick marine plywood backing for meeting rooms as shown in the plans	22.97	sq.m			
	<b>SUBTOTAL COST:</b>					
<b>IX.</b>	<b>MASONRY WORKS</b>					
9.01	25mm thk. granite countertop including 300mm high splashboard on concrete slab sub-counter at all pantry areas.	7.56	sq.m			
9.02	25mm thk. granite countertop including 300mm high splashboard in 50mm x 50mm solid wood k.d. tanguile framing on 3/4" thk marine plywood counter support for toilet counters	4.46	sq.m			
9.03	25mm thk. X 200mm granite ledge installed on top of concrete ledge.	0.63	sq.m			
9.04	25mm thk. Granite ledge on reinforced concrete support embedded to walls at 1400mm above floor finish for water closet	1.60	sq.m			
	<b>SUBTOTAL COST:</b>					
<b>X.</b>	<b>LIGHTING FIXTURES</b>					

10.01	18 watts daylight recessed type LED in 210mm diameter aluminium casing with glass frame down light fixture general ceiling areas and other areas shown in the plans	207.00	set			
ITEM NO.	ITEM DESCRIPTION AND LOCATION	QTY	UNIT	DIRECT UNIT COST	TOTAL COST	REMARKS
10.02	Surface mounted LED light fixture. Supply, delivery and installation of 5.7W LED daylight bulb with E27 lamp base with 100mm diameter round aluminium surface mounted down light fixture with glass cover and E27 socket for existing slab ceiling works and other areas shown in the plans	9.00	set			
10.03	6 watts warm white recessed type LED in 110mm diameter aluminium casing with glass frame down light fixture located above toilet sink and other areas shown in the plans	6.00	set			
10.04	600mm x 600mm x 12mmH 39W daylight slim type LED panel ceiling light fixture with aluminium housing, 100-240Vac Input and 26-30Vdc Output and optical PMMA diffuser for offices, elevator lobby and other areas as shown in the plans	172.20	set			
10.05	Low bay lighting fixtures comprising of low bay reflector bracket with E27 socket, 400mm diameter sand blasted reflector and glass cover, and 15W LED PAR38 daylight bulb with E27 lamp base for storages, utility areas and other areas as shown in the plans	36.00	set			
10.06	Indoor recessed wall lamp: recessed type aluminium die cast with glass lens wall light fixture with 60W E27 compact fluorescent lamp for hallways and other areas as shown in the plans	7.00	set			
10.07	T5 electronic fluorescent lamp with slim type luminaire (14W, 21W, 28W), for mirror lighting and other areas for cove lighting as shown in the plans	21.00	set			
	<b>SUBTOTAL COST:</b>					
<b>XI.</b>	<b>TOILET FIXTURES</b>					
11.01	Water closet	7.00	set			
11.02	Water Closet Sensor	7.00	set			
11.03	Bidet spray	7.00	set			
11.04	Urinal	4.00	set			
11.05	Urinal Sensor	4.00	set			
11.06	Countertop porcelain basin	7.00	set			

ITEM NO.	ITEM DESCRIPTION AND LOCATION	QTY	UNIT	DIRECT UNIT COST	TOTAL COST	REMARKS
11.07	Basin Faucet (Sensor)	7.00	set			
11.08	Slop sink faucet	1.00	set			
11.09	Enamel cast iron slop sink complete with accessories	1.00	set			
11.10	Stainless steel grab bar for PWD toilet	1.00	set			
	<b>SUBTOTAL COST:</b>					
<b>XII.</b>	<b>TOILET PARTITION</b>					
12.01	12mm thick machine pressed laminated phenolic board substrate partitions with high scratch and impact resistance with aluminium edge and corner profile, complete with indicator and accessories for water closet and shower	6.00	set			
12.02	12mm thick machine pressed laminated phenolic board substrate partitions with high scratch and impact resistance with aluminium edge and corner profile for urinal partition	3.00	set			
	<b>SUBTOTAL COST:</b>					
<b>XIII.</b>	<b>PANTRY FIXTURES AND ACCESSORIES</b>					
13.01	Pantry sink – chrome finish stainless steel L760 x W460mm single bowl upper-counter sink with drain board with corrosion resistance property for pantry	4.00	set			
13.02	Pantry sink faucet mixer – stainless steel chrome finish faucet mixer faucet with brass fittings H121 x L222mm with minimal lead traces in waterways and corrosion resistance for pantry	4.00	set			
13.03	0.75HP – 225v food waste disposer, with 3 grind stages, stainless steel grind elements and 1180mL stainless steel grind chamber for pantry	4.00	set			
	<b>SUBTOTAL COST:</b>					
<b>XVI.</b>	<b>MISCELLANEOUS WORKS</b>					
14.01	12mm thk machine-pressed natural wood veneer cladding on 12mm x 50mm wood spacers, with 25mm x 25mm aluminum corner guard and aluminum strip at 2100mm high from floor finish at elevator lobby.	3.88	sq.m.			
14.02	2.1m x 2.4m; Galvanized steel panel roll- up door, manual and motor operated with 1/4 HP single phase motor including electronic device push button switch at 5 seconds located in areas shown in the plans	2.00	set			
	<b>SUBTOTAL COST:</b>					

ITEM NO.	ITEM DESCRIPTION AND LOCATION	QTY	UNIT	DIRECT UNIT COST	TOTAL COST	REMARKS
XV.	WATER PROOFING WORKS					
15.01	Cementitious crystallization waterproofing using crystalline formulation for all pantry and toilets	51.67	sqm			
	<b>SUBTOTAL COST:</b>					
	<b>ARCHITECTURAL WORKS TOTAL COST:</b>					
<b>Sanitary / Plumbing Works Budgetary Estimates</b>						
<b>XVI.</b>	<b>FACILITY STORM DRAINAGE PIPING</b>					
	Storm Line (Collectors/Downspouts)					
	Supply and installation of Polyvinyl Chloride (PVC) pipes, Series 1000 II or approved equal, including fittings, painting, sleeves, supports, hangers and other miscellaneous items as shown and as required to complete the system					
16.01	150mm diameter x 3m	39.00	l.m.			
16.02	100mm diameter x 3m	24.00	l.m.			
<b>XVII.</b>	<b>AIRCON DRAINAGE PIPING</b>					
	Aircon Drain Line (Collectors and risers)					
	Supply and installation of Polyvinyl Chloride (PVC) pipes, Series 1000 II or approved equal, including fittings, painting, sleeves, supports, hangers and other miscellaneous items as shown and as required to complete the system					
17.01	100mm diameter x 3m	18.00	l.m.			
17.02	50mm diameter x 3m	72.00	l.m.			
17.03	25mm diameter x 3m	51.00	l.m.			
	Plumbing Insulation					
	Supply and installation of 20mm thick, pre-molded elastomeric closed cell rubber insulation, wrapped with polyethylene tape and clad with GA-26 aluminum sheets, including vapor barrier and other miscellaneous items as shown and as required to complete the system					
17.04	Condensate Insulation					
17.05	100mm diameter	18.00	m			
17.06	50mm diameter	72.00	m			
	25mm diameter	51.00	m			
	<b>Clean-out</b>					

ITEM NO.	ITEM DESCRIPTION AND LOCATION	QTY	UNIT	DIRECT UNIT COST	TOTAL COST	REMARKS
17.07	Supply and installation of Ceiling Clean-out					
	150mm diameter jointing to PVC Pipe	5.00	pc/s			
	<b>Drains</b>					
	Supply and installation of drains including adaptors and p-trap as required, setting in concrete, making good around with approved grouting					
	<b>Gutter Drain</b>					
17.08	100mm diameter jointing to PVC Pipe	16.00	pc/s			
<b>XVIII.</b>	<b>FACILITY SANITARY SEWERAGE</b>					
	Sanitary Sewer Line (Collectors and Risers)					
	Supply and installation of Polyvinyl Chloride (PVC) pipes, Series 1000 II or approved equal, including fittings, painting, sleeves, supports, hangers and other miscellaneous items as shown and as required to complete the system					
18.01	150mm diameter x 3m	6.00	l.m			
18.02	100mm diameter x 3m	84.00	l.m.			
18.03	75mm diameter x 3m	9.00	l.m.			
18.04	50mm diameter x 3m	90.00	l.m.			
	Supply and installation of Cast Iron Pipe, Service weight or approved equal, including fittings, painting, sleeves, supports, hangers and other miscellaneous items as shown and as required to complete the system					
18.05	100mm diameter x 3m	3.00	l.m.			
	<b>Vent Line (Horizontal and lateral branches)</b>					
	Supply and installation of Polyvinyl Chloride (PVC) pipes, Series 1000 II or approved equal, including fittings, painting, sleeves, supports, hangers and other miscellaneous items as shown and as required to complete the system					
18.06	75mm diameter x 3m	6.00	l.m.			
18.07	50mm diameter x 3m	192.00	l.m.			
	Supply and installation of Cast Iron Pipe, Service weight or approved equal, including fittings, painting, sleeves, supports, hangers and other miscellaneous items as shown and as required to complete the system					

ITEM NO.	ITEM DESCRIPTION AND LOCATION	QTY	UNIT	DIRECT UNIT COST	TOTAL COST	REMARKS
18.08	75mm diameter x 3m	3.00	l.m.			
18.09	50mm diameter x 3m	3.00	l.m.			
	<b>Clean-out</b>					
	Supply and installation of Ceiling Clean-out					
18.10	50mm diameter jointing to PVC Pipe	5.00	pc/s			
	Supply and installation of Floor Clean-out					
18.11	100mm diameter jointing to PVC Pipe	8.00	pc/s			
18.12	75mm diameter jointing to PVC Pipe	4.00	pc/s			
	<b>Drains</b>					
	Supply and installation of drains including adaptors and p-trap as required, setting in concrete, making good around with approved grouting					
	<b>Floor Drain</b>					
18.13	50mm diameter jointing to PVC Pipe	9.00	pc/s			
	Grease trap					
	Supply and installation of grease trap, complete with removable stainless wire basket, 6mm thick hot dipped checkered steel plate cover, round bar lifting handle and all other necessary accessories and connections					
18.14	Grease trap; stainless steel Capacity: 4 GPM	4.00	pc/s			
<b>XIX.</b>	<b>FACILITY WATER DISTRIBUTION</b>					
	Cold Water Line (Main distribution line)					
	High Density Polypropylene Random Copolymer (PPR) pipes, Class PN-20 including fittings, painting, sleeves, support, hangers, and other miscellaneous items as shown and as required to complete the system. (Including connection of new PPR to existing GI main)					
19.01	50mm diameter x 4m	4.00	l.m.			
19.02	40mm diameter x 4m	12.00	l.m.			
19.03	32mm diameter x 4m	16.00	l.m.			
19.04	25mm diameter x 4m	16.00	l.m.			
19.05	20mm diameter x 4m	52.00	l.m.			
19.06	15mm diameter x 4m	16.00	l.m.			

ITEM NO.	ITEM DESCRIPTION AND LOCATION	QTY	UNIT	DIRECT UNIT COST	TOTAL COST	REMARKS
	Cold Water Line (Roughing-ins)					
	High Density Polypropylene Random Copolymer (PPR) pipes, Class PN-20 including fittings, painting, sleeves, support, hangers, and other miscellaneous items as shown and as required to complete the system.					
19.07	32mm diameter x 4m	16.00	l.m.			
19.08	25mm diameter x 4m	4.00	l.m.			
19.09	20mm diameter x 4m	36.00	l.m.			
19.10	15mm diameter x 4m	80.00	l.m.			
	<b>Gate Valves</b>					
	Supply and Install					
19.11	50mm diameter Screwed	1.00	pc/s			
19.12	40mm diameter Screwed	1.00	pc/s			
19.13	32mm diameter Screwed	3.00	pc/s			
19.14	25mm diameter Screwed	1.00	pc/s			
19.15	20mm diameter Screwed	2.00	pc/s			
19.16	15mm diameter Screwed	5.00	pc/s			
	<b>The following are in respect of the whole of the Plumbing installations</b>					
19.17	Sealing, packing and fire proofing wherever required where pipes, conduits, cables or trunking pass through slabs, walls, beams and the like	1.00	item			
19.19	providing identification, color coding and labelling	1.00	item			
19.20	providing operation and maintenance manuals consisting of five (5) sets	1.00	item			
19.21	testing and commissioning including making good all defects and re-testing as necessary and leaving all in sound and perfect working order on completion	1.00	item			
19.22	instructing the Owner's representatives in operation, maintenance and service of completed installation; a period of twelve (12) months from the date of issuance of Certificate of Completion	1.00	item			



ITEM NO.	ITEM DESCRIPTION AND LOCATION	QTY	UNIT	DIRECT UNIT COST	TOTAL COST	REMARKS
19.23	maintenance including labor and parts replacement; a period of twelve (12) months from the date of issuance of Certificate of Completion	1.00	item			
19.24	disinfecting the whole water distribution system issuing of the certificate of insurance that the whole system is free from contamination	1.00	item			
	<b>SANITARY / PLUMBING TOTAL COST:</b>					
<b>Fire Protection Works Bill of Quantities</b>						
XXI.	<b>Fire Protection Lines (Horizontal Pipes)</b>					
	Supply and installation of Black Iron Pipes, Schedule 40, or approved equal, including fittings, painting, sleeves, supports, hangers and other miscellaneous items as shown and as required to complete the system					
	75mm diameter x 6m	6.00	lm			
21.03	65mm diameter x 6m	30.00	pc/s			
21.07	50mm diameter x 6m	6.00	pc/s			
21.09	40mm diameter x 6m	6.00	pc/s			
21.12	32mm diameter x 6m	6.00	pc/s			
21.17	25mm diameter x 6m	984.00	pc/s			
XXII.	<b>Sprinkler Heads</b>					
	Supply and installation of sprinkler heads and other miscellaneous items as shown and as required to complete the system (All existing and relocated sprinkler heads to be replaced with new)					
22.01	Pendent	186.00	pc/s			
22.02	Upright	7.00	pc/s			
22.03	Sidewall	2.00	pc/s			
	<b>SUBTOTAL COST:</b>					
XXIII.	<b>SUNDRIES</b>					
	The following are in respect of the whole of the Fire Protection installations	-				
23.01	Sealing, packing and fire proofing wherever required where pipes, conduits, cables or trunking pass through slabs, walls, beams and the like	1.00	item			

ITEM NO.	ITEM DESCRIPTION AND LOCATION	QTY	UNIT	DIRECT UNIT COST	TOTAL COST	REMARKS
23.03	providing identification, color coding and labelling	1.00	item			
23.04	providing operation and maintenance manuals consisting of five (5) sets	1.00	item			
23.05	testing and commissioning including making good all defects and re-testing as necessary and leaving all in sound and perfect working order on completion	1.00	item			
23.06	instructing the Owner's representatives in operation, maintenance and service of completed installation; a period of twelve (12) months from the date of issuance of Certificate of Completion	1.00	item			
23.09	maintenance including labor and parts replacement; a period of twelve (12) months from the date of issuance of Certificate of Completion	1.00	item			
23.10	disinfecting the whole water distribution system issuing of the certificate of insurance that the whole system is free from contamination	1.00	item			
	<b>SUBTOTAL COST:</b>					
	<b>FIRE PROTECTION WORKS TOTAL COST:</b>					
<b>Mechanical Works Budgetary Estimates</b>						
<b>XXIV.</b>	<b>AIR CONDITIONING UNIT</b>					
24.01	ACCUV-2-06, 17HP Variable Refrigerant Flow Air Cooled Condensing Unit. Coil Blue Fin Coated	1.00	set			
24.02	ACCUV-2-07, 17HP Variable Refrigerant Flow Air Cooled Condensing Unit. Coil Blue Fin Coated	1.00	set			
24.03	ACUV 3-01, 2.0HP Ceiling Cassette Unit, c/w signals wires and local thermostat. Coil Blue Fin Coated	1.00	set			
24.04	ACUV 3-02, 2.0HP Ceiling Cassette Unit, c/w signals wires and local thermostat. Coil Blue Fin Coated	1.00	set			
24.05	ACUV 3-03, 1.5HP Ceiling Cassette Unit, c/w signals wires and local thermostat. Coil Blue Fin Coated	1.00	set			
24.06	ACUV 3-04, 1.5HP Ceiling Cassette Unit, c/w signals wires and local thermostat. Coil Blue Fin Coated	1.00	set			
24.07	ACUV 3-05, 1.5HP Ceiling Cassette Unit, c/w signals wires and local thermostat. Coil Blue Fin Coated	1.00	set			
24.08	ACUV 3-06, 1.5HP Ceiling Cassette Unit, c/w signals wires and local thermostat. Coil Blue Fin Coated	1.00	set			

ITEM NO.	ITEM DESCRIPTION AND LOCATION	QTY	UNIT	DIRECT UNIT COST	TOTAL COST	REMARKS
24.09	ACUV 3-07, 2.0HP Ceiling Cassette Unit, c/w signals wires and local thermostat. Coil Blue Fin Coated	1.00	set			
24.10	ACUV 3-08, 3.0HP Ceiling Cassette Unit, c/w signals wires and local thermostat. Coil Blue Fin Coated	1.00	set			
24.11	ACUV 3-09, 2.0HP Ceiling Cassette Unit, c/w signals wires and local thermostat. Coil Blue Fin Coated	1.00	set			
24.12	ACUV 3-10, 1.5HP Ceiling Cassette Unit, c/w signals wires and local thermostat. Coil Blue Fin Coated	1.00	set			
24.13	ACUV 3-11, 1.5HP Ceiling Cassette Unit, c/w signals wires and local thermostat. Coil Blue Fin Coated	1.00	set			
24.14	Refrigerant Pipes, Pipe Insulation and Special Pipe Connectors for VRF	1.00	lot			
24.15	Electrical Wirings, Panel Boards and other signal wires	1.00	lot			
24.16	Podium Floor VRF Central Control and Monitoring System	1.00	set			
	<b>SUBTOTAL COST:</b>					
<b>XXV.</b>	<b>FANS AND BLOWERS</b>					
25.01	EF 3-01, Ceiling Mounted Type at 120 Lps	1.00	set			
25.02	EF 3-02, Ceiling Mounted Type at 120 Lps	1.00	set			
25.03	EF 3-03, Ceiling Mounted Type at 120 Lps	1.00	set			
25.04	EF 3-04, Ceiling Mounted Type at 120 Lps	1.00	set			
25.05	TEF 3-01, Ceiling Mounted Type at 75 Lps	1.00	set			
25.06	TEF 3-02, Ceiling Mounted Type at 120 Lps	1.00	set			
25.07	TEF 3-03, Ceiling Mounted Type at 120 Lps	1.00	set			
	<b>SUBTOTAL COST:</b>					
<b>XXVI.</b>	<b>DUCTWORK AND ACCESSORIES</b>					
26.01	Galvanized Iron Sheet					
	US Ga. # 26	250.00	sq.m.			
	US Ga. # 24	294.00	sq.m.			
26.02	Flexible Duct c/w insulation					
	300 dia.	6.00	lm			
	250 dia.	334.00	lm			

ITEM NO.	ITEM DESCRIPTION AND LOCATION	QTY	UNIT	DIRECT UNIT COST	TOTAL COST	REMARKS
	200 dia.	30.00	lm			
26.03	25mm thk. Crosslinked Polyolefin Insulation c/w vapor barrier and adhesive	515.00	sqm			
	Volume Control Dampers, Damper Splitter	1.00	lot			
	<b>SUBTOTAL COST:</b>					
<b>XXVII.</b>	<b>AIR DIFFUSERS</b>					
27.01	1200x50mm Linear Bar Grille c/w Opposed Blaed Damper, Aluminum Type	35.00	pcs			
27.02	1200x75mm Linear Bar Grille c/w Opposed Blaed Damper, Aluminum Type	135.00	pcs			
27.03	250x250 4-way ceiling diffuser c/w obd	1.00	pcs			
27.04	300x300 4-way ceiling diffuser c/w obd	4.00	pcs			
27.05	350x350 4-way ceiling diffuser c/w obd	1.00	pcs			
27.06	1200x75mm Continuos Linear Bar Grille	1.00	lot			
27.07	350X350 4-Way Ceiling Diffuser c/w Opposed Blade Damper	4.00	pcs			
27.08	300X300 4-Way Ceiling Diffuser c/w Opposed Blade Damper	2.00	pcs			
	<b>SUBTOTAL COST:</b>					
<b>XXVIII.</b>	<b>OTHERS</b>					
28.01	Duct and Pipe Hangers, equipment Support, noise and vibration isolators	1.00	lot			
28.02	Consumables	1.00	lot			
28.03	Testing and Commissioning and Miscellaneous Items other miscellaneous items to complete the system	1.00	lot			
	<b>SUBTOTAL COST:</b>					
	<b>MECHANICAL WORKS TOTAL COST:</b>					
<b>Electrical Works Budgetary Estimates</b>						
<b>XXIX.</b>	<b>PANEL BOARDS, TRANSFORMERS &amp; CIRCUIT BREAKERS</b>					
29.01	2UP3 230V, 3P+G, NEMA 1, SURFACE MOUNTED	1.00	assy			
	Main: 1 - EZC F 100AT, 100AF, 3P, 25KAIC, 230V, MCCB					
	Brs: 18 - iC60 N 20AT, 63AF, 2P, 20KAIC, 230V, MCB					
29.02	2L3 230V, 3P+G, NEMA 1, SURFACE MOUNTED	1.00	assy			

ITEM NO.	ITEM DESCRIPTION AND LOCATION	QTY	UNIT	DIRECT UNIT COST	TOTAL COST	REMARKS
	Main: 1 - EZC F 80AT, 100AF, 3P, 25KAIC, 230V, MCCB					
	Brs: 1 - iC60 N 50AT, 63AF, 2P, 20KAIC, 230V, MCB					
	17 - iC60 N 20AT, 63AF, 2P, 20KAIC, 230V, MCB					
	Spare: 1- iC60 N 20AT, 63AF, 2P, 20KAIC, 230V, MCB					
29.03	R3 230V, 3P+G, NEMA 1, SURFACE MOUNTED	1.00	assy			
	Main: 1 - Main Lugs Only, 60A, 3P					
	Brs: 10 - iC60 N 20AT, 63AF, 2P, 20KAIC, 230V, MCB					
	Spare: 2 - iC60 N 20AT, 63AF, 2P, 20KAIC, 230V, MCB					
29.04	PP-3 230V, 3P+G, NEMA 1, SURFACE MOUNTED	1.00	assy			
	Main: 1 - iC60 N 100AT, 100AF, 3P, 25KAIC, 230V, MCB					
	Brs: 24 - iC60 N 20AT, 63AF, 2P, 10KAIC, 230V, MCB					
29.05	25kVA 480V/ 230 DRY TYPE TRANSFORMER	1.00	assy			
	<b>SUBTOTAL COST:</b>					
	<b>WIRING DEVICES</b>					
	one gang switch					
30.01	two gang switch	11.00	set			
30.02	three gang switch	19.00	set			
30.03	Three-way switch - one gang					
30.04	Three-way switch - two gang					
30.05	Three-way switch - three gang	4.00	set			
30.06	<b>CONDUITS</b>					
	15mmØ EMT conduits					
30.07	15mmØ EMT elbow	489.00	pcs			
30.08	15mmØ EMT coupling	978.00	pcs			
30.09	15mmØ EMT connector	1,074.00	pcs			
30.10	15mmØ EMT Locknut & Bushing	1,074.00	pcs			
30.11	15mmØ flexible metal conduit	806.00	lm			
30.12	15mmØ straight connector	537.00	pcs			

ITEM NO.	ITEM DESCRIPTION AND LOCATION	QTY	UNIT	DIRECT UNIT COST	TOTAL COST	REMARKS
30.13	15mmØ angle connector	537.00	pcs			
30.14	BOXES					
	4" x 4" x 2" Octagonal Box, Gauge 16, Zinc-Chromate					
30.15	2" x 4" Utility Box, Gauge 16, Zinc-Chromate	38.00	pcs			
30.16	6" x 6" x 4" Pull Box, Gauge 16, Zinc-Chromate	1.00	pcs			
30.17	4-11/16" x 4-11/16" Square Box, Gauge 16, Zinc-Chromate	205.00	pcs			
	<b>WIRES &amp; CABLES</b>					
30.19	3.5mm <sup>2</sup>	8,802.00	lm			
	<b>SUBTOTAL COST:</b>					
	<b>POWER SYSTEM</b>					
XXXI.	WIRING DEVICES					
31.01	<b>Duplex Convenience Outlet</b>	332.00	sets			
31.02	Refrigerator Outlet, Grounding					
31.03	Microwave oven Outlet, Grounding Type	4.00	sets			
31.04	Food waste disposal outlet, Grounding Type	4.00	sets			
31.05	Hand Dryer Outlet	4.00	sets			
	<b>CONDUITS</b>	2.00	sets			
31.06	15mmØ EMT conduits					
31.07	15mmØ EMT elbow	591.00	lghts			
	15mmØ EMT coupling	197.00	pcs			
31.09	15mmØ EMT connector	591.00	pcs			
31.10	15mmØ EMT Locknut & Bushing	534.00	pcs			
	<b>BOXES &amp; PULL BOXES</b>	534.00	pcs			
31.11	4" x 4" Octagonal Box, Gauge 16, Zinc-Chromate					
31.12	4-11/16" x 4-11/16" Square Box, Gauge 16, Zinc-Chromate	107.00	pcs			
	2" x 4" Utility Box, Gauge 16, Zinc-Chromate	89.00	pcs			
	<b>WIRES &amp; CABLES</b>					
	3.5mm <sup>2</sup>	5,315.00	lm			
	<b>SUBTOTAL COST:</b>					

ITEM NO.	ITEM DESCRIPTION AND LOCATION	QTY	UNIT	DIRECT UNIT COST	TOTAL COST	REMARKS
<b>XXXII.</b>	<b>FIRE DETECTION ALARM SYSTEM</b>					
	<b>CONDUIT &amp; FITTINGS</b>					
32.01	20mmØ EMT conduits	215.00	lights			
32.02	20mmØ EMT elbow	166.00	pcs			
32.03	20mmØ EMT coupling	215.00	pcs			
32.04	20mmØ EMT connector	184.00	pcs			
32.05	20mmØ Locknut & Bushing	184.00	pcs			
32.06	15mmØ flexible metal conduit	138.00	lights			
32.07	15mmØ straight connector	92.00	pcs			
32.08	15mmØ angle connector	92.00	pcs			
	<b>BOXES &amp; PULL BOXES</b>					
32.09	4" x 4" x 2" Octagonal Box, Gauge 16, Zinc-Chromate	92.00	pcs			
32.10	2" x 4" Utility Box, Gauge 16, Zinc-Chromate	37.00	pcs			
32.11	4-11/16" x 4-11/16" Square Box, Gauge 16, Zinc-Chromate	20.00	pcs			
	<b>WIRES &amp; CABLES</b>					
32.12	Twisted Pair #16 (MINERAL INSULATION FRC)	663.00	pcs			
	<b>EQUIPMENT &amp; DEVICES</b>					
32.13	manual pull station	6.00	pcs			
32.14	horn with strobe light	37.00	set			
32.15	smoke detector	55.00	pcs			
	<b>SUBTOTAL COST:</b>					
<b>XXXIII.</b>	<b>TELEPHONE SYSTEM</b>					
	<b>CONDUIT &amp; FITTINGS</b>					
33.01	25mmØ EMT conduits	317.67	pcs			
33.02	25mmØ EMT elbow	158.83	pcs			
33.03	25mmØ EMT coupling	317.67	pcs			
33.04	25mmØ EMT connector	349.43	pcs			
33.05	25mmØ Locknut & Bushing	349.43	pcs			
33.06	25mmØ flexible metal conduit	87.00	pcs			

ITEM NO.	ITEM DESCRIPTION AND LOCATION	QTY	UNIT	DIRECT UNIT COST	TOTAL COST	REMARKS
33.07	25mmØ straight connector	174.72	pcs			
33.08	25mmØ angle connector	174.72	pcs			
33.09	32mmØ EMT conduits	49.00	pcs			
33.10	32mmØ EMT elbow	24.50	pcs			
33.11	32mmØ EMT coupling	49.00	pcs			
33.12	32mmØ EMT connector	53.90	pcs			
33.13	32mmØ Locknut & Bushing	53.90	pcs			
33.14	32mmØ flexible metal conduit	14.00	pcs			
33.15	32mmØ straight connector	26.95	pcs			
33.16	32mmØ angle connector	26.95	pcs			
	<b>BOXES &amp; PULL BOXES</b>					
33.17	4" x 4" x 2" Octagonal Box, Gauge 16, Zinc-Chromate	41.00	pcs			
33.18	2" x 4" Utility Box, Gauge 16, Zinc-Chromate	41.00	pcs			
	<b>WIRES &amp; CABLES</b>					
33.19	<b>CAT 5e Cable</b>	2,626.00	lm			
	<b>SUBTOTAL COST:</b>					
	<b>ELECTRICAL WORKS TOTAL COST:</b>					
	<b>THIRD FLOOR TOTAL COST (A,S/P,FP,M,E,S)</b>					

FOURTH FLOOR						
Architectural Works Bill of Quantities for Fourth Floor						
Package 2 (Fourth Floor)						
ITEM NO.	ITEM DESCRIPTION AND LOCATION	QTY	UNIT	DIRECT UNIT COST	TOTAL COST	REMARKS
I.	<b>GENERAL REQUIREMENTS</b>					
1.01	All insurances such as bonds and guarantee performance bonds, third party insurance and surety bond against down payment and retention bond, building permit and occupancy permit.	1.00	lot			
1.02	Mobilization and demobilization of workers, tools and equipment	1.00	lot			
1.03	Temporary facilities and temporary utilities	1.00	lot			



ITEM NO.	ITEM DESCRIPTION AND LOCATION	QTY	UNIT	DIRECT UNIT COST	TOTAL COST	REMARKS
1.01	Safety and security, daily cleaning and maintenance works	1.00	lot			
1.02	Demolition, dismantling and hauling of debris (verify architectural technical specifications)	1.00	lot			
	Demolish all existing walls and partitions as stated in the plan.					
	Strip all existing wall finishes affected with the renovation					
	Dismantle existing ceiling finishes except for bottom of slab ceiling.					
	Dismantle all existing doors, door jambs, hardware and accessories and turnover all items to the owner for proper handling except for doors to be retained					
	Dismantle all existing glass partition and accessories and turnover all items to the owner for proper handling.					
	Dismantle all existing lighting fixtures and electrical devices on site and all items are subject for turnover to the owner for proper handling.					
	Dismantle all existing AC equipment on site subject for replacement and turnover all items to the over for proper handling.					
	Dismantle and relocation of all necessary existing utility lines, conduits, pipes, ductworks and sprinkler heads subject for replacement as per plan. i					
	Demolish and dismantle all existing floor finishes as per plan					
	Demolish and dismantle all existing wall cubicle partition and floor tiles at existing toilets.					
	Demolish all existing CHB toilet partitions at common toilets.					
	Demolish existing lavatory counter at existing toilets.					
	Dismantle all existing toilet fixtures and accessories for replacement.					
	Dismantle existing wall mounted facial mirror at existing toilets.					
	Demolish existing walls and slab affected for the accommodation of new elevator shaft.					
	Demolish affected slab for all areas to be converted to pipe chase.					

ITEM NO.	ITEM DESCRIPTION AND LOCATION	QTY	UNIT	DIRECT UNIT COST	TOTAL COST	REMARKS
	Demolish existing walls at executive toilets as per plan					
1.06	As-buit drawings. Including all disciplines	1.00	lot			
1.07	equipment Rental using twin cage building hoist (total of 4T capacity)	1.00	lot			
1.08	H-frame scaffolding complete with necessary things and accessories; and formworks	1.00	lot			
	<b>SUBTOTAL COST:</b>					
<b>II.</b>	<b>FLOOR WORKS</b>					
2.01	500mm x 500mm integrated tufted pattern loop solution dyed 100% synthetic fiber with 4.00mm pile height carpet tiles with Polyester spunbouned primary backing and condensed vinyl with fiberglass reinforcement secondary backing at offices and other areas shown in the plans	1,291.72	sq.m.			
2.02	12mm thk. x 600mm x 600mm non-skid, indoor granite tiles at hallways and other areas shown in the plans	58.87	sq.m.			
2.03	10mm thk. x 600mm x 600mm non-skid, non-vitreous porcelain tiles for toilets and other areas shown in the plans	38.95	sq.m.			
2.04	3mm thk. x 300mm x 300mm homogenous and resilient type Vinyl tiles, with primer and water-based acrylic floor adhesive at pantry, storage and other areas shown in the plans	188.83	sq.m.			
2.05	Exisiting marble floor finish subject for crystallization at elevator lobby and other areas shown in the plans	79.89	sq.m.			
	<b>SUBTOTAL COST:</b>					
<b>III.</b>	<b>WALL WORKS</b>					
3.01	Drywall partition using 12mm thk. fiber cement board using 100mm thk. Using 400mm x 400mm metal suds vertical and horizontal on center	367.18	sq.m.			
3.02	100mm thick concrete hollow blocks with 25mm thick plaster on both sides complete with steel bars for Ground floor walls as shown in the plans	91.79	sq.m.			
3.03	25mm thk x 100mm. Wood plastic composite baseboard installed on both sides of all drywall and CHB wall partitions	285.17	l.m			
3.04	Exisiting marble wall finish subject for crystallization for areas shown in the plans	87.87	sq.m.			
	<b>SUBTOTAL COST:</b>					

ITEM NO.	ITEM DESCRIPTION AND LOCATION	QTY	UNIT	DIRECT UNIT COST	TOTAL COST	REMARKS
<b>IV.</b>	<b>WALL FINISHES</b>					
4.01	10mm thick x 600mm x 600mm glazed porcelain wall tiles for all toilets and other areas shown in the plans	174.63	sq. m			
	<b>SUBTOTAL COST:</b>					
<b>V.</b>	<b>CEILING WORKS</b>					
5.01	12mm thk. Gypsumboard on 400mm x 400mm furring channel horinztal and vertical with 1200mm x 1200mm hanger both ways with 50mm shadow gap between walls and ceiling as per plan	1,468.92	sq.m.			
5.02	12mm thk. Moisture Resistant Gypsumboard on 400mm x 400mm furring channel both ways with 1200mm x 1200mm hanger both ways with 50mm shadow gap between walls and ceiling as per plan	37.29	sq.m.			
	<b>SUBTOTAL COST:</b>					
<b>VI.</b>	<b>PAINTING WORKS</b>					
6.01	Existing walls and columns shall be repainted for areas indicated in the plans	538.58	sq.m.			
6.02	New CHB wall and drywall partitions shall be painted with latex paint for interior wall surfaces as shown in the plans	776.46	sq.m.			
6.03	Epoxy paint for all utility floor areas as per plan; for fire exit existing pebble wash out floor finish to be painted with chemical emulsion	175.60	sq.m.			
6.04	All ceiling works shall be painted with latex paint as shown in the plans	1,506.21	sq.m.			
6.05	All existing bottom of slab shall be painted with latex paint at utility areas as shown in the plans	198.99	sq.m.			
	<b>SUBTOTAL COST:</b>					
<b>VII.</b>	<b>DOORS AND WINDOWS</b>					
7.11	D11. 2.10m x 0.90m; 44mm thick kiln dried mahogany wood panel single-swing door with 50mm x 100mm kiln dried mahogany wood door jamb in wood stain finish with clear gloss top coat lacquer, complete with hardwares, and accessories as per plan.	11.00	set			
7.14	D14. 2.10m x 0.9m; GA 20 bended sheet panel, steel reinforced single-swing vault door with rockwool insulation, with GA16 50mm x 150mm standard steel door jamb in epoxy paint finish, complete with hardware and accessories as per plan.	1.00	set			

ITEM NO.	ITEM DESCRIPTION AND LOCATION	QTY	UNIT	DIRECT UNIT COST	TOTAL COST	REMARKS
7.16	D16. 2.10m x 0.9m; GA 20 B.I. bended sheet steel single swing louvered with GA. 16 standard steel jamb painted with epoxy paint finish complete with hardwares and accessories as per plan	1.00	set			
7.17	D17. 2.10m x 0.70m; 44mm thick kiln dried louvered mahogany wood panel door with 50mm x 100mm kiln dried mahogany wood door jamb in wood stain finish with clear gloss top coat lacquer, complete with hardwares and accessories as per plan.	2.00	set			
7.18	D18. 2.10m x 1.00m; 44mm thick kiln dried louvered mahogany wood panel single-swing door with 50mm x 100mm kiln dried mahogany wood door jamb in wood stain finish with clear gloss top coat lacquer, complete with hardwares and accessories as per plan.	1.00	set			
7.23	D28. 2.1m x 0.7m; 44mm thick kiln dried louvered mahogany wood panel single-swing door with 50mm x 100mm kiln dried mahogany wood door jamb in wood stain finish with clear gloss top coat lacquer, complete with hardwares and accessories as per plan.	1.00	set			
7.24	D29. 2.1m x 0.90m; 44mm thick kiln dried louvered mahogany wood panel single-swing door with 50mm x 100mm kiln dried solid wood door jamb in wood stain finish with clear gloss top coat lacquer, complete with hardwares and accessories as per plan.	1.00	set			
7.08	D32. 2.10m x 6.0m. Combination of 12mm thk fixed tempered glass on FD-100 aluminum frame and 2.10 m x 0.90m single-swing glass door, complete with accessories as per plan.	2.00	set			
7.09	D34. 2.1m x 5.0m. Combination of 12mm thk fixed tempered glass on FD-100 aluminum frame and 2.10 m x 0.90m single-swing glass door, complete with accessories as per plan.	1.00	set			
7.10	D35. 2.1m x 6.70m. Combination of 12mm thk fixed tempered glass on FD-100 aluminum frame and 2.10 m x 1.80m double-swing glass door, complete with accessories as per plan.	2.00	set			

ITEM NO.	ITEM DESCRIPTION AND LOCATION	QTY	UNIT	DIRECT UNIT COST	TOTAL COST	REMARKS
7.11	D36. 2.1m x 7.30m. Combination of 12mm thk fixed tempered glass on FD-100 aluminum frame and 2.10 m x 0.90m single-swing glass door, complete with hardwares and accessories as per plan.	3.00	set			
7.12	D37.2.10m x 4.75m. Combination of 12mm thk fixed tempered glass on FD-100 aluminum frame and 2.10 m x 0.90m single-swing glass door, complete with hardwares and accessories as per plan.	2.00	set			
7.13	D41. 2.1m x 4.0m. Combination of 12mm thk fixed tempered glass on FD-100 aluminum frame and 2.10 m x 0.90m single-swing glass door, complete with hardwares and accessories as per plan.	4.00	set			
7.14	D42. 2.1m x 2.4m. Combination of 12mm thk fixed tempered glass on FD-100 aluminum frame and 2.10 m x 0.90m single-swing glass door, complete with accessories as per plan.	1.00	set			
7.15	D43. 2.1m x 5.79m. Combination of 12mm thk fixed tempered glass on FD-100 aluminum frame and 2.10 m x 0.90m single-swing glass door, complete with hardwares and accessories as per plan.	1.00	set			
7.16	D44. 2.10m x 8.10m. Combination of 12mm thk fixed tempered glass on FD-100 aluminum frame and 2.10 m x 1.80m double-swing glass door, complete with accessories as per plan.	1.00	set			
7.17	D45. 2.10m x 7.30m. Combination of 12mm thk fixed tempered glass on FD-100 aluminum frame and two 2.10 m x 0.90m single-swing glass door, complete with hardwares and accessories as per plan.	1.00	set			
7.18	D46. 2.10m x 5.70m. Combination of 12mm thk fixed tempered glass on FD-100 aluminum frame and 2.10 m x 1.80m double-swing glass door, complete with hardwares and accessories as per plan.	1.00	set			
7.19	D47. 2.10m x 2.30m. Combination of 12mm thk fixed tempered glass on FD-100 aluminum frame and 2.10 m x 0.90 single-swing glass door, complete with accessories as per plan.	1.00	set			

ITEM NO.	ITEM DESCRIPTION AND LOCATION	QTY	UNIT	DIRECT UNIT COST	TOTAL COST	REMARKS
7.20	D48. 2.10m x 10.24m. Combination of 12mm thk fixed tempered glass on FD-100 aluminum frame and 2.10 m x 1.80m double-swing glass door, complete with hardwares and accessories as per plan.	1.00	set			
7.21	D49. 2.10m x 8.55m. Combination of 12mm thk fixed tempered glass on FD-100 aluminum frame and two 2.10 m x 0.90 m single-swing glass door, complete with hardwares and accessories as per plan.	1.00	set			
7.22	DR. Existing single swing steel door panels and door jamb jamb to be retained and repainted. Existing door shall be painted with one (1) coat epoxy primer and two (2) coats epoxy top coat. All existing hardware and accessories subject for replacement.	3.00	set			
7.23	DR. Existing fire exit doors to be retained and repainted. Hardwares and accessories including panic device to be replaced	2.00	set			
7.24	DR. Existing vault doors to be retained and repainted. Hardwares and accessories including panic device to be replaced	1.00	set			
7.25	100mm wide door threshold at all doors with different floor elevations from entry point and area interior	20.70	l.m			
	<b>SUBTOTAL COST:</b>					
<b>VIII.</b>	<b>GLASS WORKS</b>					
8.01	12mm thick tempered glass in FD 100 powder-coated aluminum framing including sealant application and frosted sticker for all glass partitions as shown in the plans	122.01	sq.m.			
8.02	Facial Mirror with 6mm thick marine plywood backing for toilets as shown in the plans	7.83	sq.m			
8.03	Graphicote with 6mm thick marine plywood backing for meeting rooms as shown in the plans	30.89	sq.m			
	<b>SUBTOTAL COST:</b>					
<b>IX.</b>	<b>MASONRY WORKS</b>					
9.01	25mm thk. granite countertop including 300mm high splashboard on concrete slab sub-counter at all pantry areas.	6.56	sq.m			
9.02	25mm thk. granite countertop including 300mm high splashboard in 50mm x 50mm solid wood k.d. tanguile framing on 3/4" thk marine plywood counter support for toilet counters	4.46	sq.m			

ITEM NO.	ITEM DESCRIPTION AND LOCATION	QTY	UNIT	DIRECT UNIT COST	TOTAL COST	REMARKS
9.03	25mm thk. X 200mm granite ledge installed on top of concrete ledge.	0.63	sq.m			
9.04	25mm thk. X 200mm Granite ledge installed 25mm thk. Granite ledge on reinforced concrete support embedded to walls at 1400mm above floor finish for water closet	1.60	sq.m			
	<b>SUBTOTAL COST:</b>					
<b>X.</b>	<b>LIGHTING FIXTURES</b>					
10.01	18 watts daylight recessed type LED in 210mm diameter aluminium casing with glass frame down light fixture general ceiling areas and other areas shown in the plans	244.00	set			
10.02	Surface mounted LED light fixture. Supply, delivery and installation of 5.7W LED daylight bulb with E27 lamp base with 100mm diameter round aluminium surface mounted down light fixture with glass cover and E27 socket for existing slab ceiling works and other areas shown in the plans	9.00	set			
10.03	6 watts warm white recessed type LED in 110mm diameter aluminium casing with glass frame down light fixture located above toilet sink and other areas shown in the plans	6.00	set			
10.04	600mm x 600mm x 12mmH 39W daylight slim type LED panel ceiling light fixture with aluminium housing, 100-240Vac Input and 26-30Vdc Output and optical PMMA diffuser for offices, elevator lobby and other areas as shown in the plans	169.68	set			
10.05	Low bay lighting fixtures comprising of low bay reflector bracket with E27 socket, 400mm diameter sand blasted reflector and glass cover, and 15W LED PAR38 daylight bulb with E27 lamp base for storages, utility areas and other areas as shown in the plans	26.26	set			
10.06	Indoor recessed wall lamp: recessed type aluminium die cast with glass lens wall light fixture with 60W E27 compact fluorescent lamp for hallways and other areas as shown in the plans	1.00	set			
10.07	T5 electronic fluorescent lamp with slim type luminaire (14W, 21W, 28W), for mirror lighting and other areas for cove lighting as shown in the plans	14.40	set			
	<b>SUBTOTAL COST:</b>					
<b>XI.</b>	<b>TOILET FIXTURES</b>					
11.01	Water closet	7.00	set			

ITEM NO.	ITEM DESCRIPTION AND LOCATION	QTY	UNIT	DIRECT UNIT COST	TOTAL COST	REMARKS
11.02	Water Closet Sensor	7.00	set			
11.03	Bidet spray	7.00	set			
11.04	Urinal	4.00	set			
11.05	Urinal Sensor	4.00	set			
11.06	Countertop porcelain basin	7.00	set			
11.07	Basin Faucet (Sensor)	7.00	set			
11.08	Slop sink faucet	1.00	set			
11.09	Enamel cast iron slop sink complete with accessories	1.00	set			
11.10	Stainless steel grab bar for PWD toilet	1.00	set			
	<b>SUBTOTAL COST:</b>					
<b>XII.</b>	<b>TOILET PARTITION</b>					
12.01	12mm thick machine pressed laminated phenolic board substrate partitions with high scratch and impact resistance with aluminium edge and corner profile, complete with indicator and accessories for water closet and shower	6.00	set			
12.02	12mm thick machine pressed laminated phenolic board substrate partitions with high scratch and impact resistance with aluminium edge and corner profile for urinal partition	3.00	set			
	<b>SUBTOTAL COST:</b>					
<b>XIII.</b>	<b>PANTRY FIXTURES AND ACCESSORIES</b>					
13.01	Pantry sink – chrome finish stainless steel L760 x W460mm single bowl upper-counter sink with drain board with corrosion resistance property for pantry	3.00	set			
13.02	Pantry sink faucet mixer – stainless steel chrome finish faucet mixer faucet with brass fittings H121 x L222mm with minimal lead traces in waterways and corrosion resistance for pantry	3.00	set			
13.03	0.75HP – 225v food waste disposer, with 3 grind stages, stainless steel grind elements and 1180mL stainless steel grind chamber for pantry	3.00	set			
	<b>SUBTOTAL COST:</b>					



ITEM NO.	ITEM DESCRIPTION AND LOCATION	QTY	UNIT	DIRECT UNIT COST	TOTAL COST	REMARKS
<b>XIV.</b>	<b>MISCELLANEOUS WORKS</b>					
14.01	12mm thk machine-pressed natural wood veneer cladding on 12mm x 50mm wood spacers, with 25mm x 25mm aluminum corner guard and aluminum strip at 2100mm high from floor finish at elevator lobby.	3.88	sq.m.			
14.02	2.1m x 2.4m; Galvanized steel panel roll- up door, manual and motor operated with 1/4 HP single phase motor including electronic device push button switch at 5 seconds located in areas shown in the plans	2.00	set			
	<b>SUBTOTAL COST:</b>					
<b>XV.</b>	<b>WATER PROOFING WORKS</b>					
15.01	Cementitious crystallization waterproofing using crystalline waterproofing formulation for all pantry and toilets	53.13	sqm			
	<b>SUBTOTAL COST:</b>					
	<b>ARCHITECTURAL WORKS TOTAL COST:</b>					
<b>Sanitary / Plumbing Works Budgetary Estimates</b>						
<b>XVI.</b>	<b>FACILITY STORM DRAINAGE PIPING</b>					
	<b>Storm Line (Collectors/Downspouts)</b>					
	Supply and installation of Polyvinyl Chloride (PVC) pipes, Series 1000 II or approved equal, including fittings, painting, sleeves, supports, hangers and other miscellaneous items as shown and as required to complete the system					
16.01	150mm diameter x 3m	39.00	l.m.			
16.05	100mm diameter x 3m	21.00	l.m.			
	<b>Drains</b>					
	Supply and installation of drains including adaptors and p-trap as required, setting in concrete, making good around with approved grouting					
	<b>Gutter Drain</b>					
16.08	100mm diameter jointing to PVC Pipe	16.00	pc/s			
<b>XVII.</b>	<b>AIRCON DRAINAGE PIPING</b>					
	Aircon Drain Line (Collectors and risers)					
	Supply and installation of Polyvinyl Chloride (PVC) pipes, Series 1000 II or approved equal, including fittings, painting, sleeves, supports, hangers and other miscellaneous items as shown and as required to complete the system					

ITEM NO.	ITEM DESCRIPTION AND LOCATION	QTY	UNIT	DIRECT UNIT COST	TOTAL COST	REMARKS
	100mm diameter x 3m					
17.03	50mm diameter x 3m	66.00	l.m.			
17.08	25mm diameter x 3m					
	Plumbing Insulation					
	Supply and installation of 20mm thick, pre-molded elastomeric closed cell rubber insulation, wrapped with polyethylene tape and clad with GA-26 aluminum sheets, including vapor barrier and other miscellaneous items as shown and as required to complete the system					
	Condensate Insulation					
17.12	100mm diameter	18.00	m			
17.13	50mm diameter	66.00	m			
17.14	25mm diameter	66.00	m			
XVIII.	FACILITY SANITARY SEWERAGE					
	Sanitary Sewer Line (Horizontal and lateral branches)					
	Supply and installation of Polyvinyl Chloride (PVC) pipes, Series 1000 II or approved equal, including fittings, painting, sleeves, supports, hangers and other miscellaneous items as shown and as required to complete the system					
18.01	150mm diameter x 3m	6.00	l.m.			
18.03	100mm diameter x 3m	84.00	l.m.			
18.09	75mm diameter x 3m	9.00	l.m.			
18.13	50mm diameter x 3m	96.00	l.m.			
	Supply and installation of Cast Iron Pipe, Service weight or approved equal, including fittings, painting, sleeves, supports, hangers and other miscellaneous items as shown and as required to complete the system					
	100mm diameter x 3m					
	Vent Line (Horizontal and lateral branches)					
	Supply and installation of Polyvinyl Chloride (PVC) pipes, Series 1000 II or approved equal, including fittings, painting, sleeves, supports, hangers and other miscellaneous items as shown and as required to complete the system					

ITEM NO.	ITEM DESCRIPTION AND LOCATION	QTY	UNIT	DIRECT UNIT COST	TOTAL COST	REMARKS
18.21	75mm diameter x 3m	3.00	l.m.			
18.23	50mm diameter x 3m	177.00	l.m.			
	Supply and installation of Cast Iron Pipe, Service weight or approved equal, including fittings, painting, sleeves, supports, hangers and other miscellaneous items as shown and as required to complete the system					
	75mm diameter x 3m					
	50mm diameter x 3m					
	<b>Clean-out</b>					
	Supply and installation of Ceiling Clean-out					
18.32	100mm diameter jointing to PVC Pipe	3.00	pc/s			
18.33	50mm diameter jointing to PVC Pipe	7.00	pc/s			
	Supply and installation of Floor Clean-out					
18.34	100mm diameter jointing to PVC Pipe	8.00	pc/s			
18.35	75mm diameter jointing to PVC Pipe	4.00	pc/s			
	<b>Drains</b>					
	Supply and installation of drains including adaptors and p-trap as required, setting in concrete, making good around with approved grouting					
	<b>Floor Drain</b>					
18.36	50mm diameter jointing to PVC Pipe	9.00	pc/s			
	<b>Grease trap</b>					
	Supply and installation of grease trap, complete with removable stainless wire basket, 6mm thick hot dipped checkered steel plate cover, round bar lifting handle and all other necessary accessories and connections					
18.37	Grease trap; stainless steel Capacity: 4 GPM	3.00	pc/s			
XIX.	<b>FACILITY WATER DISTRIBUTION</b>					
	Cold Water Line (Main line, Horizontal and lateral branches)					
	High Density Polypropylene Random Copolymer (PPR) pipes, Class PN-20 including fittings, painting, sleeves, support, hangers, and other miscellaneous items as shown and as required to complete the system. (Including connection of new PPR to existing GI main)					

	50mm diameter x 4m					
19.06	40mm diameter x 4m	12.00	l.m.			
19.12	32mm diameter x 4m	16.00	l.m.			
19.16	25mm diameter x 4m	16.00	l.m.			
	20mm diameter x 4m					
	15mm diameter x 4m					
	Cold Water Line (Roughing-ins)					
	High Density Polypropylene Random Copolymer (PPR) pipes, Class PN-20 including fittings, painting, sleeves, support, hangers, and other miscellaneous items as shown and as required to complete the system.					
19.29	32mm diameter x 4m	16.00	l.m.			
19.34	25mm diameter x 4m	4.00	l.m.			
19.39	20mm diameter x 4m	36.00	l.m.			
	15mm diameter x 4m					
	Gate Valves					
	Supply and Install					
19.49	50mm diameter Screwed	1.00	pc/s			
19.50	40mm diameter Screwed	1.00	pc/s			
19.51	32mm diameter Screwed	3.00	pc/s			
19.52	25mm diameter Screwed	1.00	pc/s			
	20mm diameter Screwed					
	15mm diameter Screwed					
	The following are in respect of the whole of the Plumbing installations					
19.56	Sealing, packing and fire proofing wherever required where pipes, conduits, cables or trunking pass through slabs, walls, beams and the like	1.00	item			
19.57	providing identification, color coding and labelling	1.00	item			
	providing operation and maintenance manuals consisting of five (5) sets	1.00	item			
	testing and commissioning including making good all defects and re-testing as necessary and leaving all in sound and perfect working order on completion	1.00	item			

19.60	instructing the Owner's representatives in operation, maintenance and service of completed installation; a period of twelve (12) months from the date of issuance of Certificate of Completion	1.00	item			
	maintenance including labor and parts replacement; a period of twelve (12) months from the date of issuance of Certificate of Completion	1.00	item			
	disinfecting the whole water distribution system issuing of the certificate of insurance that the whole system is free from contamination	1.00	item			
<b>SANITARY / PLUMBING TOTAL COST:</b>						
<b>Fire Protection Works Budgetary Estimates</b>						
<b>XXI.</b>	<b>Fire Protection Lines (Horizontal Pipes)</b>					
	Supply and installation of Black Iron Pipes, Schedule 40, or approved equal, including fittings, painting, sleeves, supports, hangers and other miscellaneous items as shown and as required to complete the system					
21.01	65mm diameter x 6m	6.00	l.m.			
21.05	50mm diameter x 6m	6.00	l.m.			
	40mm diameter x 6m					
21.10	32mm diameter x 6m	6.00	l.m.			
	25mm diameter x 6m					
XXII.	Sprinkler Heads					
0.00	Supply and installation of sprinkler heads and other miscellaneous items as shown and as required to complete the system (All existing and relocated sprinkler heads to be replaced with new)					
	Pendent					
22.02	Upright	6.00	pc/s			
22.03	Sidewall	2.00	pc/s			
XXIII.	Portable Fire Extinguishers					
	<b>Supply and installation of portable fire extinguishers and other miscellaneous items as shown and as required to complete the system</b>					
	10lbs PFE-36					
	Data center Fire Suppressionc(Novec 1230)					
23.02	Supply and Install	1.00	lot			
	<b>SUBTOTAL COST:</b>					

ITEM NO.	ITEM DESCRIPTION AND LOCATION	QTY	UNIT	DIRECT UNIT COST	TOTAL COST	REMARKS
XXIV.	SUNDRIES					
	The following are in respect of the whole of					
	the Fire Protection installations					
24.01	Sealing, packing and fire proofing wherever required where pipes, conduits, cables or trunking pass through slabs, walls, beams and the like	1.00	item			
24.02	providing identification, color coding and labelling	1.00	item			
24.03	providing operation and maintenance manuals consisting of five (5) sets	1.00	item			
24.04	testing and commissioning including making good all defects and re-testing as necessary and leaving all in sound and perfect working order on completion	1.00	item			
24.05	instructing the Owner's representatives in operation, maintenance and service of completed installation; a period of twelve (12) months from the date of issuance of Certificate of Completion	1.00	item			
24.06	maintenance including labor and parts replacement; a period of twelve (12) months from the date of issuance of Certificate of Completion	1.00	item			
24.07	disinfecting the whole water distribution system issuing of the certificate of insurance that the whole system is free from contamination	1.00	item			
	SUBTOTAL COST:					
	<b>FIRE PROTECTION WORKS TOTAL COST:</b>					
<b>Mechanical Works Budgetary Estimates</b>						
XXV.	<b>AIR CONDITIONING UNIT</b>					
25.01	ACCUV-6-10, 16HP Variable Refrigerant Flow Air Cooled Condensing Unit. Coil Blue Fin Coated	1.00	set			
25.02	ACCUV-6-11, 16HP Variable Refrigerant Flow Air Cooled Condensing Unit. Coil Blue Fin Coated	1.00	set			
25.03	ACUV 4-01, 1.5HP Ceiling Cassette Unit, c/w signals wires and local thermostat. Coil Blue Fin Coated	1.00	set			
25.04	ACUV 4-02, 1.5HP Ceiling Cassette Unit, c/w signals wires and local thermostat. Coil Blue Fin Coated	1.00	set			
25.05	ACUV 4-03, 1.5HP Ceiling Cassette Unit, c/w signals wires and local thermostat. Coil Blue Fin Coated	1.00	set			

ITEM NO.	ITEM DESCRIPTION AND LOCATION	QTY	UNIT	DIRECT UNIT COST	TOTAL COST	REMARKS
25.06	ACUV 4-04, 1.5HP Ceiling Cassette Unit, c/w signals wires and local thermostat. Coil Blue Fin Coated	1.00	set			
25.07	ACUV 4-05, 1.5HP Ceiling Cassette Unit, c/w signals wires and local thermostat. Coil Blue Fin Coated	1.00	set			
25.08	ACUV 4-06, 2.0HP Ceiling Cassette Unit, c/w signals wires and local thermostat. Coil Blue Fin Coated	1.00	set			
25.09	ACUV 4-07, 1.5HP Ceiling Cassette Unit, c/w signals wires and local thermostat. Coil Blue Fin Coated	1.00	set			
25.10	ACUV 4-08, 1.5HP Ceiling Cassette Unit, c/w signals wires and local thermostat. Coil Blue Fin Coated	1.00	set			
25.11	ACUV 4-09, 1.5HP Ceiling Cassette Unit, c/w signals wires and local thermostat. Coil Blue Fin Coated	1.00	set			
25.12	ACUV 4-10, 1.5HP Ceiling Cassette Unit, c/w signals wires and local thermostat. Coil Blue Fin Coated	1.00	set			
25.13	ACUV 4-10, 1.5HP Ceiling Cassette Unit, c/w signals wires and local thermostat. Coil Blue Fin Coated	1.00	set			
25.14	ACUV 4-11, 2.0HP Ceiling Cassette Unit, c/w signals wires and local thermostat. Coil Blue Fin Coated	1.00	set			
25.15	ACUV 4-12, 3.0HP Ceiling Cassette Unit, c/w signals wires and local thermostat. Coil Blue Fin Coated	1.00	set			
25.16	ACUV 4-13, 3.0HP Ceiling Cassette Unit, c/w signals wires and local thermostat. Coil Blue Fin Coated	1.00	set			
25.17	Refrigerant Pipes, Pipe Insulation and Special Pipe Connectors for VRF.	1.00	lot			
25.18	Electrical Wirings, Panel Boards and other signal wires	1.00	lot			
25.19	Podium Floor VRF Central Control and Monitoring System	1.00	set			
	<b>SUBTOTAL COST:</b>					
	<b>AIR CONDITIONING UNIT (DATA CENTER)</b>					
26.01	7.5 TR Precision Type Air Conditioning Unit c/w condensing unit, refrigerant pipes, power wires, signal wires	3.00	set			
	SUBTOTAL COST:					
<b>XXVII.</b>	<b>FANS AND BLOWERS</b>					
27.01	EF 4-01, Ceiling Mounted Type at 120 Lps	1.00	set			

ITEM NO.	ITEM DESCRIPTION AND LOCATION	QTY	UNIT	DIRECT UNIT COST	TOTAL COST	REMARKS
27.02	EF 4-02, Ceiling Mounted Type at 120 Lps	1.00	set			
27.03	TEF 4-01, Ceiling Mounted Type at 75 Lps	1.00	set			
27.04	TEF 4-02, Ceiling Mounted Type at 120 Lps	1.00	set			
27.05	TEF 4-03, Ceiling Mounted Type at 120Lps	1.00	set			
	<b>SUBTOTAL COST:</b>					
<b>XXVIII.</b>	<b>DUCTWORK AND ACCESSORIES</b>					
	Galvanized Iron Sheet					
28.01	US Ga. # 26	285.00	sq.m.			
28.02	US Ga. # 24	230.00	sq.m.			
28.03	US Ga. # 22	65.00	sq.m.			
	Flexible Duct c/w insulation and vapor barrier					
28.04	250 dia.	400.00	lm			
28.05	200 dia.	30.00	lm			
28.06	25mm thk. Crosslinked Polyolefin Insulation c/w vapor barrier and adhesive	550.00	sqm			
28.07	Volume Control Dampers, Damper Splitter	1.00	lot			
	<b>SUBTOTAL COST:</b>					
<b>XXIX.</b>	<b>AIR DIFFUSERS</b>					
29.01	1200x50mm Linear Bar Grille c/w Opposed Blaed Damper, Aluminum Type	25.00	pcs			
29.02	1200x75mm Linear Bar Grille c/w Opposed Blaed Damper, Aluminum Type	170.00	pcs			
29.03	1200x75mm Continuos Linear Bar Grille	1.00	lot			
29.04	350X350 4-Way Ceiling Diffuser c/w Opposed Blade Damper	4.00	pcs			
29.05	300X300 4-Way Ceiling Diffuser c/w Opposed Blade Damper	2.00	pcs			
	<b>SUBTOTAL COST:</b>					
<b>XXX.</b>	<b>OTHERS</b>					
30.01	Duct and Pipe Hangers, equipment Support, noise and vibration isolators	1.00	lot			
30.02	Consumables	1.00	lot			
30.03	Testing and Commissioning and Miscellaneous Items other miscellaneous items to complete the system	1.00	lot			
	<b>SUBTOTAL COST:</b>					



ITEM NO.	ITEM DESCRIPTION AND LOCATION	QTY	UNIT	DIRECT UNIT COST	TOTAL COST	REMARKS
	<b>MECHANICAL WORKS TOTAL COST:</b>					
<b>Electrical Works Budgetary Estimates</b>						
<b>XXXI.</b>	<b>PANEL BOARDS, TRANSFORMERS &amp; CIRCUIT BREAKERS</b>					
31.01	2L4 (NEW) 230V, 3P+G, NEMA 1, SURFACE MOUNTED	1.00	assy			
	Main: 1 - EZC F 80AT, 100AF, 3P, 25KAIC, 230V, MCCB					
	Brs: 2 - iC60 N 50AT, 63AF, 2P, 20KAIC, 230V, MCB					
	15 - iC60 N 20AT, 63AF, 2P, 20KAIC, 230V, MCB					
	Spare: 3 - iC60 N 20AT, 63AF, 2P, 20KAIC, 230V, MCB					
31.02	2UP4 240V, 3P+G, NEMA 1, SURFACE MOUNTED	1.00	assy			
	Main: EZC F 70AT, 100AF, 3P, 25KAIC, 240V, MCCB					
	Brs: 19 - iC60 N 20AT, 63AF, 2P, 20KAIC, 230V, MCB					
	Spare: 5 - iC60 N 20AT, 63AF, 2P, 20KAIC, 230V, MCB					
31.03	PP-4 230V, 3P+G, NEMA 1, SURFACE MOUNTED	1.00	assy			
	Main: 1 - iC60 N 60AT, 100AF, 3P, 25KAIC, 230V, MCB					
	Brs: 24 - iC60 N 20AT, 63AF, 2P, 10KAIC, 230V, MCB					
31.03	PP-DATA 400V, 3P+G, NEMA 1, SURFACE MOUNTED	1.00	assy			
	Main: 1 - iC60 N 350AT, 400AF, 3P, 36KAIC, 400V, MCB					
	R4 230V, 3P+G, NEMA 1, SURFACE MOUNTED					
	Main: 1 - iC60 N 60AT, 100AF, 3P, 25KAIC, 230V, MCB					
	Brs: 8 - iC60 N 20AT, 63AF, 2P, 20KAIC, 230V, MCB					
	Spare: 3 - iC60 N 20AT, 63AF, 2P, 20KAIC, 230V, MCB					
	Space: 1 - 63AF, 2P					
	15kVA 480V/ 230 DRY TYPE TRANSFORMER					
	<b>SUBTOTAL COST:</b>					
<b>XXXII.</b>	<b>WIRING DEVICES</b>					
32.01	one gang switch	9.00	set			
32.02	two gang switch	10.00	set			

ITEM NO.	ITEM DESCRIPTION AND LOCATION	QTY	UNIT	DIRECT UNIT COST	TOTAL COST	REMARKS
32.03	three gang switch	21.00	set			
32.04	Three-way switch - one gang	1.00	set			
32.05	Three-way switch - two gang	5.00	set			
32.06	Three-way switch - three gang	2.00	set			
	<b>CONDUITS</b>					
32.07	15mmØ EMT conduits	1,024.00	lights			
32.08	15mmØ EMT elbow	512.00	pcs			
32.09	15mmØ EMT coupling	1,024.00	pcs			
32.10	15mmØ EMT connector	1,230.00	pcs			
32.11	15mmØ EMT Locknut & Bushing	1,230.00	pcs			
32.12	15mmØ flexible metal conduit	843.00	lm			
32.13	15mmØ straight connector	562.00	pcs			
	15mmØ angle connector					
	<b>BOXES</b>					
	4" x 4" x 2" Octagonal Box, Gauge 16, Zinc-Chromate	562.00	pcs			
32.15	2" x 4" Utility Box, Gauge 16, Zinc-Chromate	47.00	pcs			
32.16	6" x 6" x 4" Pull Box, Gauge 16, Zinc-Chromate	1.00	pcs			
32.17	4-11/16" x 4-11/16" Square Box, Gauge 16, Zinc-Chromate					
32.18	<b>WIRES &amp; CABLES</b>					
32.19	3.5mm <sup>2</sup>	9,216.00	lm			
	<b>SUBTOTAL COST:</b>					
<b>XXXIII.</b>	<b>POWER SYSTEM</b>					
	<b>WIRING DEVICES</b>					
	Duplex Convenience Outlet	336.00	sets			
33.01	Refrigerator Outlet, Grounding Type	3.00	sets			
33.02	Microwave oven Outlet, Grounding Type	3.00	sets			
33.03	Food waste disposal outlet, Grounding Type	3.00	sets			
33.04	Hand Dryer Outlet	2.00	sets			

ITEM NO.	ITEM DESCRIPTION AND LOCATION	QTY	UNIT	DIRECT UNIT COST	TOTAL COST	REMARKS
	<b>CONDUITS</b>					
33.05	15mmØ EMT conduits	621.00	lghts			
33.06	15mmØ EMT elbow	207.00	pcs			
33.07	15mmØ EMT coupling	621.00	pcs			
33.08	15mmØ EMT connector	576.00	pcs			
33.09	15mmØ EMT Locknut & Bushing	576.00	pcs			
33.10	<b>BOXES &amp; PULL BOXES</b>					
33.11	4" x 4" Octagonal Box, Gauge 16, Zinc-Chromate	116.00	pcs			
	4-11/16" x 4-11/16" Square Box, Gauge 16, Zinc-Chromate	96.00	pcs			
33.12	2" x 4" Utility Box, Gauge 16, Zinc-Chromate	288.00	pcs			
33.14	<b>WIRES &amp; CABLES</b>	-	0			
33.15	3.5mm <sup>2</sup>					
	<b>SUBTOTAL COST:</b>	-	0			
<b>XXXIV.</b>	<b>FIRE DETECTION ALARM SYSTEM</b>					
	<b>CONDUIT &amp; FITTINGS</b>					
34.01	20mmØ EMT conduits					
34.02	20mmØ EMT elbow					
34.03	20mmØ EMT coupling	226.00	pcs			
34.04	20mmØ EMT connector	194.00	pcs			
34.05	20mmØ Locknut & Bushing	194.00	pcs			
34.06	15mmØ flexible metal conduit	146.00	lghts			
34.07	15mmØ straight connector	97.00	pcs			
34.08	15mmØ angle connector	97.00	pcs			
	<b>BOXES &amp; PULL BOXES</b>					
34.09	4" x 4" x 2" Octagonal Box, Gauge 16, Zinc-Chromate	97.00	pcs			
34.10	2" x 4" Utility Box, Gauge 16, Zinc-Chromate					
34.11	4-11/16" x 4-11/16" Square Box, Gauge 16, Zinc-Chromate	20.00	pcs			
	<b>WIRES &amp; CABLES</b>					
34.12	Twisted Pair #16 (MINERAL INSULATION FRC)	697.00	pcs			
	<b>EQUIPMENT &amp; DEVICES</b>					

ITEM NO.	ITEM DESCRIPTION AND LOCATION	QTY	UNIT	DIRECT UNIT COST	TOTAL COST	REMARKS
34.13	manual pull station	5.00	pcs			
34.14	horn with strobe light					
34.15	smoke detector	57.00	pcs			
	<b>SUBTOTAL COST:</b>					
<b>XXXV.</b>	<b>TELEPHONE SYSTEM</b>					
35.01	CONDUIT & FITTINGS					
	32mmØ EMT conduits	255.00	lghts			
	32mmØ EMT elbow	128.00	pcs			
	32mmØ EMT coupling	255.00	pcs			
	32mmØ EMT connector	280.00	pcs			
	32mmØ Locknut & Bushing	280.00	pcs			
	32mmØ flexible metal conduit	209.00	pcs			
	32mmØ straight connector	140.00	pcs			
	32mmØ angle connector	140.00	pcs			
35.02	BOXES & PULL BOXES					
	4" x 4" x 2" Octagonal Box, Gauge 16, Zinc-Chromate	41.00	pcs			
	2" x 4" Utility Box, Gauge 16, Zinc-Chromate	41.00	pcs			
35.03	WIRES & CABLES					
	Cat5e Cable	3,507.00	l.m.			
35.04	EQUIPMENTS & DEVICES					
	Socket	41.00	pcs			
	SUBTOTAL COST:					
	<b>ELECTRICAL WORKS TOTAL COST:</b>					
	<b>FOURTH FLOOR TOTAL COST (A,S/P,FP,M,E,S)</b>					

FIFTH FLOOR						
Architectural Works Bill of Quantities for Fifth Floor						
Package 2 (Fifth Floor)						
ITEM NO.	ITEM DESCRIPTION AND LOCATION	QTY	UNIT	DIRECT UNIT COST	TOTAL COST	REMARKS

ITEM NO.	ITEM DESCRIPTION AND LOCATION	QTY	UNIT	DIRECT UNIT COST	TOTAL COST	REMARKS
I.	<b>GENERAL REQUIREMENTS</b>					
1.01	All insurances such as bonds and guarantee performance bonds, third party insurance and surety bond against down payment and retention bond, building permit and occupancy permit.	1.00	lot			
1.02	Mobilization and demobilization of workers, tools and equipment	1.00	lot			
1.03	Temporary facilities and temporary utilities	1.00	lot			
1.04	Safety and security, daily cleaning and maintenance works	1.00	lot			
1.05	Demolition, dismantling and hauling of debris (verify architectural technical specifications)	1.00	lot			
	Demolish all existing walls and partitions as stated in the plan.					
	Strip all existing wall finishes affected with the renovation					
	Dismantle existing ceiling finishes except for bottom of slab ceiling.					
	Dismantle all existing doors, door jambs, hardware and accessories and turnover all items to the owner for proper handling except for doors to be retained					
	Dismantle all existing glass partition and accessories and turnover all items to the owner for proper handling.					
	Dismantle all existing lighting fixtures and electrical devices on site and all items are subject for turnover to the owner for proper handling.					
	Dismantle all existing AC equipment on site subject for replacement and turnover all items to the over for proper handling.					
	Dismantle and relocation of all necessary existing utility lines, conduits, pipes, ductworks and sprinkler heads subject for replacement as per plan. i					
	Demolish and dismantle all existing floor finishes as per plan					
	Demolish and dismantle all existing wall cubicle partition and floor tiles at existing toilets.					
	Demolish all existing CHB toilet partitions at common toilets.					
	Demolish existing lavatory counter at existing toilets.					

ITEM NO.	ITEM DESCRIPTION AND LOCATION	QTY	UNIT	DIRECT UNIT COST	TOTAL COST	REMARKS
	Dismantle all existing toilet fixtures and accessories for replacement.					
	Dismantle existing wall mounted facial mirror at existing toilets.					
	Demolish existing walls and slab affected for the accommodation of new elevator shaft.					
	Demolish affected slab for all areas to be converted to pipe chase.					
	Demolish existing walls at executive toilets as per plan					
1.06	As-buit drawings. Including all disciplines	1.00	lot			
1.07	equipment Rental using twin cage building hoist (total of 4T capacity)	1.00	lot			
1.08	H-frame scaffolding complete with necessary things and accessories; and formworks	1.00	lot			
	<b>SUBTOTAL COST:</b>					
<b>II.</b>	<b>FLOOR WORKS</b>					
2.01	500mm x 500mm integrated tufted pattern loop solution dyed 100% synthetic fiber with 4.00mm pile height carpet tiles with Polyester spunbonded primary backing and condensed vinyl with fiberglass reinforcement secondary backing at offices and other areas shown in the plans	1,449.89	sq.m.			
2.02	12mm thk. x 600mm x 600mm non-skid, indoor granite tiles at hallways and other areas shown in the plans	64.12	sq.m.			
2.03	10mm thk. x 600mm x 600mm non-skid, non-vitreous porcelain tiles for toilets and other areas shown in the plans	42.42	sq.m.			
2.04	3mm thk. x 300mm x 300mm homogenous and resilient type Vinyl tiles, with primer and water-based acrylic floor adhesive at pantry, storage and other areas shown in the plans	1,383.58	sq.m.			
2.05	Existing marble floor finish subject for crystallization at elevator lobby and other areas shown in the plans	87.01	sq.m.			
	<b>SUBTOTAL COST:</b>					
<b>III.</b>	<b>WALL WORKS</b>					
3.01	Drywall partition using 12mm thk. fiber cement board using 100mm thk. Using 400mm x 400mm metal studs vertical and horizontal on center	555.59	sq.m.			

ITEM NO.	ITEM DESCRIPTION AND LOCATION	QTY	UNIT	DIRECT UNIT COST	TOTAL COST	REMARKS
3.02	100mm thick concrete hollow blocks with 25mm thick plaster on both sides complete with steel bars for Ground floor walls as shown in the plans	49.50	sq.m.			
3.03	25mm thk x 100mm. Wood plastic composite baseboard installed on both sides of all drywall and CHB wall partitions	384.44	l.m			
3.04	Existing marble wall finish subject for crystallization for areas shown in the plans	87.87	sq.m.			
	<b>SUBTOTAL COST:</b>					
<b>IV.</b>	<b>WALL FINISHES</b>					
4.01	10mm thick x 600mm x 600mm glazed porcelain wall tiles for all toilets and other areas shown in the plans	174.63	sq. m			
	<b>SUBTOTAL COST:</b>					
<b>V.</b>	<b>CEILING WORKS</b>					
5.01	12mm thk. Gypsumboard on 400mm x 400mm furring channel horinztal and vertical with 1200mm x 1200mm hanger both ways with 50mm shadow gap between walls and ceiling as per plan	1,425.11	sq.m.			
5.02	12mm thk. Moisture Resistant Gypsumboard on 400mm x 400mm furring channel both ways with 1200mm x 1200mm hanger both ways with 50mm shadow gap between walls and ceiling as per plan	37.29	sq.m.			
	<b>SUBTOTAL COST:</b>					
<b>VI.</b>	<b>PAINTING WORKS</b>					
6.01	Existing walls and columns shall be repainted for areas indicated in the plans	538.58	sq.m.			
6.02	New CHB wall and drywall partitions shall be painted with latex paint for interior wall surfaces as shown in the plans	958.84	sq.m.			
6.03	Epoxy paint for all utility floor areas as per plan; for fire exit existing pebble wash out floor finish to be painted with chemical emulsion	175.60	sq.m.			
6.04	All ceiling works shall be painted with latex paint as shown in the plans	1,462.40	sq.m.			
6.05	All existing bottom of slab shall be painted with latex paint at utility areas as shown in the plans	172.05	sq.m.			
	<b>SUBTOTAL COST:</b>					

ITEM NO.	ITEM DESCRIPTION AND LOCATION	QTY	UNIT	DIRECT UNIT COST	TOTAL COST	REMARKS
<b>VII.</b>	<b>DOORS AND WINDOWS</b>					
7.07	D07. 2.1m x 1.8m; Combination of 12mm thk tempered double-swing glass on FD-100 aluminum frame and 2.10 m x 1.80m double-swing glass door, complete with hardwares and accessories as per plan.	4.00	set			
7.10	D10. 2.1m x 0.9m; 12mm thk tempered single-swing glass on FD-100 aluminum frame complete with hardwares and accessories as per plan.	10.00	set			
7.11	D11. 2.10m x 0.90m; 44mm thick kiln dried mahogany wood panel single-swing door with 50mm x 100mm kiln dried mahogany wood door jamb in wood stain finish with clear gloss top coat lacquer, complete with hardwares, and accessories as per plan.	11.00	set			
7.16	D16. 2.10m x 0.9m; GA 20 B.I. bended sheet steel single swing louvered with GA. 16 standard steel jamb painted with epoxy paint finish complete with hardwares and accessories as per plan	1.00	set			
7.17	D17. 2.10m x 0.70m; 44mm thick kiln dried louvered mahogany wood panel door with 50mm x 100mm kiln dried mahogany wood door jamb in wood stain finish with clear gloss top coat lacquer, complete with hardwares and accessories as per plan.	2.00	set			
7.18	D18. 2.10m x 1.00m; 44mm thick kiln dried louvered mahogany wood panel single-swing door with 50mm x 100mm kiln dried mahogany wood door jamb in wood stain finish with clear gloss top coat lacquer, complete with hardwares and accessories as per plan.	1.00	set			
7.23	D28. 2.1m x 0.7m; 44mm thick kiln dried louvered mahogany wood panel single-swing door with 50mm x 100mm kiln dried mahogany wood door jamb in wood stain finish with clear gloss top coat lacquer, complete with hardwares and accessories as per plan.	1.00	set			
7.24	D29. 2.1m x 0.90m; 44mm thick kiln dried louvered mahogany wood panel single-swing door with 50mm x 100mm kiln dried solid wood door jamb in wood stain finish with clear gloss top coat lacquer, complete with hardwares and accessories as per plan.	1.00	set			



ITEM NO.	ITEM DESCRIPTION AND LOCATION	QTY	UNIT	DIRECT UNIT COST	TOTAL COST	REMARKS
7.10	D34. 2.1m x 5.0m. Combination of 12mm thk fixed tempered glass on FD-100 aluminum frame and 2.10 mx 0.90m single-swing glass door, complete with accessories as per plan.	4.00	set			
7.11	D35. 2.1m x 6.70m. Combination of 12mm thk fixed tempered glass on FD-100 aluminum frame and 2.10 mx 1.80m double-swing glass door, complete with accessories as per plan.	2.00	set			
7.12	D36. 2.1m x 7.30m. Combination of 12mm thk fixed tempered glass on FD-100 aluminum frame and 2.10 m x 0.90m single-swing glass door, complete with accessories as per plan.	1.00	set			
7.13	D37. 2.10m x 4.75m. Combination of 12mm thk fixed tempered glass on FD-100 aluminum frame and 2.10 m x 0.90m single-swing glass door, complete with accessories as per plan.	4.00	set			
7.14	D42. 2.1m x 2.4m. Combination of 12mm thk fixed tempered glass on FD-100 aluminum frame and 2.10 m x 0.90m single-swing glass door, complete with accessories as per plan.	1.00	set			
7.15	D44. 2.10m x 8.10m. Combination of 12mm thk fixed tempered glass on FD-100 aluminum frame and 2.10 m x 1.80m double-swing glass door, complete with accessories as per plan.	1.00	set			
7.16	D47. 2.10m x 2.30m. Combination of 12mm thk fixed tempered glass on FD-100 aluminum frame and 2.10 m x 0.90 single-swing glass door, complete with accessories as per plan.	1.00	set			
7.17	D50. 2.1m x 7.80m. Combination of 12mm thk fixed tempered glass on FD-100 aluminum frame and two 2.10 m x 0.90 single-swing glass door, complete with accessories as per plan.	1.00	set			
7.18	D51. 2.10m x 8.50m. Combination of 12mm thk fixed tempered glass on FD-100 aluminum frame and 2.10 m x 0.90 single-swing glass door, complete with accessories as per plan.	1.00	set			
7.19	D52. 2.1m x 6.30m. Combination of 12mm thk fixed tempered glass on FD-100 aluminum frame and 2.10 m x 1.80m double-swing glass door, complete with accessories as per plan.	1.00	set			
7.20	D53. 2.10m x 3.30m. Combination of 12mm thk fixed tempered glass on FD-100 aluminum frame and 2.10 m x 0.90 single-swing glass door, complete with accessories as per plan.	1.00	set			

ITEM NO.	ITEM DESCRIPTION AND LOCATION	QTY	UNIT	DIRECT UNIT COST	TOTAL COST	REMARKS
7.21	D54. 2.1m x 1.8m;Combination of 12mm thk fixed tempered glass on FD-100 aluminum frame and 2.10 m x 0.90 single-swing glass door, complete with accessories as per plan.	3.00	set			
7.22	D55. 2.1m x 4.4m; Combination of 12mm thk fixed tempered glass on FD-100 aluminum frame and 2.10 m x 0.90 single-swing glass door, complete with accessories as per plan.	3.00	set			
7.23	D56. 2.1m x 5.4.m;Combination of 12mm thk fixed tempered glass on FD-100 aluminum frame and two 2.10 m x 0.90 single-swing glass door, complete with accessories as per plan.	1.00	set			
7.24	DR.Existing single swing steel door panels and door jamb jamb to be retained and repainted. Existing door shall be painted with one (1) coat epoxy primer and two (2) coats epoxy top coat. All existing hardware and accessories subject for replacement.	3.00	set			
7.25	DR. Existing fire exit doors to be retained and repainted. Hardwares and accessories including panic device to be replaced	2.00	set			
7.26	DR. Existing vault doors to be retained and repainted. Hardwares and accessories including panic device to be replaced	1.00	set			
7.27	100mm wide door theshold at all doors with different floor elevations from entry point and area interior	30.40	l.m			
0.00	SUBTOTAL COST:	-	0			
VIII.	GLASS WORKS	-	0			
8.01	12mm thick tempered glass in FD 100 powder-coated aluminum framing including sealant application and frosted sticker for all glass partitions as shown in the plans	81.27	sq.m.			
8.02	Facial Mirror with 6mm thick marine plywood backing for toilets as shown in the plans	7.83	sq.m			
8.03	Graphicote with 6mm thick marine plywood backing for meeting rooms as shown in the plans	46.80	sq.m			
	<b>SUBTOTAL COST:</b>					
IX.	<b>MASONRY WORKS</b>					
9.01	25mm thk. granite countertop including 300mm high splashboard on concrete slab sub-counter at all pantry areas.	16.20	sq.m			

ITEM NO.	ITEM DESCRIPTION AND LOCATION	QTY	UNIT	DIRECT UNIT COST	TOTAL COST	REMARKS
9.02	25mm thk. granite countertop including 300mm high splashboard in 50mm x 50mm solid wood k.d. tanguile framing on 3/4" thk marine plywood counter support for toilet counters	4.46	sq.m			
9.03	25mm thk. X 200mm granite ledge installed on top of concrete ledge.	0.63	sq.m			
9.04	25mm thk. Granite ledge on reinforced concrete support embedded to walls at 1400mm above floor finish for water closet	1.60	sq.m			
	<b>SUBTOTAL COST:</b>					
<b>X.</b>	<b>LIGHTING FIXTURES</b>					
10.01	18 watts daylight recessed type LED in 210mm diameter aluminium casing with glass frame down light fixture general ceiling areas and other areas shown in the plans	274.00	set			
10.02	Surface mounted LED light fixture. Supply, delivery and installation of 5.7W LED daylight bulb with E27 lamp base with 100mm diameter round aluminium surface mounted down light fixture with glass cover and E27 socket for existing slab ceiling works and other areas shown in the plans	6.00	set			
10.03	6 watts warm white recessed type LED in 110mm diameter aluminium casing with glass frame down light fixture located above toilet sink and other areas shown in the plans	11.55	set			
10.04	600mm x 600mm x 12mmH 39W daylight slim type LED panel ceiling light fixture with aluminium housing, 100-240Vac Input and 26-30Vdc Output and optical PMMA diffuser for offices, elevator lobby and other areas as shown in the plans	163.80	set			
10.05	Low bay lighting fixtures comprising of low bay reflector bracket with E27 socket, 400mm diameter sand blasted reflector and glass cover, and 15W LED PAR38 daylight bulb with E27 lamp base for storages, utility areas and other areas as shown in the plans	30.45	set			
10.06	Indoor recessed wall lamp: recessed type aluminium die cast with glass lens wall light fixture with 60W E27 compact fluorescent lamp for hallways and other areas as shown in the plans	1.00	set			
10.07	T5 electronic fluorescent lamp with slim type luminaire (14W, 21W, 28W), for mirror lighting and other areas for cove lighting as shown in the plans	60.90	set			

ITEM NO.	ITEM DESCRIPTION AND LOCATION	QTY	UNIT	DIRECT UNIT COST	TOTAL COST	REMARKS
0.00	SUBTOTAL COST:	-	0			
XI.	TOILET FIXTURES	-	0			
11.01	Water closet	7.00	set			
11.02	Water Closet Sensor	7.00	set			
11.03	Bidet spray	7.00	set			
11.04	Urinal	4.00	set			
11.05	Urinal Sensor	4.00	set			
11.06	Countertop porcelain basin	7.00	set			
11.07	Basin Faucet (Sensor)	7.00	set			
11.08	Slop sink faucet	1.00	set			
11.09	Enamel cast iron slop sink complete with accessories	1.00	set			
11.10	Stainless steel grab bar for PWD toilet	1.00	set			
	<b>SUBTOTAL COST:</b>					
XII.	<b>TOILET PARTITION</b>					
12.01	12mm thick machine pressed laminated phenolic board substrate partitions with high scratch and impact resistance with aluminium edge and corner profile, complete with indicator and accessories for water closet and shower	6.00	set			
12.02	12mm thick machine pressed laminated phenolic board substrate partitions with high scratch and impact resistance with aluminium edge and corner profile for urinal partition	3.00	set			
	<b>SUBTOTAL COST:</b>					
XIII.	<b>PANTRY FIXTURES AND ACCESSORIES</b>					
13.01	Pantry sink – chrome finish stainless steel L760 x W460mm single bowl upper-counter sink with drain board with corrosion resistance property for pantry	5.00	set			
13.02	Pantry sink faucet mixer – stainless steel chrome finish faucet mixer faucet with brass fittings H121 x L222mm with minimal lead traces in waterways and corrosion resistance for pantry	5.00	set			
13.03	0.75HP – 225v food waste disposer, with 3 grind stages, stainless steel grind elements and 1180mL stainless steel grind chamber for pantry	5.00	set			
	<b>SUBTOTAL COST:</b>					
XIV.	<b>MISCELLANEOUS WORKS</b>					

ITEM NO.	ITEM DESCRIPTION AND LOCATION	QTY	UNIT	DIRECT UNIT COST	TOTAL COST	REMARKS
14.01	12mm thk machine-pressed natural wood veneer cladding on 12mm x 50mm wood spacers, with 25mm x 25mm aluminum corner guard and aluminum strip at 2100mm high from floor finish at elevator lobby.	3.88	sq.m.			
14.02	Demolition and construction of partition of pipe chase at 6th floor	1.00	lot			
14.03	2.1m x 2.4m; Galvanized steel panel roll- up door, manual and motor operated with 1/4 HP single phase motor including electronic device push button switch at 5 seconds located in areas shown in the plans	2.00	set			
	<b>SUBTOTAL COST:</b>					
XV.	<b>WATER PROOFING WORKS</b>					
15.01	Cementitious crystallization waterproofing using crystalline waterproofing formulation for all pantry and toilets	73.42	sqm			
	<b>SUBTOTAL COST:</b>					
	<b>ARCHITECTURAL WORKS TOTAL COST:</b>					
<b>Sanitary / Plumbing Works Budgetary Estimates</b>						
	<b>FACILITY STORM DRAINAGE PIPING</b>					
	Storm Line (Collectors/Downspouts)					
0.00	Supply and installation of Polyvinyl Chloride (PVC) pipes, Series 1000 II or approved equal, including fittings, painting, sleeves, supports, hangers and other miscellaneous items as shown and as required to complete the system					
16.01	150mm diameter x 3m	39.00	l.m.			
16.05	100mm diameter x 3m	75.00	l.m.			
XVII.	<b>AIRCON DRAINAGE PIPING</b>					
	Aircon Drain Line (Collectors and risers)					
	Supply and installation of Polyvinyl Chloride (PVC) pipes, Series 1000 II or approved equal, including fittings, painting, sleeves, supports, hangers and other miscellaneous items as shown and as required to complete the system					
17.01	100mm diameter x 3m	24.00	l.m.			
17.03	75mm diameter x 3m					
	50mm diameter x 3m					
	25mm diameter x 3m					

ITEM NO.	ITEM DESCRIPTION AND LOCATION	QTY	UNIT	DIRECT UNIT COST	TOTAL COST	REMARKS
	<b>Plumbing Insulation</b>					
	Supply and installation of 20mm thick, pre-molded elastomeric closed cell rubber insulation, wrapped with polyethylene tape and clad with GA-26 aluminum sheets, including vapor barrier and other miscellaneous items as shown and as required to complete the system					
	<b>Condensate Insulation</b>					
17.16	100mm diameter	24.00	m			
17.17	75mm diameter	36.00	m			
17.18	50mm diameter	114.00	m			
17.19	25mm diameter	147.00	m			
	<b>Clean-out</b>					
	Supply and installation of Ceiling Clean-out					
17.20	100mm diameter jointing to PVC Pipe	8.00	pc/s			
17.21	75mm diameter jointing to PVC Pipe	2.00	pc/s			
	50mm diameter jointing to PVC Pipe	2.00	pc/s			
XVIII.	<b>FACILITY SANITARY SEWERAGE</b>					
	Sanitary Sewer Line (Collectors, lateral branches)					
18.01	Supply and installation of Polyvinyl Chloride (PVC) pipes, Series 1000 II or approved equal, including fittings, painting, sleeves, supports, hangers and other miscellaneous items as shown and as required to complete the system					
	150mm diameter x 3m					
	100mm diameter x 3m					
	75mm diameter x 3m					
18.13	50mm diameter x 3m	114.00	l.m.			
18.17	Supply and installation of Cast Iron Pipe, Service weight or approved equal, including fittings, painting, sleeves, supports, hangers and other miscellaneous items as shown and as required to complete the system					
18.18	100mm diameter x 3m	3.00	l.m.			
	<b>Vent Line (Horizontal and Vertical)</b>					

ITEM NO.	ITEM DESCRIPTION AND LOCATION	QTY	UNIT	DIRECT UNIT COST	TOTAL COST	REMARKS
	Supply and installation of Polyvinyl Chloride (PVC) pipes, Series 1000 II or approved equal, including fittings, painting, sleeves, supports, hangers and other miscellaneous items as shown and as required to complete the system					
	75mm diameter x 3m					
18.23	50mm diameter x 3m	225.00	l.m.			
18.25	Supply and installation of Cast Iron Pipe, Service weight or approved equal, including fittings, painting, sleeves, supports, hangers and other miscellaneous items as shown and as required to complete the system					
	75mm diameter x 3m	3.00	l.m.			
18.29	50mm diameter x 3m					
	<b>Clean-out</b>					
18.30	Supply and installation of Ceiling Clean-out					
18.31	100mm diameter jointing to PVC Pipe	4.00	pc/s			
	50mm diameter jointing to PVC Pipe	11.00	pc/s			
18.32	Supply and installation of Floor Clean-out					
18.33	100mm diameter jointing to PVC Pipe	11.00	pc/s			
	75mm diameter jointing to PVC Pipe	4.00	pc/s			
	<b>Drains</b>					
	Supply and installation of drains including adaptors and p-trap as required, setting in concrete, making good around with approved grouting					
18.34	Floor Drain					
	50mm diameter jointing to PVC Pipe	9.00	pc/s			
	<b>Grease trap</b>					
18.35	Supply and installation of grease trap, complete with removable stainless wire basket, 6mm thick hot dipped checkered steel plate cover, round bar lifting handle and all other necessary accessories and connections					
	Grease trap; stainless steel Capacity: 4 GPM	5.00	pc/s			
XIX.	<b>FACILITY WATER DISTRIBUTION</b>					
	Cold Water Line (Main line,Horizontal and Vertical)					

ITEM NO.	ITEM DESCRIPTION AND LOCATION	QTY	UNIT	DIRECT UNIT COST	TOTAL COST	REMARKS
	High Density Polypropylene Random Copolymer (PPR) pipes, Class PN-20 including fittings, painting, sleeves, support, hangers, and other miscellaneous items as shown and as required to complete the system. (Including connection of new PPR to existing GI main)					
	50mm diameter x 4m	4.00	l.m.			
19.06	40mm diameter x 4m					
19.12	32mm diameter x 4m	16.00	l.m.			
19.17	25mm diameter x 4m	16.00	l.m.			
	20mm diameter x 4m	60.00	l.m.			
	15mm diameter x 4m					
	<b>Cold Water Line (Roughing-ins)</b>					
	High Density Polypropylene Random Copolymer (PPR) pipes, Class PN-20 including fittings, painting, sleeves, support, hangers, and other miscellaneous items as shown and as required to complete the system.					
19.30	32mm diameter x 4m	16.00	l.m.			
19.35	25mm diameter x 4m	4.00	l.m.			
19.40	20mm diameter x 4m	36.00	l.m.			
	15mm diameter x 4m	92.00	l.m.			
	<b>HoseBibb</b>					
	Supply and Install					
19.50	15mm diameter	3.00	pc/s			
	<b>Gate Valves</b>					
	Supply and Install					
	50mm diameter Screwed	1.00	pc/s			
	40mm diameter Screwed	1.00	pc/s			
19.53	32mm diameter Screwed	3.00	pc/s			
19.54	25mm diameter Screwed	1.00	pc/s			
19.55	20mm diameter Screwed	2.00	pc/s			
19.56	15mm diameter Screwed	5.00	pc/s			



ITEM NO.	ITEM DESCRIPTION AND LOCATION	QTY	UNIT	DIRECT UNIT COST	TOTAL COST	REMARKS
	<b>The following are in respect of the whole of the Plumbing installations</b>					
19.57	Sealing, packing and fire proofing wherever required where pipes, conduits, cables or trunking pass through slabs, walls, beams and the like	1.00	item			
19.58	providing identification, color coding and labelling	1.00	item			
19.59	providing operation and maintenance manuals consisting of five (5) sets	1.00	item			
19.60	testing and commissioning including making good all defects and re-testing as necessary and leaving all in sound and perfect working order on completion	1.00	item			
19.61	instructing the Owner's representatives in operation, maintenance and service of completed installation; a period of twelve (12) months from the date of issuance of Certificate of Completion	1.00	item			
19.62	maintenance including labor and parts replacement; a period of twelve (12) months from the date of issuance of Certificate of Completion	1.00	item			
19.67	disinfecting the whole water distribution system issuing of the certificate of insurance that the whole system is free from contamination	1.00	item			
<b>SANITARY / PLUMBING TOTAL COST:</b>						
<b>Fire Protection Works Budgetary Estimates</b>						
<b>XXI.</b>	<b>Fire Protection Lines (Horizontal Pipes)</b>					
	Supply and installation of Black Iron Pipes, Schedule 40, or approved equal, including fittings, painting, sleeves, supports, hangers and other miscellaneous items as shown and as required to complete the system					
21.01	75mm diameter x 6m	6.00	l.m.			
21.03	65mm diameter x 6m	30.00	l.m.			
21.07	50mm diameter x 6m	6.00	l.m.			
21.09	40mm diameter x 6m	6.00	l.m.			
21.12	32mm diameter x 6m	6.00	l.m.			
21.17	25mm diameter x 6m	966.00	l.m.			

ITEM NO.	ITEM DESCRIPTION AND LOCATION	QTY	UNIT	DIRECT UNIT COST	TOTAL COST	REMARKS
XXII.	Sprinkler Heads					
	Supply and installation of sprinkler heads and other miscellaneous items as shown and as required to complete the system (All existing and relocated sprinkler heads to be replaced with new)					
22.01	Pendent	168.00	pc/s			
22.02	Upright	6.00	pc/s			
22.03	Sidewall	2.00	pc/s			
	<b>Portable Fire Extinguishers</b>					
	Supply and installation of portable fire extinguishers and other miscellaneous items as shown and as required to complete the system					
22.04	10lbs PFE-36	2.00	pc/s			
	<b>SUBTOTAL COST:</b>					
XXIII.	<b>SUNDRIES</b>					
	The following are in respect of the whole of the Fire Protection installations					
23.01	Sealing, packing and fire proofing wherever required where pipes, conduits, cables or trunking pass through slabs, walls, beams and the like	1.00	item			
23.03	providing identification, color coding and labelling	1.00	item			
23.04	providing operation and maintenance manuals consisting of five (5) sets	1.00	item			
23.05	testing and commissioning including making good all defects and re-testing as necessary and leaving all in sound and perfect working order on completion	1.00	item			
23.06	instructing the Owner's representatives in operation, maintenance and service of completed installation; a period of twelve (12) months from the date of issuance of Certificate of Completion	1.00	item			
23.07	maintenance including labor and parts replacement; a period of twelve (12) months from the date of issuance of Certificate of Completion	1.00	item			
23.08	disinfecting the whole water distribution system issuing of the certificate of insurance that the whole system is free from contamination	1.00	item			
	<b>SUBTOTAL COST:</b>					
	<b>FIRE PROTECTION WORKS TOTAL COST:</b>					

**Mechanical Works Budgetary Estimates**

<b>XXIV.</b>	<b>AIR CONDITIONING UNIT</b>					
<b>ITEM NO.</b>	<b>ITEM DESCRIPTION AND LOCATION</b>	<b>QTY</b>	<b>UNIT</b>	<b>DIRECT UNIT COST</b>	<b>TOTAL COST</b>	<b>REMARKS</b>
24.01	ACCUV-6-12, 16HP Variable Refrigerant Flow Air Cooled Condensing Unit. Coil Blue Fin Coated	1.00	set			
24.02	ACCUV-6-13, 16HP Variable Refrigerant Flow Air Cooled Condensing Unit. Coil Blue Fin Coated	1.00	set			
24.03	ACCUV-6-14, 16HP Variable Refrigerant Flow Air Cooled Condensing Unit. Coil Blue Fin Coated	1.00	set			
24.04	ACUV 5-01, 2.0HP Ceiling Cassette Unit, c/w signals wires and local thermostat. Coil Blue Fin Coated	1.00	set			
24.05	ACUV 5-02, 3.0HP Ceiling Cassette Unit, c/w signals wires and local thermostat. Coil Blue Fin Coated	1.00	set			
24.06	ACUV 5-03, 3.0HP Ceiling Cassette Unit, c/w signals wires and local thermostat. Coil Blue Fin Coated	1.00	set			
24.07	ACUV 5-04, 2.0HP Ceiling Cassette Unit, c/w signals wires and local thermostat. Coil Blue Fin Coated	1.00	set			
24.08	ACUV 5-05, 1.5HP Ceiling Cassette Unit, c/w signals wires and local thermostat. Coil Blue Fin Coated	1.00	set			
24.09	ACUV 5-06, 2.0HP Ceiling Cassette Unit, c/w signals wires and local thermostat. Coil Blue Fin Coated	1.00	set			
24.10	ACUV 5-07, 1.5HP Ceiling Cassette Unit, c/w signals wires and local thermostat. Coil Blue Fin Coated	1.00	set			
24.11	ACUV 5-08, 1.5HP Ceiling Cassette Unit, c/w signals wires and local thermostat. Coil Blue Fin Coated	1.00	set			
24.12	ACUV 5-09, 1.5HP Ceiling Cassette Unit, c/w signals wires and local thermostat. Coil Blue Fin Coated	1.00	set			
24.13	ACUV 5-10, 1.5HP Ceiling Cassette Unit, c/w signals wires and local thermostat. Coil Blue Fin Coated	1.00	set			
24.14	ACUV 5-11, 1.5HP Ceiling Cassette Unit, c/w signals wires and local thermostat. Coil Blue Fin Coated	1.00	set			
24.15	ACUV 5-12, 1.5HP Ceiling Cassette Unit, c/w signals wires and local thermostat. Coil Blue Fin Coated	1.00	set			
24.16	ACUV 5-13, 1.5HP Ceiling Cassette Unit, c/w signals wires and local thermostat. Coil Blue Fin Coated	1.00	set			
24.17	ACUV 5-14, 1.5HP Ceiling Cassette Unit, c/w signals wires and local thermostat. Coil Blue Fin Coated	1.00	set			

ITEM NO.	ITEM DESCRIPTION AND LOCATION	QTY	UNIT	DIRECT UNIT COST	TOTAL COST	REMARKS
24.18	ACUV 5-15, 2.0HP Ceiling Cassette Unit, c/w signals wires and local thermostat. Coil Blue Fin Coated	1.00	set			
24.19	ACUV 5-16, 2.0HP Ceiling Cassette Unit, c/w signals wires and local thermostat	1.00	set			
24.20	ACUV 5-17, 3.0HP Ceiling Cassette Unit, c/w signals wires and local thermostat. Coil Blue Fin Coated	1.00	set			
24.21	ACUV 5-18, 2.0HP Ceiling Cassette Unit, c/w signals wires and local thermostat. Coil Blue Fin Coated	1.00	set			
24.22	Refrigerant Pipes, Pipe Insulation and Special Pipe Connectors for VRF	1.00	lot			
24.23	Electrical Wirings, Panel Boards and other signal wires	1.00	lot			
24.24	Podium Floor VRF Central Control and Monitoring System	1.00	set			
	<b>SUBTOTAL COST:</b>					
XXV.	<b>FANS AND BLOWERS</b>					
25.01	EF 5-01, Ceiling Mounted Type at 120 Lps	2.00	set			
25.02	EF 5-02, Ceiling Mounted Type at 120 Lps	1.00	set			
25.03	EF 5-03, Ceiling Mounted Type at 120 Lps	1.00	set			
25.04	EF 5-04, Ceiling Mounted Type at 120 Lps	1.00	set			
25.05	TEF 5-01, Ceiling Mounted Type at 75 Lps	1.00	set			
	TEF 5-02, Ceiling Mounted Type at 120Lps	1.00	set			
	TEF 5-03, Ceiling Mounted Type at 120Lps	1.00	set			
	<b>SUBTOTAL COST:</b>					
XXVI.	<b>DUCTWORK AND ACCESSORIES</b>					
	Galvanized Iron Sheet					
26.01	US Ga. # 26	232.00	sq.m.			
26.02	US Ga. # 24	217.00	sq.m.			
0.00	Flexible Duct c/w insulation and vapor barrier					
26.03	250 dia.	402.00	lm			
26.04	200 dia.	30.00	lm			
26.05	25mm thk. Crosslinked Polyolefin Insulation c/w vapor barrier and adhesive	426.00	sqm			
26.06	Volume Control Dampers, Damper Splitter	1.00	lot			
	<b>SUBTOTAL COST:</b>					
XXVII.	<b>AIR DIFFUSERS</b>					
28.01	1200x50mm Linear Bar Grille c/w Opposed Blaed Damper, Aluminum Type	35.00	pcs			

ITEM NO.	ITEM DESCRIPTION AND LOCATION	QTY	UNIT	DIRECT UNIT COST	TOTAL COST	REMARKS
28.02	1200x75mm Linear Bar Grille c/w Opposed Blade Damper, Aluminum Type	150.00	pcs			
28.03	1200x75mm Continuous Linear Bar Grille	1.00	lot			
28.04	350X350 4-Way Ceiling Diffuser c/w Opposed Blade Damper	4.00	pcs			
28.05	300X300 4-Way Ceiling Diffuser c/w Opposed Blade Damper	2.00	pcs			
	<b>SUBTOTAL COST:</b>					
<b>XXVIII.</b>	<b>OTHERS</b>					
28.06	Duct and Pipe Hangers, equipment Support, noise and vibration isolators	1.00	lot			
28.07	Consumables	1.00	lot			
28.08	Testing and Commissioning and Miscellaneous Items other miscellaneous items to complete the system	1.00	lot			
	<b>SUBTOTAL COST:</b>					
	<b>MECHANICAL WORKS TOTAL COST:</b>					
<b>Electrical Works Budgetary Estimates</b>						
<b>XXIX.</b>	<b>PANEL BOARDS, TRANSFORMERS &amp; CIRCUIT BREAKERS</b>					
29.01	2UP5 230V, 3P+G, NEMA 1, SURFACE MOUNTED	1.00	assy			
	Main: 1 - EZC F 100AT, 100AF, 3P, 25KAIC, 230V, MCCB					
	Brs: 18 - iC60 N 20AT, 63AF, 2P, 20KAIC, 230V, MCB					
29.02	PP-5 230V, 3P+G, NEMA 1, SURFACE MOUNTED	1.00	assy			
	Main: 1 - iC60 N 60AT, 100AF, 3P, 25KAIC, 230V, MCB					
	Brs: 24 - iC60 N 20AT, 63AF, 2P, 10KAIC, 230V, MCB					
29.03	2L5 230V, 3P+G, NEMA 1, SURFACE MOUNTED	1.00	assy			
	Main: 1 - iC60 N 80AT, 100AF, 3P, 25KAIC, 230V, MCB					
	Brs: 2 - iC60 N 50AT, 63AF, 2P, 20KAIC, 230V, MCB					
	120- iC60 N 20AT, 63AF, 2P, 20KAIC, 230V, MCB					
	Spare: 4 - iC60 N 20AT, 63AF, 2P, 20KAIC, 230V, MCB					
29.04	PR5 230V, 3P+G, NEMA 1, SURFACE MOUNTED	1.00	assy			
	Main: 1 - EZC F 60AT, 100AF, 3P, 25KAIC, 230V, MCCB					

ITEM NO.	ITEM DESCRIPTION AND LOCATION	QTY	UNIT	DIRECT UNIT COST	TOTAL COST	REMARKS
	Brs: 17 - iC60 N 20AT, 63AF, 2P,20KAIC, 230V, MCB					
	Spare: 1 - iC60 N 20AT, 63AF, 2P, 20KAIC, 230V, MCB					
29.05	30kVA 480V/ 230 DRY TYPE TRANSFORMER	1.00	assy			
	<b>SUBTOTAL COST:</b>					
	<b>LIGHTING SYSTEM</b>					
30.01	<b>WIRING DEVICES</b>					
	one gang switch					
	two gang switch	12.00	set			
	three gang switch	18.00	set			
	Three-way switch - one gang	3.00	set			
	Three-way switch - two gang	11.00	set			
	Three-way switch - three gang	2.00	set			
30.02	<b>CONDUITS</b>	-	0			
	15mmØ EMT conduits					
	15mmØ EMT elbow	507.00	pcs			
	15mmØ EMT coupling	1,013.00	pcs			
	15mmØ EMT connector	1,217.00	pcs			
	15mmØ EMT Locknut & Bushing	1,217.00	pcs			
	15mmØ flexible metal conduit	834.00	lm			
	15mmØ straight connector	556.00	pcs			
	15mmØ angle connector	556.00	pcs			
30.03	<b>BOXES</b>	-	0			
	4" x 4" x 2" Octagonal Box, Gauge 16, Zinc-Chromate					
	2" x 4" Utility Box, Gauge 16, Zinc-Chromate	54.00	pcs			
	6" x 6" x 4" Pull Box, Gauge 16, Zinc-Chromate	1.00	pcs			
	4-11/16" x 4-11/16" Square Box, Gauge 16, Zinc-Chromate	152.00	pcs			
30.04	<b>WIRES &amp; CABLES</b>	-	0			
	3.5mm <sup>2</sup>					

ITEM NO.	ITEM DESCRIPTION AND LOCATION	QTY	UNIT	DIRECT UNIT COST	TOTAL COST	REMARKS
	<b>SUBTOTAL COST:</b>	-	0			
XXXI.	<b>POWER SYSTEM</b>	-	0			
31.01	<b>WIRING DEVICES</b>					
	<b>Duplex Convenience Outlet</b>					
	Refrigerator Outlet, Grounding Type					
	Microwave oven Outlet, Grounding Type	5.00	sets			
	Food waste disposal outlet, Grounding Type	5.00	sets			
	Hand Dryer Outlet	2.00	sets			
31.02	<b>CONDUITS</b>					
	15mmØ EMT conduits	808.00	lghts			
	15mmØ EMT elbow					
	15mmØ EMT coupling	808.00	pcs			
	15mmØ EMT connector	540.00	pcs			
	15mmØ EMT Locknut & Bushing	540.00	pcs			
31.03	<b>BOXES &amp; PULL BOXES</b>					
	4" x 4" Octagonal Box, Gauge 16, Zinc-Chromate	108.00	pcs			
	4-11/16" x 4-11/16" Square Box, Gauge 16, Zinc-Chromate					
	2" x 4" Utility Box, Gauge 16, Zinc-Chromate	270.00	pcs			
31.05	<b>WIRES &amp; CABLES</b>					
	3.5mm <sup>2</sup>	7,272.00	lm			
	<b>SUBTOTAL COST:</b>					
XXXII.	<b>FIRE DETECTION ALARM SYSTEM</b>					
32.01	<b>CONDUIT &amp; FITTINGS</b>					
	20mmØ EMT conduits	221.00	lghts			
	20mmØ EMT elbow	171.00	pcs			
	20mmØ EMT coupling	221.00	pcs			
	20mmØ EMT connector	190.00	pcs			
	20mmØ Locknut & Bushing	190.00	pcs			
	15mmØ flexible metal conduit	143.00	lghts			
	15mmØ straight connector	95.00	pcs			

ITEM NO.	ITEM DESCRIPTION AND LOCATION	QTY	UNIT	DIRECT UNIT COST	TOTAL COST	REMARKS
	15mmØ angle connector	95.00	pcs			
32.02	<b>BOXES &amp; PULL BOXES</b>	-	0			
	4" x 4" x 2" Octagonal Box, Gauge 16, Zinc-Chromate	95.00	pcs			
	2" x 4" Utility Box, Gauge 16, Zinc-Chromate	34.00	pcs			
	4-11/16" x 4-11/16" Square Box, Gauge 16, Zinc-Chromate	20.00	pcs			
32.03	<b>WIRES &amp; CABLES</b>					
	Twisted Pair #16 (MINERAL INSULATION FRC)	682.00	pcs			
32.04	<b>EQUIPMENT &amp; DEVICES</b>					
	manual pull station	5.00	pcs			
	horn with strobe light	15.00	set			
	heat detector					
	smoke detector	61.00	pcs			
	<b>SUBTOTAL COST:</b>					
<b>XXXIII.</b>	<b>TELEPHONE SYSTEM</b>					
33.01	<b>CONDUIT &amp; FITTINGS</b>					
	25mmØ EMT conduits	726.00	pcs			
	25mmØ EMT elbow	363.00	pcs			
	25mmØ EMT coupling	726.00	pcs			
	25mmØ EMT connector	798.00	pcs			
	25mmØ Locknut & Bushing	798.00	pcs			
	25mmØ flexible metal conduit	595.00	pcs			
	25mmØ straight connector	798.00	pcs			
	25mmØ angle connector	798.00	pcs			
	32mmØ EMT conduits	343.00	lghts			
	32mmØ EMT elbow	171.00	pcs			
	32mmØ EMT coupling	343.00	pcs			
	32mmØ EMT connector	377.00	pcs	PHP 340.97		
	32mmØ Locknut & Bushing	377.00	pcs	PHP 142.73		



ITEM NO.	ITEM DESCRIPTION AND LOCATION	QTY	UNIT	DIRECT UNIT COST	TOTAL COST	REMARKS
	32mmØ flexible metal conduit	281.00	pcs	PHP 198.24		
	32mmØ straight connector	188.00	pcs	PHP 134.80		
	32mmØ angle connector	188.00	pcs	PHP 206.17		
33.02	<b>BOXES &amp; PULL BOXES</b>					
	4" x 4" x 2" Octagonal Box, Gauge 16, Zinc-Chromate	41.00	pcs	PHP 62.80		
	2" x 4" Utility Box, Gauge 16, Zinc-Chromate	41.00	pcs	PHP 62.80		
33.03	<b>WIRES &amp; CABLES</b>					
	Cat5e Cable	4,802.00	l.m.	PHP 38.06		
33.04	<b>EQUIPMENTS &amp; DEVICES</b>					
	Socket	41.00	pcs	PHP 248.99		
	<b>SUBTOTAL COST:</b>					
	<b>ELECTRICAL WORKS TOTAL COST:</b>					
	<b>FIFTH FLOOR TOTAL COST (A,S/P,FP,M,E,S)</b>					

***Section IX. Bidding Forms***

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## Bid Form

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Date: \_\_\_\_\_

IB<sup>1</sup> N<sup>o</sup>: \_\_\_\_\_

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

Address: *[insert address]*

We, the undersigned, declare that:

- (a) We have examined and have no reservation to the Bidding Documents, including Addenda, for the Contract *[insert name of contract]*;
- (b) We offer to execute the Works for this Contract in accordance with the Bid and Bid Data Sheet, General and Special Conditions of Contract accompanying this Bid;

The total price of our Bid, excluding any discounts offered below is: *[insert information]*;

The discounts offered and the methodology for their application are: *[insert information]*;

- (c) Our Bid shall be valid for a period of *[insert number]* days from the date fixed for the Bid submission deadline in accordance with the Bidding Documents, and it shall remain binding upon us and may be accepted at any time before the expiration of that period;
- (d) If our Bid is accepted, we commit to obtain a Performance Security in the amount of *[insert percentage amount]* percent of the Contract Price for the due performance of the Contract;
- (e) Our firm, including any subcontractors or suppliers for any part of the Contract, have nationalities from the following eligible countries: *[insert information]*;
- (f) We are not participating, as Bidders, in more than one Bid in this bidding process, other than alternative offers in accordance with the Bidding Documents;
- (g) Our firm, its affiliates or subsidiaries, including any subcontractors or suppliers for any part of the Contract, has not been declared ineligible by the Funding Source;
- (h) We understand that this Bid, together with your written acceptance thereof included in your notification of award, shall constitute a binding contract between us, until a formal Contract is prepared and executed; and

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<sup>1</sup> If ADB, JICA and WB funded projects, use IFB.

- (i) We understand that you are not bound to accept the Lowest Calculated Bid or any other Bid that you may receive.
- (j) **We likewise certify/confirm that the undersigned, is the duly authorized representative of the bidder, and granted full power and authority to do, execute and perform any and all acts necessary to participate, submit the bid, and to sign and execute the ensuing contract for the [Name of Project] of the [Name of the Procuring Entity].**
- (k) **We acknowledge that failure to sign each and every page of this Bid Form, including the Bill of Quantities, shall be a ground for the rejection of our bid.**

Name: \_\_\_\_\_

In the capacity of: \_\_\_\_\_

Signed: \_\_\_\_\_

Duly authorized to sign the Bid for and on behalf of: \_\_\_\_\_

Date: \_\_\_\_\_

## Form of Contract Agreement

---

THIS AGREEMENT, made this *[insert date]* day of *[insert month]*, *[insert year]* between *[name and address of PROCURING ENTITY]* (hereinafter called the “Entity”) and *[name and address of Contractor]* (hereinafter called the “Contractor”).

WHEREAS, the Entity is desirous that the Contractor execute *[name and identification number of contract]* (hereinafter called “the Works”) and the Entity has accepted the Bid for *[insert the amount in specified currency in numbers and words]* by the Contractor for the execution and completion of such Works and the remedying of any defects therein.

### NOW THIS AGREEMENT WITNESSETH AS FOLLOWS:

1. In this Agreement, words and expressions shall have the same meanings as are respectively assigned to them in the Conditions of Contract hereinafter referred to.
2. The following documents shall be attached, deemed to form, and be read and construed as integral part of this Agreement, to wit:
  - (a) General and Special Conditions of Contract;
  - (b) Drawings/Plans;
  - (c) Specifications;
  - (d) Invitation to Bid;
  - (e) Instructions to Bidders;
  - (f) Bid Data Sheet;
  - (g) Addenda and/or Supplemental/Bid Bulletins, if any;
  - (h) Bid form, including all the documents/statements contained in the Bidder’s bidding envelopes, as annexes, and all other documents submitted (e.g., Bidder’s response to request for clarifications on the bid), including corrections to the bid, if any, resulting from the Procuring Entity’s bid evaluation;
  - (i) Eligibility requirements, documents and/or statements;
  - (j) Performance Security;
  - (k) Notice of Award of Contract and the Bidder’s conforme thereto;
  - (l) Other contract documents that may be required by existing laws and/or the Entity.
3. In consideration of the payments to be made by the Entity to the Contractor as hereinafter mentioned, the Contractor hereby covenants with the Entity to execute and complete the Works and remedy any defects therein in conformity with the provisions of this Contract in all respects.

4. The Entity hereby covenants to pay the Contractor in consideration of the execution and completion of the Works and the remedying of defects wherein, the Contract Price or such other sum as may become payable under the provisions of this Contract at the times and in the manner prescribed by this Contract.

IN WITNESS whereof the parties thereto have caused this Agreement to be executed the day and year first before written.

Signed, sealed, delivered by \_\_\_\_\_ the \_\_\_\_\_ (for the Entity)

Signed, sealed, delivered by \_\_\_\_\_ the \_\_\_\_\_ (for the Contractor).

Binding Signature of Procuring Entity

\_\_\_\_\_

Binding Signature of Contractor

\_\_\_\_\_

*[Addendum showing the corrections, if any, made during the Bid evaluation should be attached with this agreement]*

## Omnibus Sworn Statement

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REPUBLIC OF THE PHILIPPINES )  
CITY/MUNICIPALITY OF \_\_\_\_\_ ) S.S.

### AFFIDAVIT

I, *[Name of Affiant]*, of legal age, *[Civil Status]*, *[Nationality]*, and residing at *[Address of Affiant]*, after having been duly sworn in accordance with law, do hereby depose and state that:

1. **Select one, delete the other:**

*If a sole proprietorship:* I am the sole proprietor or authorized representative of *[Name of Bidder]* with office address at *[address of Bidder]*;

*If a partnership, corporation, cooperative, or joint venture:* I am the duly authorized and designated representative of *[Name of Bidder]* with office address at *[address of Bidder]*;

2. **Select one, delete the other:**

*If a sole proprietorship:* As the owner and sole proprietor or authorized representative of *[Name of Bidder]*, I have full power and authority to do, execute and perform any and all acts necessary to participate, submit the bid, and to sign and execute the ensuing contract for *[Name of the Project]* of the *[Name of the Procuring Entity]* *[insert "as shown in the attached duly notarized Special Power of Attorney" for the authorized representative]*;

*If a partnership, corporation, cooperative, or joint venture:* I am granted full power and authority to do, execute and perform any and all acts necessary to participate, submit the bid, and to sign and execute the ensuing contract for *[Name of the Project]* of the *[Name of the Procuring Entity]*, accompanied by the duly notarized Special Power of Attorney, Board/Partnership Resolution, or Secretary's Certificate, whichever is applicable;

3. *[Name of Bidder]* is not "blacklisted" or barred from bidding by the Government of the Philippines or any of its agencies, offices, corporations, or Local Government Units, foreign government/foreign or international financing institution whose blacklisting rules have been recognized by the Government Procurement Policy Board;

4. Each of the documents submitted in satisfaction of the bidding requirements is an authentic copy of the original, complete, and all statements and information provided therein are true and correct;



5. *[Name of Bidder]* is authorizing the Head of the Procuring Entity or its duly authorized representative(s) to verify all the documents submitted;

6. **Select one, delete the rest:**

*If a sole proprietorship:* The owner or sole proprietor is not related to the Head of the Procuring Entity, members of the Bids and Awards Committee (BAC), the Technical Working Group, and the BAC Secretariat, the head of the Project Management Office or the end-user unit, and the project consultants by consanguinity or affinity up to the third civil degree;

*If a partnership or cooperative:* None of the officers and members of *[Name of Bidder]* is related to the Head of the Procuring Entity, members of the Bids and Awards Committee (BAC), the Technical Working Group, and the BAC Secretariat, the head of the Project Management Office or the end-user unit, and the project consultants by consanguinity or affinity up to the third civil degree;

*If a corporation or joint venture:* None of the officers, directors, and controlling stockholders of *[Name of Bidder]* is related to the Head of the Procuring Entity, members of the Bids and Awards Committee (BAC), the Technical Working Group, and the BAC Secretariat, the head of the Project Management Office or the end-user unit, and the project consultants by consanguinity or affinity up to the third civil degree;

7. *[Name of Bidder]* complies with existing labor laws and standards; and

8. *[Name of Bidder]* is aware of and has undertaken the following responsibilities as a Bidder:

- a) Carefully examine all of the Bidding Documents;
- b) Acknowledge all conditions, local or otherwise, affecting the implementation of the Contract;
- c) Made an estimate of the facilities available and needed for the contract to be bid, if any; and
- d) Inquire or secure Supplemental/Bid Bulletin(s) issued for the *[Name of the Project]*.

9. *[Name of Bidder]* did not give or pay directly or indirectly, any commission, amount, fee, or any form of consideration, pecuniary or otherwise, to any person or official, personnel or representative of the government in relation to any procurement project or activity.

IN WITNESS WHEREOF, I have hereunto set my hand this \_\_\_ day of \_\_\_, 20\_\_ at \_\_\_\_\_, Philippines.

\_\_\_\_\_  
Bidder's Representative/Authorized Signatory

**SUBSCRIBED AND SWORN** to before me this \_\_\_\_ day of *[month]* *[year]* at *[place of execution]*, Philippines. Affiant/s is/are personally known to me and was/were identified by me through competent evidence of identity as defined in the 2004 Rules on Notarial Practice (A.M. No. 02-8-13-SC). Affiant/s exhibited to me his/her *[insert type of government identification card used]*, with his/her photograph and signature appearing thereon, with no. \_\_\_\_\_ and his/her Community Tax Certificate No. \_\_\_\_\_ issued on \_\_\_\_ at \_\_\_\_\_.

Witness my hand and seal this \_\_\_\_ day of *[month]* *[year]*.

**NAME OF NOTARY PUBLIC**

Serial No. of Commission \_\_\_\_\_

Notary Public for \_\_\_\_\_ until \_\_\_\_\_

Roll of Attorneys No. \_\_\_\_\_

PTR No. \_\_\_\_\_ *[date issued]*, *[place issued]*

IBP No. \_\_\_\_\_ *[date issued]*, *[place issued]*

Doc. No. \_\_\_\_\_

Page No. \_\_\_\_\_

Book No. \_\_\_\_\_

Series of \_\_\_\_\_

\* This form will not apply for WB funded projects.

**Bid-Securing Declaration**

**(REPUBLIC OF THE PHILIPPINES)**  
**CITY OF \_\_\_\_\_ ) S.S.**  
**X-----X**

**Invitation to Bid** *[Insert reference number]*

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

I/We, the undersigned, declare that:

1. I/We understand that, according to your conditions, bids must be supported by a Bid Security, which may be in the form of a Bid-Securing Declaration.
2. I/We accept that: (a) I/we will be automatically disqualified from bidding for any contract with any procuring entity for a period of two (2) years upon receipt of your Blacklisting Order; and, (b) I/we will pay the applicable fine provided under Section 6 of the Guidelines on the Use of Bid Securing Declaration, within fifteen (15) days from receipt of written demand by the procuring entity for the commission of acts resulting to the enforcement of the bid securing declaration under Sections 23.1(b), 34.2, 40.1 and 69.1, except 69.1 (f), of the IRR of RA 9184; without prejudice to other legal action the government may undertake.
3. I/We understand that this Bid-Securing Declaration shall cease to be valid on the following circumstances:
  - a. Upon expiration of the bid validity period, or any extension thereof pursuant to your request;
  - b. I am/we are declared ineligible or post-disqualified upon receipt of your notice to such effect, and (i) I/we failed to timely file a request for reconsideration or (ii) I/we filed a waiver to avail of said right;
  - c. I am/we are declared as the bidder with the Lowest Calculated Responsive Bid, and I/we have furnished the performance security and signed the Contract.

**IN WITNESS WHEREOF**, I/We have hereunto set my/our hand/s this \_\_\_\_ day of [month] [year] at [place of execution].

**[Insert NAME OF BIDDER'S AUTHORIZED REPRESENTATIVE]**  
**[Insert signatory's legal capacity]**

Affiant

**SUBSCRIBED AND SWORN** to before me this \_\_ day of [month] [year] at [place of execution], Philippines. Affiant/s is/are personally known to me and was/were identified by me through competent evidence of identity as defined in the 2004 Rules on Notarial Practice (A.M. No. 02-8-13-SC). Affiant/s exhibited to me his/her [insert type of government identification card used], with his/her photograph and signature appearing thereon, with no. \_\_\_\_\_.

Witness my hand and seal this \_\_\_\_ day of [month] [year].

**NAME OF NOTARY PUBLIC**

**Serial No. of Commission** \_\_\_\_\_  
**Notary Public for** \_\_\_\_\_ **until** \_\_\_\_\_  
**Roll of Attorneys No.** \_\_\_\_\_  
**PTR No.** \_\_, [date issued], [place issued]  
**IBP No.** \_\_, [date issued], [place issued]  
**Doc. No.** \_\_\_\_  
**Page No.** \_\_\_\_  
**Book No.** \_\_\_\_  
**Series of** \_\_\_\_.

