Republic of the Philippines
Department of Science and Technology
Philippine Science High School System

PHILIPPINE SCIENCE HIGH SCHOOL – BICOL REGION CAMPUS

Procurement for the Rehabilitation of School Buildings (Academic 1, 2, and Dormitory 1)

Preface

These Philippine Bidding Documents (PBDs) for the procurement of Infrastructure Projects (hereinafter referred to also as the "Works") through Competitive Bidding have been prepared by the Government of the Philippines for use by all branches, agencies, departments, bureaus, offices, or instrumentalities of the government, including government-owned and/or -controlled corporations, government financial institutions, state universities and colleges, local government units, and autonomous regional government. The procedures and practices presented in this document have been developed through broad experience, and are for mandatory use in projects that are financed in whole or in part by the Government of the Philippines or any foreign government/foreign or international financing institution in accordance with the provisions of the 2016 revised Implementing Rules and Regulations (IRR) of Republic Act (RA) No. 9184.

The PBDs are intended as a model for admeasurements (unit prices or unit rates in a bill of quantities) types of contract, which are the most common in Works contracting.

The Bidding Documents shall clearly and adequately define, among others: (i) the objectives, scope, and expected outputs and/or results of the proposed contract; (ii) the eligibility requirements of Bidders; (iii) the expected contract duration; and (iv) the obligations, duties, and/or functions of the winning Bidder.

Care should be taken to check the relevance of the provisions of the PBDs against the requirements of the specific Works to be procured. If duplication of a subject is inevitable in other sections of the document prepared by the Procuring Entity, care must be exercised to avoid contradictions between clauses dealing with the same matter.

Moreover, each section is prepared with notes intended only as information for the Procuring Entity or the person drafting the Bidding Documents. They shall not be included in the final documents. The following general directions should be observed when using the documents:

a. All the documents listed in the Table of Contents are normally required for the procurement of Infrastructure Projects. However, they should be adapted as necessary to the circumstances of the particular Project.

b. Specific details, such as the "*name of the Procuring Entity*" and "*address for bid submission*," should be furnished in the Instructions to Bidders, Bid Data Sheet, and Special Conditions of Contract. The final documents should contain neither blank spaces nor options.

c. This Preface and the footnotes or notes in italics included in the Invitation to Bid, BDS, General Conditions of Contract, Special Conditions of Contract, Specifications, Drawings, and Bill of Quantities are not part of the text of the final document, although they contain instructions that the Procuring Entity should strictly follow.

d. The cover should be modified as required to identify the Bidding Documents as to the names of the Project, Contract, and Procuring Entity, in addition to date of issue.

e. Modifications for specific Procurement Project details should be provided in the Special Conditions of Contract as amendments to the Conditions of Contract. For easy completion, whenever reference has to be made to specific clauses in the Bid Data Sheet or Special Conditions of Contract, these terms shall be printed in bold typeface on Sections I (Instructions to Bidders) and III (General Conditions of Contract), respectively.

f. For guidelines on the use of Bidding Forms and the procurement of Foreign-Assisted Projects, these will be covered by a separate issuance of the Government Procurement Policy Board.

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Glossary of Terms, Abbreviations, and Acronyms

ABC – Approved Budget for the Contract.

ARCC – Allowable Range of Contract Cost.

BAC – Bids and Awards Committee.

Bid – A signed offer or proposal to undertake a contract submitted by a bidder in response to and in consonance with the requirements of the bidding documents. Also referred to as *Proposal* and *Tender*. (2016 revised IRR, Section 5[c])

Bidder – Refers to a contractor, manufacturer, supplier, distributor and/or consultant who submits a bid in response to the requirements of the Bidding Documents. (2016 revised IRR, Section 5[d])

Bidding Documents – The documents issued by the Procuring Entity as the bases for bids, furnishing all information necessary for a prospective bidder to prepare a bid for the Goods, Infrastructure Projects, and/or Consulting Services required by the Procuring Entity. (2016 revised IRR, Section 5[e])

BIR – Bureau of Internal Revenue.

BSP – Bangko Sentral ng Pilipinas.

CDA – Cooperative Development Authority.

Consulting Services – Refer to services for Infrastructure Projects and other types of projects or activities of the GOP requiring adequate external technical and professional expertise that are beyond the capability and/or capacity of the GOP to undertake such as, but not limited to: (i) advisory and review services; (ii) pre-investment or feasibility studies; (iii) design; (iv) construction supervision; (v) management and related services; and (vi) other technical services or special studies. (2016 revised IRR, Section 5[i])

Contract – Refers to the agreement entered into between the Procuring Entity and the Supplier or Manufacturer or Distributor or Service Provider for procurement of Goods and Services; Contractor for Procurement of Infrastructure Projects; or Consultant or Consulting Firm for Procurement of Consulting Services; as the case may be, as recorded in the Contract Form signed by the parties, including all attachments and appendices thereto and all documents incorporated by reference therein.

Contractor – is a natural or juridical entity whose proposal was accepted by the Procuring Entity and to whom the Contract to execute the Work was awarded. Contractor as used in these Bidding Documents may likewise refer to a supplier, distributor, manufacturer, or consultant.

CPI – Consumer Price Index.

DOLE – Department of Labor and Employment.

DTI – Department of Trade and Industry.

Foreign-funded Procurement or Foreign-Assisted Project – Refers to procurement whose funding source is from a foreign government, foreign or international financing institution as specified in the Treaty or International or Executive Agreement. (2016 revised IRR, Section 5[b]).

GFI – Government Financial Institution.

GOCC – Government-owned and/or –controlled corporation.

Goods – Refer to all items, supplies, materials and general support services, except Consulting Services and Infrastructure Projects, which may be needed in the transaction of public businesses or in the pursuit of any government undertaking, project or activity, whether in the nature of equipment, furniture, stationery, materials for construction, or personal property of any kind, including non-personal or contractual services such as the repair and maintenance of equipment and furniture, as well as trucking, hauling, janitorial, security, and related or analogous services, as well as procurement of materials and supplies provided by the Procuring Entity for such services. The term "related" or "analogous services" shall include, but is not limited to, lease or purchase of office space, media advertisements, health maintenance services, and other services essential to the operation of the Procuring Entity. (2016 revised IRR, Section 5[r])

GOP – Government of the Philippines.

Infrastructure Projects – Include the construction, improvement, rehabilitation, demolition, repair, restoration or maintenance of roads and bridges, railways, airports, seaports, communication facilities, civil works components of information technology projects, irrigation, flood control and drainage, water supply, sanitation, sewerage and solid waste management systems, shore protection, energy/power and electrification facilities, national buildings, school buildings, hospital buildings, and other related construction projects of the government. Also referred to as *civil works or works*. (2016 revised IRR, Section 5[u])

LGUs – Local Government Units.

NFCC – Net Financial Contracting Capacity.

NGA – National Government Agency.

PCAB – Philippine Contractors Accreditation Board.

PhilGEPS - Philippine Government Electronic Procurement System.

Procurement Project – refers to a specific or identified procurement covering goods, infrastructure project or consulting services. A Procurement Project shall be described, detailed, and scheduled in the Project Procurement Management Plan prepared by the agency which shall be consolidated in the procuring entity's Annual Procurement Plan. (GPPB Circular No. 06-2019 dated 17 July 2019)

PSA – Philippine Statistics Authority.

SEC – Securities and Exchange Commission.

SLCC – Single Largest Completed Contract.

UN – United Nations.

Section I. Invitation to Bid

Invitation to Bid for *the Rehabilitation of School Buildings (Academic I, II and Dormitory Building I)*

1. The *Philippine Science High School-Bicol Region Campus*, through the *General Appropriations Fund 2021* intends to apply the sum of **Twenty-Two Million One Hundred Forty-Seven Thousand Five Hundred Pesos (Php 22,147,500.00**) being the Approved Budget for the Contract (ABC) to payments under the contract for Construction of the ***Rehabilitation of School Buildings (Academic I,II and Dormitory I).*** Bids received in excess of the ABC shall be automatically rejected at bid opening.

2. The *Philippine Science High School-Bicol Region Campus* now invites bids for the above Procurement Project. Completion of the Works is required *within one hundred eighty (180) calendar days*. Bidders may 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 (RA) No. 9184.

4. Interested bidders may obtain further information from *Philippine Science High School-Bicol Region Campus* and inspect the Bidding Documents at the address given below from *7:30AM-4:30PM*.

5. A complete set of Bidding Documents may be acquired by interested bidders on *November 23, 2021* from given address and website/s below *and upon payment of the applicable fee for the Bidding Documents, pursuant to the latest Guidelines issued by the GPPB, in the amount of Twenty-Five thousand pesos (Php 25,000.00)* .The Procuring Entity shall allow the bidder to present its proof of payment for the fees *in person, or through electronic means.*

6.The *Philippine Science High School-Bicol Region Campus* will hold a Pre-Bid Conference[1] on December 1, *2021, 10AM* at the Board Room, Administration Building, PSHS-BRC, Goa, Camarines Sur and/or through videoconferencing/webcasting *via ZOOM*

https://us02web.zoom.us/j/83765704093?pwd=ZGFiOWdxSHFRN0t4WFRpYVBYYTd2UT09

which shall be open to prospective bidders.

[1] May be deleted in case the ABC is less than One Million Pesos (PhP1,000,000) where the Procuring Entity may not hold a pre-bid conference.

6. Bids must be duly received by the BAC Secretariat through (i) manual submission at the office address as indicated below, (ii) online or electronic submission as indicated below, or (iii) both} on or before December 14, *2021, 10AM.* Late bids shall not be accepted.

7. All bids must be accompanied by a bid security in any of the acceptable forms and in the amount stated in **ITB** Clause 15.

8. Bid opening shall be on *December 14, 2021, 10 AM* at the given address below and/or through *Zoom (link shall be sent to bidders who intended to join).* Bids will be opened in the presence of the bidders' representatives who choose to attend the activity.

9. *Eligible bidders shall submit a certified true copy of Valid PCAB license for Size Range-Medium A,* License category B.

10. The *Philippine Science High School-Bicol Region campus* 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 Sections 35.6 and 41 of the 2016 revised Implementing Rules and Regulations (IRR) of RA No. 9184, without thereby incurring any liability to the affected bidder or bidders.

11. For further information, please refer to:

    JOY MELGA B. OLAZO
    BAC Secretariat Chairperson
    Philippine Science High School-Bicol Region
    Tagongtong, Goa, Camarines Sur
    Email ad: bac@brc.pshs.edu.ph
    School Website: brc.pshs.edu.ph
    Cp# 09178373849

12. You may visit the following websites:

    For downloading of Bidding Documents: *PhilGEPS, brc.pshs.edu.ph*

    For online bid submission: bac@brc.pshs.edu.ph

November 23, 2021

SEVEDEO J. MALATE
BAC Chairperson or Authorized Representative

Section II. Instructions to Bidders

1. Scope of Bid

The Procuring Entity, *Philippine Science High School-Bicol Region Campus* invites Bids for the Construction of the Rehabilitation of School Buildings (Academic Building I,II and Dormitory Building I) with Project Identification Number Infra-2021-06.

2. Funding Information

2.1. The GOP through the source of funding as indicated below for Calendar Year 2021 in the amount of **Twenty-Two Million One Hundred Forty-Seven Thousand Five Hundred Pesos (Php 22,147,500.00**).

2.2. The source of funding is:

General Appropriations Act 2021

3. Bidding Requirements

The Bidding for the Project shall be governed by all the provisions of RA No. 9184 and its 2016 revised IRR, including its Generic Procurement Manual and associated policies, rules and regulations as the primary source thereof, while the herein clauses shall serve as the secondary source thereof.

Any amendment made to the IRR and other GPPB issuances shall be applicable only to the ongoing posting, advertisement, or invitation to bid by the BAC through the issuance of a supplemental or bid bulletin.

The Bidder, by the act of submitting its Bid, shall be deemed to have inspected the site, determined the general characteristics of the contracted Works and the conditions for this Project, such as the location and the nature of the 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 and examine all instructions, forms, terms, and project requirements in the Bidding Documents.

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

The Procuring Entity, as well as the Bidders and Contractors, shall observe the highest standard of ethics during the procurement and execution of the contract. They or through an agent shall not engage in corrupt, fraudulent, collusive, coercive, and obstructive practices defined under Annex "I" of the 2016 revised IRR of RA No. 9184 or other integrity violations in competing for the Project.

5. Eligible Bidders

5.1. Only Bids of Bidders found to be legally, technically, and financially capable will be evaluated.

5.2. 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 PSA's CPI, except under conditions provided for in Section 23.4.2.4 of the 2016 revised IRR of RA No. 9184.

A contract is considered to be "similar" to the contract to be bid if it has the major categories of work stated in the **BDS**.

5.3. 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 Bidding Document prepared for this purpose.

5.4. The Bidders shall comply with the eligibility criteria under Section 23.4.2 of the 2016 IRR of RA No. 9184.

6. Origin of Associated Goods

There is no restriction on the origin of Goods other than those prohibited by a decision of the UN Security Council taken under Chapter VII of the Charter of the UN.

7. Subcontracts

7.1. The Bidder may subcontract portions of the Project to the extent allowed by the Procuring Entity as stated herein, but in no case more than fifty percent (50%) of the Project.

The Procuring Entity has prescribed that:
[*Select one, delete other/s*]

a. Subcontracting is allowed. The portions of Project and the maximum percentage allowed to be subcontracted are indicated in the **BDS,** which shall not exceed fifty percent (50%) of the contracted Works.

b. Subcontracting is not allowed.

7.1. *[If Procuring Entity has determined that subcontracting is allowed during the bidding , state:]* The Bidder must submit together with its Bid the documentary requirements of the subcontractor(s) complying with the eligibility criterial stated in **ITB** Clause 5 in accordance with Section 23.4 of the 2016 revised IRR of RA No. 9184 pursuant to Section 23.1 thereof.

7.2. *[If subcontracting is allowed during the contract implementation stage, state:]* The Supplier may identify its subcontractor during the contract implementation stage. Subcontractors identified during the bidding may be changed during the implementation of this Contract. Subcontractors must submit the documentary requirements under Section 23.1 of the 2016 revised IRR of RA No. 9184 and comply with the eligibility criteria specified in **ITB** Clause 5 to the implementing or end-user unit.

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

8. Pre-Bid Conference

The Procuring Entity will hold a pre-bid conference for this Project on the specified date and time and either at its physical address {*[insert if applicable]* and/or through videoconferencing/webcasting} as indicated in paragraph 6 of the **IB.**

9. Clarification and Amendment of Bidding Documents

Prospective bidders may request for clarification on and/or interpretation of any part of the Bidding Documents. Such requests must be in writing and received by the Procuring Entity, either at its given address or through electronic mail indicated in the **IB**, at least ten (10) calendar days before the deadline set for the submission and receipt of Bids.

10. Documents Comprising the Bid: Eligibility and Technical Components

10.1. The first envelope shall contain the eligibility and technical documents of the Bid as specified in **Section IX. Checklist of Technical and Financial Documents**.

10.2. If the eligibility requirements or statements, the bids, and all other documents for submission to the BAC are in foreign language other than English, it must be accompanied by a translation in English, which 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. For Contracting Parties to the Apostille Convention, only the translated documents shall be authenticated through an apostille pursuant to GPPB Resolution No. 13-2019 dated 23 May 2019. The English translation shall govern, for purposes of interpretation of the bid.

10.3. A valid PCAB License is required, and in case of joint ventures, a valid special PCAB License, and registration for the type and cost of the contract for this Project. Any additional type of Contractor license or permit shall be indicated in the **BDS**.

10.4. A List of Contractor's key personnel (e.g., Project Manager, Project Engineers, Materials Engineers, and Foremen) assigned to the contract to be bid, with their complete qualification and experience data shall be provided. These key personnel must meet the required minimum years of experience set in the **BDS**.

10.5. A 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, must meet the minimum requirements for the contract set in the **BDS**.

11. Documents Comprising the Bid: Financial Component

11.1. The second bid envelope shall contain the financial documents for the Bid as specified in **Section IX. Checklist of Technical and Financial Documents**.

11.2. Any bid exceeding the ABC indicated in paragraph 1 of the **IB** shall not be accepted.

11.3. For Foreign-funded procurement, a ceiling may be applied to bid prices provided the conditions are met under Section 31.2 of the 2016 revised IRR of RA No. 9184.

12. Alternative Bids

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.

13. Bid Prices

All bid prices for the given scope of work in the Project as awarded shall be considered as fixed prices, and therefore not subject to price escalation during contract implementation, except under extraordinary circumstances as determined by the NEDA and approved by the GPPB pursuant to the revised Guidelines for Contract Price Escalation guidelines.

14. Bid and Payment Currencies

14.1. Bid prices may be quoted in the local currency or tradeable currency accepted by the BSP at the discretion of the Bidder. However, for purposes of bid evaluation, Bids denominated in foreign currencies shall be converted to Philippine currency based on the exchange rate as published in the BSP reference rate bulletin on the day of the bid opening.

14.2. *Payment of the contract price shall be made in:*

a. Philippine Pesos.

15. Bid Security

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

15.2. The Bid and bid security shall be valid until *One Hundred Twenty-One calendar days.* Any bid not accompanied by an acceptable bid security shall be rejected by the Procuring Entity as non-responsive.

16. Sealing and Marking of Bids

Each Bidder shall submit one copy of the first and second components of its Bid.

The Procuring Entity may request additional hard copies and/or electronic copies of the Bid. However, failure of the Bidders to comply with the said request shall not be a ground for disqualification.

If the Procuring Entity allows the submission of bids through online submission to the given website or any other electronic means, the Bidder shall submit an electronic copy of its Bid, which must be digitally signed. An electronic copy that cannot be opened or is corrupted shall be considered non-responsive and, thus, automatically disqualified.

17. Deadline for Submission of Bids

The Bidders shall submit on the specified date and time and either at its physical address or through online submission as indicated in paragraph 7 of the **IB.**

18. Opening and Preliminary Examination of Bids

18.1. The BAC shall open the Bids in public at the time, on the date, and at the place specified in paragraph 9 of the **IB**. The Bidders' representatives who are present shall sign a register evidencing their attendance. In case videoconferencing, webcasting or other similar technologies will be used, attendance of participants shall likewise be recorded by the BAC Secretariat.

In case the Bids cannot be opened as scheduled due to justifiable reasons, the rescheduling requirements under Section 29 of the 2016 revised IRR of RA No. 9184 shall prevail.

18.2. The preliminary examination of Bids shall be governed by Section 30 of the 2016 revised IRR of RA No. 9184.

19. Detailed Evaluation and Comparison of Bids

19.1. The Procuring Entity's BAC shall immediately conduct a detailed evaluation of all Bids rated "*passed*" using non-discretionary pass/fail criteria. The BAC

shall consider the conditions in the evaluation of Bids under Section 32.2 of 2016 revised IRR of RA No. 9184.

19.2. If the Project allows partial bids, all Bids and combinations of Bids as indicated in the **BDS** 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 Security as required by **ITB** Clause 16 shall be submitted for each contract (lot) separately.

19.3. In all cases, the NFCC computation pursuant to Section 23.4.2.6 of the 2016 revised IRR of RA No. 9184 must be sufficient for the total of the ABCs for all the lots participated in by the prospective Bidder.

20. Post Qualification

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**.

21. Signing of the Contract

The documents required in Section 37.2 of the 2016 revised IRR of RA No. 9184 shall form part of the Contract. Additional Contract documents are indicated in the **BDS**.

Section III. Bid Data Sheet

Bid Data Sheet

ITB Clause	
2.1	The GOP through the source of funding as indicated below for Calendar Year 2021 in the amount of **Twenty-Two Million One Hundred Forty-Seven Thousand Five Hundred Pesos (Php 22,147,500.00**)
5.2	For this purpose, contracts similar to the Project refer to contracts which have the same major categories of work, which shall be: *Rehabilitation of buildings*
7.1	*Subcontracting is not allowed.*
8	*Pre-bid conference will be held on December 1, 2021 at 10:00 AM at the Board Room, Administration Bldg., PSHS-BRC Goa, Camarines Sur and /or through video conferencing/webcasting via zoom* ***https://us02web.zoom.us/j/83765704093?pwd=ZGFiOWdxSHFRN0t4WFRpYVBYYTd2UT09***
10.3	*Eligible bidders shall submit a Certified True Copy of valid PCAB license for Size Range-Medium A- License Category B .*
10.4	The key personnel must meet the required minimum years of experience set below: Key Personnel — General Experience — Relevant Experience a. Registered Civil Engineer — 3 years b. Electrical Engineer — 3 years c. Architect — 3 years d. Sanitary Engineer — 3 years
10.5	The minimum major equipment requirements are the following: Equipment — Capacity — Number of Units One-Bagger Concrete Mixer — 1 Delivery Truck — 1 Welding Machine (with generator) — 1
15.1	The bid security shall be in the form of a Bid Securing Declaration or any of the following forms and amounts: a. The amount of not less than Php 442,950.00 if bid security is in cash, cashier's/manager's check, bank draft/guarantee or irrevocable letter of credit; b. The amount of not less than Php 1,107,375.00 if bid security is in Surety Bond.

15.2	The bid and bid security shall be valid until One Hundred Twenty (120) calendar days
16	Each bidder shall submit (1) original and (3) copies of the first and second components of its bid.
17	Deadline for submission of bids is December 13, 2021 @ 10:00AM.
19.2	Partial bids are not allowed.
20	*Bidder shall submit/present all required licenses and permits relevant to the project.*
21	Additional contract documents relevant to the Project that may be required by existing laws and/or the Procuring Entity, such as construction schedule and S-curve, manpower schedule, construction methods, equipment utilization schedule, construction safety and health program approved by the DOLE, and other acceptable tools of project scheduling.

Section IV. General Conditions of Contract

1. Scope of Contract

This Contract shall include all such items, although not specifically mentioned, that can be reasonably inferred as being required for its completion as if such items were expressly mentioned herein. All the provisions of RA No. 9184 and its 2016 revised IRR, including the Generic Procurement Manual, and associated issuances, constitute the primary source for the terms and conditions of the Contract, and thus, applicable in contract implementation. Herein clauses shall serve as the secondary source for the terms and conditions of the Contract.

This is without prejudice to Sections 74.1 and 74.2 of the 2016 revised IRR of RA No. 9184 allowing the GPPB to amend the IRR, which shall be applied to all procurement activities, the advertisement, posting, or invitation of which were issued after the effectivity of the said amendment.

2. Sectional Completion of Works

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

3. Possession of Site

3.1 The Procuring Entity shall give possession of all or parts of the Site to the Contractor based on the schedule of delivery indicated in the **SCC,** which corresponds to 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.

3.2 If possession of a portion is not given by the above date, 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 may be addressed through contract extension provided under Annex "E" of the 2016 revised IRR of RA No. 9184.

4. The Contractor's Obligations

The Contractor shall employ the key personnel named in the Schedule of Key Personnel indicating their designation, in accordance with **ITB** Clause 10.3 and specified in the **BDS**, 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.

5. Performance Security

5.1. Within ten (10) calendar days from receipt of the Notice of Award from the Procuring Entity but in no case later than the signing of the contract by both parties, the successful Bidder shall furnish the performance security in any of the forms prescribed in Section 39 of the 2016 revised IRR.

5.2. The Contractor, by entering into the Contract with the Procuring Entity, acknowledges the right of the Procuring Entity to institute action pursuant to RA No. 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.

6. 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.

7. Warranty

7.1. In case the Contractor fails to undertake the repair works under Section 62.2.2 of the 2016 revised IRR, 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.

7.2. The warranty against Structural Defects/Failures, except that occasioned-on force majeure, shall cover the period from the date of issuance of the Certificate of Final Acceptance by the Procuring Entity. Specific duration of the warranty is found in the **SCC**.

8. 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.

If the Contractor is a joint venture, all partners to the joint venture shall be jointly and severally liable to the Procuring Entity.

9. Termination for Other Causes

Contract termination shall be initiated 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 corrupt, fraudulent, collusive, coercive, and obstructive practices as stated in **ITB** Clause 4.

10. Dayworks

Subject to the guidelines on Variation Order in Annex "E" of the 2016 revised IRR of RA No. 9184, 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.

11. Program of Work

11.1. The Contractor shall submit to the Procuring Entity's Representative for approval the said Program of Work showing the general methods, arrangements, order, and timing for all the activities in the Works. The submissions of the Program of Work are indicated in the **SCC.**

11.2. 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.

12. Instructions, Inspections and Audits

The Contractor shall permit the GOP or the Procuring Entity to inspect the Contractor's accounts and records relating to the performance of the Contractor and to have them audited by auditors of the GOP or the Procuring Entity, as may be required.

13. Advance Payment

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**, subject to the requirements in Annex "E" of the 2016 revised IRR of RA No. 9184.

14. Progress Payments

The Contractor may submit a request for payment for Work accomplished. Such requests 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.

15. Operating and Maintenance Manuals

15.1. If required, the Contractor will provide "as built" Drawings and/or operating and maintenance manuals as specified in the **SCC.**

15.2. If the Contractor does not provide the Drawings and/or manuals by the dates stated above, or they do not receive the Procuring Entity's Representative's approval, the Procuring Entity's Representative may 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	
2	*Intended completion of days is 180 calendar days.*
3.1	*The Procuring Entity shall give possession of all parts of the Site to the Contractor upon NTP.*
4	Key Personnel — General Experience — Relevant Experience a. Registered Civil Engineer — 3 years b. Electrical Engineer — 3 years c. Architect — 3 years d. Sanitary Engineer — 3 years
6	The site investigation reports: Site Inspection
7.2	Warranty against structural defects: Fifteen (15) years.
10	a. Dayworks are applicable at the rate shown in the Contractor's original Bid.
11.1	The Contractor shall submit the Program of Work to the Procuring Entity's Representative within *fourteen (14)* days of delivery of the Notice of Award.
11.2	The amount to be withheld for late submission of an updated Program of Work is _____
13	The amount of the advance payment is *15% of the total contract price and schedule of payment.*
14	Materials and equipment delivered on the site but not completely put in place shall be included for payment.
15.1	The date by which operating and maintenance manuals are required is *before full payment of the contract.*
15.2	The amount to be withheld for failing to produce "as built" drawings and/or operating and maintenance manuals by the date required is *still to be determined.*

Section VI. Specifications

Asyana
CONSTRUCTION & CONSULTANCY

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TECHNICAL SPECIFICATION

Project: REHABILITATION OF SCHOOL BUILDINGS (ACA I, ACA II, AND DORMITORY BUILDING I)

Client : PHILIPPINE SCIENCE HIGH SCHOOL-BICOL REGION CAMPUS

Location : GOA, CAMARINES SUR

PART 1 GENERAL

1.1 DESCRPTION

The work specified herein is for the completion of the REHABILITATION OF SCHOOL BUILDINGS (ACA I, ACA II, AND DORMITORY BUILDING I) located at GOA, CAMARINES SUR

1.1 INTRODUCTION

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

B. Specification on the other hand, is used to describe the materials, construction techniques, samples, shop drawings, guarantees, and other contract requirements. Together, the Drawings and the Specifications are used to inform the Contractor.

1.2 NATIONAL LAWS, LOCAL ORDINANCES AND BUILDING RULES AND REGULATIONS

A. Construction of the structure stipulated under this Specification and related Contract Documents prepare for his project by ASYANA CONSTRUCTION CONSULTANCY shall be in conformity with National Laws, Local Ordinances and Building Rules and Regulations.

1.3 REFERENCE TO OTHER RELATED CONTRACT DOCUMENTS

A. Work listed and described in this Division as well as those called for and described in other division of this work.

B. Detailed Specification of more significant or highly involved phases or trades of Construction work, or those which under certain circumstances are deemed to required further elaboration or clarification, are also included in this set of specifications.

1.4 THE LANGUAGE OF SPECIFICATIONS

A. The specification is of the abbreviated type and includes incomplete sentences.

B. The selection of sentences structure depends on the underlying principles of specification:
1. That the technical specifications are only one part of the Contract Documents;
2. That the contract is between Owner and the General Contractor; and;
3. That the General Contractor is the only party responsible for completing the work in accordance with the Contract Documents

Therefore:

a. Only the General Contractor is referred to in the Specification so as not to violate the intent of the contract and so as not to undermine the proper chain of command.
b. Any reference to Specialty Trade Contractor in the technical specifications is made only in so far as selection of Specialty Trade Contractors is made through biding. Once the Specialty Trade Contractors are selected and assigned to the General Contractor, the General Contractor assumes all responsibilities for the execution of the whole project in accordance with the Contract Documents. Therefore, in the contract between the Owner and the General Contractor is not referred to. In all the Contract Documents, the word "Contractor" is meant the General contractor.
c. The omission of the phrase "The Contractor shall" is intentional because the whole specification is directed to the Contractor. Omitted words or phrases shall be supplied by interference in the same manner as they are when "note" occurs on the drawings.
d. Where "as shown", "as indicated" or words of similar imports are used, it shall be understood that reference to the drawings accompanying the specifications is made unless otherwise stated.
e. Where "as directed"', "as required", "as permitted", "as authorized", "as approved", "as accepted" or words of similar imports are used, it shall be understood that the direction, requirements, permission, authorization, approval, or acceptance of the Architect is intended unless otherwise stated.
f. As used herein, "provided" shall be understood to mean "provide complete in place" that is "furnished and installed".

g. Most sentences are in the imperative mood. This style is especially suited for instructions covering installation of products and equipment

Example:
"Spread adhesives using notched trowel"

"Use a notched trowel"
"Install flooring with texture side up"
The verb is the first word of the sentence clearly defining the action to be performed. This style is readily understandable and concise.

PART - 2 GENERAL PARAGRAPHS

2.0 PROJECT INFORMATION

A. The work shall conform to the following contract drawings, detail and maps, all of which form a part of these specifications.

B. Omissions from the drawings or specifications or the mis-description of details of work which are manifestly necessary to carry out the intent of the drawings and specifications, or which are customarily performed, shall not relieve the Contractor from performing such omitted or mis-described details of the work but they shall be performed as if fully and correctly set forth and described in the drawings and specifications.

C. The Contractor shall check all drawings furnished him immediately upon their receipt and shall promptly notify the Project Manager of any discrepancies. Figures marked on drawings shall be followed in preference to scale measurements. Large scale drawings shall govern small scale drawings. The Contractor shall compare all drawings and verify figures before laying out the work and will be responsible for any error which might have been avoided thereby.

D. All drawings issued for construction to General Contractor/s, Sub – Contractors shall be furnished solely by the Architects.

E. Physical Data: The physical conditions indicated on the drawings and in the Specifications is the result of site investigations by survey and soil boring conducted. However it is expressly understood that the Architect/Designer will not be responsible for any interpretation or conclusion drawn there from.

F. It shall be the duty of the Contractor to carefully examine, compare, and verify the data furnished by the Plans and Specifications. Any doubt as to the meaning of the plans (including notes thereon) and the Specifications, or any obscurity as to the wording of the Specifications will be explained. All directions and explanations necessary and proper to make more definite and certain any requirements of the plans (including notes thereon) or of the provision of the Specification to give them duet effect, will be given by the Architect.

G. In any case of discrepancy in the figures or drawing, the matter shall be submitted immediately to the Architect, before any adjustment made by the Contractor save only at the latter's own risk and expense. The decision of the Architect on the adjustment of the discrepancies so as to

confirm the real intent of the plans and Specifications shall govern and shall be followed by the Contractor without extra charge.

2.1 PROTECTION OF MATERIALS, WORK AND PROPERTY

A. The Contractor shall put up and continuously maintain adequate protection of all his work from damage and shall protect the Owner's property, as well as all materials furnished and delivered to him by the Owner, from injury or loss except such as may be caused by agents or employees of the Owner

B. The Contractor shall adequately protect adjacent property as provided by law and the Contract Documents. The conclusion, building, or work in addition to any neigh boring property or building which may be jeopardized in any manner, must be thoroughly and substantially braced against winds, floods, setting, falling or like occurrences, and when necessary, covered and protected from sun and rain at the Contractor's expense. The Contractor shall be liable for all damages occasioned in any manner by his acts or neglect, or his agents, employees, or workmen.

C. If it is necessary in the prosecution of the work to interrupt or obstruct the natural flow of rivers or streams, the drainage of the surface, or flow of artificial drains, the Contractor shall provide for the same during the progress of the work in such a way that no damage shall result to either public or private interest. For any neglect to provide for either natural or artificial drainage which he may interrupted, he shall be liable for all damages which may result therefrom during the progress of the work.

2.2 INSPECTION OF WORK

A. The Architect and his representative shall, at all time, have access to the work wherever it is in preparation or progress and the Contractor shall provide facilities for such access and for inspection.

B. If the Specifications, the Architect's instruction, laws, ordinances or any public authority require any work to be specially tested pr approved, the Contractor shall given the Architect timely notice of its readiness for inspection, and if the inspection is by another authority than the Architect shall be promptly made, and where practicable, at the source of supply. If any work should be covered up without approval or consent of the Architect, be uncovered for examination at the Contractor's expense.

C. Should it be considered necessary or advisable by the Architect at any time before final acceptance of the entire work, to make an examination of the work already completed, remove or tear out same, the Contractor shall, on request, promptly furnished all necessary facilities, labor and materials. If such work is found to be defective in any material respect, due to the fault of the Contractor or his sub- contractor, he shall defray all expenses of such examination and of satisfactory reconstruction. If, however, such work is found to meet the requirements of the Contract, the actual cost of labor and material necessarily involved in the examination and replacement, plus 15 percent, shall be allowed the Contractor and he shall, in addition, if completion of the work has been delayed thereby, be granted a suitable extension of time on account of the additional work involved.

D. Defective work and material may be condemned or rejected by the Architect at any time before the final acceptance of the work. When such work has been condemned, it shall be taken out immediately by the Contractor and rebuilt in accordance with the plans and Specifications. When defective materials have been condemned, they shall be removed at once by the Contractor from the line of the work.

E. Failure or neglect on the part of the Architect, or any of his representatives, to condemn or reject bad or inferior work or materials shall not be construed to imply an acceptance of the work of the same, if such bad or inferior work or materials are discovered at any time prior to the final acceptance of the work or materials are discovered at any time prior to the final acceptance of the work by the Owner and the release of the Contractor.

2.3 CORRECTION OF WORK

A. The contractor shall promptly removed from the premises all materials condemned or rejected by the Architect as failing to conform to the contract, whether incorporated in the work, not and the Contractor shall promptly replace and re-execute his own work in accordance with the contract and without expenses of making good all work of the other Contractors destroyed or damaged by such removal or replacement.

B. If the Contractor does not remove such condemned or disapproved work and materials within a reasonable time, fixed by written notice, the Owner may remove them and may store the material at the expense of the Contractor.

C. Neither the final certificate nor any provision in the Contract Documents shall relieve the Contractor of the responsibility for faulty materials or workmanship and, unless otherwise specified, he shall remedy any defects due thereto and pay for any damage to other work resulting there from, which shall appear within a period of one (1) year from the date of substantial completion.

D. The Owner shall give notice of observed defects with reasonable promptness. All questions arising under this article shall be decided by the Architect, subject to arbitration.

2.4 CUTTING, PATCHING AND DIGGING

A. THE Contractor shall do all cutting, fitting or patching of his work that may be required to make its several parts come together properly and fit it to receive or be received by work of and other Contractors shown upon, or reasonably implied by the plans and Specifications for the completed structure, and shall make good after them as the Architect may direct.

B. Any cost caused by defective or ill-timed work is borne by the party responsible therefore. The Contractor shall not endanger any work by cutting, digging, or otherwise, shall not cut or alter the work of any other Contractor save with consent of the Architect.

PART -3 SUBMITTALS

3.0 PROPOSED MATERIALS SUBMITTALS, CATALOG AND SAMPLES

A. Proposed material submittals required of the Contractor shall be submitted within 30 calendar days after Notice to Proceed to allow sufficient time processing, review, approval and procurement before the Contractor is ready to use prior o written approval.

B. The Contractor shall furnish the name and addresses of the manufacturer of each material and equipment. Each submittal shall be accompanied by a cover letter by the Contractor.

C. The Contractor shall furnish three copies approval, giving full information, such as identifying description, catalog cuts, and data sheet as may be required for all material and equipment designated in the technical section of this specifications so as to identify in the submittals, with cross-references to the item number of the Contract drawings and specifications so as to identify clearly the use for which it is intended. Data submitted in a bound volume in the same numerical sequence as specifications section paragraphs.

D. The Contractor shall certify on all submittal that the material being proposed conforms to contract requirements. In the event of any variance, the Contractor shall state specifically with portions vary, and request approval of a substitute. Incomplete submittals and submittal inadequate data will be rejected.

E. Methodology should be provided by the manufacturers/suppliers.

3.1 SHOP DRAWINGS

A. Before starting the fabrication or installation of any of this wok, the Contractor shall submit drawings as may be required and designated in the technical section of these specifications.

B. In addition to the drawings designated in the technical sections, the Contractor shall furnish any and all sketches, drawing, and/or diagrams used in connection with the completion of the projects, to the Architect thru Project Manager. Drawings submitted for review or approval shall be clearly identified as their intended use in the project.

C. The Contractor shall prepare at his own expense submit with such promptness as to cause no delay in his own work or in that of any other Contractor doing work on the same building, one (1) electronic copy of pdf file in cd format (2) blue print copies in 20” x 30” size of all shop drawings as well as schedules, required connections, including all necessary corrections relating to artistic effect. The Contractor shall make any corrections by the Architect, file with him, two (2) corrected copies and furnish such other copies as may be needed.

D. The Contractor shall not relieve responsibility for any deviation from the requirements of the Contact Documents by the Architect’s approval of Shop Drawings, Product Data or Samples unless the Contactor has specifically informed the Architect in writing of such deviation at the time of submission and the Architect has given written approval to the specific deviation.

E. The Contractor shall not be relieved from the responsibility for errors or omission in the Shop Drawings, Product Data or samples by the Architect’s approval thereof.

F. No portion of the work requiring submission of a Shop Drawings, Product Data or Sample shall commenced until the submittal has been approved by the Architect. All such portions of the work shall be in accordance with approved submittals.

3.2 MAUFACTURER'S CERTICATES OF CONFORMANCE

A. Before delivery, manufacturer's certifications shall be furnished by the Contractor as required by the technical specifications. Pre-printed certification will not be acceptable. All certifications shall be in original copy. The original of all manufacturer's certifications shall name the appropriate items of equipment or material, specification, standard, or other document or material, specification, standard, or other documents specified as controlling the quality of that items item and shall have attached thereto certified copies of test data upon which the certifications are based. All certifications shall be signed the manufacturer's official authorized to sign certificates of conformance.

3.3 LABORATORY REPORTS

A. Reports shall cite the contract requirements, the test or analysis procedures used, the actual test result, and state that the item tested or analyzed conforms or fails to conform to the specification requirements. All test reports shall be signed by representative of the testing laboratory authorized to sign certified test reports.

3.4 WARANTY DOCUMENTS

A. In addition to warrantees required, the Contractor shall submit together with the technical publications specified herein, a copy of all warranty documents on all items of equipment, including those obtained in writing from sub-contractor, manufactures and suppliers.

3.5 TESTS AND INSPECTIONS (TESTING AND COMMISIONING BY "THIRD PARTY"-FROM CLIENT)

A. Test inspections and approvals of portions of the Work required by the Contract Documents or by laws, ordinances, rules, regulations or order public authorities having jurisdiction shall be made at an appropriate time. Unless otherwise provided, the Contractor shall make arrangements for such tests, inspections and approvals with an independent testing laboratory or entity acceptable to the Owner, or with the appropriate public authority, and shall bear all related costs of tests, inspections and approvals. The Contractor shall give the Architect timely notice of when and where tests and inspections are to be made so the Architect may observe such procedure. The Owner shall bear costs of tests, inspections or approvals which do not become requirements until after bids are received or negotiations conclude.

B. If the Architect, Owner or public authorities having jurisdiction determine that portions of the work require additional testing, inspection or approval not include under Sub-paragraph 3.6, item-A, the Architect will, upon written authorization from the Owner, instruct the Contractor to make arrangements for such additional testing, inspections or approvals by an entity acceptable to the Owner, and the Contractor shall give timely notice to the Architect when and where tests and inspections are to be made so the Architect may observe such procedures. The Owner shall bear such costs except as provided in Sub-paragraph 3.6 Item-C.

C. If such procedures for testing, inspection or approval under Sub-paragraph

3.6 items –A and –B reveal failure of the Work to comply with requirements established by the Contract Documents, the Contractors shall bear all costs made necessary by such failure including those of repeated procedures and compensations for the Architect's services and expenses.

D. Required certificates of testing, inspection or approval shall, unless otherwise required by the Contract Documents, be secured by the Contractor and promptly delivered to the Architect.

E. Tests or inspections conducted pursuit to the Contract Documents shall be made promptly to avoid unreasonable delay in Work.

3.6 EXTRA MATTERIALS (ATTIC STOCK)

A. Provide extra materials in quantities specified below:

1. Interior Stone: Provide 1/10 of 1% of each size, color and surface finish of Granite/Marble specified for countertop.
2. Finish Hardware: Provide ten (10) extra key lock cylinders for each Master keypad groups.
3. Tile: Provide 1/10 of 1% of each size, color and surface finish of tile specified
a. Ceramic tiles (floors and walls)
b. Homogenous tiles (matte and polished finish)
4. Acoustical Ceilings: Provide 1/10 of 1% of total acoustical unit area for extra tiles or panels.
5. Resilient Flooring: Provide 1/10 of 1% of flooring, linear meter of base and each material specified.
6. Carpet Tiles: Provide 1/10 of 1 % of each selected color and pattern selected.
7. Resinous Flooring: Provide 2 galloons (8-liters) of resinous coating materials, of each color selected. Label each container with color, type, texture, room locations and in addition to the manufacturer's label.
8. Paintings: Provide 1 gallon (4-liters) of each color, type and surface texture. Label each container with color, type, texture, room locations and in addition to the manufacturer's label.
9. Window Shades: Provide 2-each for control cords, rods and wands.

B. Deliver all extra materials to site with proper labels and place in location as directed by the Owner.

3.7 OPERATING AND MAINTENANCE MANUALS

A. The accuracy, relevancy and timeliness of well-developed, user-friendly O&M manual are becoming increasingly important. Hence, it is becoming more common for detailed, facility specific O&M manuals to be prepared prior to commissioning. The goal is to effectively support the life cycle of the product/equipment by realizing life-cycle cost savings. These manuals should be provided by manufacturers/suppliers for the protection of product/item supplied as well as to serve the warranty given.

3.8 AS-BUILT PLANS (BY CONTRACTOR)

A. Revised set of drawing submitted by a contractor upon completion of a project. They should reflect all changes made in the specifications and working drawings during the construction

process and show the exact dimension, geometry, and location of all elements of the work completed under the contract.

PART – 4 GENERAL CONDITIONS

4.0 OWNER'S RIGHT TO STOP THE WORK

A. If the contractor fails to correct Work which is not in accordance with the requirements of the Contract Documents as required by Paragraph of " Correction of Work" or persistently fails to carry out Work in accordance with the Contract Documents, the Owner by written order signed personally or by an agent specifically so empowered by the Owner in writing, may order the Contractor to stop the Work, or any portion thereof, until the cause for such order has been eliminated ; however, the right of the Owner to stop the Work shall not give rise to a duty on the part of the Owner to exercise the right for the benefit of the Contractor or any other person or entity, except to the extent required by coordination of activities of the Owner's own forces and of each separate Contractor with the work of the General Contractor.

4.1 OWNER'S RIGHT TO CARRY OUT THE WORK

A. If the Contractor defaults or neglects to carry out the Work in accordance with the Contract Documents and fails within a seven-day period after receipt of written notice from the Owner to commence and continue correction of such default or neglect with diligence and prompt-nests, the Owner may after such seven-day period. If the Contractor within such second seven-day period after receipt of such seconds notice fails commence and continue to correct any deficiencies the Owner may, without prejudice to other remedies the Owner may have correct such deficiencies, the Owner may without prejudice to other remedies the Owner may have correct such deficiencies. In such case an appropriate "Change Order" shall be issued deducting from payments then or thereof due the Contractor the cost of correcting the cost of correcting such deficiencies, including compensation for the Architect's additional services and expenses made necessary by such default, neglect or failure. If payments then or thereafter due to Contractor are not sufficient to cover such amounts, the Contractor shall pay the difference to the Owner.

4.2 OWNER'S RIGHT TO TERMINATE THE CONTRACT

A. The owner may terminate the contract if the Contractor:

1. Persistently or repeatedly refuses or fails to supply enough properly skilled workers or proper materials;
2. Fails to make payment to Subcontractors for materials or labor in accordance with the respective agreement between the contractor and the subcontractors;
3. Persistently disregards laws, ordinance, or rules, regulations or orders of a public authority having jurisdiction; or
4. Otherwise is guilty of substantial breach of a provision of the Contract Documents

B. When any of the above reason exist, the Owner, upon certification by the Architect that sufficient cause exist to justify such action, may without prejudice to any other rights or remedies of the Owner and after giving the Contractor and the Contractor's surely, if any, seven days' written notice, terminate employment of the Contractor and may, subject to any prior rights pf the surely:

1. Take possession of the site and all materials, equipment, tools, and construction equipment and machinery thereon owned by the Contractor;
2. Accept assignment of subcontracts pursuant to contingent assignment of sub-contracts; and
3. Finish the Work by whatever reasonable method the Owner may deem expedient.

C. When the Owners terminate the Contract for one of the reasons stated in paragraph 4.3, item A. the Contractor shall not be entitled to receive further payment until the Work is finished.

D. If the unpaid balance of the Contract Sum exceeds costs of finishing the Work, including compensation for the Architect's services and expenses made necessary thereby, such excess shall be paid to the Contractor. If shall costs exceed the unpaid balance, the Contractor or Owner as the case may be, shall be certified by the Architect, upon application and this obligation for payment shall survive termination of the Contract.

4.3 CHANGES IN THE WORK

A. Changes

1. Changes in the Work may be accomplished after execution of the Contract, and without invalidating the Contract, by Change Order, Construction Change Directive or order for a minor change in the Work, subject to the limitations stated in this article and elsewhere in the Contract Documents.
2. Change Order shall be based upon agreement among the Owner, Contractor and Architect; a Construction Change Directive requires agreement by the Owner and Architect and may be issued by the Architect alone.
3. Changes in the Work shall be performed under applicable provision of the Contract Documents, and the Contractors shall proceed promptly, unless otherwise provided in the Change Order, Construction Change Directive or order for a minor change in the Work.
4. If unit's prices are stated in the Contract Documents or subsequently agreed upon, and if quantities originally contemplated are so changed in a proposed Change Order or Construction Change Directive that application of such unit prices to a quantities of Work proposed will cause substantial inequity to the Own or Contractor, the applicable unit prices shall be equitably adjusted.

B. Change Order

1. A Change Order Is a written instrument prepared by the Architect and signed by the Owner, Contractor and Architect, stating their agreement upon all of the following:

a. A change in the Work
b. The amount of the adjustment in the Contract Sum, if any; and
c. The extent of the adjustment in the Contract time, if any.

2. Method used in determining adjustment to the Contract Sum may include those listed in "Construction Change Directive"

C. Construction Changes Directive

1. A Construction Change Directive is a written order prepared by the Architect and signed by the Owner and Architect, directing a change in the Work and stating a proposed basis for adjustment, if any, in the Contract Sum or Contact Time, or both. The Owner may by Construction Change Directive, without invalidating the Contract, order changes in the Work

within the general scope of the Contract consisting of additions, deletions or other revision, the Contract Sum and Contract Time being adjusted accordingly

2. A Construction Change Directive shall be used in the absence of total agreement on the terms of a Change Order
3. If the Construction Change Detective provides for an adjustment to the Control Sum, the adjustment shall be based on one of the following methods:

    a. Mutual acceptance of a lump sum properly itemized and supported by sufficient substantiating data to permit evaluation;
    b. Unit prices stated in the Contract Documents or subsequently agreed upon;
    c. Cost to be determined in a manner agreed upon by the parties and a mutually acceptable fixed or percentage fee; or
    d. As provided in sub-paragraph 6.

4. Upon receipt of a Construction Change Directive, the Contractor shall promptly proceed with the change in the Work involved and advise the Architect of the Contractor's agreement or disagreement with the method, if any, provided in the Construction Change Directive for determining the proposed adjustment in the Contract Sum or Contact Time.
5. A Construction Change Directive signed by the Contractor indicates the agreement of the Contractor there with, including adjustment in Contact Sum and Contract Time or the method for determining them. Such agreement shall be effective immediately and shall be recorded as Change Order
6. If the Contractor does not respond promptly or disagrees with method for adjustment in the Contract Sum, the method and the adjustment shall be determined by the Architect on the basis of reasonable expenditures and saving of those performing the Work attribute to the change, including, in case of an increase in the Contract Sum, a reasonable allowance for overhead and profit. In such case, and also under Sub-Paragraph C, item 3-b, the Contractor shall keep and present, in such form as the data Architect may prescribe, an itemized accounting together with appropriate supporting data. Unless otherwise provided in a Contract Documents, costs for the purposes of this item 6 shall be limited to the following:

    a. Cost of labor, including social security, old age and unemployment insurance, fringe benefits required by the agreement or customs, and workers or worker's compensation insurance;
    b. Cost of materials, supplies and equipment, including cost of transportation, whether Incorporated or consumed;
    c. Rental costs machinery and equipment, exclusive of hand tools, whether rented from the Contractor or others;
    d. Costs of a premiums for all bonds and insurance, permit fees, and sales, use or similar taxes related to the Work; and
    e. Additional costs of supervision and field office personnel directly attributable to the change.

7. Pending final determination of cost to the Owner, amounts not in dispute may be included in an Application for payments. The amount of credit to be allowed by the Contractor to the Owner for a deletion or change which results in a net decrease in the Contract Sum shall be actual net cost as confirmed by the Architect. When both additions and credits covering related Work or substitution are involved in a change. The allowance for overhead and profit shall be figured on the basis of net increase, if, any with respect to that change.

8. If the Owner and Contractor do not agree with the adjustment on the method shall be referred to the Architect for determination.
9. When the Owner and Contractor agreed with the determination made by the Architect concerning the adjustment in the Contract Sum and Contract Time, or otherwise reach agreement upon the adjustment, such agreement shall be effective immediately and shall be recorded by preparation and execution of the appropriate Changes Order.

C. Minor Changes in the Work

1. The Architect will have authority to order minor changes in the Work not involving adjustment in the Contract Sum or extension of the Contract Time and not inconsistent with the intent of the Contract Documents. Such changes shall be effected by written order and shall be binding on the Owner and the Contractor. The Contractor shall carry out such written order promptly.

4.4 CONTRACT TIME

A. Progress and Completion

1. Time limits stated in the Contract Documents are of the Contract by executing the Agreement; the Contractor confirms that the Contract Time is a reasonable period for performing the Work.
2. The Contractor shall not knowingly accept by the agreement or instruction of the Owner on writing, prematurely commence operation on the site or elsewhere prior to the effective date of insurance required by Article in "Insurance and Bonds" to be furnished by the Contractor. The date of such insurance. Unless the date of commencement established by a notice to proceed given by the Owner, the Contractor shall notify the Owner in writing not less than five days or other agreed period before commencing in the Work to permit the timely filling of mortgages, mechanic's liens and other security interests
3. The Contractor shall precede expeditiously with adequate forces and shall achieve Substantial Completion within the Contract Time.

B. Delays and Extension of Time

1. If the contractor is delayed at any time in progress of the Work by an act or neglect of the Owner or Architect, or of an employee of either, or of a separate Contractor employed by the Owner, or by changes ordered in the Work, or by labor disputes, fire, unusual delay in deliveries, unavoidable causalities or other cause beyond the Contractor's control, or by other causes which the Architect determines may justify delay, then the Contract Time shall be extended by Changes Order for such reasonable time as the Architect determine.
2. Claims relating to time shall be made in accordance with applicable provision of "Claims and Dispute".
3. This paragraph "Delay and Extension of Time" does not preclude recovery of damages for delay by either party under other provision of the Contract Documents

4.5 SUBSTANTIAL COMPLETION

A. When the Contractor considers that the Work, or a portion thereof which the Owner agrees to accept separately, is substantially complete, the Contractor shall prepare and submit to the Architect a comprehensive list of items to be completed or collected. The Contractor shall proceed promptly to complete and correct items on the list. Failure to include an item on such list does not alter the responsibility of the Contractor to complete all the Work in accordance with the Contract Documents. Upon receipt of the Contractor's list, the Architect will make an

inspection to determine whether the Work or designated portion thereof is substantially complete. If the Architect's inspection discloses any item, whether or not included on the Contractor shall before issuance of the Certificate of Substantial Completion, complete or correct such items upon notification by the Architect. The Contractor shall then submit a request for another inspection by the Architect to determine Substantial Completion. When the Work or designated portion thereof is substantially complete, the Architect will prepare a Certificate of Substantial Completion which shall established the date of Substantial Completion, shall established responsibilities of the Owner and the Contractor for security, maintenance, heat, utilities, damage to the Work and insurance, and shall fix the time within which the Contractor Documents shall commence on the date of Substantial Completion of the Work or designated portion thereof unless otherwise provided in the Certificate of Substantial Completion. The Certificate of Substantial Completion shall be submitted to the Owner and Contractor for their written acceptance of responsibilities assigned to them in such Certificate.

4.6 PARTIAL OCCUPANCY OR USE

A. When the Contractor considered a portion substantially complete, the Contractor shall prepare and submit a list to the Architect as provided under paragraph "Substantial Completion" Consent of the Contractor to a partial occupancy or use shall not be unreasonably withheld. The stage of the progress of the Work shall be determined by the written agreement between the Owner and the Contractor or, if no agreement is reached, but decision of the Architect.
B. Immediately prior to such partial occupancy or use the Owner, Contractor and Architect shall jointly inspect the area to be occupied or portion of the Work to be used in order to determine and recorded the condition of the Work.
C. Unless otherwise agreed upon, partial occupancy or use of a portion of the Work shall not constitute acceptance of Work not complying with the requirements of the Contract Documents.

4.7 PROTECTION OF PERSONS AND PROPERTY

A. Safety Precautions and Programs

1. The contractor shall be responsible for initiating, maintaining and supervising all safety precautions and programs in connection with the performance of the Contract.

2. In the event the Contract encounters on the site material reasonably believed to be asbestos or polychlorinated biphenyl (PCB) which has not been rendered harmless, the Contractor shall immediately stop Work in the affected area shall not thereafter be resumed except by written agreement of the Owner and Contractor if in fact the material is asbestos or polychlorinated biphenyl (PCB) and has not been rendered harmless. The Work in the affected area shall be resumed in the absence of asbestos or polychlorinated biphenyl (PCB), or when it has been rendered harmless, by written agreement of the Owner and the Contractor, or in accordance with final determination by the Architect on which arbitration has not been demanded, or by arbitration under "Administration of the Contract"

3. The Contractor shall not be required, pursuant to paragraph on "Changes in the Work", to perform without consent any Work relating to asbestos or polychlorinated biphenyl (PCB)

B. Safety of the Person and Property

1. The Contractor shall take reasonable precautions for safety of, and shall provide reasonable protection to prevent damage, injury or loss to:

   a. Employees on the Work and other persons who may be affected thereby;

   b. The Work and materials and equipment to be incorporated therein, whether in storage on or off the site, under care, custody or control of the Contractor or the Contractor's Subcontractors or Sub-subcontractors; and

   c. Other property at the site or adjacent thereto, such as trees, shrubs, lawns, walks, pavements, roadways, structures band utilities not designated for removal, relocation or replacement in the course of Construction.

2. The Contractor shall give notices and comply with applicable laws, ordinance, rules, regulations, and lawful orders of public authorities bearing on safety of persons or property or their protection from damage, injury or loss.

3. The Contractor shall erect and maintain, as required by existing conditions and performance of the Contract, reasonable safeguard for safety and protection, including posting dangersigns and other warnings against hazards, promulgating safety regulations and notifying Owners and Users of adjacent sites and utilities.

4. When use or storage of explosive or other hazardous materials or equipment or unusual methods are necessary for execution of the Work, the Contractor shall exercise utmost care and carry on such activities under supervision of properly qualified personnel.

5. The Contractor shall promptly remedy damaged and loss (other than damage or loss insured under property insurance required by the Contract Documents) to property referred to in sub-paragraph 4.7, B, items – 1b and – 1c caused in whole or in part by the Contractor, a Subcontractor, a Sub-subcontractor, or anyone directly or indirectly employed by anyone for whose acts they may be liable and for which the Contractor is responsible under Sub-paragraph 4,7, B, items – 1b and – 1c except damage or loss attributable to actor omissions of the Owner or Architect or anyone directly or by anyone employed by either of them, or by anyone for whose acts either of them may be liable, and not attribute to the fault or negligence of the Contractor . The foregoing obligation of the Contractor are in addition to the Contractor's obligation under paragraph of "Indemnification"

6. The Contractor shall designate a responsible member of the Contractor's organization at the site whose duty shall be the prevention of accidents. This person shall be the Contractor's superintendent unless otherwise designated by the Contractor in writing to the Owner and the Architect.

7. The Contractor shall not load or permit any part of the Construction or site to be loaded so as to endanger its safety.

C. Emergencies

1. In an emergency affecting safety persons or property, the Contractor shall act, at the Contractor's discretion, to prevent threatened damage, injury or loss. Additional compensation or extension of time claimed by the Contractor on account of an Emergency shall be determined as a provided as provided in paragraphs of "Claims of Dispute" and "Changes in the Work".

4.8 UNCOVERING AND CORRECTION OF WORK

A. Uncovering of Work

1. If a portion of the Work is covered contrary to the Architect's request or to requirements specifically expressed in the Contract Documents, it must, if required in writing by the Architect, be uncovered for the Architect's observation and be replaced at the Contractor's expenses without change in Contract Time.

2. If a portion of the Work has been covered which architect has not specifically requested to observe prior to its being covered, the Architect may request to see such Work and it shall be uncovered by the Contractor. If such Work is in accordance with the Contract Documents, costs of uncovering and replacement shall, by appropriate Change Order, be charged to the Owner. If such Work is not in accordance with the Contract Documents, the Contractor shall pay such costs unless the condition was caused by the Owner or a separate Contractor in which event the Owner shall be responsible for payment of such costs.

B. Correction of Work

1. The Contractor shall promptly correct work rejected by the Architect or failing to conform to the requirements of the Contract Documents whether observed before or after Substantial Completion and whether or not fabricated, installed or completed. The Contractor shall bear costs of correcting such as rejecting Work, including additional testing and inspection and compensation for the Architect's service and expenses made necessary thereby.

2. If within one year after the date of Substantial Completion of the Work or designated portion thereof, or after the date of commencement of warranties established under Subparagraph 4.6, items- A or by terms of an applicable special warranty required by the Contract Documents, any of the Work is found to be not in accordance with the requirements of the Contract Documents, the Contractor shall correct it promptly after receipt of written notice from the Owner to do so unless the Owner has previously given the Contractor a written acceptance of such condition, This period of one year shall be extended with respect to portions of Work first performed after Substantial Completion by the period of time between Substantial Completion and the actual performance of the Work. This obligation under this Subparagraph item-2 shall survive acceptance of the Work under the Contract and termination of the Contract the Owner shall give such notice promptly after discovery of the condition.

3. The Contractor shall remove from the site portions of the Work which are not in accordance with the requirements of the Contract Documents and are neither corrected by the Contractor nor accepted by the Owner.

4. if the Contractor fails to correct non-conforming Work within a reasonable time, the Owner may correct in accordance with Paragraph 4.1, Item-A. If the Contractor does not proceed with correction of such non-conforming Work within a reasonable time fixed b written notice from the Architects, the Owner may remove it and store the salvageable materials o equipment at

the Contractor's expense. If the Contractor does not pay costs of such removal and storage within ten dogs otter written notice, the Owner may upon, ten additional days' written notice sell such materials and equipment at auction or at private sale and shall account for the proceeds thereof, after deducting costs and damages that. should have been borne by the Contractor, including compensation for me Architect's services and expenses made necessary thereby. If such proceeds of sole do not cover costs which the Contractor should have borne, the Contract Sum shall be reduced by the definitely. If figments then or thereafter due the Contractor are not 'sufficient to cover such amount, the Contractor shall pay the difference to the Owner.

5. The Contractor shall bear the costs of correcting destroyed or damaged construction, whether completed or partially competed, of the Owner or separate Contractors caused by the Contractor correction or removal of Work which is not in accordance with the requirements of the Contract Documents.
6. Nothing contained in this Paragraph 4.8, item -B shall be construed to establish a period of limitation with respect to other obligations which _the Contractor might have under the Contract Documents Establishment of the time period of one gear as described in Subparagraph 4.8, items B-2 relates only to the specific obligation of the Contractor Documents may be sought to be enforced, nor to the time within which proceedings may be commenced to establish the Contractor respect to the Contractor's obligations other than specifically to correct the Work

4.9 CONSTRUCTIOM GUIDELINES

A. The General Contractor and its nominated sub-contractors and/or suppliers including specialty contractor must comply to the following procedures in compliance to materials, specifications per owner's requirements for endorsement of the Architect in charge for Owner's approval.

B. Submit at least 3 material samples as specified, c/w product technical data and existing project where the materials have been installed/applied.
C. Plant visit if required, accountable to the supplier.
D. Submit shop drawings plans for Architect's review. Provide 3 mock-ups for endorsement to the Owner.
1. Any discrepancy or details not clear/shown on plan and specification shall be as (RFI) Request for Information to be replied by the Design Architect.
2. All mock-ups and materials sample based on specifications, the contractor must provide (RFA) Request for Approval for Architect's comments and review prior to endorsement to the Client.
3. The Owner/Client has right to conduct value engineering works to be reviewed by the Architect.

E. Methodology/Application procedures. (Method Statement).

F. Upon approval of materials, the Contractor shall 8, provide warranty at least 2 to 5 gears as per client's requirements and attic stock (Spare materials) is least- 2% to 10% of total materials for Owner's maintenance stock.

1. The Contractor must submit updates on BOQ Progress. York Schedule without cost implication.
2. The Contractor must conduct monthly progress report, with power point presentation curing fortnightly meeting to be scheduled every last Friday of the month.

G. No change order and price escalation with or without cause, delays or acts or nature. The Contractor shall not be relieved from their responsibilities.

H. Upon turn-over all works are subject to Punch listings: Pre-punch list and of Acceptance or Closing out of material workmanship quality. final punch listing prior to Certificate

I. The Contractor must provide Safety Officer 8 Security Guard, QA/QC procedures, as-built plans and materials maintenance manual 8 procedures, as-built plans and maintenance manual procedures.

J. All and above procedures shall be the responsibilities of the contractor without time and cost impact to the project duration bases on Contractor's Contract.

K. The Contractor must be aware & faithfully follow all restrictions, house rules, regulators, within the premises of trio project as per requirements of the client.

L. All Workers must have (PPE) Personal Protection Equipment's, safety shoes, hardhat, gloves, goggles harness, reflectorized vest, boots& coats to ensure safety on all times.

PART -5 SUMMARY OF MATERIALS AND FINISHES

5.0 GENERAL

A. All applicable provisions of the different divisions of the Specifications for each work trade shall apply for all items cited in these Specifications.

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

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

D. Any details shown on the plans/drawings but not stated in the specifications shall be considered as existing in both. In case of conflict in scale and dimensions, the interpretation of the designing Architect shall be allowed

E. Materials and Finishes for on-site improvements and facilities:

   A. Demolition/clearing, excavation and site grading works in preparation for the construction and eventually, for landscaping.
   B. Construction of. (i) Curbs and gutters, walks and miscellaneous slabs, (ii) Below grade structures such as septic vault, manhole, area drain, catch basins and grease trap.

C. Exterior utility lines, raceway system, fixtures, switches/buzzers of control at their terminals and including fittings and accessories as required by the specialty trades under plumbing and electrical works.

F. Off-site improvements shall generally be under responsibility of the Owner included in the Contract with the exception of the following which shall be part of the Contractor's work.

1. Permanent connections to the local utility lines for electrical, water, drainage and sewer Lines including equipment, facilities, materials, fees, and/or work which utility companies or authorized may require of the applicant Owner.

5.1 SECURING PERMITS

A. Visit the site of the work and examine the premises to fully understand all existing conditions relative to work. No increase in cost or extension of performance time be considered for failure to verify and know actual site conditions.

B. Contractor to secure and pay for all necessary permits needed for the work.

C. Contractor to protect adjacent properties, persons, shrubs, trees, lawns, structures, and utilities therein against harm or damage.

D. Contractor to provide sheet piles, if necessary to protect adjacent properties.

5.2 CONCRETE AND MASONRY WORKS

5.2.1 STEEL BARS AND TIE-WORKS

A. Standard: Use reinforcing steel conforming to ASTM Standards, deformed for concrete and masonry reinforcement.
B. High Tensile Grade Deformed Bars: 413 70 MPa, Fy= 60,000psi for 20mm diameter and above Intermediate Grade Deformed Bars: 275 80 MPa, Fy= 40,000psi for 16mm diameter, and below. All reinforcement shall be deformed or otherwise specified. if distances are specified in the plans/drawings do not use undersize reinforcing bars. Use only the size of the ASTM (10mm, 12mm, 16mm, 20mm and 25mm diameters) Equal to "Power steel", "DN Steel", CT, "Steel Asia"
C. The wires: Use Ga, #1 6 G.I. tie wires, double strands at joints or laps of place reinforcement as indicated in the plans.

5.2.2 CAST-IN- PLACE CONCRETE

A. Cement: shall be as per ASTM Standard Specifications for Portland Cement (ASTM Designation C-150 latest revision) Type 1 Use one (1) brand for the whole structural and masonry works'. Class "A" mixture (1:2.4), 27 60 MPa (4,000psi) shall be used for all reinforced concrete slabs, columns, beams, column footings, wall footings, reinforced concrete slab of septic vault. Equal to Holcim", "Republic" brands, "CEMEX"

B. Aggregates Gravel-crushed gravel hard uncoated grain, strong, and durable reasonably clean stones, Use 25mmoa (1") maximum for footing, 19mmo (3/4") for all beams, slabs, columns and 2m mma(1 ") for compacted gravel bed for slab on fill.
C. Sand clean, washed sand: Sand from salt water is not allowed

D. Water Fresh and fit for drinking, free from injurious amount of oil, acids, alkali, organic materials, and other deleterious substances

5.2.3 MASONRY

A. Concrete Hollow blocks (CHB) Use 150mm (6") thick for exterior wall and 100mm (4") thick for interior wall, 700 psi for load bearing capacity, and 400psi tor non-load bearing capacity as indicated in the plans Equal to "Quality-Star Concrete Products", "Jackbit Industries, Inc.," or "CJRN Concrete block "
B. All concrete hollow blocks shall be laid out with cement Mortar as specified with vertical 'joints breaking half-way over course below unless otherwise shown on plans. Bed joints (horizontal) and joints (vertical)must be filled with mortar thoroughly to avoid leakage or moisture.
C. All concrete hollow block walls shall be built plumbed, true to the given dimension with blocks always set to bond and breaking joints.
D. Class B- 1:3, 17.24 Mpa (2,500psi) as concrete mortar works with mix texture as required Cement mortar shall be one (1) part Portland Cement and shall be one (1) part line out and four and one- half (4 1/2) parts sands by volume, but not more than one (1) Part Portland Cement. No cement shall be used for exceeding one hour. Mortar which shows tendency to become dry before this time shall have added it and be mixed.

5.2.4 CONCRETE FORMWORKS

A. Check all forms to conform to the shape, lines and dimensions of the members as called for in the plans. The forms shall be substantial and designed to resist the pressure and weight of the concrete, and be properly tied and braced or shored so as to maintain position and shape. They shall be sufficiently light to prevent leakage of mortar.
B. Check all formwork for the plumpness and correct alignment.
C. Provide openings in column form for cleaning and inspection preferably at lowest points of pour lifts immediately before depositing concrete.
D. Provide chamber for cantilever and long span beams or as indicated in Construction notes.
E. Always provide continuous vertical supports for framework directly below any pour line. All exposed corner shall be square.
F. Remove from only upon approval of the Engineer in such manner and ask such time as to insure the complete safety of the structure. In no case shall the supporting forms and shoring's be removed until the members have attained sufficient strength support safety their weight and load thereon.
G. Exercise due care while stripping forms and protect corner subsequently against shipping or other damage by approved means.

5.2.5 ADHENSIVES AND GROUNTS

A. Adhesive; for adhesion of tiles and natural stone use polymer cementitious thin- set powder to be mixed with water; equal to " Smart bond tile AdhensiveC2S1- Build rite chemical industries" Laticrete 325 Premium Tile Adhesive" or "Bertonit" or approved equivalent.

B. Provide a grout joint that is dense, hard and durable; equal to "Tile grip - Buildrite chemical industries" " Laticrete 1600 Unsanded Grout" or “Bentonit" or approved equivalent.
C. Slips resistant treatment- Slip Resistant Finish: Aluminum oxide dry powder type, color, as selected form manufacture's standard range; manufactured "MBTech" or 'Sika" or " ParexDavco" products.
D. Epoxy concrete bonding agent-Epoxy Concrete Bonding Agent: For bonding fresh concrete to existing concrete surfaces with direct shears bond strength of 7.0-10.5 Mpa, equal to " Buildrite Construction Chemicals" Seal bond chemical industries "MBTech" or "Sika" products.

5.2.6. STANDARD VOC LIMITS

Floor coating applied elements shall the VOC content limits established in South Coast Air Quality Management District (SQAQMD) Rule 1113, Architectural Coating, rules in effect on January 1, 2004
Rule 1168, Adhesive and Sealants, rules in effect July 1, 2005 and Green Seal Standard, GS-11, Calculate according to 49CFR 59, Subpart D (EPA Method 24).
Coating Category Ceiling Limit Current Limit Concrete-Curing Compound 350 100
Floor Coating 420 50 Industrial Maintenance (IM) Coatings 420 50
Magnetite Cement Coating 600 450
Mastic Coatings 300
Metallic Pigmented Coating 500 Waterproofing Sealer 400 100 Waterproofing Concrete/ Masonry Sealers 400 100
Law- Solid Coating 120

5.3.1 EXECUTION

5.3.8 GENERAL

A. Related miss-formed surfaces are to be truck off, floated and/or troweled to product texture consistent with adjacent formed surfaces or as indicated on the drawings
B. Do not sand float, bag, sack, grout, clean or otherwise apply cementitious masking to formed surfaces.
C. Storing (or rubbing) shall be done with a carborundum stone with only enough water to develop a cement paste from the concrete mortar.

5.3.9 EXAMINATION

A. Verify site conditions.
B. Verify that floor surfaces are acceptable to receive the work of this section.

5.4 METALS
5.4.1 STRUCTURAL STEEL

A. All structural steel shall conform to ASTM A-36 steel.
B. All arc-welding electrodes shall conform to AWS Specifications for Iron and Steel Arc Welding Electrodes latest edition. Electrodes for arc-welding shall be E-60 and E-70 series.
C. All bolts, nuts and washers shall conform to ASTM A- 370 and ASTM A-325 specifications
D. All arc-welding electrodes shall conform to AWS Specifications for Iron and Steel Arv Welding Electrodes latest edition. Electrodes for arc-welding shall be E-60 and E-70 series.

E. All bolts, nuts and washers shall conform to ASTM A-370 and ASTM A-325 specification
F. All arc-welding electrodes shall conform to AWS Specification for Iron and Steel Arc Welding Electrodes latest edition. Electrodes for arc-welding shall be E60 and E-70 series
G. All bolts, nut and washers shall conform to ASTM A-370 and ASTM A-325 specifications.
H. Steel Tubing: ASTM A500, Grade B.
I. Plates: ASTM A283
J. Pipe ASTN A53, Grade B Schedule 40
K. Fasteners: Stainless steel.
L. Bolts, Nuts, and Washers: ASTM A325, galvanized to ASTM A153 for galvanized components.
M. Welding Materials: AWS D1. 1; type required for materials being welded.
N. Shop and Touch-Up Primer: SSPC 15, Type 1, red oxide, VOC content: not more than 250g/L when calculated according to 40CFR 59 Subpart D (EPA Method 24).

5.4 ALUMINUM

A. Extruded Aluminium: ASTM B221, Alloy 6063, Temper T5
B. Sheet Aluminium: ASTM B209
C. Aluminium-Alloy Drawn Seamless Tubes: ASTM B210, Alloy 6063, Temper T6.
D. Aluminium-Alloy Bars: ASTM B211, Alloy 6063, Temper T6.
E. Bolts, Nuts, and Washers: Stainless steel.
F. Welding Materials: AWS D1,1. type required for materials being welded.

5.5 FINISHES

Steel

1. Clean surfaces of rust, scale, grease, and foreign matter prior to finishing. Do not prime surfaces in direct contact with concrete or where field welding is required. Prime paints items with one coating.
2. Structural Steel Member: Galvanized after fabrication to ASTM A123. Provide minimum 380 g/sq. m galvanized coating.
3. Non-structural Items: Galvanized after fabrication to ASTM A123. Provide minimum 380 g/sq. m galvanized coating.
4. Chrome Planting: ASTM B177, weight, nickel-chromium alloy, satin polished finish.
5. Repair of Zinc-Coated Surfaces: Repair surfaces damaged by welding or other means with galvanizing repair paint conforming to High Zinc Dust Content. Galvanizing repair point or by the application of stick or thick paste metallic specifically- designed for repair of galvanizing as approved. Clean areas to be repaired and remove the slag from the welds. Surfaces to which stick or paste materials is applied, shall be heated with a torch to aa temperature sufficient to melt the materials in stick or paste, spread the molten material uniformly over surfaces to be coated and wipe the excess material off.

5.6 RAILINGS/HANDRAILS:

A. Exterior Railings: Constructed of 38mm diameter, Stainless steel pipe handrails and vertical bar railings, with paints finish as shown on the drawings. Install at Fire escape railings and as indicated in drawings.
B. Provide Stainless Handrails with vertical and horizontal bars on all ramps for all buildings s specified in the drawing.

5.8 ROOFING FRAMEWORK:

A. Shall be fabricated from structural steel frames of design and profile as indicated on the drawings. Equal to "SteelTech", " "Puyat steel" or " Philmetal Products Incorporated. Construct and install at areas indicated.

5.9 COLD FORMED STEEL FRAMING:

A. Thus includes metal studs, tracks, channel, tee runners, and furring's, with zinc coating to protect steel corrosion. Equal to " Jea Steel- Jwa Maxx", Philmetal Products Incorporated or " World Urban- CMT" products.

5.10. SAFETY NOSING:

A. At Bridgeway: Shall be 10 mm grooves on architectural none skid tiles or aluminum fluted nosing installed on areas indicated on the drawings.

5.11. MISCELLANEOUS

A. Miscellaneous materials or accessories not listed above shall be provided as specified hereinafter the various items of work and/or indicated on the plans/drawings.

6.0 WOODS
6.1. LUMBER:

All lumber shall be of approved quality of the respective kinds required for the various parts of the works and be well-seasoned, free from large saps, loose knots, shakes or other imperfections impairing is strength and durability equal to"Armourwood"or"Mafimco-Matwood"or approved equivalent, all exposed surfaces shall smoothly have dressed and dried.

A. Apitong, Sound and thoroughly seasoned, warp free, pressure treated wilh approved preservatives smooth and level on one side or wherever in correct paneling.
B. Tanguile or Mohagany: kiln dried, S4S sound, hard and fee from lumber defects, use one color or shade for assembly framing which are exposed. Use Tanguile or Mahogany KD for wood not specified elsewhere, and other interior or finishing carpenter work.
C. Frames: Doors, or other openings where so indicated on plans, shall have frames and sills of the dimensions shown or as indicated on door schedules. Frames in contract with concrete shall be enclosed by 20d nails, spaced not more than 200mm (8") on center around the contract surfaces and paint with two (2) coats of mop asphalt.

D. Fastening: Fastening shall be common nails flathead wood screws (R. H, W. S.), bolts or lag screws where specifically called for. Conceal fastenings as far as possible, locate them in inconspicuous place. Where nailing is permitted through woodwork face, conceal nail heads, below
E. Hardware and Fasteners: Use metal nails, screws, bolts, miscellaneous fasteners or anchorage concealed or countersunk whenever called for, with size shape and type to members in place. Use "Sikwel" or other approved water-resistant glue for cabinet framing joints.

D. Adhesive: Laminating adhesives used to fabricate on-site woodworks must not contain added urea-formaldehyde resins. Adhesives must comply with South Coast Air Quality Management District (SCAQMD) Rule # 1168, Volatile Organic Compound (VOC) limits as listed

Architectural/Specialty	VOC Limit (g/L less wafer)
Multipurpose construction adhesives	70
Contact Adhesive.	80
Special Purpose Contract Adhesive.	250
Structural Wood Member Adhesive.	140
Substrate Specifics Applications	VOC Limit (g/L less water)
Wood	30

E. Wood Preservative: All lumber should be treated to prolong its lifespan and be protected from termites, woodborers and fungi, equal to "Woca oil","Solignum" or "Bona"or approved equivalent.

6.2 PLYWOOD OR PLYBOARD

A. 19mm (3/4") the, Class-A Marine Plywood/Plyboard : For woodwork/cabinetry requirements. 1/4"thk. Plywood for backing.

6.3 Built-in Counters, Cabinets and Shelves: Fabricate counters, cabinets and shelves in accordance with details shown,

A. Make all wood Finish, and millwork true to details, clean and sharply defined. Erect cabinet straight, level and plumb and securely anchor in place. Set panels to allow for free movement in case of shrinkage or swelling. Conceal means fastening various parts together. Separate with 6mm (1/4") stone-cut joints all interior trims set against concrete, masonry or wood. Make mill melding perfectly smooth on exposed surfaces and True to profile. Make joints tight and in a manner to conceal shrinkage. Secure trim with fine finishing nails, screws, or glue where required. Set nails for putty stopping. Install counters, cabinets and shelves with complete hardware. Use High Pressure Laminate Finish equal to "Formica" or approved equal for Kitchen cabinets or other cabinets specified in the drawings.

7.0 MOISTURE AND THERMAL PROTECTION

7.1 Caulking

A. Polyurethane or Silicone sealant, equal to "Bostik, Sika, or Dow Corning", for all joints gaps between steel/metal and concrete, for joint gaps between lavatory and countertop and where indicated. Provide sealant in accordance with the manufacturer's recommendations. Apply sealant in continuous manner so as to fill entire width and required depth of joint without voids or air pockets.

B. Fire stop Sealants, equal to "Hill", Specsea" or "3M" used to seal openings and joints in fire resistance wall and/or floor assemblies. Fire stops are designed to restore the fire- resistance of wall and/or floor assemblies by impeding the spread of fire by filling the openings with fire resistant materials.

7.2 WATERPROOFING

7.3.1 CAPILLARY TYPE WATER PROOFING

A. Shall consist of a blend of moisture-activated chemicals, high-grade silica aggregates and selected cements. It waterproofs through the formation and development of crystals in water bearing capillaries and interstices, effectively blocks the further passage of water and ensures permanent water tightness of the structure. Apply capillary waterproofing on interior face of floor and walls of Elevator pits prior to required finishes. This surface applied capillary water proofer to concrete mortar shall be equal to "Crystor- Build rite construction chemical", "Seal proof of CW-Seal bond chemical industries"

B. Cementitious/crystallization type. Shall be chemically controls and permanently fixes non-soluble crystalline growth throughout the capillary voids of the concrete. Provide a complete system for horizontal and vertical application including primers and sealants by a single manufacturer.
   1. Concentrate Compound: Shall be in dry pack consistency for filling form tie holes, sealing strips and structural defects.
   2. Modified Compound: Used for a second coat where 2-coats are required, or in a mortar consistency for placement of a cove strip.
   3. Ultra Plug and Liquid Quickset: Used for plugging cracks and joints against a direct flow of water.

A. Membrane Waterproofing

1. Apply surface conditioner at a rate recommended by manufacturer. Protect conditioner from rain until dry. Apply 300 mm wide strip of joint cover sheet over cracks, non-working joints, and expansion joints over 1.6 mm but not exceeding 13 mm in width. At expansion joints from 13 25 mm in width, loop cover sheet down into joint between 31 and 44 mm. Extend sheet 150 mm on either side of expansion joint. Center joint cover sheet over crack or joints. Roll joint cover sheet into 3.2 mm coating of waterproofing material. Apply second coat over sheet extending minimum of 150 mm beyond sheet edges. Apply this procedure to expansion joints between horizontal and vertical surfaces. Apply waterproofing material in accordance with manufacturer's instructions. Continue waterproofing material up vertical surfaces minimum 150 mm. Install can’t strip at internal corners. Apply extra thickness of waterproofing material at corners, intersections, angles, and over joints. Seal watertight, items projecting through waterproofing material. Extend waterproofing material and flexible flashing into drain clamp flange, apply liberal coating of liquid membrane to assure clamp ring seal. Install membrane flashing and seal into waterproofing material.

7.4 PRODUCT

A. Manufacturers:

1. Buildrite construction chemicals - "Crystor" Seal bond chemical industries "Seal proof of CW cementitious Crystallization".
2. Davco "K-11 flex" & "K-11 super flex" - Cementitious Waterproofing.
3. Elastomeric radiation control coating, emulsion of high grade acrylic resin in water. "Therma coat" from "Premiere Cleantech". Thermacoat TC 938/45s/101 can be applied by airless spray or by brush roller.

B. Application Area

a. For all toilets, male and female toilets, powder rooms, balcony apply cementitious, equal to Davco "K-11 flex" or K-11 super flex" from Parex Davco.
b. Epoxy Tank Lining, shall be 100% solids two-component epoxy coating formulated from high-grade resins and curing agents; equal to "Buildrite construction chemicals-Protek ETL "Specserv's Spexcoat","Crystor - buildrite construction chemical". Apply epoxy thank lining for interior slab and perimeter walls of SYP Cistern tanks and Water Storage Tanks.
c. For roof deck use Davco "K-10 plus". Apply waterproofing in accordance to manufacturer's standard instructions or applications.

7.5 JOINTS

A. Apply bentonite packing and sealer at construction control joints.

7.5.1 PROTECTION OF FINISH WORK

A. Protect finished Work.
B. Do not permit traffic over unprotected or uncovered waterproofing.
C. Protect installed waterproofing from precipitation or ground water with temporary polyethylene sheeting. When back filling begins, remove sheeting.
D. Protect waterproofing from damage by adhering protection board over waterproofing surface Scribe and cut boards around projections and interruptions.
E. Backfill as soon as possible after installation has been approved, working in strict accordance with the pertinent provisions of other Sections of these Specifications.

7.5.2 ENVIRONMENT REQUIREMENTS

A. Maintain temperature and humidity recommended by the sealant manufacturer during and after installation.

7.5.3 COORDINATION

A. Coordinate work under provisions of the General Requirements.
B. Coordinate the work with all sections referencing this section.

7.5.4 WARRANTY

A. Provide five-year warranty as required.
B. Warranty Include coverage for installed sealants and accessories whick fail to achieve air tight. seal, water tight seal, and exhibit loss of adhesion or cohesion, or do not cure.

7.6 PRODUCTS

Manufacturers/Suppliers

1. Dow Sil-Silicone Building Sealant "795 or 790"
2. Sika-Silicone Sealants - "Sikasil SG-18 or WS-305" or sikaflex"

3. GE/Toshiba-Ultraglaze 4000 or Silglaze II or silpruf.

7.7 SEALANTS

A. Polyurethane Sealant ASTM C920, Grade M,Class 25,Use NT,multi component,chemical

1. curing, non-staining, non-bleeding, capable of continuous water immersion, non-sagging type.
2. color as selected.
3. Elongation Capability 25 percent.
4. Service Temperature Range 40 to 82 degrees C.
5. Shore A Hardness Range 20 to 35

B. Silicone Sealant: ASTM C920, Grade S, Class 25, Use NT, single component, solvent curing, on-sagging, non-staining, non-bleeding, color as selected

1. Elongation Capability 25 percent
2. Service Temperature Range 54 to 82 degrees C 3 Shore A Hardness Range 15 to 35

C. VOC Content of Interior Sealants. Provide sealants and sealant primers for use inside the weatherproofing system that comply with the following limits for VOC content when calculated according to 40 CFR 59, sub party D (EPA method 24)

1. Architectural sealants: not more that 250g/L
2. Non-membrane roof of sealants 300g/L
3. Sealant Primers for Non-Porous Substances. not more than 250g/L
4. Sealant Primers for Porous Substances; not more than 775g/L

7.8 ACCESSORIES

A. Primer: Non staining, quick-drying type of consistency recommended by sealant manufacturer to suit application.
B. Joint Cleaner: on corrosive and non-staining type, recommended by sealant manufacturer, compatible with joint forming materials.
C. Joint Backing: ASTM D1056; round, foam rod; oversize 30 to 50 percent larger than joint width Glass fiber roving or neoprene, butyl, polyurethane foams free from oil or there staining elements as recommended by sealant manufacturer. Backing material shall be compatible with sealant.
D. Band Breaker: Pressure sensitive tape recommended by sealant manufacturer to suit application.

7.9 EXECUTION

7.9.1 EXAMINATION

A. Examine the substrates, adjoining construction and the conditions under which the work is to be installed. Don not proceed with the work until unsatisfactory conditions have been corrected.

B. Examine anchorage of substrate to determine whether it is strong enough to withstand the tensile and compressive forces thick will be included by the sealant. Repair or strengthen substrate as required before proceeding with this work.
C. Verify that substrate surfaces and joint openings are ready to receive work.
D. Verify that joint backing and release tapes are compatible with sealant.

7.9.2 PREPARATION

A. Surfaces shall be clean, dry to the touch and free from dirt, moisture, grease, oil, wax, lacquer paint and other foreign matter that would tend to destroy or impair adhesion. When resealing an existing joint, remove existing caulk or sealant prior to applying new sealant.
B. Remove loose materials and foreign matter which might impair adhesion if sealant. Clean and prime joints in accordance with manufacturer's instructions.
C. Perform preparation in accordance with ASTM C804 for solvent release and ASTM C790 for late base sealants. Protect element surrounding the work of this section from damage or disfiguration.
E. Remove temporary protective coatings from aluminum or other surfaces that will be in contact with sealant. When masking tape is used as a protective coating, remove tape and only residual adhesive just prior to sealant application. For removing protective coatings and final cleaning, use non-staining solvents recommended by the manufacturer of the item containing aluminum or other metal surfaces.

7.9.3 INSTALLATION

A. Perform installation in accordance with ASTM C804 for solvent release and ASTM C790 for latex base sealants.
B. Measure joint dimensions and size materials to achieve required width/depth ratios. Install joint backing to achieve neck dimension no greater than 1/3 of the joint width. Install bond breaker where joint backing is not used. Install sealant free of air pockets, foreign embedded matter, ridges, and sags. Apply sealant within recommended application temperature ranges. Consult manufacturer when sealant cannot be applied within these temperature ranges. Tool joints as detailed.
C. Joint Width-to-Depth Ratios:

1. Acceptable ratios: JOINT WIDTH JOINT DEPTH

    a. For metal, glass or Minimum Maximum other nonporous surfaces: 6.25 mm (min.) 6.25 mm 6.25 mm Over 6.25 mm 1/2 of width Equal to width unless noted otherwise on drawing
    b. For wood, concrete, masonry or stone surfaces 6.25 mm (min)6 25 mm 6. 25 mm over 6. 25 mm to 12 mm 6. 25 mm Equal to width over 12 mm to 5c0 mm 12 mm 16 mm Over 50 mm (As recommended by sealant manufacturer) Unless noted otherwise on drawings.

2. Unacceptable Ratios: Were joints of acceptable width-to- depth ratios have not been provided, clean out joints to acceptable depths and grind or cut to acceptable widths without damage to the adjoining work. Grinding shall not be required on metal surfaces 7

7.8.4 ADJUSTING AND CLEANING

A. Protect areas adjacent to joints from sealant smears. Masking tape may be used for this purpose, if removed 5 to 10minutes after the joints is filled. Upon completion of sealant application, remove remaining smears and stains and leave work in a clean and neat condition.
B. Immediately scrape off fresh sealant that sealant that has been smeared on masonry and rub clean with a solvent as recommended by the sealant to cure for 24hours then removed by wire brushing or sanding
C. Remove excess sealant with a solvent-moistened cloth on metal and other nonporous surfaces.

7.9.10 PROTECTION, ADJUSTING AND CLEANING OF FINISHED WORK

A. Protect areas adjacent to joints from sealant smear. Masking tape may be used for this purpose if removed 5 to 10 minutes after the joints is filled. Upon completion of sealant application, remove remaining smear and stains and leave the work in a clean and neat condition.
B. Immediately scrape off fresh sealant smears on masonry and rub clean with solvent as recommended by the sealant manufacturer. Allows excess sealant to cure for 24 hours then remove by wire brushing or sanding.
C. Remove excess sealant with a solvent-moistened cloth on metal and other non-porous surfaces.

8.0 DOORS AND WINDOWS
8.1 DOORS

A. Provide and Install all doors with complete lockset, hinges, and accessories. Use Guijo KD or Tanguile KD for doors jambs of locally fabricated wooden doors, as standard to manufacturers.
B. Set doors frames plumbs and level brace until built-in floor.
C. All metal and aluminum doors must be guarantees against twisting or denting. The obligates Contractor to make good such defects and/or replace entirely any and all such defective door see Door Schedule)
D. Metal Flush Doors and Frames: Doors frames and frame component shall be manufactured from cold-rolled steel conforming to ASTM A 1008; or hot-dipped galvanized steel having an A60 zinc coating conforming to ASTM A653, with minimum coating thickness of .009mm. The coating weight shall meet or exceed the minimum requirements for coating having 0.4 oz/ft (122 g/m²), Galvanized door shall have galvanized hardware reinforcements. Fabricated steel doors shall be reinforced, stiffened, sound deadened and insulated with impregnated Kraft honeycomb core completely filling the inside of the doors and laminated to inside of the both panels. All doors, frames and frame components shall be finished as standard to manufacturer with a coat of baked-on rust inhibiting prime paint. Metal doors and frames shall be fabricated according to the design shown on the drawings or selected from Metal Door Manufacturer standard designs, equal to "Jea-Steel", " LEC steel Mfg Corp. " or "Doortech" or "Maxsteel" or “Metrotech Steel Industries ". Provide complete with hardware such as push plate, foot plate, push bars, door lock, hinges etc.

1. Provide Ga. 18 Steel Door with honeycomb insulation, 6mm thick clear glass vision panel, foot plate, glazed paint finished in Ga. 16 mild steel single rabbet door jamb with louver & accessories.
F. All lumber for wooden doors including door jambs, and all wood work of similar nature, shall be kin-dries with not more than 10% moisture content.
G. All wooden doors shall be manufactured with wood stiffener, and of the lumber specified herein, the plywood edge projection shall consist in rabbeting it around into the outside frame of the door in order to prevent "peeling-off" of the plywood at the edges.

H. All wood doors must be guaranteed against warping, twisting or cracking. Door protection equal to "Gerflor, SPM Door Protection (Straight Cut Decochoic panel, Decochoc, Thermoforming. This obligates the Contractor to make good such detects and/or replace entirely any and all such defective door (see Door Schedules)

I. Sliding Solid Panel Doors (Pocket Door) 45mm thk. Panel door shall use Tanguile KD or Mahogany KD or Gmelina KD wood doorbor approved equivalent, for Nurse Lounge Rooms. All wooden doors shall be fabricated in accordance with the designs shown on the drawings and standard to Wood Door Manufacturer/Sash Fabricator, equal to "Wood strong","Pateco" or "Mastercraft" or "Luxacraft" products. Provide complete with Tanguile KD or Guijo KD wood door jambs and door hardware and accessories. Equal to "Yale","Dorma","Noppon,"Elmes" or "Assa abloy".

L. Aluminum Framed Glass, Fixed and Sliding Doors Frame members shall be designed as shown in the drawings and as per manufacturer's standard sections. Aluminum frame shall be powder coated finish. Provide 10mm, 12mm and 6mm thick tempered glass panels as indicated on the drawings. Provide complete with hardware such as door lock, hinges, sliding mechanism,etc.(Equal to "Dorma" or "Blum" or "Assa Abloy") Aluminum Framed Glass door manufacturers shall be equal to "Multiple Options" "Aluminum Resource and installation System, Inc." , "C. G. Umali Commercial Inc. " or "Saint Gobain".

M. Fire Rated Doors with vision panel: Provide insulation on fire-rated doors. Insulated steel doora shall have core of honey come insulation, Face sheets, edges and frames of galvanized steel not lighter than 20 gauge, 18 gauge and 16 gauge respectively, And with required hardware and accessories. Doors and frame shall receive phosphate treatment, epoxy based primer and baked acrylic enamel finish. At least has 2-hour fire rating. Equal to "Doortech" "Jea steel","Metrotech","Doortech Mfg".

A. Aluminum framed Glass Casement, Awning, and Fixed Wall Glass type Windows and doors. Frame members shall be designed as shown in the drawings and as per manufacturer's standard profiles/sections. Aluminum frame shall be powder coated finish, equal to “Republic Powder Coat”, with color to be selected.

B. Provide 10 mm thick clear tempered type glass panels for all windows.

C. Manufacturers/fabricators shall be equal to "JNSTW Inc. " " Coalesce Inc." or " Multiple options " or "C. G. Umali Commercial Inc. "

9.2 FINISH HARDWARE

A. locksets: Equal to "Yale", "Dorma", "Nippon","Schalage" or "Elmes", martise type for Entrances of secured areas, and cylindrical bored tyoes for all metal doors, keyed entry function, satin chrome finish.

B. Deadbolts: Equal to "Yale","Dorma","Nippon","Schalage" or "Elmes", heavy duty, double cylinder, satin stainless steel finish. Provide Male & Female Toilets.

C. Hinges: Equal to "Yale","Dorma","Nippon","Schalage" or "Elmes”,3 ½" x 3 ½" ball bearing type, loose pin, satin chrome finish. Provide four (4) pieces for metal doors at Service Rooms, Fire Exit Stairs, while other interior doors shall have three pieces’ hinges.

D. Door Closer: Chrome finish, Equal to "Yale","Dorma","Nippon","Schalage" or "Elmes".

E. Push Plate: Equal to "Yale","Dorma","Nippon","Schalage" or "Elmes”, satin stainless steel finish, for Toilets at as indicated on architectural drawings.

F. Pull Plate: Equal to, satin stainless steel finish, for Toilets at as indicated on architectural drawings.

9.8 MIRROR MATERIALS

A. Mirror Glass: ASTM C1036, Type 1 transparent flat, Class 1 clear, Quality sizes noted on Drawings. See Section 10800-Toilet and Both Accessories.
B. Concave/Convex Mirror: Selected from manufacturer's standard profile, to be provided at Lower Ground Floor, an areas shown on the drawings.

9.9 GLAZING COMPOUNDS

A. Polyurethane Sealant: ASTM C920, Type S, Grade NS, single component, chemical curing, non-staining, non-bleeding, Shore A Hardness Range 20 to 35, color as selected, VOC content 250g/L or less when calculated according to 40 CFR 59 Subpart D (EPA method 24)
B. Silicone Sealant: ASTM C920, Type S, Grade NS, Class, single component, chemical curing, capable of water immersion without loss of properties, non-bleeding, non- staining, cured Shore A Hardness of 15 to 25,color as selected, VOC content 250g/L or less when calculated according to 40 CFR 59 Subpart D (EPA method 24).

10.0 FINISHES
10.1 Floor Finishes

a. Finish concrete floor surfaces in accordance with ACI 301 and ACI 302.
b. Wood float surfaces which will receive ceramic tile with full bed setting system.
c. Steel trowel surfaces which will receive resilient flooring and thin set ceramic tile. Steel trowel surfaces, which are scheduled to be exposed and colored, shall be smooth obtaining creative edging and scoring texture surface and pattern. In areas with floor drains, maintain design floor elevation at walls; slope surfaces uniformly to drains at 10 mm per meter nominal or as indicated an drawing.

10.2 FLOOR SURFACE TREATMENT

a. Apply dry shake hardener in accordance with manufacturer's instructions on floor surfaces.
b. Apply slip resistant finish in accordance with manufacturer's instructions on floor surfaces.
c. Apply sealer in accordance with manufacturer's instructions on floor surfaces.

10.4 FLOOR FINISHES

A. 300mm X 600mm Unglazed Ceramic tiles equal to "Mariwasa", "Floor Center. “," Metro Tiles", Color and Design shall be selected. For all toilets.
B. 400mm X 400mm Ceramic tiles equal to "Mariwasa", "Floor Center. “," Metro Tiles", Color and Design shall be selected. For kitchen, counselling rm.
C. 600mm X 600mm Ceramic tiles equal to "Mariwasa", "Floor Center. “," Metro Tiles", Color and Design shall be selected. For main stairs, fire exit, caretaker's rm.
D. Provide plain cement finish with 10mm grooves on PWD ramps.
E. 600mm X 600mm Homogeneous Floor tiles equal "Mariwasa", "Floor Center. “," Metro Tiles"Color and Design shall be selected. For part of shared workspace office, meeting rm, lounge area, hallway Provide tile Threshold Tiles for break connection as indicated in the drawings.
F. 900mm X 900mm Homogeneous Floor tiles from "Mariwasa", "Floor Center. “," Metro Tiles", Color and Design shall be selected. For part of shared workspace office.
G. Provide Engineered Wood Flooring, use "Matimco" for bedrooms.

H. Provide Non Skid Self-leveling epoxy floor coating, equal to "Epocoat-Fc with primer from "Buildrite construction chemicals" for utility rms.
I. Provide plain cement finish with waterproofing membrane equal to "Davco k18 plus" from "Parex Davco" on roof deck.

10.5 GRANITE COUNTERTOP

Granite Standard: Granite shall comply with ASTM C 615, "Standard Specification for Granite Dimension Stone" for material characteristics, physical requirements, and sampling for selection of granite GENERAL. All granite/marble shall be of standard architectural grads, free of cracks seams, or starts which may impair its structural integrity or function. Color or other visual characteristics indigenous to the particular material and adequately demonstrated in the sampling or mock-up phases will be accepted provided they do not compromise the structural or durability capabilities of the maternal. Texture and finish shall be within the range of samples approved by the Design Professional, equal to "Boer, Builders Construction Corp. "or "Euroasia". For all toilets, pantry and kitchen countertops and fault doors of columbium as indicated in drawings.

10.6 WALL FINISHES

A. Cements Plaster Painted Wall Finish: Consisting of the scratch and finish coats, both consisting of one (1 pair of Portland Cement and two (2) parts of clean, washed sand measured by volume for exterior surfaces called for in the drawings and where plastering is essential to complete the work.
B. 300mm X 300mm Glazed Ceramic Tiles from "Mariwasa", "Floor Center. “," Metro Tiles" with waterproofing up to 6"of wall height from float finish. For all toilets, male and female toilets, PWD toilets and t&b's. Verify drawing for application of tiles height level.
C. Provide plain cement plaster elastomeric point finish for exterior elevations and plain paint finish for interior as indicated drawing. Color shall be selected.
D. Provide precast molding on exterior elevation as indicated in the drawing.

10.7 CEILING FINISHES

A. Painted 12mm thick Moisture Resistant Gypsum Ceiling Boards, Equal to USG BORAL, Knauff, Skycon or Gyproc on metal furring Equal to "JEA steel or approved equivalent) and Channels check reflected ceiling plan for location.
B. Painted 12mm thick Gypsum Ceiling Boards USG BORAL, Knauff, Skycon or Gyproc Channels check reflected ceiling plan for location.
C. Fiber cement board equal to "USG BORAL" or "Knauff", check reflected ceiling plan for location.
D. Exposed Slab for All the slab soffits of staircase, all storage and utility areas and general storages and pump rooms. Shall be elastomeric pointed finish.

11.0 PAINTING

A. Painting materials shall be "Boysen" All exposed finish hardware, lighting fixtures and accessories, plumbing fixtures and accessories, glass works and the like shall be protected so as not to stain with point and other pointing materials prior to painting works. All other surfaces which would be endangered by stains and paint marks should be yapped and covered with craft paper or equal and as specified hereunder or as per manufacturer's direction.

11.1 METAL SURFACES

A Metal Surfaces (Steel, windows, ornamental grillwork, etc.) 1.) Primer: Primer
2.) Topcoat: Premium Glass/Semi Glass

11.2 CONCRETE AND PLASTERED MASANRY (EXTERIOR)
1.) Primer: Primer
2.) Topcoat: Antifade

-Low VOC, Low Odour, Acrylic Water based, Reduces Temperature, Anti- Fungal/Algae, Dirt Resistant
11.3 WOOD SURFACES
1.) Enamel Semi-Glass Finish 1st coat- Primer
2nd coat- Premium Semi-Gloss 3rd coat- Premium Semi-Gloss
2.) Stain Finish for other stain requirements 1st coat- Sanding
2nd coat- Wood Shield Exterior/ Deck (floating/furniture) using Jotun Thinner 02
3.) Duco Finish for wood door/jambs 1st coat- Primer

11.4 LATEX POINT

2nd coat- Premium Gloss 3rd coat- Premium Gloss

A. Semi-Glass: For exterior plastered surfaces 1st coat: Primer 2nd to 3rd coats: Antifade (Sheen finish)
   Flat- For interior plastered surfaces & gypsum ceiling boards 1st coal- Majestic Primer 2nd to 3rd coats: Majestic True Beauty Matt

11.5 FIBER CEMENT SURFACES

1st coat:
2nd coat:

11.6 EXTERIOR CONCRETE WALLS

1.) Surface Preparation
a.) New Surface: The substrate must be sound, clean, dry and free from dust, oil, grease laitance etc., All traces of foam release agents must be removed. A light sanding with a suitable abrasive material is recommended before application any resulting dust/loose particles must be removed.
b.) Old Surface: Remove all loose, scaling, flaking, and peeling off paint either with the use of paint remover, wire brushing, scrapping, or water blushing. Let it dry, in case of mildew infestation, treat with Fungicidal Wash solution by swabbing or brushing. To ensure proper treatment, allow to remain.

5.9.7 PAINT APPLICATION- Dirt Resisting Acrylic Paint System (plain finish)

a.) Apply one (1) coat of Primer by brush or roller. Allow two (2) hours before recoating. b.) Puffy cracks, crevices, and surface defects with putty compound using putty knife. Let dry, sand and spot coats.

c.) Finish with two (2) coats of with Antifade Colors Series by brush or roller. Allow (2) hours drying in between coats.

11.7 PAINT APPLICATION-Elastomeric Paint Finish

a.) Apply one (1) coat of Primer by brush or roller. Allow two (2) hours before recoating. b.) Puffy cracks, crevices, and surface defects with putty compound using putty knife. Let dry, sand and spot prime area with the primer used above. Finish with two (2) coats of by brush or roller. Allow (2) hours drying in between coats.

12.0 PLUMBING FIXTURES & ACCESSORIES

A. All rough-in pipes and fixture shall be laid simultaneously with the construction of the masonry and concrete slabs. Hence, no sanitary and plumbing pipes shall be exposed. Provide and install at all Toilets, color and model as approved by the Architect. All fixtures shall be equal to "American Standard" include necessary fittings and accessories such as faucets, grab bars, toilet paper holder, tissue holder, seat and cover, p-traps, angle valve, etc. to complete the requirements of the toilet/plumbing fixtures.
B. toilet lavatory countertop Refer to section 10.5.

12.1 FOR TOILETS

A. Water Closets: Flush by valve type and flush type, Floor mounted elongated front equal to "American Standard" For all male and female T&B's toilets.
B. Lavatory:

1. Under-the-counter type, Vitreous equals to "American Standard" for all male and female toilets

12.2 Fittings

A. Lavatory Faucets

Single hole lavatory faucet, lever type, chrome finish, with pop up drain; equal to "American Standard" T&B’s.

B. Flushing System: Equal to "American Standard" For all flush valve type water closets and urinals.

12.3 ACCESSORIES

A. Facial Mirror: 6mm thick plate glass mirror electrolytic ally copper plated, with Type 304 stainless steel frameless beveled edge type with bolt and cap, furnish with mounting brackets and screws, size, height and length to be determined as to agree with countertop configuration as specified in drawings. Equal to "Pacific Glass", "San Francisco- Nice Mirrors" -For all Male and female toilets, PWD toilets and powder rooms. Toilet Paper Holder: Constructed of type 303 stainless steel, bright polished finish, complete with mounting screws and plate, furnished with chrome-plated plastic roller, Equal to " American Standard”, For all Male and female toilets, PWD toilets and powder rooms.
B. Provide stainless steel grab bars wherever specified in drawing equal to "American Standard" with complete accessories.

12.4 TOILET POSITIONS

A. Positions shall be fabricated from double forced, autoclaved high density cellulose fiber cement or wood particle board core, or solid compact laminated panels or phenolic board position. Thickness of panels shall be 18mm, wall hung or floor mounted type, of dimension as shown in the drawings. Provide toilet position system and urinal screens complete with stainless steel standard fittings, accessories and anchorage. Robe hooks and toilet paper holders shall be provided as a standard to toilet partition manufacturer/Supplier. Install at all Male and Female Toilets, powder rooms, PWD toilets and where indicated

PART-13 LABOR

13.0 It is understood that the work shall be done and execute in accordance to the good engineering methods and practices.

13.1 The Contractor shall and thereby warrants all work performed by him directly and for which guarantee are required. The Contractor shall and thereby warrants and/or guarantees for a period of one year, or for the longer period where so provided in this Specifications, a evidenced by date of final certificate issued by Architect, all materials and workmanship installed under Contract to be of good quality in every respect and to remain so for periods described herein

13.2 Such any defects develop in aforesaid work, within the specified periods, due to faults in material and/or workmanship, the Contractor thereby agrees to make all repairs and do all necessary work to correct defective work to the Architect satisfactory. Such repairs and corrective works shall be done without cost to the Owner and entire cost and expense of the Contract.

PART – 14 ALTERATIONS

14.0 Any alterations and revision from the Plans/Drawings and Specifications done without the knowledge of the Architects, that may impair the strength and/or the aesthetic of the project is not the liability of the Architect, but shall be borne by the General Contractor instead.

ELECTRICAL GENERAL PROVISION

PART 1- GENERAL

1.1 DESCRIPTION

A. The general and supplementary Conditions are a part of the requirements for the work under this Division of the Specifications.

1.2 WORK INCLUDED

A. Provide labor and materials required to install, test and place into operation the electrical systems as called for in the Contract Documents, and in accordance with applicable codes and regulations.

B. Provide labor, materials, and accessories required to provide complete, operating electrical systems. Labor, materials or accessories not specifically called for in the Contract documents, but required to provide complete, operating electrical systems shall be provided without additional cost to the owner.

1.3 QUALITY ASSURANCE

A. Comply with the current applicable codes, ordinance, and regulations of the authority or authorities having jurisdiction, the rules, regulations and requirements of the utility companies serving the project and the owner's insurance underwriter.

B. Drawings, specifications, codes and standards are minimum requirements. Where requirements differ the more stringent apply.

C. Should any change in drawings or specifications be required to comply with the governing regulations, notify the Consultant prior to submitting bid.

D. All equipment and installations shall meet or exceed minimum requirements of PS, PEC, ANSI, ASTM, IES, ETL, NEC, NEMA, NFPA, SMACNA, UL, ICAO and The Fire Marshal.

E. Execute work in strict accordance with the best practices of the trade in a thorough, (substantial, workmanlike manner be competent workmen. Provide a competent, experienced, full-time Superintendent who is authorized to make decisions on behalf of the Contractor.)

1.4 ABBREVIATIONS AND DEFINITIONS

A. Abbreviations:

1. PS Philippines Standard

2. PEC Philippines Electrical Code

3. ANSI American National Standards Institute

4. ASTM American Society for Testing and Materials

5. ETL Electrical Testing Laboratories

6. IEC International Electro Technical Committee

7. IEEE Institute of Electrical and Electronic Engineers

8. IES Illuminating Engineering Society

9. IPCEA International Power Cable Engineers Association

10. NEC National Electrical Code

11. NEMA National Electrical Manufacturer's Association

12. NFPA National Fire Protection Association

13. SMACNA Sheet Metal and Air Conditioning Contractors National Association

14. UL Underwriters Laboratory

B. DEFINITIONS

1. Where is stated in this specification to submit to Engineer for review, refer to Architectural General and Special Conditions for proper procedures.

2. FURNISH means to supply all materials, labor, equipment, testing apparatus, controls, tests, accessories, and all other items customarily required for the proper and complete application.
3. INSTALL means to join, fasten, link, attach, set up or otherwise connect together before testing and turning over to Owner, complete and ready for regular operation.

4. PROVIDE means to FURNISH and INSTALL.

5. AS DIRECTED means as directed by the architect, or his representative.

6. CONCEALED means embedded in masonry or other construction, installed behind wall furring or within drywall partitions, or installed within hung ceilings.

7. SUBMIT means submit to Consultant for review.

1.5 GUARANTEE

A. Submit a single guarantee stating that the work is in accordance with the contract documents. Guarantee work against faulty and improper material and workmanship for a period of one year from the date of final acceptance by the owner, except that where guarantees or warranties for longer terms are provided or specified herein, the longer term shall apply. Correct any deficiencies which occur during the guarantee period, within 24 hours of notifications, without additional cost to the Owner, to the satisfaction of the owner. Obtain similar guarantees from subcontractors, manufacturers, suppliers and sub trade specialists.

PART 2- PRODUCTS

2.1 MATERIALS

A. Provide products and materials that are new, clean, free of defects, and free of damage and corrosion.

B. Products and materials shall not contain asbestos, PCB, or any other material which is installed considered hazardous by the authority having jurisdiction.

C. Install materials with qualified trade's people.

D. Follow manufacturer's instructions for installing, connecting, and adjusting equipment. Provide a copy of such instructions at the equipment during installation.

E. Energy consuming equipment shall meet local energy ordinances.

PART 3- EXECUTION

3.1 SUBMITTALS AND REVIEWS

A. Submit shop drawings, manufacturer's product data sheets, samples and test reports as specified.

B. Submit materials and equipment by manufacturer, trade name, and model number. Include copies of applicable brochure o catalog material. Maintenance and operating manuals are not acceptable substitutes for shop drawings.

C. Maintain a complete set of reviewed product data and samples and on site.

3.3 COORDINATION OF WORK

A. Contract documents establish scope, materials and quality but are not detailed installation instruction. Drawings are diagrammatic.

B. Coordinate work with related trades and furnish, in writing, any information necessary to permit the work of related trades to be installed satisfactory and with the least possible conflict or delay.

C. The locations of lighting fixtures, outlets, panels and other equipment indicated on the drawings are approximately correct, but they are understood to be subject to such revision as may be found necessary or desirable at the time the work is installed in consequence of increase or reduction of the number of outlets, or in order to meet field conditions, or to coordinate with modular requirements of ceiling, or to simplify the work, or for other legitimate causes.

D. Verify with the Architect the exact location and mounting height of outlets and equipment not dimensionally located on the drawings.

E. Circuit tags in the form of numbers are used where shown to indicate the circuit designation numbers in electrical panels. Show the actual circuit numbers on the as built Record Drawings and on the associated typed panel board directory card. Where circuiting is not indicated, provide required circuiting in accordance with the loading indicated on the drawings and/or as indicated.

F. Whenever work interconnects with work of other trades, coordinate with other trades to ensure that they have the information necessary so that they may properly install the necessary connections and equipment. Identify items (remote ballast, pull boxes, etc.) requiring access In order that the ceiling trade will know where to install access doors and panels.

G. Consult with other trades regarding equipment so that, whenever possible, motor controls and distribution equipment are of the same manufacturer.

H. Furnish services of an experienced Superintendent, who shall be in constant charge of all work, and who shall coordinate work with the work of other trades. No work shall be installed without coordinating with other trades.

3.4 EXMINATION OF SITE

A. Prior to the re-submitting of bids, visit the project site and become familiar with all condition affecting the proposed installation and make provisions as to the cost thereof.

3.22 FINAL PUNCHLIST

A. Prior to the final punch list, certify that systems and materials are complete, operational, and are in compliance with the Contract Documents.

B. During the final punch list, provide personnel with access keys, hand held radios, and necessary expertise to operate each system and piece of equipment to demonstrate operational compliance with the Contract Documents.

C. Any deficiencies noted on the final punch list shall be expeditiously corrected and certified in writing.

FIRE PROTECTION

1.1 General

a. Comply with General Provision and all documents referred to therein.
b. Provide all labour, material, products, equipment and services to supply and install sprinkler system as indicated on the Drawings and specified in this Section of the Specifications.
c. Sprinkler system to include for:

- Hydraulically designed automatic wet pipe system and pre-action system.
- Zoning indicated on Drawings

1.2 Requirements for Acceptance

a. Provide certificate of compliance that components ate compatible and where applicable, certified for intended use by nationally recognized testing agency.
b. Submittal drawings shall be reviewed and incorporate requirements of local authorities. Drawings shall be certified correct prior to submission to Client.
c. Submit system layout drawings, component Shop Drawings, specifications, and hydraulic design calculations for Client's review prior to commencing installation.
d. Submittal data shall be as indicated, but not limited to the following:
    - Shop Drawings: Sprinkler heads and piping system layout Electrical wiring diagrams
    - Product Data: Piping Sprinkler heads , Pipe hangers and supports
    - Design Data: Sprinkler system design

- Test Reports
- Preliminary test on piping system
- Certificates : Qualifications of Installer
- Closeout Submittals: As-built drawings of each system

e. Upon completion of the installation, recalculate systems and submit hydraulic design data based on as-built installation.
f. Obtain all approvals before proceeding with work

1.3 Reference Standards

The Installations, Material and Equipment shall comply with the latest requirements of the Standard Codes, Guide and other documents issued by the Authorities, Institutions and Organizations referred to in various sections including the following:

a. American Society for Testing and Materials (ASTM)

A47 - Malleable iron Coatings/Fittings

A53 - Pipe Steel, Black and Hot-Dipped, Zinc Coated, Welded and Seamless

A135 - Electric-Resistance Welded Steel Pipe

b. American National Standards Institute (ASNI):

A214 - Mechanical Joint Fittings
A21.21 -Mechanical Joint Ductile Iron Pipe

c. National Fire Protection Association (NFPA):

NFPA 13 -Installation of Sprinkler Systems

d. All sprinkler system components shall be UL listed and/or FM approved.

1.4 Coordination

Refer to final Architectural Reflected Ceiling Plans and coordinate locations of sprinkler heads with lighting and other ceiling mounted components. Coordinate sprinkler piping to avoid interference with all other services.

1.5 Pipes & Fitting

a. Meet NFPA and requirements specified herein.
b. Piping and Fittings

- Provide materials specified; however, only one material selection will be allowed for any nominal steel pipe size.

- Interior suspended piping, 50 mm and smaller: black steel pipe (seamless), ASTM A53, Schedule 40 with cast iron or malleable iron threaded fittings for wet systems. Alternative Materials: Black steel pipe schedule 40 (ERW), ASTM A135.

c. Plain-end fittings with mechanical couplings and fittings which use steel gripping devices to bite into the pipe when pressure is applied will not be permitted. Rubber gasketed grooved-end pipe and fittings with mechanical couplings shall be permitted in pipe sizes 65 mm and larger. Fittings shall be UL listed or FM approved for use in wet pipe sprinkler system. Fittings, mechanical couplings, and rubber gaskets shall be supplied by the same manufacturer. Steel piping with wall thickness less than Schedule 30 shall not be threaded. Side outlet tees using rubber gasketed fittings shall not be permitted.
d. Field fabricated fittings will not be acceptable.
e. Provide1200 kPa (175 psa) working pressure fittings of threaded cast iron, threaded malleable iron, and flanged cast iron. Unions are permissible for pipe 50 mm and smaller
f. Fasten flanges with square or hex headed bolts and heave hex nuts.
g. Provide flange gaskets1.6 mm thick.

1.6 Sprinkler Heads

a. Sprinkler heads shall be UL listed or FM approved type. Submit samples for approval.
b. Where pendent type sprinkler heads are shown on the drawings, provide chrome plated recessed sprinkler heads with chrome plated escutcheons.
c. Where upright type and upright vertical sidewall (cut-off) sprinkler heads are shown on the drawings, provide bronze upright sprinkler heads with bronze finish.
d. Where concealed type sprinkler heads shown on the drawings, provide concealed sprinkler heads with cover plate having plate finish to architect's requirement.
e. Use high temperature heads where required to suit the governing authority, and where located in elevator machine rooms, in electrical rooms and near heat producing equipment.

1.7 Escutcheon Plates

Provide split hinge metal plates for piping entering walls, floors, and ceilings in exposed spaces. Provide polished stainless steel plates or chromium-plated finish on copper alloy plates in finished spaces. Provide paint finish on metal plates in unfinished spaces.

1.8 Testing

a. Test all sprinkler systems to NFPA-13 requirements.
b. Carry out any additional tests required by the authorities having jurisdictions
c. Perform tests in the presence of each governing authority's authorized inspector.
d. Submit certification that systems have been designed and installed in accordance with local requirements.
e. Perform test before piping is concealed.
f. Remove all components which will not withstand test pressure, and replace after tests.
g. Eliminate leaks, or remove and refit defective parts. Caulking of threaded or welded joints will not be permitted.
h. Repeat tests as often as necessary to obtain certification.

1.9 Sprinkler Installation

a. Installation, workmanship, fabrication, assembly, erection, examination, inspection, and testing shall be in accordance with NFPA 13, except as modified herein. Install piping straight and true to bear evenly on hangers and supports. Do not hang piping from plaster ceilings. Keep the interior and ends of new piping and existing piping affected by Contractor's operations thoroughly cleaned of water and foreign matter. Keep piping systems clean during installation by means of plugs or other approved methods. When work is not in progress, securely close open ends of piping to prevent entry of water and foreign matter. Inspect piping before placing into position. Provide Teflon pipe thread paste on male threads.

b. Install sprinkler heads symmetrically in ceiling tiles, unless otherwise directed by the Client.

1.10 Protection

a. Provide guards for sprinkler heads in elevator machine rooms, garbage room,mechanical rooms, storage rooms and where indicated on Drawings.

b. Assume full responsibility for protecting sprinkler heads during painting. Replace damaged and painted components.

1.11 Field Painting

Cleaning, pre-treat, prime, and paint new fire extinguishing sprinkler systems including valves, piping, conduit, hangers, supports, miscellaneous metalwork, and accessories. Apply coatings to clean, dry surfaces, using clean brushes. Clean the surfaces to remove dust, dirt, rust, and loose mill scale. Immediate after cleaning, provide the metal surfaces with one coat of zinc molybdate primer applied to a minimum dry film thickness of 1.0 mil. Shield sprinkler heads with protective covering while painting is in progress. Upon completion of painting, remove protective covering from sprinkler heads. Remove sprinkler heads which have been painted and replace with new sprinkler heads. Provide printed surfaces with the following:

a. Piping in Finished Areas

Provide primed surfaces with two coats of paint to match adjacent surfaces, except provide valves and operating accessories with one coat of red alkyd gloss enamel applied to a minimum dry film thickness of 1.0 mil. Provide piping with 2-inch wide red enamel bands or self-adhering red plastic bands spaced at maximum of 20-foot intervals throughout the piping systems.

End of Specification

PLUMBING WORKS

1.1 General Standards of Construction

a. The General Conditions apply to all work under this section of the specifications

1.2 Scope of Work

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 a listed herein but not limited to the following.

1. The Plumbing Contractor is required to refer to all architectural, structural, mechanical, fire protection and electrical plans and investigate all the possible interference and conditions affecting his work

.

2. All work shall comply with the pertinent provisions of the Plumbing Code of the concerned city, the Code on Sanitation of the Phil., and/or the Revised National Plumbing Code of the Philippines.

3. Tapping from an existing public water main / or deep well of the building distribution system to include supply and installation of main water meter.

4. All building sanitary drains, waste and venting system including floor drains

5. Sewage collection and disposal system including sewer junction boxes, sewer manholes if any and up to final disposal point

6. Building storm drainage system including deck and roof drains, canopy drains, and plant boxes drains

7. Building storm under drains and collection system including peripheral collector line into storm manholes / or sump pits if any and up to existing storm drains.

8. Testing for leakage of all water supply and distribution system, drains waste and venting system plus pressure testing and disinfection of the water supply and distribution.

9. Preparation and submission of two (5) sets of as-built plans, hard copy & e-files (cadd)

10. Furnishing of written one (1) year warranty on the Plumbing system.

1.3 Work Included
ACA II

a. Replacement of drains, downspouts, and other plumbing works related to it
b. Renovation of fixed laboratory tables and cabinets, including its piping and plumbing systems and fixtures (Chemistry Laboratory)
c. Repair/replacement of aircon pipe at dark room.
d. Renovation of fixed laboratory tables and cabinets, including its piping and plumbing systems and fixtures (Research Laboratory)

ACA I

a. Piping works from pump house to the whole building

BOY'S DORM
a. C.R. fixtures
b. C.R.'s and kitchen sinks

1.4 Approval of Shop Drawings

a. The drawings show the general arrangement of all piping. However, where local and/or actual conditions at the jobsite necessitate a deviation or rearrangement, the Contractor shall prepare and submit the new arrangement for the Client's approval.

b. Small scale drawing 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 conditions.

1.5 Codes Application & Ordinance

a. The work covered in this contract to be installed according to the specification codes, ordinances and requirement of the following:

- Revised National Plumbing Code of the Philippines.
- The Code on Sanitation of the Philippines.
- Department of Environment and NaturalResources Environmental Regulations.
- Ordinances of Concerned City or Municipality

b. All construction permits and fees required for the work shall be obtained & at the expense of the Contractor. The Contractor shall furnish the Client final certificates of inspection after the completion of the work.

1.6 Workability

a. All work shall be performed in first class and neat workmanship by mechanics skilled in their work shall be satisfactory to the Client.
b. The Plumbing Contractor is required to refer the General Conditions and to all architectural, structural, electrical, mechanical, fire protection plans specifications and shall investigate all possible interference's and conditions affecting his work.

1.7 Materials

1.7.1 General

a. Except as specified, the Contractor shall submit for the Client's approval, a complete set of materials he proposes to use

b. The Contractor shall assume the cost of 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.

1.7.2 Pipes and Fitting Schedule

a. Cold Water Lines – shall be PPR-C PN 20, approved by the Designer

b. Sewer Lines - shall be polyvinyl chloride (PVC) pipes, series 1000 II, "Moldex", Neltex, Emerald, Atlanta or Crown brand. Fittings shall be solvent cement joint to ASTM D2729

c. Sewer Lines - shall be polyvinyl chloride (PVC) pipes, series 1000 II, "Moldex", Neltex, Emerald, Atlanta or Crown brand. Fittings shall be solvent cement joint to ASTM D2729

d. Downspout – shall be polyvinyl chloride (PVC) pipes, series 1000 II, "Moldex", Neltex, Emerald, Atlanta or Crown brand. Fittings shall be solvent cement joint to ASTM D2729.

e. Storm Drainage Line – shall be polyvinyl chloride (PVC) pipes, series 1000 II, "Moldex", Neltex, Emerald, Atlanta or Crown brand. Fittings shall be solvent cement joint to ASTM D2729.

f. Underdrain Pipes – series 1000 II, "Moldex", Neltex, Emerald, Atlanta or Crown brand. Fittings shall be solvent cement joint to ASTM D2729.

1.7.3 Other Materials

a. Drains – JPI as indicated
- Roof Deck
- Floor/
- Canopy

b. Hose Bibbs – 20 mm standard hose connections, male tapered threads, polished chromium plated.

c. Outdoor Pipe Lines, Appurtenances:

d. Drainage Junction Boxes – 140 kg / sq. c.m. reinforced concrete with pre-cat reinforced concrete cover.

- Trust Blocks – 140 kg. / sq. c.m. plain concrete.
- Sewer Junction Boxes - 140 kg. / sq. c.m. reinforced concrete with C.I grating cover.
- Area – Drain / Catch Basin – 140 kg. / sq. c.m reinforced concrete with C.I grating cover.
- Cistern – 210 kg. / sq. c.m. reinforced concrete.

1.8 Approval of Materials

1.8.1 General

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 Clients' approval, the manes of suppliers and materials proposed including trade names and / or samples of the materials if deemed necessary.

c. Brand names mentioned in his specifications are only for the purposes of indicating the desired quality and design.

1.9 Quality Testing & Criteria

1.9.1 General

a. Materials intended to be substituted for the accepted only after a formal request for substitution, accompanied by:

   - Reason for substitutions;
   - Certificate of test indicating quality, compared to those originally specified.

b. Cost testing of materials, whether on originally specified items or on substitutions, shall be to the account of the Contractor.

c. Results of test shall be submitted to the Client for evaluation at least 15days before the materials is due for installation on the job.

1.10 Soil, Waste Drain & Vent Pipes

1.10.1 General

a. All pipes and fittings, unless specifically noted shall be as specified on section 1.10.2 Product on this specification.

b. All cast iron soil & drainage pipes shall be pitched 6mm per 300 mm but no case flatter than 3mm per 300mm.

1.10.2 Traps

Every plumbing fixture shall be separately trapped by a vented water sealed trap as close to the fixture outlets as the conditions allow, but in no case at a distance greater than 600mm. 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 fixtures which they shall serve, all traps shall have a water seal of at least 32 mm with brass thumbscrew cleanout at the bottom of the seal.

1.10.3 Vents

a. Vent shall be taken from the crown fixture, 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 obstructions. 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 distance, the vent shall run independently through the roof.

b. A vent shall be wherever practicable, direct extension of a soil or waste line.

c. 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 forty-five degree (45°) connection.

d. All vertical 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.

e. 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 in the main vent or vent stack.

f. Air Admittance Valves (AAV's) installation shall be as per manufacturer's recommendation and/or as per standard details shown on plans, Studor Brand or equal.

1.10.4 Roughing-in

Roughing – in for pipes and fixtures shall be carried 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.

1.10.5 Fittings

All changes in pipe sizes on soil waste and drain lines shall be made with reducing fittings or reducers. All changes in direction shall be made by the appropriated use (45°) wyes, or long sweep bends elbow 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.

1.10.6 Materials

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.

1.11 Miscellaneous

1.11.1 Cleanout

Cleanout shall be of the same size as the pipe, the location of which is extended to an easily accessible place.

1.11.2 Traps

a. Every Plumbing fixtures of equipment requiring connections to the drainage system shall be equipped with trap.

b. Each trap shall be placed as near as possible to the fixture. No fixture shall be double- trapped.

1.11.3 Valves & Hose Bibbs

a. Valves shall be provided on all water supplies or fixtures as specified.

b. Hose bibs shall be made of brass with 15 mm make male inlet threads hexagon shoulders and 20 mm connections.

1.11.4 Pipe Hanger & Support

a. Horizontal runs of pipe shall be hung with adjustable wrought iron or malleable iron pipe hangers spaced not over 3 mm apart, except hub and spigot soil pipes which shall have hangers spaced not over 1.52 m apart and located near the hub.

b. Hangers shall have short turn buckles or other approved means of adjustment.

c. Inserts shall be of cast steel and shall be of type or received a machine bolt or nut after installation.

d. Vertical runs or pipe shall be supported by wrought iron clamps or collars spaced not more than 9 m apart.

e. 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 insert plate; toggle bolts, clamps or expansion shield.

1.11.5 Pipe Sleeves

a. Pipes sleeves shall be installed and properly secured in place at all points where pipes pass through masonry or concrete.

b. Pipes sleeves shall be of sufficient diameter to provide approximately 6.1 mm clearance around the pipe of insulation.

c. Pipes sleeves in walls and partitions shall be in cast iron, wrought iron or steel pipe. Pipes sleeves in concrete beams or concrete slabs shall be wrought iron or steel pipe.

End of Specification

STRUCTURAL

PART 1 - WORKING DRAWINGS

1.1 In the interpretation of Structural Plans, indicated dimensions shall govern and distances or sizes shall not be scaled for construction purposes.

1.2 In cases of conflict in details or dimensions between the Architectural and Structural plans, verify with the Structural Engineer or his authorized representative for decision.

1.3 In case of conflict between the Structural Plans and Structural Specifications, the Plans shall govern.

PART 2 - REINFORCED CONCRETE BEAMS

3.1 Unless otherwise noted in the plans or specifications, camber all reinforced Concrete beams at least 10 mm for every 4000 mm of clear span and For cantilever beams shall be 50 mm for every 3000 mm of clear span.

3.2 When a beam crosses a girder, rest beam bars on top of the girder bars. At column intersection girder bars shall be on top of beam bars.

PART 3 - REINFORCED CONCRETE SLABS

4.1 Unless otherwise noted in plans or specifications, camber all reinforced concrete slabs 8 mm per 3000 mm of shorter span and 14 mm for every 2000 mm of cantilever span.

4.2 If bars are reinforced both ways, bar along the shorter span shall be Placed below those along the long span at the center and over the longer span bars near the supports.

PART 4 - STRUCTURAL TOLERANCES

Unless otherwise specified by the Structural Engineer, the following are the acceptable tolerances for cast-in-place concrete construction. All dimensions not within the required tolerances shall be corrected prior to pouring of concrete.

4.1 Cross sectional dimensions and location of reinforcement
Dimension less than 200 mm - + 6 mm
200 mm to 600 mm - + 9 mm
Over 600 mm - + 12 mm

4.2 Deviation from straight line -+ 6 mm per 3000 mm
(Sweep and/or plumbness)
4.3 Locations of bar cut-off or bonds - + 50 mm

PART 5

CONCRETE PROTECTION FOR BUNDLED REINFORCEMENT

5.1 For bundled bars, the minimum concrete cover shall be equal to the equivalent diameter of the bundled bars, but need not be greater than 50 mm.

PART 6 STANDARD HOOKS

6.1 "Standard hook" for rebar shall mean either of the following:
6.1.1 A semi-circular turn plus an extension of at least 4 bar diameter but not less than 65 mm at free end of bar.
6.1.2 A 90-degree turn plus an extension of at least 12 bar diameter at the free end of bar.
6.2 Minimum diameter of bend measured on the inside of the bar shall be as follows:

10 mm to 25 mm – 6 bar diameter
28 mm to 32 mm – 8 bar diameter
No. 11 to No. 18 – 10 bar diameter

PART 7 WELDED SPLICES

7.1 The Contractor shall submit details of all welded splices for approval by the Structural Engineer.
7.2 Only Certified welders shall be allowed to perform welding operations.
7.3 Connection of crossing bars by tack welding is not allowed.

PART 8 CONSTRUCTION JOINT

8.1 Where a joint is to be made, the surface of the concrete shall be thoroughly cleaned and all laitance and standing water removed. Vertical joint also shall be thoroughly wetted and coated with rich cement grout immediately before pour of new concrete.

PART 9 - PIPES EMBEDDED IN CONCRETE

9.1 Conduits and pipes, with their fittings, embedded within a concrete column shall not displace more than 4 percent of the cross sectional area where strength is calculated or required for fire protection.
9.2 Vertical pipes are not allowed to punch through beams or girders.
9.3 Aluminum pipes shall not be embedded inconcrete.

PART 1 - GENERAL
1.1 SUMMARY

1. Section includes: Steel reinforcement, including fabrication and installation accessories, for precast shotcrete and cast-in- place concrete, and masonry.
1.2 REFERENCE STANDARDS

1. The publications listed below form a part of this specification to the extent referenced.

The publications are referred to in the text by basic designation only. AMERICAN CONCRETE INSTITUTE (ACI)

ACI 117 Standard Tolerances for Concrete Construction and Materials

ACI 315 Manual of Standard Practice for Detailing Reinforced Concrete Structures

ACI 318 Building Code Requirements for Reinforced Concrete
AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A 120 Pipe, Steel, black and Hot-Dipped Zinc-Coated (Galvanized) Welded and Seamless, for Ordinary Uses

ASTM A 184 Fabricated Deformed Steel bar Mats for Concrete Reinforcement
ASTM A 185 Welded Steel Wire Fabric for Concrete Reinforcement

Reinforcement

Reinforcement

ASTM A 497 Welded Deformed Steel Wire Fabric for Concrete

ASTM A 499 Steel Bars and Shapes, Carbon Rolled from “T” Rails ASTM A 615 Deformed and Plain Billet-Steel Bars for Concrete

ASTM A 675 Steel Bars, Carbon, Hot-Wrought, Special Quality,

Mechanical Properties

ASTM A 706 Low-Alloy Steel Deformed Bars for Concrete Reinforcement
AMERICAN WELDING SOCIETY (AWS)

AWS D 1.4 Structural Welding Code – Reinforcing Steel

AMERICAN CONCRETE REINFORCING STEEL INSTITUE (CSRI)

CSRI 01 Manual of Standard Practice

1.3 SUBMITTALS

1. Shop Drawings

    a. Detail drawings shall be prepared in accordance with ACI 315. Submittals shall show reinforcing steel schedules, placing plans, sizes, grades, and splicing and bending details. Any embedded plates, bolts, etc., shall also be shown for purposes of checking for potential interference. Drawings shall show support details including types, sizes and spacing. Scaling of drawings will not be permitted to determine require bar lengths.

2. Welding Procedures and Qualifications

    a. Owner's Representative shall be furnished a list of qualified welders.

3. Certificates of Compliance

    a. Certified copies of mill reports attesting that the reinforcing steel furnished meets the requirement specified shall be obtained from the supplier prior to the installation of reinforcing steel.

1.4 QUALIFICATIONS

1. Welders shall be qualified in accordance with AWS D1.4. Qualification test shall be performed at the worksite and the Contractor shall notify the Owner's Inspector/Representative 24 hours prior to conducting tests. Welding procedures qualified by others and welders qualified by another employer may be accepted as permitted by AWS D1.4.

1.5 DELIVERY AND STORAGE

1. Reinforcement and accessories shall be stored off the ground on platforms, skids, or other supports.

PART 2 - PRODUCTS

2.1MATERIALS

1. Welded Wire Fabric: ASTM A 185; wire in accordance with ASTM A 496; mesh and wire sizes as noted on drawings.
2. Epoxy Grout: Epoxy grout shall be of type and manufacturers as indicated in drawings.
3. Reinforcing Steel: Reinforcing steel shall be deformed bars for 10 mm diameter and above & round bars for 8 mm diameter & below.
4. Wire Ties: Wire ties shall be ASTM A 82 16-gauge double annealed wire. Provide corrosion resistant wire for precast concrete.
5. Supports: Bar supports for formed surfaces shall be designed and fabricated in accordance with CRSI 01 Class A, C or D or precast concrete blocks. Precast concrete blocks shall be not less than 4 inches square when supporting reinforcement on ground. Precast concrete blocks shall have compressive strength equal to that of the surrounding concrete. Where concrete formed surfaces will be exposed to weather or where surfaces are to be painted, steel supports shall be class C or D. Concrete supports used in concrete exposed to view shall be class C or D.

2.2 FABRICATION

1. Steel Bar Reinforcement: Fabricate and detail to shapes and dimensions shown on drawings in accordance with ACI 315.
2. Bending & Straightening: In accordance with ACI 318, Chapter 7, unless otherwise noted on drawings; no bending or straightening of reinforcement will be permitted after partial embedment in concrete; heating of reinforcement will be permitted only if entire operation is approved.
3. Welding: Welding of reinforcing bars is not permitted unless specifically shown welded on Structural drawings. When welding of reinforcement is indicated and required, provide welds in accordance with AWS D1.4.
4. Splicing:

    a. Reinforcing bars shall be lap spliced for tension unless otherwise noted on the drawings.
    b. At the Contractor's option, mechanical butt splicing using an exothermic welding process and high-strength sleeves or threaded splicing may be substituted for lap splices with prior approval. Butt welds, thermite welds, and threaded splices shall be capable of developing in tension at least 125% of the specified yield strength (Fy) on the bar.

    c. Mechanical coupler shall be allowed provided they are capable of developing in tension at least 125% of the specified yield strength (Fy) of the bar. In no case should the result fail in the threaded portion, submit test results and product literature for approval.

    d. Welding or tack welding of reinforcing bars to other bars or to plates, angles, etc.., is prohibited, except where specifically detailed on the approved shop drawings. Where welding is approved, it shall be done by AWS Certified Welders using E9018 or approved electrodes. Welding procedures shall conform to the requirements of AWS D1.4.

5. Welded Wire Fabric: In accordance with CRSI, Chapter 2, unless otherwise noted or indicated

PART 3 - EXECUTION

3.1 INSTALLATION

1. General: Clean reinforcing steel free from loose rust, mud, oil, and other foreign matter-affecting bond. Install supports in accordance with CRSI, Chapter 3 unless otherwise indicated.

2. Placement Of Bars: In accordance with ACI 318 and approved placement drawings. If bars are displaced, or if necessary to shift bars to avoid interference with other reinforcing or embedded items, and if bars are moved to locations exceeding allowable tolerances, obtain approval of the resulting arrangement prior to placing concrete.

3. Allowable Tolerances: In accordance with the requirements of ACI 117, paragraph 6.1

4. Cover: Allowable cover for reinforcement is indicated or noted on drawings; where no cover is indicated or noted, allow minimum of 3 inches of cover.

5. Tie Wires: After cutting tie wires, turn to the inside of section and bend so that concrete placement will not force ends to exposed concrete surfaces.

6. Welded Wire Fabric: Place welded wire fabric reinforcing in accordance with requirements of ACI 315, unless otherwise noted or indicated. Place continuous between control and expansion joints; stop at expansion joints and cut ½ through at control joints unless noted otherwise. Extend fabric across beams and walls. Lap fabric at a minimum of 1 ½ mesh minimum.

3.2 DEFECTIVE WORK

1. General: The following reinforcing steel work will be considered defective and shall be removed and replaced by the Contractor:

   a. Bars with kinks or bends not shown on drawings.
   b. Bars injured due to bending or straightening.
   c. Bars heated for bending.
   d. Reinforcement not placed in accordance with the drawings and/or specifications.

PART 4 - SAMPLING AND TESTING

4.1 General: All steel bars must be positively identified as to heat number and mill analysis.

1. All steel bars that cannot be identified by heat number and mill analysis shall have one tensile and one bend test made for each 2 ½ tons or fraction thereof, of each size and kind of reinforcing steel.
2. Testing procedure shall conform to ASTM A 615.

PART 1- GENERAL

1.1 APPLICABLE PUBLICATIONS: The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only. The latest edition shall be applicable.

1.1.1 U.S. Army Corps of Engineers (COE) Waterways Experiment Station Publications:

CRD-C-572 Specifications for Polyvinylchloride Waterstop
CRD-C-621 Handbook for Concrete and Cement, Specification for Nonshrink Grout, Volume II

PS 1 Construction and Industrial Plywood

1.1.2 American Association of State Highway and Transportation Officials (AASHTO) Publication:

M 182 Burlap Cloth Made From Jute or Kenaf

1.1.3 American Concrete Institute (ACI) Publications:

117 Standard Tolerances Of Construction for Concrete Construction and Materials.

211.1 Standard Practice for Selecting Proportions for Normal, Heavyweight and Mass Concrete
211.2 Standard Practice for Selecting Proportions for Structural Lightweight Concrete.
301 Specifications for Structural Concrete for Buildings
302 Guide for Concrete Floor and Slab Construction
304 Recommended Practice for Measuring, Mixing, Transporting and Placing Concrete
305 Hot Weather Concreting
315 Details and Detailing of Concrete Reinforcement
347 Recommended Practice for Concrete Formwork

1.1.4 American Society for Testing and Materials (ASTM) Publications:

A 82 Cold-Drawn Steel Wire for Concrete Reinforcement

A 185 Welded Steel Wire Fabric for Concrete Reinforcement

A 615 Deformed & Plain Billet-Steel Bars for Concrete Reinforcement

C 31 Making and Curing Concrete Test Specimens in the Field
C 33 Concrete Aggregates

C 39 Compressive Strength of Cylindrical Concrete Specimens

C 42 Obtaining and Testing Drilled Cores and Sawed Beams of Concrete

C 94 Ready-Mixed Concrete
C 143 Slump of Portland Cement Concrete
C 150 Portland Cement
C 171 Sheet Materials for Curing Concrete
C 172 Sampling Freshly Mixed Concrete

C 173 Air Content of Freshly Mixed Concrete by the Volumetric Method

C 309 Liquid Membrane-Forming Compounds for Curing Concrete
C 330 Lightweight Aggregates for Structural Concrete
C 494 Chemical Admixtures for Concrete
C 567 Unit weight of Structural Lightweight Concrete
C 881 Epoxy-Resin-Base bonding Systems for Concrete
C 920 Elastomeric Joint Sealants
D 1190 Concrete Joint Sealer, Hot-Poured Elastic Type

D 1751 Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Non-extruding and Resilient Bituminous types)

D 1752Preformed Sponge Rubber and Cork Expansion Joint Filler for Concrete Paving and Structural Construction
D 1850Concrete Joint Sealer, Cold Application Type

1.1.5 American Welding Society (AWS) Publication:
D1.4Structural Welding Code-Reinforcing Steel

1.2 DESCRIPTION OF WORK: The work includes the provision of cast-in place concrete. In the ACI publications referred to herein, the advisory provisions shall be considered to be mandatory, as though the word "shall" has been substituted for "should" wherever it appears.
1.3 SUBMITTALS:
1.3.1 Shop Drawings: Reproductions of contract drawings are unacceptable.

1.3.1.1 Shop Drawings for Reinforcing Steel: ACI 315. The Contractor shall submit three (3) sets of shop drawings for review and approval by the Engineer prior to any steel reinforcing bar fabrication and installations. Shop drawings shall be submitted at least seven (7) calendar days prior to any installations of reinforcing bars, depending on the number of drawings submitted, and shall be drawn on either 20" x 30" or 30" x 40" sheets. Indicated bending diagrams, assembly diagrams, splicing and laps of bars, shapes, dimensions, and details of bar reinforcing, accessories and concrete cover. Do not scale dimensions from structural drawings to determine lengths of reinforcing bars.
1.3.2 Contractor Mix Design: Thirty days minimum prior to concrete placement, submit a mix design for each strength and type of concrete. Furnish a complete list of materials including type, brand, source and amount of cement, and admixtures; applicable reference specifications; and copies of test reports showing that the mix has been successfully tested to produce concrete with the properties specified and will be suitable for the job conditions. Provide fly ash and pozzolan test results performed within 6 months of submittal date. Obtain approval before concrete placement. Submit additional data regarding concrete aggregates if the source of aggregate changes.

1.3.3 Certificates of Compliance:

a. Aggregates
b. Admixtures
c. Reinforcement
d. Cement
e. Fly ash
f. Pozzolan
g. Silica fume
h. Lightweight aggregate

1.3.4 Catalog Data:

a. Waterstops
b. Materials for Curing Concrete
c. Joint Sealant

d. Joint Filler
e. Vapor Barrier
f. Epoxy Bonding Agents

1.4 DELIVERY: Do not deliver concrete until vapor barrier, forms, reinforcement, embedded items, and chamfer strips are in place and ready for concrete placement.

1.5 STORAGE: ACI 301 for jobsite storage of concrete aggregates. Store reinforcement of different sizes and shapes in separate piles of racks raised above the ground to avoid excessive rusting. Protect from contaminants such as grease, oil, and dirt. Provide for accurate identification after bundles are broken and tags removed.

2.1.1.1 Slump Requirements:

The allowable slump shall be as follows:

	SLUMP (mm)	
ELEMENT	MINIMUM	MAXIMUM
Walls, columns, and grade beams	50	130

PART 2 - PRODUCTS

2.1 CONCRETE

2.1.1 **Contractor-Furnished Mix Design** : ACI 211.1 and ACI 301. Concrete have a 28-day compressive strengths shall as specified or indicated on the Provide ASTM C 33 aggregate size drawings. no. 57 and 67. The content shall not exceed one percent. maximum chloride

2.1.2 Lightweight Concrete Proportion:

ACI 211.2. Provide ASTM C330 aggregates for concrete; concrete strength and unit weight (dry) as indicated on the drawings.

2.2 MATERIALS

2.2.1 Cement: ASTM C 150, Type I for general use in construction; Type II where concrete is exposed to moderate sulfate action or where moderate heat of hydration is required.

2.2.2 Water: Water shall be fresh, clean and potable.

2.2.3 Aggregates: ASTM C 33, Class 1N or 2N, except as modified herein. Obtain aggregates for exposed concrete surfaces from one source. Aggregates shall not

Floors, exterior slabs, and other building construction	25	100

contain any substance which may be deleteriously reactive with the alkalies in the cement. Aggregates shall consist of gravel, crushed gravel, or crushed stone conforming to the requirements of ASTM C 33. Submit test results as required in ASTM C 33.

2.2.3.1 Aggregates for Lightweight Concrete: ASTM C330.1

2.2.4 Non-shrink Grout: COE CRD-C-621.

2.2.5 Admixtures: Water-reducing retarders shall be used in proportions recommended by the manufacturer. Trial mixes shall be made with the admixture and job materials at temperatures and humidities anticipated on the project. Sampling and testing shall be performed at no cost to the Owner, and with the supervision of the Project Inspector.

2.2.5.1 Retarding: ASTM C 494, Type B, D or G.

2.2.5.2 Water Reducing: ASTM C 494, Type A or F.

2.2.5.3 Fly Ash and Pozzolan: ASTM C618, Type N, F, or C except that the maximum allowable loss on ignition shall be 6 percent for Type N and 2.5 percent for Types F and C and a maximum of 24 plus or minus 2 percent may be retained on a No.325 sieve. Add with cement.

2.2.6 Reinforcement:

2.2.6.1 Reinforcing Bars: ACI 301 unless otherwise specified. ASTM A 706, Grade 60 (see notes on drawings.) ASTM 615, Grade 40 and 60 may be used provided it meets the requirement s of NSCP with regards to their strengths.

2.2.6.2 Mechanical Reinforcing Bar Connectors: ACI 301. Provide 125 percent minimum yield strength of the reinforcement bar.

2.2.6.3 Welded Wire Fabric: ASTM A 185 or ASTM A 497.

2.2.6.4 Wire: ASTM A 82 or ASTM A 496.

2.2.7 Vapor Barrier: ASTM C 171 polyethylene sheeting, minimum 6 mil thickness.

2.2.8 Polyvinylchloride Water stops: COE CRD-C-572.

2.2.9 Materials for Curing Concrete:

2.2.9.1 Impervious Sheeting: ASTM C 171; waterproof paper, clear or white polyethylene sheeting, or polyethylene - coated burlap.

2.2.9.2 Pervious Sheeting: AASHTO M 182.

2.2.9.3 Liquid Membrane-Forming Compound: ASTM C 309, white-pigmented, Type 2 Class B, free of paraffin or petroleum.

2.2.9.4 Liquid Chemical Sealer-Hardener Compound: Compound shall not contain petroleum resins or waxes. Compound shall not reduce the adhesion of resilient flooring, tile, paint, roofing waterproofing, or other material applied to concrete.

2.2.10 Expansion/Contraction Joint Filler: ASTM D 1751 or ASTM D 1752, 1/2-inch thick, unless otherwise indicated.

2.2.11 Joint Sealants

2.2.11.1 Horizontal Surfaces (3 percent slope, maximum):
a. Outside Buildings: ASTM D 1190.
b. Inside Buildings: ASTM D 1190 or ASTM D 1850.

2.2.11.2 Vertical Surfaces (greater than 3 percent slope): ASTM C 920, Type M, Grade NS, Class 25, Use T.

2.2.12 Epoxy Bonding Compound: ASTM C 881, Type I, for bonding hardened concrete to hardened concrete; Type II for bonding freshly mixed concrete to hardened concrete; Type III as a binder in epoxy mortar or concrete, or for use in bonding skid-resistant materials to hardened concrete.

2.2.13 Lightweight Concrete:

2.2.13.1 Structural Lightweight Concrete: ACI 211. Lightweight aggregates shall be expanded clay or other types conforming to ASTM C330. Materials of structural lightweight concrete shall be proportional to obtain the densities and respective 28-day compressive strengths indicated on the drawings.

2.2.13.2 Non-Structural Lightweight Concrete: Lightweight concrete shall consist of foam concrete or a mixture with the use of perlite aggregates. Foaming agent shall not contain any aluminum. Materials for lightweight concrete shall be proportioned to obtain a maximum density of 70 pounds per cubic foot for roof and 90 pounds per cubic foot for floors with 28-day compressive strength of 500 psi and 900 psi, respectively, unless otherwise indicated on the drawings.

2.2.14 Integral Waterproofing: 3CC System as manufactured by CEMENTAID or approved equal.

a. Splices: ACI 315. See notes on drawings. Unlessindicated otherwise, splices for large diameter bars (28 mm or larger) shall be made only with the use of threaded tension dowel couplers duly approved by the Structural Engineer. (See notes of Mechanical Couplers)

PART 3 - EXECUTION

3.1 FORMS: ACI 301. Provide forms, shoring, and scaffolding for concrete placement unless indicated or specified otherwise. Concrete for footings may be placed in excavations without forms upon inspection and approval by the Engineer. Set forms mortar-tight and true to line and grade. Chamfer above grade exposed joints, edges, and external corners or concrete 0.75 inch unless otherwise indicated. Provide formwork with clean-out openings to permit inspection and removal of debris. Forms submerged in water shall be watertight.

3.1.1 Coating: Before concrete placement, coat the contact surfaces of forms with a nonstaining mineral oil, nonstaining form coating compound, or two coats

of nitrocellulose lacquer. Do not use mineral oil on forms of surfaces to which adhesive, paint, or other finish material is to be applied.

3.1.2 Removal of Forms: Prevent concrete damage during form removal. After placing concrete, forms shall remain in place for the following minimum time period, not necessarily consecutive, where minimum temperatures specified in paragraph entitled "Curing Period and Minimum Temperatures" are maintained adjacent to the concrete and formwork. The minimum time period for removal of forms shall govern where it exceeds the minimum specified curing period. Where the formwork for one element supports the formwork for another element, the greater time period shall apply to both elements.

ELEMENT	TIME PERIOD (Days Minimum)
Walls, columns, sides of beams girders and slabs on grade	1
Pan joist forms (sides only):	
30 inches wide or less	3
Over 30 inches wide	4
Joist, beam, or girder soffits:	
Clear span between structural supports	
Under 10 feet	7
10 to 20 feet	14
Over 20 feet	21
One-way floor slabs : Clear span between	
structural supports	
Under 10 feet	4
10 to 20 feet	7
Over 20 feet	10

3.1.2.1 Special Requirements for Reduced Time Period Prior to Form Removal: Forms may be removed earlier than specified if ASTM C 39 test results of field-cured samples from a representative portion of the structure indicate that the concrete has reached a certain design strength capable of supporting the induced construction loads. Earliest will be after 4 days where concrete is expected to reach 60% of the design strength and there exist adequate permanent undisturbed shorings. Re-shoring has to be done after removal of forms.

3.1.3 Reshoring: Reshore concrete elements where forms are removed prior to the specified time period. Do not permit elements to deflect or accept loads during form stripping or reshoring. Where columns, walls, or other load-bearing concrete members are placed in advance of other framing and forms are needed for future use, forms may be stripped after 2 days if loads are not applied to load-bearing members, and if members are cured as specified in

paragraph entitled “Curing and Protection”. After forms are removed, slabs and beams over 10 feet in span and cantilevers over 4 feet shall be reshored for the remainder of the specified time period in paragraph entitled “Removal of Forms”. Perform reshoring operations to prevent subjecting concrete members to overloads, eccentric loading, or reverse bending. Reshoring elements shall have the same load-carrying capabilities as original shoring and shall be spaced similar to original shoring. Firmly secure and brace reshoring elements to provide solid bearing and support.

3.2 PLACING REINFORCEMENT AND MISCELLANEOUS MATERIALS

ACI 301. Provide bars, wire, fabric, wire ties, supports, and other devices necessary to install and secure reinforcement. Reinforcement shall not contain rust, scale, oil, grease, clay, and foreign substances that would reduce the bond. Rusting of reinforcement is a basis of rejection if the effective cross sectional area or the nominal weight per foot of the reinforcement has been reduced to less than specified in paragraph entitled “Reinforcing Bars”. Remove loose rust prior to placing steel. Tack welding is prohibited.

3.2.1 Tolerances: Place reinforcement and secure with galvanized or non-corrosive chairs, spacers, or metal hangers. Use concrete or other non-corrosive material for supporting reinforcement on the ground.

3.2.2 Splicing: Splices shall be approved prior to use. Do not splice at points of maximum stress. Overlap welded wire fabric the spacing of the cross wires, plus 2 inches.

3.2.3 Future Bonding: Plug exposed, threaded, mechanical reinforcement bar connectors with a greased bolt. Bolt threads shall match the connector. Countersink the connector in the concrete. Caulk the depression after the bolt is installed.

3.2.4 Cover: ACI 301 for minimum coverage, unless otherwise indicated.

3.2.5 Setting Miscellaneous Material: Place and secure anchors and bolts, pipe sleeves, conduits, and other such items in position before concrete placement. Plumb anchor bolts and check location and elevation. Temporarily fill voids in sleeves with readily removable material to prevent the entry of concrete.

3.2.6 Construction Joints: Locate joints to least impair strength and as approved by

the Structural Engineer. Continue reinforcement across joints unless otherwise indicated.

3.2.7 Expansion Joints and Contraction Joints: For slabs on grade, provide at edges of interior floor slabs, adjacent to walls, and as indicated. Make expansion joints 0.5-inch wide except as indicated otherwise. Fill expansion joints not exposed to weather with preformed joint filler material. Completely fill joints exposed to weather with joint filler material and joint sealant. Do not extend reinforcement or other embedded metal items bonded to the concrete through any expansion joint unless an expansion sleeve is

used. Provide contraction joints, either formed or saw cut or cut with a jointing tool, to the indicated depth after the surface has been finished. Sawed joints shall be completed within 4 to 12 hours after concrete placement. Protect joints from intrusion of foreign matter.

3.2.8 Water stop Splices: Fusion weld in the field.

3.2.9 Form Ties and Accessories: The use of wire alone is prohibited. Form ties and accessories shall not reduce the effective cover of the reinforcement.

3.2.10 Waterproofing: All concrete for basement walls, water reservoirs and superseded slabs and roof decks that will be exposed to standing water shall be waterproofed by approved product and methodology. Check with the Architect or Structural Engineer for specific type of waterproofing.

3.3 MEASURING, MIXING, TRANSPORTING, AND PLACING CONCRETE

ASTM C 94, ACI 301, ACI 302.1R, and ACI 304, except as modified herein. ASTM C 94 Provide mandatory batch ticket information for each load of ready mix concrete.

3.3.1 Measuring: Make moisture, weight, and air determination of intervals as specified in paragraph entitled “Sampling and Testing.” Allowable tolerances for measuring cement and water shall be 1 percent; for aggregates, 2 percent; and for admixtures, 3 percent.

3.3.2 Mixing: ASTM C 94. Machine mix concrete. Begin mixing within 30 minutes after the cement has been added to the aggregates. Place concrete within 90 minutes of either addition of mixing water to cement and aggregates or addition of cement to aggregates if the air temperature is less than 85 degrees F. Reduce mixing time and place concrete within 60 minutes if the air temperature is greater than 85 degrees F unless it can be proven by test results that the time can be increased with the addition of admixtures. Additional water may be added, provided that both the specified maximum slump and water-cement ratio are not exceeded. Dissolve admixtures in the mixing water and mix in the drum to uniformly distribute the admixture throughout the batch.

3.3.3 Transporting: Transport concrete from the mixer to the forms as rapidly as practicable. Prevent segregation or loss of ingredients. Clean transporting equipment thoroughly before each batch. Do not use aluminum pipe or chutes. Remove concrete which has segregated in transporting and dispose of as directed.

3.3.4 Placing: Place concrete as soon as practicable after the forms and the reinforcement have been inspected and approved. Do not place concrete when weather conditions prevent proper placement and consolidation; in uncovered areas during periods of precipitation; or in standing water. Prior to placing concrete, remove dirt, construction debris and water from within the forms. Deposit concrete as close as practicable to the final position in the forms. Place concrete in one continuous operation from one end of the structure towards the other. Position grade stakes on 10-foot centers

maximum in each direction when pouring interior slabs and on 20-foot centers maximum for exterior slabs.

3.3.4.1 Vibration: ACI 301. Furnish a spare vibrator at the jobsite whenever concrete is placed. Consolidate concrete slabs greater than 4 inches in depth with high frequency internal, mechanical vibrating equipment supplemented by hand spading and tamping. Consolidate concrete slabs 4 inches or less in depth by wood tampers, spading, and settling with a heavy leveling straight edge. Operate vibrators with vibratory element submerged in the concrete, with a minimum frequency of not less than 6000 impulses per minute when submerged. Do not use vibrators to transport the concrete in the forms. Insert and withdraw vibrators approximately 18 inches apart.Penetrate the previously placed lift with the vibrator when more than one lift is required. Place concrete in 18-inch maximum vertical lifts. External vibrators shall be used on the exterior surface of the forms when internal vibrators do not provide adequate consolidation of concrete.

3.3.4.2 Application of Epoxy Bonding Compound: Apply a thin coat of compound to dry, clean surfaces where indicated. Scrub compound into the surface with a stiff-bristle brush. Place concrete while compound is stringy. Do not permit compound to harden prior to concrete placement. Follow manufacturer's instructions regarding safety and health precautions when working with epoxy-resins.

3.3.5 Hot Weather: ACI 305R. Provide and maintain required concrete temperature using Figure 2.1.5 in ACI 305 R to prevent the evaporation rate from exceeding 0.2 pound of water per square foot of exposed concrete per hour. Cool ingredients before mixing or use other suitable means to control concrete temperature and prevent rapid drying of newly placed concrete. Shade the fresh concrete as soon as possible after placing. Start curing when the surface of the fresh concrete is sufficiently hard to permit curing without damage. Provide water hoses, pipes, spraying equipment, and water hauling equipment, where worksite is remote to water source to maintain a moist concrete surface throughout the curing period. Provide burlap cover or other suitable permeable material with fog spray or continuous wetting of the concrete when weather conditions prevent the use of either liquid membrane curing compound or impervious sheets. For vertical surfaces, protect form from direct sunlight and add water to top of structure once concrete is set.

3.4 SURFACE FINISHES (EXCEPT FLOOR, SLAB AND PAVEMENT FINISHES)

3.4.1 Defects: Repair formed surfaces by removing minor honeycombs, pits greater than one square inch surface area or 0.25 inch maximum depth, or otherwise defective areas. Provide edges perpendicular to the surface and patch with non- shrink grout. Patch tie holes and defects when the forms are removed. Concrete with extensive honeycomb (including exposed steel reinforcement, cold joints, entrapped debris, and separated aggregate or other defects) which affect the serviceability or structural strength will be rejected, unless correction of defects is approved. Obtain approval of corrective action prior to repair. The surface of the concrete shall not vary more than the allowable tolerances of ACI 347. Exposed surfaces shall be

uniform in appearance and finished to a smooth form finish unless otherwise specified.

3.4.2 Not Against Forms (Top of Walls): Surfaces not otherwise specified shall be finished with wood floats to even surfaces. Finish shall match adjacent finishes.

3.4.3 Formed Surfaces:

3.4.3.1 As-Cast Rough Form (For Surfaces Not Exposed to Public View): Remove fins and other projections exceeding 0.25 inch is height; level abrupt irregularities.

3.4.3.2 As-Cast Smooth Form (For Surfaces Exposed to Public View): Form facing material shall produce a smooth, hard, uniform texture on the concrete. Remove fins and other projections.

3.4.4 Rubbed Finish: Provide concrete with a smooth form finish. Finish as follows:

a. Smooth Rubbed: Provide a newly hardened concrete within 24 hours following form removal. Wet surfaces and rub with an abrasive tool to produce uniform color and texture. Use only the cement paste drawn from the concrete rubbing process.

   Grout Cleaned: Finishing operations shall not begin until adjacent surfaces to be cleaned are completed and accessible. Cleaning as the work progresses shall not be permitted. Mix one part cement and 1.5 parts fine sand with sufficient water to produce a grout with the consistency of thick paint.

   Substitute white cement for a part of the gray cement in order to produce a color matching the color of the surrounding concrete, determined by a trial patch. Wet the surface of the concrete sufficiently to prevent absorption of water from the grout. Apply the grout uniformly with brushes or spray gun. Immediately after applying the grout, scrub the surface vigorously with cork float or stone to coat the surface and fill air bubbles and holes. Remove excess grout while still plastic by working the surface with a rubber float, sack, or other approved method. When dry, rub the surface vigorously with clean burlap. Keep damp for 36 hours minimum after final rubbing.

3.4.5 Surface Finish Samples: Provide a minimum of three samples concrete panels for each finish for each mix design, 3 feet by 3 feet, 3 inches thick. Use the approved concrete mix design (s). Provide sample panel on-site at locations directed. Once approved, each set of panels shall be representative of each of the finishes specified and shall be representative of the workmanship and finish/es required. Do not remove or destroy samples until directed by the Architect.

3.5 FLOOR, SLAB AND PAVEMENT FINISHES AND MISCELLANEOUS CONSTRUCTION. ACI 302.1R, unless otherwise specified. Slope floors uniformly to drains where drains are provided. Depress the concrete base slab where quarry tile, ceramic tile, or marble tile are indicated. Provide interior floor slabs with a steel troweled finish or power float finish, as required. After troweling is completed, apply a liquid chemical sealer-hardener compound on interior floor slabs that do not receive floor covering.

3.5.1 Finish: Place, consolidate, and immediately strike off concrete to obtain proper contour, grade, and elevation before bleed water appears. Permit concrete to attain a set sufficient for floating and supporting the weight of the finisher and equipment. If bleed water is present prior to floating the surface, drag the excess water off or remove by absorption with porous materials. Do not use dry cement to absorb bleed water.

3.5.1.1 Floated: Provide for machinery pads and other exterior slabs where not otherwise specified. Float the surface by hand with a wood or magnesium float, or use a power-driven float. Floating or any one area shall be the minimum necessary to produce an even finish, level within 1/4 inch in 10 feet for exterior work and level within 1/8 inch in 10 feet for interior work where floor drains are not provided.

3.5.1.2 Steel Troweled: First, provide a floated finish. When slab attains a proper set, trowel to a smooth, hard, dense finish. Finished surfaces shall be free of troweled marks, uniform in texture, and a true plane, flat within 0.01 foot (Approximately 1/8 inch) in 10 feet. Hand finish portions of the slab not accessible to power-finishing equipment (e.g., edges, corners) to match the remainder of the slab. Power trowel once and finally hand trowel where a finished floor covering (e.g., tile, carpet) is specified. Power trowel twice and finally hand trowel for exposed concrete floors.

3.5.1.3 Broomed: Provide for exterior walks, platforms, patios, and ramps, unless otherwise indicated. Provide a floated finish, then finish with a flexible bristle broom. Permit surface to harden sufficiently to retain the scoring or ridges. Broom transverse to traffic or at right angles to the slope of the slab.

3.5.1.4 Pavement: Screed the concrete with a template advanced with a combined longitudinal and crosswise motion. Maintain a slight surplus of concrete ahead of the template. After screeding, float the concrete longitudinally. Use a straight edge to check slope and flatness; correct and refloat as necessary. Obtain final finish by belting. Lay belt flat on the concrete surface and advance with a sawing motion; continue until a uniform but gritty non- slip surface is obtained. Round edges and joints with an edger having a radius of 1/8 inch.

3.5.2 Concrete Walks: Provide 4 inches thick minimum. Provide contraction joints spaced every 5 linear feet unless otherwise indicated. Cut contraction joints ¾ inch deep with a jointing tool after the surface has been finished. Provide 0.5 inch thick transverse expansion joints at changes in direction where sidewalk abuts curb, steps, rigid pavement, or other similar structures; space expansion joints every 50 feet maximum apart. Provide walks with a

broomed finish. Provide a transverse slope of 1/4 inch per foot. Limit variation in cross section to 1/4 inch in 5 feet.

3.5.3 Pits and Trenches: Place bottoms and walls monolithically or provide water stops and keys.

3.5.4 Curbs and Gutters: Provide contraction joints spaced every 10 feet maximum unless otherwise indicated. Cut contraction joints ¾ inch deep with a jointing tool after the surface has been finished. Provide expansion joints ½ inch thick and spaced every 100 feet maximum unless otherwise indicated. Provide a pavement finish.

3.6 CURING AND PROTECTION: ACI 301 unless otherwise specified. Begin curing immediately following form removal. Protect concrete from injurious action by sun, rain, flowing water, mechanical injury, tire marks, and oil stains. Do not allow concrete to dry out from time of placement until the expiration of the specified curing period. Do not use membrane-forming compound on surfaces where appearance would be objectionable, on any surface to be painted, where coverings are to be bonded to the concrete, or on concrete to which other concrete is to be bonded. If forms are removed prior to the expiration of the curing period, provide another curing procedure specified herein for the remaining portion of the curing period.

3.6.1 Moist Curing: Provide for the removal of water without erosion or damage to the structure.

3.6.1.1 Ponding or Immersion: Continually immerse the concrete throughout the curing period. Water shall not be more than 20 degrees F less than the temperature of the concrete.

3.6.1.2 Fog Spraying or Sprinkling: Provide uniform and continuous application of water throughout the curing period.

3.6.1.3 Pervious Sheeting: Completely cover surface and edges of the concrete with two thickness of wet sheeting. Overlap sheeting 6 inches over adjacent sheeting. Sheeting shall be at least as long as the width of the surface to be cured. During application, do not drag the sheeting over the finished concrete nor over sheeting already placed. Wet sheeting thoroughly and keep continuously wet throughout the curing period.

3.6.1.4 Impervious Sheeting: Wet the entire exposed surface of the concrete thoroughly with a fine spray of water and cover with impervious sheeting throughout the curing period. Lay sheeting directly on the concrete surface and overlap edges 12 inches minimum. Provide sheeting not less than 18 inches wider than the concrete surface to be cured. Secure edges and transverse laps to form closed joints. Repair torn or damaged sheeting or provide new sheeting. Cover or wrap columns, walls, and other vertical structural elements from the top down with impervious sheeting, overlap and continuously tape sheeting, overlap and continuously tape sheeting joints, and introduce sufficient water to soak the entire surface prior to completely enclosing.

3.6.2 Liquid Membrane-Forming Compound Curing: Seal or cover joint openings prior to application of curing compound. Prevent curing compound from entering the joint. Provide and maintain compound on the concrete surface throughout the curing period. Do not use this method of curing where the use of Figure 2.1.5 in ACI 305R indicates that hot weather conditions will cause an evaporation rate exceeding 0.2 pounds of water per square foot per hour.

3.6.2.1 Application: Unless the manufacturer recommends otherwise, apply compound immediately after the surface loses its water sheen and has dull appearance, and before joints are sawed. Mechanically agitate curing compound thoroughly during use. Use approved power-spraying equipment to uniformly apply two coats of compound in a continuous operation. The total coverage for the two coats shall be 200 square feet maximum per gallon of undiluted compound unless otherwise recommended by the manufacturer's written instructions. The compound shall form a uniform, continuous, coherent film that will not check, crack, or peel. Immediately apply an additional coat of compound to areas where the film is defective. Re-spray concrete surfaces to rainfall within 3 hours after the curing compound application.

3.6.2.2 Protection of Treated Surfaces and Completed Work: Prohibit foot and vehicular traffic and other sources of abrasion for not less than 72 hours after compound application. Maintain continuity of the coating for the entire curing period and immediately repair any damage. Completed works such as stairs, floor slab, and other concrete surfaces which are likely to be damaged by construction loads and traffic shall be protected at all times. Any damage to these surfaces shall be repaired immediately to the satisfaction of the Engineer.

3.6.3 Liquid Chemical Sealer-Hardener Curing: Provide for interior floors that do not receive a floor covering, or in lieu of liquid membrane-forming compound curing for other surfaces. Apply sealer-hardener in accordance with the manufacturer's recommendations. Seal or cover joints and openings in which joint sealant is to be applied as required by the joint sealant manufacturer.

3.6.4 **Curing Period**:

TIME PERIOD (Days Minimum)	***CONCRETE STRUCTURE OR CEMENT TYPE***
7	ASTM C 150, Type I or II, either with or without fly ash, pozzolan or ground slag; and ASTM C 595 cement for concrete not specified otherwise.
10	Retaining walls that will be subjected to deteriorating conditions; pavement not under a roof, chimneys.
14	Water tanks for potable and non-potable water; structures that will be in contact with water; decks and similar parts of water front structures over seawater that will not ordinarily be wetted

by sea-water.

3.6.4.1 Additional Curing: Double the required curing period if either one or the average of both 7-day test cylinders indicate less than 90 percent of the strength specified (f'c).

3.7 SAMPLING AND TESTING:

3.7.1 Sampling: ASTM C 172. Collect samples of fresh concrete to perform tests specified. ASTM C 31 for making test specimens. Samples shall be collected at final discharge point.

3.7.2 Testing:

3.7.2.1 Slump Tests: ASTM C 143. Take concrete samples during concrete placement. The maximum slump may be increased as specified with the addition of an approved admixture provided that the water-cement ratio is not exceeded. Perform tests at commencement of concrete placement, when test cylinders are made, and for each batch (minimum) or every 10 cubic yards (maximum) of concrete.

3.7.2.2 Temperature Tests: Test the concrete delivered and the concrete in the forms. Perform tests for each batch (minimum) or every 10 cubic yards (maximum) of concrete, until the specified temperatures obtained, and whenever test cylinders and slump tests are made.

3.7.2.3 Compressive Strength Tests: ASTM C39. Sampling shall be in accordance with ASTM C 31. Obtain cylinder samples for compressive strength tests at the rate of three (3) sets of five (5) samples per set for each day's pour or for every 150 cubic meters of concrete poured or for every 500 square meters of area for slabs or walls, whichever is greater. Test two (2) cylinders at 7 days, one (1) cylinder at 14 days and one (1) cylinder at 28 days, and hold one (1) cylinder in reserve. If the average strength of the 28-day test cylinders is less than the specified f'c and a maximum of one single cylinder is less than f'c minus 500 psi, obtain core samples for compressive strength tests in accordance with ASTM C 42 at the rate recommended in ACI 318. Concrete represented by core tests shall be considered structurally adequate if the average of three cores is equal to at least 85 percent of f'c and if no single core is less than 75 percent of f'c. Locations represented by erratic core strengths shall be re-tested. Remove concrete not meeting strength criteria and provide new, acceptable concrete. Repair core holes with non-shrink grout. Match color and finish of adjacent concrete.

3.7.2.4 Air Content: ASTM C 173 or ASTM C 231. Test air-entrained concrete for air content at the same frequency as specified for slump tests.

3.7.2.5 Cost of Tests: All costs of initial tests for compressive strength of concrete and test for reinforcing bars shall be at the Contractor's expense. Cost of re-tests, core tests, load tests and other tests performed as a result of initial test failing to meet all specified requirements shall likewise be at the Contractor's expense.

3.8 SAMPLING AND TESTING OF STEEL REINFORCEMENT

3.8.1 The Contractor shall satisfy the Engineer that steel reinforcement delivered to the site has had sufficient routine inspection and testing carried out by the manufacturer. In addition the following routine testing shall be carried out on steel reinforcement delivered to the site.

3.8.2 Hot –Rolled Steel Reinforcing Bars

a. Every batch of steel bars delivered to the site shall be tested to verify the mass and tensile properties for every shipment of 5,000 kg or fraction thereof.

b. The test shall consist of 10 specimens. Abbreviated testing may be considered on a particular batch at the discretion of the Engineer. If the bar pattern of the specific diameter is acceptable for abbreviated testing the test shall consist of 3 specimens.

c. The specimens should be selected from different bars in the batch. A batch is defined as any quantity of bars of one size and grade, manufactured by the same mill, covered by the same mill certificate, and delivered to the site at any one time. Steel bars in more than one delivery to the site within a short period may be considered as part of the same batch provided that the deliveries belong to one single consignment from the manufacturer and are covered by the same mill certificate.

d. If one of more valid test results is less than 93% of the specified characteristics strength, the batch shall be deemed not complying with the characteristic strength requirements.

e. If one of more valid test results fail to meet the mass, tensile strength, elongation or bend test requirements, two additional specimens for each failure shall be taken from different bars for the same batch and subjected to the test, or tests in which the original specimen failed. If any of the additional specimens fail, the batch shall be deemed not complying.

f. The test report should contain the following information:

1. Full description of test specimens including names of steel manufacturer, country of origin, grade and size as stated by the person submitting them for testing;
2. Sketch of pattern deformation or mill marks;
3. Mill Certificate;
4. Identification of the batch and date of delivery to the site to which the test specimens relate;
5. Measured mass and calculated effective cross-sectional area of test specimens;
6. Results of yield stress tensile strength, elongation and bond tests if required.

3.8.3 Mechanical Splicing

a. Splice sample should be taken at a rate of 1 sample for every 250 splices or 6 samples for every floor, whichever is greater.

b. The only acceptable form of full strength butt joint for a bar in tension comprises a mechanical coupler satisfying the following criteria:

1. When a test is made of representative gauge length assembly comprising reinforcement of the size, grade and profile to be used and a coupler of the precise type to be used, the permanent elongation after loading to 0.60 Fy should not exceed 0.10 mm.
2. A full mechanical connection shall develop in tension as required at least 125% of the specifying strength (Fy) of the steel bar.

3.9 COST OF TESTS

3.10.1 All costs of initial tests for compressive strength of concrete and test for reinforcing bars shall be at the Contractor's expense, including costs of retests, core tests, load tests and other tests performed as a result of initial tests failing to meet all specified requirements.

3.10 TOLERANCES

3.11.1 Tolerances of formwork, reinforcements, finished concrete work shall be in accordance with ACI Standard 117.

PART 1- GENERAL

1.1 APPLICABLE PUBLICATIONS: The latest edition of the publications listed below form a part of this specification to the extent referenced.

1.1.1 American Society for Testing and Materials (ASTM) Publications: A 82 Cold-Drawn Steel Wire for Concrete Reinforcement

A 90 Weight of Coating on Zinc-Coated (Galvanized) Iron or Steel Articles
A 153 Zinc Coating (Hot-Dip on Iron and Steel Hardware)
A 615 Deformed and Plain Billet-Steel Bars for Concrete Reinforcement
C 90 Hollow Load-Bearing Concrete Masonry Units
C 91 Masonry Cement
C 144 Aggregate for Masonry Mortar
C 150 Portland Cement
C 270 Mortar for Unit Masonry
C 476 Grout for Reinforced and Non-Reinforced Masonry

1.2 SUBMITTALS:

1.2.1 Samples: Submit for approval samples of each type of wall reinforcements and wall ties and design mix for grout.

1.2.2 Certificates of Conformance: Submit certificates attesting that masonry cement, masonry units, aggregates and accessories meet the requirements specified herein.

1.3 DELIVERY AND STORAGE: Deliver cement and other cementitious materials to the site in unbroken bags, barrels, or other approved containers, plainly marked and labeled with manufacturer's names and brands. Store cementitious materials in dry, weather tight sheds or enclosures and handle so as to prevent entry of foreign materials and damaged by water or dampness. Handle masonry units with care to avoid chipping and breakage. Protect masonry material from damage, and except for sand, keep dry until used.

PART 2- PRODUCTS

2.1 MASONRY UNITS

2.1.1 Concrete Masonry Units: Units of modular dimensions and air, water, or steam cured. Store Type II units at the site before use a minimum of 28 days for air-cured units, 10 days for atmospheric steam or water-cured units, and 3 days for units cured with steam at a pressure of 120 to 150 psi and at a temperature of 350 to 365 degrees F for at least 5 hours. Surfaces of units which are to be plastered or stuccoed shall be sufficiently rough to provide a suitable bond; elsewhere, exposed surfaces of units shall be comparatively smooth and/or uniform in texture.

a. Hollow Load-Bearing Units: ASTM C 90, Grade N-1 or N-II, made with normal weight aggregates with ultimate compressive strength of at least 1,200 psi at 28 days.
b. Hollow Non-Load Bearing Units: ASTM C-129 made with normal weight aggregates, and with ultimate compressive strength of at least 650 psi at 28 days.
c. Special Shapes: Provide special shapes such as closures, header units, and jamb units as necessary to complete the work. Special shapes shall conform to the requirements for the units with which they are used.

2.1.2 Precast Concrete Lintels: Same materials and surface texture as adjacent masonry units, with a 28-day compressive strength of not less than 2,000 psi. Provide reinforcing as indicated. Provide lintels of sizes indicated, straight and true, with at least 8 inches of bearing at each end.

2.2 MORTAR

2.2.1 Portland Cement: ASTM C 150, Type I.

2.2.2 Masonry Cement: ASTM C 91, except that the air content of the mortar specimen shall be not more than 16 percent by volume in lieu of 22 percent. Containers shall bear complete instructions for proportioning and mixing to obtain the required types of mortar.

2.2.3 Sand: ASTM C 144.

2.2.4 Water: Clean, potable, and free from substances which could adversely affect the mortar.

2.2.5 Mortar Types: ASTM C 270, Type M for foundation walls, Type N or S for non-load bearing, non-shear wall interior concrete masonry and Type S for all other masonry work. If masonry cement is used, submit the manufacturer's printed instructions on proportions of water and aggregates and on mixing to obtain the type of mortar required.

2.3 ACCESSORIES

2.3.1 Horizontal Joint Reinforcement: Horizontal joint reinforcements shall be reinforcing bars, as indicated, conforming to ASTM A615, or fabricated from

cold drawn steel wire, conforming to ASTM A82. The wire shall be zinc-coated after fabrication by the hot-dip process in accordance with ASTM A 153 either bright steel, copper-clad steel, or zinc coated after fabrication. Reinforcement shall consist of two or more parallel longitudinal wires, not less than 0.1620 inch (8-gage) in diameter, weld connected with cross wires, not less than 0.1350-inch (9-gage) in diameter. Cross wires shall be crimped to provide an effective moisture drip in wall cavity. The out-to-out spacing of the longitudinal wires shall be 1-1/2 to 1-3/4 inches less than the actual width of the masonry. The distance between welded contacts of cross wires with each longitudinal wire shall not exceed 16 inches. Joint reinforcement shall be provided in flat sections, not less than 10 feet in length, except that corner reinforcement and other special shapes may be less in length.

2.3.2 Ties: Provide approved design of copper-clad steel, zinc coated steel, or non-corrosive metal having the equivalent total strength of steel types. Zinc- coat items by the hot-dip process after fabrication to a minimum of 1.25 ounces of zinc per square foot of surface when tested in accordance with ASTM A 90.

a. Wire Mesh Ties: Wire not lighter than 20-gage, galvanized, ½ inch mesh with width of one inch less than thickness of masonry.
b. Corrugated Metal Ties: Not less than 7/8 inch wide by approximately 6 inches long and not lighter than 22-gage.

2.3.3 Fastenings: Provide suitable and approved bolts, metal wall plugs, or other approved metal fastenings for securing furring to masonry and elsewhere as necessary. Bolts or other fastenings longer than 1-½ inches (40 mm) shall be attached to masonry units only where there are grouted cells.

PART 3 - EXECUTION

3.1 INSTALLATION: Coordinate masonry work with the work of other trades to accommodate built-in items and to avoid cutting and patching. Do not change source of supply materials after the work has started if the appearance of the finished work would be affected.

3.1.1 Protection

a. Stains: Protect exposed surfaces from mortar and other stains. When mortar joints are tooled, remove mortar from exposed surfaces from splash stains by covering adjacent ground with sand, sawdust, or polyethylene.

b. Loads: Do not apply uniform loads for at least 12 hours or concentrated loads for at least 72 hours after masonry is constructed.

3.1.2 Workmanship: Masonry wall shall be carried up level and plumb all around. One section of the walls shall not be carried up in advance of the others, unless specifically approved by the Engineer. Unfinished work shall be stepped back for jco.ining with new work; toothing will not be permitted, except where specified. Heights of masonry shall be checked with an instrument at each floor, and at sills and heads of openings, to maintain the level of the walls. Door and window frames, louvered openings, anchors, pipes, ducts, conduits shall be built in carefully and neatly as the masonry work progresses. Spaces around metal doorframes shall be filled solidly with mortar. Masonry units

shall be handled with care to avoid chipping, cracking, and spalling of faces and edges. Drilling, cutting, fitting, and patching, to accommodate the work of other, shall be performed by masonry mechanics. Masonry shall be cut with masonry saws in exposed work, where indicated by the Engineer. Structural steelworks, bolts, anchors, inserts, plugs, ties, lintels, and miscellaneous metalwork specified elsewhere shall be placed in position as the work progresses. Chases of approved dimensions for pipes and other purposes shall be provided where indicated or necessary. Tops of exposed walls and partitions, not being worked on, shall be covered with a waterproof membrane, well secured in place. Unless indicated otherwise, partitions shall extend from floor to the bottom of the floor or roof construction above. Walls and partitions shall be structurally bonded or anchored to each other and to beams and columns. Non-load bearing partitions and interior walls shall be securely anchored to the construction above, in a manner that provides lateral stability while permitting unrestricted deflection of construction above. Scaffolding shall be inspected regularly, and shall be amply strong, well braced, and securely tied in position. Overloading of scaffolding will not be permitted.

3.1.3 Mortar Mixing: Measure mortar materials in proper containers to maintain control and accuracy of proportions. Do not measure materials with shovels. Unless specified otherwise, mix mortar in proportions by volume. Introduce and mix aggregate in such a manner that the materials will be distributed uniformly throughout the mass. Add water gradually and mix not less than 3 minutes, until proper plasticity is obtained. Machine mix mortar, is mixers of the type in which the quantity of water can be controlled accurately and uniformly. Hand mixing may be used only when specifically approved. Keep mortar boxes, pans, and mixer drums clean and free of debris or dried mortar. Do not use re-temper ed mortar which has not been placed in its final position within 1-1/2 hours after the initial mixing.

d. Mortar: Mix mortar at the site using materials conforming to ASTM C 270 to obtain type of mortar required. Measurement and mixing shall conform to ASTM C 270. When masonry cement is used, conform to printed mixing instructions of the masonry cement manufacturer.

e. Grout: ASTM C 476. Provide fine grout in grout spaces less than 2 inches in any horizontal dimensions or in which clearance between reinforcing and masonry is less than 3/4 inch. Provide coarse grout in grout spaces 2 inches or greater in all horizontal dimensions, provided the clearance between reinforcing and masonry is not less than 3/4 inch.

3.1.4 Mortar Joints: Uniform thickness of 3/8 inch (10 mm), unless otherwise indicated. Tool exposed joints slightly concave with a round or other suitable jointer slightly larger than the width of the joint so that complete contact is made along the edges of the units, compressing and sealing the surface of the joint. Strike flush joints that will not be exposed. Tool horizontal joints first. Brush joints to remove all loose and excess mortar. All horizontal joints shall be level; vertical joints shall be plumb and in alignment from top to bottom of wall within a tolerance of not more than 1/2 inch in 40 feet. Provide concrete curb or pedestal at the bottom with the necessary height to obtain a clear height of the masonry wall in modules of masonry unit height plus mortar of 3/8 inch

(10 mm) to avoid cutting of masonry units. Insertion of broken masonry units at the top of wall below a beam or slab will not be permitted.

3.1.5 Concrete Masonry Unit Work: Lay the first course in a full bed of mortar for the full width of the unit. Lay succeeding courses in running bond unless otherwise indicated. Form bed-joints by applying the mortar to the entire top surfaces of the inner and outer face shells. Form head joints by applying the mortar for a width of about 1 inch to the end of the adjoining units laid previously. The mortar shall be smooth, not furrowed, and shall be of such thickness that it will be forced out of the joints as the units are being placed in position. Where anchors, bolts, and ties occur within the cells of the units, place metal lath in the joint at the bottom of such cells and fill the cells with mortar or grout as the work progresses. Use concrete brick for bonding walls, working out the coursing, topping out walls under sloping slabs, distributing concentrated loads, backing brick headers, and elsewhere, as required. Do not dampen concrete masonry units before or during laying.

a. Special Concrete Masonry Unit Work: Where exposed concrete masonry unit walls and partitions are indicated, provide special concrete masonry unit work. Select units for uniformity of size, texture, true plane, and undamaged edges and ends of the exposed surfaces. Place units plumb, parallel, and with properly tooled joints of maximum 3/8 inch (10 mm) thickness. Keep exposed surfaces clean and free from blemishes or defects. Lay units in the bond pattern indicated.

b. Reinforced Concrete Masonry Unit Walls: Where vertical reinforcement occurs, fill cores solid with grout. Lay units in such a manner as to preserve the unobstructed vertical continuity of cores to be filled. Embed the adjacent webs in mortar to prevent leakage of grout. Remove mortar fins protruding from joints before grout is placed. Minimum clear dimensions of vertical cores shall be 2 by 3 inches. Position reinforcing accurately as indicated. As masonry work progresses, secure vertical reinforcing in place at vertical intervals not to exceed 160 bar diameters. Embed horizontal reinforcing in grout as grouting proceeds. Minimum clear distance between masonry and vertical reinforcement shall not be less than ½ inch. Unless indicated or specified otherwise, form splices by lapping bars not less than 40 bar diameters and wire tying them together.

3.1.6 Bonding and Anchoring: Unless indicated otherwise, extend partitions from the floor to the bottom of the floor or roof construction above. Structurally bond or anchor walls and partitions to each other and to concrete walls, beams, and columns. Securely anchor non-load bearing partitions and interior walls to the construction above as indicated. Completely embed anchors in mortar joints.

a. Corners of Load-Bearing Walls: Provide a true masonry bond in each course, except where indicated or specified otherwise.

b. Intersections of Load-Bearing Walls: Provide a true masonry bond in each course or anchor with rigid steel anchors not more than 2 feet apart vertically, unless otherwise indicated.

c. Intersections of Non-Load-Bearing Partitions with Other Walls or Partitions: Tie with wire mesh at vertical intervals of not more than 2 feet or with masonry bonding in alternate courses.

d. Masonry Walls Facing or Abutting Concrete Members: Anchor masonry to the concrete with dovetail or wire-type anchors inserted in slots or inserts built into the concrete. Locate anchors not more than 18 inches on centers vertically and not more than 24 inches on centers horizontally.

3.1.7 Horizontal Joint Reinforcement: Provide reinforcement in every other course and in the first two courses above and below openings in walls and partitions of concrete masonry units. Reinforcement shall be continuous except at control joints and expansion joints. Reinforcement above and below openings shall extend not less than 24 inches beyond each side of openings. Provide reinforcement in the longest available lengths, utilizing the minimum number of splices. Overlap ends not less than 12 inches. Provide welded L-shaped assemblies not less than 32 by 32 inches, both of the same size members and the same construction as the straight reinforcement, at corners and intersections of walls and partitions. Place the reinforcement and apply mortar so as to provide mortar cover for the wire of at least 5/8 inch for exterior wall face and 1/2 inch for interior wall face.

3.1.8 Concrete Masonry Unit Lintels and Bond Beams: Provide special units, fill cells solidly with grout of concrete, with a strength same as masonry or higher and provide not less than two ø16 reinforcing bars, unless indicated otherwise. Reinforcing shall overlap a minimum of 40 bar diameters at splices. Terminate bond beams and reinforcing on each side of expansion joints (and control joints). Concrete masonry units shall be thoroughly wet prior to pouring concrete grout. Concrete masonry units used for lintels and bond beams shall have exposed surfaces of the same material and texture as the adjoining masonry units. Allow lintels to set at least 6 days before shoring is removed. Lintels shall be straight and true and shall have at least 8 inches of bearing at each end.

3.1.9 Control Joints: Provide where indicated in concrete masonry unit walls. Provide control joints of the sawed type or the built-in type, as the case requires. Joints shall occur directly opposite each other on both faces of the wall and shall be filled with an approved non-staining elastic calking compound or sealant.

3.1.10 Grout Placement: Place grout from the interior side of walls, except as approved otherwise. Protect sills, ledges, offsets, and other surfaces and remove any excess grout immediately. Grout shall be well mixed to prevent segregation and shall be sufficiently fluid to flow into joints and around reinforcing without leaving voids. Place grout by pumping or pouring from buckets equipped with spouts in lifts not exceeding 4 feet. Keep pours at 1- 1/2 inches below the top of masonry units in top course, except at the finish course.

Puddle or agitate grout thoroughly to eliminate voids. Do not displace masonry from its original position. Remove masonry displaced by grouting operation and relay in alignment with fresh mortar.

3.1.11 Forms and Shoring: Construct to the shape, lines and dimensions of members indicated and make sufficiently rigid to prevent deflections which may result in cracking or other damage to supported masonry. Forms shall remain on girders and beams not less than 10 days after completion of the members. Not less than 16 hours shall elapse before uniformly distributed construction loads are applied to completed masonry members. Not less than 64 hours shall elapse before concentrated loads are applied.

3.2 CLEANING

3.2.1 Protection: Protect work which may be damaged, stained or discolored during cleaning operations.

3.2.2 Pointing: Upon completion of masonry work, cut out defective mortar joints and tuck joints and all holes solidly with mortar.

3.2.3 Cleaning: Clean exposed masonry surface with clear water and stiff fiber brushes and rinse with clear water. Where stains, mortar, or other soil remain, continue cleaning as follows: Clean masonry surfaces by scrubbing with warm water and soap and rinsing thoroughly with clean water. Restore damaged, stained, and discolored work to its original conditions or replace with new work.

PART 1 - GENERAL

1.1 SUMMARY

1.1.1 Structural steel framing and shoring system, complete with base plates, bracing,
anchorage including the following:

a. Erection and connecting structural steel frame and temporary structural steel framework.
b. Baseplate grouting.

1.2 APPLICABLE PUBLICATIONS: The publications listed below form part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only. The latest edition shall be applicable.

1.2.1 American Institute of Steel Construction (AISC):

1. "Code of Standard Practice for Steel Buildings and Bridges," except Paragraph 4.2.1 is modified by deletion of the following sentence: This approval constitutes the owner's acceptance of all the responsibility for the design adequacy of any connections designed by the fabricator as a part of his preparation of these shop drawings."
2. Manual of Steel Construction, Allowable Stress Design, 9th Edition, 1989.
3. "Specifications of the Design, Fabrication and Erection of Structural Steel for Buildings."
4. Specification for Structural Joints Using ASTM A325 or A490 Bolts.

1.2.2 American Society of Testing and Materials (ASTM):

A6 General Requirements for Rolled Steel Plates, Shapes, Sheet Piling and Bars for Structural Use.
A36 Structural Steel. A53 Pipe.
A123 Zinc (Hot-Dip Galvanized) Coatings on Products Fabricated from Rolled, Pressed, and Forged Steel Shapes, Plates, Bars and Strip.
A153 Zinc Coating (Hot-Dip) on Iron and Steel Hardware
A307 Carbon Steel Externally and Internally Threaded Standard Fasteners.
A325 High Strength Bolts for Structural Steel Joints.
A441 High Strength, low Alloy Structural Manganese Vanadium Steel.
A490 Quenched and Tempered Alloy Steel Bolts for Structural Steel Joint.
A500 Grade B Cold-Formed Welded and Seamless Carbon Steel Structuring Tubing.
A501 Hot-Formed Welded and Seamless Carbon Steel Structural Pipe.
A572 High Strength Low-Alloy Columbium-Vanadium Steels of Structural Quality.
A588 High Strength Low-Alloy Structural Steel with 50,000 PSI Minimum Yield Point to 4-inch Thickness.

1.2.3 American Welding Society (AWS):

A2.4 Welding Symbols
A3-0 Terms and Definitions
A5.1 Specifications for Mild Steel Electrodes for Flux Cored Arc Welding.
A5.20 Specification for Low-Alloy Steel Covered Arc-Welding Electrodes.
A5-5 Specification for Low-Alloy Steel Covered Arc-Welding Electrodes.
A5.17 Specification for Carbon Steel Electrodes and Fluxes for Submerged Arc Welding.

A5-23 Specification for Low-Alloy Steel Electrodes and Fluxes for Submerged Arc Welding.

D1.1 Structural Welding Code-Steel.
D1-4 Reinforcing Steel Welding Code, including Metal Inserts and Connections in Reinforced Concrete.

F959 Compressible-Washer-Type Direct Tension Indicators for Use with Structural Fasteners.

1.2.4 Federal Specifications (Fed. Spec.):

TT-C-490 Cleaning Method and Pretreatment of Ferrous Surfaces for Organic Coatings
TT-P-645 Primer Paint, Zinc Chromate, Alkyd Type

1.2.5 Steel Structures Painting Council (SSPC) Publications:

SP3 Power tool Cleaning
SP6 Commercial Blast Cleaning

1.2QUALITY ASSURANCE

1.3

1.3.1 Fabricator/Erector: Must have plant, facilities and personnel qualified and sufficient to fabricate and/or erect structural metal framing as indicated on drawings. Must have minimum of 5 years' experience and to be able, upon request, to show framing of size, materials and scope similar to work of this contract.

1.3.2 Material: Provide only structural steel certificate as conforming to specified requirements and fabricate especially to the requirements of this contract. Material which, does not conform to the requirements of this contract, may be rejected at any time prior to final acceptance.

1.3.3 Allowable Tolerances: Unless otherwise specified or noted on drawing, provide structural steel work in accordance with the following minimum tolerances:

a. Fabrication Tolerances: In accordance with requirements of AISC specification unless noted otherwise and as required to maintain the erection tolerances specified herein.

b. Erection Tolerances: In accordance with requirements of AISC. The contractor alone shall be responsible for the correct fitting of all structural members including the elevations and alignments. Refer to the drawings for additional requirements.

1.3.4 Connection Identification: Each person installing connections shall be assigned an identifying symbol or mark and all shop and field connections shall be so identified so that the Owners Testing Lab can refer to the person making the connection.

1.3.5 Test and Inspection: Work is subject to special testing and inspection. The fabricator/erector shall provide the Owners Testing Lab and Architect/Engineer access to places where material is being fabricated/erected. Notice shall be given for joints requiring inspection for proper end preparation, root opening, etc., and prior to welding.

1.3.6 Connections Designed on the Structural Drawings:

a. Contractor shall not deviate from these designs unless approved by the Architect/Engineer.
b. Connections shown on the drawings may eliminate certain methods of erection.
c. If contractor elects a method of erection that required a change of some of the connections, it must be approved by Architect/Engineer.

1.3.7 Engineering by Contractor: Design and calculations shall be prepared by a Contractor's Structural Engineer, for the support of hoisting equipment, welding machines and other superimposed loads, for the stacking of materials such as metal decking, etc., and where required for temporary bracing, shoring and other safety related construction procedures.

a. It is Contractor's responsibility to obtain and pay for such engineering services.

1.3.8 Welder Qualifications:

a. Each welder performing work on this project shall be qualified in accordance with the American Welding Society. AWS D1.1.
b. He shall have been qualified a minimum of six (6) months before commencement of welding on this project.
c. Copies of each welder's qualification records shall be made available to the Engineer for inspection.

1.3.9 Inspections: Shop welding is to be done in ICBO approved licensed shops. Field welds shall be continuously inspected by a qualified inspector per UBC Section 306.

1.3.10 Vendor Quality Assurance: The fastener supplier shall visit the project site during the bolting start-up to demonstrate proper installation procedures and verify inspection procedure with the Owners Testing Lab. The fastener supplier must provide documentation of quality assurance including mill reports and description of bolt origin. Submit performance records from two prior projects of similar size. Records should include percentage of bolt failure during erection and rate of replacement required during inspection. Supplier quality assurance program shall also be outlined. Program must include assurance that bolts from only one heat will be included in a keg.

1.3.11 Shop Testing by Contractor: The Contractor shall perform ultrasonic testing and visual inspection of all plate material and rolled sections greater than 1-½ inches in thickness and located at welded connections for discontinuities prior to fabrication. The test area is defined as a cone up to 6 inches away from the weld in the connection. These tests shall be in additional to the ultrasonic testing of all full-penetration welds which will be performed by the Owners Testing Lab. The contractor's testing shall be approved by the Architect/Engineer and Owners Testing Lab. All costs associated with this testing shall be borne by the Contractor.

a. Ultrasonic Testing: Conduct in accordance with ASTM A435 with the following modifications and supplementary requirements:

i. Supplementary Requirement S1, requiring 100 percent scanning of the test are to be included.

ii. Section 5.2, Acceptance Standards, is supplemented with the following provision: "The fabricator, insofar as practical, may reposition a rejected plate so that rejected defects are not located in a test area."

1.3.12 Use adequate number of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this section.

1.4 SUBMITTALS

1.4.1 Shop Drawings: Submit shop drawings for review prior to commencing any fabrication of structural steel.

a. Before shop drawings are submitted, fabricator shall back check drawings to discover obvious drafting and detailing errors.
b. Show framing layout, dimensions, connections with adjoining materials and construction, finishes, welds, bolts and fasteners, anchoring and all fabrication or erection accessories required.
c. Show field welds, cuts, holes and fasteners.
d. Verify all dimensions and correlate with adjoining construction and materials.
e. Indicate size, type and grade of all members.
f. Include with each detail shown on the top shop drawings a reference to the Architect's and Engineer's drawings and details, where applicable.

1.4.2 Submit fabricator's quality assurance procedures to the architect, engineer, owner and Owners Testing Lab.

1.4.3 Indicate welded connections on shop drawings using standard AWS welding symbols. Show all welded connections with details showing size, length, location and type of welds.

1.4.4 Mill Reports: Submit certified copies of mill reports indicating heat and melt numbers of steel.

a. If test reports are not submitted or test reports cannot be identified with material proposed for use in the work, then secure and perform structural test on 5 percent of all such identified steel.
b. Contractor shall furnish all such material for testing and pay for all such tests.
c. Furnish Owner, Architect and Structural Engineer certified copies of all test reports.

1.4.5 Inspection Test Reports: Upon request, submit to Engineer copies of ultrasonic testing reports.

1.4.6 Placement Plans: Submit placement plans and details as required for the satisfactory placing, connection and anchorage of all structural members.

1.4.7 Survey Reports: Upon request, promptly submit an accurate survey of actual elevations and location of base plates and anchor bolts and alignments as well as elevations of all steel as noted on the drawings.

1.4.8 Certification: Submit manufacturer's certified test reports on load indicator washers and/or tension control bolts on at least three samples from each heat supplied to conform to tolerance range.

1.4.9 Welding Procedures: For welded joints pre-qualified and non-pre- qualified by AWS D1.1, submit detailed description of welding procedures proposed for use on structural metals. Obtain approval prior to any welding operation.

Furnish joint welding procedure qualification tests as required by AWS D1.1 for non-pre-qualified welded joints.

1.4.10 Manufacturer's Certification: Required as follows:

a. Bolts, Nuts and Washers: Furnish complete manufacturer's mill test reports conforming to ASTM A325, Type 1, or ASTM A490. Markings and chemistry must also comply to specification. Certification numbers must appear on product containers and correspond to certification numbers on mill test report to be accepted. Mill test report must be supplied to both purchaser and Owners Testing Lab.

b. Filler material welding.

1.5 DELIVERY, STORAGE, HANDLING

1.5.1 Comply with the requirements of the general conditions and of ASTM A6, including the following.

1.5.2 Store materials to permit easy access for inspection and identification.

a. Keep steel members off the ground, using pallets, platforms or other supports.
b. Protect steel members and packaged materials from erosion and deterioration.

1.5.3 Do not store materials on the structure in a manner that might cause distortion or damage to the members of the supporting structures. Repair or replace damaged materials or structures at no additional expense to owner.

1.5.4 Columns, beams, girders and other members, which are to receive sprayed- on fireproofing, shall be free of loose rust, heavy mill scale, oil, dirt or other foreign substances prior to application of fireproofing materials.

1.5.5 All fasteners shall be stored and protected in accordance with the current requirements of the "Specification for Structural Joints using ASTM A325 or A490 Bolts."

1.6 JOB CONDITIONS

Coordination: Coordinate exact locations of beam penetrations with mechanical and/or electrical contractor. Exact locations of all penetrations must be submitted to the Engineer for review.
Temporary Bracing: Temporary bracing and guylines shall be provided to adequately protect all persons and property and to ensure proper alignment.

Temporary Floors: All temporary flooring, planking and scaffolding necessary in connection with the erection of the structural steel or support of erection machinery shall be provided. The temporary floors or use of steel decking shall be as required by law and governing safety regulations. The reduced load capacity of members and assembly, especially the floor and roof beams and girders, due to their untraced connection prior to welding of metal deck and completion of concrete slabs is hereby noted.

Holding and Protection: In assembling and during welding, the component parts shall be held with sufficient clamps or other adequate means to keep parts straight and in close contact. In welding, precautions shall be taken to minimize "lock-up" stress and distortion due to heat. During high winds, welding shall be done only after adequate wind protection is furnished and set up.

PART 2 - PRODUCTS

2.1 MATERIALS AND COMPONENTS

2.1.1 Carbon Steel and High Strength Low-Alloy Steel: Provide steel shapes, plates and bars of structural quality, sizes and types noted on drawings for use in welded and bolted construction. Steel manufactured by the acid Bessemer process shall not be used for structural purposes. Steel, which in the opinion of the inspector is badly corroded or physically damaged, shall not be incorporated in the work.

2.1.2 Coating: Provide steel unprimed where steel is to be fireproofed. Metal Shop Finish for required primer and painting of non-proofed steel.

2.1.3 Standard Fasteners: Low-carbon steel externally and internally threaded fasteners conforming to requirements of ASTM A307, Grade A. Provide hexagonal heads and nuts for all connections. Include lock washers under nuts or self-locking nuts.

2.1.4 High-Strength Fasteners: Quenched and tempered steel bolts and nuts conforming to requirements of ASTM A325 or AST A490.

a. Provide heavy hexagonal head bolts and nuts, and hardened steel washers.
b. Load indicator washers conforming to ASTM F959 or tension control bolts shall be used.
c. Any proposed substitutions must have documentation submitted for review and approval of the structural engineer prior to construction.
d. Acceptable tension control bolt suppliers shall be Lejuene Bolt Company/Lakeview, Minn. And Bristol Industries/Brea, Calif.

2.1.5 Welded Electrodes:

a. For base metal conforming with ASTM A36, A53 and A500, shielded metal arc, flux-cored arc and submerged arc welding use E70XX, E7XT-X and F7X- EXXX electrodes in accordance with AWS A5.1, AWS a5.20, AWS A5.20 or AWS 23.

2.1.6 Steel Stud Anchors: All steel stud anchors welded to steel beams or plates for concrete anchorage shall be "tru-weld studs," Division of Tru-Fit Screw Products Corporation, Cleveland, Ohio, "Nelson Stud," Division of Gregory Industries, Inc., Lorain, Ohio or approved equal. All stud anchors shall be automatically end-welded in shop or field with equipment recommended by manufacturer of studs.

2.1.7 Drilled-in-Concrete Anchors: Refer to structural drawings.

2.1.8 Shop Painting:

a. Pre-Treatment: Mil. Specs DOD-P-15328 or Fed. Specs. TT-C- 490, Type I, II or IV.
b. Primer: Fed. Specs TT-P-645

2.1.9 Galvanizing: ASTM A123 or A153, as applicable, unless specified otherwise.

a.Galvanizing Repair Paint: Mil. Specs. DOD-P-21035

2.1.10 Other Materials: Provide all incidental and accessory materials, tools, methods and equipment required for fabrication and erection of structural steel framing as indicated on drawings.

2.1.11 General: Miscellaneous materials or accessories not listed above shall be provided as specified hereinafter under the various items of work and as indicated on the drawings or required for good construction practice.

2.1.12 Provide additional structural steel support framing for metal deck where normal deck bearing is precluded by column flange plates or other framing members.

2.1.13 Provide other materials, not specifically described but required for a complete and proper installation, as selected by the contractor subject to the approval of the Engineer.

2.2 FABRICATION

2.2.1 Fabricate all steel in accordance with requirements of AISC specifications and in accordance with details indicated on the drawings or as approved on shop drawings.

a. Identify all steel at mill showing grade and yield points.
b. Identify each piece with an erection mark corresponding to identifications noted on erection drawings.

2.2.2 Cutting: All holes and openings must be approved by the owner's Structural Engineer.

a. No flame cutting by hand for openings greater than one half the depth of the member shall be allowed, unless approved by engineer.
b. All flame-cut holes shall be smoothed by chipping, planning or grinding members to required AISC tolerances.
c. Sharp bends or kinks will not be allowed.
d. Flame cutting by hand will not be allowed for holes at connections.

2.2.3 Materials shall be properly marked and matched-marked where field assembly requires. The sequence of shipments shall be such as to expedite erection and minimize the field handling of material.

2.2.4 Milled surfaces shall be completely assembled or welded before milling. Milled surfaces to provide full bearing over the cross section.

2.2.5 Beams and girders shall be upward cambered where indicated on the drawings. For beams and girders without specified cambers, fabricate members so that after erection, any minor camber due to rolling or fabrication is upward.

2.2.6 Beam connections shall be as shown or noted on the drawings.

a. Unless noted otherwise, standard connections shall be used in accordance with AISC standards.

b. Steel requiring adjustment shall be provided with slotted holes, as indicated on the drawings.

2.2.7 Combination of bolts and welds techniques and procedures shall conform to the requirements of UBC – Standard No. 27-6.

a. Welding, AISC specification for the "Design, Fabrication and Erection of Structural Steel for Buildings," and AWS "Structural Welding Code," and "Filler Metal Specifications."

2.2.8 For stud anchor and deformed bar anchor welding, the area where the anchor is to be attached shall be made free of all foreign material such as rust, oil, grease, paint, etc.

2.2.9 Welding processes other than shielded metal arc, flux core arc, and submerged arc may be used provided procedure qualification tests in accordance with the American Welding Society are made for the intended application of all such processes.

2.2.10 Built-up sections assembled by welding shall be free or warpage and all faces shall be true alignment.

2.2.11 Welds not specified shall be continuous fillet welds, using not less than the minimum fillet as specified by AWS.

2.2.12 Welding sequences, preheat methods, and detailing of joints shall be such as to reduce the residual stresses to a minimum.

a. Structural Engineer may authorize suitable testing to determine magnitude of residual stresses due to welding on several initial fabricated production units. Such testing will be performed in a timely manner coordinated with the fabricator's production schedule.
b. Types of Welds: Required weld types are indicated by symbols on drawings; characteristics of welds in accordance with standard specifications or codes as applicable; each welder shall mark his identification symbol on his work.
c. Welding: Shape edges to be joined as indicated on drawings; prepare and clean edges of all oil, grease, scale and rust in accordance with AWS D1.1.

b. Reinforcing Steel: Welding or tack welding or reinforcing bars to other bars or plates, angles and similar shapes is prohibited, except where specifically shown on plans or approved by structural engineer, where required, use electrodes in accordance with requirements of AWS D1.4/12.1, and the structural general notes.

2.2.13 The toughness and notch sensitivity of the steel shall be considered in the formation of all welding procedures to prevent brittle and premature fracture during fabrication and erection.

2.2.14 Detailing of connections, welding sequences and preheat methods shall be such as to minimize the accumulation and concentration of through thickness strains due to weld shrinkage.

2.2.15 Cleaning: Clean all surfaces of oil, grease, loose rust, loose mill scale and other fco.reign matter present in sufficient quantities to impair bond of spray fireproofing.

a. Remove all slag or flux remaining on any bean before proceeding; remove any cracks or blow holes that appear on any bead by chipping, grinding or gas gouging before proceeding.

2.2.16 Fabrication Tolerances: In accordance with AISC specifications, except as required to maintain the erection tolerances specified herein. Maximum tolerances for camber of steel beams/girders shall be plus or minus ¼ inch.

2.2.17 Steel Stud and Deformed Bar Anchors:

a. All anchors shall be automatically end-welded in the shop or field with equipment recommended by the manufacturer of the studs and by qualified welders. Steel stud material, welding and inspection shall be in accordance with AWS D1.1. End-weld in such a manner as to provide complete fusion between the end of the stud and the plate. There shall be no porosity or evidence of lack of fusion between the welded end of the stud and the plate.

b. Tests and Inspections: At the beginning of each day's work, a minimum of two test stud welds shall be made, with the equipment to be used, to metal which is the same as the actual work pieces. The test studs shall be subjected to a 90-degree bend test by striking them with a heavy hammer. After the above test, the weld section shall not exhibit any tearing out or cracking.

PART 3 – EXECUTION

3.1 ERECTION

3.1.1 General: Erect structural steel framing in accordance with governing codes and specifications. Conform to configurations and connections as approved on shop and erection drawings.

3.1.2 Bracing: Provide temporary shoring and bracing members as necessary.

3.1.3 Column Base and Bearing Plates: Align attached column bases and bearing plates for beams and similar structural members. Set loose column bases and bearing plates. Grout solid with non-shrink grout as specified.

3.1.4 Field Assembly: Accurately assemble structural framing to lines and elevations indicated within specified or noted tolerances.

a. Align and adjust various members of framing system prior to fastening.
b. Prior to assembly, clean bearing surfaces and surfaces, which will be in permanent contact.

c. Splice structural members only where indicated or where approved.
d. Cut holes by drilling only.
e. Fasten splices of compression members after bringing abutting surfaces completely into contact.
f. Make all field connections by high strength bolting or welding, unless otherwise noted.
g. Tighten and leave erection bolts in place after welding. Where high strength bolts is required, provide identified and marked bolts; install using procedure as hereinafter specified; mark tightened bolts.

3.1.5 Do not use gas cutting torches in the field, unless approved by Architect/Engineer for correcting fabrication errors in the structural framing.

3.1.6 Furnish shim plates or develop fills where required to obtain proper fit and alignment.

3.1.7 Composite Construction: This building utilizes composite (concrete and structural steel) construction for various beams, careful sequencing of steel erection and concrete placement is recommended.

3.1.8 Connections: No welding or bolting shall be done until as much of the structure as will be stiffened by the welding or bolting has been properly aligned.

3.1.9 Drift pins shall not be used to enlarge unfair holes in main material. Holes that must be enlarged shall be reamed up to a maximum of 1/16th of an inch larger to admit bolts. Burning, drifting and reaming may be used to align unfair holes, in members only after approval by the Owner's Structural Engineer.

3.1.10 When high-strength friction or high-strength bearing bolts are used, the installation shall be by use of direct tension indicator washers or tension control bolts as specified.

a. All bolts shall have threads extended not less than ¼ inch beyond nuts. Provide a minimum of one washer per bolt.

3.1.11 Mutilate threads or use lock nuts for unfinished bolts to prevent nuts from backing off. Draw unfinished bolt heads and nuts tight against the work.

3.1.12 Establish required leveling and plumbing measurements on the mean operating temperature of the structure.

a. Make allowances for differences between temperature at time of erection and mean temperature at which the structure will be maintained when completed and in service.

3.1.13 The steel erector shall leave the steel clean of oil or other contaminants as outlined under Part 2 of this specification.

3.2 HIGH STRENGTH BOLT INSTALLATION AND INSPECTION

3.2.1 General: All high-strength bolts, nuts and washers, as well as their installation and inspection, shall conform to requirements of current edition of "Specification for Structural Joint using ASTM A325 of A490 Bolts," except that the installation of "turn-of-nut tightening" will not be accepted.

a. All high-strength bolts, both friction and bearing type, shall be installed in accordance with Paragraph 5D, "tightening by use of direct tension indicator," unless, noted otherwise on the drawings.

b. Load-indicator washers (LIW) or tension bolts (TCB) shall be used as the authorized direct tension indicator.

3.2.2 Load Indicator Washers (LIW): LIW shall be supplied, providing tensions at gaps specified no less than the minimum and no more than 20 percent above the minimum bolt tensions per Table 3, "Structural Joints Using ASTM A325 or A490 Bolts," (-0, +20%)

a. The manufacturer shall provide certified test reports of at least three load indicators from each heat supplied to confirm the tolerance range (-0, +20%.)

b. Hardened washers shall be used under elements turned on all high – strength bolts to reduce galling of components

c. Prior to the final tightening of all high-strength bolts in multi-bolt connections, draw together all the piles of steel by partially compressing LIX protrusions during "snug tight" operation. This will show that each bolt has been partially tensioned, allowing for plat compression so that there will be no subsequent loosening of the bolts when they are finally tightened. The tensioning shall progress systematically from the most rigid past of the joint to its free edges until the protrusions of all LIW's are closed to the required gap.

a. The Inspection Testing Laboratory (ITL) need not be present during the entire installation and tightening operation, provided that it has done the following:

i. Inspected the surfaces and bolt type for conformance to plans and specifications as proof to start bolting.

ii. Will, upon completion of all bolting, verify the minimum specified bolt tensions visually and by using the feeler gauge as "no go" inspection on a few bolts in each connection (10 percent or two bolts, whichever is greater.)

b. All LIW's shall be of the same surface condition, either "weathered" or "bright."

3.2.3 Tension Control Bolts (TCB): TCB shall be supplied providing shearing of the bolt tip at no less than the minimum and no more than 20 percent above the minimum bolt tension per Table 3, "Structural Joints Using ASTM A325 or A490 Bolts," (-0 , + 20%.) To ensure quality control, test a minimum of three bolts for each grade, diameter and type for each heat, tests shall be performed at weekly intervals on three bolts for each grade, diameter and type taken from the supply of bolts on the floor actually being installed at the time. Tighten each bolt in the SWBTC until the torque-off spline has sheared, and observe the tensions values obtained. The values obtained on the SWBTC shall be no less than the minimum and no more than 20 percent above the minimum bolt tension per Table 3 (-0, +20%.)

a. Prior to the final tightening of all high-strength bolts in a multi-bolt joint, draw together all the plies of steel to a "snug-tight" condition by partially tightening the bolts without shearing the torque-off spline. After a "snug-tight" condition has been accomplished, tension the bolts until the torque-off spline shears, progressing systematically from the most rigid part of the joint to its free edge.

b. The ITL need not be present during the entire installation and tightening operation, provided the ITL has:
   i. Prior to the start of bolting, inspected all surfaces and bolt types for conformance with plans and specifications.
   ii. Performed the quality control bolt tests specified above.
   iii. Visually inspected 100 percent of the high-strength bolts for proper installed tension. Except as noted below, it will be assumed that properly installed bolt tensions have been achieved if the spline has twisted off.

3.2.4 Other Inspections: In both LIW and TCB installation, the ITL shall further examine large, multibolt, multirow connections for possible loss of bolt tensions due to fit-up problems.

a. In the case of a dispute regarding final installed bolt tensions in a specific joint, a calibrated torque wrench shall be used to verify the installation as outlined in Section 6 (D) 4 of "Structural Joints Using ASTM A325 or A490 Bolts."

3.3 CUTTING

3.4.1 Do not field cut or alter structural member without the written approval of the Structural Engineer.

3.4.2 Do not use gas cutting torches for correcting fabrication errors in structural framing.

3.4.3 Finish Gas-cut sections equal to a sheared performance.

3.4 ERECTION TOLERANCES AND SURVEY

3.5.1 Plumb, level and align individual pieces in accordance with the requirements of the "AISC Code of Standard Practice for Steel Buildings and Bridges."

3.5.2 Field Survey: Make an accurate survey of alignments and elevations of all steel members as noted on the drawings.

a. Should locations vary beyond the allowable tolerances, notify Architect/Engineer and take necessary corrective measures and modify details and/or procedures as required and approved.

b. Permanent benchmarks shall be established by a registered Professional Engineer employed by Contractor in accordance with the requirements of contract documents.

End of Specification

Section VII. Drawings

Drawings shall be attached on a separate folder and can be accessed at the school's website at brc.pshs.edu.ph. or email ***bac@brc.pshs.edu.ph*** *for the file.*

Section VIII. Bill of Quantities

Republic of the Philippines
Department of Science and Technology
Philippine Science High School System
PHILIPPINE SCIENCE HIGH SCHOOL – BICOL REGION CAMPUS
GENERAL SERVICES MANAGEMENT - Engineering
Tagongtong, Goa, Camarines Sur, Philippines 4422

Telefax: (054) 453-2048 http://www.brc.pshs.edu.ph

SUMMARY for BILL OF QUANTITIES

PROJECT : REHABILITATION OF SCHOOL BUILDINGS (Academic Building I, II, Dormitory Building I)

LOCATION : PSHS-BRC Compound, Tagongtong, Goa, Camarines Sur 4422

SUBJECT : DETAILED COST ESTIMATES

BIDDER : _____

ITEM NO.	DESCRIPTION	TOTAL COST
I	GENERAL REQUIREMENTS	
II	ACADEMIC BUILDING I	
II.1	Architectural Improvement of Façade (specially front and left side)	
II.2	Restoration Works for all Windows	
II.3	Restoration Works for all Doors	

II.4	Replacement of Guardrails/Handrails	
II.5	Tiles	
II.6	Painting Works for the Whole Building	
II.7	Renovation of Restrooms	
II.8	Repair and Repainting of Canopies	
II.9	Conversion of Rooms 207 and 208 into Registrar's Office	
II.10	Provision of Solution to Conceal Overhead Electrical Wires and Power Lines	
II.11	Guidance Room Renovation	
II.12	Additional Toilets	
III	ACADEMIC BILDING II	
III.1	SITE WORKS	
III.2	CONCRETE	
III.3	METALS	
III.4	DOORS AND WINDOWS	
III.5	FINISHES	
III.6	SIGNAGES	
III.7	FURNITURES	
III.8	LAVATORIES	
III.9	MECHANICAL WORKS	

III.10	WIRE CONCEALMENT	
III.11	STORM DRAINAGE SYSTEM	
IV	**DORMITORY BUILDING I (Boys Dorm)**	
IV.1	Architectural Improvement of Façade and Rear of Building	
IV.2	Renovation of Entrance Lounge, Complete with Interior Design and Furnishings	
IV.3	Repair/Replacement of All (damaged) Windows	
IV.4	Repair/Repainting of All Doors, Including Replacement of Damage Accessories	
IV.5	Repair/Repainting/Replacement of Damaged Accessories /Parts of Furniture and Fixtures	
IV.6	Replacement of All Tiles	
IV.7	Painting Works for the Whole Building	
IV.8	Provision of Study Table to all Rooms	
IV.9	Renovation of the following Rooms(including necessary Furnishing)	
IV.10	Repair Works for Waterproofing (including waterproofing) Ceiling at the Third Floor and Room 218	
	GRAND TOTAL COST	
	TOTAL COST IN WORDS : _____ _____	

Submitted by:

Name of Contractor

Date

Republic of the Philippines
Department of Science and Technology
Philippine Science High School System
PHILIPPINE SCIENCE HIGH SCHOOL – BICOL REGION CAMPUS
GENERAL SERVICES MANAGEMENT - Engineering
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Pursuit of Truth ✦ *Passion for Excellence* ✦ *Commitment to Service*

BILL OF QUANTITIES

PROJECT : REHABILITATION OF SCHOOL BUILDINGS (Academic Building I, II, Dormitory Building I)
LOCATION : PSHS-BRC Compound, Tagongtong, Goa, Camarines Sur 4422
SUBJECT : DETAILED COST ESTIMATES
BIDDER :

ITEM NO.	DESCRIPTION	QTY	UNIT	UNIT COST	ADJUSTED TOTAL COST
I.	GENERAL REQUIREMENTS				
	a. Mobilization/Demobilization	1.00	lot		
	b. Transportation and Communication	1.00	lot		
	c. PPE and Covid Safety Requirements (RTPCR or Rapid Testing)	1.00	lot		
	d. Barracks	1.00	lot		
II	ACADEMIC BUILDING I				
1.00	Architectural Improvement of Façade (specially front and left side)				

	Demolition and dismantling of Existing Façade	1.00	lot			
	Improvement of Façade	1.00	lot			
	WALL CLADDING					
	ACP Panels (Replace Dameged or Dilapilated Panels only)	55.70	sq.m			
	Painting of ACP Panels	129.97	sq.m			
2.00	**Restoration Works for all Windows**					
	Repair of jalousie window frames (2.5 x1.2)	19.00	sets			
	Repair of jalousie window glass (2.5 x1.2)	14.00	sets			
	Repair of Aluminum Frame Analoque (1.7 x .5)	2.00	sets			
	Repair of Glass (0.2mx0.2m)	27.00	sets			
	Repair of Steel Frame (1.7 x .5)	66.00	sets			
	Repainting of Grills (Mild Steel)	812.80	m^3			
	Accessories	1.00	lot			
3.00	**Restoration Works for all Doors**					
	Main Door Jamb Replacement	5.00	sets			
	Main Flush Door Replacement	6.00	pcs			
	Main Door knob Replacement	9.00	sets			
	Main Door Lockset Replacement	9.00	sets			

	Painting Works	1.00	lot			
	Sand	0.50	m^3			
	Cement	2.00	bags			
	Common wire nail (3")	3.00	kgs			
	Demolition of jambs	5.00	sets			
4.00	**Replacement of Guardrails/Handrails**					
	Removal of the existing handrails	459.62	m			
	Installation of SS Corridor Handrails (D38mm)	282.50	m			
	Installation of SS Stairs Handrails(D38mm)	177.12	m			
5.00	**Tiles**					
	A. First Floor					
	Corridor	218.50	m^2			
	Demolition of Existing Floor finishes	68.30	m^2			
	Hauling of debris	68.30	m^2			
	D. Stairs					
	Installation	47.00	m^2			
	Demolition of Existing Floor finishes	11.75	m^2			
	Hauling of debris	11.75	m^2			
6.00	**Painting Works for the Whole Building**					

	Exterior Walls	1,464.75	m²			
	Ceiling	1,630.70	m²			
	Interior Walls	866.67	m²			
7.00	**Renovation of Restrooms**					
	A. First Floor					
	Window	6.00	sets			
	B. Second Floor					
	Window	6.00	sets			
	C. Third Floor					
	Window	6.00	sets			
8.00	**Repair and Repainting of Canopies**					
	Repainting of Canopies	1.00	lot			
	Repairing of Canopies	1.00	lot			
9.00	**Conversion of Rooms 207 and 208 into Registrar's Office**					
	Demotition of Existing Wall	13.13	m²			
	Installation of Wall Partition (Dry wall)	16.13	m²			
12.00	**Provision of Solution to Conceal Overhead Electrical Wires and Power Lines**					
	WIRE CONCEALMENT					
	3"x2"x2m PVC Mouldings	294.00	lgts			

	Supporting Materials	1.00	lot			
	Consumables	1.00	lot			
13.00	**Guidance Room Renovation**					
	Demolition of Walls	25.60	m^2			
	100mm thk CHB	1.68	m^2			
	Plaster	3.36	m^2			
	Masonry Paint	3.36	m^2			
15.00	**Additional Toilets**					
	6" thk CHB	63.39	m^2			
	Plaster	126.78	m^2			
	Masonry Paint	134.55	m^2			
	Floor Tile	4.21	m^2			
	Wall Tiles	23.40	m^2			
	Toilet Fixtures and Accessories	1.00	lot			
II	ACADEMIC BUILDING II					
1.00	SITE WORKS					

	DEMOLITION/REMOVAL WORKS				
	REPLACEMENT OF ROOF GUTTER				
	G.I. Roofing (for replacement)	175.00	sq.m		
	G.I. Gutter (for replacement)	180.00	l.m		
	Damaged Storm Drainage Lines	338.50	l.m		
	THIRD FLOOR, LIBRARY RM				
	Damaged Ceiling Finish (Library Room)	69.95	sq.m		
	DOORS	3.00	pc		
	WINDOW PAINTING	200.38	sqm		
	GUARDRAILS, 38MMØ B.I. PIPES	164.20	l.m		
	HANDRAILS, 38MMØ B.I. PIPES	32.73	l.m		
	LABORATORIES, FIRST FLOOR				
	Old Plumbing Lines	1.00	lot		
	Old Plumbing Fixtures	1.00	lot		
	Cabinets	101.55	sq.m		
	CHIPPING OF FLOOR & COUNTERTOPS	419.00	sq.m		
	HAULING OF REMOVED MATERIALS & OTHERS	1.00	lot		
	FALSEWORKS	1.00	lot		
	CONCRETE BRIDGE				
	Excavation	21.60	cu.m		
	Backfill	28.80	cu.m		
	Gravel Fill	0.90	cu.m		
2.00	CONCRETE				

	CONCRETE GUTTER					
	Precast Gutter, 3000psi	30.00	pc			
	Delivery&Installation	1.00	lot			
	Concrete	3.41	cu.m			
	RSB, Gr 40	32.55	kgs			
	Formworks	770.00	sq.m			
	CONCRETE BRIDGE					
	Concrete	20.75	cu.m			
	RSB, Gr 40	2,997.40	kgs			
	Formworks	144.90	sq.m			
3.00	METALS					
	SS Guardrails, 38mmØ	164.20	l.m			
	SS Stair Handrails, 38mmØ	34.37	l.m			
4.00	DOORS AND WINDOWS					
	D17, 0.80X2.10M Painted Water Resistant Hollow Core Wood	1.00	pc			
	D15, 0.80X2.10M Painted Water Resistant Hollow Core Wood	1.00	pc			
	D13, 0.90X2.10M Solid Core Wood	1.00	pc			
	Accessories:					
	JAMB	3.00	pc			
	KNOB	3.00	pc			
	HINGES	3.00	sets			

5.00	FINISHES					
	Repainting of G.I. Roofing	174.05	sq.m			
	6mm thk Fiber Cement Board Ceiling on Metal furring (3F-Library)	69.92	sq.m			
	6mm thk Fiber Cement Board Wall on Metal furring (AVR/Theatre)	35.74	sq.m			
	4.5mm thk Acoustic Gypsum Board on Metal furring (AVR/Theatre)	15.13	sq.m			
	PAINTING FINISHES					
	Wood Painting, Ceiling	73.41	sq.m			
	Wood Painting, Doors	35.06	sq.m			
	Interior, Masonry Paint	2,511.69	sq.m			
	Exterior, Masonry Paint	2,023.87	sq.m			
	Concrete Bridge, Masonry Paint	36.54	sq.m			
	Masonry Paint, Concrete Charging Benches	26.32	sq.m			
	Metal Painting, Steel Casement Windows Frame	200.38	sq.m			
	FLOOR FINISH					
	Non-Skid Tiles	522.39	sq.m			
	Ceramic Tiles (Library)	34.96	sq.m			
	CONCRETE BRIDGE ROOFING W/ TRUSS	1.00	lot			
	Other Finishing Materials					
	P.tech A Series Aluminum Stair Nosing	77.70	l.m			
	Butterfly Hinge	325.62	l.m			
	Cabinet Handle	192.00	pc			

6.00	SIGNAGES					
	Stainless Steel Signages for Rooms and Offices	31.00	pcs			
7.00	FURNITURES					
	CHEMISTRY LABORATORY					
	Working Tables Renovation	12.00	no.s			
	Computer Table and Chairs	36.00	no.s			
8.00	LAVATORIES					
	SS Eyewash Wall Mounted	2.00	set/s			
9.00	MECHANICAL WORKS					
	Rough-ins of piping for Laboratory Fume Hood, Chemistry Lab	1.00	lot			
	Replacement of Aircon Pipe, Dark Room	1.00	lot			
	Exhaust Replacement, Chemistry Lab	1.00	lot			
10.00	WIRE CONCEALMENT					
	3"x2"x2M PVC Mouldings	264.00	lgts			
	Supporting Materials	1.00	lot			
	Consumables	1.00	lot			
11.00	STORM DRAINAGE SYSTEM					
	75mmØ PVC Pipes	338.50	l.m			

	Consumables	1.00	lot			
II	DORMITORY BUILDING I (Boys Dorm)					
1.00	Architectural Improvement of Façade and Rear of Building					
	Demolition and dismantling of Existing Façade	1.00	lot			
	Improvement of Façade	1.00	lot			
2.00	Renovation of Entrance Lounge, Complete with Interior Design and Furnishings					
	Complete with Interior Design and Furnishings	1.00	lot			
3.00	Repair/Replacement of All (damaged) Windows					
	A. First Floor		8.00			
	Repair of jalousie window frames and glass(2.5 x1.2)	2.00	sets			
	Repair of Aluminum Frame Analoque(1.7 x .5)	2.00	sets			
	Replace insect screen(2.5 x 1.2) 28 sets	84.00	m^2			
	Replace insect screen(1.3 x .9) 27 sets	32.00	m^2			
	Repair of Aluminum Frame Analoque Screen(1.7 x .5)	2.00	sets			
	B. Second Floor					

	Replace insect screen(2.5 x 1.2) 27 sets	81.00	m^2			
	Replace insect screen(1.3 x .9) 25 sets	30.00	m^2			
	C. Third Floor					
	Repair of jalousie window frames and glass(2.5 x1.2)	8.00	sets			
	Replace insect screen(2.5 x 1.2) 28 sets	84.00	m^2			
	Replace insect screen(1.3 x .9) 12 sets	14.00	m^2			
4.00	Repair/Repainting of All Doors, Including Replacement of Damage Accessories					
	Main Door Jamb Replacement	13.00	sets			
	CR Door Jamb Replacement	3.00	sets			
	Main Flash Door Replacement	29.00	pcs			
	CR Flash Door Replacement	18.00	pcs			
	CR Door knob Replacement	2.00	sets			
	Main Door knob Replacement	10.00	sets			
	Painting Works	181.50	m^2			
	Sand	2.00	m^3			
	Cement	20.00	bags			
	Common wire nail (3")	15.00	kgs			
	Demolition of jambs	16.00	pcs			

5.00	**Repair/Repainting/Replacement of Damaged Accessories /Parts of Furniture and Fixtures**					
	Replacement of double deck bed frames	38.00	sets			
	Kitchen furnitures and C.R. fixtures					
	a. Lavatory	2.00	sets			
	b. Lavatory faucet	8.00	sets			
	c. Shower head	15.00	sets			
	d. Shower valve	4.00	sets			
	e. P-trap	4.00	sets			
6.00	**Replacement of All Tiles**					
	A. First Floor					
	Corridor	185.00	m²			
	Lobby 1 and 2	82.00	m²			
	Lounge	14.00	m²			
	Comfort Room	333.00	m²			
	Demolition of Existing tiles and Floor finishes	614.00	m²			
	B. Second Floor					
	Corridor	185.00	m²			
	Lobby 1	20.00	m²			
	Lounge	14.00	m²			
	Stair	62.00	m²			
	Comfort Room	281.00	m²			

	Demolition of Existing tiles and Floor finishes	562.00				
	C. Third Floor					
	Corridor	185.00	m²			
	Lounge	14.00	m²			
	Stair	62.00	m²			
	Comfort Room	495.00	m²			
	Demolition of Existing tiles and Floor finishes	756.00	m²			
	Hauling of debris	1.00	lot			
7.00	**Painting Works for the Whole Building**					
	Exterior Walls	1,566.53	m²			
	Ceiling	2,717.33	m²			
	Interior Walls	6,412.50	m²			
8.00	**Provision of Study Table to all Rooms**					
	A. First Floor					
	Study Table with chairs (for 4 students)	14.00	sets			
	B. Second Floor					
	Study Table with chairs (for 4 students)	21.00	sets			
	C. Third Floor					
	Study Table with chairs (for 4 students)	20.00	sets			

9.00	Renovation of the following Rooms(including necessary Furnishing)					
	A. Conversion into Treatment and Isolation of Rm 101 and 103					
	Demolition of walls	15.00	m²			
	Restoration of walls	6.00	m²			
	B. Conversion into Dining Area with bsic furnishing of Rm 102 and 104					
	Demolition of walls	37.00	m²			
	Restoration of walls	9.00	m²			
	C. Conversion into Recreational Area of Rms 106 and 108, 107 and 109					
	Demolition of walls	74.00	m²			
	Restoration of walls	18.00	m			
	sand	0.50	m³			
	cement	5.00	bags			
	D. Hauling of Debris	1.00	lot			
10.00	Repair Works for Waterproofing (including waterproofing) Ceiling at the Third Floor and Room 218					
	Water proofing of concrete roof top	282.50	m²			
	Demolition/removal of concrete topping	282.50	m²			
	Removal/demolition of existing corrogated roof	364.00	m²			
	Installation of rib type roof and accessories	364.00	m²			

	Provision of wire mesh/screen along concrete gutter	30.00	m			
	Demolition of damaged ceiling	101.00	m²			
	Repair of ceiling	101.00	m²			
	Hauling of debris	1.00	lot			
	Consumables	1.00	lot			
				TOTAL PROJECT COST		
	TOTAL COST IN WORDS : _____					

Submitted by:

_____

Name of Contractor

_____

Date

Section IX. Checklist of Technical and Financial Documents

Checklist of Technical and Financial Documents

I. TECHNICAL COMPONENT ENVELOPE

Class "A" Documents

Legal Documents

☐ (a) Valid PhilGEPS Registration Certificate (Platinum Membership) (all pages);

or

☐ (b) Registration certificate from Securities and Exchange Commission (SEC), Department of Trade and Industry (DTI) for sole proprietorship, or Cooperative Development Authority (CDA) for cooperatives or its equivalent document;

and

☐ (c) Mayor's or Business permit issued by the city or municipality where the principal place of business of the prospective bidder is located, or the equivalent document for Exclusive Economic Zones or Areas;

and

☐ (e) Tax clearance per E.O. No. 398, s. 2005, as finally reviewed and approved by the Bureau of Internal Revenue (BIR).

Technical Documents

☐ (f) Statement of the prospective bidder 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**

☐ (g) Statement of the bidder's Single Largest Completed Contract (SLCC) similar to the contract to be bid, except under conditions provided under the rules; **and**

☐ (h) Philippine Contractors Accreditation Board (PCAB) License;

or

Special PCAB License in case of Joint Ventures;

and registration for the type and cost of the contract to be bid; **and**

☐ (i) Original copy of Bid Security. If in the form of a Surety Bond, submit also a certification issued by the Insurance Commission;

or

Original copy of Notarized Bid Securing Declaration; **and**

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

☐ a. Organizational chart for the contract to be bid;

☐ b. List of contractor's key 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;

☐ c. List of contractor's major equipment units, which are owned, leased, and/or under purchase agreements, supported by proof of ownership or certification of availability of equipment from the equipment lessor/vendor for the duration of the project, as the case may be; **and**

☐ (k) Original duly signed Omnibus Sworn Statement (OSS);

and if applicable, Original Notarized Secretary's Certificate in case of a corporation, partnership, or cooperative; or Original Special Power of Attorney of all members of the joint venture giving full power and authority to its officer to sign the OSS and do acts to represent the Bidder.

Financial Documents

☐ (l) The prospective bidder's audited financial statements, showing, among others, the prospective bidder's total and current assets and liabilities, stamped "received" by the BIR or its duly accredited and authorized institutions, for the preceding calendar year which should not be earlier than two (2) years from the date of bid submission; **and**

☐ (m) The prospective bidder's computation of Net Financial Contracting Capacity (NFCC).

Class "B" Documents

☐ (n) If applicable, duly signed joint venture agreement (JVA) in accordance with RA No. 4566 and its IRR in case the joint venture is already in existence;

or

duly notarized statements from all the potential joint venture partners stating that they will enter into and abide by the provisions of the JVA in the instance that the bid is successful.

II. FINANCIAL COMPONENT ENVELOPE

☐ (o) Original of duly signed and accomplished Financial Bid Form; **and**

Other documentary requirements under RA No. 9184

☐ (p) Original of duly signed Bid Prices in the Bill of Quantities; **and**

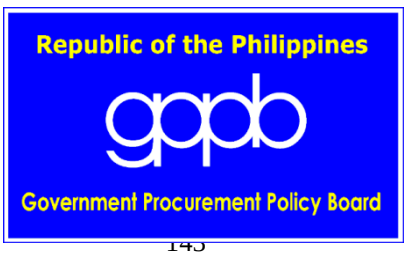
☐ (q) Duly accomplished Detailed Estimates Form, including a summary sheet indicating the unit prices of construction materials, labor rates, and equipment rentals used in coming up with the Bid; **and**

☐ (r) Cash Flow by Quarter.

Important:

For some of the above forms, updated templates are provided through this link:

https://www.gppb.gov.ph/downloadables.php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gppb
Government Procurement Policy Board