



**AFRICOM
Humanitarian Assistance Program**

TYAZO SCHOOL GROUP UPGRADE

**Nyamasheke District, Rwanda
OHASIS RW-HA-2016-023572**

FY16

July 2016

TECHNICAL REQUIREMENTS

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LEGEND: ACRONYMS AND DEFINITIONS

As used throughout this solicitation/contract:

stands for number, or for a generic digit

BOD stands for beneficial occupancy date; it sets the date of facilities acceptance and warranty start

COR stands for the Contracting Officer Representative, who is a qualified Government employee appointed by the KO to assist in the technical monitoring or administration of a contract

D/B contract stands for **Design and Build** contract, which means that the contractor shall first provide a complete and executable design matching the specifications of the TR, then implement the construction in accordance to such a design.

DOD stands for U.S. Department of Defense

ESR stands for Engineering System Requirements

Government or **Govt.** stands for the Government of the United States of America (U.S.A.);

HVAC stands for Heating, Ventilating and Air Conditioning

KO stands for **Contracting Officer**; it is the Government's representative in charge for executing the contract and responsible for any amendment.

KTR stands for **Contractor**; it is the Offeror that has been awarded the present contract

LPS stands for Lightning Protection System

MOU stands for memorandum of understanding

NAVFAC EURAFSWA stands for Naval Facilities Engineering Command Europe, Africa and South West Asia; it is the Government's executive agent for construction.

NTPC stands for Notice To Proceed with the Construction

NTR stands for Navy Technical Representative, who is in charge to monitor the performance of work under the contract and is an accountable official for purposes of certifying payments

Offeror is any constructor that submits a bid

PM stands for **Project Manager**; it is the Government's technical representative in charge for managing the project (scope, cost, and schedule) from design authorization to closeout

PPC stands for Portland Cement Concrete

PTS stands for Performance Technical Specifications

RFP stands for Request for Proposal

RFQ stands for Request for Quote

SF stands for Government's standard form; this acronym is followed by a number identifying what contract action the form is intended for

SOW stands for **Statement Of Work**; it is the detailed description of the work activities, deliverables and timeline the contractor will execute against in performance of specified work

TEB stands for the Government Technical Evaluation Board in charge to receive, accept and evaluate the technical offers

TR stands for **Technical Requirements** which are integrant part of the SOW and provide all the specifications for the design and the implementation of the project.

VIP stands for Ventilated Improved Pit which is the type of latrine to be implemented at the site as described in this SOW.

1 PROJECT DESCRIPTION

1.1 GENERAL

This is a **design-build** project to **expand and renovate a primary school** (current layout shown at par. 3.1) in accordance to the requirements, sketches, and tables included hereby..

The project site is located at the **GPS coordinates: -2.332229, 29.135504.**

The **work shall include a complete design and drawing package** as described in this document.

Design-Build Procedure

The Design-Build procurement method consists of a design phase and construction phase. The construction phase shall start only after acceptance of the contractor's design.

Design Acceptance and Construction Authorization

The construction cannot start until all submittals required by this contract are received and reviewed by the US Government and shown to meet the requirements of these Technical Requirements and the RFP package. The acceptance of the design and authorization to start construction will be issued by the NAVFAC EURAFSWA designated project manager.

The work shall include - but not be limited to - the following: Demolition of existing structures, Foundations, Structures, Superstructures, Interior Construction, Roof System, Drainage System, Electrical System, Plumbing System, Exterior Area Settlement, Site Improvements and Other Work as required.

1.2 SCOPE OF PROJECT

The work shall consist of the following (dimensions are approximate):

CLIN 001

I. Dismantle buildings D1, D2, D3, D4 - shown on the site map at par. 3.1 (~400sqm) - from roof to foundation; dismantle the soak tanks and the sludge disposal shelter and reclaim the entire latrine area; dispose all demolition materials unless differently requested by the end user; clear, grade, and flat the soil to make it ready for new construction

II. Build One Multipurpose Building, to include:

- one 16m x 14m multipurpose hall
- one 6m x 4m office
- one 8m x 4m library
- one veranda covering the full length of the front side
- electrical system and LPS
- rain water drainage system

III. Build Classroom Buildings in accordance to Rwandan school standards to include:

- a total of eleven 8m x 7m classrooms to be split as better fitting the topography
- one veranda covering the full length of each building front side
- electrical system and LPS
- rain water drainage system

IV. Renovate the Classroom Building R - shown on the site map at par. 3.1 (~170 sqm) - to include:

- Reinforce foundations if needed
- Remove and replace roof structure and metal cover sheet
- Tile floors
- Remove and replace all windows and doors

- Plaster and paint all interior walls
 - Repair bricks on exterior walls
 - Scrub and polish exterior walls
 - Patch concrete slabs around the building where cracked
 - Provide access to disabled
 - Install electrical system and LPS
 - Implement a rain water drainage system
- V. Implement a Rainwater Collection and Distribution System, to include:
- at least one new 5,000 liter water tank per each building object of this contract (except latrines and minor facilities), to be connected to the sinks in the closest latrine or kitchen facility
 - 1 tap on the tank
 - 1 gridded drain below the tap
 - 1 pipeline to feed faucets in VIP facilities
- VI. Build Three Dry VIP Facilities (3 for students and 1 for teachers) to include:
- 12 stalls (6 per gender, 2 for teachers)
 - a screen wall in front of the stall doors
 - 3 faucets per each student side, 1 faucet per each teacher side
- VII. Settle Exterior Areas, to include:
- Remove architectural barriers to disabled
 - Connect all facilities in the compound through paved pathways suitable for disabled
 - Implement a paved 5-car parking on the right side of the main entrance
 - Implement a gridded drainage gutter system for the entire compound
 - Reclaim the area used for latrine sludge disposal
 - Rearrange unpaved areas surrounding new constructions.
- VIII. Build a perimeter fencing to be 2m-tall (50cm masonry surmounted by a metal structure) to secure the entire school property, with one vehicular and pedestrian main gate, and a secondary pedestrian gate to give access the church area.

CLIN 002

- I. Implement Sport Facilities, to include:
- 1 basketball court in the area indicated with P1 at par. 3.3
 - 1 paved playground in the area P2 (~ 1,300 sqm)
 - 1 handball court with lateral bleachers to act as containment wall in the area indicated with P3 at par. 3.3.

CLIN 003

- I. Build Kitchen & Other Minor Facilities to include:
- one kitchen room 4m x 6m
 - one kitchen storage room 4m x 3m
 - one support-to-girls facility 4m x 6m
 - one veranda covering the full length of building front side
 - one sentry box 2m x 1.5m
 - electrical system and LPS to all facilities

The new work shall result into complete, safe and usable school facilities, whose interior spaces shall reflect the space tabulation provided in **Part 4**.

Design and construction details are provided in **Part 5**, and specified in Parts 6, 7, and 8.

All buildings shall have concrete superstructure and masonry infill construction with basic finishes. All buildings shall have a storm water drainage system to prevent erosion.

Design to meet all requirements of the RFP package. Drawings to be as described below and as required to communicate the design to the US Government, final users, contractor's staff and sub-contractors. Material selection, specifications and installation to be as described the in the Engineering Systems Requirements (ESR), and in the Performance Technical Specification (PTS), included below as the last two parts.

The ESR and the PTS of this document provide generalized technical requirements that apply to multiple facility types and include more requirements than applicable to this specific project. Therefore, only the RFP requirements (as specified in Parts 1 through 6) that apply to the project provide a guideline for the design package. If an item that applies to the project is included in the ESR/PTS, the requirements of the ESR/PTS and applicable local codes shall govern. In case an item that applies to the project is NOT included in the ESR/PTS, the requirements of applicable local codes shall govern.

The **design shall be developed by qualified design professionals**, either consistently employed in the contractor's company or working for a design firm hired by the contractor for the purpose of this project.

1.3 SIGNAGE

Project Sign

The Contractor shall provide a painted project sign to be located at the worksite as soon as the construction starts. The paint shall be water resistant and display the project name, the Rwandan and American flags, and the wording explaining the cooperation between the two Governments.

The Contractor shall submit a proof of the sign for acceptance prior to construction.

See detailed requirements at **par. 4.12**

Dedication Sign

The Contractor shall provide a project dedication sign (approximately 800 mm x 1200 mm) at the project site at least 2 weeks prior to project completion.

The project name shall appear at the top center, followed by the sentence "An everlasting example of friendship between the people of Rwanda and the United States" above the flags, and the sentence "Completed by the people of Rwanda and the United States of America on DD MONTH, YYYY" at the bottom.

The sign shall be constructed of sheet metal with a water resistant coating and affixed directly to the building at a location approved by the facility administrator and the COR.

The Contractor shall submit a proof of the sign for acceptance prior to manufacturing the sign.

See detailed requirements at **par. 4.13**

1.4 STANDARD NOMENCLATURE

This is an American document, and this note is to define the way in which numbers are presented herein:

- 1,000 = one thousand
- 3,500 = three-thousand five-hundred
- 1.08 = one and eight hundredths
- 0.1 = one-tenth

1.5 PROCEDURE

The construction phase shall start only once that the official **Notice to Proceed with Construction (NTPC)** is issued by the NAVFAC EURAFSWA Project Manager/Contracting Officer.

The NTPC will not be issued until all required pre-construction submittals are received and reviewed by the US Government and shown to meet the specifications of these Technical Requirements and the Solicitation package.

PRE-CONSTRUCTION SUBMITTALS

The complete pre-construction submittal packages shall consist of:

- Concept Design
- Final Design
- Construction Schedule
- Quality Control Plan
- Accident Prevention Plan
- SSHO Certification
- Construction permit(s)
- MOU with the end user
- Worksite Delimitation Plan

All submittals shall be electronically submitted in pdf format to the PM/COR. The font sizes shall be readable when the file is printed on A4 paper.

Concept Design

The concept design shall be completed within **90** calendar days of receipt of the award. The concept design is intended to assure all lay-out requirements are clearly met before the full design is developed. It shall identify site preparation, including items to be removed and to be kept. It shall provide the basic architectural design, including:

- Geotechnical Report
- Current Site Layout plan with dimensions and distances
- Topographic Site Plan
- Final Site Layout plan with dimensions and distances
- Final Plans, Elevations and Sections of each building object of the contract.

The Government shall review the concept design submission for compliance with these Technical Requirements and the Solicitation package and provide written comments to the contractor.

See paragraph **6.5** for detailed explanation about the concept design.

Final design

The contractor shall have **180** calendar days to complete the design, incorporating all design review comments provided by the US Government. In the event the contractor does not concur with the US Government comments, the contractor shall notify the contracting officer in writing of the reasons for the non-concurrence.

The final design shall meet all the requirements identified in these Technical Requirements and the Solicitation package and shall include:

- List of all drawings, with identifying code and title
- Civil Drawings (to be identified as C-##)
- Architectural Drawings (to be identified as A-##)
- Structural Drawings (to be identified as S-##)
- Plumbing Drawings (to be identified as P-##)
- Electrical Drawings (to be identified as E-##)
- Other Drawings (to be identified as O-##)
- All Calculations and Details required to validate the design.

The electronic file name associated to each drawing shall commence with the correspondent code, followed by a title shortly describing the content.

See paragraph **6.3**, **6.4** and **6.5** for detailed explanation about the final design.

Construction Schedule

The contractor shall have **450** calendar days to complete the construction work.

Within the timeframe allowed for the final design submission, the contractor shall prepare and submit a schedule of construction where the different work segments are identified and associated to the timeframe set for completion. The construction schedule shall state which work segments completion determines the achievement of the construction steps associated to the progressive invoicing (i.e. 10% (design completion), 25%, 40%, 55%, 70%, and 85% work progress). The final payment will be done on the facilities acceptance.

See paragraph **6.5** for more details about the construction schedule.

Quality Control Plan

Within the timeframe allowed for the final design submission, the Contractor will prepare and submit a Quality Control Plan describing personnel, procedures, tests and installation techniques that he plans to perform to ensure the quality required by this document and his design is obtained.

Accident Prevention Plan [APP]

Within the timeframe allowed for the final design submission, the Contractor will prepare and submit an APP describing procedures he plans to perform to ensure the safety of personnel and equipment on the job site. At a minimum, the safety plan must address types of personnel protective equipment to be used by personnel, types and frequencies of safety inspections, **activity hazard analysis [AHA]** to prevent safety incidents, and training utilized to familiarize employees with safety policies and practices.

See paragraph **6.5** for more details about the APP.

Site Safety and Health Officer [SSHO] Certification

Within the timeframe allowed for the final design submission, the Contractor shall provide the certification for the Site Safety and Health Officer (SSHO) appointed to stay **full time on-site**; the SSHO is required to have completed the **OSHA 40-hour online training** “EM385-1-1 Safety and Health (Sections 1÷34)”, which is offered for free at: <http://www.oshatrain.org/pages/professional-training-courses.html>) and to have **at least one year experience** as SSHO in construction projects.

See paragraph **6.5** for more details about the SSHO.

Construction Permit and MOU with the End User

Within the timeframe allowed for the final design submission, the Contractor shall verify that nothing prevents the construction from starting, shall submit copy of the construction permit, and copy of the written agreement reached with the end user in order to coordinate the school operability.

Worksite Delimitation Plan

Within the timeframe allowed for the final design submission, the Contractor shall submit a site plan showing how the worksite will be delimited in the several phases of work, to make sure to prevent unauthorized access and to allow safe operation of the facilities not included in the contract.

INTERIM SUBMITTAL REQUIREMENTS

During construction, the Contractor is required to submit:

- Bi-weekly work progress report with photos
- Monthly work man-hours report
- Test results as required per the contract
- At least 10 days prior to installation of all electrical components, plumbing fixtures, windows and doors and associated hardware, a sample (or catalog photo) must be shown to the COR for acceptance.
- Possible construction schedule changes (to be motivated)
- Possible design changes (to be motivated)
- Invoices in accordance to work progress

COMPLETION SUBMITTAL REQUIREMENTS

Upon completion of project and prior to final payment, the Contract is required to submit:

- Final as-built drawings
- Operations and maintenance plan
- A telephone contact number available for the duration of the warranty period.

1.6 CONTRACT MILESTONES

The key contract milestones as scheduled by this document are summarized in the following table:

		<i>TIMING</i>
<i>a</i>	CONCEPT DESIGN SUBMISSION	Within 90 days of contract award
<i>b</i>	PRE-CONSTRUCTION SUBMITTAL COMPLETION	Within 270 days of contract award
<i>c</i>	NOTICE TO PROCEED WITH CONSTRUCTION	Upon acceptance of all required deliverables
<i>d</i>	CONSTRUCTION COMPLETION	within 450 days of NTPC
<i>e</i>	FINAL INSPECTION	Within 2 months of work completion
<i>f</i>	BENEFICIAL OCCUPANCY DATE [BOD] RELEASE	On work acceptance <i>(after all punch list items found during Final Insp. have been fixed)</i>
<i>g</i>	WARRANTY PERIOD	1 year from BOD

~~~ End of Part 1 ~~~

## **2 PROJECT OBJECTIVES**

### **2.1 MISSION STATEMENT**

DoD humanitarian assistance activities were first authorized by US Congress in 1986. In FY 1996, DoD was permitted to fund a wider variety of HA activities, including using contracts and deployment of U.S. Government personnel to conduct specific humanitarian projects.

Typical projects include the refurbishment of medical facilities, construction of school buildings, digging of wells, improvement of sanitary facilities, and training of host country personnel in internally displaced persons/refugee repatriation operations and in disaster relief and emergency response planning.

The DoD, in an attempt to assist in development and implementation of the Humanitarian Assistance Program, is funding and coordinating the project which is the subject matter of this contract.

NAVFAC EURAFSWA has been designated as the Construction Agent for this project.

### **2.2 FACILITY FUNCTION**

The school complex is situated in a region lacking basic education. The expansion of this school will allow education to all young population in this area, so to influence children away from deviant behavior, and to produce more competent human resources for economic and social development of the Country.

### **2.3 PROJECT SPECIFIC PRIORITIES**

#### **Sustainable Design**

Integrate sustainable principles into the design, development and construction of the project.

Reduce the total cost of ownership of the facility using a whole building, life-cycle approach.

Provide integrated sustainable design strategies and features to minimize the energy consumption of the facilities; conserve resources; minimize adverse effects to the environment; and improve occupant productivity, health, and comfort.

#### **Energy Conservation**

Integrate energy conservation principles into the design, development and construction of the project. Reduce the total cost and consumption of energy in the facility using a whole building approach.

### **2.4 APPROPRIATE DESIGN**

The design is to maintain an indigenous character. As much as possible, materials are to be available locally to promote the local economy and to take advantage of the skills and experience of local trades-persons. Construction methods are to be in-line with those used locally to take advantage of the skills and experience of local trades-persons.

### **2.5 WORKFLOW PROCESS - HOURS OF OPERATION**

The work of this contract is to be done during the hours the facility is normally open to the public.

The effect of noise and dust from site work shall be minimized by performing site work during hours of the day and/or days of the week when students are not present.

If needs arise to work other than normal hours, the schedule shall be coordinated with the facility owner, and approved by the PM or COR.

~~~ End of Part 2 ~~~

3 SITE ANALYSIS

3.1 EXISTING SITE CONDITIONS

The school compound is accessible from a short and steep dirty road branching from the main road in Kirambo area, Nyamasheke region, at the **GPS coordinates: -2.332229, 29.135504**.

The school complex is currently fenced only on the entrance side, and it is connected to the electrical and water public supplies; it includes 9 buildings and 2 latrine blocks of 10 stalls each.

The school has about 1,200 students from primary to high school.

The school is currently connected to the public electrical network but the electrical system is very poor, old and malfunctioning.

The school is also connected to the public water network, but the water is not consistently running.

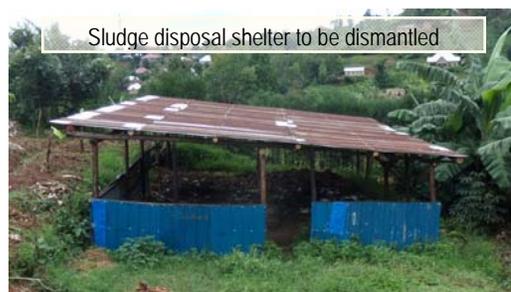
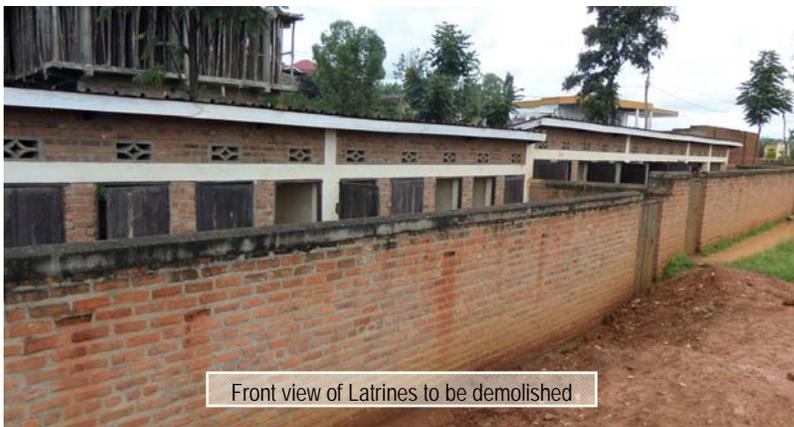
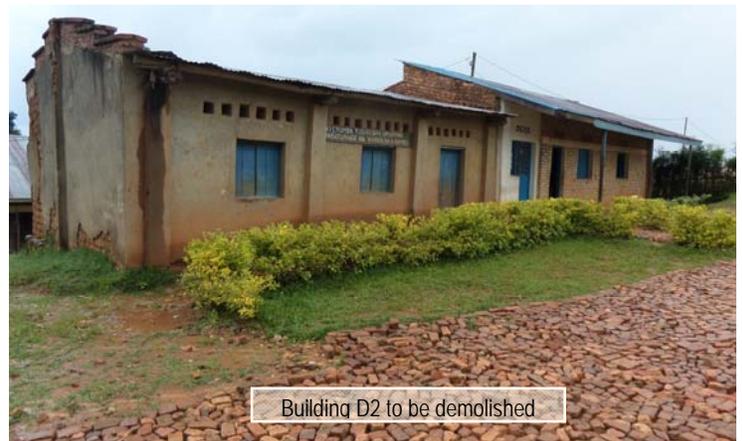
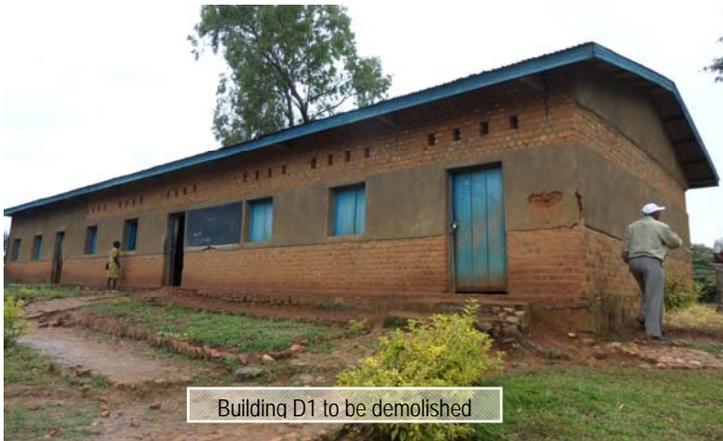
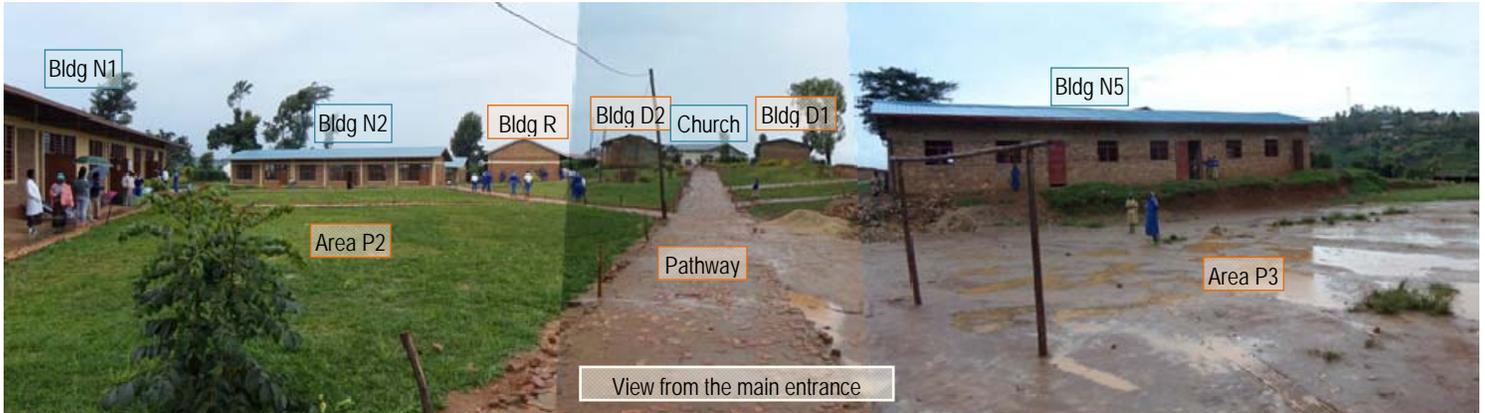
The satellite view of the site is reported below:

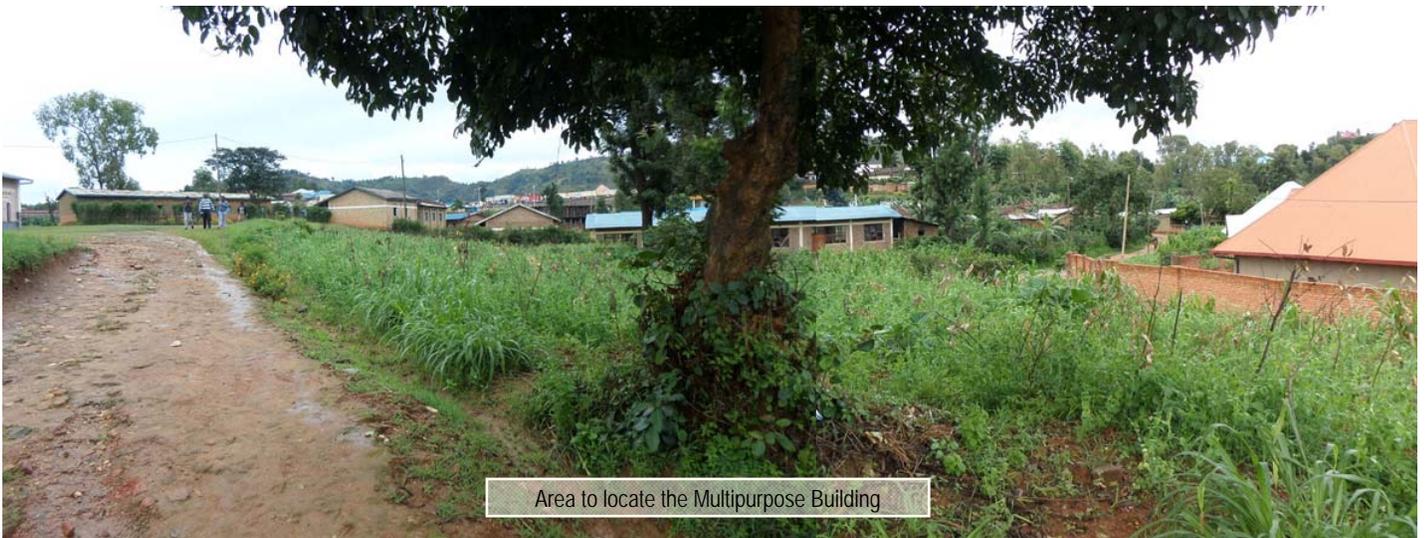
The buildings indicated with **N#** have recently been built, and are **NOT part of this contract**.

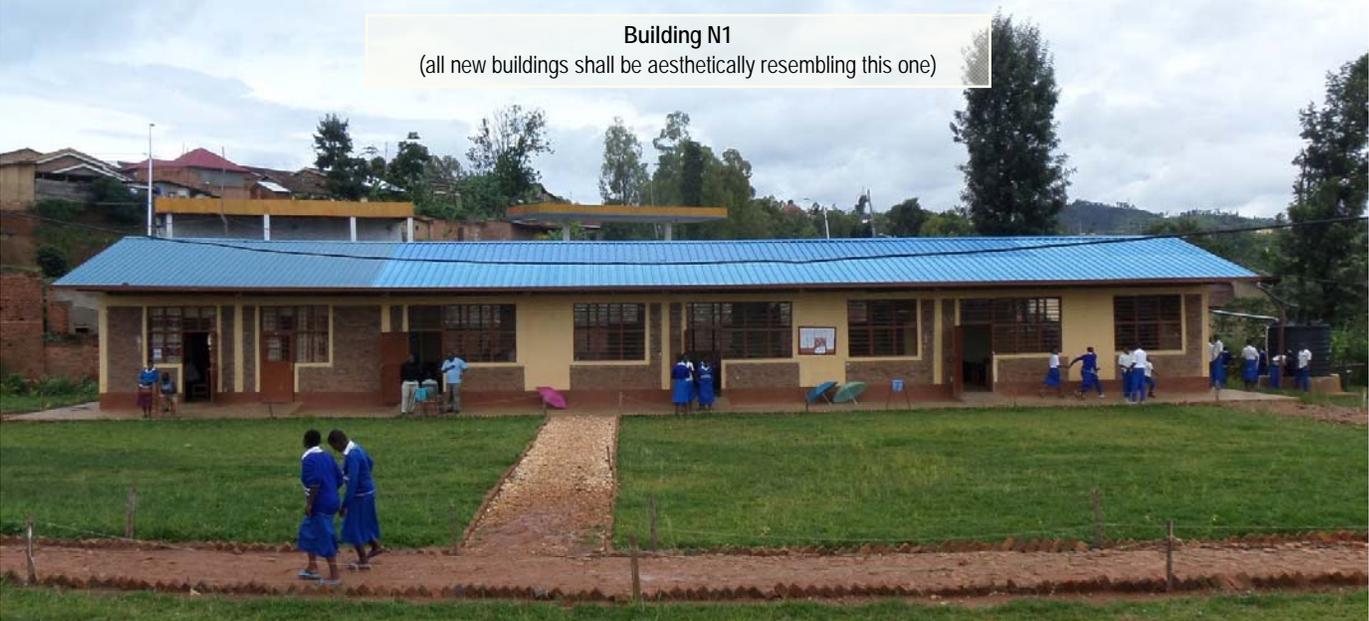


3.2 PHOTO DESCRIPTION

The school compound object of the present contract is shown in the photos below:







3.3 SITE DEVELOPMENT REQUIREMENTS

An example of the final school compound layout in line with the contract terms is sketched below. Exact new facility location shall be selected to best fit the topography, and to be coordinated with the PM and school officials.



The buildings reported as N# are not part of this contract.

FACILITY FOOTPRINT

A scaled drawing with exact dimensions showing the site lay-out including location and dimensions of all existing buildings, latrines, and perimeter wall (if any) with gate locations shall be included in the concept design.

DESIGN CONSTRAINTS

Design of the facility and its location and orientation within the proposed site shall take into consideration all natural and man-made constraints, which include but aren't limited to:

Topography: all site slopes shall be taken in account in order to minimize the need for cut and fill operations

Vegetation / Landscaping: vegetation shall be protected, and landscaping design shall be maintainable

Climatology (solar orientation, etc.): Design shall take advantage of prevailing wind direction and solar orientation to naturally moderate the interior temperature of the buildings

Geotechnical Data: Foundations and structural components of the buildings shall be designed in accordance with geotechnical soils report information. Geotechnical engineering services shall be provided if no current report exists for the site. Design shall be in accordance to the seismic zone of classification of the project site.

Hydrographic Survey: a hydrographic survey shall be performed to determine the storm water runoff

Vehicular Access and Circulation: existing vehicular access shall be taken in account

Site Utilities: location and capacity of all existing utilities on site shall be verified prior to start design

Site Drainage: the facilities shall be designed without negative impact from storm water runoff to the adjacent area of the site.

Existing Buildings: Identify and accurately locate on the site plan all existing buildings on the site.

Fencing: Identify and accurately locate on the site plan all existing fencing on the site.

Permits: all permits, approvals, and authorizations needed to implement the design shall be obtained prior to start construction.

ACCESS, CIRCULATION, AND SITE DEVELOPMENT

Any proposed vehicular and/or pedestrian access, paths, sidewalks, steps, parking areas, outdoor recreation area, landscaping etc. shall be reported on the site plan, as well as areas of material storage and **temporary security fencing**.

All proposed drainage channels shall be shown on the site plan.

The location of the construction sign and any other signage required by local authorities shall be indicated on the site plan.

~~~ End of Part 3 ~~~

## **4 BUILDING REQUIREMENTS**

### **4.1 BUILDINGS TO BE DEMOLISHED AND RE-BUILT**

All buildings indicated as D# on the map at par. 3.1 shall be demolished from roof to foundation and re-built in different location and layout. Exact position shall be determined to best fit the topography and to minimize the grading work.

Each new classroom building shall be composed of max 4 classrooms matching the Rwandan construction standards for schools.

All demolition materials shall be properly disposed unless differently requested by the end user.

The demolition schedule shall be coordinated with the school officials to have the minimum impact on the school operability.

The design shall maintain an indigenous character and result **aesthetically resembling the existing building N1** (not part of this contract).

### **4.2 EXISTING LATRINE SYSTEM DISMANTLEMENT**

In addition to demolishing the latrine buildings indicated as D3 on the maps, KTR shall reclaim and collapse the septic pits and the sludge disposal area, shall clear the entire latrine system, shall compact and grade the soil as needed, and shall plant thick vegetation on potentially contaminated area that are not going to be paved or occupied by a new building, so to prevent children from approaching.

Temporary pit latrines may need to be provided in case the school is operational during the time of dismantlement and reconstruction.

### **4.3 CLASSROOM BUILDING TO BE RENOVATED**

The classroom building indicated as R on the maps at par 3.1 and 3.3 shall be renovated to include:

- Reinforce foundations if needed
- Remove the roof including the structure
- Install a corrugated metal roof cover interspersed by polycarbonate corrugated roofing panels in correspondence of blackboards
- Install light color ceramic tiles on all interior floors
- Remove and replace all windows and doors
- Plaster and paint interior walls
- Repair bricks on exterior walls
- Scrub and polish exterior walls
- Patch concrete slabs around the building where cracked
- Provide access to disabled
- Install electrical system and LPS
- Implement a storm water drainage system

### **4.4 MULTIPURPOSE BUILDING**

One Multipurpose Building shall be built in the area in front of the church as sketched on the map at par. 3.3. Exact orientation shall be determined to best fit the topography and to minimize the grading work.

The building shall be made of one multipurpose hall, one library, and one office to be in accordance with the Rwandan construction standards for schools.

The design shall maintain an indigenous character and result aesthetically resembling the existing building N1 (not part of this contract).

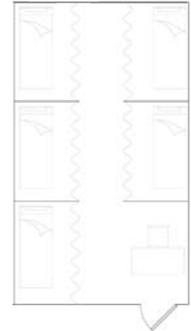
## 4.5 KITCHEN & OTHER MINOR FACILITIES

Kitchen facilities shall be built in the area indicated on the map at par. 3.3; exact position to be determined in coordination with the end user and the PM.

The kitchen room shall be equipped with 2 large concrete or ceramic basins, a tiled counter along one wall, and a large fireplace with hood and flue to naturally extract the smoke.

The support-to-girls facility shall be one room partitioned with 2 m high walls creating 5 spaces to fit a bed, plus a space at the entrance with a masonry cabinet and a sink. It may be attached to the kitchen block, if this is acceptable to the end user.

The masonry sentry box shall be located on one side of the main gate



Support-to-girls facility

## 4.6 LIGHTNING PROTECTION SYSTEM (LPS)

An LPS shall be implemented for all the new facilities.

It shall consist of a conductor system with air terminals on the roof of the buildings, bonding of the structure and other metal objects, grounding of electrodes, and interconnecting conductors.

A bimetallic connector shall be used to connect all copper cable conductors to all aluminum cable conductors.

Metal compatibility (galvanic action) shall be taken into consideration in order to avoid corrosion.

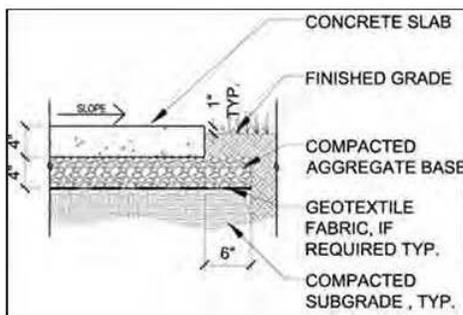
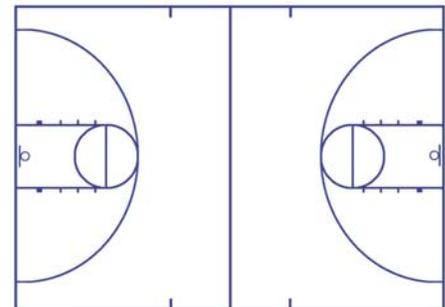
In any case a copper conductor shall be used to complete the connection to the grounding rod on both sides of each building.

Type and number of air terminals and ground rods to be used shall be determined by the Designer, based on local conditions, earth resistivity data, and on the size and type of the electrical installation.

## 4.7 OUTDOOR BASKETBALL COURT

The basic requirements necessary for building a court include:

- Orientation: Long axis is north to south
- Drainage: Drain end to end
- Dimension 11 m x 22 m
- Court: Concrete slab with 5 cm wide white markings
- Safety Buffer: 3 m unobstructed behind the back boundary line and a minimum of 2 m on each sideline
- Pavement Area: Allow a minimum of 1 m additional from sideline to edge of pavement
- Goal Post: In-ground pole,  $\Phi$  3 1/2", with a galvanized finish
- Backboard: One-piece cast aluminum alloy backboard with 2.5 cm deep supporting flanges
- Net: White nylon



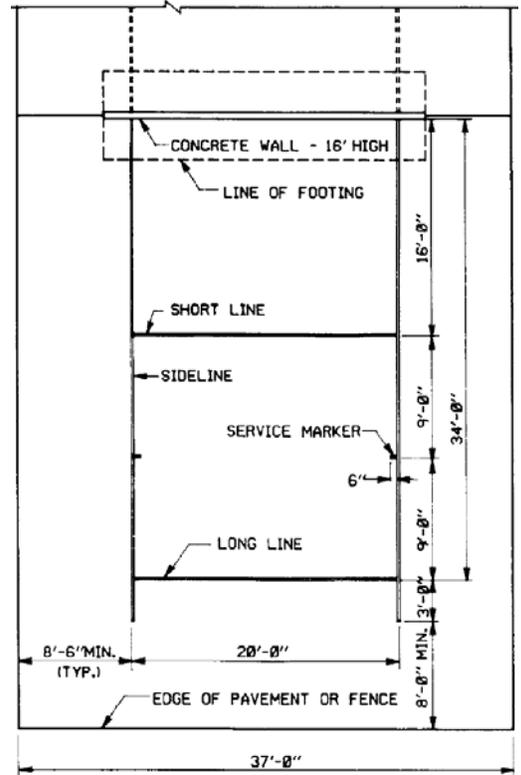
Court Slab Detail (Not to Scale)

The court slab shall be implemented in accordance to the drawing on the side

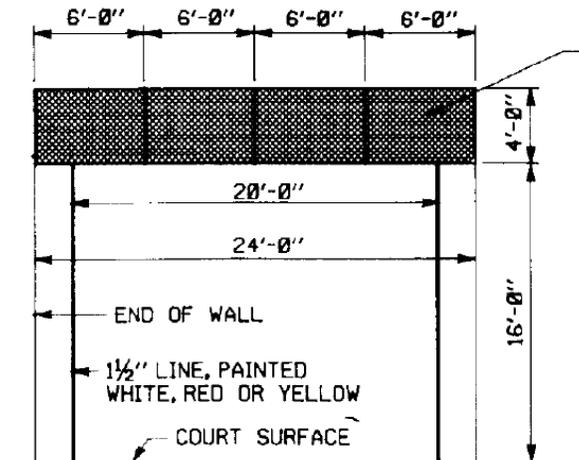
## 4.8 OUTDOOR ONE WALL HANDBALL COURT

The basic requirements necessary for building a court include:

- Orientation: Long axis north to south with the wall at the north end.
- Recommended area. Ground space is 1,665 square feet (155 sqm) plus walls and footings.
- Size and dimension. Playing court is 20 feet wide by 34 feet long (6.096 m x 10.3632) plus a required 11 feet minimum width of surfaced area to the rear and a recommended 8 feet 6 inches minimum width on each side.
- Surface and drainage. Floor surface is to be smooth concrete with a minimum slope of 1 inch in 10 feet (0.08 percent) from the wall to the rear of the court. Wall to be concrete with very smooth finish, free of irregularities.
- Court markings 1½" wide lines painted white, red, or yellow



COURT LAYOUT

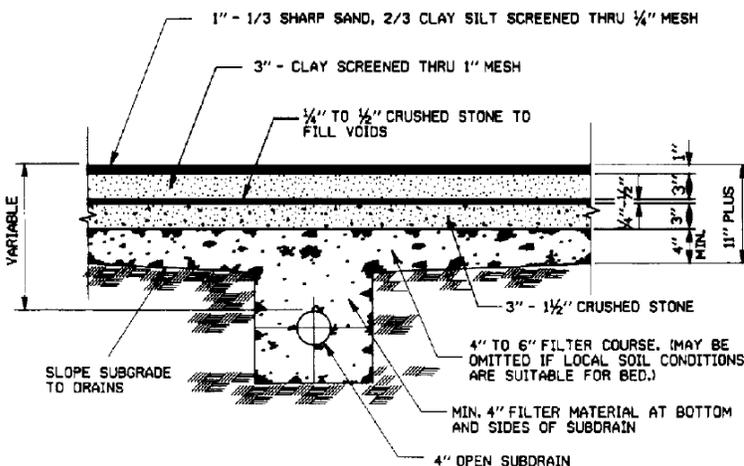


ELEVATION

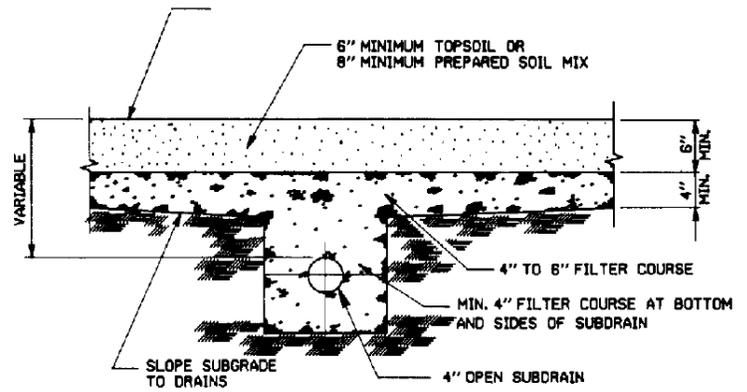
Walls and footings shall be designed for site specific conditions.

Underground utilities shall be installed before constructing the playing surface

Surfacing details are sketched below



TYPICAL SECTION - SAND CLAY



TYPICAL SECTION - NATURAL TURF

## 4.9 SETTLEMENT OF OTHER EXTERNAL AREAS

In the remaining external areas the following shall implemented.

- Compact, grade, and plant vegetation to settle dismantled areas not occupied by new facility
- Flat, clear, and pave the area P2 to be used as playground (~ 1,300 sqm)
- Pave all existing pathways
- Implement new paved pathways to connect all facilities in the compound
- Implement a paved 5-car parking on the right side of the main access gate
- Implement a gridded drainage gutter system for the entire compound
- Rearrange unpaved areas surrounding new constructions.

The Contractor shall grade the site to limit water from ponding and promote positive drainage off of the grounds.

See Part 8 par. G20 for further details.

## 4.10 RAIN WATER COLLECTION SYSTEM

The water collection is intended to provide water to the faucets in the VIP facilities and to the classrooms.

Each new roof (apart from latrines and minor facilities) shall be equipped with gutters connected to a new 5,000 liter tank and to the existing tank - if any - to collect storm water. Each new tank shall be connected to a pipeline feeding the faucets in the VIP, kitchen, and support-to-girls facilities, and shall be equipped with a tap above a grated drain on ground.

The tanks shall be provided with a foundation, base and all accoutrements to ensure proper functionality and ease of use. Their position shall be sufficiently elevated to guarantee adequate pressure at the faucets.

The tanks shall be provided with an overflow protected by an insect screen and with a vent welded to the cover plate on the top, protected by an aluminum bird/insect screen.

## 4.11 FENCING

A 2m-tall perimeter fence shall be implemented to secure the entire school compound, incorporating the existing part on the entrance side.

The fence shall be designed considering a 50 cm tall CMU (Concrete Masonry Unit) infill wall reinforced approx. every 2m, with reinforced footings and 2m tall concrete columns or metal bars spaced at about 4m; the fence fabric between the columns shall be 9 gauge (3 mm) steel wire mesh material (as a minimum) with mesh openings not larger than 51 mm (2 inches) or a steel bar grating with similar inter-spacing.

The masonry part shall be plastered and painted or show a brick work to match the existing feature.

The main gate shall be both pedestrian and vehicular, while the back gate (church side) shall be only pedestrian.

See Part 8 par. G2030 for further details.



## 4.12 NEW FACILITY SPACE TABULATION

Indicative data regarding the required size of the spaces in the new facilities are provided in the table below.

On the concept design submittal the contractor is required to provide exact dimensions corresponding to the actual design; a variance exceeding  $\pm 10\%$  of the indicative size will not be considered acceptable.

| NEW CLASSROOM BUILDING |             |                           |                          |                   |                    |                 |                                                                                                     |
|------------------------|-------------|---------------------------|--------------------------|-------------------|--------------------|-----------------|-----------------------------------------------------------------------------------------------------|
| Space Name             | Qty         | Unit m <sup>2</sup> (Net) | Tot m <sup>2</sup> (Net) | Optimal Size (m)  | Ceiling Height (m) | people per room | Remarks                                                                                             |
| Classroom              | 11          | 56                        | 616                      | 7 x 8             | 2.90               | 45              | 2 doors on opposite walls, 2 windows on each door wall, 1 blackboard, 1 platform, 1 masonry cabinet |
| Veranda                | 1 per block |                           |                          | 1.8 x (as needed) |                    |                 | along the entrance side                                                                             |

| MULTIPURPOSE BUILDING |     |                           |                          |                  |                    |                 |                                                                                                                      |
|-----------------------|-----|---------------------------|--------------------------|------------------|--------------------|-----------------|----------------------------------------------------------------------------------------------------------------------|
| Space Name            | Qty | Unit m <sup>2</sup> (Net) | Tot m <sup>2</sup> (Net) | Optimal Size (m) | Ceiling Height (m) | people per room | Remarks                                                                                                              |
| Multipurpose Hall     | 1   | 160                       | 160                      | 10 x 16          | 2.90               | 60              | 2 door to the exterior, 2 doors to the interior, windows on all perimeter walls, at least 4 per side, 4 ceiling fans |
| Library               | 1   | 24                        | 24                       | 6 x 4            | 2.90               | 15              | Entrance from main hall, at least 3 windows on perimeter walls, masonry shelves on interior walls, 1 ceiling fan     |
| Office                | 1   | 16                        | 16                       | 4 x 4            | 2.90               | 2               | Entrance from veranda, 1 door to the hall, windows on perimeter walls, 1 ceiling fan                                 |
| Veranda               | 1   | 36                        | 36                       | 1.8 x 20         | -                  | -               | along the entrance side                                                                                              |

| VIP FACILITY   |     |                           |                          |                  |                    |                 |                                                                         |
|----------------|-----|---------------------------|--------------------------|------------------|--------------------|-----------------|-------------------------------------------------------------------------|
| Space Name     | Qty | Unit m <sup>2</sup> (Net) | Tot m <sup>2</sup> (Net) | Optimal Size (m) | Ceiling Height (m) | people per room | Remarks                                                                 |
| Stalls         | 36  | 1.7                       | 61                       | 1.5 x 1.1        | 2.75               | 1               | 2 wall vents on the door and on the opposite wall and 1 pipe vent       |
| Screened areas |     |                           |                          |                  |                    |                 | 1 basin with 3 faucets for students, 1 basin with 1 faucet for teachers |
| Dry pit        | 3   | 17                        | 51                       | 1.3 x 13         | -                  | 0               | below the stalls, 6 m deep                                              |

| KITCHEN and other minor facilities |     |                           |                          |                    |                    |                 |                                                                                                                |
|------------------------------------|-----|---------------------------|--------------------------|--------------------|--------------------|-----------------|----------------------------------------------------------------------------------------------------------------|
| Space Name                         | Qty | Unit m <sup>2</sup> (Net) | Tot m <sup>2</sup> (Net) | Optimal Size (m)   | Ceiling Height (m) | people per room | Remarks                                                                                                        |
| Kitchen Room                       | 1   | 24                        | 24                       | 4 x 6              | 2.90               | 3               | 1 exterior door, 1 interior doors to storage, windows on all perimeter walls, 2 basins, 1 counter, 1 fireplace |
| Kitchen Storage                    | 1   | 12                        | 12                       | 4 x 3              | 2.90               | 0               | 1 exterior door, 1 interior doors to kitchen, masonry shelves on walls                                         |
| Support-to-girls                   | 1   | 24                        | 24                       | 4 x 6              | 2.90               | 6               | 1 exterior door, windows on perimeter walls, 2m partition walls, 1 sink, 1 masonry cabinet, 1 ceiling fan      |
| Sentry Box                         | 1   | 3                         | 3                        | 2 x 1.5            | 2.10               | 1               | No veranda                                                                                                     |
| Veranda                            |     |                           |                          | 1.8 x (as needed)- |                    | -               | along building entrance side                                                                                   |

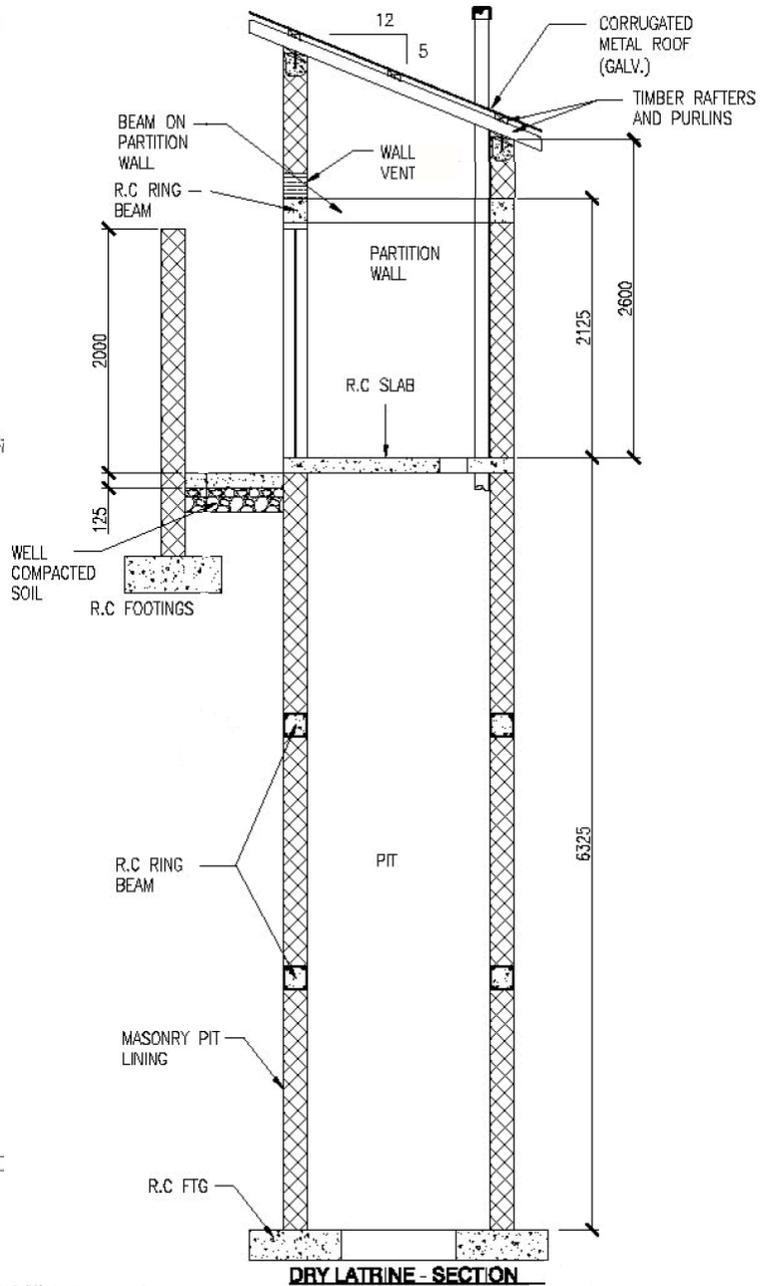
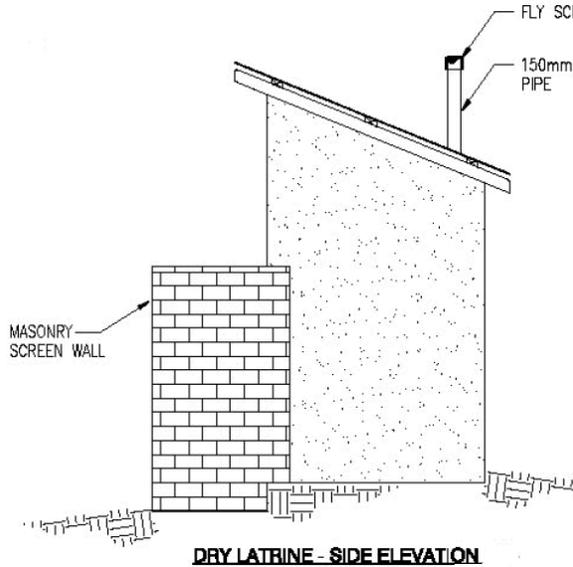
### 4.13 DRY VENTILATED IMPROVED PIT (VIP) LATRINES

Three 12-stall dry VIP latrine facilities shall be built to replace the existing ones.

Exact orientation shall be determined in order to guarantee proper ventilation and easy access.

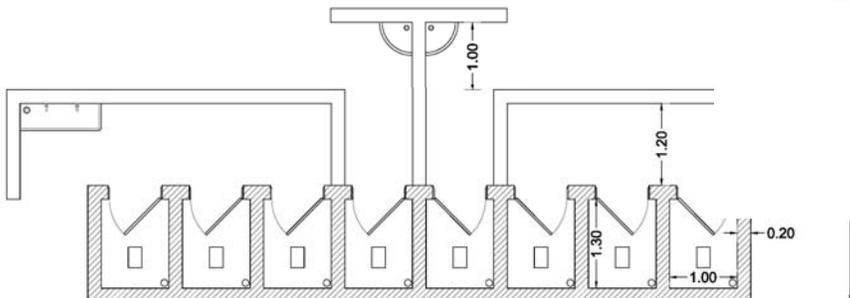
Special attention shall be provided to make sure the VIP facility is placed downwind of the school facilities, preferably where the soil is firmer and has good drainage. The doorway of the VIP latrine shall face the prevailing winds.

The latrine facilities shall be located at least 6 m away from any other surrounding construction, including the fence wall. Separate male/female access to be implemented.



The final design shall reflect the shape and dimensions of section and elevation reported above and on the side, and shall incorporate all requirements described at par. 5.3.

A reference scheme for a 8-stall VIP design with separate access for teachers is shown below: the final **design shall be adjusted to the number of stalls and faucets required** in this document.



#### 4.14 PROJECT SIGN

The Contractor shall provide a painted project sign to be located at the worksite as soon as the construction starts. The sign shall be made of wood and supported by wooden or metal posts. The approximate size of the sign shall be 800mm x 1200mm and the sign shall be placed in such a way so as to provide the most visibility to passers-by; the location shall be agreed with the COR. The Contractor shall submit a proof of the sign for approval prior to construction. The paint shall be water resistant and display the following:



Project name shall appear at the top center in 76mm (3 inch) tall capital block letters. The sentence below the flags shall be in 38mm (1.5 inch) sentence case lettering. Contractor company name may be added at the bottom of the sign.

#### 4.15 DEDICATION SIGN

At least 2 weeks prior to project completion a project dedication sign shall be affixed at the project site. The sign shall be affixed directly to the building at a location approved by the facility administrator and the COR to provide optimal visibility. The sign shall display the following:



The sign shall be constructed of sheet metal with a water resistant coating and shall have a frame around it. The frame material shall be wood and be approved by the COR prior to installation. The size of the sign shall be approximately 800 mm x 1200 mm.

No later than 4 weeks prior to the planned project completion, the Contractor shall contact the KO or the COR regarding final wording for the dedication sign.

The Contractor shall provide a proof of the sign for acceptance prior to manufacturing the sign.

The project name shall appear at the top center in 76mm (3 inch) tall block letters, followed by the above sentence in 38mm (1.5 inch) sentence case lettering that shall be repeated in the Host Nation primary language. The Host Nation and American flags shall be placed as displayed in the above sketch. The sentence at the bottom shall be in 20mm (0.75 inch) sentence case lettering.

~~~ End of Part 4 ~~~

5 ROOM MINIMUM REQUIREMENTS

5.1 FLOORS, WALLS AND CEILINGS

All interior floors shall be tiled.

All interior walls shall be plastered and painted with light color washable enamel suitable for school use. All veranda floors shall be hardened and sealed industrial concrete floor.

All exterior wall finishes shall resemble the building N1. For the building to be renovated, the exterior walls shall be repaired where needed, scrubbed, and polished.

All new building rooms shall be provided with false ceilings.

Complete **details** are reported at Part 7 and Part 8, **Section C30** of this document.

5.2 DOORS, WINDOWS, AND OPENINGS

All the doors and windows shall be equipped with lintels.

Each new classroom shall be accessible from one main door on the veranda side and one rear door.

All classroom rear doors shall be at least 160 cm large and equipped with an emergency bar; all exterior doors shall open to the exterior.

All windows shall be 100% openable and positioned on opposite walls to guarantee ventilation, grated to be protected from access, and equipped with mosquito screens. Their size and shape shall resemble the building N1 windows, even for non-classroom buildings.

Complete **details** are reported at Part 7 and Part 8, **Section C10** of this document.

5.3 DRY VIP LATRINES

Stall floors shall be reinforced concrete slabs with openings to serve as squat holes finished with hardened and sealed industrial concrete floor.

Stall walls shall be plastered and painted with dark color washable enamel.

Stall roof shall be galvanized corrugated metal sheeting on timber or metal rafters and purlins.

Dry **pit** shall be **6 m deep** with plan dimensions equal to the total stall area.

Pit walls shall be lined with the masonry block.

Wall **vents** located on top of each door shall be **0.5m x 0.2m** and shall be protected with mosquito screen.

Each stall shall be equipped with a uPVC **vent pipe ϕ 150mm extending at least 0.5m** above the roof.

Vent pipe shall be covered with gauze mesh or fly-proof netting and shall ensure unobstructed air flow.

A **2m tall masonry screen** wall shall be provided at the front of the latrine block, at least **1.5 m off** the latrine doors. M,

The concept design for a 8-stall latrine is provided at par. 4.13 as a reference. The final design shall be in accordance to this concept and with the above detailed requirements.

5.4 PLUMBING AND FIXTURES

A basin with multiple faucets shall be installed on the interior side of the screen wall, on both sides of each block. The faucets shall be connected to the new water storage tanks; the basin shall be connected to the drainage system.

Complete **details** are reported at Part 7 and Part 8, **Section D20** of this document.

5.5 ELECTRICITY AND LIGHTING

The electrical design shall keep into consideration the room use and the equipment to be installed. At least four 16A sockets shall be installed in each room.

The multipurpose hall shall have at least six 16A sockets and four ceiling fans.

Three-way switches shall be installed close to each entry point to any space having more than one entrance.

Emergency lights shall be installed on each main door. Exterior lights shall be suitable for external use.

It is required the installation of **low consumption or led lamps** in a number and size sufficient to guarantee proper illumination to each type of space. The average illumination over the room area at 80 mm above the floor shall be at least 107 lux for offices and classrooms and at least 11 lux for corridors.

Electrical cables shall be dimensioned in accordance to the loads relevant to each circuit.

In order to properly dimension the section of an electrical cable it is recommended to make reference to the table below showing the typical max resistance values for copper cables of different sizes and the relevant maximum current each one can bear.

| Section (mm ²) | R (Ω/km) | Max Current (A) |
|----------------------------|----------|-----------------|
| 1 | 19.5 | 5 |
| 1.5 | 13.3 | 10 |
| 2.5 | 7.98 | 16 |
| 4 | 4.95 | 26 |
| 6 | 3.30 | 32 |
| 10 | 1.91 | 50 |
| 16 | 1.21 | 68 |
| 25 | 0.78 | 92 |
| 35 | 0.55 | 120 |

The potential drops (depending on the cable resistance and on the current through it, $V=R*I$) shall be kept under 4%.

The connection to the public electrical network shall be done in agreement to the electrical company requirements.

Complete **details** are reported at Part 7 and Part 8, **Section D50** of this document.

5.6 GROUNDING SYSTEM

A **grounding (earthing) system** consisting of multiple connected rods shall be designed and implemented.

Rods shall be located away from most accessible areas, shall be protected from involuntary/unauthorized access and signposted by the earth symbol shown on the side. At least two rods per building shall be installed.



Grounding Symbol

5.7 ELECTRICAL PANELBOARD

The electrical power feed shall be divided into subsidiary circuits by a **panelboard** providing a protective circuit breaker for each circuit. A **main panelboard** - providing a breaker for each line connecting to **subpanels** located at each new and renovated classroom block - shall be located immediately downstream the delivery point (meter). All electrical panels shall be housed in a common enclosure.

The panelboard enclosure shall be galvanized sheet steel cabinet minimum 1.5 mm thickness, properly mating the panelboard to be enclosed; enclosure's door shall be lockable.

A main switch located upstream the main panelboard shall protect the electrical system against both overcurrents and residual (ground fault) currents through a Residual Current Breaker with Overcurrent (**RCBO**) protection whose sensitivity I_{Δ} is 30 mA. Sensitivity may be bigger in case other **RCDs** (Residual Current Devices) with $I_{\Delta} = 30 \text{ mA}$ are provided downstream to protect groups of circuits.

Fig. 6 shows an example of RCBO.

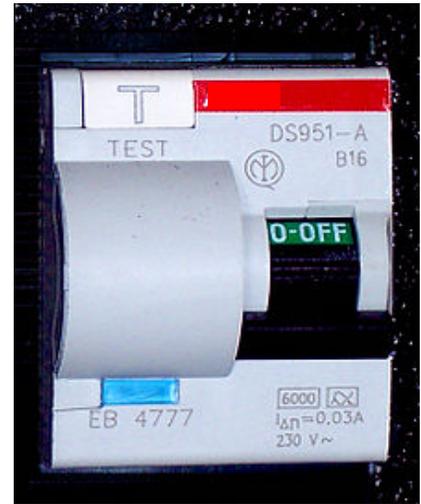


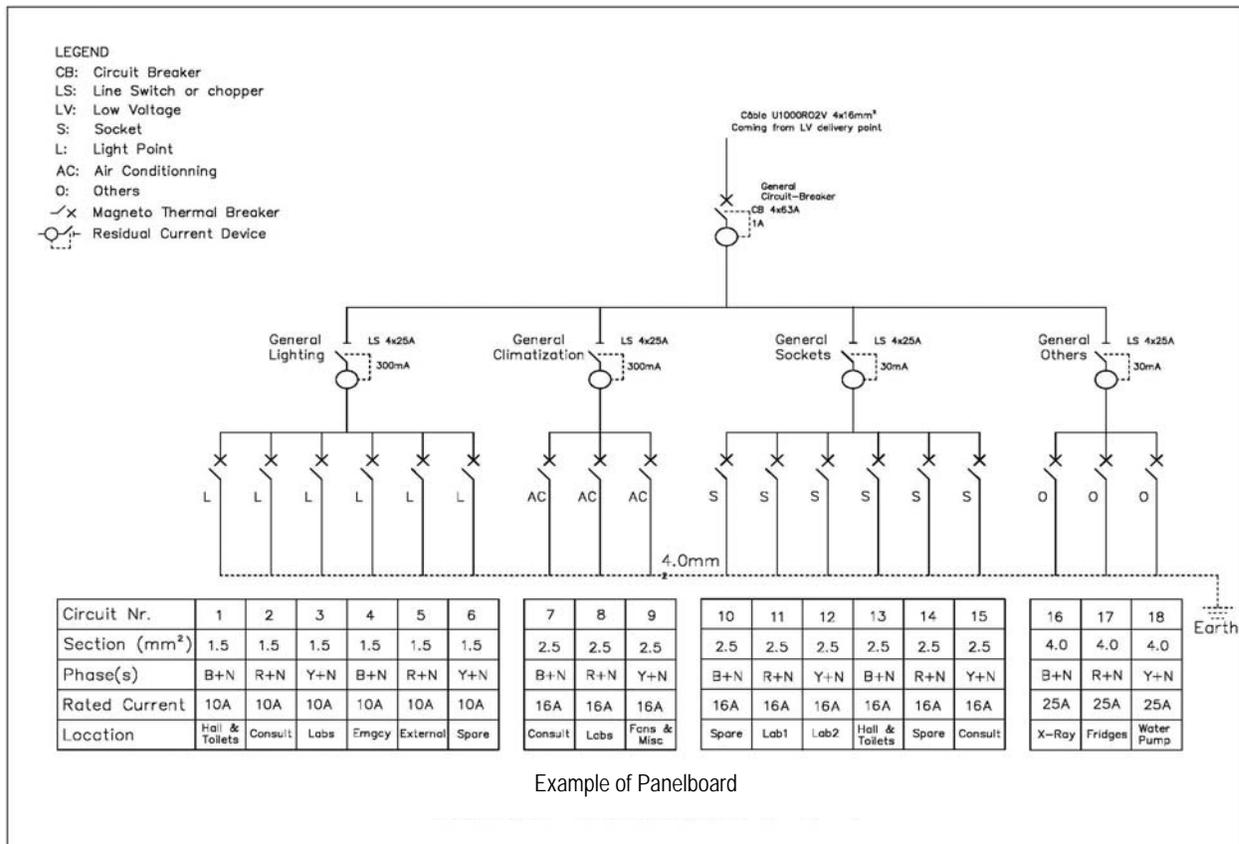
Fig. 6 - RCBO

Each circuit in the panelboard shall be protected against over-currents by a thermal magnetic breaker whose nominal current is \leq of the max current associated to the relevant cable section, as shown in the table at par. 5.3.

Each breaker shall be labeled to show which circuit it controls.

Lighting circuits and utilization circuits shall be kept separated and individually protected on the panel board.

Fig. 7 shows an example of panelboard design matching the above requirements.



5.8 LIGHTNING PROTECTION SYSTEM REQUIREMENTS

Type and number of air terminals and ground rods to be used shall be determined by the Designer, based on local conditions, earth resistivity data, and on the size and type of the electrical installation. It is required that LPS is designed and installed by **qualified**, trained, personnel.

For normal conditions, **copper clad steel rods** are typically used.

Galvanized coated steel or **stainless steel rods** are typically used where **low soil resistivities** are encountered and galvanic corrosion may occur between adjacent underground metallic masses and the copper-clad rods.

In **high resistivity soils**, 3 m **sectional rods** may be used to obtain the required resistance to ground; however where rock is encountered, additional rods, a counterpoise, or ground grid may be necessary.

~~~ End of Part 5 ~~~

## **6 GENERAL WORK REQUIREMENTS**

### **6.1 REFERENCE STANDARDS**

Construction shall be in accordance with sound construction practices, and shall conform to the latest revision/edition of the codes, criteria, and standards referenced below except as otherwise indicated by this Request for Proposal.

Construction shall also comply with applicable codes, ordinances and regulations of the Republic of Rwanda governing life/safety, fire protection, building construction, HVAC (heating ventilation and air conditioning) systems, plumbing systems and electrical systems in effect during this contract, except where specifically stated herein.

Any material installed that does not meet the requirements of the following Performance Technical Specification (PTS) and/or applicable codes, ordinances and regulations will be removed and reinstalled at Contractor's expense.

### **6.2 WORK REQUIREMENTS**

The building renovation and the exterior area settlement as described from Part 1 through 5 shall be in accordance to the specifications provided in the following Parts 7 and 8. All the engineering system requirements described in the Part 7 are more detailed in the corresponding Part 8.

Special attention shall be paid to develop and to adhere to the STRUCTURAL DESIGN and to the ELECTRICAL DESIGN.

All the concrete and electrical work shall be tested and delivered with a Test Certificate issued by a local qualified entity.

### **6.3 DESIGN GUIDANCE**

Design shall be in accordance with sound design and engineering practices, and shall conform to the latest revision/edition of the codes, criteria, and standards referenced below except as otherwise indicated by this Request for Proposal. Design shall also comply with applicable codes, ordinances and regulations of the Republic of Rwanda governing life/safety, fire protection, building construction, plumbing systems, electrical systems and sanitation systems in effect during this contract, except where specifically stated herein.

The advisory provisions of all codes, requirements, and standards shall be mandatory; substitute words such as "shall", "must", or "required" for words such as "should", "may", or "recommended," wherever they appear. The results of these wording substitutions incorporate these code and standard statements as requirements. Reference to the "authority having jurisdiction" shall be interpreted to mean "Contracting Officer". Comply with the required and advisory portions of the current edition of the standard at the time of contract award.

The last two sections of this document, in many instances, give multiple options for material and processes. It is the intent to give the contractor's designer freedom to use one or multiple options in the design, based upon sound design and engineering practices and the requirements of the project. Once an option is selected for the project, all requirements outlined in the PTS for that option are to be incorporated in the design.

### **6.4 PERFORMANCE TECHNICAL SPECIFICATIONS**

The specifications for this project are requirements based, meaning that the technical details of how to meet this requirement are not included in the PTS.

The contractor shall determine the technical requirements for satisfying these specifications and present them as part of the design package.

The contractor's design shall provide the technical requirements for the project and the contractor shall be responsible for ensuring their design meets all specifications presented in this SOW.

## 6.5 PRE-CONSTRUCTION SUBMITTAL PACKAGE

The Contractor shall be responsible for **developing a design** for the facility that meets all the operational requirements identified in this document. Contractor shall provide a full design of the facility to include drawings and all calculations and details required to validate the design.

In order for the construction to start, a complete Pre-Construction Submittal Package shall be submitted and accepted within 270 days from contract award.

The package shall consist of:

- Concept Design
- Final Design
- Construction Schedule
- Quality Control Plan
- Accident Prevention Plan
- SSHO Certification
- Construction permit(s)
- MOU with the end user
- Worksite Delimitation Plan

All submittals shall be electronically submitted in pdf format to the PM/COR. The font sizes shall be readable when the file is printed on A4 paper.

### CONCEPT DESIGN

Within **90** calendar days since the contract award, the contractor shall submit a **concept design** to consist of the following submittals:

- Facility Footprint (identifying existing items to demolish and existing items to remain)
- Topographic Site Plan
- Current Site Plan with all dimensions
- Final Site Plan (identifying existing items to remain and new items with dimensions)
- Floor Plans of new structures
- Exterior Elevations of new structures
- Sections of new structures
- Geotechnical report with structural recommendations

The Government shall review the submission and provide written comments to the contractor. The contractor shall incorporate all comments in the design.

In the event the contractor does not concur with the Government comments, the contractor shall notify the Government in writing of the reasons for the non-concurrence.

### FINAL DESIGN

Within **180** calendar days after the review of the concept design submittal is complete and comments are returned to the contractor, the contractor shall submit a complete, **final design** to consist of the following submittals(as applicable):

- List of all drawings, with identifying code and title
- Civil Drawings (to be identified as C-##)
  - Site Demolition Plan
  - Site Plan with dimensions
  - Grading Plan
  - Fencing Plan and Sections
  - Pathway Plan and Details
  - Playground Plan and Details
  - Basketball Court Plan and Details
  - Handball Court Plan and Details
- Architectural Drawings (to be identified as A-##)
  - Floor Plans
  - Roof Plans
  - Exterior Elevations
  - Building Sections

- Enlarged Plans
- Wall Sections
- Reflected Ceiling Plans
- Interior Elevations
- Door and Window Schedules
- Door and Window Details
- Room Finish Schedule
- Miscellaneous Details
- Structural Drawings (to be identified as S-##)
  - Structural Notes/Basis of Design
  - Pier Plan/Schedule
  - Foundation Plan
  - Floor and Roof Framing Plans
  - Lateral-Force Resisting System
  - Sections and Details
  - Fencing structural details
  - Water tank support details
  - Structure Calculation
- Plumbing Drawings (to be identified as P-##)
  - Plumbing Plans
  - Rain Drainage Plans
  - Water tanks design
  - Miscellaneous Details
- Electrical Drawings (to be identified as E-##)
  - Notes, Legends, Symbols List
  - Distribution Switchboard Scheme
  - Grounding System Plan
  - Single Line Diagrams
  - Floor Plans, power and lighting
  - LPS system plans and details
  - Circuit/breaker size calculation
  - Miscellaneous Details
- Other drawings (to be identified as O-##)

Each drawing shall be univocally identified by a code composed of one letter indicating the type of drawing (architectural, electrical, structural, etc.) and two digits indicating a progressive number, as specified above. The electronic file name associated to each drawing shall commence with the correspondent code, followed by a title shortly describing the content.

### **CONSTRUCTION SCHEDULE**

Within **270** days from contract award, the contractor shall prepare a **Construction Schedule** in a format approved by the PM. The schedule shall identify the different work segments associated to the timeframe set for completion. Payment will be tied to satisfactory completion of each of these work segments. The construction schedule shall state which work segments completion determines the achievement of the construction steps associated to the progressive invoicing - i.e. 10% (design completion), 25%, 40%, 55%, 70% and 85% work progress. The final payment will be done on the facilities acceptance.

The contractor shall submit the proposed schedule to the PM within the timeline allowed for the final design submission. The contractor shall have **450** calendar days to complete the work.

### **QUALITY CONTROL PLAN**

Within **270** days from contract award, the Contractor shall prepare a **Quality Control Plan** describing personnel, procedures, tests and installation techniques that he plans to perform to ensure the quality required by these TR and by his design is obtained.

**ACCIDENT PREVENTION PLAN**

Within **270** days from contract award, the Contractor shall prepare and submit an **Accident Prevention Plan [APP]** describing procedures to be put in place to ensure the safety of personnel and equipment on the job site.

The APP shall consist of the following **10 sections**:

1. Signature Sheet
2. Background Information (area map)
3. Statement of Safety and Health Policy (signed company Safety Policy)
4. Responsibilities and Lines of Authority (Proof of competency/qualification of listed personnel)
5. Subcontractors and Suppliers (List)
6. Training
7. Safety and Health Inspections
8. Accident Reporting
9. Plans (Programs, Procedures)
10. Risk Management Processes (**Activity Hazard Analysis [AHA]**, required for each Definable Feature Of Work [DFOW])

Several sections require certain supporting documents (resumes, certificates of training, organization chart, specific plans (crane lift plan medical support plan, etc.). The supporting documents and plans must be attached to the APP.

**Generic AHAs** will be made available by the PM. To use the Generic AHA the contractor shall provide a table like the one below to indicate which Generic AHAs are incorporated in the APP; furthermore he/she shall fill all blanks in each generic AHA that applies (which shall be checked and signed).

| Generic AHA used in the APP                 | Yes | No/NA |
|---------------------------------------------|-----|-------|
| G1 - Mobilization / General Construction    |     |       |
| G2 - Demolition                             |     |       |
| G3 - Scaffolding / Fall Protection          |     |       |
| G4 - Excavation / Trenching                 |     |       |
| G5 - Electrical                             |     |       |
| G6 – Cement Work                            |     |       |
| G7 – Masonry Work                           |     |       |
| G8 – Confined Spaces & Hazardous Atmosphere |     |       |
| G9 – Plumbing                               |     |       |
| G10 – Painting                              |     |       |
| G11 – Steel Structure Erection              |     |       |
| G12 – Abrasive Blasting                     |     |       |

**SITE SAFETY AND HEALTH OFFICER [SSHO] CERTIFICATION**

A qualified person shall be designed to be the **Site Safety and Health Officer (SSHO)**, required to be at worksite all the time. At a minimum, the qualified SSHO shall have three years experience and have completed the OSHA 40 hour online training offered for free at the following site:

<http://www.oshatrain.org/pages/professional-training-courses.html>.

The relevant certification shall be provided with the APP.

**CONSTRUCTION PERMIT**

Within the timeframe allowed for the final design submission, the Contractor shall provide evidence that the local authorities allow the construction to start, and shall immediately notify the KO and PM in case any stop cause is identified. In particular, prior to be issued the NTPC the Contractor shall submit copy of the construction permit released by the Rwandan competent office.

## **MOU WITH THE END USER**

Within the timeframe allowed for the final design submission, the Contractor shall make agreements with the school officials to carefully coordinate the work schedule and the worksite delimitation in order to guarantee the school safe operability during the timeframe the construction is in progress. A memorandum of understanding specifying all details (including the temporary student relocation, if needed) shall be signed by both parties, and an electronic copy shall be forwarded to PM prior to be issued the NTPC.

## **WORKSITE DELIMITATION PLAN**

Within the timeframe allowed for the final design submission, the Contractor shall submit a site plan showing how the worksite will be delimited in the several phases of work, in order to allow safe operation of the facilities not included in the contract and to make sure that unauthorized access to construction site is prevented.

Upon final acceptance of the Complete Submittal Package by the Government, the contractor shall be issued a written **notice to proceed with construction [NTPC]**.

No construction work is authorized to start prior to the NTPC is issued.

## **6.6 CONSTRUCTION GUIDANCE**

Construction shall start after a **NTPC** is issued by NAVFAC EURAFSWA.

Construction shall be in accordance with sound construction practices, and shall conform to the latest revision/edition of the codes, criteria, and standards referenced below except as otherwise indicated by the Request for Proposal.

Construction shall also comply with applicable codes, ordinances and regulations of the Republic of Rwanda governing life/safety, fire protection, building construction, HVAC (heating ventilation and air conditioning) systems, plumbing systems, electrical systems and sanitation systems in effect during this contract, except where specifically stated herein.

Any material installed that does not meet the requirements of this document and/or applicable codes, ordinances and regulations will be removed and reinstalled at Contractor's expense.

## **6.7 CERTIFICATIONS, LICENSES, PERMITS, FEES, ETC.**

The Contractor shall be responsible for determining and paying all fees associated with, and obtaining any required permits for this project including, but not necessarily limited to permits for on-site and off-site hauling, demolition/disposal, storm water discharge, construction activity, utilities, road improvements, communications, etc.

The contractor is responsible for acquiring any required certifications (licensing). Coordinate all permit requirements with the PM/COR. Submit all completed permit application material, and associated back-up material, required to operate facilities, to the PM/COR for approval prior to agency submission.

Contractor shall be responsible for complying with all environmental laws, regulations and requirements as effective in the Country.

## **6.8 COORDINATION**

All coordination with the local, regional, national authorities shall be the responsibility of the contractor.

The Contracting Officer shall be notified of any disputes between agencies or approvals that will affect Contract Completion or Contract Price.

## **6.9 VEGETATION CONTROL**

The Contractor shall control vegetation within the work area during construction by treating with an approved herbicide/soil sterilizant and removing dead material as directed by the herbicide manufacturer's instructions. Treated material is to be removed to an off-site location as directed by the contracting officer.

The Contractor shall control the vegetation on staging and access areas of the site during construction by cutting so that the vegetation does not exceed 6 inch (15 cm) in height. Cut material is to be removed to an off-site location as directed by the contracting officer. Contractor shall leave staging and access areas clean and in original condition at end of project.

## **6.10 RESPONSIBILITY OF MATERIALS**

All materials delivered to the construction site shall remain in the ownership and responsibility of Contractor. Contractor will be responsible to safeguard the procession and condition of the material until US Government takes procession of the finalized project.

Material that is not intended to become part of the project shall not be delivered, placed, retained nor stored on the project site.

All refuse or salvaged materials shall become the property of the Contractor and shall be disposed of, off-site, in accordance with applicable regulations.

## **6.11 SAFETY AND PROTECTION**

The contractor shall be responsible for a safe and hygienic work environment both on the project site and at off-site locations where work is done in conjunction with this project.

The contractor shall be responsible for the protection of all grounds, vegetation and improvements that exist and are to remain after the project is complete; with-in the project work areas, adjacent to the project work areas and along the common route of access to the site, outside of the work areas. The Contractor shall be responsible to have any damage caused by Contractor's employees, equipment or sub-contractors repaired and restored to pre-damage condition, as approved by the PM, at no cost to the Government.

The contractor shall be responsible for adequate and safe traffic control in work areas and along the common route of access to the site outside of the work areas. Traffic control shall include; Contractor's workforce traffic, vehicular traffic interfacing with Contractor's traffic and pedestrian traffic interfacing with Contractor's traffic. Traffic controls shall include; signage, barriers, pavement markings and traffic control personnel.

The Contractor shall comply with all applicable safety regulations of the Republic of Rwanda, including all required record keeping.

The Contractor shall provide and maintain in working order during the entire construction period, such fire protective equipment and devices as required by applicable safety standards and as deemed necessary and suitable for any possible class or type of fires. Extinguishers shall be non-freeze type of not less than ten pound (5kg) capacity each.

Provide protection against rain, wind, or heat so as to maintain all work, materials, apparatus, and fixtures, incorporated in the work or stored on the site, free from injury or damage. At the end of the day's work, cover all new work likely to be damaged.

Contractor shall acquaint themselves with the location of utilities, which may be encountered or be affected by work, and shall be responsible for damage caused by neglect to provide proper precautions or protection. Contractor shall contact local authorities to locate any utility, if necessary.

Provide, erect and maintain all required barricades, of sufficient size and strength necessary for protection of material storage, as well as to prevent accidents to the public and the workmen at the job site.

Watchmen will not be provided. Contractor will be held responsible for loss or injury to persons or property where work is involved, and shall take such precautionary measures as they may deem necessary to protect their own interest.

Injuries to any person and damage to any property not belonging to the Contractor shall be reported immediately to the COR.

## **6.12 SPILL CONTINGENCY PLAN**

While working the Contractor is liable for the containment, cleanup and disposal of all Contractor spills (equipment breakdowns, wash ups, clean ups of construction materials, etc.) in compliance with the rules and regulations of the Republic of Rwanda.

Contractor shall reimburse any third party for damage resulting from a spill and for costs incurred by the third party to clean up and dispose of waste at no cost to the Government.

Contractor's representative must have a copy of the spill clean up procedure and supplies on-hand equipment to control a spill.

When a spill occurs, Contractor's representative must notify the COR, comply with the contingency spill plan and complete, and file spill incident report within 24 hours of incident.

Contractors shall have, on the job site, spill cleanup materials and equipment to handle spills up to 5 gallons. At a minimum the Contractor's spill response kit should contain the following:

- Oil Absorbents
- Cellulose Socks
- Latex Gloves
- Dust Masks
- Disposal Bags or Containers
- Hand Wipes

Contractor shall identify the cleanup materials and equipment that they will have on the job site. The COR will be the sole judge of acceptability of Contractor's cleanup materials and equipment.

## **6.13 SPECIAL SITE CONDITIONS**

Confine all operations, equipment, apparatus and storage of materials, to the immediate area of work to the greatest possible extent.

Contractor shall ascertain, observe and comply with all rules and regulations in effect on the project site, including, but not limited to parking and traffic regulations, use of walks, security restrictions, hours of allowable ingress and egress.

## **6.14 CLEANING**

Contractor shall keep premises free of accumulations of surplus materials and rubbish caused by their operations. Combustible rubbish shall be removed from the premises each day. Burning of rubbish on premises is not permitted.

In addition, the Contractor shall perform final cleaning to remove all foreign matter, spots, soil and construction dust, so as to put the project in a complete and finished condition ready for acceptance and use intended.

All waste areas and storage areas will be cleaned up to the COR's satisfaction. All excess materials will be removed from the site and the Contractor will leave the premises free of debris and excess waste materials.

~~~ End of Part 6 ~~~

7 ENGINEERING SYSTEMS REQUIREMENTS

7.1 SECTION A10 FOUNDATIONS

System Description

Provide the building foundation system in accordance with the building codes and authority having jurisdiction. Foundation shall be designed to suit subsurface conditions, and shall be capable of transmitting all building loads to the ground.

In addition, design the structure in accordance with the building codes and authority having jurisdiction. Load combinations shall include but not be limited to all applicable dead loads, roof live loads, floor live loads, wind loadings, and seismic loading.

General

The Contractor shall commission the services of a geotechnical engineer registered as a Professional Engineer in accordance with the authority having jurisdiction.

Subsurface soil information, including a geotechnical report, are not included in these TR.

As a minimum, the successful bidder's Geotechnical Engineer shall perform an adequate number of borings to the required depth, and supplementary laboratory classification of soils encountered, on the building site to support the foundation design.

A site-specific seismic ground motion study is not required, unless it is required to develop the spectral accelerations to adequately design the structure for the seismic loads.

A1010. STANDARD FOUNDATIONS

See "System Description" above. The foundation construction is anticipated to be reinforced cast-in-place concrete continuous footings at walls and spread footings at columns and pilasters, but may include any foundation system meeting the requirements of this section. [Do not use timber footings or wood foundations.

A1030. SLAB ON GRADE

Provide standard concrete slab on grade. Where slab on grade is below the existing adjacent exterior grade, provide a perimeter drainage system to remove ground water from the area immediately adjacent to the building[s]. Provide perimeter insulation.

7.2 SECTION B10 SUPERSTRUCTURE

System Description

Provide the building framing system in accordance with the building codes and authorities having jurisdiction.

In addition, design the structure in accordance with the building codes and authority having jurisdiction. Load combinations shall include but not be limited to all applicable dead loads, roof live loads, floor live loads, wind loadings, and seismic loading.

B1010. FLOOR CONSTRUCTION

The floor construction is anticipated to be reinforced cast-in-place concrete slabs on removable forms, but may include any structural framing system meeting the requirements of these TR. The floor is anticipated to be supported by reinforced concrete columns and beams, but may be supported by any structural system meeting the requirements of these TR.

B1020. ROOF CONSTRUCTION

The roof construction is anticipated to be reinforced cast-in-place concrete slabs on removable forms but may include any structural framing system meeting the requirements of this section. The roof deck is anticipated to be supported by reinforced concrete columns and beams, but may be supported by any structural system meeting the requirements of these TR.

7.3 SECTION B20 EXTERIOR ENCLOSURE

System Description

This system consists of the exterior facing of the facility, which includes all vertical and horizontal exterior closure such as exterior walls, exterior windows, and exterior doors. This system excludes roofing (See System B30, Roof).

Structural frame elements at exterior such as columns, beams, load bearing exterior walls, spandrels, etc., are included in Superstructure, with only the applied exterior finishes (i.e., paint stucco, etc.) being included here.

Finishes to the inside face of walls which are not an integral part of the wall construction will be included in System C30, Interior finishes.

B2010. EXTERIOR WALLS

The primary exterior material of the buildings shall be cast-in-place concrete with unit masonry infill wall systems as described in System B10, Superstructure faced on all exposed surfaces with painted stucco.

B201001. Balcony Walls, Guard Rails & Handrails

At any accessible horizontal surface, such as a floor, deck, veranda or roof, that is more than 30 inches (75 cm) above an adjacent surface, provide fall protection in the form of walls and/or guardrails. The walls and/or guardrails shall be 42 inches (100 cm) in height above the horizontal surface. Provide complete concrete and masonry walls and/or non-corrosive metal railing systems including anchors and attachment sleeves and fasteners. Balcony walls shall match the exterior walls of the building. Railing shall be ornamental to harmonize with the building.

At any stair into a building, between floors or that is a part of exterior walkways, provide handrails extending from 12 inches (30 cm) beyond the top step and 12 inches (30cm) beyond the bottom step. The walls and/or handrails shall be 32 inches (80 cm) in height above the nose of the steps. Provide complete concrete masonry walls and/or non-corrosive metal railing systems including anchors and attachment sleeves and fasteners. Handrail walls shall match the exterior walls of the building. Railing shall be ornamental to harmonize with the building.

Walls and rails shall be designed in such a way that a 4 inch (10cm) sphere can not pass through any point in the wall or rail.

B201002. Exterior Coatings

Provide field applied exterior coatings (paints, etc.) for all items that are not prefinished, and to prefinished items when required to provide a color other than a standard prefinished color.

B2020. EXTERIOR WINDOWS

As much as practical, windows shall be provided in each area of the building that is regularly occupied, to enhance the working environment, without compromising visual acuity and comfort. Natural day lighting is preferred.

B202001. Exterior Windows

Exterior windows shall be wood, aluminum or plastic. Operable windows shall be provided with an integral insect screen.

B202002. Exterior Glazing

Glazing shall be clear, tempered glass.

B201003. Exterior Louvers & Screens

Provide exterior louvers and screens, where required, that match the finish of the windows and detailed to integrate with the architecture of the building, as appropriate to the design of the building.

B2030. EXTERIOR DOORS

Provide hollow metal door assemblies at the exterior door openings. Any glazing shall match the window glazing. Provide door hardware as required to hang, swing, lock and operate doors.

B203007. Gates

Provide gates at any opening in perimeter security walls or openings in the exterior wall of the building requiring open ventilation.

7.4 SECTION B30 ROOFING

System Description

Roof systems shall be watertight and compatible with facility function, construction, and service conditions. Provide complete roof system design and construction services for the entire new facility roof system, including all ancillary and incidental work necessary for a complete, new, watertight roof system installation.

Design Submittal Requirements: roof plan, method of drainage, standard details and details unique to the project, wind load calculations and requirements.

Roofing systems shall be designed to resist wind uplift as indicated in System B10, Superstructure.

B3010. ROOF COVERINGS

B301001. Steep Slope Roofing Systems

Steep slope roofing systems (4:12 or greater) are preferred over low slope roofing systems, where practical. Steep slope roofing systems that are acceptable include metal, slate, concrete tiles, clay tiles, and asphalt shingles.

B301002. Low Slope Roofing Systems

Low slope roofing systems (Less than 4:12) that are acceptable include metal, slate, concrete tiles, clay tiles, and asphalt shingles. Low slope roofing systems that are acceptable include aggregate surfaced four-ply built-up roofing, three-ply built-up roofing systems with modified bitumen cap sheet surfacing or three-ply modified bitumen roofing.

7.5 SECTION C10 INTERIOR CONSTRUCTION

System Description

Interior construction includes interior partitions, interior doors, and specialties.

Provide durable construction appropriate to the buildings use.

C1010. PARTITIONS

All interior partitions shall be unit masonry.

C101001. Interior Guardrails

At any accessible horizontal surface, such as a floors and balconies, that are more than 30 inches (75 cm) above an adjacent surface, provide fall protection in the form of walls and/or guardrails. The walls and/or guardrails shall be 42 inches (100 cm) in height above the horizontal surface. Provide complete concrete and masonry walls and/or non-corrosive metal railing systems including anchors and attachment sleeves and fasteners. Balcony walls shall match the interior partitions of the building. Railing shall be ornamental to harmonize with the building.

At any stair provide handrails extending from 12 inches (30 cm) beyond the top step and 12 inches (30cm) beyond the bottom step. The walls and/or handrails shall be 32 inches (80 cm) in height above the nose of the steps. Provide complete concrete masonry walls and/or non-corrosive metal railing systems including anchors and attachment sleeves and fasteners. Handrail walls shall match the interior partitions of the building. Railing shall be ornamental to harmonize with the building.

Walls and rails shall be designed in such a way that a 4 inch (10cm) sphere can not pass through any point in the wall or rail.

C101002. Interior Screens

Provide screen walls where required to prohibit view.

C101003. Interior Windows

Provide interior windows of wood, aluminum, plastic or hollow metal.

C101004. Interior Glazing

Interior glazing shall be clear tempered glass.

C1020. INTERIOR DOORS

C102001. Standard Interior Doors

All interior doors shall be wood or hollow metal. All interior door frames shall be wood or hollow metal to match the doors. Provide door hardware as required to hang, swing, lock and operate doors.

C102002. Glazed Interior Doors

Provide vision glazing in doors where it is deemed advantageous to be able to see through the door, either for safety of pedestrian traffic, or other functional reason.

C1030. SPECIALTIES

C103001. Toilet Compartments and Accessories

Provide toilet compartments in all toilet rooms with more than one water closet or urinal. Provide toilet accessories as indicated in Part 4 of these TR.

C103003. Marker Boards

Provide marker boards.

C103004. Counters

Provide counter tops and back splashes.

C103005. Cabinets

Provide cabinetry and millwork items with associated accessories.

C103006. Ornamental Metal Work

Provide ornamental metalwork and stair handrails.

7.6 C30 INTERIOR FINISHES

System Description

Interior finishes include wall finishes, floor finishes, wall base finishes, and ceiling finishes.

Provide aesthetically pleasing, functional, durable finishes appropriate to the buildings use.

Acoustic properties of materials, as well as durability and ease of maintenance, shall be considered during material selection. Maximize the use of sustainable materials.

C3010. WALL FINISHES

Interior wall finish materials shall be painted cement plaster, ceramic tile or natural marble.

Provide ceramic tile in all toilet rooms full height of all walls.

C3020. FLOOR FINISHES

Primary floor finish shall be ceramic tile except as indicated in the Part 4 of these TR. Edges of tile work not against a wall, including changes in floor height, shall be finished with a rounded factory tile edge. If edge tile needs to be cut, place cut edges toward grout line.

Exposed concrete floors shall be coated with a sealer appropriate to the function of the space.

C3030. CEILING FINISHES

Ceiling finishes shall be as indicated in the Part 4 of these TR.

Exposed structural systems shall be painted.

C3040. INTERIOR COATINGS AND SPECIAL FINISHES

Paint all interior exposed wood or metal items.

7.7 SECTION D20 PLUMBING

Refer to PTS D20 for performance requirements of the building elements included in the plumbing system.

System Description

The plumbing system shall be complete and usable for the facility usage consisting of all fixtures, sanitary waste and vent piping systems, accessories, finish trim, anchorage and other specialty piping and equipment within 1.5 meter (5 foot) of the building.

General System Requirements

Provide working space around all equipment. Provide concrete pads under all equipment. Provide all required fittings, connections and accessories required for a complete and usable system. All equipment shall be installed per the criteria of TR section D20 and the manufacturer's recommendations. Design and installation shall be in accordance with manufacturer's

recommendations and local law and other requirements that may govern. Where the word “should” is used in the manufacturer’s recommendations, substitute the word “shall”.

D2010. PLUMBING FIXTURES

Provide quantity and type of plumbing fixtures required for the occupancy, use, and functions described for this facility. Provide handicapped fixtures in accordance with the referenced criteria in the Project Program.

Anchor all plumbing fixtures securely into their final location.

D201001. Water Closets

Provide floor-mounted flush tank type water closets.

D201002. Urinals

Provide wall-mounted flush valve type urinals.

D201003 Lavatories

Provide wall mounted lavatories made of vitreous china, with shelf back.

D201004. Sinks

Provide sink as described in the Part 4 of these TR.

D201005. Finish Trim

Provide escutcheons or other finish trim where pipes supplying plumbing fixtures penetrate visible, finish wall surfaces.

D2020. DOMESTIC WATER DISTRIBUTION

Water supply shall be provided by connecting to the existing water service in the existing building. Refer to PTS D20.

D202001. Pipes and Fittings

For cold water piping distribution, provide copper piping for above ground installations, and use PVC or CPVC piping buried piping installations.

For hot water piping installations, use copper tubing only, and do not install hot water piping underground. Conceal hot water piping in wall a soffit, a pipe chase, or in the attic.

D202002. Domestic Water Equipment

Provide electric geyser for heating of domestic water.

D202003. Insulation & Identification

Provide mineral fiber insulation with vapor barrier on domestic water (hot and cold) supply piping. Provide identification for piping and equipment.

D202004. Specialties

Provide valve box for buried valves.

D202005. Other Domestic Water Supply

Provide piping supports in accordance with the piping manufacturer. Provide inspections, disinfection, and testing in accordance with the local regulations.

7.8 SECTION D50 ELECTRICAL

System Description

Connect to the existing electrical system as required and provide adequate protection to all the circuits.

Provide an interior electrical system consisting of Service Entrance Wiring and Equipment, Distribution and Lighting Switchboards, Conduits, Feeder and Branch Circuits, Lighting and Branch Wiring, Emergency Lighting and Power, Grounding, and Lightning Protection, including accessories and devices as necessary and required for a complete and usable system. This section covers installations out to the building 1.5 meter (5 foot) line.

The interior distribution system shall consist of insulated conductors in conduit.

General System Requirements

Provide an Electrical System complete in place, tested and approved, as specified throughout these TR, as needed for a complete, usable and proper installation. All equipment shall be installed per the

criteria of PTS D50 and the manufacturer's recommendations. Where the word "should" is used in the manufacturer's recommendations, substitute the word "shall".

D5010. ELECTRICAL SERVICE AND DISTRIBUTION

D501002. Service Entrance Equipment

All service into the facility shall be underground.

Provide a main distribution panel as service equipment. Provide each service entrance with digital metering.

D501004. Switchboard

Provide distribution and branch circuit switchboard to serve loads as required.

D501005. Enclosed Circuit Breakers

Provide enclosed circuit breakers.

D5020. LIGHTING AND BRANCH WIRING

Provide electrical connections for all systems requiring electrical service.

Provide lighting and general purpose receptacles throughout all spaces as required.

D502001. Branch Wiring

All branch wiring shall be insulated conductors in conduit.

D502002. Lighting Equipment

Provide a complete lighting system consisting of exit and emergency lighting and area lighting consisting of fluorescent, incandescent and/or high intensity discharge lighting including switches and, possibly, automatic controls including occupancy sensors, automatic lighting shutoff systems and/or dimming systems.

D502003. Finish Trim

Provide escutcheons or other finish trim where conduits penetrate visible, finish wall surfaces.

D502004. Potential Drop

The potential drop depends on the cable resistance and on the current through it, as stated by the Ohm law: $V=R*I$.

The conductor resistance depends on the material resistivity (ρ - for the copper it's 1.72×10^{-8}), on its section (S) and on its length (L), as per the formula $R = L/S*\rho$.

A potential drop bigger than 4% is NOT acceptable, and a good reference is to keep it under 2%.

D5040. OTHER ELECTRICAL SERVICES

D504001. General Construction Items (Electrical)

Provide General Construction Items (Electrical) including, but not necessarily limited to, all connections, fittings, boxes and associated equipment needed by this and other sections of these TR as required for a complete and usable system.

D504002. Emergency Lighting and Power

Provide power and wiring for emergency lights and exit lights throughout the facility.

D504003. Grounding Systems

Provide a complete grounding system for the facility electrical and telecommunications systems.

D504004. Lightning Protection

Provide a complete lightning protection system including, but not necessarily limited to, strike termination devices, conductors, ground terminals, interconnecting conductors, surge suppression devices, and other connectors and fittings required for a complete and usable system.

Work shall include necessary modifications to the existing lightning protection system such that the entire system meets the local requirements.

Lightning Protection Systems shall not void the roof warranty.

D504005. Electric Heating

Provide power wiring and connections as required for all electric heating systems and equipment.

7.9 SECTION G10 SITE PREPARATION

System Description

The site preparation system consists of site clearing, and earthwork necessary to ready the site for other work associated with the project.

Develop the project site and perform all off-site work necessary to meet the requirements of the project, local codes, reference standards, technical specifications and performance criteria.

A topographic survey of the existing site has not been performed. Prior to starting work, the Contractor is to obtain all topographic survey data required to provide a quality final design.

The Contractor shall be responsible for performing pre-construction and periodic site visits throughout construction to assess site conditions. The Contractor shall submit the updated plan informing the Contracting Officer of the status of the plan and an accounting of Contractor adherence to the plan; specifically addressing any present or potential problems.

Minimize the impact of construction activity on operations and neighboring facilities.

Identify and obtain all permits to comply with all national, regional, and local regulatory requirements associated with this work. Contractor shall determine correct permit fees and pay said fees. Copies of all permits, and permit applications shall be forwarded to the Contracting Officer.

G1010. SITE CLEARING

All plant material removed from the project site shall be disposed of off-site.

Burning will not be allowed.

G1020 TITLE TO REMOVED MATERIALS

Demolition work includes the demolition, removal and legal disposal of existing construction debris as required to accommodate the new construction.

Whenever possible, all features demolished or removed shall be salvaged or recycled in lieu of being disposed of as waste in a landfill.

G1030 DISPOSAL

All waste materials shall become the property of the Contractor and shall be transported, disposed of and/or recycled off site.

Removed materials and equipment cannot be viewed by prospective purchasers or sold on the site.

7.10 SECTION G20 SITE IMPROVEMENTS

System Description

The site improvements system consists of landscaping and other exterior site development work related to this project.

Provide site improvements as required to make a useable facility that meets functional and operational requirements and blends into the existing environment.

Identify and obtain all permits to comply with all federal, and local regulatory requirements associated with this work.

Minimize the impact of construction activity on operations and neighboring facilities.

Locate new site improvements at locations indicated on the sketches provided with these TR. If specific locations are not provided, site the improvements to develop appropriate and positive relationships with other facilities and to conform to existing development patterns.

Refer to Site Analysis and Building Requirements Sections for additional site improvement functional program information.

G2040. SITE DEVELOPMENT

G204001. Freestanding Walls & Gates

Provide boundary/security walls as indicated on the drawings in another part of these TR.

Provide boundary/security walls constructed of plaster faced unit masonry to match construction and finish and color of exterior walls of building.

Provide ornamental gates of wrought iron along with associated hardware.

7.11 SECTION G30 SITE CIVIL/MECHANICAL UTILITIES

The site civil/mechanical utility systems include water supply systems, sanitary sewer systems, storm drainage systems, heating distribution systems, cooling distribution systems, fuel distribution systems and associated appurtenances which are more than 5 feet (1.5 meters) outside the building.

Develop the site to provide water, fire protection, sanitary sewer, storm drainage, heating, cooling and fuel distribution services that meet the requirements of each applicable regulatory agency that governs and issues permits for the construction and operation of these systems.

Provide each system complete and ready for operation.

Physically verify the location of existing above and below ground utilities prior to starting work.

G301003. Water Storage

Water storage facility shall have a minimum capacity of 5 cubic meters. Provide automatic level control to fill and prevent overflow of the tank.

Obtain end user approval for the shape of tank, the color and pattern of exterior coating.

~~~ End of Part 7 ~~~

## **8 PERFORMANCE TECHNICAL SPECIFICATIONS (PTS)**

### **8.1. NARRATIVE**

All Technical Requirements (TR) sections must be used in conjunction with all parts of the Design Build (D/B) Request for Proposal/Quote (RFP/RFQ) to determine the full requirements of this solicitation. The PTS (Part 8) provides general requirements for the other Parts of these TR and is used in conjunction with the other parts of this document.

### **8.2. SECTION A10: FOUNDATIONS [6/07]**

#### **A10 GENERAL**

##### *1.1 Design Guidance*

1.1.1 Provide the design and installation in accordance with the Part 6. of this document.

1.1.2 In the absence of design guidance from the authority having jurisdiction, the Design A&E shall design according the following:

1.1.2.1 Load combinations in accordance with the approved authority having jurisdiction shall be used in design. Load combinations should include all loads to which the building will be subjected to. In the absence of a governing building code the following load combinations shall be used:

1.1.2.1.1 Strength Design:

1.4(D+F)

1.2(D+F+T)+1.6(L+H)+0.5(Lr or S or R)

1.2D+1.6(Lr or S or R)+(L or 0.8W)

1.2D+1.6W+L+0.5(Lr or S or R)

1.2D+1.0E+L+0.2S

0.9D+1.6W+1.6H

0.9D+1.0E+1.6H

1.1.2.1.2 Allowable Stress Design:

(D+F)

D+H+F+L+T

D+H+F+(Lr or S or R)

D+H+F+0.75(L+T)+0.75(Lr or S or R)

D+H+F+(W or 0.7E)

D+H+F+0.75(W or 0.7E)+0.75L+0.75(Lr or S or R)

0.6D+W+H

0.6D+0.7E+H

1.1.2.1.3 Where:

D = Dead Load

E = Earthquake Load

F = Load to fluids with well defined pressures and maximum heights

H = Load to lateral earth pressure, ground water pressure, or pressure over bulk materials

L = Live Load

Lr = Roof live load

R = Rain Load

S = Snow Load

T = Self straining force

W = Wind load

#### 1.1.2.1.4 Dead Loads

Dead loads consist of the weight of all materials of construction incorporated into the building including, but not limited to, walls, floors, roofs, ceilings, stairways, built-in partitions, finishes, cladding, and other similarly incorporated architectural and structural items, and fixed service equipment including the weight of cranes.

In determining dead loads for purposes of design, the actual weights of materials and constructions shall be used provided that in the absence of definite information, values approved by the authority having jurisdiction shall be used.

In determining dead loads for purposes of design, the weight of fixed service equipment, such as plumbing stacks and risers, electrical feeders, and heating, ventilating, and air conditioning systems shall be included.

#### 1.1.2.1.5 Live Loads

Live loads for occupancies shall be in accordance with the authority having jurisdiction. Live loads shall not be less than the following:

Occupancy: Classroom

Uniform Live load: 1.92 kN/m<sup>2</sup>

Concentrated Live Load: 4.45 kN

Occupancy: Corridor

Uniform Live load: 4.79 kN/m<sup>2</sup>

Concentrated Live Load: 4.45 kN

Occupancy: Office Space

Uniform Live load: 2.4 kN/m<sup>2</sup>

Concentrated Live Load: 8.9 kN

Occupancy: Roof

Uniform Live load: 0.96 kN/m<sup>2</sup>

#### 1.1.2.1.6 Importance Factors

Importance Factors for design shall be in accordance with the approved authority having jurisdiction.

#### 1.1.2.1.7 Wind Exposure

Wind design and corresponding exposure category shall be in accordance with the approved authority having jurisdiction.

#### 1.1.2.1.8 Earthquake Loads

Earthquake Loads shall be generated in accordance with locally approved authority having jurisdiction.

### 1.2 Construction Guidance

1.2.1 The Contractor shall provide all plant, labor, material, and equipment necessary to provide, deliver and place exterior walls to form exterior enclosure as specified herein.

### 1.3 General Requirements

1.3.1 Earthwork shall be performed in accordance with means and methods in compliance with the laws and building codes of the authority having jurisdiction.

#### 1.3.2 Geotechnical Report

1.3.2.1 The Contractor-provided geotechnical engineer, shall be experienced with soil conditions in the region where the project site is located. The geotechnical engineer shall evaluate the TR data, obtain and evaluate all additional data as required to support the design and construction, and prepare a Geotechnical Report.

#### 1.3.2.2 Subsurface Soils Information

1.3.2.2.1 The data included in these TR are intended for proposal preparation and preliminary design only. Contractor shall perform, at his expense, such subsurface exploration, investigation, testing, and analysis as his Designer of Record deems necessary for the design and construction of the foundation system.

1.3.2.2.2 Prior to the Foundation Work Design submittal include a Contractor Geotechnical Report (electronically submitted) for review and record keeping purposes. The report shall become the property of the Government. Geotechnical reports generated during construction, such as pile driving results and analysis, shall be provided to the Contracting Officer (electronically submitted) for record keeping purposes.

#### 1.3.2.3 Contractor-Provided Geotechnical Report

1.3.2.3.1 Submit a Geotechnical report, electronically submitted, based upon Government-provided subsurface investigation data and all additional field and laboratory testing accomplished at the discretion of the Contractor's Geotechnical Engineer. The Geotechnical Report shall include the following:

The project site description, vicinity map and site map.

Results of all the field and laboratory testing, Contractor-provided.

Engineering analysis, discussion and recommendations addressing:

Settlement

Bearing Capacity

Foundation selection and construction considerations (shallow, deep, special); dimensions, and installation procedures.

Site preparation (earthwork procedures and equipment), compaction requirements, building slab preparation (as applicable), soil sensitivity to weather and equipment, and groundwater influence on construction

Sheeting and shoring considerations, as applicable

Pavement design parameters, actual or assumed, including recommended thicknesses and materials, be for design or for proposed modifications to the TR provided pavement design only

Haul routes and stockpile locations for earthwork, as applicable

Calculations to support conclusions and recommendations

Recommendations shall be presented on a structure-by-structure basis

1.3.2.3.2 The Geotechnical Report shall be signed by a Geotechnical Engineer registered with the jurisdiction having authority.

1.3.2.3.3 The submitted report shall be accomplished by a cover letter identifying any recommendations of the report proposed to be adopted into the design which are interpreted by the Contractor as either conflicting with or being modifications to the Geotechnical or Pavement related requirements of the TR.

1.3.2.4 Geotechnical Site Data required in Design Drawings

1.3.2.4.1 The Contractor's final design drawings shall include the Government-provided subsurface data presented in the TR as noted below, as well as any additional borings and laboratory test result data performed by the Contractor.

Logs of Borings and related summary of laboratory test results and groundwater observations.

The locations of all borings shall be indicated on the drawings. The applicable design drawings shall be revised to reference the Contractor's Geotechnical Report as being a basis for design.

## **A1010 STANDARD FOUNDATIONS**

1.1 Provide sheeting and shoring as required. Sheeting and shoring plans shall be signed by the Contractor's geotechnical/structural engineer.

### **1.2 Termite Control Barrier System**

1.2.1 Formulate and apply termiticide in accordance with the manufacturer's label directions. The termiticide label shall bear evidence of registration by the appropriate requirements of the host country.

1.2.2 Apply termiticide to the soil that will be covered by or lie immediately adjacent to the building(s) and structure(s), providing a protective barrier against subterranean termites.

1.2.3 Applicator(s) shall be licensed or certified the host country, as applicable.

1.2.4 To maintain resistance to termites, complete the system and do not disturb, penetrate or damage during the remaining contract time period. Provide Manufacturer's Guidance for performing a visual assessment of the installed system to ensure the system provides the designed termite physical barrier.

### **A101001 Wall Foundations**

1.1 Provide concrete foundation walls as required in accordance with the requirements of this section and other portions of these TR.

1.2 Concrete footings for walls must have a minimum thickness of 12 inches (305mm) and a minimum width of 18 inches (460mm).

### **A101002 Column Foundations And Pile Caps**

1.1 Provide concrete column foundations or pile caps and grade beams as required in accordance with the requirements of this section and other portions of these TR.

1.2 Concrete column footings must have a minimum thickness of 12 inches (305mm) and a minimum width of 18 inches (460mm).

### **A101003 Foundation Drainage**

1.1 If required, perimeter drainage system shall be provided to remove water away from the foundation of the facility and to be deposited in the storm sewerage system of the site. Pipe for the foundation drainage system shall be of the type specified, shall be perforated, and shall be of a size

sufficient to remove water from the foundation successfully. Provide one, or a combination of more than one, of the following types of pipe:

- Corrugated Polyethelene (PE) Drainage Pipe
- Acrylonitrile-Butadiene-Styrene (ABS) Pipe
- Polyvinyl Chloride (PVC) Pipe

Installation shall include wrapping the pipe with filter fabric sock and careful bedding of the pipe with appropriate fill material to ensure that the pipe does not become filled with the bedding material.

### **A1020 SLAB ON GRADE**

1.1 Provide standard concrete slab on grade to meet the required loading requirement in accordance with the requirements of this section and other portions of these TR.

1.2 Floor slab on grade shall be designed and constructed so that any settlement of the floor slab shall not result in harmful distortion of the floor, or vertical misalignment of the floor with other building components (doorways, trenches, etc.).

#### **A102001 Concrete Slabs On Grade**

1.1 Concrete floor slabs on ground must be reinforced and shall have a thickness of not less than 100mm. Vapor retarders shall not be less than 0.25mm thick. Minimum reinforcing shall be #10 reinforcing bars at 405mm on center or 152x152xMW18.7xMW18.7 welded wire reinforcing (do not use roll type). The slab reinforcing shall be placed on firm supports approximately 1/3 the slab depth from the top of slab with a minimum cover of 38mm. Fiber reinforcing in the concrete mix shall not be considered as replacing the steel reinforcing.

1.2 For concrete floor slabs on ground, the maximum length of any continuous placement shall be 30.5m between construction or expansion joints. Within any placement, the maximum spacing between control joints shall be 7.6m in each direction. Slab reinforcing shall not continue through construction and control joints.

#### **A102002 Slab On Grade Insulation**

1.1 Provide only thermal insulating materials recommended by manufacturer for perimeter insulation. Provide either cellular glass or extruded preformed cellular polystyrene block thermal insulations.

1.2 The thickness of insulation and thermal resistance value shall be sufficient to meet the applicable building codes in accordance with the local jurisdiction having authority.

### **A1030 ELEVATED FLOOR SLABS**

1.1 Concrete for floor construction must have a 28 day compressive strength of 24MPa in accordance with compressive strength cylinder tests as approved by authority having local jurisdiction. Maximum concrete slump shall be 100mm unless a high water reducing admixture has been used; in which case the maximum concrete slump can be increased to 200mm.

1.2 The following maximum water-cement ratios must apply to all structural concrete:

| Compressive Strength | Without AE | With AE |
|----------------------|------------|---------|
| 20.7MPa              | 0.58       | 0.50    |
| 24.1MPa              | 0.54       | 0.48    |
| 27.6MPa              | 0.50       | 0.45    |

Where, AE = Air Entrainment

1.3 Proportions of materials for concrete shall be established to provide:

- 1.3.1 Workability and consistency to permit concrete to be worked readily into forms and around reinforcement under conditions of placement to be employed, without segregation or excessive bleeding.
- 1.3.2 Resistance to any special exposure conditions.
- 1.3.3 Conformance with the specified compressive strength requirements.

### **A1040 CONCRETE**

1.1 The work shall be performed as described herein. The work consists of providing shallow wall foundations, building slabs and veranda slabs and all other building components designed by the Contractor to be reinforced concrete.

1.2 Provide a difference in height between 15cm (6 in) and 17.5cm (7 in) from adjacent grade and the veranda slab.

- 1.4 The construction documents for structural concrete construction shall include:
- The specified compressive strength of concrete at the stated ages or stages of construction for which each concrete element is designed.
  - The specified strength or grade of reinforcement.
  - The size and location of structural elements, reinforcement, and anchors.
  - Anchorage length of reinforcement and location and length of lap splices.

#### A104001 Concrete Materials

- 1.1 Cement shall be Portland cement and acceptable with locally approved authority having jurisdiction.
- 1.2 Locally available aggregates shall be provided in accordance with locally approved authority having jurisdiction. Aggregates provided shall produce concrete of adequate strength and durability in accordance with requirements of these TR and locally approved authority having jurisdiction. Nominal maximum size of aggregate shall not be larger than:
- 1/5 the narrowest dimension between sides of forms, nor
  - 1/3 the depth of the slab, nor
  - 3/4 the minimum clear spacing between individual reinforcing bars or wires, bundles of bars, individual tendons, bundled tendons, or ducts.
- 1.3 Water used in mixing concrete shall be clean and free from injurious amounts of oils, acids, alkalis, salts, organic materials or other substances that are deleterious to concrete or steel reinforcement
- 1.4 Sand used in mixing concrete shall be clean and free of chlorides or other substances that would cause reduced durability of the finished concrete and/or deterioration of the steel reinforcement. Beach sand used in a concrete mix shall be thoroughly washed and free of salts and chlorides.
- 1.5 Steel reinforcement shall be deformed reinforcement, except plain reinforcement is permitted for spirals or prestressing steel. Reinforcing shall have a minimum yield strength of 413 MPa (413,685 kN/m<sup>2</sup>). The yield strength shall be taken as the stress corresponding to a strain of 0.35%.
- 1.6 Admixtures shall be in compliance with locally approved authority having jurisdiction.

#### A104002 Concrete Formwork

- 1.1 Forms shall result in a final structure that conforms to the shapes, lines, and dimensions of the members as required by the design drawings and specifications.
- 1.2 Forms shall be substantially tight to prevent leakage of material.
- 1.3 Forms shall be properly braced or tied together to maintain position and shape.
- 1.4 Design of formwork shall consider: rate and method of placing concrete; construction loads – including vertical, horizontal, and impact loads.
- 1.5 Forms shall be removed in such a manner as not to impair safety and serviceability of the structure. Concrete exposed by form removal shall have sufficient strength not to be damaged by removal operation.

#### A104002 Concrete Reinforcement

- 1.1 Reinforcing bars with standard hooks shall meet the following dimensional requirements:
- 1.1.1 180 degree bend plus 4xbar diameter extension, but not less than 2.5 inches (65mm)
  - 1.1.2 90 degree bend plus 12xbar diameter extension at free end of bar.
  - 1.1.3 For stirrups and tie hooks:
    - 1.1.3.1 #16 bars and smaller, 90 degree bend plus 6xbar diameter extension at free end of bar
    - 1.1.3.2 #19, #22, and #25 bars, 90 degree bend plus 12xbar diameter extension at free end of bar
    - 1.1.3.3 #25 bar and smaller, 135 degree bend plus 6xbar diameter extension at free end of bar
- 1.2 Diameter of bend measured on the inside of the bar, other than for stirrups and ties in sizes #10 through #16 shall not be less than the values shown in the table below.
- 1.3 Inside diameter of bend for stirrups and ties shall not be less than 4xbar diameters for #16 bar and smaller. For bars larger than #16, diameter of bend shall be in accordance with table below.

| Bar size        | Minimum Diameter  |
|-----------------|-------------------|
| #10 through #25 | 6 x bar diameters |
| #29, #32, #36   | 8 x bar diameters |

#43 and #57

10 x bar diameters

- 1.4 All reinforcement shall be bent cold.
- 1.5 Reinforcement partially embedded in concrete shall not be field bent.

#### A104003 Placing Concrete Reinforcement

- 1.1 Reinforcement shall be accurately placed and adequately supported before concrete is placed and shall be secured against displacement.
- 1.2 The minimum clear distance between parallel bars in a layer shall be equal to the diameter of the bar, but not less than 1 inch (25mm).
- 1.3 Where parallel reinforcement is placed in two or more layers, bars in the upper layers shall be placed directly above bars in the bottom layer with clear distance between layers not less than 1 inch (25mm).
- 1.4 In spirally reinforced or tied reinforced compression members, clear distance between longitudinal bars shall not be less than 1.5 x bar diameter nor less than 1.5 inches (38mm).
- 1.5 Clear distance limitation between bars shall apply also to the clear distance between a contact lap splice and adjacent splices or bars.
- 1.6 In walls or slabs other than concrete joist construction, primary flexural reinforcement shall not be spaced farther than three times the wall or slab thickness, or farther apart than 18 inches (455mm).
- 1.7 At the time concrete is placed, reinforcement shall be free from mud, oil, or other nonmetallic coatings that decrease bond.
- 1.8 The following minimum concrete cover shall be provided for reinforcement:
  - a. Concrete cast against and permanently exposed to earth  
3" 75mm
  - b. Concrete exposed to earth or weather:
    - #19 bar through #57 bars 2" 50mm
    - #16 bars and smaller 1.5" 38mm
  - c. Concrete not exposed to weather or in contact with ground:
    - Slabs, walls, and joists:
      - #43 and #57 bars 1.5" 38mm
      - #36 bars and smaller .75" 19mm
    - d. Beams, columns:
      - Primary reinforcement, ties, stirrups, spirals 1.5" 38mm
    - e. Shells, folded plate members:
      - #19 bar and larger 0.75" 19mm
      - #16 bar and smaller 0.5" 13mm

#### A104004 Concrete Mixing

- 1.1 All concrete shall be mixed until there is a uniform distribution of materials and shall be discharged completely before mixer is recharged.
- 1.1 Job mixed concrete shall be mixed in a batch mixer approved by the locally approved authority having jurisdiction. The mixer shall be rotated at a speed as recommended by the manufacturer. The mixing shall be continued for at least 1-1/2 minutes after all materials are in the drum. A detailed record shall be kept to identify the number of batches produced, proportions of materials used, approximate location of final deposit in structure and the time and date of mixing and placing.

#### A104005 Concrete Conveying

- 1.1 Concrete shall be conveyed from mixer to place of final deposit by methods that will prevent separation or loss of materials. Conveying equipment shall be capable of providing a supply of concrete at site of placement without separation of ingredients and without interruptions sufficient to permit loss of plasticity between successive increments.

#### A104006 Concrete Depositing

- 1.1 Concrete shall be deposited as nearly as practical in its final position to avoid segregation due to rehandling or flowing. Placing of concrete shall be performed at such a rate that concrete is at all times plastic and flows readily into spaces between reinforcement. Concrete that has partially hardened or been contaminated by foreign materials shall not be deposited in the structure.

Retempered concrete that has been remixed after initial set shall not be used. Placing of concrete shall be continuous until placing of panel or section, as defined by its boundaries or predetermined joints is completed. Top surfaces of vertically formed lifts shall be generally level. All concrete shall be thoroughly consolidated by suitable means during placement and shall be thoroughly worked around reinforcement and embedded fixtures and into corners of forms.

#### A104007 Concrete Curing

1.1 Curing of concrete shall be performed in accordance with the locally approved authority having jurisdiction. At a minimum concrete shall be maintained above 50°F (10°C) and in a moist condition for at least the first 7 days after placement.

#### A104008 Hot Weather Concrete

1.1 Concrete placement operations in hot weather conditions shall be performed in accordance with the locally approved authority having jurisdiction. During hot weather, proper attention shall be given to ingredients, production methods, handling, placing, protection, and curing to prevent excessive concrete temperatures or water evaporation that could impair required strength or serviceability of the member or structure.

#### A104009 Concrete Construction Joints

1.1 Location of construction joints shall be as approved by the Engineer responsible for the design and the locally approved authority having jurisdiction.

#### A104010 Concrete Testing

1.1 Concrete shall be tested by field technicians qualified in accordance with the locally approved authority having jurisdiction. Tests shall be performed on fresh concrete at the job site; prepare specimens required for curing under field conditions; prepare specimens required for testing in the laboratory, and record the temperature of the fresh concrete when preparing specimens for strength tests. Technicians qualified in accordance with the locally approved authority having jurisdiction shall perform laboratory tests.

1.2 Sampling shall be performed at the rate required by the jurisdiction having authority. If not specified, samples for strength tests of each class of concrete placed each day shall be taken not less than once a day, nor less than once for each 115 m<sup>3</sup> of concrete, nor less than once for each 460 m<sup>2</sup> of surface area for slabs or walls.

1.3 On a given project, if total volume of concrete is such that frequency of testing required would be less than five strength tests for a given class of concrete, tests shall be made from at least five randomly selected batches or from each batch if fewer than five batches are used.

### **8.3. SECTION B10: SUPERSTRUCTURE [06/07]**

#### **B10 GENERAL**

##### *1.1. Design Submittal*

1.1.1 Provide the design and installation in accordance with "General Work Requirements".

##### *1.2. Construction Submittals*

1.2.1 The Contractor shall provide all plant, labor, material, and equipment necessary to provide, deliver and place exterior walls to form exterior enclosure as specified herein.

#### **B1010 CONSTRUCTION COMPONENTS**

1.1 Structural frame elements may include columns, girders, beams, trusses, joists, moment frames, shear walls, and/or bracing. See Section B20, *Exterior Enclosure*, for additional requirements for exterior walls used as load-bearing walls or shear walls.

1.2 Provide structural interior walls as required in accordance with the requirements of this section and other portions of these TR. See Section C10, *Interior Construction*, for additional requirements.

1.3 Provide floor decks as required in accordance with the requirements of this section and other portions of these TR.

1.4 Provide roof deck as required in accordance with the requirements of this section and other portions of these TR.

1.5 Provide canopies as required in accordance with the requirements of this section and other portions of these TR.

## **B1020 Wood**

- 1.1 The design and construction of structural elements or systems constructed partially or wholly of wood or wood based products shall be performed in accordance with the locally approved authority having jurisdiction.
- 1.2 The moisture content of lumber must not exceed 19 percent for dimensional lumber or 25 percent for timbers at the time of delivery to the site. For other lumber products the moisture content must be in accordance with the standard under which the product is produced.
- 1.3 The minimum thickness of wood structural panels used for horizontal or vertical diaphragms must be 1/2 inch (12.7mm).
- 1.4 All wood framed walls must be anchored to foundations with galvanized anchors as needed to resist the design forces. Anchors for exterior walls, interior load bearing walls and shear walls must not be less than 12.7 diameter embedded anchor bolts, expansion bolts, or adhesive anchor system with 4 inch (100mm) embedment spaced a maximum of 120cm on center. Anchors for interior non-bearing, non-shearwall partitions must not be less than 10mm diameter embedded anchor bolts, expansion anchors, or adhesive anchor systems with 4 inch (100mm) embedment spaced a maximum of 48 inches(120cm) on center, or with 1/8 inch(3.7mm) diameter powder actuated fasteners spaced at 6 inches(610mm) on center.
- 1.5 Trusses and glued laminated members shall be designed and constructed using machine graded or machine evaluated lumber.
- 1.6 Plant fabricated metal plate connected wood trusses must be produced and certified in accordance with the locally approved authority having jurisdiction.

## **B1030 UNIT MASONRY**

### *1.1 General*

- 1.1.1 The design and construction of structural elements or systems constructed partially or wholly of masonry products shall be performed in accordance with the locally approved authority having jurisdiction.
- 1.1.2 The work shall be performed as described herein. The work consists of providing masonry structural and non-bearing walls as required to enclose the programmed spaces and as required by the construction documents.
- 1.1.3 The contractor shall provide all plant, labor, and equipment necessary to provide, deliver and place plastered masonry walls ready for painting.
- 1.1.4 Empirical Design Of Masonry Shall Be Prohibited.

### *1.2 Unit Masonry Materials*

- 1.2.1 Masonry units shall be cements block, fired clay block or fired brick.
- 1.2.2 All concrete masonry shall have a specified compressive strength of not less than 1500 psi (10.3 Mpa).
- 1.2.3 All clay masonry must have a specified compressive strength of not less than 1000 psi (6.9 Mpa).
- 1.2.4 Masonry units used on exterior walls shall be nominal 8 inches (20cm) thick.
- 1.2.5 Masonry units used on interior walls unsupported for more than 9 foot (3m) shall be 6 inches (15cm) thick.
- 1.2.6 Masonry units used on all other interior walls shall be 8 inches (20cm) thick.
- 1.2.7 Mortar shall consist of a mixture of cement materials, sand and water. Mixture shall be formed by Portland cement, hydrated lime or lime putty and wet loose aggregates. All components shall be properly batched in volume.
- 1.2.8 Fluid concrete for reinforced masonry and grade beams shall be coarse grained type and shall consist of a gravel mixture with the following proportions: one part Portland cement, 1/4 part slanted lime, 3 parts sand and 3 parts fine gravel passing 1/2 inch (12 mm) sieve. It shall reach a 28 day minimum compressive strength of 2500 psi (17.2 MPa).
- 1.2.9 All reinforcing bars, unless noted on the plans, shall be deformed bars. Reinforcing bars 1 inch (25 mm) in diameter and smaller shall be high strength helically deformed bars, with minimum yield strength of 60 ksi (413 MPa).

### 1.3 Unit Masonry Placement

1.3.1 Blocks dimensions will be as required obtain thickness and types of indicated walls and will be subjected to specified tolerances in accordance with locally approved authority having jurisdiction.

1.3.2 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 1/2 inch (1 cm) to the ends of the adjoining units. The mortar shall be of such thickness that it will be forced out of the joints as the units are placed in position.

1.3.3 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. Do not dampen concrete masonry units before or during laying.

1.3.4 All walls shall be constructed using running bond construction.

1.3.5 Masonry unit foundation walls below grade shall be filled solid with grout.

1.3.6 Provide vertical control joints in masonry walls in accordance with locally approved authority having jurisdiction. The location of vertical control joints in masonry shall be clearly shown on construction documents.

1.3.7 Horizontal joint reinforcing may be used in conjunction with reinforcing bars to meet minimum prescriptive reinforcing requirements in lightly loaded walls. Joint reinforcing must not be considered to resist computed stresses.

1.3.8 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 inches by 3 inches (5 by 7.5 cm). Position reinforcing accurately as indicated. As masonry work progresses, secure vertical reinforcing in place at vertical intervals not to exceed 160 bar diameters. Use puddling rod or vibrator to consolidate the grout. Minimum clear distance between masonry and vertical reinforcement shall be not less than 1/2 inch (12 mm). Unless indicated or specified otherwise, form splices by lapping bars not less than 40 bar diameters and wire tying them together.

1.3.9 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 to meet all seismic restraint requirements.

1.3.10 Securely anchor non-load-bearing partitions and interior walls to the construction above as indicated and in a manner that provides lateral stability while permitting unrestricted deflection of construction above. Completely embed anchors in mortar joints.

### 1.4 Unit Masonry Finishing

1.4.1 Coat all exposed masonry surfaces with standard plaster finish smooth and prepared for painting. Plaster to consist of a rough coat of 1:3 cement-coarse sand mortar, body coat of 1:4 cement-sand plaster and a finish coat of cement.

### 1.5 Storage And Handling

1.5.1 Handle masonry units to avoid chipping and breaking. Deliver cement and lime in unbroken bags, barrels, or other sealed containers. Protect masonry units from contact with the soil and from rain. Keep cement dry. Store and handle cement to prevent inclusion of foreign materials. Store aggregates in a manner to avoid contamination or segregation.

### 1.6 Bracing And Scaffolding

1.6.1 Provide all bracing and scaffolding necessary for masonry work. Design bracing to resist wind pressure as required by local code.

### 1.7 Inspection

1.7.1 Inspection for structural masonry shall be performed in accordance with locally approved authority having jurisdiction.

### 1.8 Field Quality Control

1.8.1 Verify that all materials used for the work conform to the requirements of this specification. Verification shall include:

- Certification of load bearing masonry units.
- Certification of reinforcing steel bars, trusses, and horizontal joint reinforcing.

- Certification of pre-mixed mortar
- Witnessing and approval of grout slump tests.
- Ensure that all masonry surfaces and joints are level and plumb.
- Ensure that no exposed masonry is broken or cracked.
- Ensure that all masonry is clean and free from efflorescence.

## **B1050 STEEL**

### *1.1 General*

1.1.1 The design and construction of structural elements or systems constructed partially or wholly of steel products shall be performed in accordance with the locally approved authority having jurisdiction.

1.1.2 The work shall be performed as described herein. The work consists of providing steel structural elements as required to complete the superstructure as required by the construction documents.

1.1.3 The contractor shall provide all plant, labor, and equipment necessary to provide, deliver and place the superstructure ready for painting.

### *1.2 Structural Steel Materials*

1.2.1 Structural steel columns and beams shall have a minimum yield strength of 50 ksi (345 MPa).

1.2.2 Miscellaneous steel shapes and members shall have a minimum yield strength of 36 ksi (248 MPa).

1.2.3 Hollow structural tubes and pipes shall have a minimum yield strength of 42 ksi (290 MPa).

1.2.4 All structural steel exposed to the weather must adequately be protected to prevent corrosion. Structural steel to be galvanized shall be galvanized after fabrication where possible. Repair damage to galvanized coatings with zinc rich paint for galvanizing damaged by handling, transporting, cutting, welding, or bolting.

1.2.5 Steel form decks must be a minimum 0.016 inch (.4mm) thick.

1.2.6 Roof and composite decks must be a minimum 0.035 inch (0.9mm) thick.

1.2.7 Minimum thickness of cold formed steel framing members to be welded shall be 0.06 inch (1.5mm) thick.

### *1.3 Steel Assembly*

1.3.1 Structural steel shall be fabricated in accordance with locally approved authority having jurisdiction with the modifications and additional requirements specified herein, and as indicated on the approved shop drawings. Structural material shall be fabricated and assembled in the shop to the greatest extent possible. Shearing, flame cutting, and chipping shall be done carefully and accurately. Assembled pieces shall be taken apart, if necessary, for the removal of burrs and shavings produced by the reaming operation. Parts shall be secured by bolts, insofar as practicable, to prevent damage in shipment and handling.

1.3.2 The Contractor shall submit complete structural design calculations for the new structure, verified and signed by an engineer registered on the appropriate rolls of the locally approved authority having jurisdiction. The proposed design shall be in accordance with the locally approved authority having jurisdiction, and applicable seismic technical norms. Structural steel frames shall be accurately assembled to the lines and elevations indicated. The various members forming parts of a completed frame or structure after being assembled shall be aligned and adjusted accurately before being fastened. Fastening of splices of compression members shall be done after the abutting surfaces have been brought completely into contact. Bearing surfaces and surfaces that will be in permanent contact shall be cleaned before the members are assembled.

1.3.3 Any single panel point of the lower chord of exposed roof joists or trusses or any point along the length of exposed primary structural members supporting roofs over manufacturing, storage, and warehousing, or maintenance shops must be capable of safely supporting a suspended concentrated load of 2 klf (8.9 kN) in addition to dead loads. For all other occupancies, a concentrated load of 200 lbf (0.89 kN) must be used instead of 2 klf (8.9 kN).

1.3.4 Splices will be permitted only as indicated by the Engineer of Record. All erection bolts used in welded construction may be tightened securely and left in place; if erection bolts are removed, the holes shall be filled with plug welds. Bracing, adequacy of temporary

connections, alignment, and the removal of paint on surfaces adjacent to field welds shall be in accordance with the locally approved authority having jurisdiction. Field connections, high-strength bolted construction-assembly, and welded construction shall be as hereinbefore specified. Welding for redrilling will not be permitted. Holes shall not be enlarged more than 1/8 inch (2 mm) greater than the specified hole size without approval of the Engineer of Record.

#### 1.4 Connections

1.4.1 Provide anchor bolts, chemical fasteners or other connections, between the structural steel and concrete. Anchor bolts and anchors shall be correctly located and built into connecting work. Bolts and anchors shall be preset by the use of templates or other methods as may be required to locate the anchor bolts and other connections accurately. Chemical fasteners shall be installed in accordance with manufacturer's instructions reported in the technical catalogue.

1.4.2 All connections shall be designed using a minimum safety factor of 2.0 with no increase in allowable working stresses. Shop connections shall be welded unless otherwise indicated. Field connections shall be bolted, except where welded connections are indicated. Bolts shall be driven accurately into the holes without damaging the thread. Bolt heads shall be protected from damage during driving. Bolt heads and nuts shall rest squarely against the metal. Submit complete structural design calculations for all connections, verified and signed by an engineer registered in the country and locality where the project is located. The procedures for the welding method employed, the appearance and quality of welds made, the qualification of welders, and the methods used in correcting welding work shall be in accordance with the locally approved authority having jurisdiction.

1.4.3 All cold formed steel framed walls must be anchored to foundations with galvanized anchors as needed to resist design forces.

1.4.4 Anchors for framed exterior walls, framed interior load bearing walls, and framed shear walls shall not be less than 1/2 inch (12.7 mm) diameter embedded anchor bolts, expansion bolts, or adhesive anchor system with 4 inch (100mm) embedment spaced a maximum 48 inches (120 cm) on center.

1.4.5 Anchors for framed interior non-bearing, non shear wall partitions shall not be less than 1/2 inch (12mm) diameter embedded anchor bolts, expansion anchors, or adhesive anchor systems with 4 inch (100mm) diameter powder actuated fasteners spaced at 610mm on center.

1.4.6 Cold formed steel members must be connected with screw fasteners or by welding. The use of pneumatic nailing is not permitted.

#### 1.5 Painting

1.5.1 Shop prime paint all steelwork, except surfaces of steel to be encased in concrete, surfaces to be welded, or contact surfaces to be bolt connected.

1.5.2 After inspection and approval, and before leaving the shop, all steelwork specified to be painted shall be cleaned before application of the shop coat of paint.

1.5.3 Heavy rust shall be removed. Oil, grease and similar contaminants shall be removed. Steel surfaces, unless otherwise specified hereinafter, shall be given one shop coat of rust-inhibiting primer.

1.5.4 Paint shall be applied thoroughly and evenly to dry, clean surfaces by brushing, dipping, or other approved method to provide a continuous minimum thickness of 0.0016 inch (0.040 mm) for the prime coat.

1.5.5 All bare metal, structural steel members, steel plates, welded connections and other metal components assembled or fabricated in the field, whether or not exposed to view, shall receive one coat of rust inhibiting primer coat and two enamel coats, as indicated by the Designer of Record.

1.5.6 Steel members affected by welding operation shall be brushed clean to bare metal and provided with field coating as specified above.

Surfaces to receive sprayed-on fireproofing shall be cleaned and prepared in accordance with the fireproofing manufacturer's recommendations.

## 8.4. SECTION B20: EXTERIOR ENCLOSURE [04/07]

### B20 GENERAL

#### 1.1. Design Submittal

Provide the design and installation in accordance with “General Work Requirements”.

#### 1.2. Construction Submittals

The Contractor shall provide all plant, labor, material, and equipment necessary to provide, deliver and place exterior walls to form exterior enclosure as specified herein.

### B2010 EXTERIOR WALLS

1.1 Exterior wall construction shall consist of a non-structural plaster exterior skin with a unit masonry back-up wall and a non-structural plaster interior skin to provide a protective finish on the inside face of exterior walls.

1.2 Exterior wall construction shall be used for exterior enclosure, balcony walls and on-site screen walls.

#### B201001 Unit Masonry

1.1 Masonry units shall be cements block, fired clay block or fired brick.

1.2 Masonry units used on exterior walls shall be 8 inch (20 cm) thick.

1.3 The Contractor shall provide #4 (13 mm) steel reinforcement bars within the masonry walls at 39 inch (1 m) intervals horizontally and vertically.

1.4 Coat all exposed masonry surfaces with standard plaster finish smooth and prepared for painting. Plaster to consist of a rough coat of 1:3 cement-coarse sand mortar, body coat of 1:4 cement-sand plaster and a finish coat of cement.

#### B201002 Guardrails and Handrails

1.1 Design guardrails to resist uniform loads of 50 #/lf (7 kg/m) or a point load of 200# (91kg). Design anchorage connections to resist total load acting on the connection.

1.2 Top rail, intermediate rail and post material to be 1.5 inch (4 cm) diameter. Provide series 300 stainless steel pipe collars.

1.3 Design guardrail system so that there is no opening large enough for a 4 inch (10 cm) sphere to pass through.

1.4 Steel guardrails shall be hot-dip galvanized, shop primed shop painted for exterior applications. Factory coat all metal railings, except ornamental metals such as brass, bronze, stainless steel and nickel-silver, with a high performance coating with a minimum coating thickness of 1.2 mils (.03 mm).

1.5 Wood guardrails shall be of pre-finished natural hardwood in oak, walnut, or ash. Wood shall be coated with hard acrylic finish to withstand indentations.

#### B201003 Exterior Painting and Special Coatings

1.1 Painting practices shall comply with sound application and handling practices, and shall conform to the latest revision/edition of applicable codes, ordinances and regulations of the Republic of Ghana governing life/safety, fire protection and construction, in effect during this contract, except where specifically stated herein. Any material installed that does not meet the requirements of this Performance Technical Specification (PTS) and/or applicable codes, ordinances and regulations will be removed and reinstalled at Contractor's expense.

1.2 Remove dirt, splinters, loose particles, grease, oil, and other foreign matter and substances deleterious to coating performance as specified for each substrate before application of paint or surface treatments. Oil and grease shall be removed prior to mechanical cleaning. Cleaning shall be programmed so that dust and other contaminants will not fall on wet, newly painted surfaces. Exposed ferrous metals such as nail heads on or in contact with surfaces to be painted with water-thinned paints, shall be spot-primed with a suitable corrosion-inhibitive primer capable of preventing flash rusting and compatible with the coating specified for the adjacent areas.

1.3 The surfaces of wood doors, windows, frames and trim shall receive three coats of pigmented alkyd enamel paint. Apply one coat to all surfaces of wood prior to installation and two coats to exposed surfaces after installation. Prior to applying second coat spot touch-up first coat where wood is left uncoated due to cutting, drilling or other damage as a result of installation work.

## **B2020 EXTERIOR WINDOWS**

- 1.1 Standard windows shall be in compliance with local Building Codes.
- 1.2 Windows shall be provided with sills on the exterior and stools on the interior of the opening. Sills shall be special shape or cut unit masonry or precast concrete. Positively slope sills away from windows. Window stools shall be slate or solid polymer.
- 1.3 Exterior windows shall consist of operable sash used singly and in multiples. Include operating hardware, non-corroding framed metal screens and security grilles. Provide jamb support for larger windows where recommended by manufacturer.

### **B202001 Standard Window Systems**

- 1.1 Steel Windows shall be solid hot-rolled steel shape welded frames and mullions. Provide chemically cleaned and primed galvanized frames ready for field applied final paint finish. Provide glazing beads and tapes, steel framed screens with aluminum mesh, hardware, locks, and clear glazing.
- 1.2 Aluminum Windows shall be manufacturer's standard extruded shapes, welded frames and mullions. Exposed aluminum surfaces shall be factory finished with an architectural anodized coating or a high-performance organic coating. Coating shall have a total dry film thickness of 1.2 mils (.03 mm). Provide glazing beads and tapes, aluminum framed screens with aluminum or vinyl mesh, hardware, locks, and clear glazing.
- 1.3 Plastic Windows shall be integral colored or co-extruded color PVC, welded and reinforced corners with reinforcing members. Provide glazing beads and tapes, aluminum framed screens with aluminum or vinyl mesh, hardware, locks, welded sill, anchors, and clear glazing.
- 1.4 Wood Windows shall consist of standard milled shapes. All surfaces (exposed and concealed) shall be factory primed with a standard wood primer coating. Exposed surfaces shall be field finished with a high-performance organic coating. Wood Windows shall consist of complete units including frame, sash, glazing beads and tapes, glass, aluminum framed screens with aluminum or vinyl mesh, hardware, locks, and clear glazing.
- 1.5 Glazing to be minimum 1/8 inch (3 mm) clear, tempered glass. Provide thicker glazing if required by the manufacturer for the given application.

### **B202002 Louvered Windows**

- 1.1 Provide louvers for window or vent openings as shown. Provide aluminum framed screens with aluminum or vinyl mesh, hardware, and anchors.

### **B202003 Screens**

- 1.1 Screens for windows shall be standard aluminum or reinforced vinyl mesh insect screen fabric with aluminum screen frames.

### **B202004 Roll Shutters**

- 1.1 Roll shutters shall be factory finished, aluminum slats with continuous over-head housing, frame and tracks. Roll shutter shall be capable of being locked in a closed position by a non-key device.

## **B2030 EXTERIOR DOORS**

- 1.1 Exterior doors shall be standard duty hollow steel doors and frames. Door frames shall have welded corners. Knockdown door frames are not permitted.
- 1.2 See Section B203004, EXTERIOR DOOR HARDWARE, for door hardware requirements.
- 1.3 Doors shall be hung true and plumb.
- 1.4 Factory apply commercial quality primer to six sides of wood doors.
- 1.5 Factory apply commercial quality galvanized (zinc) finish to six sides of metal doors.

### **B203001 Standard Doors Systems**

- 1.1 Hollow metal (steel) doors shall be manufacturer's standard duty hollow metal door, prepared for installation of hardware. Field paint metal door per paragraph B201003 "Exterior Painting and Special Coatings" over factory applied primer over galvanized finish.
- 1.2 Wood stile and rail doors shall be manufacturer's heavy duty quality, constructed with solid, premium or custom grade lumber. Solid exterior wood doors are only allowed where facility design, overhangs and porches eliminate direct rain/moisture contact from wind driven rain. Wood doors shall be factory primed with a wood sealer coating six sides. Manufacturer's primer and field

painting shall be compatible with finish system in the paragraph B201003 "Exterior Painting and Special Coatings".

1.3 Flush wood doors shall be manufacturer's heavy duty quality, constructed with solid, premium or custom grade lumber. Solid exterior wood doors are only allowed where facility design, overhangs and porches eliminate direct rain/moisture contact from wind driven rain. Wood doors shall be factory primed with a wood sealer coating six sides. Manufacturer's primer and field painting shall be compatible with finish system in the paragraph B201003 "Exterior Painting and Special Coatings".

#### B203002 Door Frames

1.1 Form standard steel frames with welded corners for installation in exterior walls. Form stops and beads of 20 gage steel.

1.2 Anchor all metal frames with a minimum of three jamb anchors and base steel anchors per frame jamb, zinc-coated or painted with rust-inhibitive paint, not lighter than 18 gage. Mortar infill frames.

1.3 Anchor all wood frames with a minimum of three sets of 3 inch (8 cm) finish nails with frame shims at each anchor point.

1.4 Form standard wood frames from similar species to wood doors for installation in exterior walls. Form stops as one piece with jamb rails.

#### B203003 Exterior Door Hardware

1.1 Size hinges to match door size, but in no case less than 4 1/2 x 4 1/2 inches (11 cm x 11 cm), with anti-friction bearing hinges. Use two hinges for doors 60 inches (1.5 m) or less in height and one additional hinge for each additional 30 inches (.75 m), or fraction thereof, in door height.

1.2 Locks and latches shall be commercial grade.

1.3 Furnish three keys for each lock set.

1.4 Lock trim shall be commercial grade cast, forged or heavy wrought construction.

1.5 Knobs and roses shall be commercial grade.

1.6 Provide top and bottom rain drips for all exterior doors that open to the outside, where the door swing area is not covered by an overhang.

1.7 Provide door louvers as required for ventilation. Louvers shall be of the manufacturer's standard design and shall transmit a minimum of 35 percent free air. Louver shall be stationary, sight-proof type, and have insect screens.

#### B203004 Exterior Door Hardware Finishes

1.1 Provide door hardware with one of the following finish systems to match the interior door hardware:

1.1.1 Satin stainless steel finish,

1.1.2 Satin chromium plated finish over brass or bronze, except hinges which shall be satin stainless steel.

1.1.3 Hardware for aluminum doors shall be finished to match the doors.

1.1.4 Satin bronze finish, except hinges which shall be satin bronze plated finish.

#### B203005 Other Exterior Specialty Doors

1.1 Provide other exterior specialty doors where required. Provide special function exterior doors and gates and assemblies required for the proper operation and functioning of the facility. Exterior doors system may include factory-finished or painted doors and frames.

## 8.5. SECTION B30: ROOFING [04/07]

### B30 GENERAL

#### 1.1. Design Submittal

Provide the design and installation in accordance with "General Work Requirements".

#### 1.2. Construction Submittals

The Contractor shall provide all plant, labor, material, and equipment necessary to provide, deliver and place a complete leak-free roof system as specified herein.

### **B3010 STEEP SLOPE ROOF SYSTEMS**

- 1.1 Roof systems with a slope greater than 2:12 are to be considered a steep slope roof system.
- 1.2 Slope conversions from low slope to steep slope roofing systems must specifically address temporary waterproofing protection where new framing connections penetrate the existing low slope system.

#### **B301001 Slate Roofing**

- 1.1 Provide a complete roof system consisting of slate roofing, support purlins and fasteners as recommended and required by the roofing manufacturer. Roofing design shall meet deflection requirements per building code.
- 1.2 Slate materials shall be uniformly colored natural stone. Slate shall be uniformly thick and have chipped edges. Field punching of slate shall be from the back of the slate.
- 1.3 Roofing felt underlayment membrane shall be un-perforated asphalt-saturated felts, No. 30 or heavier. For graduated slate roofs, two layers of felts shall be applied with joints and laps staggered. When roof slopes are less than 4:12, a double layer of felt shall be applied in mastic or hot asphalt shall be applied. At the roofing perimeter, eaves, rakes, sidewalls, head walls, valleys and all penetrations a 3 foot (900 mm) minimum band of double layer felt shall be applied in mastic.
- 1.4 Fastening nails shall be stainless steel or copper ring shank nails. Nails shall be long enough to penetrate the roof sheathing with heads of sufficient diameter to prevent pullover of slate. Slate shall hang on the shaft of the fastener, and drawn to, but not tight against the slate surface. Exposed nails on the top courses shall be sealed. In high wind areas, provide mechanical fastening plus mastic attachment. Provide screws, wire ties, hook nails, tile locks and storm clips of brass, copper or stainless steel as recommended by the manufacturer for the project.
- 1.5 Flashings for slate roofing shall be 16 oz. (454 g) copper or 24 gage stainless steel, and 16 oz. (454 g) lead-coated copper, and shall be protected to prevent the potential for galvanic action by having contact with dissimilar metals.

#### **B301002 Roof Tiles**

- 1.1 Provide a complete roof system consisting of tile roofing, support purlins and fasteners as recommended and required by the roofing manufacturer. Roofing design shall meet deflection requirements per building code.
- 1.2 Clay tile shall be machine-formed natural clay tiles, kiln-fired to vitrification and free from surface imperfections. Provide specially shaped units as required to provide watertight installation and closure. Form fastening holes prior to firing.
- 1.3 Concrete tile shall be molded or extruded, interlocking concrete roofing tile units, and specially shaped as required to provide a watertight installation and closure. Provide with cast-in anchor lugs, transverse weather checks and fastening holes.
- 1.4 Sheet metal flashing and trim shall be fabricated of 20 oz. Copper, lead-coated copper or stainless steel.
- 1.5 Mortar set tile.

#### **B301003 Metal Roof Panels**

- 1.1 Provide a complete roof system consisting of metal roof panels, support purlins, closure strips and fasteners as recommended and required by the roofing manufacturer. Roofing design shall meet deflection requirements per building code.
- 1.2 Metal roofing panels shall be aluminum-zinc coated steel or aluminum corrugated panels formed at the manufacturing plant. Panel thickness shall be 22 gauge. The minimum gauge for aluminum panels shall be 20-gauge or greater. Roofing design shall meet deflection requirements per building code.
- 1.3 Treat exposed cut edges with coating compatible with the factory applied aluminum-zinc coating for corrosion protection.
- 1.4 Roofing system shall be designed to obtain a wind uplift resistance appropriate for wind conditions experienced at the construction site.
- 1.5 Provide other sheet metal flashings, trim moldings, closure strips, caps and other preformed metal panel accessories, of the same material, thickness and finish as roofing panels. Provide molded closure strips of closed-cell or solid-cell synthetic rubber, neoprene, or polyvinyl chloride pre-molded to match configurations of preformed metal panels.

1.6 Provide concealed fasteners for attaching panels to structural supports and to adjoining panels as approved and in accordance with printed manufacturer's recommendations.

#### B301004 Concrete Roof Panels

1.1 Provide a complete roof system consisting of corrugated fiber-reinforced concrete panels, support purlins and fasteners as recommended and required by the roofing manufacturer. Roofing design shall meet deflection requirements per building code.

1.2 Provide support strips under roofing panels at bearing/fastening points. Support strips shall have one surface shaped to match corrugations of roofing panels.

1.3 Roofing system shall be designed to obtain a wind uplift resistance appropriate for wind conditions experienced at the construction site.

1.4 Place roofing panels with a 4 inch (10 cm) side lap and a 6 inch (15 cm) end lap. Lap to create a shingling effect between panels to direct water downward toward eave edges.

1.5 Provide corrosion resistant fasteners that will securely attach roofing panels to sub-surface framing without chemically reacting with or physically damaging the roofing panels or framing members.

1.6 Place fasteners in top of corrugation ridges away from water path.

1.7 Place fasteners so that the primary connection to the structure is along the top edge of the panel which will be covered by the next lapped roofing panel.

1.8 Place fasteners at intermediate support to allow panels to resist strong winds. Minimize fasteners in exposed areas of roof panels to reduce leak points.

#### **B3020 LOW SLOPE ROOF SYSTEMS**

1.1 Roof systems with a slope of 2:12 or less are to be considered a low slope roof system.

1.2 Slope conversions from low slope to steep slope roofing systems must specifically address temporary waterproofing protection where new framing connections penetrate the existing low slope system.

1.3 Roofing system shall be designed to obtain a wind uplift resistance appropriate for wind conditions experienced at the construction site.

#### B302001 Built-Up Asphalt Roofing (Aggregate Surfaced)

1.1 Provide a complete built-up roof system consisting of glass felt, asphalt bitumen, and aggregate surfaced or modified bitumen cap sheet, support, flashings and fasteners as recommended and required by the roofing manufacturer. Roofing design shall meet deflection requirements per building code.

1.2 Standard roofing asphalt

1.3 Felt Base Sheet shall be un-perforated asphalt-saturated felts, No. 30 or heavier.

1.4 Ply Felt shall be un-perforated asphalt-saturated felts, No. 30 or heavier.

1.5 Ventilating Base Sheet shall be un-perforated asphalt-saturated felts, No. 30 or heavier.

1.6 Flashing Felt shall be SBS Modified Base Sheet, with combined polyester and glass fiber reinforcing, and a thickness of 130 mils.

1.7 SBS Bitumen Cap Sheet with combined polyester and glass fiber reinforcing, and a thickness of 130 mils.

1.8 Utilize primer as required by roofing manufacturer.

1.9 Asphalt Roof Cement as required by roofing manufacturer.

1.10 Aggregate as recommended by roofing manufacturer.

1.11 Provide metal fasteners of copper, aluminum or stainless steel, compatible with materials to be penetrated. Fasteners shall be of sufficient length to achieve appropriate embedment or penetration into the substrate below.

1.12 Metal flat discs or caps of zinc-coated steel not less than 28 gage and not less than 35 mm (1 3/8 inches) in diameter.

1.13 Traffic Pads shall be preformed reprocessed rubber, compatible with the roof membrane, 1/4 inch (6.35 mm) minimum thickness, to protect roof from foot traffic.

### **B3030 FLASHINGS & TRIM**

#### **B303001 Flashing And Sheet Metal**

1.1 This paragraph covers the requirements for flashing and sheet metal work including scuppers, and splash pans. Flashing and sheet metal shall be provided in accordance with roof manufacturer's printed installation instructions.

##### **1.2 Materials**

Furnish sheet metal items in 2.44 to 3.05 meter (8 to 10 foot) lengths. Sheet metal items include the following: gutters, including hangers; downspouts; counter-flashings; gravel stops and fascias; cap, valley, stepped, base and eave flashings and related accessories. Materials to include:

1.2.1 Copper, Sheet and Strip - cold-rolled temper.

1.2.2 Lead-Coated Copper Sheet

1.2.3 Lead Sheet - Minimum weight 4 pounds per square foot (.19 kPa).

1.2.4 Steel Sheet, Zinc-Coated (Galvanized) - Galvanized steel items shall have a baked-on, factory applied finish of polyvinylidene fluoride or an equivalent fluorocarbon coating with a minimum thickness of 0.8 to 1.3 mils.

1.2.5 Stainless Steel - Type 302 or 304, 2D finish, fully annealed, dead-soft temper.

1.2.6 Aluminum Alloy Sheet and Plate

1.2.7 Aluminum alloy, Extruded Bars, Rods, Shapes, and Tubes

1.2.8 Solder – Standard Lead-Zinc Solder

1.2.9 Asphalt Primer

1.2.10 Fasteners - Fasteners shall be of the same or compatible metal with the item being fastened. Stainless steel fasteners shall be used to fasten dissimilar materials.

#### **B301002 Gutters and Downspouts**

1.1 Provide gutters and downspouts compatible with roofing material and finish. Concealed (interior) gutters and downspouts are prohibited. The primary and secondary drainage systems shall be sized per applicable Plumbing and Building Codes. Gutters and downspouts shall be zinc-coated, galvanized steel.

#### **B301003 Roof Openings and Supports**

1.1 Provide flashings for roof openings and supports specified below:

1.2 When existing pitch pans cannot be avoided and must be utilized, insure pitch pan is a preformed pan with minimum 4-inch (100 mm) height and 2-inch (50 mm) flange with 2-inch (50 mm) clearance on all sides of the penetration. Fill bottom 1/3 with non-shrink grout. Fill remainder with pourable elastomeric sealer sloped to drain. For round penetrations, provide a metal umbrella cap clamped to the penetration.

1.3 Assure all penetration flashings extend minimum 8 inches (200 mm) above the finished roof surface.

#### **B301004 Other Roofing**

##### **1.1 Roof Drains (Existing)**

1.1.1 Where existing roof drains are to be reused in roof replacement construction, the contractor shall provide new, compatible flashing materials, a new drain clamping ring and new bolts for anchorage. Reuse of existing clamping ring and bolts is unacceptable.

## **8.6. SECTION C10: INTERIOR CONSTRUCTION [06/07]**

### **C10 GENERAL**

#### **1.1. Design Submittal**

1.1.1 Provide the design and installation in accordance with "General Work Requirements".

#### **1.2. Construction Submittals**

1.2.1 The Contractor shall provide all plant, labor, material, and equipment necessary to provide, deliver and place exterior walls to form interior construction as specified herein.

### **C1010 PARTITIONS**

1.1 Partition wall construction shall consist of a unit masonry back-up wall with non-structural plaster skin on each face of the wall to provide a protective finish.

1.2 Partition wall construction shall be used for full and partial height interior walls.

**C101001 Unit Masonry**

1.1 Masonry units shall be cements block made of lightweight or normal weight aggregate, fired clay block or fired brick.

1.2 Masonry units used on interior walls shall be 4 inch (10 cm) thick.

1.3 Coat all exposed masonry surfaces with standard plaster finish smooth and prepared for painting. Plaster to consist of a rough coat of 1:3 cement-plaster coarse sand mortar, body coat of 1:4 cement-sand plaster and a finish coat of cement.

1.4 Provide #4 (1/2 inch) (13 mm) reinforcing bars in masonry walls at the following minimums:

1.4.1 In structural walls: 24 inches (60 cm) vertical and 48 inches (120 cm).

1.4.2 In non-structural walls at 48 inches (120 cm) vertical and 80 inches (200 cm)

1.4.3 The contractor shall provide additional seismic reinforcement as required for the project.

**C101002 Handrails**

1.1 Design guardrails to resist uniform loads of 50 #/lf (7 kg/m) or a point load of 200# (91kg). Design anchorage connections to resist total load acting on the connection.

1.2 Toprail, intermediate rail and post material to be 1.5 inch (4 cm) diameter. Provide series 300 stainless steel pipe collars.

1.3 Design guardrail system so that there is no opening large enough for a 4 inch (10 cm) sphere to pass through.

1.4 Steel guardrails shall be hot-dip galvanized, shop primed shop painted for exterior applications. Factory coat all metal railings, except ornamental metals such as brass, bronze, stainless steel and nickel-silver, with a high performance coating with a minimum coating thickness of 1.2 mils (.03 mm).

1.5 Wood guardrails shall be of pre-finished natural hardwood in oak, walnut, or ash. Wood shall be coated with hard acrylic finish to withstand indentations.

**C101003 Interior Painting And Special Coatings**

1.1 Provide and apply interior painting and special coatings in accordance with Section C3040.

**C1030 INTERIOR DOORS**

1.1 Interior doors shall be standard duty hollow steel doors and frames. Door frames shall have welded corners. Knockdown door frames are not permitted.

1.2 See Section C103004, for door hardware requirements.

1.3 Doors shall be hung true and plumb.

1.4 Factory apply commercial quality wood primer to six sides of wood doors that are to receive a painted finish.

1.5 Factory apply commercial quality wood sealer to six sides of wood doors that are to receive a clear finish.

1.6 Factory apply commercial quality galvanized (zinc) finish to six sides of metal doors.

1.7 Maximum door undercut shall not exceed 3/4 inch (19 mm).

**C103001 Standard Doors Systems**

1.1 Hollow metal (steel) doors shall be manufacturer's standard duty hollow metal door, prepared for installation of hardware. Field paint metal door per paragraph C101003 "Interior Painting and Special Coatings" over factory applied primer over galvanized finish.

1.2 Wood stile and rail doors shall be manufacturer's heavy duty quality, constructed with solid, premium or custom grade lumber. Solid exterior wood doors are only allowed where facility design, overhangs and porches eliminate direct rain/moisture contact from wind driven rain. Wood doors shall be factory primed with a wood sealer coating six sides. Manufacturer's primer and field painting shall be compatible with finish system in the paragraph C101003 "Interior Painting and Special Coatings".

1.3 Flush wood doors shall be manufacturer's heavy duty quality, constructed with solid, premium or custom grade lumber. Solid exterior wood doors are only allowed where facility design, overhangs and porches eliminate direct rain/moisture contact from wind driven rain. Wood doors shall be factory primed with a wood sealer coating six sides. Manufacturer's primer and field

painting shall be compatible with finish system in the paragraph C101003 "Interior Painting and Special Coatings".

#### C103002 Door Frames

- 1.1 Form standard steel frames with welded corners for installation in interior masonry walls. Form stops and beads of 20 gage steel.
- 1.2 Anchor all metal frames with a minimum of three jamb anchors and base steel anchors per frame jamb, zinc-coated or painted with rust-inhibitive paint, not lighter than 18 gage. Mortar infill frames.
- 1.3 Form standard wood frames from similar species to wood doors for installation in interior masonry walls. Form stops as one piece with jamb rails.
- 1.4 Anchor all wood frames with a minimum of three sets of 3 inch (8 cm) finish nails with frame shims at each anchor point.

#### C103003 Interior Door Hardware

- 1.1 Size hinges to match door size, but in no case less than 4 1/2 x 4 1/2 inches (11 cm x 11 cm), with anti-friction bearing hinges. Use two hinges for doors 60 inches (1.5 m) or less in height and one additional hinge for each additional 30 inches (.75 m), or fraction thereof, in door height.
- 1.2 Locks and latches shall be commercial grade.
- 1.3 Furnish three keys for each lock set.
- 1.4 Lock trim shall be commercial grade cast, forged or heavy wrought construction.
- 1.5 Knobs and roses shall be commercial grade.
- 1.6 Provide top and bottom rain drips for all exterior doors that open to the outside, where the door swing area is not covered by an overhang.
- 1.7 Provide door louvers as required for ventilation. Louvers shall be of the manufacturer's standard design and shall transmit a minimum of 35 percent free air. Louver shall be stationary, sight-proof type. Metal louver frames shall be 20-gage steel with louver blades minimum 24 gage.
- 1.8 Provide mop plates on all doors in rooms that have a mop-able floor finish.

#### C103004 Interior Door Hardware Finishes

- 1.1 Provide door hardware with one of the following finish systems to match the exterior door hardware:
  - 1.1.1 Satin stainless steel finish.
  - 1.1.2 Satin chromium plated finish over brass or bronze, except hinges which shall be satin stainless steel.
  - 1.1.3 Hardware for aluminum doors shall be finished to match the doors.
  - 1.1.4 Satin bronze finish, except hinges which shall be satin bronze plated finish.

#### C103005 Other Interior Specialty Doors

- 1.1 Provide other interior specialty doors where required. Provide special function interior doors and gates and assemblies required for the proper operation and functioning of the facility. Interior doors system may include factory-finished or painted doors and frames.

### **C1040 SPECIALTIES**

#### C104004 Counters

- 1.1 Laminate covered counter top shall be fabricated with lumber and a core of exterior grade plywood or particleboard, glued and screwed to form an integral unit. Bond laminated plastic under pressure to exposed surfaces using manufacturer's recommended glue.
- 1.2 Acrylic solid surfacing counter top material shall consist of 100% pure acrylic polymer, mineral fillers, and pigments. The material shall be homogenous, not coated or laminated. Superficial damage to a depth of 0.010 inch (.254mm) shall be repairable by sanding or polishing. Install with factory recommended fasteners/adhesives/sealant.

#### C103005 Cabinets

- 1.1 This paragraph includes wood cabinetry items that are permanently fixed in-place. Included are all cabinetry and millwork items with their associated accessories and anchoring devices.
  - 1.2 Wall and base cabinets shall be of the same construction and appearance, with solid ends and frame fronts, or with frames all around. Frames shall be not less than 3/4 inch by 1 1/2 inches (19 mm by 38 mm) hardwood. All ends, bottoms, backs, and partitions shall be

hardwood plywood. Cabinet doors and drawer fronts shall be either medium density particleboard or medium density fiberboard cores with like materials both faces. Construction of cabinets shall be by mortise and tenon, dovetail, or dowel and glue joints. Edges of exposed plywood shall be covered with hardwood strips.

1.3 Wall and base cabinets shall be constructed to meet "Custom" quality grade.

1.4 Provide cabinet hardware including two self-closing hinges for each door and two side-mounted metal drawer slides for each drawer and pulls for all doors and drawers as follows

1.5 Provide concealed Euro-Style, back mounted hinges with opening to 165 degrees and a self-closing feature at less than 90 degrees.

1.6 Drawer slides shall be self closing and have a static rating capacity of 100 lbs. (444N).

1.7 Provide pin type, Euro-Style, shelf support hardware for wall cabinets.

#### C104006 Casework

1.1 This paragraph includes all built-in pre-manufactured metal casework items that are permanently fixed in-place for specialized functions such as labs, libraries, medical and dental facilities. Included are all casework items with their associated accessories and anchoring devices.

1.2 Provide as required for functions indicated. Casework shall be fabricated from minimum 20-gage steel of the manufacturer's standard design and construction.

1.3 Wall and base cabinets shall be of the same construction and appearance, with solid ends and frame fronts.

1.4 Provide cabinet hardware including two self-closing hinges for each door and two side-mounted metal drawer slides for each drawer and pulls for all doors and drawers as follows

1.5 Provide concealed Euro-Style hinges with opening to 165 degrees and a self-closing feature at less than 90 degrees.

1.6 Drawer slides shall be self closing and have a static rating capacity of 100 lbs. (444N).

1.7 Provide pin type, Euro-Style, shelf support hardware for wall cabinets.

## 8.7. SECTION C30: INTERIOR FINISHES [04/07]

### C30 GENERAL

#### 1.1. Design Submittal

1.1.1 Provide the design and installation in accordance with "General Work Requirements".

#### 1.2. Construction Submittals

1.2.1 The Contractor shall provide all plant, labor, material, and equipment necessary to provide, deliver and place interior finishes to form exterior enclosure as specified herein.

### C3010 WALL FINISHES

1.1 Interior wall finishes shall be moisture and mildew resistant, easily maintained, and suitable in accordance with industry standards for the architectural surface being finished. For painted wall finishes, refer to C3040 "INTERIOR PAINTING AND SPECIAL COATINGS".

#### C301001 Plaster Wall Finishes

1.1 Veneer plaster shall be cement plaster veneer finish on concrete or masonry. Refer to Section C3040 for paint system.

1.2 Portland cement plaster base coat, gray portland cement.

1.3 Portland cement plaster finish coat, gray portland cement. Factory-mixed finish coat according to the manufacturer's instructions.

#### C301002 Tile Wall Finishes

1.1 Provide ceramic tile wall systems as required in moist and clean locations such as toilets, kitchens, laboratories, etc. Install tile systems in accordance with manufacturer's instructions. Coordinate with ceramic accessories for modularity. Include all trim pieces, caps, stops, and returns to complete installation.

1.2 Ceramic Mosaic Wall Tile shall be a minimum of 1/4 inch (6mm) thick and installed from floor to ceiling, unless otherwise noted.

1.3 Wall tile shall be glazed, matte glazed or unglazed finish. Install from floor to ceiling, unless otherwise noted.

- 1.4 Porcelain wall tile shall be through color, polished or unpolished. Refer to project program for tile type, pattern, and surface texture. Install from floor to ceiling, unless otherwise noted.
- 1.5 Tile shall be placed in a thin set mortar bed. Grout tile joints once tiles are placed and grout bed has dried.
- 1.6 Provide samples of manufacturer's full range of colors and styles to facility COR for selection. Tile shall be a minimum of one grade above manufacturer's base grade.
- 1.7 Provide Designer accent tile, accent strips and accessory ceramic tile shapes as an integral part of the ceramic wall tile system.
- 1.8 Provide colored grout shall be factory sanded Portland cement, Latex-portland cement, or Epoxy. Provide tile joint grout sealer on white, light colored areas that are routinely exposed to water and liquid cleaning materials, entrance areas, and areas that require a high degree of stain resistance, and as required by the manufacturer. Provide chemical resistant epoxy resin for kitchens and other areas where high resistance to staining and absorption are required.
- 1.9 Mortar shall be Portland cement, Latex-portland cement, or Epoxy.

### **C3020 FLOOR FINISHES**

- 1.1 Refer to C3040 "Interior Painting And Special Finishes" for painted floor coatings.
- 1.2 Provide tile floor systems as required in moist and clean locations such as toilets, kitchens, laboratories, etc. Install tile systems in accordance with manufacturer's instructions. Coordinate with ceramic accessories for modularity. Include all trim pieces, caps, stops, and returns to complete installation.
- 1.3 Provide samples of tile manufacturer's full range of colors and styles to facility COR for selection. Tile shall be a minimum of one grade above manufacturer's base grade.
- 1.4 Colored grout for tile floor system shall be factory sanded Portland cement, Latex-Portland cement, or Epoxy. Provide tile joint grout sealer on white, light colored areas that are routinely exposed to water and liquid cleaning materials, entrance areas, and areas that require a high degree of stain resistance, and as required by the manufacturer. Provide chemical resistant epoxy resin for kitchens and other areas where high resistance to staining and absorption are required.
- 1.5 Mortar for tile floor system shall be Portland cement, Latex-Portland cement, or Epoxy.
- 1.6 Floor tile is to be matt finished, non-slip, fired clay mosaic tile flooring.
- 1.7 Tile shall be placed in a mortar bed. Grout tile joints once tiles are placed and grout bed has dried.
- 1.8 Slope tile floors to drains or to exterior room doors.

#### **C302001 Ceramic Tile Floor Systems**

- 1.1 Ceramic Mosaic Wall Tile shall be a minimum of 1/4 inch (6mm) thick and installed from floor to ceiling, unless otherwise noted.
- 1.2 Floor tile shall be glazed, matte glazed or unglazed finish.
- 1.3 Porcelain wall tile shall be through color, polished or unpolished. Refer to project program for tile type, pattern, and surface texture. Install from floor to ceiling, unless otherwise noted.
- 1.4 Provide Designer accent tile, accent strips and accessory ceramic tile shapes as an integral part of the ceramic wall tile system.

#### **C302002 Ceramic Glazed Tile Floor**

- 1.1 Ceramic glazed floor tiles shall be a minimum of 5/16 inch (8mm) thick with a minimum of 1/8 inch (3mm) grout width with cushioned edge. Tile shall have a 0.5 to 3.0 percent water absorption rate. Do not use in areas where there is excessive water or grease and oils such as kitchens, dining facilities, toilets, showers, shower drying rooms, building entrance areas, and in industrial and maintenance facilities.

#### **C302003 Ceramic Mosaic Unglazed Floor Tiles**

- 1.1 Ceramic Mosaic unglazed floor tiles shall be a minimum of 1/4 inch (6mm) thick with a maximum of 1/16 inch (1.6mm) grout width with cushioned edge. Tile shall have less than a 0.5 percent water absorption rate. Use in toilets, showers and shower drying rooms and locker rooms.

#### **C302004 Porcelain Floor Tile**

- 1.1 Porcelain floor tiles shall be a minimum of 5/16 inch (8mm) thick with a maximum of 1/4 inch (6mm) grout width with cushioned edge. Tile shall have a minimum breaking strength of 300 pounds

(136kg) and a maximum absorption rate of 0.5%. Use in lobbies, corridors, toilets, kitchens, dining facilities, and other areas with minimal maintenance requirements, high resistance to staining, absorption and high durability requirements. Tile shall be color through, impervious, unglazed or glazed finish with an unpolished, semi-polished, polished, or textured surface.

#### C302005 Quarry Floor Tile

1.1 Quarry floor tiles shall be a minimum of 1/2 inch (12.7mm) thick tiles with a maximum of 1/4 inch (6mm) grout width. Tile shall have a minimum breaking strength of 350 pounds (158kg) and a maximum absorption rate of 3%. Use in lobbies, corridors, kitchens, dining facilities, and other areas with high durability requirements. Use grout release for darker pigmented grout colors. Tile shall have a maximum of 3.0 percent water absorption rate. Non-slip, abrasive grain or textured surface required for tile in areas where there is excessive water or grease and oils. Tile shall consist of semi-vitreous, vitreous or clay material with smooth or textured surface and unglazed finish.

#### C302006 Terrazzo Floor Finishes

1.1 Provide terrazzo, bonded to concrete, consisting of a terrazzo topping over an underbed. Use in all general areas requiring terrazzo. Where structural movement is anticipated which may injure the terrazzo, use the sand cushion (floating) method.

1.2 Resinous terrazzo flooring shall be an epoxy terrazzo system.

#### C302007 Masonry And Stone Flooring

1.1 Unit masonry flooring system and coordinating base shall be fired red clay brick, or chemical resistant brick unit masonry flooring.

1.2 Natural Stone Flooring and coordinating base shall be of marble, granite, or travertine.

1.3 Aggregate Stone Tile and coordinating base shall be a composite of marble or granite.

1.4 Install stone floor and base in accordance standard practices and with the recommendations of the supplier applicable to the type of stone being installed.

#### C302008 Wall Base Finishes

1.1 Wall base for transition between floor and wall shall coordinate with the adjacent flooring for color, material match and modularity.

1.2 Stone and marble wall base shall coordinate with the adjacent flooring for color, material match and modularity and shall be 4 inch (89 mm) and 3/4 inch (19 mm) thick.

1.3 Tile base shall coordinate with the adjacent ceramic wall and floor tile for color, material match and modularity. Include all pre-manufactured trim pieces, special shapes, caps, stops, and returns to provide a complete installation.

#### C302008 Stair Finishes

1.1 Finishes for stair treads shall coordinate with the adjacent wall and floor finishes for color, material match and modularity. (Refer to C302001 through C302007.) Provide treads with textured, slip resistant, surfaces or raised patterns and visually impaired nosing inserts as required.

#### C302009 Hardeners And Sealers

1.1 Harden and seal concrete floors in accordance with the finished floor manufacture requirements. Utilize other methods of concrete curing if the floor finish manufacturer does not recommend a chemical hardener or sealer. Concrete floors that can utilize a hardener-sealer and will be exposed to traffic shall receive a minimum of two coats of hardener-sealer curing agent for dust protection. These hardener-sealer-cured floors shall be finished with a curing agent that shall penetrate the concrete to permanently seal the floor against moisture and the penetration of contaminants. The curing agent shall be non-toxic, non-flammable, and non-combustible and shall be installed in accordance with the manufacturer's printed instructions. The finished floor shall be dust-free.

1.2 Colored concrete floors shall include a colored pigment either applied as a topical dye; or a concrete topping with integral color pigment; or a dry shake pigment application, as required by the project program. Concrete floor shall be trowel applied in a pattern, or shall include grit for slip resistance.

### **C3030 CEILING FINISHES**

1.1 Refer to C3040 "Interior Painting And Special Coatings" for painted ceiling finishes.

### C303001 Acoustical Ceiling Tiles And Panels

1.1 All acoustical ceiling panels shall be 24 inch by 48 inch (610 mm by 1220 mm), with a minimum light reflectance of .75 (except as noted), flame spread resistant and smoke development resistant. All acoustical ceiling panels shall have minimum 60% recycled content. Provide square edge except as noted.

1.1.1 For typical open office areas, conference rooms, classrooms, provide non-asbestos mineral composition acoustical ceiling panels with factory-applied standard washable painted finish or with factory-applied plastic membrane-faced vinyl. Provide square edge in all locations to receive acoustical panels.

1.1.2 For typical humid areas such as toilets, and kitchens, provide non-asbestos mineral or glass composition acoustical ceiling panels bonded with ceramic, moisture resistant thermo-setting resin, or other moisture resistant material with factory-applied standard washable painted finish; and recycled content: minimum of 40%.

1.1.3 For areas with very high humidity, heavy soiling, or staining, impact abrasion, such as laundry rooms, or maintenance shops, provide steel or aluminum faces with white baked on enamel finish, and non-asbestos mineral composition absorbent backing.

1.2 Provide standard exposed suspended acoustical ceiling grid. Grid shall be 24 inch by 48 inch (610mm by 1220mm) aluminum or steel non-corroding intermediate-duty standard grid system for lay-in acoustical panels. Finish shall be factory applied white baked enamel. Hang grid system as recommended by manufacturer but with no less than 0.106 inch (2.7mm) diameter wires, or with one by 3/16 inch (4.76mm) galvanized steel straps. Use composition 302 or 304, condition annealed stainless steel, 0.106 inches (2.7mm) in diameter over high humidity areas such as toilets, kitchens, and laundry rooms.

### C303002 Plaster Ceiling Finishes

1.1 Plaster ceilings shall be cement plaster veneer finish on concrete or masonry. Refer to Section C3040 for paint system.

1.2 Portland cement plaster base coat, gray portland cement.

1.3 Portland cement plaster finish coat, gray portland cement. Factory-mixed finish coat according to the manufacturer's instructions.

1.4 Suspension system shall be steel materials with galvanized coating, aluminum coating, or a 55% aluminum-zinc coating. Provide primary suspended ceiling framing spaced at maximum 48 inches (1220mm) on center and secondary framing spaced at maximum 16 inches (400mm) on center, unless otherwise noted.

## **C3040 INTERIOR PAINTING AND SPECIAL FINISHES**

1.1 The following coatings are applied directly to all surfaces of interior construction.

1.2 Paints used on this project shall be lead free.

### C304001 Painting Systems Per Substrate

1.1 Painting practices shall comply with sound application and handling practices, and shall conform to the latest revision/edition of applicable codes, ordinances and regulations of the Republic of Rwanda governing life/safety, fire protection and construction, in effect during this contract, except where specifically stated herein. Any material installed that does not meet the requirements of this Performance Technical Specification (PTS) and/or applicable codes, ordinances and regulations will be removed and reinstalled at Contractor's expense.

1.2 Remove dirt, splinters, loose particles, grease, oil, and other foreign matter and substances deleterious to coating performance as specified for each substrate before application of paint or surface treatments. Oil and grease shall be removed prior to mechanical cleaning. Cleaning shall be programmed so that dust and other contaminants will not fall on wet, newly painted surfaces. Exposed ferrous metals such as nail heads on or in contact with surfaces to be painted with water-thinned paints, shall be spot-primed with a suitable corrosion-inhibitive primer capable of preventing flash rusting and compatible with the coating specified for the adjacent areas.

1.3 All coats on a particular substrate, or a paint system, must be from a single manufacturer.

1.4 The surfaces of wood doors, windows, frames and trim shall receive three coats of alkyd enamel paint. Apply one coat to all surfaces of wood prior to installation and two coats to exposed surfaces after installation. Prior to applying second coat spot touch-up first coat where wood is left uncoated due to cutting, drilling or other damage as a result of installation work.

#### C304002 Concrete Finishes

- 1.1 New and uncoated existing concrete surfaces:
  - One (1) coat latex filler/primer
  - Two (2) coats pigmented latex paint
- 1.2 Existing, previously painted, concrete surfaces:
  - Two (2) coats pigmented latex paint
- 1.3 New and uncoated existing concrete surfaces in toilets, food-preparation, food-serving, restrooms, laundry areas, shower areas, areas requiring a high degree of sanitation, and other high humidity areas unless otherwise specified, (Fill all holes in masonry surface):
  - One (1) coat latex filler/primer
  - One (1) coat pigmented alkyd paint
  - One (1) coat pigmented epoxy paint
- 1.4 Existing, previously painted concrete surfaces in toilets, food-preparation, food-serving, restrooms, laundry areas, shower areas, areas requiring a high degree of sanitation, and other high humidity areas unless otherwise specified, (Fill all holes in masonry surface):
  - One (1) coat pigmented alkyd paint
  - One (1) coat pigmented epoxy paint
- 1.5 New and uncoated existing, existing, previously painted concrete floors:
  - One (1) coat pigmented latex floor paint
  - or
  - One (1) coat pigmented epoxy paint.

#### C304003 Concrete Masonry Finishes

- 1.1 New and uncoated existing concrete masonry:
  - One (1) coat latex filler/primer
  - Two (2) coats pigmented latex paint
- 1.2 Existing, previously painted concrete masonry:
  - Two (2) coats pigmented latex paint
- 1.3 New and uncoated existing concrete masonry units in toilets, food-preparation, food-serving, restrooms, laundry areas, shower areas, areas requiring a high degree of sanitation, and other high humidity areas unless otherwise specified, (Patch imperfections and fill all masonry surface voids with block filler):
  - One (1) coat latex filler/primer
  - One (1) coat pigmented alkyd paint
  - One (1) coat pigmented epoxy paint
- 1.4 Existing, previously painted concrete masonry units in toilets, food-preparation, food-serving, restrooms, laundry areas, shower areas, areas requiring a high degree of sanitation, and other high humidity areas unless otherwise specified, (Patch imperfections and fill all masonry surface voids with block filler):
  - One (1) coat pigmented alkyd paint
  - One (1) coat pigmented epoxy paint

#### C304004 Plaster Finishes

- 1.1 New and uncoated plaster:
  - One (1) coat latex filler/primer
  - Two (2) coats pigmented latex paint
- 1.2 Existing, previously painted plaster:
  - Two (2) coats pigmented latex paint
- 1.3 New and uncoated existing plaster in toilets, food-preparation, food-serving, restrooms, laundry areas, shower areas, areas requiring a high degree of sanitation, and other high humidity areas unless otherwise specified, (Patch imperfections and fill all masonry surface voids with block filler):
  - One (1) coat latex filler/primer
  - One (1) coat pigmented alkyd paint
  - One (1) coat pigmented epoxy paint

1.4 Existing, previously painted plaster in toilets, food-preparation, food-serving, restrooms, laundry areas, shower areas, areas requiring a high degree of sanitation, and other high humidity areas unless otherwise specified, (Patch imperfections and fill all masonry surface voids with block filler):

- One (1) coat pigmented alkyd paint
- One (1) coat pigmented epoxy paint

C304005 Metal Finishes

1.1 New steel/ferrous surfaces not otherwise specified:

- Two (2) coats pigmented alkyd paint

1.2 Existing, previously painted steel/ferrous surfaces not otherwise specified:

- One (1) coat pigmented alkyd paint

1.3 New steel/ferrous surfaces in toilet, food preparation, food serving, restrooms, shower areas and areas requiring a high degree of sanitation and other high humidity areas not otherwise specified except floors, hot metal surfaces, and new prefinished equipment:

- One (1) coat pigmented alkyd paint
- One (1) coat pigmented epoxy paint

1.4 Existing, previously painted steel/ferrous surfaces in toilet, food preparation, food serving, restrooms, shower areas and areas requiring a high degree of sanitation and other high humidity areas not otherwise specified except floors, hot metal surfaces, and new prefinished equipment:

- One (1) coat pigmented epoxy paint

1.5 New and Existing, previously painted miscellaneous non-ferrous metal surfaces not otherwise specified:

- Two (2) coats pigmented alkyd paint.

1.6 New and Existing, previously painted miscellaneous galvanized doors not otherwise specified:

- Two (2) coats pigmented alkyd paint.

C304006 Interior Wood Finishes

1.1 New and existing, uncoated wood and plywood not otherwise specified:

- One (1) coat latex wood primer
- Two (2) coats pigmented latex enamel paint

1.2 Existing, previously painted wood and plywood not otherwise specified:

- Two (2) coats pigmented latex enamel paint

1.3 New and existing, previously finished or stained wood and plywood, except floors; natural finish or stained:

- Stain uniformly to desired hue
- One (1) coat clear wood sealer/primer
- One (1) coat clear, polyurethane finish

1.4 New and existing, uncoated wood timbers:

- One (1) coat latex wood primer
- One (1) coat solid body penetrating wood stain
- One (1) coat solid body penetrating wood stain

(Apply after installation to exposed surfaces. Prior to applying final coat spot touch-up first coat where wood is left uncoated due to cutting, drilling or other damage as a result of installation work.)

1.5 New and Existing, previously finished or stained wood floors; natural finish or stained:

- Stain uniformly to desired hue
- One (1) coat clear wood sealer/primer
- Two (2) coats clear, polyurethane finish

1.6 New and Existing, uncoated wood surfaces in toilets, food-preparation, food-serving, restrooms, laundry areas, shower areas, areas requiring a high degree of sanitation, and other high humidity areas not otherwise specified:

- One (1) coat latex wood primer
- Two (2) coats pigmented epoxy paint

1.7 Existing, previously painted wood surfaces in toilets, food-preparation, food-serving, restrooms, laundry areas, shower areas, areas requiring a high degree of sanitation, and other high humidity areas not otherwise specified:

Two (2) coats pigmented epoxy paint

1.8 New and existing uncoated wood doors:

One (1) coat latex wood primer

Two (2) coats pigmented latex enamel paint

## 8.8. SECTION D20: PLUMBING [08/06]

### D20 GENERAL

#### 1.1 Narrative

1.1.1 This section includes the construction of interior plumbing systems. This section covers installations inside the facility and out to the 5-foot (1.5 m) line. See Section G30, *Site Mechanical Utilities*, for continuation of systems beyond the 5-foot (1.5 m) line.

1.1.2 The Contractor shall only use materials that conform to the practices of the local construction industry for each particular construction discipline. Materials selected in this contract shall meet appropriate designated standards, or have been tested and found suitable for their specified purpose.

#### 1.2 Design Guidance

1.2.1 Provide design and installation in accordance with “*General Work Requirements*”.

#### 1.3 Construction Submittals

1.3.1 Provide product and operation and maintenance data for all equipment and fixtures to building COR.

### D2010 PLUMBING FIXTURES

1.1 Plumbing fixtures shall be provided in accordance with the local law and regulations and as specified.

#### D201001 Water Closets

1.1 White vitreous china

1.2 Self-closing type flush valve

#### D201002 Urinals

1.1 White vitreous china, wall-mounted, wall outlet, integral trap.

1.2 Self-closing type flush valve

1.3 Provide trim and concealed chair carriers.

#### D201003 Lavatories

##### 1.1 Countertop Lavatories

1.1.1 Lavatories shall be white, vitreous china with minimum dimensions of 20 inches (508 mm) wide x 18 inches (457 mm) front to rear, and self-rimming type.

1.1.2 Provide copper alloy centerset faucets. Provide with aerator, adjustable P-traps, and perforated grid strainers.

##### 1.2 Wall-Mounted Lavatories

1.2.1 White vitreous china with concealed arm carrier support, with minimum dimensions of 20 inches (508 mm) wide by 18 inches (457 mm) front to rear.

1.2.2 Provide copper alloy centerset faucets. Provide with aerator, adjustable P-traps, and perforated grid strainers.

#### D201004 Sinks

##### 1.1 Countertop Sinks

1.1.1 Sink, 20 gage stainless steel with integral mounting rim, minimum dimensions of 33 inches (840 mm) wide for two compartment or 21 inches (560 mm) wide for one compartment by 21 inches (560 mm) front to rear, with ledge back and undersides coated with sound dampening material.

1.1.2 Provide top-mounted copper alloy faucets, swing spout with aerator, and stainless steel drain outlets with cup strainers.

1.1.3 Provide adjustable P-trap with drain piping to vertical vent stack.

#### 1.2 Service Sinks

1.2.1 White enameled cast-iron or white vitreous china, wall mounted and floor supported by wall outlet cast-iron P-trap, minimum dimensions of 22 inches (560 mm) wide by 18 inches (457 mm) front to rear with 9 inch (230 mm) splashback, and stainless steel rim guard.

1.2.2 Provide copper alloy back-mounted combination faucets with vacuum breaker and 3/4 inch external hose threads.

#### 1.3 Mop Sinks

1.3.1 Pre-cast terrazzo floor-mounted mop sink, 36 inches (914 mm) x 36 inches (914 mm) x 12 inches (305 mm) shall be made of marble chips cast in white Portland cement to a compressive strength of not less than 3625 psi (25 mPa) 7 days after casting.

1.3.2 Provide brass body drains with nickel bronze strainers cast integral with terrazzo.

1.3.3 Provide stainless steel rim guard for mop sink.

1.3.4 Provide chrome-plated exposed hot and cold water faucets, wall-mounted copper alloy faucets swing spout with 3/4 inch hose connection, vacuum breaker, and pail hook.

1.3.5 Provide mop hanger on wall above sink suitable for four mops.

#### 1.4 Laundry Sinks

1.4.1 Two compartment laundry sink, minimum dimensions of 40 inches (1016 mm) wide by 21 inches (533 mm) front to rear, with floor-supported steel mounting frame secured to wall.

1.4.1 Provide copper alloy centerset faucets, swing spout with aerator, and stainless steel drain outlets with cup strainers, and 1.5 inch (40 mm) adjustable P-trap with drain piping to vertical vent stack.]

### D201005 Showers/Tubs

#### 1.1 One Piece Bath And Shower Modules

1.1.1 Made of white fiberglass reinforced plastic (FRP) or acrylic with slip-resistant bathing surfaces, integral grab bar, and three walls integrally molded in one piece. Provide outlet at left or right as necessary to suit module arrangement.

1.1.2 Provide pop-up drain fittings and adjustable P-trap.

1.1.3 Bathtub and shower supply fittings shall be diverter type with body mounted from behind the wall. Provide tub fill over-rim spout with diverter.

### **D2020 DOMESTIC WATER DISTRIBUTION**

#### D202001 Pipes & Fittings

1.1 For aboveground installations, use copper pipe and solder-type fittings with lead-free solder.

1.2 For underground installations, use PVC or any other non-metallic pipe & fitting made specifically for potable water. Provide transition union connections or threaded gate valve between metallic piping and PVC piping. Pipe and fittings shall be joined per manufacturer's recommendations.

#### D202002 Valves & Hydrants

1.1 Provide valves at water supplies to fixtures and to provide ease of maintenance as required.

1.2 Angle type, 3/4 inch copper alloy hose bibbs with vacuum breaker.

#### D202003 Domestic Water Equipment

##### 1.1 Water Heaters (For Domestic Water Only)

1.1.1 If required by ESR D30 to provide only domestic hot water, provide packaged gas-fired tankless water heater(s), capable of producing domestic hot water to meet the load of the building built under this contract. Packaged gas-fired tankless water heater shall include, but is not limited to, adjustable temperature setting, burner controls, pressure and flame safety devices, flue blower motor, flue duct, exchanger, make-up water service as recommended by the manufacturer, etc. Water heater shall be specified for "outdoor installation" if water heater will be installed outdoors, otherwise provide the appropriate make-up air.

1.1.2 Water heater shall be designed, tested, and installed per its manufacturer's recommendations and all the applicable codes that govern in the country where the water

heater is being installed. Provide all controls and safety devices that are required by the local codes that apply in the location where the water heater is installed.

#### 1.1.3 Water Heater Startup And Operational Tests

1.1.3.1 Prior to startup, clean water heater(s) in accordance with manufacturer's recommendations.

1.1.3.2 Operational Tests: Furnish the services of an engineer or technician approved by the water heater manufacturer for installation, startup, operational and safety testing. Demonstrate proper operability of combustion control, flame safeguard control, and safety interlocks.

#### 1.2 Domestic Water Pressure Booster System

1.2.1 Factory assembled, tested, and certified by a single manufacturer who assumes undivided responsibility for the system to include providing start-up services, two days instruction and furnishing related operations and maintenance manuals.

1.2.2 Each building shall be provided with its own system. Each system will consist of a minimum of two pumps mounted on a single, welded structural steel base.

1.2.3 Provide bladder type low-flow accumulator storage tank, lead-lag pump alternator selector switches and all related controls and alarms required for safe and proper system operation.

#### D202004 Insulation & Identification

1.1 Provide mineral fiber insulation on domestic water (hot and cold) supply and recirculation piping. Provide vapor retarder on cold water piping.

1.2 In addition to the requirements in Section "General Work Requirements", provide laminated plastic nameplates for valves. Stop valves in supplies to fixtures will not require nameplates. Identify above ground pipe with the type of service and direction of flow. Letter size, lengths and colors shall be per local industry standards.

1.3 Provide piping supports in accordance with local industry standards and local regulations.

1.4 Prior to initial operation, inspect piping system for compliance with drawings, specifications, and manufacturer's recommendations and perform a system pressure test.

1.5 Upon completion of the installation, disinfect all systems per local law and regulations.

### **D2030 SANITARY WASTE**

#### D203001 Waste Pipe & Fittings

1.1 For underground installations, use plastic PVC or ABS piping. Provide compatible fittings, and solvent cement.

1.2 For aboveground installations, use plastic PVC or ABS piping. Provide compatible fittings, and solvent cement. Plastic piping shall be equipped with approved firestopping devices as required by local code and law.

1.3 Provide cleanouts as required by law and local ordinances. Material shall be consistent with the piping system materials.

#### D203002 Vent Pipe & Fittings

1.1 For aboveground vent piping, use plastic PVC or ABS piping. Provide compatible fittings, and solvent cement. Plastic piping shall be equipped with approved firestopping devices as required by local code and law.

1.2 Single drainage/vent stack systems and mechanical air admittance valves are not acceptable.

#### D203003 Floor Drains

1.1 Floor drains shall be flush strainer or extended rim type as required by law and local ordinances. Provide in restrooms and plumbing chase areas, and in kitchens, if any. All floor drains shall be provided with a trap.

## **8.9. SECTION D30: HVAC [06/07]**

### **D30 GENERAL**

#### 1.1 Narrative

1.1.1 This section includes the construction of interior mechanical systems. This section covers installations inside the facility and out to the 5-foot (1.5 m) line. See Section G30, Site Mechanical Utilities, for continuation of systems beyond the 5-foot (1.5 m) line.

1.1.2 The Contractor shall only use materials that conform to the practices of the local construction industry for each particular construction discipline. Materials selected in this contract shall meet appropriate designated standards, or have been tested and found suitable for their specified purpose.

### 1.2 Design Guidance

1.1.1 Provide design and installation in accordance with “General Work Requirements”.

### 1.3 Construction Submittals

1.1.1 Provide product and operation and maintenance data for all equipment and fixtures to building COR.

## **D3010 HEAT GENERATING SYSTEMS**

### D301001 Boilers

1.1 If required by ESR D30 to provide heating hot water and domestic hot water, provide a packaged gas-fired condensing combination boiler(s), capable of producing heating hot water and domestic hot water to meet the load of the building built under this contract.

1.2 Packaged gas-fired condensing combination boiler shall include, but are not limited to, independent adjustable temperature settings for both heating hot water and domestic hot water, boiler and burner controls, pressure and flame safety devices, flue blower motor, flue duct, heat exchanger, drain, make-up water service as recommended by the manufacturer, etc.

1.3 Boiler shall be specified for “outdoor installation” when boiler is to be installed outdoors; otherwise provide the appropriate make-up air by way of an appropriately sized galvanized steel wall-mounted louver.

### D301002 Heating Hot Water Distribution Systems

1.1 Hot water piping shall be designed and manufactured for heating hot water installations.

1.2 Insulate hot water piping that is installed in unheated space with mineral fiber insulation with factory-applied all-purpose jacket. Hot water pipe that is installed in interior walls of heated spaces does not require insulation.

1.3 Provide, locate and appropriately size valves as necessary to balance water flows and/or isolate equipment for service and repairs, and as otherwise required.

1.4 Provide, locate and appropriately size relief valves as necessary to protect system and equipment from pressures that exceed manufacturers recommended operating pressures and rating pressures of system piping and fittings, and as otherwise required.

1.5 Provide appurtenances such as air separators, expansion tanks, suction diffusers, strainers, etc. as required to provide a complete heating hot water systems.

1.6 Provide test ports in piping at inlet and outlet of all major system components including boilers, pumps, convectors or other terminal devices, etc.

### D301003 Terminal Units

1.1 Provide anti-corrosion semi-gloss white enamel coating on unit. Anti-corrosion coating shall be immersion applied, baked phenolic or other approved coating. Field applied coatings are not acceptable.

### D302001 Requirements

1.1 Domestic hot water heating equipment shall be provided with all controls and safety devices that are required to meet the manufacturer’s recommendations and the applicable codes that govern in the country where the equipment is being installed. Install per the manufacturer’s recommendations.

### D302002 Hot Water Heating Equipment Startup and Operational Tests

1.1 Prior to startup, clean equipment in accordance with manufacturer’s recommendations.

1.2 Furnish the services of an engineer or technician approved by the equipment manufacturer for installation, startup, operational and safety testing. Demonstrate proper operability of combustion control, flame safeguard control, and safety interlocks.

1.3 Install per the manufacturer’s recommendations.

### **D3040 PERFORMANCE VERIFICATION AND TESTING**

1.1 Visually inspect that all system components have been installed per manufacturer's recommendations, and perform an uninterrupted 8-hour test. The objective is to ensure that the heating system is capable of providing space temperature as set by the operator.

## **8.10. SECTION D50: ELECTRICAL [08/06]**

### **D5010 GENERAL**

#### *1.1 Narrative*

This section includes the construction of interior electrical systems. This section covers installations inside the facility and out to the 5-foot (1.5 m) line.

#### *1.2 Design Guidance*

Provide design and installation in accordance with *General Work Requirements*.

#### *1.3 Construction Submittals*

Provide product and operation and maintenance data for all equipment and fixtures to building COR. Provide a **Compliance Certificate** issued by a local qualified entity regarding the entire electrical system installed.

### D501001 Quality Assurance

#### *1.1 Qualifications, Certifications, and Test Plans*

Qualifications, certifications, and Test Plans indicated herein shall be submitted 45 calendar days prior to the expected date of execution. Notify the Contracting Officer 14 calendar days prior to all testing. Submit test results within 7 calendar days of completion of testing.

#### *1.2 Designer of Record*

The Designer of Record is responsible for approving the submittals listed below.

#### *1.3 Qualified Testing Organization*

1.3.1 Contractor shall engage the services of a qualified testing organization to provide inspection, testing, calibration, and adjustment of the electrical distribution system and equipment listed in paragraph entitled "Acceptance Tests and Inspections" herein.

1.3.2 Organization shall be independent of the supplier, manufacturer, and installer of the equipment. The organization shall be a first tier subcontractor.

1.3.3 Submit name and qualifications of organization. Organization shall have been regularly engaged in the testing of electrical materials, devices, installations, and systems for a minimum of 5 years.

1.3.4 The organization shall have a calibration program, and test instruments used shall be calibrated in accordance with local government criteria.

1.3.5 Submit name and qualifications of the lead engineering technician performing the required testing services.

1.3.6 Include a list of three comparable jobs performed by the lead engineering technician with specific names and telephone numbers for reference.

1.3.7 Testing, inspection, calibration, and adjustments shall be performed by the lead engineering technician, certified by local government with a minimum of 5 years' experience inspecting, testing, and calibrating electrical distribution and generation equipment, systems, and devices.

#### *1.4 Qualified Worker*

1.4.1 Provide in accordance with local government criteria.

1.4.2 Qualified workers shall be allowed to be assisted by helpers on a 1 to 1 ratio, provided such helpers are registered in recognized apprenticeship programs.

1.4.3 Submit a certification confirming to local government criteria for qualified workers.

#### *1.5 Qualified Telecommunications Worker*

1.5.1 All installers assigned to the installation of telecommunications systems or any of its components shall be registered cabling installation technicians or have a minimum of 3 years experience in the installation of the specified copper and fiber optic cable and components.

1.5.2 Include names and locations of two projects successfully completed using optical fiber and copper communications cabling systems.

1.5.3 Include written certification from users that systems have performed satisfactorily for not less than 18 months. Include specific experience in installing and testing structured telecommunications distribution systems using optical fiber and Category 5e cabling systems.

#### 1.6 *Material Standards*

1.6.1 Ensure service support and provide manufacturer's nameplate in accordance with PTS Section "*General Work Requirements*".

1.6.2 Provide arc flash warning labels.

1.6.3 Provide laminated plastic nameplates for each switchboard, switchgear, switchboard, equipment enclosure, motor controller, relay, and switch. Each nameplate must identify the function and, when applicable, the position. Provide melamine plastic nameplates, 0.125 inch (3 mm) thick, white with black center core. Surface shall be matte finish. Corners shall be square. Accurately align lettering and engrave into the core. Minimum size of nameplates shall be 1 inch by 2.5 inches (25mm by 65 mm). Lettering shall be a minimum of 0.25 inch (6.35 mm) high normal block style.

#### 1.7 *Factory Testing*

The COR reserves the right to witness all factory testing. The manufacturer shall have a calibration program that assures that all applicable test instruments are maintained within rated accuracy.

#### 1.8 *Electrical System Startup and Testing*

1.8.1 Submit test plans for approval. The test plans shall be tailored to the systems provided.

1.8.2 The test plan shall list make and model and provide functional description of the test instruments and accessories and shall describe the setup of the tests to be conducted.

1.8.3 Test instruments shall be capable of measuring and recording or displaying test data at a higher resolution and greater accuracy than specified for the equipment's performance.

#### 1.9 *Factory Trained Engineer*

1.9.1 Provide a factory trained engineer to supervise start-up and testing as required in referenced specifications.

#### 1.10 *Performance Verification Testing*

1.10.1 The Contractor shall show by demonstration in service that all circuits and devices are in operating condition. Tests shall be such that each item of control equipment will function not less than five times.

1.10.1 The Contractor shall provide all necessary test equipment, tools, fuel, load banks, etc., labor, and materials for testing. As a minimum, all systems shall be tested in accordance with manufacturer's recommendations. Additional testing requirements for the various systems are described with those systems, hereinafter.

1.10.1 The Contractor shall assure that all applicable test instruments are maintained within rated accuracy. Dated calibration labels shall be visible on all test equipment.

1.10.1 Submit a separate electrical field test plan in accordance with manufacturer's recommendations and that conforms to local government criteria for each piece of electrical distribution equipment and/or system requiring performance verification testing.

1.10.1 The following items identify specific test requirements. Additional test requirements may be required by national or local government codes or manufacturer.

1.10.1.1 Switchboard - Field test each GFI and AFI circuit breaker with a certified outlet circuit tester to verify correct operation.

1.10.1.2 Motor control centers – Test motor control centers and motor starters in accordance with local government criteria.

1.10.1.3 Transient Voltage Surge Suppressors (TVSS)

1.10.1.3.1 Inspect for physical damage and compare nameplate data with the drawings and specifications, if applicable. Verify from the nameplate data that the TVSS equipment is appropriate for the system voltage.

1.10.1.3.2 Verify lead length between the TVSS equipment and the circuit connection is less than one foot (305 mm).

1.10.1.3.3 Verify wiring between the TVSS equipment and the circuit connection does not include high-inductance coils or sharp bends.

1.10.1.3.4 Confirm circuit breaker used for TVSS circuit connection is sized in accordance with TVSS manufacturer's requirements.

1.10.1.3.5 Ensure TVSS equipment is grounded in accordance with TVSS manufacturer's requirements. Check the ground lead on each device for individual attachment to the ground bus or electrode.

1.10.1.3.6 Check tightness of connections.

1.10.1.3.7 For TVSS equipment with visual indications of proper operation, verify that it displays normal operating characteristics.

1.10.1.4 Busway – Conduct standard tests for busway in accordance with local government criteria.

1.10.1.5 Receptacles – Test GFI receptacles with a certified outlet circuit tester to verify correct operation.

1.10.1.6 Lighting - Aim photocell switches and locate light level sensors in accordance with the manufacturer's recommendations. Verify that equipment operates in accordance with user's requirements and in accordance with manufacturer's recommendations. Fluorescent lamps on electronic dimming ballast control shall be burned in at full light output for 100 hours before dimming.

1.10.1.7 Telecommunication - Test telecommunications systems in accordance with applicable requirements.

1.10.1.8 Public address and intercommunications systems - Tests shall include originating and accepting messages at each station, at proper volume levels, without cross-talk or noise from other links or non-designated units. Test shall utilize the phonetically balanced monosyllabic word intelligibility test in accordance with local government criteria. In order to be acceptable, a score of at least 75 percent must be obtained for each system test.

1.10.1.9 Community Antenna Television Systems - Confirm design and installation is in compliance with local government criteria and in accordance with local government criteria proof of performance requirements. Test plan shall define tests required to ensure that the system meets technical, operational, and performance specifications. Test plan shall include plan for testing for signal leakage.

1.10.1.10 Electronic Security Systems (ESS) – Test ESS in accordance with local government criteria requirements.

1.10.1.11 Grounding systems - Test the grounding system in accordance with local government criteria.

1.10.1.12 Lightning protection - Upon completion of the installation, Contractor shall furnish the local government acceptance for the system.

1.10.1.13 Emergency lighting - Test emergency lighting that is intended for means of egress in accordance with local government criteria. Confirm the emergency lighting system operates for a minimum of 90 minutes and emergency illumination satisfies local government criteria specified levels.

### *1.11 Acceptance Tests And Inspections*

1.11.1 The COR reserves the right to witness all Acceptance Tests and Inspections, review data, and request other such additional inspections and repeat tests as necessary to ensure that the system and provided services conform to the stated requirements.

1.11.2 The qualified testing organization shall provide the acceptance tests and inspections test plan and perform the acceptance tests and inspections.

1.11.3 Test methods, procedures, and test values shall be performed and evaluated in accordance with local government criteria, the manufacturer's recommendations, and paragraph entitled "Field Quality Control" of each applicable specification section.

1.11.4 Tests identified as optional in local government criteria are not required unless otherwise specified.

1.11.5 Equipment shall be placed in service only after completion of required tests and evaluation of the test results have been completed.

1.11.6 Contractor shall supply to the testing organization complete sets of shop drawings, settings of adjustable devices, and other information necessary for an accurate test and inspection of the system prior to the performance of any final testing.

1.11.7 Perform acceptance tests and inspections on Diesel-Electric Generators, Uninterruptible Power Supply (UPS) Systems, Automatic Transfer Switches, and Switchgear.

### D501002 Submittals

#### *1.1. Design Submittal*

1.1.1 Design submittals shall be in accordance with the Part 6. of this document.

## 1.2. Construction Submittals

1.2.1 Provide product and operation and maintenance data for all equipment and fixtures to building COR.

1.2.2 Provide certification that all adjustable protective device settings have been set in accordance with the coordination study for the as-built equipment and configuration.

## **D5020 ELECTRICAL SERVICE AND DISTRIBUTION**

### D502001 Main Transformers

1.1 Pad mounted distribution transformers shall be in accordance with Section G40: Site Electrical Utilities.

### D502002 Service Entrance Equipment

1.1 When a switchboard or switchgear is required, the Designer of Record shall utilize equipment that meets the local government criteria.

### D502003 Interior Distribution Transformers

1.1 When required provide interior distribution transformers.

1.2 Mount interior distribution transformers on floors in non-public spaces or on wall mounted platforms.

### D502004 Switchboard

1.1 Switchboard shall comply with the local government criteria.

1.2 Switchboard for non-linear loads shall meet the local government criteria, including heat rise tested, except with the neutral assembly installed and carrying 200 percent of the phase bus current during testing.

1.3 Provide molded case circuit breakers in accordance with the local government criteria.

1.4 Provide ground fault circuit interrupting circuit breakers in accordance with the local government criteria.

1.5 Provide arc fault circuit breakers in accordance with the local government criteria.

### D502005 Enclosed Circuit Breakers

1.1 Provide molded case circuit breakers in accordance with the local government criteria. Provide with solid neutral when grounded conductor is present.

### D502006 Motor Control Centers

1.1 Motor control centers shall comply with the local government criteria.

1.2 Provide disconnecting means capable of being locked out for machines and other equipment to prevent unexpected startup or release of stored energy in accordance with the local government criteria.

1.3 When Variable Frequency Drives are required, the Designer of Record shall utilize equipment that meets the local government criteria.

### D502007 Other Service And Distribution

1.1 Transient voltage surge suppressors (tvss)

1.2 Busway shall comply with the local government criteria.

## **D5030 LIGHTING AND BRANCH WIRING**

### D503001 Branch Wiring

1.1 Provide wiring and connections for special outlets where required.

1.2 All homerun circuits must contain no more than 3 phase conductors.

1.3 Switches shall comply with the local government criteria.

### D503002 Lighting Equipment

1.1 Installation shall meet requirements of manufacturer's recommendations and the additional requirements for severe seismic disturbance. Fixture support wires shall conform with the local government criteria, galvanized regular coating, soft temper.

### D503003 Ballasts

1.1 Electronic ballasts shall include a 5-year warranty.

## **D5050 OTHER ELECTRICAL SERVICES**

### D505002 Emergency Lighting And Power

#### 1.1 Emergency Lighting

1.1.1 When an emergency generator is required, the Designer of Record shall utilize equipment that meets the local government criteria.

1.1.2 When an Automatic Transfer Switch is required, the Designer of Record shall utilize equipment that meets the local government criteria.

1.1.3 When a UPS system is required, the Designer of Record shall utilize equipment that meets the local government criteria.

## **8.11. SECTION G10: SITE PREPARATION**

### **G10 GENERAL**

#### *1.1 Design Guidance*

Provide the design and installation in accordance with “*General Work Requirements*”.

#### *1.2 Construction Guidance*

The Contractor shall provide all plant, labor, material, and equipment necessary to prepare the project site for construction activities as specified herein.

#### *1.3 Ownership Of Demolition Materials*

All demolition materials and appurtenances shall be properly disposed and in accordance with all applicable regulations. Maximize the use of deconstruction and recycling services.

#### *1.4 Hazardous Materials*

Before demolition can commence, any hazardous materials shall be abated in accordance with the requirements herein.

#### *1.5 Demolition Plan*

The Contractor shall provide a proposed demolition plan and work/outage schedule outlining demolition work activities, facility outages and utility outages. The Contractor shall obtain approval from the Contracting Officer for the proposed demolition plan and work/outage schedule prior to demolition activities.

#### *1.6 Protection Of Persons*

Where pedestrian and driver safety is endangered in the area of removal work, use traffic barricades with flashing lights.

#### *1.7 Protection Of Existing Items*

Protect existing buildings, facilities and other work that is to remain in place, be reused, or remain the property of the owner. At no additional expense to the US government, repair all items that are damaged during performance of the work to their original condition, or replace with new. Do not overload pavements to remain.

#### *1.8 Dust Control*

Prevent the spread of dust and debris to interiors of buildings or onto pavements and avoid the creation of a nuisance or hazard in the surrounding area. Do not use water for dust control if it results in hazardous or objectionable conditions such as, but not limited to, ice, flooding, or pollution. Sweep pavements as often as necessary to control the spread of debris.

#### *1.9 Noise Control*

Make the maximum use of low-noise emission products. Keep noise levels to the lowest level as practical. Coordinate and schedule loud noise production with adjacent work functions to minimize interruption of critical activities. Schedule work hours to minimize disruption of nearby residential areas.

### **G1010 SITE CLEARING**

1.1 The Contractor shall clear all trees, shrubs, brush and vegetation necessary for construction of the project. Clearing includes the felling, trimming, and cutting of trees into sections.

1.2 During clearing, demolition and construction activities, preserve and protect trees, shrubs and vegetation not directly impacted by the construction.

- 1.3 Any trees required to be removed shall be removed and disposed of to a depth of at least 18 inches (450 mm) below ground surface. Fill depressions with satisfactory material and compact. Mound fill 2 inches (50 mm) above adjacent surface to allow for settling when not part of a subbase.
- 1.4 Remove stumps to a depth of at least 450 mm (18 inches) below ground surface and grind stumps 450 to 750 mm (18 to 30 inches) below ground surface. Fill depressions with satisfactory material and compact. Mound fill 50 mm above adjacent surface to allow for settling when not part of a subbase.
- 1.5 Within the clearing limits, remove and dispose of all logs, shrubs, brush, matted roots, roots larger than 2 inches (50 mm) in diameter, and other debris to a depth of at least 18 inches (450 mm) below ground surface. Fill depressions made by grubbing with satisfactory material and compact to make the new surface conform to the adjacent surface of the ground.
- 1.6 Trim trees to remain of dead branches 1 inch (25 mm) or more in diameter. Neatly cut limbs and branches to be trimmed close to the bole of the tree or main branches.
- 1.7 Material Disposal:
  - 1.7.1 During hauling, prevent spillage on roads, or adjacent areas.
  - 1.7.2 Material is to be removed to an off-site location as directed by the contracting officer.
  - 1.7.3 Where burning is permitted, adhere to the applicable governmental, and local regulations.

## **G1020 SITE DEMOLITION & RELOCATIONS**

- 1.1 Demolition work shall include the demolition, removal and legal disposal of existing construction as required to accommodate the new construction. Contractor shall take care to prevent damage to existing construction, utilities, and other items not scheduled for demolition and shall repair such damage to the satisfaction of the Contracting Officer and at no additional cost to the Government.
- 1.2 Do not begin demolition until the Demolition Plan has been approved by and authorization is received from the Project Manager.
- 1.3 Whenever possible, all items demolished shall be salvaged or recycled in lieu of being disposed of as waste. All items to be demolished which are not salvageable or reused, shall become the property of the Contractor and shall be removed from project site. The Government will not be responsible for the condition, loss of, or damage to, such property after contract award. Materials and equipment shall not be viewed by prospective purchasers or sold on the site.
- 1.4 Remove and store materials and equipment identified to be reused or relocated to prevent damage. Reinstall as the work progresses.
- 1.5 Materials and equipment identified to be salvaged, are to be removed by the Contractor and will remain the property of the facility. Deliver salvaged items to a storage site on the facility in accordance with instructions of the Project Manager.
- 1.6 All demolition materials not identified for reuse or salvage and demolition rubbish and debris shall be properly disposed and in accordance with all applicable regulations.
- 1.7 Rubbish and debris shall be removed from the construction site daily. Materials that cannot be removed daily shall be stored in an area as directed by the contracting officer and removed from the construction site as soon as practical.
- 1.8 Maximize the use of deconstruction and recycling services.
- 1.9 Before demolition can commence, any hazardous materials shall be abated in accordance with governmental and local requirements.
- 1.10 The Contractor shall obtain approval from the Project Manager for the proposed demolition plan and work/outage schedule prior to demolition activities.

### **G102001 Building Mass Demolition**

- 1.1 For portions of the building to remain, protect building interior, materials, and equipment from weather at all times.
- 1.2 Perform demolition of substructure, superstructure, exterior closure, roofing, interior construction, interior finishes, mechanical systems, electrical systems, equipment, and other non-hazardous building items as specified herein.
- 1.3 For occupied buildings ensure openings to the exterior are secured by the end of the work shift.
- 1.4 For removal and re-roofing projects, remove only as much roofing as can be recovered by the end of the work shift.

1.5 The owner shall remove all uncontaminated furnishings and equipment from the work area prior to the start of the work.

**G102002 Hazardous Components Abatement**

1.1 Perform demolition of hazardous materials including; asbestos containing material, lead based paint, mercury, LLR (low level radiation) materials, ODS (ozone depleting substances), PCB (polychlorinated biphenyl), animal droppings, mold, mold spores, and any material contaminated by any of these, as specified herein and to comply with all applicable governmental and local regulations.

1.2 Prior to starting work, conduct any additional testing that may be needed to provide a final design and to comply with all applicable governmental and local regulations.

**G102003 Aboveground Site Demolition**

1.1 Remove concrete and asphaltic concrete paving and slabs as required for construction of project. Remove the existing aggregate base in areas to receive new pavement to the depth of the proposed pavement section below new finish grade. Remove the existing aggregate base in areas not to receive new pavement to a depth of 8 inches (200 mm) below existing adjacent grade. Provide neat sawcuts at limits of pavement removal; protect sawcuts so that new pavement will butt against the existing without feathering.

1.2 Remove aboveground storage tanks as indicated.

**G102004 Underground Site Demolition**

1.1 Remove existing utilities and terminate in accordance with government and local regulations covering the specific utility. Disturbance to utilities can not cause a failure to utilities to remain operational, unless a planned outage is approved by the contracting officer and coordinated with on-site personnel.

1.2 Protect existing utilities to remain. Where removal of existing utilities and pavement is required, provide approved barricades, temporary covering of exposed areas, and temporary services or connections. Repair damage to existing utilities to remain at no additional expense to the government.

1.3 Perform underground storage tank removal work as indicated.

**G102005 Fencing Relocation**

1.1 Replace fencing displaced during site clearing work. Remove old concrete post foundations and replace with new concrete at new location. Repair relocated items that are damaged or replace damaged items with new undamaged items as approved by the Contracting Officer and at no additional expense to the government.

**G102008 Site Cleanup**

1.1 Remove rubbish and debris from the project site daily; do not allow accumulations inside or outside the building(s) or on pavements. Store materials that cannot be removed daily in areas specified by the Contracting Officer.

**G1030 SITE EARTHWORK**

1.1 This section includes the design and construction requirements for earthwork and grading related to construction of the roadways, parking, paved areas and other related site work. Refer to Section A10 for earthwork related to construction of structures, including building, footings, foundations, retaining walls, slabs, tanks, and utility appurtenances.

**G103001 Grading**

1.1 Establish finish floor elevations so that the floor is a minimum of 4 inches (10cm) above highest grade adjacent to the building. Provide a slope away from the building of 1:10 for a distance of 5 feet (150cm) from all sides of the building.

1.2 The Contractor shall preserve natural topographic features to minimize the impact on the existing drainage patterns at and adjacent to the site.

1.3 Finish grading shall provide drainage towards new and existing drainage features. Finish grading shall not result in low spots that hold water or that direct runoff towards new or existing facilities and/or site amenities.

#### G103002 Common Excavation

1.1 The Contractor shall preserve natural topographic features to minimize cut and fill requirements. Re-use suitable excavation material as fill material as needed. All unsuitable material and surplus excavation shall become the property of the Contractor and shall be disposed of as specified above.

#### G103003 Rock Excavation

1.1 Blasting is not allowed.

1.2 Requests for additional compensation shall not be made by the Contractor for degree of hardness or difficulty encountered in removal of material. All unsuitable material and surplus excavation shall become the property of the Contractor and shall be disposed of as specified above.

#### G103004 Fill & Borrow

1.1 Where sufficient topsoil and satisfactory materials are not available on the project site, provide suitable borrow materials.

1.2 Remove unsatisfactory soil materials from the site as specified above and replace with satisfactory soil materials.

1.3 Soils that are determined as clean fill via testing shall be backfilled and compacted in accordance with these requirements.

#### G103005 Compaction

1.1 Hand compact fill material in 6 inch (15cm) lifts. Compact to a density similar to native soil.

#### G103006 Soil Stabilization

1.1 Provide soil stabilization to prevent erosion on slopes less than 1:2 and loose soil. Apply and install geosynthetics in accordance with the manufacturer's written instructions or natural woven mats with 12 inch (30cm) rot resistant wood stakes. Drive or cut off stakes to within 1/2" (10mm) of grade.

#### G103007 Slope Stabilization

1.1 Provide soil stabilization to prevent erosion on slopes greater than 1:2. Design and install manufactured gabions, or geogrids, or natural rock anchors in accordance with the manufacturer's written instructions.

#### G103008 Shoring

1.1 Provide sheeting, shoring, bracing, cribbing and underpinning in excavations and trenches deeper than 4 feet (120cm), where sides of excavation are greater than a 1:2 slope, in accordance with all government and local codes and requirements.

1.2 Provide structural shoring for slopes greater than 1:2 to protect existing structures.

#### G103009 Temporary Dewatering

1.1 The design of the temporary dewatering system shall account for soil conditions, rainfall, fluctuations in the groundwater elevations and the potential settlement impact on adjacent facilities due to dewatering. While the excavation is open, the water level shall be maintained continuously, at least 1.0 foot (0.30 m) below the working level.

1.2 French drains, sumps, ditches or trenches will not be permitted within 3 feet (1m) of the foundation of any structure without written approval of the contracting officer.

#### G103010 Temporary Erosion & Sediment Control

1.1 Develop and implement temporary erosion and sediment control measures prior to or in conjunction with commencement of earthwork in accordance with government and local erosion and sediment control regulations. Place natural woven mats with 12 inch (30cm) wood stakes.

1.2 Maintain temporary erosion control measures throughout the project until areas are fully stabilized.

#### G103011 Other Site Earthwork

1.1 During site work, if any historic artifacts are encountered, or if indications of that the site may have cultural significance, discontinue work in that area and notify the contracting officer immediately.

## **G1040 HAZARDOUS WASTE REMEDIATION**

- 1.1 Perform excavation of contaminated soil and/or groundwater in accordance with all government and local codes and requirements. Select methods and equipment to minimize disturbance to areas beyond the limits of the excavation area. Material that becomes contaminated as a result of the Contractor's operations shall be removed and disposed of at no additional cost to the Government. Where excavation extends into groundwater levels, dewatering methods shall be employed on a localized basis to facilitate excavation operations. Water generated by dewatering during excavation shall be collected and tested in accordance with the ESR and the approved work plan.
- 1.2 Water that contains contaminants above levels allowed by government and local authorities shall be removed or treated in accordance with all government and local codes and requirements.
- 1.3 Non-contaminated water may be disposed of on-site.
- 1.4 Soils determined to be contaminated must be stockpiled in a way that contains water runoff or protects soil from rain or water flow, and shall be disposed of as soon as practical in accordance with all government and local codes and requirements.
- 1.5 Soils that are determined to contain contaminants below levels allowed by government and local authorities may be used as clean fill.
- 1.6 In the event of a spill or release of hazardous substances, pollutant, contaminant or oil, notify the Contracting Officer immediately. Containment actions shall be taken immediately to minimize the effect of any spill or leak. Clean up shall be performed at the Contractor's expense in accordance with all government and local codes and requirements.
- 1.7 All contaminated waste materials shall become the property of the Contractor and shall be transported, disposed of in accordance with all government and local codes and requirements.

## **8.12. SECTION G20: SITE IMPROVEMENTS [08/06]**

### **G2010 ROADWAYS AND PARKING LOTS**

#### *1.1 Pavement Design*

1.1.1 Provide geometric and pavement design, including minimum pavement sections, in accordance with the latest revision/edition of applicable codes, ordinances and regulations of the Republic of Rwanda governing roadways and paving, in effect during this contract, except where specifically stated herein. Any material installed that does not meet the requirements of this Performance Technical Specification (PTS) and/or applicable codes, ordinances and regulations will be removed and reinstalled at Contractor's expense. Provide any required additional pavement design to provide a complete and useable facility.

1.2.1 Provide surfaces consistent in color and finish.

1.3.1 Existing utility structures shall be adjusted to meet the new finished pavement grades as required.

#### *1.2 Bases & Subbases*

1.1.1 Prepare subgrade in accordance with Section G10, Site Preparation. Geotextiles may be used for separation or reinforcement in accordance with manufacturer's instructions. Provide base course under paved areas in accordance with applicable codes, ordinances and regulations. Place base course in layers of equal thickness with no compacted layer more than 6 inches (150 mm) thick. Compact base course at optimum moisture content to maximum dry density.

#### **G201001 Paved Surfaces**

##### *1.1 Bituminous Concrete Pavement*

1.1.1 Provide bituminous concrete pavement in accordance with the applicable standard mix based on the pavement design and vehicle loading indicated in these TR.

1.1.2 Bituminous concrete placement, including minimum temperature during placement, joints, and maximum lift thickness shall be in accordance with local governmental standards. Compact bituminous concrete to 96 percent of maximum laboratory density.

1.1.3 Finished surface shall be uniform in texture and appearance and free of cracks and creases.

1.1.4 Confirm in-place compacted thickness. Acceptable tolerances are plus or minus 0.5 in (13 mm) for bituminous base course and plus or minus 0.25 in (6 mm) for bituminous surface course. One test for every 500 square yards (418 square meters); minimum 2 tests.

1.1.5 Test surface smoothness by using a 10 foot (3 meter) straightedge in transverse and longitudinal directions to pavement. Acceptable tolerances are plus or minus 0.25 in (6 mm) for bituminous base and surface courses.

1.1.6 Conduct field density of in-place compacted. One field test for every 1000 square yards (836 square meters); minimum 2 tests. One laboratory test for the project.

## 1.2 *Portland Cement Concrete [PCC] Pavement*

1.2.1 If reinforced, the welded wire fabric shall be manufactured to be used as concrete reinforcement. Bar reinforcement shall be Grade 400 (Grade 60).

1.2.2 Provide PCC pavement in accordance with the applicable standard mix for the design strength plus any allowable deviations.

1.2.3 Finished surface shall be uniform in texture and appearance and free of cracks.

1.2.4 Confirm in-place thickness. Acceptable tolerances are plus or minus 0.5 in (13 mm). One test for every 500 square feet (418 square meters); minimum 2 tests.

1.2.5 Test surface smoothness by using a 10 foot (3 meter) straightedge in transverse and longitudinal directions to pavement. The finished surfaces of the pavements shall have no abrupt change of 0.12 inch (3 mm) or more.

1.2.6 Strength: Samples for strength tests of each mix design of concrete placed each day shall be taken not less than once a day, nor less than once for each 100 cubic yards (120 cubic meters) of concrete, nor less than once for each 5000 square feet (500 square meters).

1.2.6.1 Compressive Strength: Make five test blocks (cylinders) for each set of tests. Test two blocks (cylinders) at 7 days, two blocks (cylinders) at 28 days, and hold one block (cylinder) in reserve. Each strength test result shall be the average of two blocks (cylinders) from the same concrete sample tested at 28 days. If the average of any three consecutive strength test results is less than  $f'_c$  or if any strength test result falls below  $f'_c$  by more than 500 psi, take a minimum of three core samples from the in-place work represented by the low test cylinder results and test. Concrete represented by core test 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 retested.

1.2.6.2 Flexural Strength: Make four test specimens for each set of tests. Test two specimens at 28 days, and the other two at 90 days. Concrete strength will be considered satisfactory when the minimum of the 90-day test results equals or exceeds the specified 90-day flexural strength, and no individual strength test is less than the design strength. If the ratio of the 28-day strength test to the specified 90-day strength is less than 65 percent, make necessary adjustments for conformance.

1.2.7 Remove concrete not meeting strength criteria and provide new acceptable concrete at no expense to the government. Repair core holes with non-shrink grout. Match color and finish of adjacent concrete.

## 1.3 *Joints For Portland Cement Concrete Pavement*

1.3.1 General: Joints shall be installed in a manner and at such time to prevent random or uncontrolled cracking. Joints shall form a regular rectangular pattern. Wherever curved pavement edges occur, turn joints so they intersect the curved edge at a right angle with the turn in the joint 6 inches (15 cm) from the curved edge.

1.3.2 Provide thickened edge expansion joints at the intersection of two rigid pavements. Use preformed joint filler. Filler must be compatible with joint sealer material. Preformed joint filler shall be securely held in position during concreting operations.

1.3.3 Provide thickened edge isolation joints by placing a 1/2-inch (12 mm) preformed joint filler around each structure that extends into or through the pavement before concrete is placed at that location.

1.3.4 Provide contraction joint lines by sawing "green" concrete. Contraction joints shall be 1-inch (25 mm) deep, but no more than 25% of slab depth, straight, and extend for through intersected slab edges.

1.3.5 If an emergency stop occurs remove the concrete back to location of transverse joint and install a construction joint.

1.3.6 Provide single component cold-applied silicone. Silicone sealant shall be self-leveling and non-acid curing.

1.3.7 Use performed compression seals in areas where silicone joint sealant does not perform, such as areas subject to water inundation, blasts, or constant/repeated fuel spillage.

#### 1.4 Prime Coat

1.4.1 Use prime coat in accordance with applicable local standards. Prime coat shall be emulsified asphalt materials.

#### 1.5 Tack Coat

1.5.1 Use tack coat in accordance with applicable local standards. Tack coat is required for bituminous pavement overlays and on vertical cut faces of pavement patches.

#### 1.6 Pavement Patches

1.6.1 Provide pavement patches for existing pavements where required for installation of utility trenches. Sawcut 12 inches (30 mm) beyond edge of trench. Thicknesses of pavement materials shall be equal to or greater than the existing pavement section.

1.6.2 For spalls or repairs of existing concrete pavement, perform repairs in accordance with applicable local standards. Spall repair materials shall be either Rapid Setting Cementitious Concrete (RSCC), epoxy concrete, or polymer-modified Portland Cement (non-sag mortar) products specially formulated for spall repairs, with a proven record (in service at least three years) of satisfactory use under loading and environmental conditions similar to those at the location of intended use. A manufacturer's data sheet and certificate supporting the satisfactory use shall be provided to the Contracting Officer with the design. A product manufacturer's representative shall be present during the initial two days of product application to verify that manufacturer's instructions for use are adhered to. The Contracting Officer shall be given 7 days notice prior to the initial application in order to be present.

#### 1.7 Marking

1.7.1 Pavement markings materials shall be designed for life expectancy of at least 3 years under expected traffic. Water based paints shall have durability rating of at least 4 when determined in the wheel path area.

1.7.2 Provide a half-rate initial marking application on bituminous pavements. Provide the remaining application at the end of the normal curing period.

#### 1.8 Bollards

1.8.1 Bollards shall be 4 inch (10cm) diameter minimum steel pipe filled with concrete and embedded in a portland cement concrete foundation.

### G201002 Resurfacing

1.1 Adjust rims of existing utility structures to match proposed grades after resurfacing.

1.2 Provide and apply slurry seal material in accordance with applicable local standards. Slurry seal material shall be emulsified asphalt materials.

1.3 Provide and apply bituminous concrete overlay as follows:

1.3.1 Remove old pavement by cold milling to depths required to provide new surface and leave underlying materials intact. Clean the pavement of excessive dirt, clay or other foreign matter with power brooms and hand brooms immediately prior to the milling operation.

1.3.2 Repair or replace damaged utility structures, valve boxes, or pavement that is torn, cracked, gouged, rutted, broken or undercut at no addition expense to the government.

1.3.3 Provide bituminous concrete overlay produced from hot or cold recycling of the milled material or from virgin materials in accordance with applicable local standards based on the pavement design and vehicle loading as indicated in these TR. Use tack coat for bituminous pavement overlays and on vertical cut faces of pavement patches.

1.3.3 Fiber reinforced crack sealer shall be used for sealing cracks in asphalt pavement after milling and prior to resurfacing

### **G2020 PEDESTRIAN PAVING**

1.1 Locate new sidewalks such that they maintain continuity of pedestrian traffic to and from the existing sidewalks adjacent to the site(s).

1.2 Sidewalks shall be portland cement concrete pavement, 4 inches (100 mm) thick minimum. Provide concrete as specified above for a minimum compressive strength at 28 days of 3500 psi (25 MPa) concrete. Sidewalks shall be at least 5 feet (1.5 meters) wide, except that sidewalks connecting entry points of housing units to the housing unit's parking shall be at least 36 inches (900 mm) wide. Use the maximum percentage of fly ash allowed in the applicable standard mix. Provide

a broomed finish. Unless indicated otherwise, provide a transverse slope of 1/48. Limit variation in cross section to 0.25 inch in 5 feet (6 mm in 1.50 m).

1.3 Provide contraction joints spaced at intervals equivalent to the width of the sidewalk. Provide 1/2 inch (12 mm) 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 (15 m) maximum. Provide isolation joints by placing a 1/2 inch (12 mm) preformed expansion joint filler around each structure that extends into or through the sidewalk before concrete is placed at that location.

1.4 Provide handicapped ramps of PCC pavement with an exposed aggregate finish, truncated domes, or as required by the local codes at roadway intersections.

## **G2030 FENCING & GATES**

### *1.1 Chain Link Fence*

1.1.1 Aluminum fabric, posts or accessories shall not be used.

1.1.2 Chain link fence fabric shall be at least 9 gauge (3 mm) steel wire mesh material (before any coating) with mesh openings not larger than 2 inches (51 mm). Install fence in accordance with the manufacturer's written installation instructions.

1.1.3 Tensions Wires shall be at least 9 gauge (3 mm) steel wire mesh material (before any coating).

1.1.4 Rails shall be grade A steel fence piping.

1.1.5 Provide gates with posts and fabric as specified for fence.

1.1.6 Posts and braces shall be grade A steel fence piping. Each gate, terminal and end post will be braced with truss rods.

1.1.7 Provide manufacturer's standard fencing accessories as required to provide a finished and complete fence system, including hinges, latches, drop pins, etc.

### *1.2 Ornamental Fence*

1.2.1 Fence material shall be wrought iron or steel a minimum 1/2 inch (12 mm) in its smallest cross sectional dimension. No opening in the fence shall allow a 6 inch (15 cm) ball pass through. Finish shall be non-lead, metal primer or galvanized with 2 coats of a high performance alkyd enamel finish. Posts shall be matching material designed to support the fence system and normal expected wind loads. Install fence in accordance with the manufacturer's written installation instructions.

1.2.2 Provide gates with materials and design to match the fence. Gates to be designed to resist diagonal loads associated with gate operation.

1.2.3 Provide fencing accessories as required by manufacturer to provide a finished and complete fence system, including hinges, latches, drop pins, etc.

### *1.3 Fence Walls*

1.3.1 Freestanding walls intended to enclose exterior space shall be built to match exterior enclosure of adjacent buildings in accordance with Section B20.

1.3.2 Provide gates with materials to be wrought iron or steel a minimum 1/2 inch (12 mm) in its smallest cross sectional dimension. No opening in the gate opening shall allow a 6 inch (15 cm) ball pass through. Finish shall be non-lead, metal primer or galvanized with 2 coats of a high performance alkyd enamel finish. Mountings shall be matching material designed to support the gate and withstand normal expected wind loads. Install gate in accordance with the manufacturer's written installation instructions.

### *1.4 Protective Fencing*

1.4.1 Provide protective measures to prevent access through culverts, storm drains, sewers, air intakes, exhaust tunnels and utility openings or across drainage ditches or swales.

1.4.2 Where fencing or fencing walls are used to provide an enclosure for utility equipment, ensure a minimum clearance is provided no less than 3 feet (900 mm) around the equipment to permit maintenance access and ventilation. Provide stone, gravel or concrete paving within the enclosure.

## **G2040 OTHER SITE DEVELOPMENT**

### **1.1 Retaining Walls**

Provide retaining walls to permanently resist soil pressures as well as live loads. Provide wall drainage to minimize lateral loading and protect wall materials against degradation.

### **1.2 Exterior Furnishings**

Refer to ESR G20 and other portions of the RFP for exterior furnishings required on this project. Permanently attach all site furnishings to concrete pads. Provide site furnishings in conformance with the Base Exterior Architecture Plan (BEAP) and or Installation Appearance Plan for each Activity. If no product guidance is given, coordinate material, finish and color with architecture (fiberglass and aluminum are not acceptable) and provide to the greatest extent possible, materials with industrial recycled content, preferably from regionally local manufacturers.

### **1.3 Picnic and Passive Recreation Areas**

Include tables, with attached benches, on concrete bases sloped to drain and permanent barbecue grill(s) for picnic areas. Additionally, provide separate receptacles for trash, recycling and barbecue ashes. Permanently attach all site furnishings to concrete paving extending a minimum of 12 inches (300 mm) past the furnishing, with the exception of picnic tables and benches, which require concrete paving extending 2 feet (600mm) minimum on all sides. The elevation of the finished concrete must be plus 1 inch (25 mm) above adjacent grade.

### **1.4 Trash Receptacles**

Provide trash receptacles with drain hole and stationary or self-closing lids with anchor chains secured to the receptacle to protect the contents from weather. Design receptacles to hold heavy-duty plastic or galvanized steel liners of the same manufacturer. Consider potential weight of full containers when deciding on 'top loading' or 'side loading' receptacles. Include a concrete pad 12 inches (300 mm) larger on all sides than the size of the trash receptacle base.

### **1.5 Benches**

Minimum 6 feet (1.8 meter) length to match trash and recycling receptacle material & color, installed a minimum of 18 inches (450 mm) above finish grade, permanently installed with anchor bolts or in-ground. For benches located in non-paved areas, provide concrete pads extending a minimum 2 feet (0.6 meters) beyond the edge of the seat portion of the bench (or both front and back if accessible from either).

### **1.6 Recycling Receptacles**

Provide recycling receptacles, single-piece with separate slots for cans, bottles, newspaper. Match height, material, and style of the trash receptacle.

### **1.7 Barbeque**

Minimum 12 inches (300 mm) x 18 inches (450 mm) with heavy-duty grill and hinged stainless steel lid, factory primed and painted with rust-resistant paint. Install so coal height is a minimum of 36 inches (0.91 meter) above finish grade.

### **1.8 Playgrounds**

Border playgrounds with reinforced concrete curbing to a depth appropriate to the type safety surfacing utilized. Provide shade and wind protection where these elements may significantly limit the use of the facilities.

Provide a playground safety surface. Natural wood products and decomposed granite are not allowed for surfacing. Loose fill surfacing must be a minimum of 4 inches (100 mm) below the top of edging. Consider local climate, soil conditions, location and size of area, type of activity, age of users, and intensity of use when choosing surfacing material. Provide soil separator fabric between playground loose-fill material and subgrade soil. Design play areas with permeable surface and adequate drainage. Drain to sump a minimum of 20 feet out from the playground curbing or to storm drain.

## **8.13. SECTION G30: SITE CIVIL/MECHANICAL UTILITIES [08/06]**

### **QUALITY ASSURANCE**

Materials and assemblies installed in the work shall be inspected and found to be in compliance with industry standards and these specifications prior to acceptance of the work.

Items found not to be in compliance shall be removed or corrective measures taken, to assure compliance with the referenced standard.

The Contractor shall perform field tests and provide labor, equipment and incidentals required for testing.

All materials shall be new, and shall bear the label of standardizing agency whenever standards have been established and label service is normally and regularly furnished by the agency.

All equipment provided shall be listed and labeled suitable for the specified purpose, environment, and application and installed in accordance with manufacturer's recommendations.

The Contractor shall only use materials that conform to the practices of the local construction industry for each particular construction discipline.

Materials selected in this contract shall meet appropriate designated standards, or have been tested and found suitable for their specified purpose.

The Contractor shall verify that the locations and inverts of all site utility lines are coordinated with building utility lines. If necessary, the Contractor shall make adjustments to the locations and inverts in accordance with national and local laws and regulations.

### **WATER STORAGE TANK**

Water storage volume must be adequate to meet required operational, fire and emergency demands. Fire demand must be determined in accordance with UFC 3-600-01 and consider mission critical functions. At minimum the volume of water storage required is the sum of fifty percent of the average total daily domestic requirements, plus any industrial demand that cannot be reduced during a fire period, and the required fire demand.

Storage volumes in the water supply and distribution system shall be monitored and controlled. Altitude valves or equivalent level controls will be required. High and low level pressure sensitive switches corresponding to water levels in storage tanks may be used for pump controls and alarm status monitoring. Alarms must include high level, low level, and pump malfunctions.

The Contractor shall submit a certificate signed by a registered professional engineer providing a:  
Description of the entire tank and foundation structural design loading conditions

Description of structural design methods and codes used in establishing allowable stresses and safety factors

Statement that the structural design has been checked by experienced engineers specializing in hydraulic structures to ensure that design calculations for member sizes, dimensions and fabrication processes are as prescribed by industry standards

Certification that the completed work was inspected in accordance with national and local laws and regulations.

### **WATER SUPPLY**

#### **Water Service Lines**

Underground water service lines shall be non-metallic. Plastic piping such as PVC, PEX (cross-linked high density polyethylene) or other plastic material approved for potable water applications shall be used. Pipe material selected shall be rated for pressures up to 1.1 MPa (160 psi). Fittings shall be as recommended by the manufacturer of the pipe selected.

#### **Installation**

Install pipe, fittings and accessories in accordance with manufacturer's instructions.

### Valves

Valves shall be the same diameter and have the same joint ends as the mains to which they are installed.

Each type of valve shall be of one manufacturer.

Valves shall be installed at all new points of connection. At a minimum, valves shall be located to ensure that no more than two fire hydrants (if existing) will be out of service in the event of a single break in a water main. Valves shall be located outside of pavement and heavy traffic areas whenever possible.

Contractor shall select the appropriate type of valve for each application

### Valve Box

Provide a cast iron, adjustable, valve box for each gate valve on buried piping.

Valve boxes shall be of a size suitable for the valve on which it is to be used with a minimum diameter of 5-1/4 inches (130 mm).

Provide a round head and cast the word "WATER" on the lid in the local language.

Provide corporation stops if service lines 2 inch (50 mm) diameter or less are tapping water mains. The corporation stops shall be ground key type, bronze.

Make and assemble joints to valves as specified for making and assembling the same type of joints between pipe and fittings.

Provide thrust restraint for all piping, valves, fittings, and other appurtenances of the water distribution system.

Disinfect new water piping and existing water piping affected by Contractor's operations in accordance with national and local laws and regulations.

### Elevated Water Storage

Provide water storage facilities that are designed and installed in accordance with national and local laws and regulations, including:

Tanks shall be designed and manufactured for the sole purpose of storing water.

The height of the tower supporting the storage tank shall be such that it provides a pressure no less than 40 psi (300 kPa) at a faucet in a lavatory.

Volume capacity of the storage and fill tanks shall be determined by the Contractor taking into consideration the function of the owner and the numbers of people to be served.

### Domestic Water Pumps

Components shall be furnished by a single manufacturer and the system shall be the standard cataloged product of the manufacturer.

Certified performance curves shall be furnished.

### Circulating Pump

Casings: Epoxy coated cast iron.

Impeller: Stainless steel, cast brass, bronze, or composite.

Motors: Maximum 40 degrees C (104 degrees F) ambient temperature rise, permanent split capacitor, for operation with current of voltage, phase and cycle shown in schedule on the drawings.

Motors shall be equipped with thermal overload protection.

Pump shall operate with a seven day programmable timer. In the inlet and outlet piping of the pump shutoff valves shall be installed to permit service to the pump without draining the system.

A check valve shall be installed nearby in the piping upstream of the circulating pump.

### Domestic Water Pressure Booster System

Provide factory prefabricated, prewired and pretested multistage pumps including motors, pressure regulating valves with integral check valves, pressure transducers, vibration pads, emergency switches, flow switches, power and control panels, suction and discharge manifolds, gate valves, bypass loops with appropriate valves and check valves, low pressure cut off switches, hydro-pneumatic tanks and accessories.

All components shall be factory installed on a common structural steel skid and shall be completely tested in the factory before shipment.

**System Operation and controls:** System shall automatically maintain constant system pressure at the outlet of the pressure control valve and hydropneumatic tank check valve at all times.

The pump station shall receive a 4-20mA signal from each pressure transducer, as provided by the pumping station manufacturer. A pressure transducer signal shall be provided for each pump controller. This will provide a complete lead/lag system.

The pump logic controller shall provide the following standard users selectable features:

- Low Suction Pressure Alarm and Cut Out
- High Suction Pressure Alarm and Cut Out
- Low System Pressure Alarm
- High System Pressure Alarm and Cut Out
- High Temperature Alarm and Cut Out
- Low Level Alarm and Cut Out
- No-Flow Shut Down
- A-V alarm with push to silence feature
- Overload Failure Alarm
- Pump Failure Alarm

**Pressure Regulating Valves:** System pressure shall be maintained by pilot-operated, diaphragm type pressure regulating valves, rated at 2050 kPa (300 psi) minimum, one for each pump. Valves shall be piloted to control system pressure and to cause the valve to act as a non-slam check valve. Pilot shall be rated at 1200 kPa (175 psi) minimum.

**Hydro-pneumatic Tank:** Bladder type, hydro-pneumatic, designed and constructed in accordance with requirements of the ASME Pressure Vessel Code and stamped with appropriate symbol. Tank shall include pre-pressurized, sealed-in air cushion which shall accommodate pressure increases and expanded water volumes in the tank. Tank shall include butyl rubber or poly-propylene liner in lower, or water side of chamber.

Minimum working pressure of tank shall be 1200 kPa (175 psi). Unit shall be suitable for domestic water applications.

**Power and Control Panel:** Class "A" shadow box double NEMA 1 enclosure, UL labeled, bonderized double prime coated with baked enamel finish:

- Fused disconnect switches with external operating handles.
- Magnetic contactor for each motor with H.O.A. switch.
- Door interlock.
- Thermal overload protection relay for each motor, three leg type.
- Running light for each motor.
- Power light for each motor.
- Minimum run timers to prevent short cycle operation.
- Control transformer, switch, circuit breaker, light.
- Lead pump failure protection.

**Motor and Starter:** Maximum 40 degrees C ambient temperature rise, dripproof type motor, ball bearings, voltage and phase as shown on drawings.

Motor shall be of such capacity that brake horsepower required by driven equipment at normal rated capacity will not exceed nameplate rating of the motor. Provide each motor with automatic, fully enclosed, magnetic starter.

**Instrumentation:** All instrumentation shall be factory installed and shall include the following 115 mm (4-1/2 inch) dial gages with shut-off cock.

- Pump pressure gage for each pump.
- System pressure gage.
- Suction pressure gage.

#### Tests

Make tests as recommended by product manufacturer and listed standards, under actual or simulated operating conditions and prove full compliance with design and specified requirements.

Tests of the various items of equipment shall be performed simultaneously with the system of which each item is an integral part.

When any defects are detected, correct defects and repeat test.

**Elevated Potable Water Storage**

Provide potable water storage facilities that are designed and installed in accordance with national and local laws and regulations, including:

Tanks shall be designed and manufactured for the sole purpose of storing potable water.

The height of the tower supporting the storage tank shall be such that it provides a pressure no less than 40 psi (300 kPa) at a faucet in a lavatory.

Volume capacity of the storage and fill tanks shall be determined by the Contractor taking into consideration the function of the owner and the numbers of people to be served.

~~~ End of Part 8 ~~~

End of Technical Requirements

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