

AMENDMENT OF SOLICITATION/MODIFICATION OF CONTRACT			1. CONTRACT ID CODE	PAGE OF PAGES
2. AMENDMENT/MODIFICATION NO. U0001		3. EFFECTIVE DATE 03-May-2008	4. REQUISITION/PURCHASE REQ. NO.	
6. ISSUED BY AFGHANISTAN ENGINEER DISTRICT US ARMY CORPS OF ENGINEERS KABUL APO AE 09356		CODE W917PM	7. ADMINISTERED BY (If other than item 6) See Item 6	
8. NAME AND ADDRESS OF CONTRACTOR (No., Street, County, State and Zip Code)			X	9A. AMENDMENT OF SOLICITATION NO. W917PM-08-R-0041
			X	9B. DATED (SEE ITEM 11) 14-Apr-2008
				10A. MOD. OF CONTRACT/ORDER NO.
				10B. DATED (SEE ITEM 13)
CODE		FACILITY CODE		
11. THIS ITEM ONLY APPLIES TO AMENDMENTS OF SOLICITATIONS				
<input checked="" type="checkbox"/> The above numbered solicitation is amended as set forth in Item 14. The hour and date specified for receipt of offer <input type="checkbox"/> is extended, <input checked="" type="checkbox"/> is not extended.				
Offer must acknowledge receipt of this amendment prior to the hour and date specified in the solicitation or as amended by one of the following methods: (a) By completing Items 8 and 15, and returning _____ copies of the amendment; (b) By acknowledging receipt of this amendment on each copy of the offer submitted; or (c) By separate letter or telegram which includes a reference to the solicitation and amendment numbers. FAILURE OF YOUR ACKNOWLEDGMENT TO BE RECEIVED AT THE PLACE DESIGNATED FOR THE RECEIPT OF OFFERS PRIOR TO THE HOUR AND DATE SPECIFIED MAY RESULT IN REJECTION OF YOUR OFFER. If by virtue of this amendment you desire to change an offer already submitted, such change may be made by telegram or letter, provided each telegram or letter makes reference to the solicitation and this amendment, and is received prior to the opening hour and date specified.				
12. ACCOUNTING AND APPROPRIATION DATA (If required)				
13. THIS ITEM APPLIES ONLY TO MODIFICATIONS OF CONTRACTS/ORDERS. IT MODIFIES THE CONTRACT/ORDER NO. AS DESCRIBED IN ITEM 14.				
A. THIS CHANGE ORDER IS ISSUED PURSUANT TO: (Specify authority) THE CHANGES SET FORTH IN ITEM 14 ARE MADE IN THE CONTRACT ORDER NO. IN ITEM 10A.				
B. THE ABOVE NUMBERED CONTRACT/ORDER IS MODIFIED TO REFLECT THE ADMINISTRATIVE CHANGES (such as changes in paying office, appropriation date, etc.) SET FORTH IN ITEM 14, PURSUANT TO THE AUTHORITY OF FAR 43.103(B).				
C. THIS SUPPLEMENTAL AGREEMENT IS ENTERED INTO PURSUANT TO AUTHORITY OF:				
D. OTHER (Specify type of modification and authority)				
E. IMPORTANT: Contractor <input type="checkbox"/> is not, <input type="checkbox"/> is required to sign this document and return _____ copies to the issuing office.				
14. DESCRIPTION OF AMENDMENT/MODIFICATION (Organized by UCF section headings, including solicitation/contract subject matter where feasible.)				
ANA Garrison, Delegram, Nimroz Province, Afghanistan				
Delete Section 01010 Scope of Work in its entirety and replace with Section 01010 revised Scope of Work.				
Delete Section 01015 Technical Requirements in its entirety and replace with Section 01015 Scope of Work.				
All other terms and conditions remain unchanged.				
Except as provided herein, all terms and conditions of the document referenced in Item 9A or 10A, as heretofore changed, remains unchanged and in full force and effect.				
15A. NAME AND TITLE OF SIGNER (Type or print)		16A. NAME AND TITLE OF CONTRACTING OFFICER (Type or print)		
		TEL: _____ EMAIL: _____		
15B. CONTRACT OR/OFFEROR	15C. DATE SIGNED	16B. UNITED STATES OF AMERICA		16C. DATE SIGNED
_____ (Signature of person authorized to sign)		BY _____ (Signature of Contracting Officer)		

SECTION 01010
Revised
SCOPE OF WORK

1. GENERAL

The project consists of the design, site-adaptation, and construction of a new garrison facility for the ANA brigade in Delaram, Nimroz Province, Afghanistan. Refer to site coordinates for approximate site location. The project is defined as providing the design, material, labor, and equipment to construct buildings, roads, utilities and other infrastructures for 1000 personnel to include: barracks, shower/latrine and storage facilities, dining facilities (DFAC); power plants and electrical distribution system, communication system, sanitary sewer collection system and waste water treatment, water source and distribution system; and road network inside of the compound and access road to the compound from Delaram. The work within this contract shall meet and be constructed in accordance with current U.S. design and International Building Codes (IBC), Life Safety Codes (NFPA-101), Force Protection and security standards. A partial listing of references is included herein:

IBC, International Building Codes 2003

NFPA 101, Life Safety Codes

UFC 4-010-01, DoD Minimum Anti-Terrorism Standards for Buildings.

1.1 ENGLISH LANGUAGE REQUIREMENT

All information shall be presented in English. The Contractor shall have a minimum of one English-speaking representative to communicate with the COR at all times when work is in progress.

1.2 SUBMITTALS

Submittals and a Submittal Register are required as specified in Section 01335 of the Basic Contract.

1.3 CQM TRAINING REQUIREMENT

Before project design and construction can commence, the Contractor's Quality Control Manager is required to have completed the U.S. Army Corps of Engineers CQM course, or equivalent. The Construction Trades Training Center (CTTC) in Jalalabad, Afghanistan provides a course that satisfies the requirement. Courses are offered at regular intervals. For enrollment and course information contact CTTC at the following:

Mhd. Haris

e-mail: mharis@afghanreconstruction.org

Telephone: 0700 08 0602

Pervaiz

e-mail: adpzmuj@yahoo.com

Telephone: 0700 61 3133

2. LOCATION

2.1 All work under this task order is for the design, site-adaptation, and construction of ANA Infantry Battalion facilities at Delaram, Nimruz Province, Afghanistan. the coordinates of four corners of the site are:

63°26'40.6" E 32°9'22.2" N

63°26'55.7" E 32°9'22.8" N

63°26'55.7" E 32°9'8.4" N

63°26'38.9" E 32°9'6.6" N

3. UNEXPLODED ORDNANCE (UXO)

Contractor IS NOT responsible for clearance/removal.

The contractor is not responsible for the clearance or removal of mines and unexploded ordnance (UXO) from the site prior to the commencement of construction. The site has been cleared and the certificate of clearance is available for review.

It is the responsibility of the Contractor to be aware of the risk of encountering UXO/mines and to take all actions necessary to assure a safe work area to perform the requirements of this contract. The Contractor assumes the risk of any and all personal injury, property damage or other liability arising out of or resulting from any Contractor action taken hereunder. The Contractor and its subcontractors may not handle, work with, move, transport, render safe, or disarm any UXO/mine, unless they have appropriate accreditations from the MAC.

If a UXO/mine is encountered during project construction, the Contractor shall immediately stop work in the affected area and immediately notify the Contracting Officer. UXO/mine disposal will not be the responsibility of the Contractor.

4. SITE AND UTILITY WORK REQUIREMENTS

Drawings and technical references are contained in Appendix and Section 01015. All requirements for building area size are net square meters excluding the exterior walls.

4.1 MASTER PLANNING, MOBILIZATION, GENERAL SITE WORK

The Delaram garrison site is approximately 420 meters X 450 meters irregular shape, see **Appendix A** for grid coordinates of the site area, and **Appendix B** for site layout concept which is only for reference purpose, the contractor will develop the actual layout to be most functional, logical, and engineering sound.

The contractor shall be responsible to develop a master plan base upon a site of 1000 meters x 1000 meters and 5 Kandak 4000 people to include current and future construction. The complete requirement of the Master Planning will be provided at the pre-design meeting. The Master Plan shall include but not limit to: layout of roads, buildings, facilities, structures; utility plans of electric, water, sewage, and storm drain

systems; and location of construction supporting facilities and other temporary structures for building a 4000 personnel brigade garrison.

Construction in this phase shall include but not limit to: general site grading and storm drainage system plan, physical site layout of roads, buildings, facilities, structures in this RFP; utility plans of electric, water, and sewage systems; and location of construction supporting facilities and other temporary structures. The contractor shall plan the site with good storm drain design, a site perimeter to include water well source, and avoid any existing wadi and flood zone.

4.2 SECURITY MEASURES

The contractor shall provide GENERAL perimeter force protection security for developing the site. Security may include but is not limited to temporary fences and private security guards. Perimeter security shall prevent unauthorized site access and provide safety protection to the contractor's work force and government personnel for the duration of the project in facing minor enemy attack. The contractor shall provide a statement describing what measures, facilities, and task force have included and for how long in corresponding to the price proposal Item of "Security Measures". The Contractor is responsible for providing security of the site diligently; however, local police, ANA units, and Coalition forces should be coordinated to support the general security of the site.

If the local security situation requests measures **more than** the general provision specified by the contractor, the contractor shall inform the government immediately or in advance if possible. The government may choose to provide security from military units or pay the contractor additional cost to increase the security measures.

4.3 WATER SYSTEM AND FACILITIES

Contractor shall design and construct a complete water supply, pumping, storage and distribution system with valves, fittings, bends and related accessories for optimum system performance. Design and construction includes installation of water service piping from the supply line with connection to the end user facility.

The water system design and construction include locating the site for water well, drilling of water well and installation of well pump and the sheltering building. The contractor is required to drill maximum two wells at the most potential location within the perimeter of the Garrison. Include installation of hydro-pneumatic water storage tank, service booster pumps, ground storage tank(s) (GST), sized for the entire Phase I of 1000 occupants but designed to be expandable to accommodate the end phase of 4000 occupants. The underground pipe distribution system for phase I shall be designed and constructed that any main water line passing through the phase I site to support for future phase of work shall be constructed according to the Master Plan.

Design assumes that the well shall be constructed to deliver a minimum 345-414 kPa 50-60 pounds per square inch (psi) at a flow rate that is twice the required daily demand. The storage tanks shall provide capacity for a minimum of 100 percent of the required daily demand for 1000 personnel based on 155 L/capita/day (41gal/capita/day). The distribution system shall be designed to provide a minimum 276 kPa (40 psi) at ground

level at all points in the systems. Minimum pressures of 207 kPa (30 psi), under peak domestic flow conditions, can be tolerated in small areas as long as all peak flow requirements can be satisfied. Maximum water pressures in distribution mains and service lines shall not exceed 520 kPa (75 psi) at ground elevation. Maximum pressure of 100 psi can be allowed in small, low lying areas not subject to high flow rates and surge pressures. Fire hydrant flow and irrigation systems shall not be included in design calculations. Provide an enclosed water well house.

4.4 SEWAGE SYSTEM AND WASTE WATER TREATMENT PLAN

The Contractor shall design and construct sanitary sewer gravity collection and treatment system for the garrison, including sanitary sewer collection piping to the user facilities, conveyance of raw sewage to a treatment plant(s), processing of sludge and proper disposal of treated effluent. Underground packaged treatment system is preferred. The contractor is to design the system in the most economic and efficient way in determining the number and location of the treatment plants. The design and construction shall include the requirement that part of the treated water shall be used for irrigation and car wash.

The system shall consist of all the necessary ancillary items appurtenances such as manholes, cleanouts and building service connections plus other standard fittings for optimum system performance. System capacity shall be calculated based on the Phase I 1000 occupants but designed to be expandable to accommodate the end phase of 4000 occupants. The underground pipe collection system for phase I shall be designed and constructed that any main sewage line passing through the phase I site to support for future phase of work shall be constructed according to the Master Plan. a hydraulic waste load that is equivalent to 80 percent of the Required Daily Demand for the water system, or as 33 gallons per capita per day (gpcd), whichever is greater.

4.5 POWER PLANT AND DISTRIBUTION SYSTEM

The contractor shall optimize the power plant design to provide the most economic and efficient solution to the electricity demands and in determining the number and location of the power plants, a centralized power plant is not required. A power plant shall include generators, switchgear, and all appurtenances necessary to meet the electrical demand. Generator size is not to exceed 1MW (1,000kW). Provide a properly ventilated generator shack over generators. Generation shall supply 125% of the maximum calculated demand load plus one (1) additional generator. All generators shall be identical in capacity, features, and manufacturer. Generators shall be provided with a synchronizer switch so that when the total power demand from one (1) generator reaches 90% of the generator's maximum capacity, an additional generator shall automatically start and supplement the running generator, sharing the load between the generators equally. Generators shall be provided with load banks matched to the maximum calculated demand load.

The Contractor shall provide bulk fuel storage capacity based on 30 days full-load operation for the requirements of this contract. Contractor shall provide fuel for testing and inform the government a month in advance to supply operation fuel before turnover to

the Government. All the fuel tanks shall be double walled container with proper support and accessible for refuel from a utility road away from the living and office area. Provide chain link fence and gates around entire fuel storage and power facility. Fuel Storage Tank design and installation shall be in complete compliance with NFPA, API and NEC codes.

The electric system shall be constructed for the Phase I requirement but also fully expandable to accommodate the full brigade garrison of 4000 occupants in the Master Plan. The underground main supply system for phase I shall be designed and constructed that any main power cable passing through the phase I site to support for future phase of work shall be constructed according to the Master Plan.

4.6 FORCE PROTECTION PERIMETER, GUARD FACILITY AND ECP

The Contractor shall design and construct force protection measures to include stone masonry walls, Entry Control Point (ECP), guard towers, guard houses, illumination system. The designer shall incorporate force protection setbacks for new facilities to maximum extent possible as permitted by size of the site and the requirements of the user. Force protection design shall be in accordance with Joint Security Directorate Antiterrorism/Force Protection Guide, March 2002; UFC 4-010-01, Minimum DoD Antiterrorism Standards for Buildings; and UFC 4-010-02, DoD Minimum Antiterrorism Standoff Distances for Buildings.

4.6.1 Perimeter Wall: Phase I construction size is approximately 420 meters X 450 meters. However, the contractor shall design and construct a Force Protection Perimeter Fence on four sides of total 3600 meters (approximately 400 meters overlap with adjacent base) with 2000 meters of stone masonry wall and the rest chain link fence. Provide additional two (2) gates into compound other than the main ECP; 13 guard towers evenly located with 275 meter maximum intervals. Native stone masonry walls are preferred. The height of the walls (masonry or chain-link) shall measure at least 2.5 meters from the inside and outside grades. The wall shall be topped with barbed wire outriggers and single-coil concertina style razor wire. The ground grade shall slope away from the wall for at least 5 meters.

4.6.2 Gates: The gates shall be swing type gates of 3.65 m wide x 2.4 m high leafs, constructed of steel plates, steel tube frame, and steel tube intermediate posts and rails at the masonry wall and the same type of material when the gate is at the chain-link fence section.

4.6.3 Entry Control Point: The Primary ECP shall include a entrance road, manually operated sliding steel gate, a 9 m² guard house, vehicle drop arm barriers; passive anti-ram barriers; and jersey barriers placed in serpentine pattern to prevent high speed vehicle entry into compound. Provide a rejection lane after vehicle inspection and before entering the compound.

4.6.4 Guard Towers: The Contractor shall design and construct a total of 13 Guard towers which shall have a minimum of 3m x 3m in size. The design drawings are provided as **Appendix T**. The guard tower shall be constructed so that there are no obstruction views

in any direction. The guard tower shall have a metal door and horizontal sliding windows with metal window frame. Glazing for the windows shall be a 16mm thick laminated glass. Windows shall be located on all 4 sides to provide a 360 degree viewing area. Windows shall not be screened. Guard Tower shall have a split pack AC unit, general lighting, one 360-degree omni-directional searchlight, one weather-resistant duplex receptacle. For communications, provide two RJ-45 phone jacks with Category 5e cable back to the Communication Building. Searchlights shall be provided as indicated and shall be equivalent to the following: - prison grade - nickel reflectors (bullet resistant) - 65 million candlepower (1000 watts) - manual operation from below with one hand - zenon lamp - weatherproof design

4.7 ROAD NETWORK AND SITE ACCESSORIES

The Contractor shall design the entire road and parking network in the Master Plan. The roads shall be designed to carry traffic of a 7.5 ton vehicle. A storm drainage system shall be incorporated. The road layout shall provide access to entry control points, buildings, parking lots, fuel points, generator yard, domestic water and wastewater treatment plant facilities, power generator plant and solid waste collection points. Sidewalks are required from building to roads and between buildings designed in a way logical to the needs of pedestrians. The Contractor shall construct the entire road, parking, and walkway network finished **with compacted aggregated gravel** to minimize loss of surface material. The pavement for the road network will be an optional bid item.

SOLID WASTE COLLECTION POINT: The Contractor shall design and construct, in proper locations a total of 8 solid waste collection points through out the garrison. The solid waste collection point shall be a 1.8 m X 1.8 m concrete pad with a 1.8 meter tall chain link fence around the perimeter. One side shall have a 1.2 m wide gate entrance. The solid waste collection point shall have a metal roof covering.

4.8 ACCESS ROAD TO THE GARRISON

The Contractor shall design, construct a site access road of 800 meters in length of wearing surface of 7.3 meter wide with 1.0 meters shoulders, graded for proper drainage, provided with necessary drainage measures in accordance with applicable sections of TM 5-822-2 standards, and Ministry of Public Works and Highway Standards. High erosion areas such as shallow drainage ditches and wadi crossings shall be armored with a hard surfaced crossing such as an at-grade concrete crossing structure. Erosion prevention structures shall be constructed in slide and flood areas to prevent road blockage and wash-out.

Pavement surface should consist of 150mm thick compacted aggregate base course material compacted to 95% maximum density placed above 150mm of scarified sub-grade compacted to 95% maximum density with proper drainage. Provide 1.0 meter wide, aggregate base shoulder 150mm thick @ 2.0% slope on both sides of the roadway.

5 BUILDINGS AND FACILITY COMPLEX

The contractor is required to provide **innovative method** to construct the garrison in the most economic and efficient way without compromising the quality and timeliness. The contractor is to propose and decide the structure system and construction methods as

long as the basic requirements specified in this RFP are met. For example, pre-engineered building system, site manufactured panel system, 3-D Wall Panel System used in other projects previously, and other creative construction methods fitting for the local situation are encouraged by the government in order to reduce cost and increase efficiency.

The toilet/shower facilities shall be located with toilets facing North/South away from Mecca, for cultural reasons. Do not provide urinals for cultural reasons in ANA Camp. Toilet shall be eastern style for ANA facilities.

5.1 BARRACK BUILDING TYPE A & B

The Contractor shall design and construct Type A barracks and Type B barracks shown in Appendix C and D. The Contractor shall incorporate the following features into the barracks:

- 1) Provide 6 ceiling fans and 48 power outlets evenly located in the large open rooms in each barrack building.
- 2) At least one power outlets every 4 m.
- 3) Concrete stoops shall be provided at all exterior doors.
- 4) Wall mounted electric forced air AC unit shall be used to maintain a minimum temperature of 18 degree Celsius during winter and 30 degree Celsius during Summer .
- 5) Maintain a building envelop of R-11 wall insulation, R-15 roof insulation, double insulated windows, and insulated metal doors.
- 6) Select the optimal construction method proved to be economic, durable, and fast-erecting.
- 7) The floor is smooth concrete finished with gray colored floor paint.
- 8) Provide 10% exterior area for window with double insulated glass glazing for light and ventilation.
- 9) Flat ceilings shall be located 3m above finish floor. Sloped ceilings shall be located at an average height of 3m above finished floor, with the lowest point no less than 2.6m above finished floor.
- 10) Provide four pair of RJ45 outlets (for telephone and data) in the building with wires connected to central location in the building and a connection point to the exterior of the building which will be able to link to the communication system in the garrison.
- 11) Toilet/shower rooms shall be finished with ceramic tile for floor and wall areas 2 m above floor, and with paint of gross water-resistant finish for rest walls and ceilings.

12) Provide a 2 m2 closet space in each barrack building.

5.2 LATRINE SHOWER ABLUTION FACILITY

The Contractor shall design and construct a toilet, shower, ablution building and the conceptual floor plan is attached in **Appendix E**. The Contractor shall incorporate the following features into the building:

- 1) All sinks shall be trough type constructed of block and concrete with ceramic tile exterior and lining capable of withstanding abuse.
- 2) Shower stalls shall be large enough to allow room to dress and undress between an outer and inner shower curtain and shall have a solid door on the outside.
- 3) All toilets shall be eastern style with wall-mounted hose bib on the right side of the occupant as he faces the stall door. Urinals are not required. Face all toilets in the North/South axis for cultural reasons.
- 4) Maintain a building envelop of R-11 wall insulation, R-15 roof insulation, double insulated windows, and insulated metal doors.
- 5) Wall mounted electric forced air AC unit shall be used to maintain a minimum temperature of 18 degree Celsius during winter and 30 degree Celsius during Summer .
- 6) Drainage for the entire facility shall be accomplished using a sloping floor leading to trench drains.
- 7) Showers shall contain a single mixing valve for hot and cold water mixing and a wall mounted shower head.
- 8) Electric hot water heaters shall be installed to provide hot water to the showers, ablution, and sinks.
- 9) The building shall be constructed with exhaust fans to ventilate steam to the outside environment and, where required, insulated piping to prevent freezing of water pipes in winter.
- 10) All water lines inside of the building shall be galvanized steel and surface mounted. All hot water and cold water piping shall be insulated and provided with stainless steel protective covers.
- 11) Accessories shall include soap dishes, curtain rods, robe hooks, metal shelf.

12) Electric split unit will provide heating and cooling capacity to maintain to maintain a minimum temperature of 18 degree Celsius during winter and 30 degree Celsius during summer.

13) All floors will be finished using ceramic tiles and all walls will have ceramic tile wainscots extending 2.0 m above the finish floor.

14) The lowest ceiling height shall be no less than 3.3m above finished floor.

15) The partition for the toilets and showers can be any durable and tamper-resistant opaque material with less thickness considered better.

5.3 Dining Facility

The contractor shall construct a new Dining Facility (DFAC), design drawing package of this building will be provided for construction to successful Contractor. The floor plan is attached in **Appendix F**.

General requirements as follows:

1) The contractor can re-design and select structure and construction method different from what the government provided.

2) All structural members shall have a fire resistance of at least 1 hour corresponding with construction type 2A as defined in the International Building Code.

3) Maintain a building envelop of R-11 wall insulation, R-15 roof insulation, double insulated windows, and insulated metal doors.

4) Provide evaporative Cooling and heat pump AC unit for cooling and heating.

5) All floors in building shall be slip-free ceramic tiles, except utility and storage type rooms. The dining area shall have the floor sloped to 4 floor drains.

6) One collection point suitable for solid waste disposal temporary storage area adjacent to the DFAC.

7) Hand wash stations in the entry vestibule shall be provided. Trough type sinks shall be used.

8) Provide 6 Floor drains in the kitchen cooking and dishwashing areas.

9) Provide 4 floor drains in the dining area for cleaning purpose.

10) Provide 12 propane fired cooking stoves and 5 tea brewing stoves. Provide a ventilation system (hood) over stoves that are capable of preventing smoke and steam generated during cooking from entering other areas.

11) Design and provide adequate equipment and fixture for food distribution and soiled utensil collection and cleaning processes.

12) Install a large wash basin with a low rim height designed for washing very large pots. Two two-compartment sink, two three-compartment sink, and one mop sink at the cooking and preparation area. Provide one two-compartment sink at preparation area. Provide hot water to kitchen sinks, hand wash stations, and the shower unit through electric water boiler(s).

13) The Contractor shall provide space, fixture, equipment, and electrical outlets for food preparation including refrigerators, shelves, and working tables.

14) Dining Facility Propane Storage- Provide Propane Storage for four (4) weeks operation assuming all stoves are in operation at the highest fuel consumption rate.

15) The stoves are a commercial grade propane type appliance.

16) Walls in kitchen shall be ceramic tile up 2 meter above floor and the cooking area shall be ceramic tile to the ceiling.

17) The Contractor shall provide walk-in cooler and walk-in freezer each with no less than 20 M3.

18) Kitchen ventilation design shall be in accordance with NFPA 92A, NFPA 96, NFPA 204, NFPA 211, and other standards listed in this document as appropriate.

19) Cooking area shall be provided canopy type exhaust-only kitchen hoods and associated exhaust fans. These exhaust hoods shall include baffle type aluminum filters to trap grease/oil. The exhaust fan sizing calculations should recognize the use of propane burning stoves in the kitchen, and that there will be excessive steam and moisture loading due to the use of large pots on this type of stove.

20) Motorized dampers shall be provided to change outdoor/return air mix and to allow summer/winter operation. Exhaust ventilation in the Kitchen area shall be provided with roof or wall mounted centrifugal exhaust fans.

21) Toilet rooms shall be finished with ceramic tile for floor and wall areas 2 m above floor, and with paint of gross water-resistant finish for rest walls and ceilings.

5.4 BATTALION HQ BUILDING

The battalion HQ building floor plan is attached as **Appendix G**. The Contractor shall incorporate the following features into the design and construction of the building:

- 1) Provide power outlets in walls no more than 3 m apart.
- 2) Concrete stoops shall be provided at all exterior doors.
- 3) Wall mounted electric forced air AC unit shall be used to maintain comfort in winter and summer.
- 4) Maintain a building envelop of R-11 wall insulation, R-15 roof insulation, double insulated windows, and insulated metal doors.
- 5) Select the optimal construction method proved to be economic, durable, and fast-erecting.
- 6) The floor is smooth concrete finished with gray colored floor paint, walls and ceilings flat paint finish.
- 7) Provide at least 10% exterior area for window with double insulated glass glazing for natural light and ventilation.
- 8) Provide two pair of RJ45 outlets (for telephone and data) in each room with wires connected to central location in the building and a connection point to the exterior of the building which will be able to link to the communication system in the garrison.
- 9) Toilet rooms shall be finished with ceramic tile for floor and wall areas 2m above floor, and with paint of gross water-resistant finish for rest walls and ceilings.

5.5 BATTALION STORAGE BUILDING

Construct Storage Building with the plan shown in **Appendix H**. Design shall be for open bay facilities, Provide office with 52 inch ceiling fan and an AC unit. Provide two roll up doors. Building shall have 5 meter high unobstructed space. Provide bollards at all vehicle doors, two each jamb.

- 1) Provide power outlets no more than 4 m apart in the walls.
- 2) Maintain a building envelop of R-11 wall insulation, R-15 roof insulation, double insulated windows, and insulated metal doors.
- 3) The floor is smooth concrete finished with gray colored floor paint.
- 4) Provide 10% exterior area for window with double insulated glass glazing for light and ventilation.
- 5) Provide 4 pair of RJ45 outlets (for telephone and data) in the building with wires connected to central location in the building and a connection point to the exterior of the building which will be able to link to the communication system in the garrison.

5.6 BOQ TYPE B

The Contractor shall design and construct Type B BOQ as shown in **Appendix I**. The Contractor shall incorporate the following features into the BOQ:

- 1) Provide 4 power outlets in each room.
- 2) Concrete stoops shall be provided at all exterior doors.
- 3) Wall mounted electric forced air AC unit shall be used to maintain a minimum temperature of 18 degree Celsius during winter and 30 degree Celsius during Summer .
- 4) Maintain a building envelop of R-11 wall insulation, R-15 roof insulation, double insulated windows, and insulated metal doors.
- 5) Select the optimal construction method proved to be economic, durable, and fast-erecting.
- 6) The floor is smooth concrete finished with gray colored floor paint.
- 7) Provide 10% exterior area for window with double insulated glass glazing for light and ventilation.
- 8) Provide 4 pair of RJ45 outlets (for telephone and data) in the building with wires connected to central location in the building and a connection point to the exterior of the building which will be able to link to the communication system in the garrison.
- 9) Toilet/shower rooms shall be finished with ceramic tile for floor and wall areas 2 meters above floor, and with paint of gross water-resistant finish for rest walls and ceilings.

5.7 Arms Storage Building

The Communication building floor plan is attached as **Appendix J**. The Contractor shall build the building shell for the central communication function and incorporate the following features into the design and construction of the building:

- 1) Provide power outlets in walls no more than 4 m apart.
- 2) Concrete stoops shall be provided at all exterior doors.
- 3) Wall mounted electric forced air AC units shall be used to maintain a minimum temperature of 18 degree Celsius during winter and 30 degree Celsius during Summer
- 4) Maintain a building envelop of R-11 wall insulation, R-15 roof insulation, double insulated windows, and insulated metal doors.

5) The floor is smooth concrete finished with gray colored floor paint, walls and ceilings flat paint finish.

6) Provide at least 10% exterior area for window with double insulated glass glazing for natural light and ventilation.

5.8 MOTOR POOL COMPLEX

The Contractor shall design and construct a motor pool gravel holding area of 50m x 50m, and a maintenance garage shall be included.

- 1) After leveling, grading, and compacting the holding yard, the contractor shall overlay the entire graded area with 15cm of compacted 25mm gravel/crush stone.
- 2) Construct 2 meter high chain link fence with barbed wire and vehicle gates surrounding the vehicle holding yard. The contractor shall install barbed wire on supporting arms above the fence posts.
- 3) Construct entry control points each consisting of a vehicle gate and a pedestrian gate. Extend each end member of the gate frames sufficiently above the top member to carry three strands of barbed wire in horizontal alignment.
- 4) The contractor shall construct a two-bay vehicle maintenance facility with plan provided by **Appendix K**, ground slab for garage shall be 300 mm thick to support seven ton vehicles. All concrete shall be reinforced with deformed steel rebar. Provide garage doors measuring at least 4.5 meter in height and 3 meter in width.
- 5) A proper drainage plan shall be incorporated into the maintenance building and exterior concrete finish which shall both slope away from the facility. There shall be a sub-base course installed and compacted to 95% compaction prior to pouring any concrete.
- 6) Provide at least one pair of RJ45 outlets (for telephone and data) at each power outlet location in offices, with wires connected to one central location in the building convenient for service connection. Provide a toilet, a sink and a shower unit inside the building.
- 7) Provide HVAC split unit to the office and toilet room.
- 8) Provide a POL storage building according to Appendix K, which is located at least 10m away from the building and is securely lockable.
- 9) Provide two bollards located at each side of the entrances to the rollup door.
- 10) Preferred building type is pre-engineered metal assembly.

11) A maintenance pit shall be provided with steps into the pit. The Pit shall not be more than 100mm in width and to have concrete safety curbs.

12) Provide an exhaust fan system for maintenance bay to provide adequate ventilation for vehicle exhaustive fume.

VEHICLE REFUELING POINT

The Contractor shall provide for a total capacity of 10,000 liters of diesel storage and 2,500 liters of MOGAS storage; complete with concrete containment dike (if applicable), power, and dispensing pumps. The tank systems shall be a pre-engineered fully assembled fuel storage package. Provide reinforced concrete pad suite for this application.

- The fueling area shall have a metal roof awning covering it;
- Fuel point facility shall be enclosed by a chain link fence, with one lockable vehicle gate (Entry and exit gates for use by large refuel trucks).
- An 8 SM building shall be used by the operator and located near the exit gate of the Fuel Point Facility.
- The Fuel Point Facility shall be paved with a compacted crushed aggregate surface sloped for proper drainage;
- Reinforced concrete slab adjacent to the fueling point, where vehicles can park while fueling, with a minimum 1% slope in three directions and 150mm curb along the slab on the sloped side to contain fuel spills;
- Reinforced concrete slab where tanks will be placed to suite this application.
- Bollards to protect the tanks from vehicles;
- Provide electrical service to the tank units as per the manufacturer's recommendations;
- The system shall include two diesel dispensers with dual hoses and one gasoline dispenser with dual hoses;
- All tanks shall be factory pre-wired; meeting UL Standards 142 and 2085, and UFC Appendix IIF.

6.1 OPTIONAL BUNKERS

Design and provide Concrete Personnel Bunkers though out compound with seating for 750 persons. Site and grade so water cannot stand inside bunkers. Provide 150 mm base course of gravel under sandbags.

6.2 OPTIONAL ANTI VEHICLE TRENCH

Provide an anti-vehicle trench (3 meters wide X 2 meters deep) around perimeter fence and walls. Ditch shall be adjacent to all force protection fences and walls. Ditch shall be 5 meters from perimeter fences and walls. Design anti-vehicle trenches to drain and not hold water after rainfall.

6.3 COMMUNICATION BUILDING

The Communication building floor plan is attached as **Appendix M**. The Contractor shall build the building shell for the central communication function and incorporate the following features into the design and construction of the building:

- 1) Provide power outlets in walls no more than 3 m apart.
- 2) Concrete stoops shall be provided at all exterior doors.
- 3) Wall mounted electric forced air AC units shall be used to maintain comfort in winter and summer.
- 4) Maintain a building envelop of R-11 wall insulation, R-15 roof insulation, double insulated windows, and insulated metal doors.
- 5) The floor is smooth concrete finished with gray colored floor paint, walls and ceilings flat paint finish.
- 6) Provide at least 10% exterior area for window with double insulated glass glazing for natural light and ventilation.
- 7) Toilet rooms shall be finished with ceramic tile for floor and wall areas 2m above floor, and with paint of gross water-resistant finish for rest walls and ceilings.
- 8) Floor depression and special power requirement shall be determined at a design charrette.
- 9) The communication cable system for the Garrison is **not included this contract** and it will be designed and installed under another contract.

6.4 OPTIONAL RECEPTION BUILDING

Reception building floor plan is attached as **Appendix N**. The Contractor shall incorporate the following features into the facility:

- 1) Provide power outlets in walls no more than 3 m apart.
- 2) Concrete stoops shall be provided at all exterior doors.
- 3) Wall mounted electric forced air AC unit shall be used to maintain a minimum temperature of 18 degree Celsius during winter and 30 degree Celsius during Summer.
- 4) Maintain a building envelop of R-11 wall insulation, R-15 roof insulation, double insulated windows, and insulated metal doors.
- 5) The floor is smooth concrete finished with gray colored floor paint, walls and ceilings flat paint finish.
- 6) Provide at least 10% exterior area for window with double insulated glass glazing for natural light and ventilation.

7) Provide two pair of RJ45 outlets (for telephone and data) in the building with wires connected to central location in the building and a connection point to the exterior of the building which will be able to link to the communication system in the garrison.

8) Toilet rooms shall be finished with ceramic tile for floor and wall areas 2m above floor, and with paint of gross water-resistant finish for rest walls and ceilings.

6.5 ANA LAUNDRY FACILITY

The contractor shall design and construct 150 SM ANA laundry building to host 10 commercial washer and 10 commercial dryers, a walking area and a counter, one toilet room, one storage for dirty clothes and one storage for clean laundry.

1) Provide power outlets in walls no more than 4 m apart and utilities for the dryers and washers.

2) Provide 5 deep-well sinks and 5 local clothes ringers for extreme dirty clothes.

3) Concrete stoops shall be provided at all exterior doors.

4) Wall mounted electric forced air AC unit shall be used to maintain comfort in winter and summer. Good ventilation system.

5) Maintain a building envelop of R-11 wall insulation, R-15 roof insulation, double insulated windows, and insulated metal doors.

6) The floor is smooth concrete finished with gray colored floor paint, walls and ceilings flat paint finish.

7) Provide at least 10% exterior area for window with double insulated glass glazing for natural light and ventilation.

8) Provide one pair of RJ45 outlets (for telephone and data) in the building with wires connected to central location in the building and a connection point to the exterior of the building which will be able to link to the communication system in the garrison.

6.6 OPTIONAL ANA MWR FACILITY

ANA MWR floor plan is attached as **Appendix L**. The Contractor shall incorporate the following features into the ANA MWR:

1) Provide power outlets in walls no more than 3m apart.

2) Concrete stoops shall be provided at all exterior doors.

- 3) Wall mounted electric forced air AC unit shall be used to maintain comfort in winter and summer.
- 4) Maintain a building envelop of R-11 wall insulation, R-15 roof insulation, double insulated windows, and insulated metal doors.
- 5) The floor is smooth concrete finished with gray colored floor paint, walls and ceilings flat paint finish.
- 6) Provide at least 10% exterior area for window with double insulated glass glazing for natural light and ventilation.
- 7) Provide six pair of RJ45 outlets (for telephone and data) in the building with wires connected to central location in the building and a connection point to the exterior of the building which will be able to link to the communication system in the garrison.
- 9) Toilet rooms shall be finished with ceramic tile for floor and wall areas 2m above floor, and with paint of gross water-resistant finish for rest walls and ceilings.

6.7 OPTIONAL PAVE 800 M ACCESS ROAD

Pave the road in accordance with the design criteria described in this Section and in Section 1015 and the applicable design provision of TM 5-822-5. The asphalt pavement surface shall have a smooth transition to any existing and proposed concrete culvert with and asphalt pavement surface constructed on top of the concrete.

The option item for paving access road is to pave the entire 800 meter access road with asphalt.

6.8 OPTIONAL PAVE CAMP INSIDE ROADS, PARKING AREA, and WALKWAY

Pave the road in accordance with the design criteria described in this Section and in Section 1015 and the applicable design provision of TM 5-822-5. The asphalt pavement surface shall have a smooth transition to any existing and proposed concrete culvert with and asphalt pavement surface constructed on top of the concrete.

The option item for paving the roads in the Camp includes: Asphalt paving for all vehicle access roads and parking spaces, and concrete paving for all sidewalks and walkways.

7 GENERAL NOTES AND CRITERIA

7.1 If there is conflict between Section 01010 and Section 01015, Section 01010 takes precedence.

7.2 Design and Construct circulation pathways and exit in accordance with building code references herein. Fire sprinkler system is not required. The facility shall comply with all other safety requirements as required within references. Smoke detectors and fire alarm systems shall be installed in accordance with requirements herein.

7.3 All work required under this contract shall be completed within 360 calendar days from Notice to Proceed. Review Section 00150 for Schedule requirements.

7.4 Following facilities shall have three flag poles for the Peoples Islamic Republic of Afghanistan and the United States of America: DFAC #1 and #2, Brigade and Garrison HQ Buildings.

EXAMPLE: MARKING (NOT TO SCALE)



At the base of the flag pole a marble plate shall show following:

از طرف دولت امریکا
برای مردم افغانستان

From the People of the United States
to the People of Afghanistan
In 2008

-- End of Section --

SECTION 01015
Revised
TECHNICAL REQUIREMENTS

1. GENERAL

1.1 The Contractor's design and construction must comply with technical requirements contained herein. The Contractor shall provide design and construction using the best blend of cost, construction efficiency, system durability, ease of maintenance and environmental compatibility. See Appendix D, Design Review Checklists US for additional design guidance in ensuring a quality design.

1.2 These design and product requirements are minimum requirements. The Contractor is encouraged to propose alternate design or products (equipment and material) that are more commonly used in the region; will be equally or more cost effective or allow for more timely completion, but furnish the same system durability, ease of maintenance and environmental compatibility. The Contractor will be required to submit information as requested by the Contracting Officer to make a comparison of the proposed alternate. All variations must be approved by the Contracting Officer.

1.3 ASBESTOS CONTAINING MATERIALS

Asbestos containing material (ACM) shall not be used in the design and construction of this project. If no other material is available which will perform the required function or where the use of other material would be cost prohibitive, a waiver for the use of asbestos containing materials must be obtained from the Contracting Officer.

1.4 SAFETY

1.4.1 Unexploded Ordnance (UXO)

1.4.1.1 UXO/Mine Discovery During Project Construction

It is the responsibility of the Contractor to be aware of the risk of encountering UXO and to take all actions necessary to assure a safe work area to perform the requirements of this contract. If during construction, the contractor becomes aware of or encounters UXO or potential UXO, the contractor shall immediately stop work at the site of encounter, move to a safe location, notify the COR, and mitigate any delays to scheduled or unscheduled contract work. Once the contractor has informed the COR, the contractor will await further direction. The Contractor assumes the risk of any and all personal injury, property damage or other liability arising out of or resulting from any Contractor action taken hereunder.

1.4.1.2 Explosives Safety

1.4.1.2.1 General Safety Considerations

General safety considerations applicable to personnel, both essential and non-essential, at project sites where UXO may be encountered include:

- a. Do not carry fire or spark-producing devices.
- b. Do not conduct explosive or explosive-related operations without approved procedures and proper supervision and UXO safety support.
- c. Do not become careless by reason of familiarity with UXO or the reported probability level of UXO contamination.
- d. Do not conduct explosive or potentially explosive operations during inclement weather.

- e. Avoid contact with UXO except during UXO clearance operations.
- f. Conduct UXO-related operations during daylight hours only.
- g. Employ the "buddy system" at all times.

1.4.1.2.2 Activity Hazard Analysis (AHA) briefings

- a. Activity Hazard Analysis's shall be prepared in accordance with the Corps of Engineers Safety and Health Requirements Manual, EM 385-1-1.
- b. Hazard analyses will be prepared and briefed by personnel that are knowledgeable in UXO and explosives safety standards and requirements. These personnel should understand the specific operational requirement and hazard analysis methodologies. A hazard analysis will be performed for each activity to determine the significance of any potential explosive-related hazards. Explosive residues may be discovered or exposed during UXO operations in the form of powder or various granular and powder based pellets. These contaminants can enter the body through the skin or by ingestion if proper personal hygiene practices are not followed. Explosive fillers such as white phosphorus are dangerously reactive in air and acute exposure can result in serious injury to the skin, eyes, and mucous membranes. They are also a fire hazard.

Safety requirements (or alternatives) that will either eliminate the identified hazards, mitigate or control them to reduce the associated risks to an acceptable level will be developed. The adequacy of the operational and support procedures that will be implemented to eliminate, control, or abate identified hazards or risks will then be evaluated and a second risk assessment completed to verify that a satisfactory safety level has been achieved.

1.4.1.2.3 Notification of Noncompliance

The Contracting Officer will notify the Contractor of any detected noncompliance with the foregoing requirements. The Contractor shall take immediate corrective action after receipt of such notice. Such notice, when delivered to the Contractor at the work site, shall be deemed sufficient for the purpose of notification. If the Contractor fails or refuses to comply promptly, the Contracting Officer may issue an order stopping all or part of the work until satisfactory corrective action has been taken. The Contractor shall make no part of the time lost due to such stop orders the subject of claim for extension of time or for excess costs or damages.

1.5 LIMITATION OF WORKING SPACE

The Contractor shall, except where required for service connections or other special reason(s), confine his operations strictly within the boundaries of the site. Workmen will not be permitted to trespass on adjoining property. Any operations or use of space outside the boundaries of the site shall be by arrangement with all interested parties. It must be emphasized that the Contractor must take all practical steps to prevent his workmen from entering adjoining property and in the event of trespass occurring the Contractor will be held entirely responsible.

Areas located immediately outside the construction area are known to contain mines and unexploded ordnance (UXO). Contractors assume all risks when venturing in or out of the designated work area.

1.6 TEMPORARY STRUCTURES

The Contractor shall erect suitable temporary fences, lighting, and necessary structures to safeguard the site, materials and plant against damage or theft and for the protection of the general public and shall adequately maintain the same throughout the course of the contract.

1.7 SUBCONTRACTORS

Compliance with the provisions of this section by subcontractors will be the responsibility of the contractor.

1.8 LIST OF CODES AND TECHNICAL CRITERIA:

The following codes and technical criteria and those referenced therein shall be required for this project. References within each reference below shall be required and adhered to. This list is not exhaustive and is not necessarily complete.

AABC - Associated Air Balance Council (National Standards for total System Balance)
ACI 318 Building Code Requirements for Structural Concrete (latest edition), American Concrete Institute
Air Force Manual 32-1071, Security Engineering, volumes 1-4, 1 May 1994
American Water Works Association, ANSI/AWWA C651-99 standard
ARI - Air Conditioning and Refrigeration Institute
ASCE 7-02, Minimum Design Loads for Buildings and Other Structures, 2002
ASHRAE - American Society of Heating, Refrigeration and Air-Conditioning Engineers
ASHRAE Standard 55-2004, Thermal Environmental Conditions for Human Occupancy
ASHRAE Standard 62.1-2004, Ventilation for Acceptable Indoor Air Quality
ASHRAE Standard 62.2-2004, Ventilation and Acceptable Indoor Air Quality for Low-Rise Residential
ASHRAE Standard 90.1-2001, Energy Standard for Buildings Except Low-Rise Residential Buildings
ASHRAE Standard 90.2-2004 with 2006 supplement, Energy-Efficient Design of Low-Rise Residential Buildings
ASME - American Society for Mechanical Engineering
ASTM - American Society for Testing and Materials
AASHTO – American Association of State Highway and Transportation Officials
AASHTO – A Policy on Geometric Design of Highways and Streets, latest edition.
AASHTO – Model Drainage Manual
AWS - American Welding Society
Factory Mutual (FM) Approval Guide-Fire Protection (2002).
IBC - International Building Codes, 2003 (and its referenced codes including those inset below)
 IFGC – International Fuel Gas Code
 IMC – International Mechanical Code
 IPC – International Plumbing Code
Lighting Handbook, IESNA, latest edition
MIL-HDBK-1190, Facility Planning and Design Guide
National Electrical Safety Code (NESC), Institute of Electrical and Electronic Engineers (IEEE C2), 2002 edition
NFPA 10, Portable Fire Extinguishers, 2007 edition
NFPA 54, National Fuel Gas Code, 2002
NFPA 58, Liquefied Petroleum Gas Code, 2004
NFPA 70, National Electrical Code, 2002 edition
NFPA 72, National Fire Alarm Code, 2007 edition
NFPA 75, Standard for the Protection of Information Technology Equipment
NFPA 90A, Air Conditioning and Ventilating Systems, 2002 edition
Plumbing and Drainage Institute (PDI-WH-201) water hammer arrestors
SMACNA - Sheet Metal and Air Conditioning Contractors' National Association, Standards and Guides, latest editions
International Mine Action Standards, latest edition; (see <http://www.mineactionstandards.org> for copy of standards)
TM 5-802-1 Economic Studies

TM 5-822-2 - General Provisions and Geometric Design for Roads, Streets, Walks, and Open Storage Areas
 TM 5-822-5 - Pavement Design for Roads, Streets, Walks and Open Storage Areas (Incl C1)
 UFC 1-300-07A Design Build Technical Requirements
 UFC 3-230-03a, Water Supply, 16 Jan 2004
 UFC 3-230-04a, Water Distribution, 16 Jan 2004
 UFC 3-230-06a, Subsurface Drainage, 16 Jan 2004
 UFC 3-230-07a, Water Supply: Sources and General Considerations, 16 Jan 2004
 UFC 3-230-08a, Water Supply: Water Treatment, 16 Jan 2004
 UFC 3-230-09a, Water Supply: Water Storage, 16 Jan 2004
 UFC 3-230-10a, Water Supply: Water Distribution, 16 Jan 2004
 UFC 3-230-13a, Water Supply: Pumping Stations, 16 Jan 2004
 UFC 3-230-17FA, Drainage in Areas Other than Airfields, 16 Jan 2004
 UFC 3-240-03N, Operation and Maintenance: Wastewater Treatment System Augmenting Handbook, 16 Jan 2004
 UFC 3-240-04a, Wastewater Collection, 16 Jan 2004
 UFC 3-240-09A Domestic Wastewater Treatment 22 June 2007
 UFC 3-250-01FA pavement Design for Roads, Streets, Walks and open Storage Areas
 UFC 3-250-3 Standard Manual Practice for Flexible Pavements, May 01
 UFC 3-260-02, Pavement Design for Airfields, 30 June 2001
 UFC 1-300-09N, Design Procedures, 25 May 2005
 UFC 3-310-01, Structural Load Data, 25 May 2005
 UFC 3-400-01, Design: Energy Conservation, 5 July 2002
 UFC 3-400-02, Design: Engineering Weather Data, 28 Feb. 2003
 UFC 3-410-01FA Heating, Ventilating and Air Conditioning, Change 1, 15 May 2003
 UFC 3-410-02A, HVAC Control Systems. 15 May 2003
 UFC 3-420-01, Design: Plumbing Systems, 25 Oct. 2004
 UFC 3-420-02FA, Design: Compressed Air, 15 May 2003
 UFC 3-430-01FA, Heating and Cooling Distribution Systems, 27 July 2003
 UFC 3-430-05FA, Design: Gas Distribution, 15 May 2003
 UFC 3-450-01, Design: Noise and Vibration Control, 15 May 2003
 UFC 3-460-01, Design: Petroleum Fuel facilities, 16 Jan 2004
 UFC 4-020-01FA, Security Engineering: Project Development, 1 Mar 2005
 UFC 4-020-02FA, Security Engineering: Concept Design, 1 Mar 2005
 UFC 4-020-03FA, Security Engineering: Final Design, 1 Mar 2005
 UFC 4-020-04FA, Electronic Security Systems: Security Engineering, 1 Mar 2005
 UFC 4-021-01, Design and O&M: Mass Notification Systems, draft 1 May 2006
 Underwriters' Laboratories (UL) Fire Protection Equipment Directory (2002)
 UL Standards (as applicable)
 UL 710, Exhaust Hood for Commercial Cooking Equipment, latest edition
 UL 737, Fireplace Stoves, latest edition
 UL 752, Bullet Resisting Equipment, 2000 or later

The publications to be taken into consideration shall be those of the most recent editions. Standards other than those mentioned above may be accepted if the standards chosen are internationally recognized and meet the minimum requirements of the specified standards. The Contractor shall be prepared to submit proof of this if requested by the Contracting Officer.

2. SITE DEVELOPMENT:

2.1 GENERAL

The project includes furnishing all materials, equipment and labor for constructing water, sanitary sewer and storm sewer service lines, as applicable, and connecting to the existing sewer networks.

2.2 ENVIRONMENTAL PROTECTION

2.2.1 Applicable regulations

The Contractor shall comply with all Host Nation laws, rules, regulations or standards concerning environmental pollution control and abatement with regard to discharge of liquid waste into natural streams or manmade channels. The contractor shall review host nation and U.S. Government environmental regulations with the contracting officer prior to design and discharge of any liquid wastes into natural streams or manmade channels.

2.2.2 Notification

The Contracting Officer will notify the Contractor in writing of any observed non-compliance with the foregoing provisions. The Contractor shall immediately take corrective action. If the Contractor fails or refuses to promptly take corrective action, the Contracting Officer may issue an order stopping all or part of the work until satisfactory corrective action has been taken. No extension of time or damages will be awarded to the Contractor unless it was later determined that the Contractor was in compliance.

2.2.3 Spillages

Measures shall be taken to prevent chemicals, fuels, oils, greases, bituminous materials, waste washings, herbicides and insecticides, and construction materials from polluting the construction site and surrounding area.

2.2.4 Disposal

Disposal of any materials, wastes, effluents, trash, garbage, oil, grease, chemicals, etc., shall be taken to a dumpsite off site and subject to the approval of the Contracting Officer. Burning at the project site for the disposal of refuse and debris will not be permitted.

2.3 CIVIL SITE DEVELOPMENT

2.3.1 SITE PLAN

The contractor shall locate the facilities in general agreement with the drawings included and any requirements in the Scope of Work 01010. All buildings, roads, parking areas, entry control points, guard towers, wall, fence, utility structures, and other site features shall be clearly defined and dimensioned on the site plan. Buildings shall be located to provide access for emergency vehicles and fire fighting. Roads and parking areas shall be designed for turning radius of the largest vehicle entering the compound.

The site plan shall show geometric design of the site, including applicable dimensions of all exterior facilities, mechanical equipment, pavements, utilities, etc. Required facilities are described in the following sections of this specification. All roads and areas where tractor-trailer vehicles will travel shall be designed for the worst case turning radius. Design and construction of roads and pavements shall be based on recommendations from geotechnical investigation required herein.

All site plans and master plans shall be drawn in the following projection and datum for incorporation into the U.S. Army Corps of Engineers GIS system:

WGS 1984 UTM Zone 42 S

2.3.2 DEMOLITION (NOT USED)

2.3.3 GRADING AND DRAINAGE

The contractor will provide all necessary site grading to insure adequate drainage so that no areas will be flooded due to a rainfall of a 10-year frequency. Drainage of the area should be compatible with the existing terrain. Building floor elevation shall be a minimum 150mm above grade and slope away from the building on all sides at a minimum of 5% for 3 meters.

2.3.4 PAVING

2.3.4.1 Roads

Paved roads design are required within the base camp area. All pre-existing conditions are undeveloped land with gentle slopes, without substantial vegetation and with natural drainage channels of moderate size and spacing that are dry most of the time. All roads shall be of hot mix flexible asphalt concrete wearing surface 7.3 meters (24 feet) wide, unless otherwise noted, graded for proper drainage, provided with necessary drainage structures and completed with prescribed surfaces in accordance with applicable sections of TM 5-822-2 and TM 5-822-5 standards. The compound (cantonment area) roads sections shall have 200 mm (8 inch) compacted base course minimum and shall be surfaced wearing course with a minimum 50 mm (2 inch) hot mix asphalt concrete, unless otherwise noted. Contractor shall notify the Contracting Officer immediately if initial site survey determines that area hydrology requires major drainage structures or bridges. Also, the Contracting Officer shall be immediately notified if the required lengths of road or preexisting conditions are determined to be substantially or materially different than the above-described conditions/estimates. The Contractor shall construct gravel subbase roads, complete site grading and installation of all required drainage structures, to serve the Base Bid Contract.

2.3.4.2 Bridges and Site Grading Plan

Preliminary investigation indicates existing drainage areas and wadi crossing. Bridges, culverts, gabion crossings, concrete wadi crossings or other related structures shall be constructed as required over rivers, creeks and wadis that contain water and deep drainages that fill with water during storm events. The contractor shall design a site grading plan that provides positive drainage and minimizes the requirement for major structures in a cost effective manner.

2.3.4.3 Parking Areas and Motor Pools

Contractor shall construct parking and storage areas using aggregate surface. Subgrade shall be 150mm (6 inches) minimum in depth scarified and compacted to 95% proctor density. Aggregate base shall be 150mm (6 inches). Aggregate Base Course (ABC) material must be well graded, durable aggregate uniformly moistened and mechanically stabilized by compaction. Degree of compaction shall be expressed as a percentage of the maximum density obtained by the test procedure presented in ASTM D 1557 or equivalent DIN, BS, or EN standards.

2.3.5 Entry Control Point

2.3.5.1 Exterior Compound Wall

Design and construct a Force Protection Perimeter Stone Masonry Wall per Scope of Work Section 01010 and RFP. All foundations shall extend below the frost line to frost depth (min 800 mm), top of wall shall be 2500 mm from finish grade to high point of concrete cap, and align with top of chain link. Provide detail/elevation at fence indicating how fence will transition from level to slope and over ridges. The footing must be sized to resist sliding and overturning from the design loads. Install outriggers and single-strand concertina wire on top of the wall. The walls shall measure at least 2500 mm high with a thickness of the walls not less than 600 mm.

2.3.5.2 Gates and Fence

Fence and gate fabric shall be No. 9 gage wires woven into a 50 mm diamond mesh. Fabric shall be coated with 366 grams per square meter zinc galvanizing. Posts shall be ASTM F 1083 Pipe, Steel, Hot Dipped Zinc Coated (Galvanized) Welded or equal. Post sizes shall be as shown on drawings.

The gates shall be sliding type. Vehicle gates shall be a pair of 3.65 m wide x 2.4 m high leaves, constructed of a steel tube frame and steel tube intermediate posts and rails. Design and construct a Force Protection entry gates heavy steel frame, with minimum 2.5 mm steel skin and matching man gate with view port. Gates shall swing from one meter square reinforced concrete columns covered with stone to match fence. Provide reinforced grade beam across gateway flush with pavement to lock gates with flush mounted vertical sliding bolts, bolts shall be 50 mm diameter solid steel. The design of the gates shall insure that it is dimensionally stable, square, true and planar. Provide a locking mechanism that holds the gates together when in the closed position as well as a drop bolt that engages a steel sleeve embedded in the pavement. Provide side gate door for individual access through the sliding gate with a peek hole.

2.3.5.3 Reinforced Barbed Tape

Reinforced barbed tape shall be 600 mm diameter concertina style coil consisting of 31 loops. Each loop shall consist of 19 barb clusters per loop. Adjacent coils loops shall be alternately clipped together at three points about the circumference to produce the concertina effect upon deployment. Spacing between attachments points when deployed shall be 400 mm. The reinforced barbed tape shall be fabricated from 430 series stainless steel with hardness range of Rockwell (30N) 37-45 conforming to the requirements of ASTM A 176. Each barb shall be a minimum of 30.5 mm (1.2 inch) in length, in groups of 4, spaced on 102 mm (4 inch) centers. The stainless steel core wire shall have a 2.5 mm (0.098 inch) diameter with a minimum tensile strength of 895 MPa. Sixteen gauge stainless steel twistable wire ties shall be used for attaching the barbed tape to the barbed wire. The reinforced barbed tape shall be equivalent to NSN: 5660-01-457-9852.

2.3.5.4 Outriggers

Outrigger supporting arms shall be "Y" shaped with post securely embedded into the top of the wall. Posts shall conform to ASTM F 1083, Pipe, Steel, Hot Dipped Zinc Coated (Galvanized) Welded.

2.3.5.5 Vehicle Barriers

2.3.5.5.1 Active Barriers - Drop Arm Gates

The height of the beam shall be a minimum of 30 inches above finished grade. The crash beam must be capable of blocking a minimum road width of 4.0 meters. The crash beam shall be manually raised and lowered with less than 30 pounds of force. The end of the crash beam should include a locking pin with padlock acceptance for securing the beam when it is in the down position capable of stopping large (10,000 lb.) trucks, in addition to heavy duty steel gates into the Brigade.

Additional active barriers shall be tire shredder type with manual latch down capability. Shredders shall extend the entire width of the roadway opening where installed.

2.3.5.5.2 Passive Barriers

Barriers shall be concrete blocks of one meter by one meter by one meter dimensions. Similar arrangements of large stones (one cubic meter size), jersey barriers or equal sized obstacles may

be used.

2.3.6 CIVIL UTILITIES

2.3.6.1 General

The design of the water and sanitary systems shall be sized to provide flow and discharge based on a fixture unit basis. The design drawings shall show all utility lines, line sizes, valves, manholes, disinfection systems, and applicable details associated with water and sanitary system designs. Specifications covering water lines, valves, pumps, controls, sanitary sewers and storm sewers shall be submitted as part of the design and shall require standard materials that are available in-country. Contractor shall install and connect exterior sanitary sewer collection and water supply piping to service connection points of each facility requiring such.

2.3.6.2 Water

2.3.6.2.1 General Water

Infrastructure design (groundwater wells, booster pumps, storage tanks, transmission piping and distribution piping networking) and construction shall serve the demand based on full build out population of the ANA base camp. The Contractor shall install water distribution mains, branches, laterals, lines and service connections to include all pipe, valves, fittings and appurtenances. Exterior water line construction shall include service to all buildings as described in the Scope of Work Section 01010. The required Average Daily Demand (ADD) approximation is derived from 155 liters per capita per day (lpcd) equivalent to 41 gpcd. In the event potable or non-potable use water is required prior to completion of the water facilities infrastructure the Contractor may be issued a Request for Proposal to provide non-potable (tank truck) and potable (bottled or other reliable source) consumption. Provide a minimum of one (1) outside water hydrant (hose spigot) for any building or facility for which a water supply is provided for landscaping purposes.

2.3.6.2.2 Water Quality Sampling and Analysis

The Contractor shall perform water quality sampling and testing at the source. The Contractor shall utilize well-qualified and equipped testing capability in the project site area, if available. If professional testing services are not available in the area, the Contractor will submit an alternative practical testing source for approval. Raw water quality criteria for Water Quality and Criteria Standards, and shall address the following: PH, turbidity, conductivity, oxidation reduction potential, total dissolved solids, color, odor, total coliform /fecal coliform (bacteria) an indicator of the presence of E. coli. These baseline parameters are a partial list as presented in TM5-813-3/AFM 88-10 APPENDIX A.

2.3.6.2.3 Well House

At new wells or springs, construct a permanent well house with concrete slab floor. The floor of the well house shall slope away from the casing approximately 3 mm per 300 mm (1/8" per foot) to discharge any well water overflow to the outside via a drain outlet. Top of the concrete slab (finish floor elevation) of well house shall be 300 mm or 12 inches above the expected high water mark or flood plain level and be about 30 meters from the edge of a stream or drainage channel bank. The well house design should be such that the well pump, motor and drop pipe could be removed readily via a roof hatch that shall be insulated and lockable with a hasp and lock. The well house shall protect valves and pumping equipment plus provide freeze protection for the pump discharge piping beyond the check valve. The well house shall be insulated and a heating unit installed. The entry door shall be a heavy duty insulated metal door and frame and lockable. The well shall be protected from unauthorized use by providing a surrounding security fence with a lockable gate. Provide outriggers, barbed wire and concertina wire on fence and gate.

2.3.6.2.3.1 Water Storage Tank and Well Pump Sequence of Operation:

High High, High and Low Level Switches and level transmitters shall be installed in the Water Storage Tank at predetermined levels. The Level Switches shall be similar to Varec LH23-1201 Switch-Tek Mini Level Flow Switch or equal. The High High Level Switch shall set off an alarm to signify a failure of the Well Pump instrumentation and the Water Tank is in danger of overflowing. The Low Level Switch will activate the Well Pump and provide power to a Normally Open Electrically Operated Valve located on the Water Tank nozzle. The High Level Switch will shut off power to the Normally Open EO Valve so the valve will close. The Well Pump Controller will be located near the Well Pump and shall consist of a Non Reversible Magnetic Starter with Fused Disconnect Switch sized for the pump motor and a Hand Off Automatic Switch (HOA) switch. The HOA switch will be placed in the Hand or Off position only when maintenance is being performed on the Well Pump or the Water Tank or the High High Level Alarm has been activated on the Water Storage Tank and the tank is in danger of overflowing. Otherwise the HOA switch is normally in the automatic position. A shutdown switch will also be located near the Water Tank. This switch will also be utilized only if the Tank is Overflowing. A pressure switch will be located in the Well Pump discharge line to stop the Well Pump at a designated design setting. This pressure switch shall be overridden when the HOA switch is in the Hand or Off mode.

The contractor shall account for surges and air in system due to the frequent starting/stopping of the Well Pump in the piping design.

2.3.6.2.4 Raw Water Disinfection

Contractor shall perform disinfection of the well water in accordance with AWWA A 100 or equivalent. Bacteriological samples shall be collected and examined in accordance with Standard Methods for the Examination of Water and Wastewater by a qualified lab as approved by the Contracting Officer.

2.3.6.2.5 Service Booster Pumps (Direct-Pressure System)

Contractor shall provide a booster pump station with end suction or split case double suction horizontal split case (frame mounted) centrifugal pumps arranged in parallel for pumping water storage into the main distribution system. The pumps and controls shall be designed to supply and maintain acceptable system pressure throughout the distribution network given the full range of flow conditions (low flow to peak). For conditions of low demand and to prevent short cycling of primary pumps, provide a low demand jockey pump with capacity of one-third (1/3) of the Average Daily Demand (ADD). Each booster pump, two (2), shall be capable of delivering 2 times (2x) the ADD. Provide suitable expansion tank. The suction side of the service booster pumps shall have an eccentric reducer and gate valve installed. The discharge side shall have a gate valve, check valve between the pump and the gate valve and concentric reducer, pressure gage and air relief valve.

2.3.6.2.6 Ground Water Storage Tank (GST)

Contractor shall provide a circular steel or circular concrete ground storage reservoir (GST) to be located on the ground surface. Volume of the GST shall be a minimum storage volume of a full days demand. The Contractor shall verify storage volume requirements based on final design population. The storage facility shall be located above drainage areas and locations subject to flooding as approved by the Contracting Officer. The storage facility shall be located on the higher elevations of the site to promote gravity flow and reduce pumping requirements. Overflow and air vents shall be screened so that birds, rodents and debris cannot enter the reservoir.

2.3.6.2.7 Disinfection & Chlorination System

Use hypochlorite compounds for disinfection. A hypo-chlorinator shall be used to feed a sodium hypochlorite solution of 5-15% available chlorine into the system. Hypochlorite compound may be a liquid or solid form. The hypo chlorination system shall consist of a chemical solution tank for hypochlorite, diaphragm-type pump, power supply, water pump, pressure switch and storage tank (optional hydro-pneumatic/storage). The pump shall feed a hypochlorite solution in proportion to the water demand. The hypo-chlorinator shall have a pumping rate, liters per day (lpd) (gallons per day (gpd)) adequate to deliver 5 percent (%) available hypochlorite solution adjustable to the quantity of water being produced from the source. Dosage rate will vary somewhat depending on actual pump production rate and available residual chlorine in the system. Contractor shall determine the required dosage rate milligrams per liter (mg/l) to maintain the required chlorine residual (usually 0.2-0.4mg/l) in the distribution system. Chlorine solution tank shall be large enough to hold a three days supply of hypochlorite solution. A fresh solution shall be prepared every two or three days because the solution may lose its strength over time and this will affect the actual chlorine feed rate. The hypochlorite shall be stored in a cool dry place. Sodium hypochlorite can lose from two to four percent of its available chlorine content per month at room temperature. Contractor shall verify required minimum residual chlorine in accordance with local requirements verified and approved by the Contracting Officer. The chlorination system shall have the capability for manually adjusting the dosage rate and be installed in such a manner that the system can be easily disconnected and bypassed in the event of health safety or routine maintenance and repair. Disinfection of water mains shall be in accordance with AWWA standard C651-86 and disinfection of storage facilities in accordance with AWWA standard C652 86.

2.3.6.2.8 Chlorine Shelter

Contractor shall furnish a shelter as per chlorine manufacturer's installation requirements. The Contractor shall provide manufacturers catalog information and shop drawing to the Contracting Officer for approval.

2.3.6.3 Water Distribution System

2.3.6.3.1 General

The Contractor shall provide a water distribution system described as follows: Pipe diameters used in the network shall be 300mm (12 inch), 250mm (10 inch), 200mm (8 inch), 150mm (6 inch) and 100mm (4 inch), as calculated, using ductile iron (DI) conforming to AWWA C151, installed in accordance with C 600 or polyvinyl chloride (PVC) as per ASTM D 1784 and 1785. All pipes and joints shall be capable of at least 1.03 Mpa (150 psi) and 1.38 (200psi) hydrostatic test pressure unless otherwise specified. Pipes should be adequate to carry the maximum quantity of water at acceptable velocities 0.9 to 1.5m/sec (3 to 5 ft/sec) at maximum flows not to exceed 2.8m/sec (9.2ft/sec) with working pressures of 240kPa (35psi) to 350kPa (50psi). Minimum pressure shall be 140kPa (20psi) to all points of the distribution system and maximum pressure shall be 690kPa (100psi). If high pressures (greater than 690kPa) cannot be avoided, pressure-reducing valves shall be used. Water service connections to buildings shall vary from 19mm, 25mm or 38mm to 75mm, as calculated, depending on the usage requirement. Pipe service connections from the distribution main to the building shall be either Polyvinyl Chloride (PVC) plastic Schedule 80 ASTM D 1785 or copper tubing conforming to ASTM B 88M, Type K, annealed. After choosing piping material type, use similar piping materials for all buildings for efficiency of future maintenance activities. The distribution network shall be laid out in a combination grid and looped pattern with dead ends not exceeding 30m (99 feet). Dead end sections shall not be less than 150mm (6 inch) diameter and shall either have blow off valves or fire hydrants (flushing valves) installed for periodic flushing of the line. Any pipe with a fire hydrant on the line shall be at least 150mm (6 inch) in diameter. Water supply distribution shall connect to a building service at a point approximately 1.5m (5 feet) outside the building or structure to which the service is required. Adequate cover must be provided for frost protection. A

minimum cover of 800mm (2'-8") is required to protect the water distribution system against freezing. Water lines less than 1.25 meters (4 feet) deep under road crossings shall have a reinforced concrete cover of at least 150 mm (6 inch) thickness around the pipe.

2.3.6.3.2 Pipe

The Contractor shall provide pipe of adequate strength, durability and be corrosion resistant with no adverse effect on water quality. The exterior surface of the pipe must be corrosion resistant. If the pipe is installed underground pipe shall be encased with polyethylene in accordance with AWWA C105. Water distribution pipe material shall be PVC or Ductile Iron (DI). Ductile iron pipe shall conform to AWWA C104, etal. DI fittings shall be suitable for 1.03MPa (150psi) pressure unless otherwise specified. Fittings for mechanical joint pipe shall conform to AWWA C110. Fittings for use with push-on joint pipe shall conform to AWWA C110 and C111. Fittings and specials shall be cement mortar lined (standard thickness) in accordance with C104. Polyvinyl Chloride (PVC) pipe shall conform to ASTM D 1785. Plastic pipe coupling and fittings shall be manufactured of material conforming to ASTM D 1784, Class 12454B. PVC screw joint shall be in accordance with ASTM D 1785, etal, Schedules 40, 80 and 120. PVC pipe couplings and fittings shall be manufactured of material conforming to ASTM D 1784, Class 12454B. Pipe less than 80mm (3 inch), screw joint, shall conform to dimensional requirements of ASTM D schedule 80. Elastomeric gasket-joint, shall conform to dimensional requirements of ASTM D 1785 Schedule 40, All pipe and joints shall be capable of 1.03 Mpa (150psi) working pressure and 1.38 Mpa (200psi) hydrostatic test pressure.

2.3.6.3.3 Hydrostatic, Leakage and Disinfection tests

The Contracting Officer will be notified not less than 48 hours in advance of any water piping test and will be given full access for monitoring testing procedures and results. Where any section of water line is provided with concrete thrust blocking for fittings or hydrants tests shall not be made until at least 5 days after installation of the concrete thrust blocking, unless otherwise approved.

2.3.6.3.4 Pressure Test

After the pipe is laid, the joints completed, and the trench partially backfilled leaving the joints exposed for examination, the newly laid piping or any valved section of piping shall, unless otherwise specified, be subjected for 1 hour to a hydrostatic pressure test of 1.03 MPa (150 psi). Each valve shall be opened and closed several times during the test. Exposed pipe, joints, fittings, hydrants and valves shall be carefully examined during the partially opened trench test. Joints showing visible leakage shall be replaced or remade as necessary. Cracked or defective pipe, joints, fittings, hydrants and valves discovered following this pressure test shall be removed and replaced and retested until the test results are satisfactory.

2.3.6.3.5 Leakage Test

Reference AWWA C600 (DI) pipe or AWWA C605 (PVC) - Leakage test shall be conducted after the pressure tests have been satisfactorily completed. The duration of each leakage test shall be at least 2 hours and during the test the water line shall be subjected to not less than 1.03 MPa (150psi). Leakage is defined as the quantity of water to be supplied into the newly laid pipe, or any valved or approved section, necessary to maintain pressure to within 34.5kPa (5 psi) of the specified leakage test pressure after the pipe has been filled with water and the air expelled. Pipe installation will not be accepted if leakage exceeds the allowable leakage, which is determined by the following formula:

$L = 0.0001351ND (P \text{ raised to } 0.5 \text{ power})$ L = Allowable leakage in gallons per hour N = Number of joints in the length of pipeline tested D = Nominal diameter of the pipe in inches P = Average test pressure during the leakage test, in psi gauge

Should any test of pipe disclose leakage greater than that calculated by the above formula, the defective joints shall be located and repaired until the leakage is within the specified allowance, without additional cost to the government. Leakage and pressure testing shall not be conducted until thrust block curing is complete.

2.3.6.3.6 Bacteriological Disinfection

2.3.6.3.6.1 Disinfection Procedure

Before acceptance of potable water operation, each unit of completed waterline shall be disinfected as prescribed by AWWA C651. After pressure tests have been completed, the unit to be disinfected shall be thoroughly flushed with water until all entrained dirt and mud have been removed before introducing the chlorinating material. Flushing will be performed in a manner and sequence that will prevent recontamination of pipe that has previously been disinfected. The chlorinating material shall be liquid chlorine, calcium hypochlorite, or sodium hypochlorite. The chlorinating material shall provide a dosage of not less than 50 ppm and shall be introduced into the water lines in an approved manner. Polyvinyl Chloride (PVC) pipelines shall be chlorinated using only the above-specified chlorinating material in solution. The agent shall not be introduced into the line in a dry solid state. The treated water shall be retained in the pipe long enough to destroy all non-spore forming bacteria. Except where a shorter period is approved, the retention time shall be at least 24 hours and shall produce not less than 25 ppm of free chlorine residual throughout the line at the end of the retention period. Valves on the lines being disinfected shall be opened and closed several times during the contact period. The line shall then be flushed with clean water until the residual chlorine is reduced to less than 1.0 ppm. During the flushing period, each fire hydrant on the line shall be opened and closed several times.

2.3.6.3.6.2 Sampling

For each building connected to the water system, personnel from the Contractor's commercial laboratory shall take at least 3 water samples from different points, approved by the Contracting Officer, in proper sterilized containers and perform a bacterial examination in accordance with approved methods. The commercial laboratory shall be verified to be qualified by the appropriate authority for examination of potable water.

2.3.6.3.6.3 Acceptance Requirements

The disinfection shall be repeated until tests indicate the absence of pollution for at least 2 full days. The unit will not be accepted until satisfactory bacteriological results have been obtained.

2.3.6.3.7 Time for making Tests

Except for joint material setting or where concrete thrust blocks necessitate a 5-day delay, pipeline jointed with rubber gaskets, mechanical or push-on joints, or couplings may be subjected to hydrostatic pressure, inspected and tested for leakage at any time after partial completion of backfill.

2.3.6.3.8 Concurrent Tests

The Contractor may elect to conduct the hydrostatic tests using either or both of the following procedures. Regardless of the sequence of tests employed, the results of pressure tests, leakage tests, and disinfection shall be recorded for submission and approval. Replacement, repair or retesting required shall be accomplished by the Contractor at no additional cost to the Government. a. Pressure test and leakage test may be conducted concurrently, b. Hydrostatic tests and disinfection may be conducted concurrently, using water treated for disinfection to accomplish the hydrostatic tests. If water is lost when treated for disinfection and air is admitted to

the unit being tested, or if any repair procedure results in contamination of the unit, disinfection shall be re-accomplished.

2.3.6.3.9 Valves

Valves (Gate valves w/box) shall be placed at all pipe network tee and cross intersections and the number of valves shall be one less than the number of lines leading into and away from the intersection. For isolation purposes valves shall be spaced not to exceed 3600 mm (12 feet). Gate valves shall be in accordance with AWWA C 500 and/or C509. Butterfly valves (rubber seated) shall be in accordance with C504 etal. The valves and valve boxes shall be constructed to allow a normal valve key to be readily used to open or close the valve. Provide traffic-rated valve boxes. Provide concrete pad, 1 meter (3'-4") square, for all valve boxes.

2.3.6.3.10 Vacuum and Air Release Valves

Air release valves are required to evacuate air from the main high points in the line when it is filled with water, and to allow the discharge of air accumulated under pressure. Vacuum relief valves are needed to permit air to enter a line when it is being emptied of water or subjected to vacuum. Contractor shall submit manufacturer's data for properly sized combination air and vacuum release valves and determine their locations on the distribution system subject to review and approval of the Contracting Officer.

2.3.6.3.11 Blow-Off Valves

The Contractor shall provide 40-50mm (1-5/8" – 2") blow-off valves at ends of dead end mains. Valves should be installed at low points in the mains where the flushing water can be readily discharged to natural or manmade drainage ditches, swales or other.

2.3.6.3.12 Thrust Blocking

Contractor shall provide concrete thrust blocking at any point where the layout of the system changes the direction of the flow, increases the velocity, or decreases or stops the flow. At these points, the pipes and fittings must be anchored and kept from moving or pulling apart by the use of thrust blocks installed against undisturbed earth. Thrust blocking shall follow AWWA C600 with concrete cured to exceed 17.25MPa (2,500psi) compressive strength.

2.3.6.13 Building Water Service Connections and Service Lines

Service connections and service line pipe will be installed in as direct a path as possible from the distribution main to the building served and will enter the building on the side closest to the distribution main. Service line connections will be installed below the frost depth. If the distribution main pipe diameter and wall thickness is adequate, smaller service lines may be connected to the main by direct drilling and tapping. Larger service connections (greater than 2 inch (50mm)) may necessitate the installation of tees or special branch connections. Service connections being made under pressure will use a tapping machine, tapping valve and sleeve . The Contractor shall install all base bid and future service connections on the main water supply pipe. Service connection points for future service shall be valved, plugged and terminated at the road ROW LINE or UTILITY EASEMENT LINE as applicable (**within the base bid areas at a point closest to the future facilities**). Contractor shall clearly identify all future service connection points. Future water service lines to future buildings will be installed by others. Service piping shall extend to a point (1.5m) from the building or facility, then connected to the building plumbing 1.5m point outside the building.

2.3.6.4 Sanitary Sewer

2.3.6.4.1 General

There are no functional or salvageable sanitary sewer collection, treatment or disposal facilities at this site. The Contractor shall obtain topographic information or other maps that show vegetation, drainage channels and other land surface features such as underground utilities and related structures that may influence the design and layout of the collection system. If maps are not available, or do not provide satisfactory information or sufficient detail of the site, field surveys shall be performed. Sanitary sewers less than 1.25 meters (4 feet) under road crossings shall have reinforced concrete cover at least 150 mm (6 inch) thick around the pipe.

Exterior sanitary sewer system construction shall include service to all buildings as described in the Scope of Work Section 01010. Sanitary sewer collection, pumping, treatment and effluent disposal and sludge treatment facility, shall be designed to accommodate the full base "build-out" population, (current proposed). Contractor shall design sanitary sewer collection system using approved field survey data and finished floor elevations. Depending upon the topography and building location, the most practical location of sanitary sewer lines is along one side of the street. In other cases they may be located behind buildings midway between streets. Main collection sewers will follow the most feasible route to the point of discharge. The sewer collection system shall be designed to accommodate the initial occupancy and a reasonable expansion capability. All sewers shall be located outside of the roadways as much as practical, and minimize the number of roadway crossings. To the extent practical, a sewer from one building shall not be constructed under another building, or remain in service where a building is subsequently constructed over it. Construction required shall include appurtenant structures and building sewers to points of connection with building drains 1.5m (5 feet) outside the building to which the sewer collection system is to be connected.

The Contractor shall use the following criteria where possible to provide a layout which is practical, economical and meets hydraulic requirements:

- 1) Follow slopes of natural topography,
- 2) avoid routing sewers through areas which require extensive restoration or underground demolition,
- 3) Avoid areas of high groundwater and placement of sewer below the groundwater table,
- 4) locate manholes at change in direction, size or slope of gravity sewers,
- 5) Use straight sections between manholes, curved alignment shall not be permitted,
- 6) locate manholes at intersections of streets where possible,
- 7) avoid placing manholes where the tops will be submerged or subject to surface water inflow,
- 8) evaluate alternative sewer routes where applicable,
- 9) Verify that final routing selected is the most cost effective alternative that meets service requirements.

In the event that facilities to be provided under the contract must be occupied prior to completion of permanent wastewater infrastructure, the Contractor will be responsible for providing temporary portable shower and bathroom facilities.

2.3.6.4.2 Protection of Water Supplies

The Contractor shall ensure that the sewer design meets the following criteria:

2.3.6.4.3 Sanitary sewers shall be located no closer than 15m (50 feet) horizontally to water wells or reservoirs to be used for potable water supply.

2.3.6.4.4 Sanitary sewers shall be no closer than 3 m (10 feet) horizontally to potable water lines; where the bottom of the water pipe will be at least 300mm (12 inches) above the top of the sanitary sewer, horizontal spacing shall be a minimum of 1.8 m (6 feet).

2.3.6.4.5 Sanitary sewers crossing above potable water lines shall be constructed of suitable pressure pipe or fully encased in concrete for a distance of 2.7m (9 feet) on each side of the crossing. Pressure pipe will be as required for force mains in accordance with local standards and shall have no joint closer than 1 meter (3 feet) horizontally to the crossing, unless the joint is encased in concrete.

2.3.6.4.6 Quantity of Wastewater

The Contractor shall verify the average daily flow considering both resident (full occupancy) and non-resident (8hr per day) population. The average daily flow will represent the total waste volume generated over a 24-hour period, and shall be based on the total population of the facility and usage rate of 41 gallons per capita day (water usage). The wastewater flow rate shall be calculated as approximately 80% of water volume and usage rate as specified in Part 2.3.6.2.. Design criteria guideline shall be based on average influent wastewater characteristics as BOD of 200mg/l, SS of 200mg/l.

2.3.6.4.7 Gravity Sewer

Sanitary sewers shall be designed to flow at 90 to 95 percent full. Sanitary sewer velocities shall be designed to provide a minimum velocity of 0.6 meters per second (mps) or 2.0 feet per second (fps) at the ADD flow rate and a minimum velocity of 0.8 to 1.05 mps (2.5-3.5fps) at the peak diurnal flow rate. In no case shall the velocity drop below 0.3 mps, (1.0 fps) to prevent settlement of organic solids suspended in the wastewater. Pipe slopes shall be sufficient to provide the required minimum velocities and depths of cover on the pipe. Unless otherwise indicated (see Building Connections and Service Lines), gravity sewer pipe shall be installed in straight and true runs in between manholes with constant slope and direction. Adequate cover must be provided for frost protection. A minimum cover of 800 mm (2'-8") will be required to protect the sewer against freezing.

2.3.6.4.8 Manholes

The Contractor shall provide standard depth manholes (MH), (depth may vary) an inside dimension of 1.2 meters (4 feet). Manholes shall be made of cast-in-place reinforced concrete with reinforced concrete cover following AASHTO M199 or ASTM C478. Alternate precast manhole option shall taper to a 750 mm (30-inch) cast iron frame that provides a minimum clear opening of 600 mm (24 inches). In every case, the manholes, frames and covers shall be traffic rated, ASSHTO HS20-44 load rating. All manholes shall be provided with a concrete bench with a flow line trough, smoothly formed to guide waste flow to the outlet pipe from the inlet pipe(s). The top surface of the bench shall be above the crown of all pipes within the manhole. All surfaces of the bench shall be sloped smoothly toward the trough to guide flow, even under peak flow conditions.

2.3.6.4.8.1 Manhole Design Requirements

Manholes are required at junctions of gravity sewers and at each change in pipe direction, size or slope, except as noted hereinafter for building connections.

2.3.6.4.8.2 Spacing

The distance between manholes must not exceed 120 m (400 ft) in sewers of less than 460 mm (18 inches) in diameter. For sewers 460 mm (18 inches) and larger, and for outfalls from wastewater treatment facilities, a spacing of up to 180 m (600 ft) is allowed provided the velocity is sufficient to prevent the sedimentation of solids.

2.3.6.4.8.3 Pipe Connections

The crown of the outlet pipe from a manhole shall be on line with or below the crown of the inlet pipe.

2.3.6.4.8.4 Pipe

Pipe shall conform to the respective specifications and other requirements as follows: Provide Polyvinyl Vinyl Chloride (PVC) conforming to ASTM D 3034, Type PSM with a maximum SDR of 35, size 380 mm (15inch) or less in diameter. PVC shall be certified as meeting the requirements of ASTM D 1784, cell Class 12454 B. Unplasticized polyvinyl chloride (U-PVC) for water supply shall conform to BS, EN, 1452-2:2000. the minimum pipe pressure requirement is 150 psi or 10.0 bar. Non-pressure rated underground drainage and sewerage pipe shall meet BS EN 1401-1; 1998.

2.3.6.4.8.5 Fittings

Fittings shall be compatible with pipe supplied and shall have a strength not less than that of the pipe. Fittings shall conform to the respective specifications and requirements as follows: provide PVC fittings conforming to ASTM D 3034 for type PSM pipe.

2.3.6.4.8.6 Joints

Joints installation requirements shall comply with the manufacturers installation instructions. Flexible plastic pipe (PVC or high density polyethylene pipe) gasketed joints shall conform to ASTM D3212.

2.3.6.4.8.7 Branch Connections

Branch connections shall be made by use of regular fittings or solvent-cemented saddles as approved. Saddles for PVC pipe shall conform to Table 4 of ASTM D 3034.

2.3.6.4.8.8 Frames and Covers

Frames and covers shall be cast iron, ductile iron or reinforced concrete, traffic rated in any case to an H-20 load rating. Cast iron frames and covers shall be traffic rated, circular with vent holes.

2.3.6.4.8.9 Steps for Manholes

Steps shall be cast iron, polyethylene coated, at least 15 mm (5/8 inch) thick, not less than 400mm (16 inches) in width, spaced 300 mm (12 inches) on center.

2.3.6.4.9 The minimum depth of the cover over the pipe crown shall be 0.8m (2'-8").

2.3.6.4.10 Building Sewer Service Connections and Service Lines

Service connections and service piping shall be installed in as direct a path as possible from the main sanitary or service lateral. Service connection standard fittings shall extend to the road

ROW LINE or UTILITY EASEMENT LINE and the standard “wye” fitting or “MH w/ stub out” shall be plugged and clearly identified for the future service connection. The Contractor shall install all base bid and future connection fittings on the main collector line. Future service piping to future buildings will be installed by others. Sanitary sewer service piping shall extend to a point (1.5m) from the building then connected if the building plumbing at the 1.5m point outside the building. Building connections and service lines will be planned to eliminate as many bends as practical and provide convenience in rodding. Bends greater than 45 degrees made with one fitting should be avoided; combinations of elbows such as 45-45 or 30-60 degrees should be used with a cleanout provided. Connections to other sewers will be made directly to the pipe with standard fittings rather than through manholes. However, a manhole must be used if the connection is more than 31m from the building cleanout. Cleanouts shall be provided outside of the building. Service connection lines will be a minimum of 100 mm (4 inch) diameter and laid at a minimum 1% grade, but up to 2% as design parameters dictate. Service laterals shall be 150 mm (6 inch) and sloped to maintain the minimum velocity as described in paragraph “Gravity Sewer.”

2.3.6.4.11 Cleanouts

Cleanouts must be installed on all sewer-building connections to provide a means for inserting cleaning rods into the underground pipe. Install manufactured wye fittings. Preferably the cleanout will be of the same diameter as the building sewer, and never be smaller than 100 mm (4 inch). Inspection chambers will not be permitted.

2.3.6.4.12 Field Quality Control

2.3.6.4.12.1 Field Tests and Inspections

The Contracting Officer will conduct field inspections and witness field tests specified in this section. The Contractor shall perform field tests and provide labor, equipment and incidentals required for testing.

Check each straight run of pipeline for gross deficiencies by holding a light in a manhole; it shall show a practically a full circle of light through the pipeline when viewed from the adjoining end of the line. When pressure piping is used in a non-pressure line for non-pressure use, test this piping as specified for non-pressure pipe.

Test lines for leakage by either infiltration tests or exfiltration tests. Prior to testing for leakage, backfill trench up to at least lower half of the pipe. When necessary to prevent pipeline movement during testing, place additional backfill around pipe to prevent movement during testing, but leaving joints uncovered to permit inspection. When leakage or pressure drop exceeds the allowable amount specified, make satisfactory correction and retest pipeline section in the same manner. Correct visible leaks regardless of leakage test results.

Infiltration tests and ex-filtration tests: Perform these tests for sewer lines made of specified material, not only concrete, in accordance with ASTM C 969M, ASTM C 969. Make calculations in accordance with the Appendix to ASTM C 969M, ASTM 969.

Low-pressure air tests: Perform tests as follows: 1) Concrete pipe: Test in accordance with ASTM C 924M, ASTM C 924. Allowable pressure drop shall be given in ASTM C 924M ASTM C 924. Make calculations in accordance with the Appendix to ASTM C 924M, ASTM C 924; 2) Ductile-iron pipe: Test in accordance with the applicable requirements of ASTM C 924M, ASTM C 924. Allowable pressure drop shall be as given in ASTM C 924M, ASTM C 924. Make calculations in accordance with the Appendix to ASTM C 924M, ASTM C 924; 3) PVC Plastic pipe: Test in accordance with applicable requirements of UBPPA UNI-B-6. Allowable pressure drop shall be as given in UBPPA UNI-B-6. Make calculations in accordance with the Appendix to UBPPA UNI-B-6.

2.3.6.4.13 Deflection Testing

Deflection testing will not be required. However, field quality control shall ensure that all piping is installed in accordance with deflection requirements established by the manufacturer.

2.3.6.4.14 Wastewater Treatment Plant Facilities

a) Wastewater Treatment Using Package Plant Processes

The Contractor shall provide a packaged treatment plant (pre-engineered) system per scope of work. The Contractor will determine the best treatment technology whether it be conventional activated sludge, extended aeration, contact stabilization, complete mix or moving bed biofilm reactor process. The above mentioned processes are essentially modifications of the conventional activated sludge process. Nominal capacity shall be based on the water usage rate of 41gpcd on the average daily flow rate of (adjusted to 80% of 36,900gpd) or 29,520gpd flowrate. The sewage treatment plant shall be capable of achieving a consistent water quality effluent equal to 30 mg/l Biological Oxygen Demand (BOD) and 30mg/l of Total Suspended Solids (TSS) with a pH discharge requirement of 6.5 -8.5.

The Contractor shall provide yard hydrants, hose and hose cabinet to facilitate the washing of the unit equipment. The Contractor shall insure that engineering, construction and maintenance is handled by experienced engineers, trained installers and qualified technicians, respectively. Individual equipment and every component shall be manufactured by manufacturers that have back-up spare parts in stock.

Dining Hall, Kitchen/mess facilities shall incorporate preliminary treatment with use of grease traps prior discharge into the sanitary sewer collection system. Grease traps will connect to the sanitary sewer collection system.

Upon completion of the packaged installation the Contractor shall check the system in the presence of the Manufacturer's Representative and Contracting Officer according to prescribed manufacturer's check procedures (O&M Manual). Upon clearance, the Contractor shall perform initial start up and initial operation, also in the presence of the MR and CO. The Contractor will operate the treatment facility for the contractual period performing all daily and weekly O&M tasks as recommended by the manufacturer's O&M Manual. The Contractor shall utilize the services of qualified operators, approved by the Contracting Officer, preferably trained Afghan Nationals, but imported specifically for that purpose, if necessary. During routine O&M, the Contractor shall perform all sampling and testing necessary to ensure proper daily operations and to optimize the system efficiency in achieving required effluent standards. During this performance period, the Contractor shall ensure that all prudent Log Records of daily O&M (repairs, inflow cycle, aeration cycles, effluent flow cycle and condition, etc.) are clearly, accurately and consistently recorded. The Contractor shall establish classroom training for USACE and Afghanistan National Army facility authorities and will establish long-term on-job-training (3 months) for a minimum of three local Nationals with the goal to turn over O&M to their capable services at the end of the Contractor's period of performance.

2.3.6.4.15 Sludge Handling and Disposal (Sludge Drying Beds)

The Contractor shall prepare an operation and maintenance plan for sludge disposal and removal. Drying of the sludge in beds may take at least 12 weeks in the winter and 6 weeks in the summer. The operation and maintenance plan shall be submitted for Contracting Officer's review and approval.

2.3.6.5 Effluent Pond

The Contractor shall construct an effluent holding pond to receive the treated effluent as necessary. The pond shall have an over flow device. The purpose of the effluent pond is to allow

for pumping of treated water into irrigation trucks for site watering and road dust control or other possible use. Treated effluent shall be directed to a natural or manmade drainage way and must not be allowed to pond spread on the ground surface.

2.3.6.6 Wastewater Laboratory Space and Equipment

The Contractor shall provide a wastewater laboratory space and furnish certain pieces of basic laboratory equipment that are used to perform routine sampling and analyses. The laboratory must be set up to accommodate sufficient space for the keeping of record data and arrange data in an orderly manner. Equipment and devices shall be adequate to conduct grab samples and composite samples. Equipment to be provided shall be sufficient to sample and analyze dissolved gases (DO), coliforms, residual chlorine, temperature and pH. A desk, work bench and chair with proper lighting shall be provided for the operator to carry out his routine daily duties.

2.3.6.7 Storm Sewer Systems

Oil/water separators shall be utilized for all drains from industrial sites and garage maintenance facilities. Separators shall be installed as close as possible from the drain location. Storm sewer system shall not be mixed with sanitary sewer system and shall be in accordance with UFC 3-240-03, latest edition.

3. ARCHITECTURAL REQUIREMENTS

3.1 GENERAL

All material approved shall become standardized material to be used throughout the facilities under contract. Different sub-contractors shall not use different material or standards under the contract. Intent of the project is to use locally procured materials (unless specified otherwise) and labor to the maximum extent possible while satisfying seismic building code. Conflicts between criteria shall be brought to the attention of the Contracting Officer for resolution. In such instances, the Contractor shall furnish all available information with justification to the Contracting Officer. All building exterior walls shall be constructed with reinforced CMU, insulated concrete sandwich panels, reinforced concrete or approved equivalent, except for the guard towers and guard houses which shall be fully grouted CMU walls, with concrete ceiling and floors.

3.2 DESIGN CRITERIA

The Codes, Standards, and Regulations listed herein shall be used in the construction of this project. The publications shall be the [referenced [most recent] editions. Standards other than those mentioned may be accepted provided they meet the minimum requirements and the contractor shall submit proof of equivalency to the Contracting Officer for approval.

IBC- International Building Code

NFPA-101- National Fire Protection Association, Life Safety Code.

3.3 LIFE SAFETY/ FIRE PROTECTION/ HANDICAPPED ACCESSIBILITY

To the extent possible, all facilities will be designed in accordance with recognized industry standards for life safety and building egress. An adequate fire alarm system, fire extinguishers, and smoke alarms shall all be included as required. If a sprinkler system is required by building code, a waiver will have to be obtained before construction notice to proceed is issued. However, due to the lack of adequate water volume and pressure, sprinkler systems may not be feasible. The facility shall comply with all other safety requirements of NFPA 101. In keeping with the intended function of these facilities, handicapped accessibility will not be incorporated into this project. Due to the war contingency requirement, it is assumed that only able-bodied military and civilian personnel will use the facilities listed herein.

3.4 ANTITERRORISM/ FORCE PROTECTION

Force protection/anti-terrorism measures for this location shall be followed and incorporated into this project in accordance with the referenced DoD Regulations. Information regarding force protection may be found herein and at the following link: www.tisp.org/files/pdf/dodstandards.pdf

3.5 CONCRETE

Place 150 mm (6") of capillary water barrier below areas to receive a concrete slab on properly compacted soil free of organic material. Concrete flooring in wet areas shall slope to the floor drain and not allow for water to puddle. Concrete slabs in all areas shall not be placed prior to inspection and approval of piping and sub-surface by the Contracting Officer. Foundation trenches shall be level and free of loose material. Trenches shall be inspected and approved by the Contracting Officer prior to placing of any concrete foundations. See paragraph 5 for structural characteristics of concrete and reinforcing steel for foundations and slabs.

3.5.1 INSULATED CONCRETE SANDWICH WALL SYSTEM

As an option to standard masonry construction, the Contractor may construct walls of single story buildings using an insulated concrete sandwich wall system. The insulated concrete sandwich wall system shall be field fabricated and composed of a 76 mm (3 inch) expanded polystyrene core that spans in a single piece from floor elevation to top of wall elevation. The polystyrene core shall have a welded wire fabric, 50 mm x 50 mm (2 inch x 2 inch) mesh, 2.52mm (12.5 gauge) wire, attached to both faces of the polystyrene core. The welded wire mesh shall be installed at 13mm from the face of the polystyrene core. The welded wire mesh on each face shall be attached to each other and the polystyrene core with diagonal truss wires. Apply sprayed concrete (shotcrete) to a minimum thickness of 45mm (1-3/4 inch) or as structural calculations require, whichever is greater. Method of placing the shotcrete shall be in conformance with ACI 506R-85. Concrete finishing shall be done by appropriate hand tools (darby, trowel, etc.) to provide the desired finish effect.

3.6 MASONRY

Storage of masonry materials shall be in a dry place or materials shall be covered with a plastic protective layer. Cover open walls each day to keep them protected and dry. Concrete masonry units (CMU) for exterior walls shall be either 190 mm or 290 mm wide x 390 mm x 190 mm high as shown on drawings. **All cells shall be fully grouted in exterior and shear walls.** They shall be installed in running bond level and plumb. Mortar joints shall be 10 mm on all sides between CMU. Joints shall be struck with a concave tool to provide a smooth recessed curved surface. Install only quality units. The surface shall be free of chips, cracks, or other imperfections that would detract from the overall appearance of the finished wall. Defective CMU or mortar shall be rejected.

3.7 METAL

3.7.1 METAL WINDOW SILLS

Galvanized metal window sills, 1 mm (20 gauge), shall be installed on the exterior of all windows. The metal window sills shall have a turn down of 50 mm over the exterior masonry and stucco. Metal sills shall extend from side to side of the masonry opening in a single piece. Extend the metal windowsill a minimum of 20 mm under the bottom of the aluminum windows. Install masonry mortar as required for a smooth surface under the window sills. Sills shall slope a minimum of 6mm to the exterior and not allow water to puddle.

3.7.2 STEEL COOK TOP – DFAC

Provide steel cook top in kitchen minimum thickness of 25 mm. Provide circular cut outs. Consult with the Contracting Officer for the diameter of circular cutouts. Provide steel infill plates for all cut out openings. Cook top can be made of several pieces for ease of handling. Adjacent plates shall be tight fitting to each other.

3.7.3 PASS-THROUGH COUNTER TOP - DFAC

Provide 1.6 mm (16 gauge) stainless steel, or 40 mm marble, pass through counter tops at openings between the kitchen and dining area. Edges shall be turned down 30 mm and corners shall be welded and ground smooth. Provide anchor angles welded to the bottom of the counters to anchor tops to masonry walls below. Provide six (6) anchors on the Dish Return Counter, three (3) on each side of the wall. Provide eight (8) anchors on the Serving Counter, four (4) on each side of the wall. Anchor angles to wall with masonry expansion sleeves and stainless steel screws. Counter tops are to be 600 mm wide x length of opening shown.

3.8 CARPENTRY

3.8.1 WOOD OR METAL PURLINS

If Contractor chooses to utilize wood or metal purlins, provide and install roof purlins of natural wood, locally available material 1 meter on center securely wedged between steel H structural joists. Tightly fit 30 mm boards over roof structure and nail into wood purlins. New roofing shall extend a minimum of 300 mm past the exterior surface of the wall.

3.8.2 Metal Fascia & Soffit

Contractor to provide metal fascia and soffit boards, provide and install 30 mm fascia and soffit boards. The water proof Wood boards shall be planed and smooth ready for paint finish. Soffit shall extend 300 mm out from exterior wall surface. Extend fascia board down past bottom of soffit a minimum of 6 mm for water drip. Extend roof decking out over fascia a minimum of 20 mm. Provide a 40 mm drip flashing over edge of roof decking so that it extends past bottom of decking on all sides of the building. Provide continuous soffit venting of all overhangs at both bottom and top of roof slope.

3.8.3 Wood Battens

If Contractor chooses to utilize wood ceiling batten strips, wood ceiling batten strips, 20 mm x 60 mm, shall be nailed to the bottom of the wood purlins. Battens shall be spaced at 400 mm on center (or per UBC requirements if sheetrock is substituted for plaster). This is for the support of a plaster ceiling.

3.9 ROOFING AND WEATHERPROOFING

3.9.1 SLOPED ROOFS

On sloping roofs provide and install .70 mm (24 gauge) galvanized steel in either corrugated or standing seam design. Metal roofing shall be anchored to the steel "Z" purlins or wood deck sub-surface using exposed fasteners at 300 mm on center at all seams and at 600 mm on center in the panel field. Fasteners shall be placed at the top of the corrugation taking care not to dent panel. Roof sealant or adhesive shall be placed over each anchor head. Roofing system shall include all edge, ridge and penetration flashings necessary for a watertight installation and as described in this section. Roofing shall be galvanized mil finish. Panels shall be overlapped two corrugations side to side and be continuous sheets from ridge to eave. Provide continuous ridge vents on all gable roofs.

3.9.2 LOW SLOPE ROOFS

Provide and install 3 ply built up roofing over concrete deck. Contractor may propose to the Contracting Officer an alternate roofing system with justification for consideration and alternate pricing. Concrete roof deck shall slope 21mm per meter and/or 2% slope.

3.9.2.1 Built-up Roofing System shall not be permitted nor any type of flat roof system.

Insulation: 5cm (2 inch) thick extruded polystyrene rigid thermal insulation boards, conforming DIN, EN 13164 BS, EN 13164, $k=0.2$ @ 75 degrees F mean temperature, 2.82 kg/sq cm (40 lbs/sq in) compressive strength, hydrophobic, Type VI.

3.9.2.2 Insulation Installation

Comply with insulation manufacturer's instructions and recommendations for handling, installing, and bonding or anchoring insulation to substrate. Insulation boards shall be installed loose, without glue, in staggered manner. Attention should be paid not to leave separation along edges. Where overall insulation thickness is 50 mm (2 inches) or greater, install required thickness in two layers with joints of second layer offset from joints of first layer a minimum of 300 mm (12 inches) each direction. Trim surface of insulation where necessary at roof drains so completed surface is flush with drain ring. Polyester felt or geotextile shall be installed over insulation layers as a filter layer to prevent the passage of fines in gravel layer to lower strata.

3.9.2.3 Composition Flashing and Stripping

A. Install composition flashing at cant strips, at other sloping and vertical surfaces, at roof edges, and at penetrations through roof. Install composition flashing in accordance with membrane manufacturers specifications. Nail or provide other forms of mechanical anchorage of composition flashing to vertical surfaces as recommended by manufacturer of primary roofing materials.

B. Install composition stripping where metal flanges are set on roofing. Provide not less than two plies of woven glass-fiber fabric, each set in a continuous coating of roofing cement and extended onto the deck 100 mm to 150 mm (4 inches and 6 inches), respectively. Except where concealed by aggregate surfacing or elastic flashing, apply a heavy coating of roofing cement over composition stripping.

C. Roof Drains: Fill clamping ring base with a heavy coating of roofing cement. Set built up roofing membrane in to the clamping ring base and fix the drain top on it.

D. Allow for expansion of running metal flashing and edge trim that adjoins roofing. Do not seal or bond built-up roof membrane or composition flashing and stripping to metal flanges that are over 914 mm (3 feet) in length.

E. Counterflashings: Counterflashings, cap flashings, expansion joints and similar work to be coordinated with built-up roofing work, are specified in other sections of these specifications.

F. Roof Accessories: Miscellaneous sheet metal accessory items, including insulation vents and other devices and major items of roof accessories to be coordinated with built-up roofing work.

3.9.2.4 Gravel Layer – No gravel will be allowed on any roof systems.

3.9.3 FLASHING AND SHEET METAL

3.9.3.1 Materials

Any metal listed by ASTM, DIN, BS or EN standards. Manual for a particular item may be used, unless otherwise specified or indicated. Materials shall conform to the requirements specified below and to the thicknesses and configurations established in ASTM, DIN, BS or EN standards. Different items need not be of the same metal, except that if copper is selected for any exposed item, all exposed items shall be copper.

3.9.3.2 Steel Sheet, Zinc-Coated (Galvanized)

Zinc coated steel conforming to ASTM A 525, DIN BS or EN Standards.

3.9.3.3 Aluminum wall capping and expansion joint profiles.

Aluminum wall capping conforming to ASTM B 209 M, DIN 18339, BS or EN Standards.

3.9.3.4 General

Downspouts shall be designed and fabricated on site. Unless otherwise specified or indicated, exposed edges shall be folded back to form a 13 mm (1/2 inch) hem on the concealed side, and bottom edges of exposed vertical surfaces shall be angled to form drips. Bituminous cement shall not be placed in contact with roofing membranes other than built-up roofing.

3.9.3.5 Wall, Floor, Ceiling Expansion Joints Over Plaster

Expansion joints shall be provided as specified in ASTM, DIN 18339, BS or EN Standards.

3.9.3.6 Connections and Jointing

3.9.3.6.1 Soldering

Soldering shall apply to copper and stainless steel items. Edges of sheet metal shall be pre-tinned before soldering is begun. Soldering shall be done slowly with well heated soldering irons so as to thoroughly heat the seams and completely sweat the solder through the full width of the seam. Edges of stainless steel to be pre-tinned shall be treated with soldering acid flux. Soldering shall follow immediately after application of the flux. Upon completion of soldering, the acid flux residue shall be thoroughly cleaned from the sheet metal with a water solution of washing soda and rinsed with clean water.

3.9.3.6.2 Seaming

Flat-lock and soldered-lap seams shall finish not less than 25 mm. wide. Unsoldered plain-lap seams shall lap not less than 75 mm. unless otherwise specified. Flat seams shall be made in the direction of the flow.

3.9.3.6.3 Cleats

A continuous cleat shall be provided where indicated or specified to secure loose edges of the sheet metalwork. Butt joints of cleats shall be spaced approximately 3 mm. apart. The cleat shall be fastened to supporting wood construction with nails evenly spaced not over 300 mm. on centers. Where the fastening is to be made to concrete or masonry, screws shall be used and shall be driven in expansion shields set in concrete or masonry.

3.9.3.7 Downspouts

Downspouts shall be installed as indicated. Downspouts shall be rigidly attached to the building. Supports for downspouts shall be spaced according to manufacturer's recommendations.

3.9.3.8 Flashing

Flashing shall be installed at locations indicated and as specified below. Sealing shall be according to the flashing manufacturer's recommendations. Flashings shall be installed at intersections of roof with vertical surfaces and at projections through roof, except that flashing for heating and plumbing, including piping, roof and floor drains, and for electrical conduit projections through roof or walls are specified in other sections. Except as otherwise indicated, counter flashings shall be provided over base flashings. Perforations in flashings made by masonry anchors shall be installed on top of joint reinforcement. Lashing shall be formed to direct water to the outside of the system.

3.9.3.8.1 Through-wall Flashing

Through-wall flashing includes sill, lintel, and spandrel flashing. The flashing shall be laid with a layer of mortar above and below the flashing so that the total thickness of the two layers of the mortar and flashing are the same thickness as the regular mortar joints. Flashing shall not extend further in to the masonry backup wall than the first mortar joint. Joints in flashing shall be lapped and sealed. Flashing shall be one piece for lintels and sills.

3.9.3.8.2 Lintel Flashing

Lintel flashing shall extend the full length of lintel. Flashing shall extend through the wall one masonry course above the lintels and shall be bent down over the vertical leg of the outer steel lintel angle not less than 50 mm, or shall be applied over top of masonry and pre-cast concrete lintels. Bed joints of lintels at joints shall be under laid with sheet metal bond breaker.

3.9.3.8.3 Sill Flashing

Sill flashing shall extend the full width of the sill and not less than 100 mm beyond ends of sill except at joint where the flashing shall be terminated at the end of the sill.

3.9.3.9 Wall Capping

Wall Capping shall be installed according to the manufacturer's recommendations.

3.9.4 SEALANTS

3.9.4.1 Interior Sealant

ASTM C 834 or ASTM C 920, Type S or M, Grade NS, Class 12.5, Use NT, DIN, BS, or EN equal standards.

3.9.4.2 Exterior Sealant

For joints in vertical and horizontal surfaces, provide ASTM C 920, Type S or M, Grade NS, DIN, BS, or EN equal standards.

3.9.4.3 Floor Joint Sealant

(ASTM C 920) Type S or M, Grade P, class 25, use T

3.9.4.4 Primers

Provide a non-staining, quick-drying type and consistency recommended by the sealant manufacturer for the particular application.

3.9.4.5 Backstops

Backing shall be 25 to 33 percent oversize for closed cell and 40 to 50 percent oversize for open cell material, unless otherwise indicated. Install backstops dry and free of tears or holes. Tightly pack the back or bottom of joint cavities with backstop material to provide a joint of the depth specified.

3.9.4.6 Cleaning Solvents

Provide type(s) recommended by the sealant manufacturer except for aluminum and bronze surfaces that will be in contact with sealant.

3.9.4.7 Surface Preparation

Surfaces shall be clean, dry to the touch, and free from dirt, frost, moisture, grease, oil, wax, lacquer, paint, or other foreign matter that would tend to destroy or impair adhesion. Oil and grease shall be removed with solvent and surfaces shall be wiped dry with clean cloths. When resealing an existing joint, remove existing caulk or sealant prior to applying new sealant. For surface types not listed below, the sealant manufacturer shall be contacted for specific recommendations.

3.9.4.8 Masking Tape

Masking tape shall be placed on the finish surface on one or both sides of a joint cavity to protect adjacent finish surfaces from primer or sealant smears. Masking tape shall be removed within 10 minutes after joint has been filled and tooled.

3.9.4.9 Primer

Immediately prior to application of the sealant, clean out loose particles from joints. Where recommended by sealant manufacturer, apply primer to joints in concrete masonry units, wood, and other porous surfaces in accordance with sealant manufacturer's instructions. Do not apply primer to exposed finish surfaces.

3.9.4.10 Bond Breaker

Provide bond breakers to the back or bottom of joint cavities, as recommended by the sealant manufacturer for each type of joint and sealant used, to prevent sealant from adhering to these surfaces. Carefully apply the bond breaker to avoid contamination of adjoining surfaces or breaking bond with surfaces other than those covered by the bond breaker.

3.9.4.11 Sealants

Provide a sealant compatible with the material(s) to which it is applied. Do not use a sealant that has exceeded shelf life or has jelled and can not be discharged in a continuous flow from the gun. Apply the sealant in accordance with the manufacturer's instructions with a gun having a nozzle that fits the joint width. Force sealant into joints to fill the joints solidly without air pockets. Tool the sealant after application to ensure adhesion. Sealant shall be uniformly smooth and free of wrinkles. Upon completion of sealant application, roughen partially filled or unfilled joints; apply sealant, and tool smooth as specified. Sealer shall be applied over the sealant when and as specified by the sealant manufacturer.

3.9.4.12 Protection

Protect areas adjacent to joints from sealant smears. Masking tape may be used for this purpose if removed 5 to 10 minutes after the joint is filled.

3.9.4.13 Final Cleaning

Upon completion of sealant application, remove remaining smears and stains and leave the work in a clean and neat condition.

a. **Masonry and Other Porous Surfaces:** Immediately scrape off fresh sealant that has been smeared on masonry and rub clean with a solvent as recommended by the sealant manufacturer. Allow excess sealant to cure for 24 hour then remove by wire brushing or sanding.

b. **Metal and Other Non-Porous Surfaces:** Remove excess sealant with a solvent-moistened cloth.

3.10 WINDOWS, DOORS & GLAZING

3.10.1 WINDOWS

3.10.1.1 Materials

A. **Aluminum Extrusions:** Provide alloy and temper recommended by the window manufacturer for the strength, corrosion resistance, and application of required finish, meeting the DIN 1725 raw material requirements, but not less than 215 N/mm² ultimate tensile strength and not less than 1.5 mm thick at any location for main frame and sash members.

B. **Fasteners:** Provide aluminum, nonmagnetic stainless steel, epoxy adhesive, or other materials warranted by the manufacturer to be non-corrosive and compatible with aluminum window members, trim, hardware, anchors, and other components of window units.

1. **Reinforcement:** Where fasteners screw-anchor into aluminum less than 0.125 inch thick, reinforce the interior with aluminum or nonmagnetic stainless steel to receive screw threads or provide standard non-corrosive pressed-in splined grommet nuts.

2. **Exposed Fasteners:** Except where unavoidable for application of hardware, do not use exposed fasteners. For application of hardware, use fasteners that match the finish of the member or hardware being fastened, as appropriate.

C. **Anchors, Clips, and Window Accessories:** Fabricate anchors, clips, and window accessories of aluminum, nonmagnetic stainless steel, or hot-dip zinc-coated steel or iron complying with the requirements of DIN 1748; provide sufficient strength to withstand design pressure indicated. As a minimum provide 3 anchors on each side of the frame.

D. **Compression-Type Glazing Strips and Weatherstripping:** Unless otherwise indicated, and at the manufacturer's option, provide compressible stripping for glazing and weatherstripping such as molded EPDM or neoprene gaskets.

E. **Sealant:** For sealants required within fabricated window units, provide type recommended by the manufacturer for joint size and movement. Sealant shall remain permanently elastic non-shrinking, and non-migrating. Comply with Sealants of these specifications for selection and installation of sealants.

F. **Wire Fabric Insect Screen** shall be permanently fixed to the exterior, except for guard towers.

3.10.1.2 Hardware

A. **General:** Provide the manufacturer's standard hardware fabricated from aluminum, stainless steel, or other corrosion-resistant material compatible with aluminum and of sufficient strength to

perform the function for which it is intended.

3.10.1.3 Fixed, Casement, Projected and Horizontal Sliding Windows

Provide window units meeting UL 752, level 5, but no less than 16 mm laminated single glazed. This standard shall apply to all window units within guard shack, guard house, guard tower, and guard rooms in Headquarters Building. Provide cam action sweep sash lock and keeper at meeting rails. All other glazing shall be minimum 5mm laminated single glazed.

3.10.1.4 Fabrication

Provide horizontally sliding aluminum windows with factory finish in all buildings to fit the masonry openings. Window openings shall be provided with insect screening permanently fixed to the exterior. Provide a locking device on the interior of each window. Provide anchors on each side of the frame into the adjoining masonry, 3 on each side. Provide weather stripping system for all exterior windows and doors.

3.10.1.5 Finishes

Apply baked enamel in compliance with paint manufacturer's specifications for cleaning, conversion coating, and painting.

- 1) Color: White meeting the requirements of DIN 50018

3.10.1.6 Inspection

Inspect openings before beginning installation. Verify that rough or masonry opening is correct and the sill plate is level. Masonry surfaces shall be visibly dry and free of excess mortar, sand, and other construction debris.

3.10.1.7 Installation

Comply with manufacturer's specifications and recommendations for installation of window units, hardware, operators, and other components of the work. Set window units plumb, level, and true to line, without warp or rack of frames or sash. Provide proper support and anchor securely in place. Set sill members and other members in a bed of compound or with joint fillers or gaskets, as shown, to provide weathertight construction. Refer to the Sealant sections for compounds, fillers, and gaskets to be installed concurrently with window units. Coordinate installation with wall flashings and other components of the work.

3.10.1.8 Adjusting

Adjust operating sash and hardware to provide a tight fit at contact points and at weatherstripping for smooth operation and a weathertight closure.

3.10.1.9 Cleaning

Clean aluminum surfaces promptly after installation of windows. Exercise care to avoid damage to protective coatings and finishes. Remove excess glazing and sealant compounds, dirt, and other substances. Lubricate hardware and other moving parts.

Note: No wood Windows will be allowed.

3.10.2 DOORS

All exterior doors shall be heavy duty metal doors with metal frames and all Interior door shall be hollow metal doors with hollow metal frames.

All glazed doors shall have 6 mm laminated glazing in the upper half of the door. Heavy gauge metal exterior doors are required for security of unmanned buildings, such as water treatment building, power station, warehouses, and other buildings requiring higher security. Commercial duty lock sets and hardware shall be used on all doors. Provide (3) hinges on all doors. Hinges shall be the 5 knuckle type or equivalent. Provide door handles and locksets that can be locked with a key on all doors. All door locks shall have a thumb latch on inside of door such that no key is necessary to exit the room or building. Coordinate the final keying schedule with Contracting Officer prior to ordering lock sets. Generally each building should have 8 master keys fitting all locks, 8 sub-master keys fitting all exterior doors and 3 keys each for each interior door. Include 25% spare key blanks for the amount of keys provided per building. Provide numbering system identifying key to associated room door. All glazing in or adjacent to doors shall be tempered per IBC. Provide weather stripping system for all exterior doors.

3.10.2.1 PVC Doors

PVC doors and PVC door frames are for interior wet room use only. PVC may be used for bathrooms, shower rooms, and toilets rooms.

3.10.2.2 Steel Doors

SDI A250.8, except as specified otherwise. Prepare doors to receive specified hardware. Undercut where indicated. Exterior doors shall have top edge closed flush and sealed to prevent water intrusion. Doors shall be 44.5 mm thick, unless otherwise indicated. Doors shall be constructed using heavy gauge steel with minimum thickness of 1.2 mm.

3.10.2.2.1 Accessories

3.10.2.2.2 Louvers

a. Interior Louvers

SDI 111-C, Louvers shall be stationary sight-proof or lightproof type as required. Louvers for lightproof doors shall not transmit light. Detachable moldings on room or non security side of door; on security side of door, moldings to be integral part of louver. Form louver frames of 0.9 mm thick steel and louver blades of a minimum 0.6 mm. Louvers for lightproof doors shall have minimum of 20 percent net-free opening. Sight-proof louvers shall be inverted "V" blade design with minimum 55 or inverted "Y" blade design with minimum 40 percent net-free opening.

b. Exterior Louvers

Louvers shall be inverted "Y", "V" or "Z" type. Weld or tenon louver blades to continuous channel frame and weld assembly to door to form watertight assembly. Form louvers of hot-dip galvanized steel of same gage as door facings. Louvers shall have steel-framed insect screens secured to room side and readily removable. Provide aluminum wire cloth, 7 by 7 per 10 mm or 7 by 6 per 10 mm mesh, for insect screens.

3.10.2.2.3 Astragals

For pairs of exterior steel doors which will not have aluminum astragals or removable mullions, provide overlapping steel astragals with the doors. For interior pairs of fire rated and smoke control doors, provide stainless steel astragals complying with NFPA 80 for fire rated assemblies and NFPA 105 for smoke control assemblies.

3.10.2.2.4 Moldings

Provide moldings around glass of interior and exterior doors. Provide non-removable moldings on outside of exterior doors and on corridor side of interior doors. Other moldings may be stationary or removable. Secure inside moldings to stationary moldings, or provide snap-on moldings. Moldings shall interlock at intersections and shall be fitted and welded to stationary moldings.

3.10.2.2.5 Standard Steel Frames

SDI A250.8, except as otherwise specified. Form frames to sizes and shapes indicated, with welded corners or knock-down field-assembled corners. Provide steel frames for doors, transoms, sidelights, mullions, cased openings, and interior glazed panels, unless otherwise indicated.

3.10.2.2.6 Welded Frames

Continuously weld frame faces at corner joints. Mechanically interlock or continuously weld stops and rabbets. Grind welds smooth.

3.10.2.2.7 Mullions and Transom Bars

Mullions and transom bars shall be closed or tubular construction and shall member with heads and jambs butt-welded thereto or knock-down for field assembly. Bottom of door mullions shall have adjustable floor anchors and spreader connections.

3.10.2.2.8 Stops and Beads

Form stops and beads from 0.9 mm thick steel. Provide for glazed and other openings in standard steel frames. Secure beads to frames with oval-head, countersunk Phillips self-tapping sheet metal screws or concealed clips and fasteners. Space fasteners approximately 300 to 400 mm on centers. Miter molded shapes at corners. Butt or miter square or rectangular beads at corners.

3.10.2.2.9 Anchors

Provide anchors to secure the frame to adjoining construction. Provide steel anchors, zinc-coated or painted with rust-inhibitive paint, anchors not lighter than 1.2 mm thick.

3.10.2.2.10 Wall Anchors

Provide at least three anchors for each jamb. For frames which are more than 2285 mm in height, provide one additional anchor for each jamb for each additional 760 mm or fraction thereof.

a. Masonry: Provide anchors of corrugated or perforated steel straps or 5 mm diameter steel wire, adjustable or T-shaped;

b. Completed openings: Secure frames to previously placed concrete or masonry with expansion bolts

3.10.2.2.11 Floor Anchors

Provide floor anchors drilled for 10 mm anchor bolts at bottom of each jamb member. [Where floor fill occurs, terminate bottom of frames at the indicated finished floor levels and support by adjustable extension clips resting on and anchored to the structural slabs.

3.10.2.2.12 Weather-stripping, Integral Gasket

Black synthetic rubber gasket with tabs for factory fitting into factory slotted frames, or extruded neoprene foam gasket made to fit into a continuous groove formed in the frame, may be provided in lieu of head and jamb seals. Insert gasket in groove after frame is finish painted.

3.10.2.2.13 Hardware Preparation

Provide minimum hardware reinforcing gages as specified in ANSI A250.6. Drill and tap doors and frames to receive finish hardware. Prepare doors and frames for hardware in accordance with the applicable requirements of SDI A250.8 and ANSI A250.6. For additional requirements refer to BHMA A115. Drill and tap for surface-applied hardware at the project site. Build additional reinforcing for surface-applied hardware into the door at the factory. Locate hardware in accordance with the requirements of SDI A250.8, as applicable. Punch door frames, with the exception of frames that will have weather-stripping or lightproof or soundproof gasketing, to receive a minimum of two rubber or vinyl door silencers on lock side of single doors and one silencer for each leaf at heads of double doors. Set lock strikes out to provide clearance for silencers.

3.10.2.2.14 Finishes

All surfaces of doors and frames shall be thoroughly cleaned, chemically treated and factory primed with a rust inhibiting coating as specified in SDI A250.8, or paintable A25 galvanized steel without primer. Where coating is removed by welding, apply touchup of factory primer.

3.10.2.2.15 Fabrication and Workmanship

Finished doors and frames shall be strong and rigid, neat in appearance, and free from defects, waves, scratches, cuts, dents, ridges, holes, warp, and buckle. Molded members shall be clean cut, straight, and true, with joints coped or mitered, well formed, and in true alignment. Dress exposed welded and soldered joints smooth. Design door frame sections for use with the wall construction indicated. Corner joints shall be well formed and in true alignment. Conceal fastenings where practicable. On wraparound frames for masonry partitions, provide a throat opening 3 mm larger than the actual masonry thickness. Design other frames in exposed masonry walls or partitions to allow sufficient space between the inside back of trim and masonry to receive calking compound.

3.10.2.2.16 Grouted Frames

For frames to be installed in exterior walls and to be filled with mortar or grout, fill the stops with strips of rigid insulation to keep the grout out of the stops and to facilitate installation of stop-applied head and jamb seals.

3.10.2.2.17 Installation

a. Frames

Set frames in accordance with SDI 105. Plumb, align, and brace securely until permanent anchors are set. Anchor bottoms of frames with expansion bolts or powder-actuated fasteners. Build in or secure wall anchors to adjoining construction. Backfill frames with mortar. When an additive is provided in the mortar, coat inside of frames with corrosion-inhibiting bituminous material. For frames in exterior walls, ensure that stops are filled with rigid insulation before grout is placed.

b. Doors

Hang doors in accordance with clearances specified in SDI A250.8. After erection and

glazing, clean and adjust hardware.

c. Fire and Smoke Doors/Frames

Install fire doors and frames, including hardware, in accordance with NFPA 80.

3.10.2.2.18 Protection and Cleaning

Protect doors and frames from damage. Repair damaged doors and frames prior to completion and acceptance of the project or replace with new, as directed. Wire brush rusted frames until rust is removed. Clean thoroughly. Apply an all-over coat of rust-inhibitive paint of the same type used for shop coat. Upon completion, clean exposed surfaces of doors and frames thoroughly. Remove mastic smears and other unsightly marks.

3.10.2.2.19 NO Wood Doors will be allowed

3.10.2.3 Overhead Coiling Doors

Doors shall be fabricated from interlocking cold-rolled slats, designed to withstand building wind loading and be installed with wind locks. Slats shall be continuous for the width of the door. For doors not exceeding 4.27 m, slats shall be flat-profile design, with a depth of not less than 15.9 mm, a center to center width not more than 69.9 mm, and not less than a 1.21 mm uncoated thickness. Provide weather stripping for door-head and door jamb guides, and a bottom astragal. Weather stripping and astragal shall be natural rubber or neoprene rubber. Curtain jamb guides shall be fabricated from a combination of steel angles of sufficient size to retain curtain against the specified wind. Guides shall be fabricated from structural quality steel angles. Door shall have manufacturer's standard five pin tumbler locks; keyed. Doors shall be counterbalanced by an adjustable, steel, helical torsion spring mounted around a steel shaft in a spring barrel and connected to the door curtain with the required barrel rings. Hoods shall be fabricated from steel sheets with a minimum yield strength of 227.5 MPa.

Counterbalance-barrel components shall be as follows:

- Spring barrels shall be hot-formed structural-quality carbon steel, welded or seamless pipe. Pipe shall be of sufficient diameter and wall thickness to limit deflection to a maximum of 1/360 of the span.
- Counterbalance springs shall be oil-tempered helical steel springs designed with a safety factor of 4. Springs shall be sized to counterbalance the weight of the curtain at any point of its travel, and shall be capable of being adjusted to counterbalance not less than 125% of the normal curtain load. Spring adjustment shall be arranged in such a way that the curtain need not be raised or lowered to secure the adjustment.
- Counterbalance shafts shall be case-hardened steel of the proper size to hold the fixed ends of the spring and carry the torsion load of the spring.

Barrel plugs shall be fabricated from cast steel machined to fit the ends of the barrel. Plugs shall secure the ends of the spring to the barrel and the shaft.

Barrel rings shall be fabricated from malleable iron of the proper involute shape to coil the curtain in a uniformly increasing diameter.

Shaft bearings shall be factory sealed ball bearings of the proper size for load and shaft diameters.

Door operators shall consist of an endless steel hand chain, chain-pocket wheel and guard, and a geared reduction unit of at least a 3:1 ratio. Required pull for operation shall not exceed 16 kg. Chain hoists shall have a self-locking mechanism allowing the curtain to be stopped at any point

in its upward/downward travel and to remain in that position until moved to the fully open or closed position. Hand chains shall be cadmium-plated alloy steel with a yield point of at least three times the required hand-chain pull. Pretreated zinc-coated steel sheets shall be given the manufacturer's standard prime coat and an enamel finish coat applied to the exterior face after forming.

After installation, doors, track, and operating equipment will be examined and tested for general operation and weather against the specified wind pressure, and weather resistance. Doors that fail the required tests shall be adjusted and retested. Doors that have been adjusted and fail subsequent tests shall be removed and replaced with new doors at no additional cost.

Provide bollards at all overhead door corners to protect against vehicles damaging the door frames.

3.10.3 GLAZING

ASTM C 1036, or ASTM C 1172 or equal.

3.10.3.1 Tempered Glass

Tempered glass shall be kind FT fully tempered flat type. Class 1 clear, condition A uncoated surface, Quality q3-glazing select, conforming to ASTM, DIN, BS or EN standards. Color shall be clear.

3.10.3.2 Laminated Glass

Shall be 6-mm thick glass for all single pane exterior windows, skylights and glazed doors which consist of two nominal 3-mm annealed glass panes bonded together with a minimum of a 0.75-mm polyvinyl-butyl interlayer. For insulating glass units, use 6 mm laminated glass for the inner pane as a minimum per the Unified Facilities Criteria, DoD Minimum Antiterrorism Standards for Buildings.

ASTM C 1036, or ASTM C 1172 or equal.

3.10.3.3 Glazing Accessories

3.10.3.3.1 Sealant

Sealant shall be elastomeric conforming to ASTM, DIN, BS, or EN standards. Type S or M, Grade NS, Class 12.5, Use G, of type chemically compatible with setting blocks, preformed sealing tape and sealants used in manufacturing insulation glass. Color of sealant shall be as selected from manufacturer's full range of standard colors by Contracting Officer.

3.10.3.3.2 Glazing Gaskets

Glazing gaskets shall be extruded with continuous integral locking projection designed to engage into metal glass holding members to provide a watertight seal during dynamic loading, building movements and thermal movements. Glazing gaskets for a single glazed opening shall be continuous one-piece units with factory-fabricated injection-molded corners free of flashing and burrs. Glazing gaskets shall be in lengths or units recommended by manufacturer to ensure against pull-back at corners.

3.10.3.3.3 Fixed Glazing Gaskets

Fixed glazing gaskets shall be closed-cell (sponge) smooth extruded compression gaskets of cured elastomeric virgin neoprene compounds conforming to ASTM, DIN, BS. Or EN standards.

3.10.3.3.4 Wedge Glazing Gaskets

Wedge glazing gaskets shall be high-quality extrusions of cured elastomeric virgin neoprene compounds, ozone resistant, conforming to ASTM, DIN, BS, or EN standards.

3.10.3.3.5 Putty and glazing Compound

Glazing compound shall conform to ASTM, DIN, BS, or EN standards for face-glazing metal sash. Putty shall be linseed oil type conforming to DIN, BS, or EN standards for face-glazing primed wood sash. Putty and glazing compounds shall not be used with insulating glass or laminated glass.

3.10.3.3.6 Setting and Edge Blocking

Neoprene setting blocks shall be dense extruded type conforming to ASTM, DIN, BS, or EN standards. Silicone setting blocks shall be required when blocks are in contact with silicone sealant. Profiles, lengths and locations shall be as required and recommended in writing by glass manufacturer.

3.10.3.3.7 Preparation

Openings and framing systems scheduled to receive glass shall be examined for compliance with glass manufacturer's recommendations including size, squareness, offsets at corners, presence and function of weep system, face and edge clearance requirements and effective sealing between joints of glass-framing members. Detrimental materials shall be removed from glazing rabbet and glass surfaced and wiped dry with solvent. Glazing surfaces shall be dry and free of frost.

3.10.3.3.8 Installation

Glass and glazing work shall be performed in accordance with, glass manufacturer's instructions and warranty requirements. Glass shall be installed with factory labels intact and removed only when instructed. Edges and corners shall not be ground, nipped or cut after leaving factory. Springing, forcing or twisting of units during installation will not be permitted.

3.10.3.3.9 Cleaning

Upon completion of project, outside surfaces of glass shall be washed clean and the inside surfaces of glass shall be washed and polished in accordance with glass manufacturer's recommendations.

3.10.3.4 Protection

Glass work shall be protected immediately after installation. Glazed openings shall be identified with suitable warning tapes, cloth, or paper flags, attached with non-staining adhesives. Reflective glass shall be protected with a protective material to eliminate any contamination of the reflective coating. Protective material shall be placed far enough away from the coated glass to allow air to circulate to reduce heat buildup and moisture accumulation on the glass. Glass units which are broken, chipped, cracked, abraded, or otherwise damaged during construction activities shall be removed and replaced with new units.

3.11 FINISHES

All finishes, colors and materials in existing building and new buildings shall match. See Section 01335 for color submittals required. Provide color boards with all materials for COR approval

prior to ordering materials.

The exterior of all buildings shall be stucco and/or plaster confirming to ASTM C926. A temperature of between 4 and 27 degrees C shall exist for a period of not less than 48 hours prior to application of plaster and for a period of at least 48 hours after plaster has set. Control joints shall be designed for expansion and contraction of plaster work due to thermal exposure. Control joints shall comprise of back to back casing beads. Install new stucco in 2 coats. The first coat shall be a scratch coat approximately 1 cm thick. Allow 7 days to cure. The second coat shall be finish stucco, smooth finish, approximately 1 cm thick. Allow 7 days to cure before painting. Stucco showing over sanding, cracks, blisters, pits, checks, discoloration or other defects is not acceptable. Defective plaster work shall be removed and replaced with new plaster at the expense of the Contractor. Patching of defective work will be permitted only when approved by the Contracting Officer. Patching shall match existing work in texture and color. All exterior color finish shall be integral with the stucco finish. No painted stucco shall be permitted due to minimize future maintenance. Color to be selected by the Contracting Officer from the color board provided by the Contractor.

3.11.1 Interior walls shall be plaster applied in a similar manner as exterior stucco. Paint with 2 coats of semi-gloss off-white with less than .06% lead by weight color to be selected by the Contracting Officer from the color board provided by the Contractor.

3.11.2 Ceilings of Barracks, and Headquarters, shall be plaster applied in 2 coats over wire mesh, which is to be stapled to the 20 mm x 60 mm wood battens. Paint ceiling with 2 coats of flat white, with less than .06% lead by weight. Gypsum board may be used in lieu of plaster but framing supports for Gypsum board shall be as follows: For ½" thick gypsum board structural fastener supports shall be not further apart than 400 mm. If gypsum board is thicker follow guidelines in ASTM C 840 for supports and fastener frequency.

Ceilings of Dining Facility shall be exposed concrete painted with 2 coats of flat white, with less than .06% lead by weight.

3.11.3 Paint all exposed fascia, soffit, and doors with 2 coats of gloss enamel, white.

3.11.4 Exposed exterior steel trim, frames, doors and pipe railings: Paint with one coat oil-based primer, with 2 coats of oil-based alkyd gloss enamel, color to be selected by the Contracting Officer from the color board provided by the Contractor.

3.11.5 Exposed trim, frames and doors: Paint with one coat oil-based primer, 2 coats of gloss enamel, color to be selected by the Contracting Officer from the color board provided by the Contractor

3.11.6 Tile: Tile work shall not be performed unless the substrate and ambient temperature is at least 10 degrees C and rising. Temperature shall be maintained above 10 degrees C while the work is being performed and for at least 7 days after completion of work. Upon completion, tile surfaces shall be thoroughly cleaned in accordance with manufacturer's approved cleaning instructions. Acid shall not be used for cleaning glazed tile. Floor tile with resinous grout or with factory mixed grout shall be cleaned in accordance with instructions of the grout manufacturer. After the grout has set, tile wall surfaces shall be given a protective coat of a non-corrosive soap or other approved method of protection.

3.11.6.1 Floors in wet areas shall be 300 mm x 300 mm terrazzo tile or ceramic tile with thin set mortar. Joints shall be 2-3 mm. Waterproof gray grout shall be applied the full depth of the tile. Floors shall slope, minimum 1/50, to floor drains. Slope shall be obtained with sloping mortar bed of minimum 20 mm thickness. Provide continuous waterproofing membrane beneath sloping mortar bed, turn up wall 300 mm behind wall base. Membrane shall be fully sealed at joints and shall shed water into body of floor drain. Color of tile shall be selected by the Contracting Officer

from samples provided by the Contractor.

3.11.6.2 Floors in administration areas, living quarters, corridors, and all rooms unless otherwise stated shall be 300 mm x 300 mm terrazzo tile or ceramic tile with thin set mortar. Joints shall be 2-3 mm. Waterproof gray grout shall be applied the full depth of the tile. Color of tile shall be selected by the Contracting Officer from samples provided by the Contractor.

3.11.6.3 Walls in wet areas shall be tiled with 150 mm x 150 mm glazed ceramic tile up to 2 meters above the floor to include interior of toilet stalls, showers and behind sinks. Joints shall be 2-3 mm. Waterproof gray grout shall be applied full depth of the tile. Grout shall cure for 72 hours and then be sealed with a commercial grout sealant in two coats. Color of tile shall be selected by the Contracting Officer from samples provided by the Contractor.

3.11.6.4 The ablution drain areas shall be recessed below the floor level 200 mm and lined with ceramic tile. Ceramic tile shall extend up the wall past the water spigots to a height of 2 m above finished floor. Seats shall be formed concrete with terrazzo tile or ceramic tile finish to match the floor, 300 mm x 300 mm x 300 mm high finished dimensions. Color of ceramic tile shall be selected by the Contracting Officer from samples provided by the Contractor. Spacing between tiles shall be similar to terrazzo tile or ceramic tile.

3.11.6.5 All other floors are to be completely cleaned and sealed epoxy. Color to be selected by the Contracting Officer from samples provided by the Contractor.

Kitchen in Dining Facility shall be covered with terrazzo flooring. Walls in kitchen shall be ceramic tile up to 2 m above finished floor. Floor in Dining area shall be terrazzo tile or ceramic tile.

3.12 SPECIALTIES

3.12.1 Mirrors

0.6 m x 0.9 m, 6 mm plate glass shall be mounted above all lavatories. Mount bottom of mirrors 1.1m above finished floor.

3.12.2 Toilet Paper Holders

Toilet paper holders, stainless steel, shall be installed approximately 200 mm above floor in Eastern Toilets 600 mm above floor.

3.12.3 Shower Curtain Rods & Shower Curtain

Shower curtain rods, stainless steel, heavy duty, 18 gauge shall be mounted between the screen walls of each shower stall. Mount rod at 2.0 m above finished floor. Provide a shower curtain with support rings for each shower stall.

3.12.4 Grab Bars

Stainless steel grab bars, heavy duty, 18 gauge, two each 900 mm and 1050 mm long, 40 mm diameter shall be mounted behind and beside all eastern toilets, and bathtubs as they occur.

3.12.4 Paper Towel Dispensers

Paper towel dispensers, 0.683 mm Type 304 stainless steel, surface mounted. Furnish tumbler key lock locking mechanism.

3.12.5 Light Duty Metal Shelf

Provide a 600 mm long, light duty stainless steel shelf and brackets over each lavatory.

3.12.6 Robe hooks on all toilet and shower stalls required.

3.13 COLD STORAGE ROOMS

3.13.1 Contractor shall provide the Contracting Officer shop drawings for approval of appropriately sized walk-in refrigerators and freezer to include proposed manufacturer, construction details, manufacturer's instructions, evacuation and charging procedures, operation and maintenance date, start-up and initial operational tests.

3.13.2 Walk-in coolers shall be panel type modular construction. Doors shall be swing type. Refrigeration equipment shall be remote located on the exterior of the building. Provide a temperature/ alarm system. Provide interior lighting with exterior switch. Floors of cool rooms shall be insulated panelized construction from the manufacturer of the cool rooms. The concrete floor will not be depressed.

3.13.3 Refrigeration piping shall be annealed or hard drawn seamless copper tubing in conformance with ASTM B280. Refrigeration systems shall be remote type.

3.13.4 Electrical characteristics shall match local power 400v/3ph/50Hz and 220v/1ph/50Hz.

3.13.5 Preservation and packing shall be commercial grade.

3.13.6 Provide a recording thermometer.

3.13.7 Provide temperature alarm with connector to remote temperature alarm.

3.13.8 Provide outdoor condensing unit cover and security fence or wall to protect outside units. Provide condensing unit outdoor controls for operation down to -18 degrees C ambient temperature.

3.13.9 Refrigeration Equipment

Refrigeration equipment shall be designed for remote installation. Design units for 16 to 18 hour operation at the indicated interior temperature in -18 degree C ambient temperature. Capacities, air delivery, and dimensions shall be as indicated. Remote condensing units shall be factory fabricated and rated in accordance with UL303 and ARI 365. Provide with motor, air cooled condenser, receiver, compressors, mounted on a common base. Compressors shall be hermetic type. Evaporators shall be factory fabricated and rated in accordance with UL 412 and ARI 420. Forced convection, unit cooler type, made to suspend from the ceiling panels, with forced air discharged parallel to the ceiling. Provide with air circulating motor, multi-fin tube type coil and grille assembled within a protective housing. Air circulation motors shall be lifetime sealed, and the entire unit-cooler assembly shall be accessible for cleaning. Provide a drip pan and drain connection. When the cold storage room is used for freezing, provide an automatic electric heat defrosting system. Provide a timer type defrost controllers.

3.13.9.1 Provide condensate drain lines and drains below freezer floors with electric heating cable, thermostatically controlled to maintain 10 degrees C at zero flow rate. Cable shall be sized in accordance with manufacturer's recommendations.

3.13.9.2 Submit a copy of installation instructions to the Contracting Officer covering both assembly and installation of the refrigeration equipment prior to start of work. Start up and initially operate the systems upon completion of the installation of the equipment and refrigerant piping. Adjust the safety and automatic controls to place them in operating sequence. Record

manufacturer's recommended readings hourly. Operational test shall cover a period of not less than 24 hours. Upon completion of Operational test the systems shall be performance tested. Test duration shall not be less than 8 hours. Test shall include the following information to be in the report with conclusions regarding the adequacy of the systems:

Time, dates and duration of tests:

- Inside dry-bulb and wet-bulb temperatures maintained in each room during the tests employing recording instruments calibrated before the tests.
- Outside dry-bulb and wet-bulb temperatures obtained from recording instruments calibrated and checked hourly with a sling psychrometer.
- Evaporator and condenser entering and leaving temperatures taken hourly with the compressors in operation.
- The make, model, and capacity of each evaporator and condensing unit.
- Voltmeter and ammeter readings for condensing units and evaporators.

3.13.9.3 Provide chart showing the layout of the refrigeration systems, including piping, valves, wiring, and control mechanisms. Submit printed instructions covering the maintenance and operation of refrigeration equipment. Tag shutoff valves in accordance with the instructions. Provide any special tools necessary for repair and maintenance of the systems.

3.13.10 Remove any packing material. Wash and clean floors, walls, ceilings and equipment inside of cool rooms. Wash and clean exposed surfaces on outside.

3.13.11 Upon completion of the work and at a time designated by the Contracting Officer, provide instruction to designated personnel in the operation and maintenance of each refrigeration system. The period of instruction shall not be less than one 8-hour day.

3.14 STANDARDS

The Contractor should use the following American standards to provide sound structural design if local standards are not available, relevant, or applicable. The Contractor shall follow American Concrete Institute Standards for design and installation of all concrete structures.

Concrete	210.0 kg./sq.cm (f'c) cylinder strength @ 28 days (ASTM-. C 31M)
Steel Reinforcement	4218.0 kg./sq.cm(Fy= 60.0 ksi),yield strength.
Welded Wire Fabric	ASTM A185
Anchor Bolts	ASTM A307 using A36 steel.
Concrete Masonry Units	ASTM C90, Type I (normal wt, moisture Cntrl).
Mortar	ASTM C270, Type S (Ultimate compressive strength of 130.0 kg/sq. cm.)
Proportion	1 part cement, 0-1/2 part lime and 4-1/2 parts aggregate
Grout	ASTM C476 (Slump between 200 mm to 250 and Compressive
Strength	14 MPa (2000 psi) at 28 days.
Joint Reinforcement	Standard 9 gage minimum, Ladder Type
Structural Steel	ASTM A36: 2530.0 kg./sq.cm (Fy = 36,000psi)
Welding	AWS (American Welding Society) D1.1-2002.

4. STRUCTURAL

4.1 GENERAL

The project consists of various structures. The new buildings shall be provided with a reinforced concrete slab foundation that is properly placed on suitable compacted ground area and shall be in accordance with the recommendations from the geotechnical investigation. The reinforced concrete foundation shall be designed by the Contractor. Building foundations shall be founded a minimum of 800 mm below grade. The following facilities shall be structurally designed by the contractor: Battalion HQ Building, BOQ Facilities (BOQ Facility Type A, BOQ Facility Type B), Barracks (Type A), Barracks (Type B), Shower /Toilet, Battalion Storage, Motor Pool, Communications Building, Bunkers and the Reception Building.

4.2 DESIGN

Design shall be performed and design documents signed by a registered professional architect and/or engineer. Calculations shall be in SI (metric) units of measurements. All components of the building shall be designed and constructed to support safely all loads without exceeding the allowable stress for the materials of construction in the structural members and connections. All building exterior walls shall be constructed with reinforced CMU, pre-engineered panel, shotcrete 3-D panels, or reinforced concrete unless otherwise stated in sections 1010 or 1015. All required documents, including drawings, specifications, and design analysis, shall be prepared in accordance with Section 01335 Submittal Procedures for Design Build Projects. Specific submittal requirements in these sections supplement the requirements of Section 01335.

The design analysis shall include detailed calculations and any additional information required, and the information listed below, when applicable.

All structures and all parts of the structures shall be designed and constructed to support safely all loads without exceeding the allowable stress for the materials of construction in the structural members and connections.

4.3 DEAD AND LIVE LOADS

Dead loads consist of the weight of all materials of construction incorporated in the buildings. Live loads used for design shall be in accordance with the Structural Load Data, UFC-3-310-01, as referenced herein.

4.4 WIND LOADS

Wind loads shall be calculated using a "3-second gust" wind speed of 135 km/hr.

4.5 SEISMIC

The building and all parts thereof shall be designed for the seismic requirements as defined by the International Building Code referenced herein. Spectral ordinates shall be $S_s = 1.28g$ and $S_1 = 0.51g$.

4.6 STRUCTURAL CONCRETE

Concrete structural elements shall be designed and constructed in accordance with the provisions of the American Concrete Institute, Building Code Requirements for Structural Concrete, ACI 318, latest edition. A minimum cylinder 28 day compressive strength of 21 MPa (3000 psi) shall be used for design and construction of all concrete, except that 24 MPa (3500 psi) shall be used for Shotcrete applications. Reinforcing steel shall be deformed bars conforming to American Society for Testing and Materials (ASTM) publication ASTM a 615, Deformed and Plain Billet-Steel Bars for Concrete Reinforcement. Concrete at or below grade shall have maximum water-cement ration of 0.50. No concrete shall be placed when the ambient air

temperature exceeds 32 degrees C (90 degrees F) unless an appropriate chemical retardant is used. In all cases when concrete is placed at 32 degrees C (90 degrees F) or hotter it shall be covered and kept continuously wet for a minimum of 48 hours. Concrete members at or below grade shall have a minimum concrete cover over reinforcement of 75 mm (3 inch).

For additional requirements see Section 03100 STRUCTURAL CONCRETE FORMWORK, Section 03256 HYDROPHILIC RUBBER WATERSTOPS, Section 03300 CAST-IN-PLACE STRUCTURAL CONCRETE and Section 03200 CONCRETE REINFORCEMENT.

4.7 MASONRY

Masonry shall be designed and constructed in accordance with the provisions of Building Code Requirements for Masonry Structures, ACI 530/ASCE 5/TMS 402, latest editions. Mortar shall be Type S and conform to ASTM C 270, latest edition. Masonry shall not be used below grade, unless for fully grouted and reinforced foundation stem walls. **All cells of exterior CMU walls shall be fully grouted and reinforced.**

4.8 STRUCTURAL STEEL

Structural steel shall be designed and constructed in accordance with the provisions of American Institute of Steel Construction (AISC), Specifications for Structural Steel Buildings, 9th Edition. Design of cold-formed steel structural members shall be in accordance with the provisions of American Iron and Steel Institute (AISI), Specifications for Design of Cold-Formed Steel Structural Members.

For additional requirements see Section 01520 STRUCTURAL STEEL.

4.9 METAL DECK

Deck units shall conform to SDI Pub. No.29. Panels of maximum possible lengths shall be used to minimize end laps. Deck units shall be fabricated in lengths to span three or more supports with flush, telescoped or nested 50 mm (2 inch) laps at ends, and interlocking, or nested side laps. Metal deck units shall be fabricated of steel thickness required by the design and shall be galvanized.

4.9.1 METAL ROOFING

Metal roofing shall not be less than 22 Gauge thick.

4.10 OPEN WEB STEEL JOIST

Open web steel joists shall conform to SJI Specifications and Tables. Joists shall be designed to support the loads given in the standard load tables of SJI Specifications and Tables.

4.11 FOUNDATIONS

Foundations shall be in accordance with the Geotechnical requirements of this RFP.

4.12 PRE-ENGINEERED METAL BUILDING SYSTEMS

Metal building systems shall comply with the requirements of the MBMA Low Rise Building Systems Manual-2002.

4.13 WOOD

Structural lumber shall comply with AITC OT-01. Grades and species of framing and board lumber shall comply with WWPA G-5. Wood framing shall be in accordance with AF&PA T10. Members shall be closely fitted, accurately set to required lines and levels, and rigidly secured in place. Floor platform framing lumber shall be treated in accordance with AWPA C2 with waterborne preservatives listed in AWPA P5 to a retention level of 6.4 kg per cubic meter (0.40 pcf). Plywood shall conform to PSI, underlayment grade with exterior glue, or B-C (plugged) exterior grade, 19 mm thick, 1200 mm wide, and be tongued and grooved. Any surface roughness at nail heads or joints shall be lightly sanded to blend with the undisturbed surface. For new floors receiving a vinyl finish flooring, a separate layer of fully-sanded underlayment shall be properly installed before the vinyl flooring is installed. Exterior grade treated plywood conforming to AWPA C9 should be used in exterior locations. Bolts, nuts, and other fasteners shall be appropriately sized and spaced for the job in accordance with referenced publications. Fasteners in contact with preservative treated wood, masonry or concrete shall be zinc-coated.

No exterior wood shall be used on any part of the building exterior, i.e. doors, windows, fascia, etc.

5. GEOTECHNICAL INVESTIGATION AND REPORT

5.1 General

Site specific geotechnical information necessary to design and construct the foundations, pavements, and other geotechnically related items contained in this project shall be the Contractor's responsibility. The Contractor shall determine all necessary geotechnical conditions by appropriate field and laboratory investigations and supporting calculations.

5.2 Definitions

For purposes of this specification, a major structure is defined as any structure that meets any of the following criteria: a) reinforced concrete framed structures with a building footprint in excess of 1,000 sq. m., b) steel framed structures with a building footprint in excess of 3,000 sq. m., c) a structure that has a height equal to or greater than one and a half stories, d) steel or concrete tanks in excess of 350 cubic meters. A minor structure is any structure that does not meet any of the four major structure criteria above.

5.3 Minimum Requirements

5.3.1 Structures. As a minimum for major structures, the Contractor shall advance three (3) borings or test pit within the building footprint of any major structure. For minor structures, depending on the foundation size, the Contractor shall advance one (1) to three (3) test pits within the building footprint, advancing one test pit for every 225 SM within the building footprint. The depths of these explorations shall be sufficient to determine the subsurface conditions within the influence of the structure's foundation system.

5.3.2 Pavements. As a minimum for airfield pavements, the Contractor shall excavate three (3) test pits for pavements less than or equal to 5,000 sq. m. and one (1) test pit for each additional 5,000 sq. m. of pavement or fraction thereof. As a minimum for all other pavements such as hard stands and parking lots, except roads, the Contractor shall excavate three (3) test pits for pavements less than or equal to 7,500 sq. m. and one (1) test pit for each additional 5,000 sq. m. of pavement or fraction thereof. As a minimum for roads, the Contractor shall excavate three (3) test pits for pavements less than or equal to 200 linear meters and one (1) test pit for each additional 200 linear meters or fraction thereof.

5.4 Geotechnical Report

The Contractor shall produce a detailed geotechnical report containing the field exploration and testing results, laboratory testing results, evaluations, recommendations, calculations and descriptive supporting text. Information in the report shall include, but not be limited to: existing geotechnical (e.g., surface and subsurface) conditions, location of subsurface exploration logs, exploration point, foundations selected, bearing capacity, pavement design criteria (e.g., CBR values, K Values), ground water levels, and construction materials (e.g., concrete cement, asphalt and aggregates). Two copies of the detailed geotechnical report shall be submitted to the Contracting Officer.

5.5 Geotechnical Qualifications

All geotechnical engineering design parameters shall be developed by a geotechnical engineer or geotechnical firm responsible to the Contractor. The geotechnical engineer or geotechnical firm shall be qualified by: education in geotechnical engineering; professional registration; a minimum of ten (10) years of experience in geotechnical engineering design.

5.6 Design Certification

The Contractor shall certify in writing that the design of the project has been developed consistent with the site-specific geotechnical conditions. The certification shall be stamped by the geotechnical engineer or geotechnical firm and shall be submitted with the final design.

6.MECHANICAL

6.1 GENERAL

The work covered by this section consists of design, supply, fabrication and installation of new building ventilation and air-conditioning systems. It also includes the delivery to site, erection, setting to work, adjusting, testing, balancing and handing over in perfect operating and running condition all of the equipment including all necessary associated mechanical works.

6.2 SPECIALIST SUB-CONTRACTORS QUALIFICATIONS

The ventilation, and air-conditioning works shall be executed by an air-conditioning specialist sub-contractor experienced in the design and construction of ventilation and air conditioning equipment to include conventional compression systems, indirect and direct evaporative cooling systems and knowledge in fabricating specialized units consisting of supplemental direct expansion (DX) cooling coils in satisfying the specified indoor design conditions. The HVAC design shall be prepared using recognized HVAC load analysis programs such as Trane "Trace" or Carrier "HAP". The HVAC specialist shall submit the complete HVAC analysis at the 65% design submittal. The HVAC analysis shall clearly state what types of systems are to be used and how the system will satisfy the specified indoor design conditions. Provide related psychrometric charts showing the air wet bulb and dry bulb temperatures at each section of the heat/cool unit.

Provide complete, edited specifications using the UFGS specs for evaporative cooling. The edited specifications shall be submitted along with the 65% design submittal. The specifications shall be coordinated with the manufacturer of the evaporative cool/heat units.

6.3 CODES, STANDARDS AND REGULATIONS

The equipment, materials and works covered under the ventilation and air-conditioning services shall conform to the referenced standards, codes and regulations listed in Paragraph 1.8 except where otherwise mentioned under each particular clause.

6.4 DESIGN CONDITIONS

6.4.1 Outside Design Conditions. (Contractor shall verify the ambient conditions with available and reliable local weather data.)

Ghazni area :

[Latitude – (approx.) 33 deg. North
 Longitude – (approx.) 68 deg. East
 Elevation – (approx.) 2210 M (7250 ft.)
 Summer – 30.5 deg C (87 deg F) Dry Bulb (DB) [& 8.3 deg C (47 deg F)] Wet Bulb (WB)]
 Winter – (-11.1 deg C/12 deg F)
 Daily Range – data unknown]

INDOOR DESIGN CONDITION

Summer – 23.9 deg C (75 deg F) & 50% RH for rooms with packaged air conditioning units
 Buildings served by the evaporative cooler shall be limited to EDB minus (82% of the EWBD)
 Winter – 21.1 deg C (70 deg F)

6.4.2 INDOOR DESIGN CONDITION

SUMMER:

Barracks	Cooling maximum 27.8 C (82 F)
Administrative buildings	Cooling 25.6 C (78 F)
DFAC	Cooling 25.6 C (78 F)
Bathroom/Shower/Laundry	Cooling maximum 30 C (85F)
Maintenance facilities	Cooling maximum 30 C (85F)
Warehouses	Cooling maximum 30 C (85F)
Workshops	Cooling maximum 30 C (85F)

WINTER:

NOTE: See Spec 01010 Scope of Work and requirements hereinafter to verify if a facility is to be provided heating in this contract or the HVAC system shall be designed to allow for future addition of heat using diesel heat.

Barracks	20 C (68 F)
Administrative Buildings	20 C (68 F)
DFAC	20 C (68 F)
Toilet/Showers/Laundry	20 C (68 F)
Maintenance Facilities	12.7 C (55 F)
Warehouses	No Heating
Workshops	12.7 C (55 F)

6.4.3 NOISE LEVEL

Noise levels inside occupied spaces generated by HVAC systems shall not exceed NC 35

6.4.4 INTERNAL LOADS

- Occupancy: Use ASHRAE standards to calculate sensible and latent heat from people
- Lighting (Fluor.): 21.5 W/m² (2 W/Ft²) maximum (however lighting levels shall meet minimum requirements)
- Outdoor Air: 34 CMH/Person (20 CFM) or “51 CMH/bedroom (30 CFM/bedroom)”; Latrine – 85 CMH/WC or Urinal (50 CFM) exhaust.
- Building Pressurization: 1.3 mm W.G. (0.05 in W.G.); Maintain negative pressure in latrine areas

6.4.5 THERMAL PERFORMANCE

Assemblies shall meet the requirements of TI-800, Design Criteria, UFC 3-400-01 Design: Energy Conservation, and ASHRAE Standard 90.1, latest editions, but shall meet the following minimum requirements:

Assembly	Minimum Thermal Value
exterior walls (above grade)	RSI 2.288 (R 13)
ceilings/roof	RSI 5.28 (R 30)
basement wall	
floor (over unheated space)	RSI 5.28 (R 30)
exterior doors	RSI 0.25 (R 1.43)
exterior windows/ (glazing within doors)	RSI 0.308(R 1.75)
Skylights	RSI 0.18 (R 1.02)

6.4.6 SEISMIC REQUIREMENTS

All mechanical and plumbing equipment and piping shall be installed to meet the seismic requirements as defined by the International Building Code and seismic response coefficients as identified in Paragraph 4 Structural.

6.5 NEW AIR CONDITIONING EQUIPMENT

Air Conditioning Equipment:

Environmental control of the facilities shall be achieved by air conditioning equipment as listed below and approved by the U.S. Government. Unless otherwise noted, the Contractor may choose any combination of equipment to achieve the inside design conditions specified for the floor plans. As a general rule, buildings over 250 SM qualifies for evaporative cooling with diesel heat units. Provide space in the unit to retrofit the heating module if required in the future.

Facility Type	Cooling	Heating	Type of HVAC System	Remarks
Barracks	82 F	68 F	Evap Cool w/Diesel Heat	
BOQ Type B	78 F	68 F	Evap Cool w/Diesel Heat	
Battalion HQs Brigade HQs	78 F	68 F	Evap Cool w/Diesel Heat	Command Centers and Commander's office shall be provided with split pack heat pump units
Comm. Facility	78 F	68 F	DX Type Air-conditioning	
Bathroom/Shower	82 F	68 F	Evap Cool w/Diesel Heat	
Storage	85 F	55 F	Ventilation only	No Heating-
All DFAC's	78 F	68 F	Evap Cool w/Diesel Heat	
ETTC Barracks	78 F	68 F	Evap Cool w/Diesel Heat	
Interpreter Barracks	78 F	68 F	Evap Cool w/Diesel Heat	
Power Plant Admin Area & Control Rm	78 F	68 F	Central DX type Unit	Engine Bay to be provided filtered air ventilation only
Guard Tower,	78 F	68 F	Split pack heat pumps	

Guard House, Reception Fac.,				
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6.6 EVAPORATIVE COOLING/HEATING UNITS

This is a package unit, consisting of modules: indirect evaporative unit, direct evaporative unit, DX cooling coil, (with provision to allow future addition of heater fitted with diesel atomized burner; with a double-wall 500 liter fuel tank mounted underneath), intake hood, blower with dampers & filters, all mounted on a steel chassis. The supplemental DX cooling coil module shall be installed with the direct or indirect evaporative cooling module to maintain spaces requiring 78 F indoor conditions. Evaporative units without the supplemental DX cooling coils qualify for facilities such as bathroom/shower buildings, maintenance facilities and general spaces which do not require the stringent 78 F indoor conditions. The Evap Unit has supply and return insulated air ducts to connect to the building duct system. Evaporative cooling (swamp-cooler) cooling efficiency shall be 82% for direct type and 65% for indirect type and the heating efficiency shall be 80%. The Evap Unit shall be suitable for outdoor mounting on a concrete slab.

The Evap Unit shall be installed exterior to the building, with sheet-metal ducts of calculated size to evenly distribute the cooled air to all conditioned parts of the building. For small rooms, flexible metal branch ducts may be used from the central duct system. Flexible ducts must be limited to 3 meters in length. Exterior ducts shall be insulated, interior ducts generally will not be insulated. Duct air velocity shall be between 3.0 and 6.0 m/s. Minimum galvanized duct sheet-metal thickness shall be 0.85 mm (22g). Duct sheet-metal quality shall be according to SMACNA (Sheet Metal and Air Conditioning Contractors' National Association) manual for air conditions ducts. Supply and return ducts shall be provided for each room and space. If a direct evaporative unit can satisfy the specified indoor conditions, then all the air can be discharged through the building openings. See Appendix E, Evap Drwg.

6.6.1 Submittals

The Contractor shall submit the following for the equipment to be provided under this section of the specification: manufacturer's data including performance characteristics at design conditions; manufacturer's certificate stating that each unit will perform to the conditions stated, catalog cuts showing dimensions, performance data, electrical requirements, compliance with standards as stated in paragraph CODES, STANDARDS AND REGULATIONS; complete shop drawings indicating location and installation details.

The manufacturer shall also submit a 2 year warranty for each of the units.

Water for the evaporative coolers shall be taken from the nearest water main or building service line. Water supply for the evaporative coolers shall not tie into a small branch line such that it affects the water supply to the fixtures on that line. The Contractor shall field verify the water distribution system for the facility and recommend the most appropriate line to tie into.

6.6.2 Unitary (ductless split) Heat Pump Units

Ductless split units shall be unitary in design and factory manufactured ready for installation. Heat pump units shall provide cooling during summer and heating during winter. Evaporator unit shall consist of a DX evaporator cooling coil, blower, supplemental electric heater elements and washable filter all mounted in a housing finished for exposed installation. Cooling coil condensate piping shall route to and discharge to the sanitary sewer system. The condensing unit will contain compressor, condenser coil, and all internal controls/fittings complete to include a weatherized housing. Outdoor condensing unit shall be mounted on steel supports or on a concrete pad. Copper refrigerant suction and liquid piping shall be sized, insulated and installed in accordance to unit manufacture recommendations. Unit temperature control shall include wall mounted adjustable thermostat, blower on-off-auto switch and heating-cooling change over control.

6.6.3 Temperature control for cooling shall be by turning on/off the evaporative-cooler water-pump and/or starting/stopping the blower. Temperature controls shall be securely mounted to the building surface and protected from any abuse and damage.

6.6.4 Wall Penetrations

Building wall penetrations shall be carefully made so as not to deteriorate the structural integrity of the wall system. The Contractor shall consult with the building manufacturer, if possible, to determine the best way to penetrate the wall. If the building manufacturer is not available, a structural engineer shall be consulted. In either case, the recommendations of the engineer shall be strictly adhered to.

6.6.5 Control Wiring and Protection Devices

Control wiring and protection of the air conditioning units being offered must be the manufacturer's standard, pre-wired, installed in the unit at the factory or as recommended. Thermostats shall be located near the unit return. For units serving more than one area, the thermostat shall be located near the return of the space with the highest heat generation.

6.6.6 Air Filtration

All supply air shall be filtered using manufacturer's standard washable filters mounted inside the unit (for ductless split pack) and 30% ASHRAE efficiency throwaway pleated filters (for central air handling units). In addition, all outdoor air intakes, where required shall be equipped with 50 mm (2 inch) thick washable filters.

6.7 VENTILATION AND EXHAUST SYSTEMS

All fans shall be used for building ventilation and pressurization with capacities to be selected for minimum noise level generated. Unit mounted fans either used for supply or exhaust shall be centrifugal forward curved, backward inclined, or airfoil fans with non-overloading characteristics of high efficiency and quiet running design. The fans shall be of the heavy-duty type with durable construction and proved performance in a desert environment. Each exhaust fan shall be provided with motorized or gravity dampers which close automatically when the fan is not running. Also, each fan shall be complete with vibration isolator, external lubricators, and all accessories and sound attenuators as necessary.

Supply intake openings shall be provided with motorized dampers which are interlocked with the exhaust fan. The dampers open or close when the exhaust fan is on or off respectively. Maintenance shops and similar spaces that use solvents and oils shall be provided with mechanical exhaust air systems. Exhaust fans shall be centrifugal wall mounted type. Intake openings shall be provided with motorized dampers which are interlocked with the exhaust fans. Provide minimum of 16 ACH. The systems shall consist of centrifugal fan, ductwork, exhaust grills, and interlock controls. Comply with Industrial Ventilation UFC 3-410-04N.

Toilet and Wash Area: Minimum exhaust ventilation shall be the larger of 35 m³/h / m² floor or 85 m³/h / toilet (WC). At extreme cold in winter these values can be reduced for short periods to 10 m³/h / m² or 40 m³/h / toilet (WC) to conserve heat.

Kitchen Hood Exhaust and Make-up Air: As required and as per Kitchen design specialist and equipment supplier requirements. Provide minimum of 250 cfm per linear foot of hood length or 75 cfm per square area of hood per International Mechanical Code. The designer shall take special note that multiple large propane stoves will be installed in the kitchen. The steam generated by the local style of cooking with large pots is immense in comparison to western standards, and the additional need for ventilation must be accounted for in the design. Also, the cooks are accustomed to standing on top of the stoves in order to stir the large cauldrons of food.

This common cooking practice should be taken into consideration when designing the exhaust hood. The height of the hood above the stovetop should be such that a man of average stature could stand upright without risk of hitting his head on the hood. Design per NFPA 92A, 96, 204, and 211. Make up air intake shall be integral with the hood system or be located as close to the exhaust intake to prevent cold drafts.

To reduce sand and dirt migration, outside air intakes shall be located as high as possible within architectural constraints. The intakes shall be sized so that free air velocities are below 2.5 m/s (500 fpm). For inhabited buildings locate all air intakes at least 1.5 (center-line of intake) meters above the ground. Each air intake shall be provided with a motorized damper which is interlocked with the exhaust fan.

6.7.1 Submittals

The Contractor shall submit the following for the equipment to be provided under this section of the specification: manufacturer's data including performance characteristics at design conditions; catalog cuts showing dimensions, performance data, electrical requirements, compliance with standards as stated in paragraph CODES, STANDARDS AND REGULATIONS; drawings indicating location and installation details.

6.8 TEST ON COMPLETION

6.8.1 After completion of the work, the Contractor shall demonstrate to the Contracting Officer that the installation is adjusted and regulated correctly to fulfill the function for which it has been designed. The Contractor shall test, adjust, balance and regulate the section or sections of concern as necessary until the required conditions are obtained. Operational test shall be conducted once during the summer. Coordinate with the Contracting Officer on when the test shall be scheduled. Include tests for all interlocks, safety cutouts and other protective device to ensure correct functioning. All such tests shall be carried out and full records of the values obtained shall be prepared along with the final settings and submitted to the Contracting Officer in writing.

6.8.2 The following tests and readings shall be made by the Contractor in the presence of the Contracting Officer and all results shall be recorded and submitted in a tabulated form.

- a. Ambient DB and WB temperatures
- b. Room Inside Conditions:
 1. Inside room DB & WB temperatures
 2. Air flow supply, return and/or exhaust
 3. Plot all temperatures on psychrometric chart
- c. Air Handling Equipment: Air quantities shall be obtained by anemometer readings and all necessary adjustments shall be made to obtain the specified quantities of air indicated at each inlet and outlet.

Following readings shall be made:

 1. Supply, return and outside air CMH (CFM) supplied by each air conditioning system.
 2. Total CMH (CFM) exhausted by each exhaust fan
 3. Motor speed, fan speed and input ampere reading for each fan
 4. Supply, return and outside air temperature for each air-conditioning system.
- d. Electric Motors:

For each motor: (1) Speed in RPM
(2) Amperes for each phase
(3) Power input in KW

6.9 ELECTRICAL REQUIREMENTS FOR HVAC EQUIPMENT

- a. Note that electrical requirements for all equipment shall be designed and installed to operate

on the secondary power standard required herein. The existing power distribution system may require modifications or upgrades to support the additional power required by the evaporative cooling unit with supplemental DX cooling coil. The Contractor is responsible to field verify all the conditions and provide complete shop drawings showing any incidental power upgrades. All electrical work shall comply with the National Electric Code.

b. All thermostats shall be wall mounted near the return grilles in the room with the highest heat load generation and mounted 1.5 meters (5 feet) above the floor. In lieu of a thermostat, a temperature sensor may be located in the same location or in the return duct and connected to a thermostat located near the unit return. Thermostat shall be mounted 1.5 meters (5 feet) above the finished floor and be easily accessible. Thermostats for the latrine facilities shall be located near the unit return and mounted 1.5 meters (5 feet) above the finished floor. Operation of the control system shall be at the manufacturer's standard voltage for the unit.

c. The following are the minimum requirements for motors regarding enclosure, insulation and protection:

1. Compressor Hermetic: Provide inherent (internal) overload protection.
2. Condenser: Provide internal thermal overload protection.
3. Evaporator (Open Class "A") fan motor type provides internal thermal overload protection.

6.10 CEILING FANS

6.10.1 Ceiling Fan

Provide 1320mm blade ceiling fans at one per 40 square meters of floor space. Fans shall have reversible motors. Center or distribute evenly in room. Coordinate placement with the lighting plan to prevent conflict or casting shadows. Fan mount shall be flush, standard, or angle mount depending on ceiling height. Fan shall be mounted such that the fan blade is approximately 2.44 meters above the finished floor. The fan shall be provided with out light kit. The finish shall be factory painted white. The controls shall be from either a single pole switch or from two 3 way switches to provide on/off operation. The electrical supply shall be 230volts, single phase, and 50 hertz. Install per manufacturers' instructions.

6.10.2 Submittals.

The Contractor shall submit the following for the equipment to be provided under this section of the specification: manufacturer's data including performance characteristics at design conditions; catalog cuts showing dimensions, performance data, electrical requirements, compliance with standards as stated in paragraph CODES, STANDARDS AND REGULATIONS; drawings indicating location and installation details.

6.11 PROPANE COOKING STOVE See Appendices F-1 TO F-5.

Cooking area shall be provided canopy type exhaust only kitchen hoods and associated exhaust fans. These exhaust hoods shall include baffle type aluminum filters to trap grease/oil. The exhaust fan sizing calculations should recognize the use of propane stoves in the kitchen. Sizing should accommodate all propane burning stoves running simultaneously. Additionally, the placement of the exhaust hood should allow enough clearance for an average sized male to stand on top of the stove platform unobstructed, for standing on the stove is common local cooking practice. The higher than average placement of the hood will require the extension of the lip of the hood out further than normal, in order to catch the majority of the smoke and adequately vent the area. Propane tank shall be located out the DFAC covered in the fenced storage yard New propane stoves shall be installed with consideration to ease of cooking operation and daily cleanup. The new propane stoves shall be set into a formed concrete opening such that it can easily be removed for replacement, maintenance and cleaning.

Each propane stove shall be provided with three burners. The propane stoves shall be of commercial quality and be capable of producing the highest BTU heat output with all three burners on. The center burner is low heat, center and middle burner is medium heat and all three burners is high heat. A shut off valve for each burner shall be provided at the face of the propane appliance.

Piping from the propane tanks to the respective propane stoves shall be wrought iron, ASTM B36.10M or steel (black or galvanized), ASTM A53. The steel piping shall terminate in front of the propane stoves with a shut off valve and quick disconnect nipple. A stainless steel flexible hose shall connect from the propane stove to the steel piping. Each end of the flexible hose shall be provided with quick disconnect fittings.

The propane piping shall not be embedded in the concrete floor. Installation of the propane piping in concrete trenches is highly recommended. The piping may be surface mounted provided that it is not susceptible to damage or causes any safety hazards. Piping passing through the exterior wall shall be provided with pipe sleeves.

6.11.1 Propane Fuel Storage/Distribution

Propane Storage and Distribution shall be provided to support operation of the propane stoves for cooking and boiling tea. The bulk storage of fuels shall consist of above-ground horizontal steel tanks sized to store a 30-day supply of fuel. These tanks shall be complete with fill fittings, tank gauge, vent, and other fittings and appurtenances required for full and safe operation. Tanks shall be provided with support saddles, platform/stair and concrete pad.. Bulk storage capacity shall be based on minimum four-week full load operation of the kitchen. Metal fuel tank saddles should not be placed directly on fuel containment area slabs. They should be elevated on piers to avoid moisture corrosion. Propane storage tanks shall be provided and installed in accordance with NFPA 58. The propane storage tanks shall be installed on a concrete pad, and provided within an enclosure to protect the tanks from the elements. The Contractor shall coordinate with the User and the Contracting officer in determining the capacity of propane fuel required. The propane fuel capacity shall be based on frequency of cooking, consumption of fuel every cooking cycle, frequency and availability of replacement fuel tanks and spare capacity. This project will require that the Contractor provide the agreed to amount of fuel tanks filled with propane fuel at time of completion.

Provide chain link fence and gates around entire propane storage facility. Fence shall match perimeter Force protection fence with lockable gates, and concertina wire etc. Provide fuel filling system for unloading fuel from fuel tanker into individual bulk storage tanks comprising of truck pad(s), duplex fuel transfer pumps, piping manifold and valves as required for a complete system.

7. PLUMBING

7.1 SCOPE OF WORK.

7.1.1 General

The Contractor shall design and build domestic cold and hot water systems, waste, drain and vent systems, waste-oil collection and storage and fuel-oil storage and distribution systems required in the facilities identified in Section 1010 Scope of Work and as described herein. The Contractor shall also be responsible for complete design and construction of all domestic and special plumbing systems required for full and safe operations in the Generator Plant, Water Storage and other facility or structures required in this contract.

The work covered in this scope also includes the delivery to site, erection, setting to work, adjusting, testing and balancing and handing over in full operating condition all of the plumbing equipment and associated plumbing works.

7.1.2 Sub-Contractors Qualifications

The plumbing systems shall be executed by a plumbing specialist subcontractor experienced in the design and construction of these types of systems.

7.1.3 Standard Products

All materials and equipment shall be standard product of a manufacturer regularly engaged in the manufacture of the product and shall duplicate items that have been in satisfactory use for at least two (2) years prior to bid opening.

7.1.4 SEISMIC REQUIREMENTS

All mechanical and plumbing equipment and piping shall be installed to meet the seismic requirements as defined by the International Building Code and seismic response coefficients as identified in Paragraph 4 Structural.

7.2 CODES, STANDARDS AND REGULATIONS

The design and installation of equipment, materials and work covered under the plumbing services shall conform to the standards, codes and regulations listed in paragraph 1.8 except where otherwise indicated under particular clause(s) and in accordance with design specifications set provided in this package. The publications to be taken into consideration shall be those of the most recent editions. Standards other than those mentioned herein may be accepted provided that the standards chosen are internationally recognized and meet the minimum requirements of the specified standards. The Contractor shall submit proof of equivalency if requested by the Contracting Officer.

7.3 PLUMBING SYSTEMS REQUIREMENTS

7.3.1 Water

Domestic cold and hot water shall be provided in the facilities to serve the water usage and plumbing fixtures provided for the facility. Water service to each facility shall enter the building in a mechanical, toilet, storage, or similar type space. The building service line shall be provided with a shut off valve installed either outside in a valve pit or inside the mechanical room or similar spaces. Water piping shall not be installed in or under the concrete foundation. All water piping shall be routed parallel to the building lines and concealed in all finished areas. Insulation shall be provided where required to control sweating of pipes or to provide protection from freezing.

7.3.2 Piping Materials

Domestic water shall be distributed by means of standard weight (schedule 40) galvanized steel pipe. Waste and vent piping can be made of either galvanized steel pipe (schedule 40), or Polyvinyl Vinyl Chloride (PVC) conforming to ASTM D 2665. Corrosion protection shall be provided if galvanized piping comes in contact with earth or masonry floors, walls or ceilings.

7.3.3 Plumbing Fixtures

The following typical plumbing fixtures shall be provided:

- a. Eastern Water Closet with flush tank assembly. . Provide acid resisting fired porcelain enameled cast iron water closet complete with rotating No-Hub 'P' trap and No-Hub coupling to meet piping requirements. Eastern Style water closet shall be furnished with integral non-skid foot pads and bowl wash down non-splashing flushing rim. The water

closet shall be completely self supporting requiring no external mounting hardware and shall be flush with floor. The Eastern Style water closet shall incorporate waterproofing membrane flashing flange. Provide a cold water spigot 300mm above finished floor on the right (from a perspective of standing inside of the cubicle and looking out) sidewall of the cubicle. Spigot shall have a flexible hose and spray nozzle such that the occupant can wash over the water closet. Toilets shall be oriented north and south. Toilets shall not face east or west.

b. Lavatories. All sinks shall be trough type constructed of block and concrete with ceramic tile exterior and lining capable of withstanding abuse. Faucets shall be chrome plated brass single lever mixing type. Provide maintenance access to waste piping and P-traps from under the sink. Lavatories inside the prison cells shall be tamper-proof with integral spout, soap depression, and outlet connection to slip 40mm OD tubing.

Lavatories. Enameled cast iron, wall or counter mounted. Brass fittings provided for water supplies. (To be used in American or Afghan/American mixed facilities only.)

c. Janitor's Sink. Floor mount janitor, enameled cast iron with copper alloy rim guard. Provide hot and cold water valves with manual mixing. Faucet handles shall be copper alloy. Include a stainless steel shelf and three mop holders.

d. Shower. Showerhead and faucet handles shall be copper alloy. Provide for manual mixing with hot and cold water valves. In addition to a shower head, provide each shower stall with a threaded faucet approximately 1.2 m AFF with hot and cold-water controls, mixing valve and a diverter type valve so water can be directed to either the shower or to the lower faucet. Shower shall be provided with low flow shower head. The shower head shall be heavy duty type and securely fastened to the wall.

e. Emergency Shower and Eye Wash Assembly. Provide emergency shower and or eye wash assembly in Power Plant and in other facilities where appropriate. Provide a floor drain in the area, if appropriate (where emergency water flowing on the floor may lead to additional safety or operational complications).

f. Service Sink . Standard trap type, enameled cast iron. Service sinks provided in maintenance areas shall be metallic, and in battery rooms acid resistant.

g. Kitchen Sink. Single Bowl corrosion resisting formed steel. Faucet bodies and spout shall be cast or wrought copper alloy. Handles, drain assembly, and stopper shall be corrosion resisting steel or copper alloy.

h. Ablution Trench. See building floor plans for size and construction of trench and number of stations. Provide trench drain with brass grating and strainer. Provide each station with hot and cold water valves with manual mixing. Faucet handles shall be copper alloy.

i. Grease Interceptor . Steel construction, manual cleaning type with removable checker-plate cover, complete with flow control valve. Tested and rated in accordance with PDI G-101. Concrete shall have 21 MPa (3045 psi) minimum compressive strength in 28 days. Kitchen use only.

j. Floor Sink (P-13). Provide floor sink, circular or square, with 300mm overall width or diameter and 250 nominal overall depth. Acid resistant enamel interior with cast iron body, aluminum sediment bucket and perforated grate of cast iron. Outlet size as indicated on plans.

k. Floor or Shower Drain: Cast iron construction with galvanized body, integral seepage

pan, and adjustable perforated or slotted chromium plated bronze, nickel-bronze, or nickel brass strainer consisting of a grate and threaded collar. Toilet room floor drains are similar except are provided with built-in, solid, hinged grate.

m. Room hose bibs and floor drains shall be provided as required. Afghan dining facility kitchen area clean-up hose bib to be supplied with connecting hose on reel including approximately 12 meters of hose. Provide clean-up spray nozzle with hose assembly.

n. Drinking Water Fountain: Non-refrigerated with enamel cast iron or corrosion resistant bowl with brass fittings and faucets.

o. Provide P-Traps per International Plumbing Code IPC for all fixture drains, floor and trench drains, and shower drains. P-traps shall have minimum of 50 mm water seal.

p. Large Pot sink, provide clean-up spray nozzle with hose assembly.

7.3.4 Hot Water

Hot water shall be provided for the facility to supply 49°C (120°F) hot water to fixtures and outlets requiring hot water. Hot water of a higher temperature shall be provided only where required for special use or process. Hot water piping shall be routed parallel to the building lines and concealed within finished rooms. All hot water piping shall be insulated. A hot water re-circulating pump shall be provided if hot water piping run exceeds 30m.

7.3.5 Hot Water Heaters

The hot water shall be generated by electric water heaters. The unit shall be typically located inside a mechanical room, storage room, toilet/janitor room or similar type space. The unit shall be of the commercially available tank type having low or medium watt density electric heating elements. Gas (natural or liquid propane) powered hot water generators shall be provided to satisfy large hot water requirements when economically justifiable and practical. In cases where the pressure of the water coming into the tank will violate manufacturer recommendations, a pressure reducer shall be installed in the line before the water heater. Also, all water heaters shall be equipped with a blow-off valve that will empty into a nearby floor drain or to the exterior of the building.

7.4 WASTE, DRAIN AND VENT SYSTEM

Floor drains shall be provided in each room that contains a water source. Floor drains shall be provided in the mechanical equipment and toilet rooms as required. Floor drains shall be provided next to the electric water heaters. In mechanical rooms, floor drains shall be provided to avoid running drain piping long distances above or over the floor. A trench drain shall be provided for the DFAC Kitchen. All waste and vent piping shall be provided in accordance with the latest edition of IPC. Drain outlet shall use p-trap system to trap sewer gases. P-trap drain should be a one-piece system without removable parts.

Every trap and trapped fixture shall be vented in accordance with the IPC.

7.5 SPECIAL PLUMBING SYSTEMS. Contractor shall design and construct compressor air storage and distribution, waste-oil collection and storage, fuel-oil storage and distribution other plumbing systems that are required for full performance of equipment and operations and for maintenance in the Power Plant and Vehicle Maintenance facilities. These systems shall be designed and built in accordance with codes and publications referenced herein before and in compliance with equipment manufacturer recommendations.

7.5.1 Compressed Air Systems. Compressed air shall be provided using a packaged air-cooled

electric motor driven compressor and ASME rated receiver with air cooler and moisture separator to remove moisture and oil. Compressed air system shall be capable of operation up to 200 psig maximum for 125 psig normal units. High-pressure system (above 200 psig) shall be provided to supply compressed air to equipment where required. Provide an engine driven air compressor where needed for operation during electrical power outages. The air distribution system shall be provided with necessary regulator valves to maintain desired pressure. Where required, line filters, lubricators, and/or hose reels shall be provided. Compressed air piping shall be black steel pipe and painted to match wall color. Noise level of air compressor should not exceed acceptable db limits.

7.5.2 Waste or hazardous drainage from battery repair/charging areas shall be treated prior to entering the base general waste drainage system. Hazardous waste drainage piping shall be acid resistant. Smaller battery rooms shall have waste treatment available using an acid neutralizing tank. Waste oil storage tanks shall be provided for collection of waste oil in the power plant and vehicle maintenance facilities. Waste oil storage tank shall be underground double-wall fiberglass or double-wall steel. Provisions should be made in the design of the underground storage tank that enable manual detection of leaks, prevent overfilling, facilitate liquid level detection, and allow for vapor release.

7.5.3 Drainage from maintenance areas, fueling areas, POL areas, etc., shall be treated prior to entering the base general waste drainage system. Treatment shall consist of sand and oil separators as required by facility function. Buried oil storage tanks shall be provided where required.

7.5.4 Generator Fuel Storage/Distribution. Fuel Oil Storage and Distribution shall be provided to support operation of diesel engine generators at the Power Plant, emergency generators and other locations. The bulk storage of fuels shall consist of above-ground horizontal steel tanks sized to store a 30-day supply of fuel, with containment dikes. These tanks shall be complete with fill tube and cap, suction tube, tank gauge, vent, and other fittings and appurtenances required for full and safe operation. Tanks shall be provided with support saddles, platform/stair and concrete pad. Fuel shall be transferred from the bulk storage tanks by duplex transfer pumps into individual day tanks. Fuel piping shall be fiberglass for underground and steel for piping located above grade. Bulk storage capacity shall be based on minimum 30-day full load operation of the plant. Metal fuel tank saddles should not be placed directly on fuel containment area slabs. They should be elevated on piers to avoid moisture corrosion. Fuel containment area should have a sump or manually controlled water release valves for water removal.

7.5.4.1 Provide fuel filling system for unloading fuel from fuel tanker into individual bulk storage tanks comprising of truck pad(s), duplex fuel transfer pumps, piping manifold and valves. The system shall provide remote fuel level monitoring panels at the pad(s).

7.5.5 Vehicle Fuel Point

Vehicle Fuel Point (Storage/Dispensing). Fuel storage and distribution shall be provided to support the vehicles. The fuels shall be stored in one or more above-ground horizontal steel tank as per capacity scheduled given below.

40,000 liters of Diesel and 10,000 liters of MOGAS

The Contractor shall install a vehicle re-fueling point, capable of storing 40,000 liters of diesel and 10,000 liters of MOGAS. The fuel point shall consist of one 25,000 liters tank of diesel and another dual compartment 25,000 liters tank, of which, 15,000 liters would be used for diesel and 10,000 liters would be used for MOGAS. The re-fueling point shall include fuel dispensers, and a concrete pad.

The fuel storage tanks shall be pre-engineered and fully assembled code compliant package system. The packaged fuel storage tanks shall be mounted on a concrete pad. Standard tank features shall be dual wall fire rated tanks, internal tank lining, electronic dispensers, submersible pump, low mount fill with containment, mechanical gauge, leak monitor, overflow prevention valve, emergency venting, grounding, fire extinguisher, electrical control system with "E-stop" and Flameshield & Fireguard options.

The dispensing unit shall be dual twin type and provided with a self-contained electric motor and pumping unit located in the storage tank. Provide a meter for each dispenser. Equip fuel dispensers with an in-line filtration system capable of sediment removal to 10 mg/L or less. Dispenser and nozzle shall be securable by means of standard padlock. Card and key lock access is not required. Surround fueling islands with a concrete slab graded at a minimum of 1 percent slope away from island and fuel storage tanks. Provide bollards completely around each fuel dispenser and tanks from damage by vehicles and trucks.

Following the tank tightness test, each storage tank shall be leak tested in accordance with the manufacturer's written test procedure if the manufacturer's test procedure is different from the tightness tests already performed. Each storage tank shall be completely filled with the proper fuel at the time of turnover to the Government.

7.6 TESTING AND COMMISSIONING

The Contractor shall test all piping systems in accordance with IPC International Plumbing Code. The final test shall include a smoke test for drainage and vent system and pressure test for the domestic water piping. After completing the work, the Contractor shall demonstrate that all plumbing systems operate to fully satisfy the function for which these systems have been designed. The Contractor shall test, adjust, balance and regulate the system and its controls as necessary until the required designed conditions are met. The Contractor shall include tests for interlocks, safety cutouts and other protective devices to demonstrate safe operation. All such tests shall be carried out in the presence of the Contracting Officer and full written records of the test data and final settings shall be submitted to the Contracting Officer. After all tests are complete, the entire domestic hot and cold water distribution system shall be disinfected. The system shall not be accepted until satisfactory bacteriological results have been obtained.

8. FIRE PROTECTION

8.1 GENERAL

Facility construction and fire protection systems shall be installed in accordance with the publications listed herein and the publications referenced therein. Where a conflict occurs among various criteria, the more stringent requirement shall take precedence.

8.2 BUILDING CONSTRUCTION

Building construction shall conform to fire resistance requirements, allowable floor area, building height limitations and building separation distance requirements of the building code.

8.3 LIFE SAFETY

Facilities features will be provided in accordance with NFPA 101, among other references, to assure protection of occupants from fire or similar emergencies.

8.4 FIRE PROTECTION EQUIPMENT

All fire protection equipment shall be listed by Underwriters' Laboratories (UL) or approved by Factory Mutual (FM) or equivalent and shall be listed in the current UL Fire Protection Equipment Directory or Factory Mutual Approval Guide or equivalent.

8.5 FIRE ALARM AND DETECTION

Smoke detection – see electrical section for more fire alarm and detection details. Smoke detectors are required for each building. Smoke detectors shall have back up battery power and be installed according to all applicable fire protection codes. Fire alarm evacuation systems shall be provided as required by NFPA 101 and UFC 3-600-01 and listed herein.

8.6 WATER SUPPLY FOR FIRE PROTECTION

A dedicated fire protection water supply is unavailable. Therefore, alternate methods of design and construction are being instituted.

8.7 PORTABLE FIRE EXTINGUISHERS

Portable fire extinguishers shall be provided inside all facilities and at exterior locations as required in accordance with NFPA 10. Generally, extinguishers will be of the multi-purpose dry chemical type except for occupancies requiring a special type extinguisher (e.g., carbon dioxide portable fire extinguishers for electrical rooms).

9. ELECTRICAL

9.1 SCOPE OF WORK

9.1.1 General. Contractor shall design and construct Exterior manhole ductbank Primary and Secondary Power Distribution System, to include pad mounted transformer sub-stations and all building/facility service entrance cables from transformer sub-stations.. The Contractor shall design and construct any other required systems described in section 01015 not provided as part of the design drawings and specifications to ensure a complete and usable facilities, to include electrical systems required for scope of work described under the Civil section of 01015. The contractor shall construct in accordance with the contract design drawings, specifications, and section 01015: (a) Interior Secondary Distribution System (b) Lighting and power branch circuitry, (c) Premise telephone and network/data wiring and (d) Interior Fire Detection and Alarm System. The site power distribution system shall be designed for the ultimate demand loads plus 20% spare capacity.

9.1.2 Temporary Electrical Service: Contractor shall be responsible for providing necessary temporary electrical service to all facilities which may be built / occupied prior to the completion of the Power Plant. Temporary service to each facility shall meet all required electrical demands of that facility plus 20% for spare capacity and shall be operational until such time the Base Power Plant and the exterior power distribution system is in place and becomes operational.

9.1.3 All equipment shall be tested, commissioned, and operational at time of turn-over to the government. Contractor shall provide all necessary operating instructions, commissioning reports, spare parts, and related items at time of turn-over.

9.2 DESIGN AND CONSTRUCTION CRITERIA

9.2.1 Applicable Standards

ANSI/IEEE C57.12.22-1993 (R1998) - American National Standard for Transformers— Pad-Mounted, Compartmental-Type, Self- Cooled Three-Phase Distribution Transformers With High-Voltage Bushings, 2500 kVA and Smaller: High Voltage, 34 500 Grd Y/19 920 Volts and Below;

Low Voltage, 480 Volts and Below

ANSI/IEEE Std 81-1983

ANSI/NETA ETT-2000

ANSI/NETA MTS 7.2.2-2001

ANSI/TIA/EIA-568 Commercial Building Telecommunications Cabling Standard

ANSI/TIA/EIA-569 Commercial Building Standard for Telecommunication Pathways and Spaces

ANSI/TIA/EIA-942 Telecommunications Infrastructure Standard for Data Centers

EIA ANSI/TIA/EIA-607: (1994) Commercial Building Grounding/Bonding Requirement Standard.

EIA ANSI/TIA/EIA-607: (1994) Commercial Building Grounding/Bonding Requirement Standard.

EIA ANSI/TIA/EIA-607 Commercial Building Grounding/Bonding Requirement Standard.

ETL 1110-3-412 Transformer Application Guide

ETL 1110-3-502, Telephone and Network Distribution System Design and Implementation Guide.

Factory Mutual (FM) Approval Guide-Fire Protection (2002).

IBC - International Building Code

IMC – International Mechanical Code

IPC – International Plumbing Code

IEEE C2 National Electrical Safety Code (NESC)

IEEE C57.12.28 - IEEE Standard for Pad-Mounted Equipment—Enclosure Integrity

IEEE C57.12.34-2004 - Errata to IEEE Standard Requirements for Pad-Mounted, Compartmental-Type, Self-Cooled, Three-phase Distribution Transformers (2500 kVA and Smaller)- High-Voltage: 34 500 GrdY/19 920 Volts and Below; Low Voltage: 480 Volts and Below

IEEE C57.12.80-2002 - IEEE Standard Terminology for Power and Distribution Transformers

IEEE 48 IEEE Standard Test Procedures and Requirements for Alternating- Current Cable Terminations 2.5 kV Through 765 Kv

IEEE Std 62™-1995 (R2005)

IEEE Std 81-1983

IEEE Std 81.2-1991

IEEE standard 400-1991

IEEE standard 519-1992

IEEE standard 602-1996 , Recommended Practices for Electric Systems in Health Care Facilities

IEEE standard 1100, Powering and Grounding Electronic Equipment (aka Emerald Book)

IESNA Lighting Handbook

International Electrical Testing Association Inc. (NETA) Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems

MIL-HDBK-1003/11 Diesel-Electric Generating Plants

MIL-HDBK-1004/21 Power Distribution Systems

MIL-HDBK-1012/3

NFPA 70, National Electrical Code

NFPA 72, National Fire Alarm Code, 2007 edition

NFPA 99, Health Care Facilities

NFPA 101, Life Safety Code, 2006 edition

NFPA 110, Emergency and Stand-by Power Systems, 2005

NFPA 780, Lightning Protection

TI 800-01 Design Criteria

TM 5-684 Facilities Engineering - Electrical Exterior Facilities

TM 5-688 Foreign Voltages and Frequencies Guide

TM 5-803-14 Site Planning and Design

TM 5-811-1 Design: Electrical Power Supply and Distribution

TM 5-811-3 Electrical Design: Lightning and Static Electricity Protection

UFC 1-200-01, Design: General Building Requirements, 31 July 2002

UFC 1-300-09N, Design Procedures, 25 May 2005

UFC 3-501-03N Electrical Engineering Preliminary Considerations

UFC 3-520-01 Interior Electrical Systems, 10 June 2002

UFC 3-530-01AN Design: Interior and Exterior Lighting and Controls 19 Aug 2005

UFC 3-540-04N Design: Diesel Electric Generating Plants 16 Jan 2004

UFC 3-550-03FA Electrical Power Supply and Distribution

UFC 3-550-03N Power Distribution Systems

UFC 3-560-10N, O&M: Safety of Electrical Transmission and Distribution Systems

UFC 3-600-01: Fire Protection Engineering for Facilities

UFC 4-010-01, Design: Minimum DoD Antiterrorism Standards for Buildings, 8 Oct 2003

UFC 4-010-02, DoD Minimum Antiterrorism Standoff Distances for Buildings, 8 Oct 2003

UFC 4-510-01, Design Medical Military Facilities

Underwriters' Laboratories (UL) Fire Protection Equipment Directory (2002).

USCINCCENT OPORD 97-1

UL 467 Grounding and Bonding Equipment

MIL-HDBK-1004/21 Power Distribution Systems

9.2.2 Design shall be in metric units.

9.3 MATERIAL

9.3.1 General

Unless noted otherwise, all material used shall be in compliance with the requirements of UL standards. In the event that UL compliant materials are not available, Contractor may then select applicable British Standards (BS), IEC, CE, CSA, GS, or DIN listed material, but the contractor must prove equivalence and must provide the government with a full copy of the relevant specification(s). Material and equipment installed under this contract shall be for the appropriate application and installed in accordance with manufacturers recommendations.

Equipment enclosure types shall be in compliance with the National Electrical Manufacturer's Association (NEMA) or the International Electro-Technical Committee (IEC) standards.

Material and equipment installed under this contract shall be for the appropriate application. Materials and equipment shall be installed in accordance with recommendations of the manufacturer. Major components of equipment shall have the manufacturer's name, address, type or style, voltage and current rating, and catalog number on a non-corrosive and non-heat sensitive plate, securely attached to the equipment. All equipment delivered and placed in storage, prior to installation, shall be protected from the weather, humidity and temperature variation, dirt and dust, and any other contaminants. All equipment shall be in new condition, undamaged and unused.

9.3.2 Standard Product: All material and equipment shall be a standard product of a manufacturer regularly engaged in the manufacture of the product and shall essentially duplicate items that have been in satisfactory use for at least two (2) years prior to bid opening.

9.3.3 Design Conditions: All equipment shall be rated and designed for 50 Degree Centigrade and elevation of 2,000 meters above sea level.

All medium voltage installations shall comply with the requirements of the National Electrical Safety Code (NESC, aka IEEE C2) and the National Electrical Code (NEC, aka NFPA 70), as well as appropriate UFCs and IEEE standards listed above.

9.3.4 Restrictions: Aluminum conductors shall only be used for overhead lines as approved by the Contracting Officers Representative. Aluminum windings shall NOT be used in transformers.

Any references to 120/208/220/277/480 volt, 60Hz systems in any code or standard shall be interpreted as 220/380 volt, 50Hz systems, unless otherwise modified or directed in this RFP. References in the National Electrical Code to 120 or 125 volt receptacles shall be taken to mean 220v receptacles.

9.4 DESIGN REQUIREMENTS

9.4.1 Site Primary & Secondary Power Distribution System

Primary (15kV 'Delta') and secondary power distribution (380/220V 'Wye') shall be underground. Design and installation of primary and secondary power distribution systems shall be complete and in compliance with the requirements of the National Electrical Safety Code (ANSI/IEEE C2), UFC 3-550-03FA (also called Army TM 5-811-1), National Electrical Code (NFPA 70), and other electrical references listed in this RFP. Site-wide primary power distribution system shall be designed (laid-out) to be serviced by a minimum of three (3) high voltage feeders. All feeders shall be provided with feeder-to-feeder tie capabilities to transfer loads between feeders. Feeder tie points shall be located in the field and away from the Power Plant. Primary power distribution shall be complete, to include but not be limited to, fused cut-outs, arresters, terminals, cable guards, circuit breakers, transformers, and related items. All primary feeder taps shall be protected with fused cutouts. Long feeder runs shall be provided with sectionalizing devices, such as, in-line fuses, sectionalizer or recloser, as necessary. Minimum of 3 fuses, with appropriate rating, shall be provided as spares at each fused cut-out location.

The Contractor shall complete a power system analysis for the entire site and provide site power load calculation to determine the total site power requirements, and the power production requirement for the power plant. The Contractor shall perform load calculations to determine the number of required transformers to feed all facilities in this project, to include future facilities. All power system analysis and load calculations shall be submitted as part of the 35% Design Analysis, and revised/updated for each design submittal.

Primary Distribution shall be installed in accordance with the NESC, UFC 3-550-03FA, and other applicable standards listed in this RFP.

9.4.1.1 Raceways

Exterior raceways (conduits) shall be installed at a slope towards a manhole or hand-hole to avoid collection of water in the raceway. Conduit shall be PVC, thin-wall for concrete encasement and hard-wall (Schedule 40) for direct burial. Spare conduit for all concrete encasement with secondary services, under paved areas and road crossings is required to be concrete encased. Direct buried conduit shall only be installed for street lighting circuits. Direct buried conduits shall be encased in concrete, when under paved areas or under road crossings. High voltage cables shall be installed in conduit no less than 100mm (4 inch) in diameter. Secondary cable shall be installed in conduit no less than 50mm (2 inch). Direct buried conduit shall be installed 800mm (32 inch) below grade.

All underground conduits shall use long-sweeping elbows. All communications conduits shall use long-sweeping elbows.

9.4.2. Existing Services / Building Loads

Not used.

9.4.3 Not used.

9.4.4 Transformer Substations: Transformer substations shall be strategically located close to the loads. Dedicated transformer substations shall be provided for large loads. Transformers shall be

Primary 'Delta' and Secondary 'Wye' connected. Primary side load-break disconnecting means shall be provided with all transformers. All transformers shall be sized for known projected demand loads, plus (+) 20% spare capacity for future growth. Transformer substations shall be dead-front, loop-feed, pad-mounted, compartmental, self-cooled type. Transformers shall come complete from manufacturer; use of third-party transformer housings or add-on transformer housings shall not be permitted. Transformers shall have no exposed live components.

Transformer selection, design, and installation shall be governed by NEC, NESC, ETL 1110-3-412, TM 5-684, UFC 4-510-01, UFC 3-550-03FA, UFC 3-550-03N, IEEE C57.12.28, ANSI/IEEE C57.12.22, IEEE C57.12.34, and C57.12.80.

9.4.5 Underground Conductors: All underground conductors shall meet the requirements of the codes and standards listed in this RFP, including but not limited to: NESC, NEC, UFC 3-550-03FA, and related.

9.4.6 Secondary Power Distribution System

Secondary Power shall be 380/220 volts, 3 phase, 4 wire, 50 Hz. Building secondary power distribution system shall include main distribution, lighting and power panels as required. All panel boards shall be circuit breaker 'bolt-on' type panels. In large buildings separate lighting and power panels shall be provided. The minimum size circuit breaker shall be rated at 20 amperes. Circuit breakers shall be connected to bus bar(s) within the panel boards. Daisy chain (breaker-to-breaker) connection(s) shall not be acceptable. Indoor distribution panels and load centers shall be flush mounted in finished areas. All circuit breakers shall be labeled with an identification number corresponding to the panel schedule. A 3-pole circuit breaker shall be a single unit and not made up of 3 single pole circuit breakers connected with a wire or bridged to make a 3-pole breaker. All wiring shall be copper, minimum # 12 AWG (4mm sq), recessed in finished areas and surface mounted in metal conduits in unfinished areas. All panels shall be provided with a minimum of 20% spare capacity for future load growth. Power receptacles (outlets) shall be duplex, 240 volts, 50 HZ, German (DIN) Standard. All splicing and terminations of wires shall be performed in a junction or device boxes. Proper wire nuts/connectors shall be used for splicing wire. No twist-wire connections with electrical tape wrapped around it shall be acceptable. All electrical installation shall be in accordance with the requirements of NFPA 70 (National Electric Code). Main Distribution Panel shall be provided with an ammeter, voltmeter and kilowatt-hour meter. Selector switch shall be provided for reading all 3 phases. All service entrance cables and equipment, such as main distribution panels etc., to the facilities shall be sized for the ultimate facility loads, to include any heating loads (infrared heating), initial and future provided by others.

9.4.6.1 Receptacles

General purpose receptacles shall be duplex, grounding (earthed) type, "flush" or "semi-flush" wall mounted type, color ivory and installed 500 mm above finished floor (AFF). In office or similar areas receptacles shall be provided at every 1.8 M intervals. In maintenance buildings 3-duplex receptacles shall be provided at each vehicle maintenance bay. In storage buildings, receptacles shall be provided in 5 m intervals. In communications rooms, receptacles shall be provided at 1 m intervals or closer. CEE Type receptacles with plugs 2P+E (240v) or 3P+E (380v) and with appropriate rating, shall be provided for, but not be limited to, washers, dryers, kitchen equipment and any other type of large plug-able equipment. Receptacle shall be complete to include box, cover plate and necessary screws/connectors and of the type most commonly used in Afghanistan. Receptacles near sinks or lavatories shall be switch operated and Ground Fault Circuit Interrupter (GFCI), or Residual Current Disconnect (RCD) type, with the trip setting of 30 milliampere or less.

Sinks will have a receptacle above, with one dual receptacle serving two sinks that are side-by-side. Receptacles in wet/damp areas or within 1 meter (~3 feet) of sinks, lavatories, or wash-down areas shall be ground fault circuit interrupter (GFCI) type or Residual Current Disconnect

(RCD) type, with the trip setting of 30 milliamperes or less.

Total number of duplex receptacles shall be limited to six (6) per 16- or 20-ampere circuit breaker.

9.4.6.2 Lighting

Light Fixtures: Lighting fixtures shall be a standard manufacturer's product. Fluorescent light fixtures shall be power factor corrected and equipped with standard magnetic ballast(s). All light fixtures shall be capable of receiving standard lamps used locally. Light fixtures shall be mounted at 2.7M, minimum, AFF. Fixtures may be pendant or ceiling mounted, depending on the ceiling height. All fixtures shall be fully factory wired. Lighting levels shall be as follows:

General Office Space / Computer Rooms	40 FC (400 Lux)
Conference Rooms	30 FC (300 Lux)
Dinning Rooms	30 FC (300 Lux)
Laundry Rooms	30 FC (300 Lux)
Bed Rooms	30 FC (300 Lux)
Kitchen	30 FC (300 Lux)
Lobbies	15 FC (150 Lux)
Lounges	15 FC (150 Lux)
Mechanical & Electrical Equipment Rooms	20 FC (200 Lux)
Stairways	20 FC (200 Lux)
Toilets	20 FC (200 Lux)

9.4.6.2.1 High Ceilings

Contractor may provide high bay High Pressure Sodium (HPS) vapor light fixtures in facilities with high ceilings, provided that the replacement lamps for the fixtures are available locally.

9.4.6.2.2 Emergency "EXIT" Light Fixtures

Emergency "EXIT" light fixture shall be provided in accordance with NFPA requirements. Fixtures shall be single sided and for wall and/or ceiling mounting. Unit shall illuminate continuously and be provided with self-contained nickel cadmium battery pack, to operate on floated-battery or trickle charge circuit. Fixture shall operate satisfactorily for 90 minutes during a power outage. Unit shall have test/reset and lamp failure indication buttons. Primary operating voltage shall be appropriate for the available secondary voltage. Lettering "EXIT" shall be color red and not less than 6 inches (150 mm) in height and on matte white background. Illumination shall be via LEDs.

9.4.6.2.3 Above Mirror Lights

Above mirror lights shall be provided in toilet rooms.

9.4.6.2.4 Emergency Lighting

Battery powered emergency lights shall be provided within each building per NFPA for safe egress during power outage. Fixtures shall be provided with self-contained nickel cadmium battery pack to operate on stand-by circuit for 90-minute minimum. Unit shall have test/reset and lamp failure indication buttons. Primary operating voltage shall be 220 volts.

9.4.6.2.5 Light Switch

Light switch shall be single pole. Minimum of one light switch shall be provided in every room. Lighting in large rooms/areas may be controlled from multiple switches. Lighting contactors may be used to operate lighting in open or large bay areas. Rooms with multiple entrances shall have

multi-way switches.

9.5 CONDUCTORS

All cable and wire conductors shall be copper. Conductor jacket or insulation shall be color coded to satisfy local utility requirements. Conductors shall be sized in accordance with this RFP and the listed codes and standards.

For interior wiring, the use of 75 or 90 degree C (minimum) terminals and insulated conductors is required. Use of 75 degree C conductors on circuits with protective device terminals rated for 60 degree C is inappropriate.

9.6 GROUNDING AND BONDING

In general, grounding and bonding shall comply with the requirements of NFPA 70 and NFPA 780. Underground connections shall be exothermal welded. All exposed non-current carrying metallic parts of electrical equipment in the electrical system shall be grounded. Insulated grounding conductor (separate from the electrical system neutral conductor) shall be installed in all feeder and branch circuit raceways. Grounding conductor shall be green-colored, unless the local authority requires a different color-coded conductor. Ground rods shall be copper-clad steel. Ground resistance shall not exceed 25 ohms when measured more than 48 hours after rainfall using the fall of potential method outlined in IEEE 81.

Communications Building: Grounding and Bonding shall meet the requirements of ANSI/TIA/EIA-942, IEEE 81.2 and IEEE 1100, as well as the NEC. Ground resistance shall not exceed 5 ohms when measured more than 48 hours after rainfall using the fall of potential method outlined in IEEE 81. A ground ring shall be installed around the communications building.

Power plant: Grounding and Bonding shall meet the requirements of ANSI/TIA/EIA-942, IEEE 81.2 and IEEE 1100, as well as the NEC. Ground resistance shall not exceed 5 ohms when measured more than 48 hours after rainfall using the fall of potential method outlined in IEEE 81. A ground ring shall be installed around the Power Plant.

9.6.1 Lightning Protection

Communications Building, Medical Clinic, Ammo Supply Point, Propane Tanks, Fuel Point and Power Plant including Fuel storage tanks shall have a lightning protection system installed per the NEC and NFPA 780, as well as other applicable standards listed in this document. Medical clinic lightning protection requirements shall also meet the requirements in UFC 4-510-01.

Ammo Supply Point and all fueling areas shall also implement static electricity controls in accordance with standards listed in this document.

9.7 ENCLOSURES

Enclosures for exterior applications shall be NEMA Type 4X (IEC Classification IP56) or better and for dry interior locations NEMA Type 1 (IEC Classification IP10) or better. For wet indoor locations, NEMA type 3S (IEC Classification IP54) or better shall be used.

9.8 FIRE DETECTION & ALARM SYSTEM

Per directions from the Host Nation, no Fire Detection and Alarm System shall be provided in the facilities to be used by the Host Nation's personnel. However, Fire Alarm System shall be provided, as described below, in the facilities to be used by the U.S. Personnel. In U.S. Barracks Fire Detection and Alarm System shall consist of hard-wired, multi-station smoke detectors, with building wide annunciation. In the U.S. Headquarters Building complete Fire Detection and Alarm

System shall be provided, to include, fire alarm control panel, pull (or push button) stations, horns, strobe lights, smoke and/or heat detectors, as required. No Fire Alarm System shall be provided in the Dining/MWR Facility. Fire alarm cable shall be installed in recessed hard wall PVC conduit and plastered over it. In addition to building wide fire alarm annunciation, the system shall also be capable of automatically transmitting the alarm signal via telephone lines to the local Base Fire Department / Fire Station. System design shall be in accordance with the requirements of NFPA 72. Fire alarm system shall be complete and a standard product of one manufacturer. Contractor shall provide hard-wired carbon monoxide (CO₂) detectors, with local in-room annunciation, in all rooms where wood burning or oil-fired heaters will be provided.

9.9 TELEPHONE/COMPUTER NETWORK SYSTEM

Each Corps, Brigade, and Battalion HQ building office, room shall have telephone and computer data outlets. Telephone/data System shall include cross-connect boxes, duplex RJ-45 telephone outlets with a minimum of 4 pair Category 5 Enhanced (CAT 5e) cable terminating at each outlet (jack). The Contracting Officer shall determine outlet locations for individual rooms. Telephone wiring shall be recessed in finished areas and surface mounted in metal conduits in unfinished areas. See paragraphs 10 thru 10.3.2 below for additional requirements for communications systems.

In accordance with sections 01010 and 01015, all office spaces that require telephone and data services shall be connected to the outside cable plant infrastructure in accordance with EIA/TIA 568 & 758A standards and shall have inside cable plant infrastructure in accordance with EIA/TIA 569 standards.

9.10 TELEVISION SYSTEM

Television System shall consist of television outlets and an empty metal conduit raceway system, to include necessary junction boxes and pull wire. The Contracting Officer shall determine outlet locations. Television monitors, coaxial cable any amplification devices shall be provided by others.

9.11 IDENTIFICATION NAMEPLATES

Major items of electrical equipment, such as the transformers, manholes, hand holes, panel boards and load centers, shall be provided with a permanently installed engraved identification nameplate.

9.12 SCHEDULES

All panel boards and load centers shall be provided with a panel schedule. Schedule shall be typed written in English and Afghan languages.

9.13 SINGLE LINE DIAGRAM

Complete single line diagram shall be provided in every transformer distribution panel and in Main Distribution Panel in each building. Single line diagram shall show all panels serviced from the transformer distribution panel and the MDP respectively.

10. COMMUNICATIONS SYSTEM

10.1 General: Design and construction of communication center building shall be proved by the government in close coordination with Communication and Signal engineers, The contractor will be responsible to provide raceway, conduit, manhole, pass- through, depressions and others embedded elements under and inside the structure elements within the foundation foot print of the building.

10.1.1. Applicable Specifications

The Publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by designation only.

United States Department of Agriculture, Rural Utilities Service

RUS Bulletin 1751F-643	(2002) Underground Plant Design
RUS Bulletin 1751F-644	(2002) Underground Plant Construction
RUS Bulletin 1753F-151	(2001) Construction of Underground Plant, Parts II & III
RUS Bulletin 1753F-201	(1997) Acceptance Test and Measurements Of Telecommunications Plant
RUS Bulletin 1753F-208	(1993) Specifications for Filled Telephone Cables with Expanded Insulation (PE-89)
RUS Bulletin 1753F-401	(1995) Standards for Splicing Copper And Fiber Optic Cable (PC-2)
RUS Bulletin 1753F-601	(1994) Specifications for Filled Fiber Optic Cables (PE-90)
RUS Bulletin 1753E-001	(1996) RUS General Specification for Digital, Stored Program Controlled, Central Office Equipment, RUS Form 522.
RUS Publication IP 344-2	(2006) List of Materials Acceptable For Use on Telecommunications Systems of RUS Borrowers.
RUS Bulletin 345-65	(1978) Shield Bonding Connectors (PE-33)
RUS Bulletin 345-83	(1982) REA Specification for Gas Tube Surge Arrestors (PE-80)
RUS Bulletin 1753E-001	(1996) RUS General Specification for Digital Stored Program Controlled Central Office Equipment, (Form 522)

American National Standards Institute/Telecommunications Industry Association/Electronics Industry Association

ANSI TIA/EIA 606-A	(2002) Administration Standard for The Telecommunications Infrastructure
ANSI TIA/EIA 607-A	(2002) Commercial Building Grounding (Earthing) and Bonding Requirements for Telecommunications

10.1.2 Communication Systems Design

The communications system each building is to be designed, and constructed by the Contractor. The design and construction of the systems shall be in accordance with the references and the requirements contained herein and to be proved by the government. The contractor is only responsible for the wiring and the connection to a patch panel.

10.2 Exterior Communication – not in scope

10.3 Not used

10.4 Not Used

10.5 Splices

10.5.1 Copper Splices

25 pair modules shall be used on copper splices 25 pairs or greater and discrete connectors shall be used on lesser count cable splices. The copper splice closures shall be flash tested with nitrogen in accordance with the manufacturer's recommendations before encapsulation. The encapsulant shall fill all of the splice interstices. The copper splicing connectors, bonding hardware, splice closures and encapsulant shall be on the RUS list of material acceptable for use on RUS projects, IP 344-2. Bonding and grounding shall be in accordance with the RUS standards. The copper splice closure shall be installed by the copper splicer only. The copper cable splicer (s) shall have 7 years documented unsupervised experience in the installation of the splice closure being used and 7 years experience splicing RUS type cable.

10.5.2 Fiber Optic Splices

The fiber optic splice closure shall be equipped with splice trays that properly hold the fusion splice protectors (stainless steel rod with heat shrink tube). The splice loss shall be .02dB or less as measured by the fusion splicing machine and .2dB as measured by an OTDR. The fiber optic splice closure shall be flash tested with nitrogen in accordance with the manufacturer's recommendations and also be listed in RUS IP 344-2. All bonding hardware shall also be listed in RUS IP 344-2. Bonding and grounding shall be in accordance with the RUS standards. The fiber optic splice closure shall be installed by the fiber optic splicer only. The fiber optic cable splicer (s) shall have 7 years documented unsupervised experience in the installation of the splice closure being used and with RUS cable. The fiber optic splice shall also have a minimum of 7 years documented unsupervised experience with fusion splicing machines and a minimum of three years with the particular make and model of the machine that will be used.

10.6 Not used

10.6.1 Not used

10.6.2 Protected Entrance Terminals

Building Protected Entrance Terminal, 25, 50 or 100 Pair

The PETs shall consist of an input splice chamber with punch down blocks for the copper cable pairs, a protector field for 5 pin connectors and a factory installed output punch down block terminal for each outside plant cable pair. The PET shall be listed in RUS 344-2. The station cables shall be terminated on a field installed category 5e, 110 type punch down block and jumpers shall be installed between the PET block and the field installed block to connect dial tone to the outlet.

10.6.2 Protected Entrance terminal, 6 or 12 pair. The PETS shall consist of blocks with two well type heavy duty gas tube protector units. The six pair shall consist of three units where as the 12 pair will consist of 6 units. Every building with terminated cable shall be equipped with gas tube protectors. The station cables will be terminated on a category 5e 110 "station" block and jumpers shall be installed between the PET and the "station" block to connect dial tone to the outlet.

10.7 Patch Panels

10.7.1 Copper Patch Panels, Category 5e - All Buildings with Data Outlets

Provide one patch panel port per data outlet plus 20% spare. The largest patch panel allowed shall be 48 port and the smallest 12 port. Where the 12 port is used, it shall be a category 5e, 12 port patch panel mounted on an 89 type block frame for the station cables. The 24 or 48 port patch panel shall be mounted on a swing down bracket mounted on the backboard. Cable guides and wire management bars shall be provided. Provide one category 5e patch cord, (RJ45-RJ45) per patch panel port. The Patch cords shall meet the minimum performance requirements specified in EIA/TIA-568B.1, EIA/TIA-568B.2 and EIA/TIA-568B.3.

10.8 Outside Plant Cable

The outside plant cable (cable size and cable counts) shall be engineered and installed in accordance with the referenced standards. The OSP cable engineering shall be approved by KO before any cable is ordered. Under no circumstances will home runs from each building to the communications building be allowed; normal telephone cable distribution engineering standards will be used, meaning that large cables will be installed from the vault splices and the cables will get smaller as the buildings are provided service.

10.9.1 Battalion /Company HQ building. 50 pairs copper, 12 strands single mode fiber optic cable. Copper and fiber shall be installed in the building, terminated and tested. All outlets except wall outlets in the building shall be dual RJ 45, category 5e, one white labeled voice and one blue labeled data. An additional 50 pair copper and 12 strand fiber optic cable shall be installed in the command center constructed on the buildings. The cables shall be part of the consolidated 100 pair copper, 24 strand fiber optic "Command Center" cables installed from the respective MDFs to the command centers in the buildings. The command centers shall have dual category 5e, RJ 45 outlets installed on the walls at 1.5 meter intervals.

10.9.2 BOQ Facilities Types A & B: 12 pairs copper and 6 strands fiber optic cable, installed, terminated and tested in the building. All outlets except wall outlets in the building shall be dual RJ 45, category 5e, one white labeled voice and one blue labeled data.

10.9.3 Barracks Type A, 12 pairs copper and 6 strands fiber optic cable installed, terminated and tested in the building. All outlets except wall outlets in the building shall be dual RJ 45, category 5e, one white labeled voice and one blue labeled data.

10.9.4 Barracks Type B, 12 pairs copper and 6 strands fiber optic cable installed, terminated and tested in the building. All outlets except wall outlets in the building shall be dual RJ 45, category 5e, one white labeled voice and one blue labeled data.

10.9.5 DFAC, 12 pairs copper and 6 strands fiber optic cable installed, terminated and tested in the building. All outlets except wall outlets in the building shall be dual RJ 45, category 5e, one white labeled voice and one blue labeled data.

10.9.7 Battalion Storage, 12 pairs copper and 6 strands fiber optic cable allocated in the cable plant and accessible in the closest manhole/handhole to the building.

10.9.8 Motor Pool, 6 pairs copper, installed, terminated and fully tested in the building. No fiber.

10.9.9 Communications Building. All cables originate from this building.

10.9.10 Fuel Point, 12 pairs copper and 6 strands fiber optic cable allocated in the cable plant and accessible in the closest manhole/handhole to the building.

10.9.11 Bunkers 12 pairs copper and 6 strands fiber optic cable allocated in the cable plant and accessible in the closest manhole/handhole to the building.

10.10 Guard House. 25 pairs copper installed and terminated in the building. 12 strands fiber optic cable allocated in the cable plant and accessible in the closest manhole/handhole to the building. Copper to be fully tested and fiber to be tested to ensure no fractures occurred during installation. The 25 pair cable "perimeter cable" from the MDF shall be connected from each guard house, tower and gate house and back to the MDF.

10.11 Guard Tower, 25 pairs copper installed and terminated in the building. 6 strands fiber optic cable allocated in the cable plant and accessible in the closest manhole/handhole to the building. Copper to be fully tested and fiber to be tested to ensure no fractures occurred during installation. The 25 pair cable "perimeter cable" from the MDF shall be connected from each guard house, tower and gate house and back to the MDF.

10.12 Reception building (if applicable). 6 pairs copper installed and terminated in the building. 6 strands fiber optic cable allocated in the cable plant and accessible in the closest manhole/handhole to the building. Copper to be fully tested. Fiber to be tested to ensure no fractures occurred during installation.

10.13 All buildings not included above but included in the master plan (future) except the fire station, the medical clinic, the training building, Brigade Headquarters and Garrison Headquarters, shall be considered to have requirements of 12 copper cable pairs and 6 fiber strands for planning purposes. The fire station and medical clinic should have plans for 50 copper pairs, and 12 fiber strands each, the training building should be planned for 25 copper cable pairs and 12 fiber strands.

END OF SECTION