

AMENDMENT OF SOLICITATION/MODIFICATION OF CONTRACT			1. CONTRACT ID CODE	PAGE OF PAGES
2. AMENDMENT/MODIFICATION NO. 0004		3. EFFECTIVE DATE 19-Jan-2009	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) <b>See Item 6</b>	
8. NAME AND ADDRESS OF CONTRACTOR (No., Street, County, State and Zip Code)			X	9A. AMENDMENT OF SOLICITATION NO. W917PM-09-R-0032
			X	9B. DATED (SEE ITEM 11) 17-Dec-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 <u>1</u> 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.)  The purpose of this amendment is to incorporate a revised Section 01015 and incorporate Vendor Questions and Government responses.  1. This amendment deletes "in addition to heavy duty steel gates into the compound" from solicitation section 01015, paragraph 2.4.2.1.1, Active Barriers - Drop Arm Gates. A revised section 01015 is incorporated into this amendment to reflect the changes.  2. See Section SF30 Block 14 Continuation page for question and answers.				
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. CONTRACTOR/OFFEROR  _____ (Signature of person authorized to sign)	15C. DATE SIGNED	16B. UNITED STATES OF AMERICA  BY _____ (Signature of Contracting Officer)		16C. DATE SIGNED  19-Jan-2009

SECTION SF 30 BLOCK 14 CONTINUATION PAGE

**SUMMARY OF CHANGES**

SECTION SF 30 - BLOCK 14 CONTINUATION PAGE

The following have been modified:

QUESTION AND ANSWERS

Vendor Question: When is the closing/proposal due date — 25 January 2009 or 27 January 2009?

Government Answer: The current closing date for this solicitation is 27 January 2009. Solicitation Section 00110 has been changed to reflect 27 January 2009.

Vendor Question: Will the Government provide a separate timeframe for completing the geotechnical report? For example, will the Government allow 7 days after notice to proceed to complete the geotechnical report and 14 days from completion of the geotechnical report to complete the design work?

Government Answer: Contractor should start design work based on assumption from previous geotechnical work conducted near the proposed area. Geotechnical Report should be used to evaluate assumptions made and make any adjustments necessary to previous design work

Vendor Question: Will the Government provide a plug number for installing the truck scanner for radiation and explosive scanning? Alternatively, will the Government provide a description of the installation requirements so offerors can develop a realistic price for this requirement?

Government Answer: The Government does not have the scanner model procured. Any specification submitted now by the Government proposed scanners may not be the actual model procured in the future. As a result, the Government cannot provide detailed data, including plug types. Offerors will need to account for this in their proposal.

**Vendor Question 1:** For RSOI buildings, the conceptual drawings and information are provided in Appendix A. How can we get the concept drawings for the other buildings mentioned in SOW?

**Government Provided Response 1:** Solicitation Section 01010 specifications describe the function and lists the size of each building in the requirement. No existing as-built drawings will be provided to the contractor and no additional concept drawings will be provided by the Government. Contractor is responsible for providing a functional design layout to the existing MWR Training and Administrative Building.

**Vendor Question 2:** Reference Section 4.1.1, General Requirements for facilities. This section states an “automatic fire sprinkler system is required for the RSOI barracks only.” However, Section 4.14.2-f MWR Administration Facility, and Section 4.16.3, Cold Storage facility both include a requirement for Fire Protection Systems. Please clarify the requirement to install fire sprinkler systems.

**Government Provided Response 2:** RSOI barracks requires a wet pipe sprinkler system; the Class I warehouse requires a fire protection system based upon the applicable codes. The offeror has options for fire protection for the class I warehouse, which may include a sprinkler system or may not, depending on how the offeror wants to provide fire protection per the applicable fire codes. No other facility requires fire sprinkler protection.

**Vendor Question 3:** Will existing utility drawings be provided via Amendment?

**Government Provided Response 3:** No utility drawings are provided. The offeror had the opportunity to attend the site visit and is responsible for any utility connections. This is a Design Build contract which places such responsibilities on the offeror; the offeror should bid accordingly.

**Vendor Question 4:** Reference Section 4.16.3, Cold Storage Facility, requires space for 40 freezer/refrigerated units. Will the government provide the dimensions and function for these freezer/refrigerated units?

**Government Provided Response 4:** The government provided a description of the freezer/fridge unit in the spec 01010. A sample sketch was provided in appendix A for location and approximate size. A scale was provided. This is a Design Build contract, the onus for the design of these structures is on the offeror, not the government.

**Vendor Question 5:** Reference Section 2.3.1 Site Plan. Please clarify the number of bunkers, corresponding capacity, and locations.

**Government Provided Response 5:** The number of bunkers depends on the number of occupants. The government gave the number of occupants in the specifications, section 01010. The offeror is responsible to provide bunkers for these occupants. The government gave the UFC code references for bunker protection. The offeror is responsible for the safe distance from the bldg, the number of bunkers and capacity of each bunker. The government will not perform this design function; it is solely the responsibility of the offeror.

**Vendor Question 6 - Reference Section 00150 para 2.2.** The Design Phase is divided into 3 parts and a final phase. Yet in the following paragraphs the first phase is described as 65% all design drawings including 35% for ECP and 100 percent civil drawings. Then second phase is described as 65% all design drawings including 100 percent civil drawings. It looks like phase 2 and 1 are nearly the same, with the only difference noted being 35% ECP design drawings in the first stage. Shouldn't it be 35% drawings with 100% civil drawings as first phase, 65% drawings in second phase, then 99% as last phase followed by 100% (corrected final design)?

**Government Provided Response 6:** Solicitation Section 01335 is very clear that only the ECP requires a 35% design submittal; the other facilities in this project do not require a 35% design submittal.

**Vendor Question 7:** What is the order of preference in between SOW (section 01010) and technical requirements (section 01015)?

**Government Provided Response 7:** Solicitation Section 01010 only refers to the scope of the project. Solicitation Section 01015 references the technical requirements to support the scope in section 01010.

**Vendor Question 8:** How long does it take for a material transporting truck to pass the gates?

**Government Provided Response 8:** This is a Design Build contract; the offeror must assume these risks in their bid. No doubt there are specific force protection issues that will change over time, applicable to this project. The government is not in a position to detail all of these issues or predict future force protection requirements.

**Vendor Question 9:** Is there a transformer that we can hook into to use the site electricity or do we have to generate our own electricity?

**Government Provided Response 9:** See solicitation sections 01010 and 00160 for existing utility and offeror responsibility for supplying utilities.

**Vendor Question 10:** In amendment 0002, section 00010, RSOI Barracks, MWR and ECP Facilities, base bid item 0003AA is described as "Construct MWR/Admin/Training Fac". In section 01010 paragraph 4.1.2 (a), a non-matching item number 0003A is described as "Renovate MWR / Admin / Training facility in. Which is correct?

**Government Provided Response 10:** The confusion lies in that the MWR facility is actually an existing facility that will be modified. The 01010 spec provides considerable detail, including each room and respective size and function, on this facility. The line items are the same.

**Vendor Question 11:** In amendment 0002, section 00010, RSOI Barracks, MWR and ECP Facilities, base bid item 0005 is described as “Construct Utilities”. In section 01010 para 4.1.2 (a), item 0005 is described as “Construct Limited Water, Fire Protection, Limited Sewer and Storm Drainage”. Which is correct?

**Government Provided Response 11:** These are the same line items.

**Vendor Question 12:** In amendment 0002, section 00010, RSOI Barracks, MWR and ECP Facilities, base bid item 0006 is described as “Construct Roads/Walkways”. In section 01010 para 4.1.2 (a), item 0006 is described as “Construct Aggregate Surface Course Roads and Walkways”. Which is correct?

**Government Provided Response 12:** These are the same line items.

**Vendor Question 13:** Would the government provide a better description of the structures to be demolished at these three sites? What is the height and footprint area of these structures? What materials are they constructed from?

**Government Provided Response 13:** The offeror had the opportunity to inspect structures to be demolished. The offeror must make an interpretation of the building materials, etc from the site visit. If the offeror suspects substantial structural demo or HAZ MAT abatement, then the offeror must include in their bid. The government provides general information for demolition on both the solicitation sections 01010 and 01015 specifications. This requirement is for a Design Build contract and it is the responsibility of the offeror to address risks in their bid.

**Vendor Question 14:** 4.4 Water system. It is required to provide a temporary Non-Potable Water System. Why is the system called temporary? What will happen to the system at the end? If the system is called temporary because a new or permanent water distribution system for the whole base will be designed and constructed in the future, where will the connection point be? Is the contractor responsible for constructing utility lines to these connection points?

**Government Provided Response 14:** A temporary system will be required to support the facilities until the future KAF utility improvements can be constructed. The temporary system will be government property at the end of the contract. The contractor is to provide properly designed utility building connections. If locations of utility connections are not mentioned within the 01010 Scope of Work, contractor should assume building connections will be within 3 meters of the building, and should select locations with access for future connection to the KAF utility improvements. Final connection to the

KAF utility improvements will be the responsibility of the contractor performing the KAF utility improvements.

**Vendor Question 15:** 4.5 Sanitary Sewer & Treatment System. The Sanitary System calls for System capacity to be calculated based on a hydraulic waste load equivalent to 80 percent of the water usage rate of 190L per capita day, or 152L per capita day. Which rate will be used, 190 or 152?

**Government Provided Response 15:** 152 liters per person per day is 80% of the 190 liter per person per day (ADD) used for the water demand calculation. Contractor shall base the Sanitary System on the 152 liter/person/day hydraulic waste load, follow UFC 3-240-09FA Domestic Wastewater Treatment guidance for appropriate use of the required capacity factor.

**Vendor Question 16:** 4.5 Sanitary Sewer & Treatment System. "The gravity sewer collection system shall connect to temporary sanitary sewer holding tanks. Contractor shall construct sanitary sewer connection points for connection to the future air field sanitary sewer infrastructure. Temporary sanitary sewer holding tanks shall be provided and installed underground and positioned in areas easily accessible to pumping trucks." Why are these holding tanks called temporary? Where should the connection point for this future sanitary sewer infrastructure be?

**Government Provided Response 16:** Future KAF utility improvements will eliminate the need for holding tanks. Holding tanks are to be considered temporary structures. See response to question 14 for locations of future utility building connections.

**Vendor Question 17:** 4.13 Trash point. "The Contractor shall design, in a location convenient for easy removal, a trash collection point for each site as part of the site work per the base bid schedule items." There is no separate line item for this. Which line item does the government want us to include costs for this work?

**Government Provided Response 17:** The trash points are part of the site work and considered incidental to their small size. They have minimal effect on the bid items hence, no separate line item for this small work.

**Vendor Question 18:** It is required to have trash points for each facility. Won't this be more than required? Can one trash point serve several buildings within close proximity?

**Government Provided Response 18:** The solicitation sections 01010 and 01015 call out trash point requirements, including what buildings they serve and give an approximate size and construction type. We cannot provide more info without designing the structures. The ktr has clear direction which facilities require trash points. Any other interpretation is at the risk of the ktr. The govt cannot provide further info or clarification on this item.

**Vendor Question 19:** Barracks for RSOI are required to be pre-engineered. Is the exterior facade required to be CMU? If not, what other materials are acceptable?

**Government Provided Response 19:** The govt specifically called out CMU block walls for the RSOI projects. This is a prescriptive requirement of the Design Build contract. Any deviation of this prescriptive requirement is solely the risk of the offeror, not the government. The offer should read the Design Build requirements portion of this contract to fully understand the nature of design-build work.

**Vendor Question 20:** Are there any material specifications for the drop arm?

**Government Provided Response 20:** The Government has provided the technical requirements of the drop arm via the referenced codes, publications and standards. The Government has also provided the locations and approximate sizes of the drop arms. Each offeror must research the requirements of the drop arm and included in their bid.

**Vendor Question 21:** Can a truck stay inside the gates at night before it is unloaded?

**Government Provided Response 21:** No trucks will be allowed to stay inside the gates at night. Any variation must be coordinated with ISAF.

**Vendor Question 22:** If a truck can not enter the site during working hours, can the truck stay at a parking lot at the entrance of the site? How will the security of the truck be provided?

**Government Provided Response 22:** Requests for vehicle movement must be coordinated with ISAF at the installation at the time of the request.

**Vendor Question 23:** Is there a transformer that we can hook into to use the site electricity or do we have to generate our own electricity? Is there a well we can get water to drink or to use for construction purposes?

**Government Provided Response 23:** The contractor is responsible for utilities reference 01010 and 00160.

**Vendor Question 24:** Can cell phone and photo camera be used by our technical personnel at site with permission by KAF?

**Government Provided Response 24:** No contractor use of photo/video equipment is allowed. Use of cell phones is permitted.

**Vendor Question 25:** What is the situation of mobilization to site? How big of an area will be provided for Mobilization? Can we use only one area for Mobilization and pass thru certain point in site without delays as all our personnel will have badges?

**Government Provided Response 25:** Adequate areas are available at each location/project. Badging is to be coordinated with ISAF.

**Vendor Question 26:** In order to design the required facilities, we will need to carry out geo-technical and topographical survey. Will we be able to access all points required for our design? This issue will be critical to get adequate data for design.

**Government Provided Response 26:** The contractor will have access to all sites for topographical/geo-technical work.

## SECTION 00800 - SPECIAL CONTRACT REQUIREMENTS

The following have been modified:

### SECTION 01015

## SECTION 01015

### TECHNICAL REQUIREMENTS – DESIGN/BUILD SOUTH PARK IMPROVEMENTS

#### 1.0 GENERAL

This contract consists of three diverse projects, the RSOI barracks project, the Entry Control Point project and the Class I warehouse project. The items listed within this specification represent the totality of the diverse technical requirements.

#### 1.1 COMPLIANCE

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.

#### 1.2 MINIMUM & ALTERNATE REQUIREMENTS

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 safety, 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 of approved designs 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. A certificate of non-ACM compliance is required for materials suspected of containing asbestos.

#### 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.

NOTE: For previous UXO/mine information, the following points of contact from the UN Mine Action Center of Afghanistan are provided:

Mohammad Sediq, Chief of Operations,  
Email: [sediq@unmaca.org](mailto:sediq@unmaca.org)  
Cell: +93 070 295207

Hansie Heymans, Chief Information Officer,  
Email: [hansie@unmaca.org](mailto:hansie@unmaca.org)  
Cell: +93 070 294286

### 1.4.1.1 Explosives Safety

#### 1.4.1.1.1 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.

#### 1.4.1.1.2 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 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 & INSTALLATION ACCESS AND SECURITY

The Contractor shall comply with all Base security requirements. Constant changes of installation access and security requirements on Base shall be anticipated by the contractor. Detailed requirements are listed below.

#### 1.5.1 ACCESS AND SECURITY PROCEDURES

All contractor access and exit from the Installation will be through the Entry Control Point (ECP) as directed by the Contracting Officer. The KAF Force Protection Officer maintains the ultimate authority for establishing, monitoring, and enforcing access and security requirements for the Installation. All contractor, subcontractor, or vendor personnel and vehicles at any tier working at any location on the installation are subject to a thorough search upon entering, departing, or at any time deemed necessary by the Force Protection Office Personnel. The Contractor shall be responsible for compliance with all Installation security requirements. The Government reserves the right to deny access or to require the contractor to remove any personnel or equipment deemed to be a threat to the security of the Installation Force Protection Office or the Installation personnel. The Contractor shall work through the Contracting Officer to ensure that the Installation Security Regulations are followed.

##### 1.5.1.1 Employee Badging Process

All contractor employees who are working on the Installation must receive a badge designating that the individual has certain rights of access onto the Installation. In order to receive this badge each employee must undergo a screening procedure in conformance with the Installation Force Protection Access Control Procedures. This process requires a written application with accompanying documents (copy of passport, evidence of Visa,); a background screening and an interview with a representative of the KAF Force Protection Office.

There are three categories of access privileges. They are: 1.) US Citizen Contractor personnel who are in possession of Common Access Card (CAC) are granted unescorted access on the installation. 2.) Third Country Nationals (TCN) from Coalition or other approved countries that have been properly vetted through

the Installation Screening System are granted unescorted access to the installation. 3.) Afghanistan Nationals that have been properly vetted thru the Installation Screening process are granted escorted access to the installation.

Contractor CAC holders or TCN badged personnel may act as escorts if approved by the Installation Force Protection Office. All TCN and LN personnel must display their access badges at all times while on the Installation. If an access badge is lost it shall immediately be reported to the Installation Force Protection Office.

Any individual, who may be banned, terminated, resigns or no longer is required to have access to the Installation will be escorted to the Installation Force Protection Office. Force Protection personnel, will collect the individual's badge, and conduct an exit interview with the employee, before allowing him/her to leave the Installation.

#### 1.5.1.2 Identification of Contractor Vehicles

Vehicle access to the Installation shall be limited to essential official business related to execution of the contract only. Vehicle operators must be granted driving privileges on the Installation through the Installation Force Protection Office. Truck Visitor badges will be issued to vehicles that deliver materials onto the installation. The contractor must escort these individuals from the ECP and for the entire time they are on the Installation. The Contractor shall be responsible for requiring each vehicle engaged in the work to display permanent vehicular identification as approved and directed by the Contracting Officer. Each Contractor vehicle, machine, piece of equipment, or towed trailers, shall show the Contractor's name such that it is clearly visible on both front doors of the vehicle and both sides of a towed trailer. A valid license plate shall be displayed at all times. Contractor vehicles operated on Government property shall be maintained in a good state of repair, shall be insured, and shall be registered in accordance with local law and base security requirements. Contractor shall anticipate delay for delivery trucks and vehicle access to the gate for routine security inspections.

#### 1.5.1.3 Entry and Exit Access through Entry Control Point (ECP)

All contractor personnel not remaining on the installation in the Contractor's Life Support Area overnight shall be required to enter the installation, each morning and depart each evening through the designated Entry Control Point. Because all other Afghan national personnel who work on the installation also enter and exit through this ECP, the contractor must take appropriate steps to insure efficient, timely entry and exit.

The main installation work force begins to queue at the ECP at approximately 0700 each morning. It is highly recommended that the contractor work force begin queuing at 0600. The Local National work force entering the Installation shall be processed through several security check points. After the last security check the Force Protection personnel will match the Local Nationals with the appropriate contractor escort. The workers will then be escorted to the work site. The contractor should assume that the entry process for any group of workers may take 1-2 hours each day and exit time may take ½ hour to 1 hour.

The contractor will assign a management representative to be present at the ECP during the entrance and egress processing each day to insure the Local National work force maintains order during the process, to coordinate with the Force Protection Office personnel manning the Entry Control Point and to report on any abnormalities with the daily entry and egress process.

#### 1.5.1.4 Limitations 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 three sites. 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.

#### 1.5.1.5 Security Requirements Specific to Kandahar Air Field (KAF)

The aforementioned specification sections regarding site security are presented as an overview. Specific force protection and security requirements, including badging and ID, are presented in Appendix D.

### 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 Handbooks: Fundamentals; HVAC Systems and Equipment; HVAC Applications; Refrigeration.

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

AWS - American Welding Society

DCID 6/9 Physical Security Standards for Sensitive Compartmented Information Facilities

DCID 1/21, Manual for Physical Security Standards For Sensitive Compartmented Information Facilities (SCIF)

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

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

IBC - International Building Codes, 2006 or latest edition (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  
Codes and Standards of the National Fire Protection Association (NFPA)  
as applicable and enacted in 2002 or later, unless otherwise noted  
National Electrical Safety Code (NESC), Institute of Electrical and Electronic Engineers (IEEE C2), 2007  
edition  
International Building Code, 2006 Edition  
NFPA 10, Portable Fire Extinguishers, 2002 edition  
NFPA 13, Sprinkler Systems  
NFPA 20, Fire Pumps  
NFPA 24, Underground Fire Service Mains  
NFPA 30, Flammable and Combustible Liquids Code, 2003 edition  
NFPA 30A, Code for Motor Fuel Dispensing Facilities and Repair Garages, 2003 edition  
NFPA 54, National Fuel Gas Code, 2002  
NFPA 58, Liquefied Petroleum Gas Code, 2004  
NFPA 70, National Electrical Code, 2008 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  
NFPA 101, Life Safety Code, 2009 edition  
NFPA 110, Standard for Emergency and Standby Power Systems, 2005 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 5-785 Weather Data  
TM 5-802-1 Economic Studies  
TM 5-805-4 Noise and Vibration  
UFC 1-200-01, Design: General Building Requirements, 20 June 2005  
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 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 3-410-01FA Heating, Ventilating and Air Conditioning, Change 1, 15 May 2003  
UFC 3-410-02A, HVAC Control Systems. 15 May 2003  
UFC 3-410-04N, Industrial Ventilation, 25 October 2004  
UFC 3-420-01, Plumbing Systems Design, 19 June 2003  
UFC 3-430-01FA, Heating and Cooling Distribution Systems, 27 July 2003  
UFC 3-460-01, Petroleum Fuel Facilities, 16 January 2004  
UFC 3-501-03N, Electrical Engineering Preliminary Considerations, 16 Jan 2004  
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 Design: Electrical Power Supply and Distribution Systems, 1 Mar 2005  
UFC 3-600-01, Design: Fire Protection Engineering for Facilities, 26 Sept 2006  
UFC 4-010-01, Design: Minimum DoD Antiterrorism Standards for Buildings, 22 Jan 2007  
UFC 4-010-02, DoD Minimum Antiterrorism Standoff Distances for Buildings, 19 Jan 2007  
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 4-022-01, Security Engineering: Entry Control Facilities/Access Control Points, 25 May 2005  
Underwriters' Laboratories (UL) Fire Protection Equipment Directory (2002)  
UL Standards (as applicable)  
UL 752, Bullet Resisting Equipment, 2000 or later  
USCINCCENT OPORD 97-1

The publications to be taken into consideration shall be those of the most recent editions.  
Unified Facility Criteria (UFC) is available online at [http://www.wbdg.org/ccb/browse\\_cat.php?o=29&c=4](http://www.wbdg.org/ccb/browse_cat.php?o=29&c=4)

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.

## **2.0 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 or new 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. . There is no approved waste sites in Kandahar or local area suggest contractor coordinate with COMKAF or ANA to locate a proper disposal site prior to construction start.

## **2.3 CIVIL SITE DEVELOPMENT**

### **2.3.1 Site Plan**

The contractor shall prepare plat or plan of property as part of the design package consisting of a site boundary at Kandahar Air Field, Afghanistan. The survey shall show the closure of the property boundary consisting of identifying all property corners, establishing horizontal and vertical control listing all bearing and distances of property lines from the centerline of all adjacent roads. The contractor shall place property corner markers and a monument on the property showing site elevations, coordinate grid systems and WGS 84 latitude longitude. This survey shall meet the requirements of World Geodetic System 1984 (WGS 84 UTM Zone in decimal degrees[Kandahar Air Field 41R QQ}). The survey design shall include topographic map and the locations of all building corners, structures, major trees, road right of ways, names of roads, widths of roads, easements, right of ways, setbacks, parking and paving areas, storage containers, stoops, sidewalks and walkways, above ground utilities, electrical and Bunker locations. The contractor shall identify and show perimeter security walls, fences, hesco barriers, guard towers and entry control point structures. The contractor shall locate the facilities in general agreement with the drawings included and any requirements in the Scope of Work, section 01010. All 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

Note: for this project, given the sensitive nature of Kandahar Air Field, the contractor is not afforded a base map showing the locations of the three sites. The local site maps for each project is shown in Appendix A.

### **2.3.2 Demolition**

Demolition shall include removal of all structures, foundations, pavements, and utilities, and clear and grubbing. All refuse and debris shall be disposed of off site. Scrap metal shall be the property of the Host Government. The scrap metal on site shall be moved to an area away from the site perimeter as directed by the Contracting Officer's Representative and left for the Host Government to remove and/or salvage.

Demolished fencing and concertina wire shall be neatly rolled up for reuse by the government and as directed by the Contracting Officer. Likewise, used fence posts and outriggers shall be neatly stockpiled for reuse by the host government.

### **2.3.3 Site Grading & Drainage**

The contractor will provide all necessary 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 ground floor finished elevation shall be a minimum 150mm above adjacent grade and outside grade shall slope away from the building on all sides at a minimum slope of 5% for a distance of 3 meters. Holes and depressions shall be backfilled. Fill materials shall be composed of satisfactory soils or aggregates defined in ASTM D 2487 as GW, GP, GM, SP, SM, SC, SW, CL-ML. Minimum soil compaction shall be 95 percent of maximum density as defined in ASTM D 1557.

## **2.3.4 Paving**

### **2.3.4.1 Roads**

For some project site areas as noted in specifications 01010, paved roads are required. 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 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 250 mm (10 inch) compacted base course minimum and shall be surfaced with minimum 75 mm (3 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.

Aggregate roads with PCC curbs are required within all 3 project sites. All roads shall be of wearing surface 7.3 meters (24 feet) wide, minimum 250 mm course thickness, 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 contractor shall notify the Contracting Officer immediately if initial site survey determines that area hydrology requires major drainage structures or bridges.

### **2.3.4.2 Bridges and Site Grading Plan**

Preliminary investigation indicates no need for bridges or major drainage structures. The Contractor shall notify the Contracting Officer immediately if initial site survey determines that area hydrology requires major drainage structures or bridges. 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 Warehouse Staging Area**

Contractor shall construct parking and storage areas using aggregate surface. Subgrade shall be scarified and compacted to 95% proctor density. Aggregate base shall be 150mm (6 inches) for parking areas, and 250mm (10 inches) for motor pools. 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.

## **2.4 FORCE PROTECTION DESIGN**

The Contractor shall design and construct force protection measures for each project site. The Force Protection design shall incorporate minimum 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. Force

Protection design shall also meet the requirements of UFC 4-010-01, Design: Minimum DoD Antiterrorism Standards for Buildings, 8 Oct 2003 and UFC 4-010-02, DoD Minimum Antiterrorism Standoff Distances for Buildings, 8 Oct 2003 and Joint Security Directorate Antiterrorism/Force Protection Guide, March 2002.

The RSOI and Class I Warehouse projects are located within Kandahar Air Field proper and do not require extensive force protection requirements. The Entry Control Point is located on the perimeter of Kandahar Air Field and has extensive force protection requirements.

## **2.4.1 Project Site Security Features**

### **2.4.1.1 Fence Access Requirements (for ECP and Class I Warehouse projects)**

#### **2.4.1.1.1 Swinging Gates**

Gates shall be swing type and be constructed of steel and be a pair of 3.65 m wide x 2.4 m high steel leaves, constructed of 6mm steel plate skins, steel tube frame, and steel tube intermediate posts and rails. Gate design shall insure it is dimensionally stable, square, true and planar. Gate leaves shall not rack, shake or deflect during operation and the hinges are to be designed and constructed to support the entire weight of each leaf. Gates shall have a sufficient number of hinges to support each gate leaf. 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.

#### **2.4.1.1.2 Sliding Gates (if used)**

Gates shall be K4 sliding type. Gate shall be a minimum 3 M tall, with 0.5 M of high tension razor wire mounted on top. Gate shall be constructed of 100 mm x 100 mm x 5 mm square steel tubing, faced with 5mm steel plate. The design and construction of the gates shall insure that it is dimensionally stable, square, true and planar. Sliding Gate shall not rack or deflect when open, closed, or in motion. Gate tracks shall be anchor mounted to galvanized steel stanchions. Provide a locking mechanism that holds the gate closed. Provide reinforced grade beam across gateway flush with pavement to lock gate with flush mounted vertical sliding bolts, bolts shall be 50 mm dia solid steel. The sliding gate will also have a built- in personnel gate with its own locking mechanism.

#### **2.4.1.2 Outriggers**

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

#### **2.4.1.3 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 100 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.

#### **2.4.1.4 Chain-Link Fence and Gates**

Provide chain-link fence and gates as noted 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. Top of fence and gates shall be provided with outriggers and reinforced barbed tape as indicated above. Post sizes shall be as shown on drawings.

The gates shall be swing type. Hinged 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. The design of the gates shall insure that it is dimensionally stable, square, true and planar. Gate leaves shall not rack or deflect when install on its hinges. Gates shall have a sufficient number of hinges, anchor mounted to the exterior masonry walls, to support each gate leaf. 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.

#### 2.4.1.5 Sniper Screen (if directed by the contracting officer)

Sniper screen material will be ultraviolet light resistant and guaranteed against sunlight degradation for five years. Material will allow wind to blow through, without stretching the material, or distorting the frame. Sniper screen material will be fastened to standard galvanized fencing (see above) mounted to a rigid frame. The frame shall be securely embedded into the top of the wall. Frame components shall conform to ASTM F 1083, Steel Pipe, Hot Dipped Zinc Coated (Galvanized Welded).

### 2.4.2 Entry Control Point (ECP), Primary

The scope of work for the ECP project was described in specifications section 01010. The following information is provided as technical guidance to the scope of work.

#### 2.4.2.1 Vehicle Barriers

##### 2.4.2.1.1 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.

##### 2.4.2.1.2 Active Barriers – Tire Shredder

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. At minimum provide one shredder at rejection lane entrance to prevent unauthorized gate access.

##### 2.4.2.1.3 Active Barriers – Cable Lift Barrier

A Cable Lift Gate will be provided in addition to the sliding gate. Cable lift gate will normally be in the raised (deployed) position. Cable lift gate shall be certified to stop a 6,800 KG truck travelling 80 KPH. Shall be able to be balanced by counterweights so it can be manually raise or lowered by one man in seconds. Deployed height will be at least 1 M. Cables shall be a minimum of 25mm diameter braided steel.

##### 2.4.2.1.4 Active Barriers – Pop Up Barrier

Barrier shall deploy in 10 seconds and be certified to stop a 6,800 KG truck travelling 80 KPH.

#### 2.4.2.1.4 Passive Barriers - Concrete

Barriers shall be both Texas and Alaska size barriers, similar in size and dimensions that are currently in use at Kandahar Air Field. The general locations of concrete barriers were shown on the site plans in Appendix A, the specific types in use (either Alaska or Texas) and locations will be directed by the Contracting Officer.

### 2.4.3 Loudspeakers and Alarm System

Install Loud Speaker & Alarm System that can alert the entire compound via panic button from any tower or guard post station. Speaker & Alarm System shall be exterior grade components to withstand severe weather conditions of cold, heat, rain, sleet, and dust storms and to be completely understandable during these conditions from any point within the compound. All wires shall be installed in conduits.

## 2.5 CIVIL UTILITIES

### 2.5.1 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, cleanouts, 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. Water and sanitary sewer systems do not currently exist for any of the proposed facilities. The contractor will be required to provide temporary potable water tanks as well as temporary sanitary sewer holding tanks for the ECP and Class I Yard. Water tanks shall be capable of holding a minimum of the Average Daily Demand (ADD) or as directed in the Section 1010 Scope of Work facility descriptions. Sanitary sewer holding tanks shall at a minimum be capable of holding 80% of the ADD.

### 2.5.2 Water

#### 2.5.2.1 General

Infrastructure design and construction shall serve the demand. 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 190 liters per capita per day (lpcd) or 50 gallons per capita per day (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 hose spigot for any building or facility for which a water supply is provided for landscaping purposes. Water supply system does not currently exist for the proposed facilities. Temporary water tanks will be required to support the ECP and Class I facilities. The contractor shall construct water supply connection points for connection to the future air field infrastructure.

#### 2.5.2.2 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.

### 2.5.2.3 Service Booster Pumps

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.

### 2.5.2.4 Water Storage Tank

Contractor shall provide a circular steel or circular concrete ground storage reservoir (GST) to be located on the ground surface. Blivets may be used as temporary water holding facilities. 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.

### 2.5.2.5 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

### 2.5.2.6 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.

## 2.5.3 Water Distribution System

### 2.5.3.1 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 MPa (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). **Minimum pressure shall be 276kPa (40psi) to all points of the distribution system and maximum pressure shall be 517kPa (75psi).** 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 extending out to 1m from each road edge.

### 2.5.3.2 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.

### 2.5.3.3 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 concrete thrust blocking, unless otherwise approved.

### 2.5.3.4 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 1.38 MPa (200 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.

#### 2.5.3.5 Leakage Test

Leakage tests shall be conducted after all pressure tests have been satisfactorily completed. The duration of each leakage test shall be at least 2 hours, and, during the test, water lines shall be subjected to not less than 1.38 MPa (200 psi). 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 all air expelled. Pipe installation will not be accepted if leakage exceeds the allowable leakage, as determined by the following formula:

$L = 0.0001351ND (P \text{ raised to } 0.5 \text{ power})$ , where  
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.

#### 2.5.3.6 Bacteriological Disinfection

##### 2.5.3.6.1 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.

##### 2.5.3.6.2 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.

#### 2.5.3.6.3 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.

#### 2.5.3.6.4 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.

#### 2.5.3.6.5 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. Pressure and leakage testing may be conducted concurrently, 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.

#### 2.5.3.7 Valves

Valves (Gate valves w/box) shall be placed at all pipe network tees 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.

##### 2.5.3.7.1 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.

##### 2.5.3.7.2 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.

#### 2.5.3.8 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.

## 2.5.4 Sanitary Sewer

### 2.5.4.1 General

There are no functional or salvageable sanitary sewer collection, treatment or disposal facilities at this site. The contractor shall provide temporary sanitary sewer holding facilities to meet the expected one (1) days average daily sanitary sewer flow for the ECP and Class I Yard. The contractor shall provide sanitary sewer connection points for connection to the future air field infrastructure project. 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. Concrete cover will extend out to at least 1 m from each road edge.

Exterior sanitary sewer line construction shall include service to all buildings as described in the Scope of Work Section 01010. 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:

- a. Follow slopes of natural topography for gravity sewers.
- b. Check subsurface investigations for groundwater levels and types of subsoil encountered. If possible, avoid areas of high groundwater and the placement of sewers below the groundwater table.
- c. Avoid routing sewers through areas which require extensive restoration or underground demolition
- d. Depending upon the topography and building locates, 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. The intent is to provide future access to the lines for maintenance without impacting vehicular traffic.
- e. Avoid placing manholes in low-lying areas where they could be submerged by surface water or subject to surface water inflow. In addition, all manholes shall be constructed 50 mm higher than the finished grade, with the ground sloped away from each manhole for drainage.
- f. Sewer lines shall have a minimum of 800 mm of cover for frost protection.
- g. Locate manholes at change in direction, pipe size, or slope of gravity sewers.
- h. Sewer sections between manholes shall be straight. The use of a curved alignment shall not be permitted.
- i. If required by the design, locate manholes at intersections of streets where possible. This minimizes vehicular traffic disruptions if maintenance is required.
- j. Sewer lines less than 1.25 meters deep under road crossings shall have a reinforced concrete cover of at least 150mm thickness around the pipe or shall utilize a steel or ductile iron carrier pipe. It is

recommended to continue the reinforced concrete cover or carrier pipe a minimum of one (1) meter beyond the designated roadway.

- k. Verify that final routing selected is the most cost effective alternative that meets service requirements.

#### 2.5.4.2 Protection of Water Supplies

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

- a. Sanitary sewers shall be located no closer than 15m (50 feet) horizontally to water wells or reservoirs to be used for potable water supply.
- b. 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 1.8m (6 feet).
- c. 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 1m (3 ft) horizontally to the crossing, unless the joint is fully encased in concrete.

#### 2.5.4.3 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 50 gallons (190 liters) per capita day (water usage). The wastewater flow rate shall be calculated as approximately 80% of water usage rate, or 41 gallons per capita day. Design criteria guideline shall be based on average influent wastewater characteristics as BOD of 250mg/l, SS of 250mg/l, BOD load of 750ppd, and SS load of 750ppd.

#### 2.5.4.4 Gravity Sewer

Sanitary sewers shall be designed to flow at a maximum in the following way: Trunk Sewers - 90 percent full; Laterals and Mains – 80 percent full, Building connections (service) – 70 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.

**Table 1. Minimum Slopes for Sewers.**

Sewer Size	Minimum Slope in Meters per 100 Meters
100 mm	1.00
150 mm	0.62
200 mm	0.40
250 mm	0.28
300 mm	0.22
350 mm	0.17
375 mm	0.15
400 mm	0.14
450 mm	0.12
525 mm	0.10
600 mm	0.08

#### 2.5.4.5 Manholes

The Contractor shall provide standard depth manholes (MH), (depth may vary) an inside dimension of 1.2m (4 ft). Manholes shall be made of cast-in-place reinforced concrete with reinforced concrete cover. Alternate pre-cast 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, H-20 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.

##### 2.5.4.5.1 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.

##### 2.5.4.5.2 Spacing

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

##### 2.5.4.5.3 Pipe Connections

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

##### 2.5.4.5.4 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.

#### 2.5.4.5.5 Steps for Manholes

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

#### 2.5.4.6 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.

##### 2.5.4.6.1 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.

##### 2.5.4.6.2 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.

##### 2.5.4.6.3 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.

2.5.4.6.4 The minimum depth of the cover over the pipe crown shall be be 0.8m (2 ft 8").

##### 2.5.4.6.5 Building Connections and Service Lines

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. Service connection lines will be a minimum of 150 mm (6 inch) diameter and laid at a minimum 1% grade, but up to 2% as design parameters dictate. Service laterals shall be 200 mm (8 inch) and sloped to maintain the minimum velocity as described in paragraph "Gravity Sewer."

##### 2.5.4.6.6 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. In lieu of a wye fitting, an inspection chamber may be installed. The inspection chamber shall be of the same construction as a manhole. Preferably the cleanout will be of the same diameter as the building sewer, and never be smaller than 150mm (6 in). Cleanouts shall be located within 1m from the building.

##### 2.5.4.6.7 Field Quality Control

#### 2.5.4.6.7.1 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 and ASTM 969.

Low-pressure air tests: Perform tests as follows:

- (a) 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;
- (b) 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;
- (c) 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.

#### 2.5.4.6.8 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.

### 2.5.6 Storm Sewer Systems

Oil/water separators shall be utilized for all drains from industrial sites. 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 3-230-17FA, Drainage in Areas Other than Airfields.

## 3.0 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.

### **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 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, 2006

NFPA 101 - Life Safety Code, 2006.

### **3.3 LIFE SAFETY/ FIRE PROTECTION/ HANDICAPPED ACCESSIBILITY**

All facilities will be designed in accordance with recognized industry standards for life safety and building egress and will satisfy the requirements of NFPA 101, UFC 3-600-01, and The International building Code. Compliant manual and automatic fire alarm and notification systems, portable fire extinguishers, fire sprinkler systems, and exiting facilities shall all be included when and as required. The water supply and distribution system in South Park is being designed to supply sprinkler systems for most if not all buildings planned. However, if the water supply and distribution system cannot supply a sprinkler system demand in a particular building(s) where sprinklers are required, then a set-up of fire pump(s) and water tank(s) will need to be provided for that building(s). Any waivers to sprinkler system requirements will need to be specifically requested per building by the user and granted in writing by the appropriate authority. Until such written waivers are in-hand, all buildings shall be considered to be subject to any requirements for sprinkler systems as dictated by NFPA 101, Unified Facilities Criteria 3-600-01, and International Building Code. The RSOI barrack facilities and any storage warehouse over 5000 square feet will require sprinkler protection and the UFC 3-600-01 requirements for water supply must be met. 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](http://www.tisp.org/files/pdf/dodstandards.pdf) .

### **3.5 EXCAVATION**

Trench excavation shall be made for concrete footings. Trenches shall be a minimum of .8 meter deep. Trenches deeper than 1.5 meters shall have protective shoring to protect workers or have the sides of the trench sloped back at a slope of 1.5:1. Care shall be taken when backfilling of foundation trenches to avoid damage to walls. Any excess dirt shall become the property of the Contractor and shall be removed from the site to a location approved by the Contracting Officer.

### **3.6 THERMAL PERFORMANCE OF EXTERNAL BUILDING ASSEMBLIES**

External building 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 1.936 (R 13)
Ceilings/roof	RSI 3.345 (R 30)
Floor (over unheated space)	RSI 3.345 (R 19)

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)

RSI measured in m<sup>2</sup>-K/W, R measured in sqft-F-hr/BTU.

### **3.7 CONCRETE & MASONRY**

#### **3.7.1 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.

#### **3.7.2 Insulated Concrete Sandwich Wall System (3-D Building System)**

This system is not used on this project.

#### **3.7.3 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 100 mm or 190 mm or 290 mm wide x 390 mm x 190 mm high as shown on drawings or described in section 01010. All cells shall be fully grouted and reinforced. 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.

### **3.8 METAL**

#### **3.8.1 Building Systems**

##### **3.8.1.1 Arch Span**

Insulated Arch-Span metal roofing systems shall be supported by reinforced concrete stem walls approximately 2.5 m in height. Stem walls shall be insulated and finished with gypsum board or plaster on the interior, and finished with stucco on the exterior. The floor slab shall be reinforced concrete with a minimum thickness of 150mm placed on a clean vapor barrier above a capillary water barrier of 150mm minimum thickness on properly compacted soil. Exterior walls shall be insulated with a minimum of R-13 insulation, and provide a minimum of R-30 insulation for the roof. The roof insulation system shall be spray applied and harden to a durable rigid surface, as per the arch span manufacturer's standards.

Ribbed steel roof panels shall be mechanically fabricated from prefinished steel coil and joined by machines and operators, all certified by the arch span building manufacturer. The contractor shall present certificates of manufacturer's training for machine operators, and certificates of authenticity for proprietary machines and equipment.

Only prefinished steel coil certified by the arch-span system manufacturer shall be used on this project. Fasteners for accessories shall be manufacturer's standard. All materials and Concealed fasteners for steel roof panels shall be zinc-coated steel, aluminum, corrosion resisting steel, or nylon capped steel.

Fasteners for structural connections shall provide both tensile and shear strength of not less than 350 kg per fastener.

### 3.8.1.2 Pre-Engineered Metal Building Systems

Metal building systems shall comply with the requirements of the MBMA Low Rise Building Systems Manual-2002. Facilities designated as long-span, shall have no interior columns.

## 3.8.2 Trim

### 3.8.2.1 Metal Window Sills

Galvanized metal window sills, 1 mm (20-gage), 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 window sill 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.

### 3.8.2.2 Metal Fascia & Soffit

No wood fascias and/or soffits are allowed. Use metal fascias and soffits throughout. 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.

## 3.9 CARPENTRY

The use of wood framing as indicated below is acceptable only where allowed by IBC 2003 and NFPA 101.

### 3.9.1 Wood Purlins

If Contractor chooses to utilize wood 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.

### 3.9.2 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.

## 3.10 ROOFING AND WEATHERPROOFING

### 3.10.1 Sloped Roofs

On sloping roofs provide and install .70 mm (24 gauge) galvanized steel in either corrugated or standing seam design. 0.64 mm (22 gauge) for pre-denotation roof issues which should be augmented with sand bags in the ceiling below the metal roofing as directed by the Contracting Officer. 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.

### 3.10.2 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 m.

#### 3.10.2.1 Built-up Roofing System

A Insulated-Deck, Coal Tar, Glass-Fiber, Aggregate Roofing (ICGA-BUR): Provide built-up, aggregate-surfaced roof system with coal tar bitumen and glass-fiber ply felts (roof manufacturer's separation layers) for layup as indicated.

3.10.2.1.1 Primer: ASTM D 41 primer as recommended by roofing manufacturer.

3.10.2.1.2 Coal Tar Bitumen: ASTM D 450, Type III, as an option to asphalt.

3.10.2.1.3 Bitumen Membrane which meets the following:

- a. ASTM D312 or the equivalent EN 1849-1 for thickness and unit weight,
- b. ASTM D312 or the equivalent EN-1426 for penetration,
- c. ASTM D312 or the equivalent EN-1427 for softening point
- d. ASTM D312 or the equivalent TS 11758-1 for flash point or heat stability
- e. ASTM D4601 or the equivalent TS 11758-1 for width and area of roll
- f. ASTM D4601 (moisture percentage) or the equivalent EN 1928 (water tightness)
- g. ASTM D226 (pliability) or the equivalent EN 1109 (cold bending).

3.10.2.1.4 Glass Roofing Felt: ASTM D 2178, Type IV or VI, except felts for coal tar systems shall be impregnated with a bituminous resin coating which is compatible with coal tar bitumen.

3.10.2.1.5 Organic Felt Base: ASTM D 2626 for use with asphalt roofing system.

3.10.2.1.6 Organic Felt Base: ASTM D 226 for use with asphalt roofing system and ASTM D 227 for use with coal tar roofing system. Organic felts may be used for bitumen stops and edge envelopes.

3.10.2.1.7 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.

#### 3.10.2.2 Roof Membrane Installation

- a. Prime surface of concrete deck with asphalt primer per manufacturers recommended application rate.
- b. Cant Strips/Tapered-Edge Strips: Wood, not less than 89 mm (3-1/2 inches) high, 45-degree insulation cant strips at juncture of membrane with vertical surface. Provide tapered-edge strips at perimeter edges of roof that do not terminate at vertical surfaces.
- c. Base Layer: Install one lapped course of base sheet. Attach first layer of roofing membrane material to substrates and elsewhere as indicated. Mop to non-nailable substrate with hot bitumen or apply with torch method per manufacturer's specifications

- c. **Second Layer:** Install second layer of roofing membrane material over the first course staggering joints and seams in both directions by at least 300 mm. Mop top layer of membrane to base layer, or attach via torch method per manufacturer's specifications.

#### 3.10.2.3 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.

#### 3.10.2.4 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.

#### 3.10.2.5 Gravel Layer

A gravel layer of 16 to 32 mm diameter stone will be laid in at least 5cm thick on top of the filter layer in non-trafficable flat roofs. The gravel layer will be applied as soon as possible to prevent UV damage and/or wind damage to insulation and filter layers.

### 3.10.3 Flashing & Sheet Metal

#### 3.10.3.1 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.

#### 3.10.3.2 Steel Sheet, Zinc-Coated (Galvanized)

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

#### 3.10.3.3 Aluminum wall capping and expansion joint profiles.

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

#### 3.10.3.4 Roof Gutters

Roof gutters shall be installed as indicated. Roof gutters shall be rigidly attached to the building. Supports for roof gutters shall be spaced according to manufacturer's recommendations.

#### 3.10.3.5 Downspouts

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. Downspouts shall be rigidly attached to the building with supports a minimum of 1.5 M apart.

#### 3.10.3.6 Wall, Floor, Ceiling Expansion Joints In Plaster & Stucco

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

#### 3.10.3.7 Connections and Jointing

##### 3.10.3.7.1 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.

##### 3.10.3.7.2 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.

##### 3.10.3.7.3 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.

#### 3.10.3.8 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.

#### 3.10.3.8.1 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.

#### 3.10.3.8.2 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.

#### 3.10.3.8.3 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.

#### 3.10.3.8.4 Wall Capping

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

### **3.10.4 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 smooth fresh 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.

#### 3.10.4.1 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.

#### 3.10.4.2 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.

#### 3.10.4.3 Floor Joint Sealant

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

#### 3.10.4.4 Primers

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

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.

#### 3.10.4.5 Bond Breakers

Provide the type and consistency recommended by the sealant manufacturer to prevent adhesion of the sealant to backing or to bottom of the joint.

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.

#### 3.10.4.6 Backing

Backing shall be 25 to 33 percent oversize for closed cell and 40 to 50 percent oversize for open cell material, unless otherwise indicated.

#### 3.10.4.7 Cleaning Solvents

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

#### 3.10.4.8 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.

#### 3.10.4.9 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.

#### 3.10.4.10 Backstops

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.

#### 3.10.4.11 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.

#### 3.10.4.12 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.

### **3.11 WINDOWS, DOORS & GLAZING**

#### **3.11.1 Windows**

##### **3.11.1.1 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/mm<sup>2</sup> 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.

##### **3.11.1.2 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.

##### **3.11.1.3 Fixed, Casement, Projected and Horizontal Sliding Windows**

Provide window units meeting UL 752, level 5, AK-47 resistance.. 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 6mm laminated with .75mm polyvinyl-butylal (PVB) interlayer per UFC 4-010-01.

#### 3.11.1.4 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.

#### 3.11.1.5 Finishes

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

(a) Color: White meeting the requirements of DIN 50018

#### 3.11.1.6 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.

#### 3.11.1.7 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.

#### 3.11.1.8 Adjusting

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

#### 3.11.1.9 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.

### 3.11.2 Doors

All exterior doors (entry and exist doors) shall be heavy duty metal doors with metal frames. Interior door shall be hollow metal doors with hollow metal frames. All glazed doors shall have 5 mm single 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. Install required

louvers, as called for in paragraph 6, in the lower portion of the door. 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.

#### 3.11.2.1 Solid Plastic & Phenolic doors

Solid Plastic & Phenolic doors and frames are for interior wet room use only. Solid Plastic & Phenolic doors and frames be used for bathrooms, shower rooms, and toilets rooms.

#### 3.11.2.2 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.

##### 3.11.2.2.1 Accessories

###### 3.11.2.2.1.1 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.

###### 3.11.2.2.1.2 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.

###### 3.11.2.2.1.3 Astragals

Provide overlapping steel astragals on pairs of exterior steel doors which will not have aluminum astragals or removable mullions. 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.

###### 3.11.2.2.1.4 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.

### 3.11.2.2.2 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.

#### 3.11.2.2.2.1 Welded Frames

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

#### 3.11.2.2.2.2 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.

#### 3.11.2.2.2.3 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.

#### 3.11.2.2.3 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.

##### 3.11.2.2.3.1 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

##### 3.11.2.2.3.2 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.

#### 3.11.2.2.4 Fire and Smoke Doors and Frames

The requirements of NFPA 80 and NFPA 105 respectfully shall take precedence over details indicated or specified.

#### 3.11.2.2.5 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.

#### 3.11.2.2.6 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.

#### 3.11.2.2.7 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.

#### 3.11.2.2.8 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.

#### 3.11.2.2.9 Installation of Doors & Frames

##### 3.11.2.2.9.1 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.

##### 3.11.2.2.9.2 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.

##### 3.11.2.2.9.3 Doors

Hang doors in accordance with clearances specified in SDI A250.8. After erection and glazing, clean and adjust hardware.

##### 3.11.2.2.9.4 Fire and Smoke Doors and Frames

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

### 3.11.2.2.9.10 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.

### 3.11.2.3 Wood Doors and Frames

Provide doors that are hollow steel (exterior) and wood (interior), solid core, 900/1000/1100/1200 mm. Wide x 2200 mm. High x 45 mm. Thick with steel frame to match new door masonry openings. All glazed doors shall have 5 mm. single tempered glazing. Wired glass shall be used for glazing for fire rated doors, if required. Fire rated doors must have UL seal or European equivalent attached.

#### 3.11.2.3.1 Accessories

##### 3.10.2.5.1.1 Door Louvers

Fabricate from wood and of sizes indicated. Louvers shall be of the manufacturer's standard design and shall transmit a minimum of 35 percent free air. Louvers shall be the slat type.

##### 3.11.2.3.1.1 Door Lite Openings

Provide glazed openings with the manufacturer's standard wood moldings except that moldings for doors to receive natural finish shall be of the same species and color as the face veneers. Moldings for flush doors shall be lip type.

##### 3.11.2.3.1.2 Weather Stripping

Provide weather-stripping that is a standard cataloged product of a manufacturer regularly engaged in the manufacture of this specialized item. Weather stripping shall be looped neoprene or vinyl held in an extruded non-ferrous metal housing. Air leakage of weather stripped doors shall not exceed 0.003125 cubic meter per second of air per square meter of door area when tested in accordance with ASTM E 283.

##### 3.11.2.3.2 Pre-fitting

At the Contractor's option, doors may be provided factory pre-fit. Doors shall be sized and machined at the factory by the door manufacturer in accordance with the standards under which they are produced. The work shall include sizing, beveled edges, mortising, and drilling for hardware and providing necessary beaded openings for glass and louvers. Provide the door manufacturer with the necessary hardware samples, and frame and hardware schedules as required to coordinate the work.

##### 3.11.2.3.3 Finishes

Provide door finish colors as selected by the Contracting Officer from the color selection samples.

##### 3.11.2.3.4 Water-Resistant Sealer

Provide a water-resistant sealer compatible with the specified finish as approved and as recommended by the door manufacturer.

##### 3.11.2.3.5 Installation

Before installation, seal top and bottom edges of doors with the approved water-resistant sealer. Seal cuts made on the job immediately after cutting using approved water-resistant sealer. Fit, trim, and hang doors with a 2 mm minimum, 3 mm maximum clearance at sides and top, and a 5 mm minimum, 6 mm maximum clearance over thresholds. Provide 10 mm minimum, 11 mm maximum clearance at bottom where no threshold occurs. Bevel edges of doors at the rate of 3 mm in 50 mm. Door warp shall not exceed 6 mm when measured in accordance with WDMA I.S. 1-A.

Install doors in strict accordance with the manufacturer's printed instructions and details. Provide weather stripping on exterior swing-type doors at sills, heads and jambs to provide weather tight installation. Apply weather stripping at sills to bottom rails of doors and hold in place with a brass or bronze plate. Apply weather stripping to door frames at jambs and head. Shape weather stripping at sills to suit the threshold.

#### 3.11.2.4 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 minimum yield strength of 227.5 MPa.

Counterbalance-barrel components shall be as follows:

- (a) 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.
- (b) 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.
- (c) 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.
- (d) 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.
- (e) Barrel rings shall be fabricated from malleable iron of the proper involute shape to coil the curtain in a uniformly increasing diameter.
- (f) Shaft bearings shall be factory sealed ball bearings of the proper size for load and shaft diameters.
- (g) 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.

- (h) 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.

### **3.11.3 Glass & Glazing**

Glazing shall conform to ASTM C 1036 or ASTM C 1172 or equal.

#### **3.11.3.1 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.

#### **3.11.3.2 Laminated Glass**

Laminated glass shall be constructed out of two, 3mm glass panes bonded together with a minimum .75mm polyvinyl-butylal (PVB) interlayer. Follow the UFC 4-010-01 requirements for ballistic resistant glazing, where required, at the ECP.

#### **3.11.3.3 Insulated Glass**

All exterior glazing shall be insulated, constructed of two panes of laminated glass separated by hermetically sealed 12mm airspace.

#### **3.11.3.4 Glazing Accessories**

##### **3.11.3.4.1 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.

##### **3.11.3.4.2 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.

##### **3.11.3.4.3 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.

##### **3.11.3.4.4 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.

#### 3.11.3.4.5 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.

#### 3.11.3.4.6 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.

#### 3.11.3.4.7 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.

#### 3.11.3.4.8 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.

#### 3.11.3.4.9 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.

#### 3.11.3.5 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.

### **3.12 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.

#### **3.12.3 Exterior Walls**

All building facilities for each site in this project are pre-manufactured (warehouse, barracks, MWR and ECP buildings) and have a factory exterior finish applied. Some structures may require additional wall structure, painting or finish as directed by the contracting officer or by the specifications 01010 and 01015.

### **3.12.4 Interior Walls**

Interior walls shall be painted 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.

### **3.12.5 Interior Ceilings**

Most ceilings are pre-manufactured and have a factory applied finish. For other ceilings, gypsum board is used with 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. Note that for fire rated assemblies, 15 mm thickness type X gypsum board is used if specified within the 01015 and 01010.

### **3.12.6 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.

### **3.12.7 Exposed Wood 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

### **3.12.8 Tile Work for wet areas, where used**

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.

3.12.8.1 Floors in wet areas shall be 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.

3.12.8.2 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.

## **3.13 SPECIALTIES**

### **3.13.1 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 (AFF).

### **3.13.2 Toilet Paper Holders**

Toilet paper holders, stainless steel, shall be installed approximately 600 mm AFF above floor.

### **3.13.3 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, 150 mm from ceiling surface.

### **3.13.4 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.

### **3.13.5 Paper Towel Dispensers**

Paper towel dispensers, 0.683 mm Type 304 stainless steel, surface mounted, 1200 mm AFF. Furnish tumbler key lock locking mechanism.

### **3.13.6 Light Duty Metal Shelf**

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

### **3.13.7 Robe Hooks**

Robe hooks on all toilet and shower stalls required, mounted at 1800 mm AFF.

## **4.0 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.

### **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, or reinforced concrete unless otherwise stated in sections 01010 or 01015.

### **4.3 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 strength	280.0 kg./sq.cm (f'c) (4000psi) a minimum specified compressive @ 28 days (ASTM-. C 39 and ACI 318) with a maximum water-cement ratio of 0.5.
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Plaster strength	140.0 kg./sq.cm (f'c) (2000psi) conforming to ASTM C 926.
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 gauge minium, Ladder Type
Structural Steel	ASTM A36: 2530.0 kg./sq.cm (Fy = 36,000psi)
Welding	AWS (American Welding Society) D1.1-2002.

#### 4.4 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, and edition as referenced herein.

#### 4.5 WIND LOADS

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

#### 4.6 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  $S_1 = 0.51g$ .

#### 4.7 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, referenced edition. A minimum cylinder 28 day compressive strength of 21 MPa (4000 psi) shall be used for design and construction of all concrete. 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 0.450. 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).

#### 4.8 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 CMU walls shall be fully grouted and reinforced. Exterior CMU walls are 200 mm thickness; interior are 100 mm thickness.**

#### 4.9 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.

#### **4.9.1 Steel Roof Joists**

Steel roof joists shall be placed according to the roof design and roof manufacturer specifications. Steel purlins shall be installed perpendicular to the steel beams. Use continuous metal roof sheets from ridge to eave to avoid constructing roof seams. In lieu of the continuous metal roof sheets, the Contractor can submit a plan for roofing seams; however, the plan must show a detail of how leaks will be avoided, and the Contracting Officer before application must approve the plan. Steel "hat channels" shall be installed on the bottom side of steel beams for the installation of gypsum board with screws. Provide all necessary metal framing for roof fascia and soffits. See structural paragraph for structural characteristics of steel joists.

#### **4.10 METAL DECK**

Deck units shall conform to SDI Publication Number 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.

#### **4.11 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.

#### **4.12 FOUNDATIONS**

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

#### **4.13 EARTHWORK AND FOUNDATION PREPARATION**

##### **4.13.1 Capillary Water barrier**

ASTM C 33 fine aggregate grading with a maximum of 3 percent by weight passing ASTM D 1140, 75 micrometers, No. 200 sieve, or 37.5mm and no more than 2 percent by weight passing the 4.75mm No. 4 size sieve and conforming to the soil quality requirements specified in the paragraph entitled "Satisfactory Materials."

##### **4.13.2 Satisfactory Materials**

Any materials classified by ASTM D 2487 as GW, GW-GM, GW-GC, SW, SW-SM, SM, SW-SC, SC, or CL and free of debris, roots, wood, scrap material, vegetation, refuse, soft unsound particles, or objectionable materials. Unless specified otherwise, the maximum particle diameter shall be one-half the lift thickness at the intended location.

##### **4.13.3 Unsatisfactory Materials**

Any materials which do not comply with the requirements set forth in the Satisfactory Materials paragraph. Unsatisfactory materials also include man-made fills, trash, refuse, or backfills from previous construction. Unsatisfactory material also includes material classified as satisfactory which contains root and other organic matter, frozen material, and stones larger than 75mm. The Contracting Officer shall be notified of any unsatisfactory materials.

##### **4.13.4 Clearing and Grubbing**

Unless indicated otherwise, remove trees, stumps, logs, shrubs, brush and vegetation, and other items that would interfere with construction operations within lines 1.5 meters outside of the building and structure line. Remove stumps entirely. Grub out matted roots and roots over 50mm in diameter to at least 460mm below existing surface.

#### **4.13.5 Stripping**

Strip suitable soil from the site where excavation or grading is indicated and stockpile separately from other excavated material. Material unsuitable for use as topsoil shall be stockpiled and used for backfilling. Locate topsoil so that the material can be used readily for the finished grading. Where sufficient existing topsoil conforming to the material requirements is not available on site, provide borrow materials suitable for use as topsoil. Protect topsoil and keep in segregated piles until needed.

#### **4.13.6 Excavation and Compaction of Fill**

Excavate to contours, elevation, and dimensions indicated. Reuse excavated materials that meet the specified requirements for the material type required at the intended location. Keep excavations free from water. Excavate soil disturbed or weakened by Contractor's operations, soils softened or made unsuitable for subsequent construction due to exposure to weather. Excavations below indicated depths will not be permitted except to remove unsatisfactory material. Unsatisfactory material encountered below the grades shown shall be removed as directed. Refill with satisfactory material and compact to at least 95 percent of the maximum dry density, as determined by the Modified Proctor laboratory procedure. ASTM D 1557 shall be used for producing the Modified Proctor moisture-density curve, unless the soil to be compacted includes more than 30% retained on the 19 mm (3/4") sieve. In this case, the Contractor must replace the ASTM D 1557 laboratory compaction procedure with AASHTO T 180, Method D, corrected with AASHTO T 224.

During compaction, the moisture content of the soil shall be within 1.5 percent of the optimum moisture content, as determined by the Modified Proctor laboratory procedure. The thickness of compacted lifts shall not exceed 15 cm and the dry density of each compacted lift shall be tested by either sand cone (ASTM D 1556) or nuclear gage (ASTM D 2292). If the nuclear gage is used, it must first be compared to sand cone tests for each soil type to verify the accuracy of the nuclear gage measurements for moisture content, wet density, and dry density. Furthermore, every tenth nuclear gage test must be accompanied by a sand cone test and these verification data must be summarized and submitted to the Contracting Officer. Density tests shall be performed at a frequency of not less than one test for each 200 square meters and not less than two tests per compacted lift.

#### **4.13.7 Structures with Spread Footings**

Ensure that footing subgrades have been inspected and approved by the Contracting Officer prior to concrete placement. Fill over excavations with concrete during foundation placement.

### **5.0 GEOTECHNICAL**

#### **5.1 SOIL INVESTIGATION**

Existing geotechnical information is not available at the project site. Any site-specific geotechnical data required to develop foundations, materials, earthwork, and other geotechnical related design and construction activities for this project shall be the Contractor's responsibility. The Contractor shall develop all pertinent geotechnical design and construction parameters by appropriate field and laboratory investigations and analyses. The Contractor shall produce a detailed geotechnical report containing field exploration and testing results, laboratory testing results (particle sizes and distribution, liquid and plastic limit test, and moisture and density test, etc.). Information in the report shall include, but not limited to: existing geotechnical (e.g. surface and subsurface) conditions, location of subsurface exploration logs on

site plan, exploration point, allowable soil bearing capacity and foundations recommendations, 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.

## **5.2 GEOTECHNICAL QUALIFICATIONS**

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

## **6.0 MECHANICAL**

### **6.1 GENERAL**

The work covered by this section consists of design, supply, fabrication and installation of new building heating, ventilation and air-conditioning (HVAC) 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 HVAC equipment including all necessary associated mechanical works.

### **6.2 SPECIALIST SUB-CONTRACTORS QUALIFICATIONS**

The heating, ventilation, and air-conditioning works shall be executed by an air-conditioning specialist sub-contractor experienced in the design and construction HVAC equipment and systems . The HVAC heating and cooling load calculations shall be prepared using recognized HVAC load analysis programs such as Trane "Trace" or Carrier "HAP". The heating and cooling load calculations shall take into account the site elevation and ambient design temperatures when determining required HVAC equipment capacities and airflows. The HVAC specialist shall submit the complete HVAC analysis at the 65% design submittal. The HVAC analysis shall clearly state what type 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 during both design heating and cooling operation.

Provide complete, edited specifications using the UFGS specs for the applicable HVAC systems. The edited specifications shall be submitted along with the 65% design submittal.

### **6.3 CODES, STANDARDS AND REGULATIONS**

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

### **6.4 DESIGN CONDITIONS**

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

Kandahar area:

Latitude – (approx.) 31.5 deg. North

Longitude – (approx.) 65.85 deg. East

Elevation – (approx.) 1010 M (3314 ft.)

Summer – 41 deg C (106 deg F) Dry Bulb (DB) [& 21.7 deg C (71 deg F)] Wet Bulb (WB)

Winter – (-1.7 deg C/29 deg F)

Daily Range – 21 F)

**6.4.1 Indoor Design Condition**

	<u>Cooling</u>	<u>Heating</u>
Barracks	25.6 C (78 F)	20 C (68 F)
Administrative buildings	25.6 C (78 F)	20 C (68 F)
Bathroom/Shower bldgs	30 C (85F)	20 C (68 F)
Maintenance facilities	30 C (85F)	12.7 C (55 F)
Warehouses	30 C (85F)	12.7 C (55 F)

**6.4.2 Noise Level**

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

**6.4.3 Internal Loads**

- Occupancy: Use ASHRAE standards to calculate sensible and latent heat from people. In general, light/moderate office work is 73watts sensible and 45watts latent.
- Lighting: 21.5 W/m<sup>2</sup> (2 W/Ft<sup>2</sup>) maximum (however lighting levels shall meet minimum requirements and shall be accounted for in the heating and cooling loads based on the actual lighting design).
- Outdoor Air: Outdoor ventilation air shall be provided per ASHRAE Standard 62.1 with the exception of guard towers, guard shacks, and storage facilities. In general this requires 2.5 L/s/Person (5 CFM/Person) and 0.3 L/s per square meter of floor space (0.06 CFM/sqft); Latrine/Bathroom Exhaust– 85 CMH (50 CFM) per toilet, urinal, and shower head.
- Building Pressurization: 1.3 mm W.G. (0.05 in W.G.) for occupied spaces such as admin offices, living quarters and sensitive electronic spaces; Maintain negative pressure in toilets and janitor closets..

**6.4.4 Thermal Performance**

External building 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 Insulation Resistance Value (R-value)
Exterior walls (above grade)	RSI 1.936 (R 13)
Ceilings/roof	RSI 3.345 (R 30)
Floor (over unheated space)	RSI 3.345 (R 19)
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)

RSI is measured in m<sup>2</sup>-K/W; R is measured in sqft-F-hr/BTU. The design analysis shall include exterior building assembly R-value calculations for each separate assembly. The calculations shall be in accordance with ASHRAE Fundamentals or EN ISO 6946. The calculations shall indicate the thermal conductivity, thickness, and R-value of each assembly component and the overall R-value for the assembly. The assembly R-value calculations shall investigate the effects of thermal bridging from the use of metal building material such as metal wall studs, roof Purlins, wire mesh wall ties or bolts, structural members, etc.

Window glazing surface area shall be determined based on the architectural design per each building and shall not be an assumed percentage of the wall area.

## 6.5 NEW AIR CONDITIONING & HEATING EQUIPMENT

Environmental control of the facilities shall be achieved by HVAC 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 that is the most Life Cycle Cost Effective to the government. Contractor shall size and select equipment based on equipment manufacturer's performance data at the project site elevation and ensures the equipment's performance meets the design heating and cooling sizing requirements. Air conditioning equipment shall be of the highest EER available.

Facility Type	Cooling	Heating	Type of HVAC System	Remarks
Barracks	25.6C 78 F	20C 68 F	Packaged heat pump unit	Ducted forced air system
Admin Facility	25.6C 78 F	20C 68 F	Packaged heat pump unit	Reuse existing
MWR Facility	25.6C 78 F	20C 68 F	Packaged heat pump unit	Reuse existing
ECP Facilities	25.6C 78 F	20C 68 F	Split pack heat pump units	

### 6.5.2 Unitary Ducted Heat Pump Units

Ducted heat pump units shall be unitary in design and factory manufactured ready for installation. Heat pump units shall provide cooling during summer and heating during winter. The unit shall consist of DX evaporator cooling coil, blower, supplemental electric heater elements, washable filter, and condenser unit containing the compressor, condenser coil, fans and all internal controls/fittings complete all mounted in a weatherized housing finished for exposed installation. The 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.

### 6.5.3 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 DUCTWORK

Air shall be distributed from central Air Handling Units (AHUs) to achieve proper airflow throughout the facility by means of air distribution ductwork. Air distribution system shall be comprised of supply and return ductwork, fittings, grilles, registers, and/or diffusers. Ductwork shall be constructed of galvanized steel or aluminum sheets and installed as per SMACNA "HVAC Duct Construction Standards (Metal and Flexible)." Flexible non-metallic duct may be used for final unit/diffuser connection in ceiling plenums.

These flexible duct run-outs shall be limited to 3 meters in length.

#### **6.6.1 Duct Insulation**

Duct insulation shall be provided for all supply ductwork that is not located in the conditioned space and for return ductwork not located within the conditioned space. All ductwork exterior to the building shall be insulated with a minimum  $RSI=0.88$  (R5).

In general interior ducts shall be exposed to the rooms and will not be insulated. The heat lost or gained from the un-insulated ducts shall be considered as part of the heating or cooling of the conditioned space.

#### **6.6.2 Diffusers, Registers & Grilles**

Diffusers, registers and grilles shall be factory fabricated of steel or aluminum and distribute the specified air quantity evenly over the space intended. The devices shall be round, half round, square, rectangular, linear, or with perforated face as determined by the design. Units will be mounted in ceilings, high sidewalls, or directly to ductwork and shall be sized for the airflow to be delivered with a maximum NC rating of 35. Pressure loss through the diffuser shall be considered in sizing the duct system and the system static pressure calculations.

#### **6.6.3 Branch Take-offs**

Air extractors or 45° entry corners shall be provided at all branch duct take-offs. Manual volume control dampers shall be included at the branch duct take-offs and where required to facilitate air balancing and shall be shown on the design drawings.

#### **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. Piping penetrating through walls shall be provided with pipe sleeves embedded in the wall. The annular space between the pipe and pipe sleeve shall be filled with back stop material and sealed to prevent any moisture migration.

#### **6.6.5 Air Filtration**

All supply air shall be filtered using manufacturer's standard washable filters mounted inside the unit. In addition, all outdoor air intakes shall be equipped with 50 mm (2 inch) thick washable filters.

#### **6.6.6 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, and shall include lockable housing that allows viewing of settings without permitting access. For units serving more than one area, the thermostat shall be located near the return of the space with the highest heat generation.

### **6.7 COLD STORAGE WAREHOUSE CLASS I**

#### **6.7.1 Shop Drawings**

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

tests.

#### 6.7.2 Modular Construction

Walk-in coolers and freezers shall be panel type modular construction. Doors shall swing out. Condenser unit shall be remotely located at the exterior of the units and the evaporator shall be mounted inside of the unit. 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.

#### 6.7.3 Piping

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

#### 6.7.4 Electrical

Electrical characteristics shall match local power 380v/3ph/50Hz and 220v/1ph/50Hz.

#### 6.7.5 Packing Material

Preservation and packing shall be commercial grade.

#### 6.7.6 Temperature Record & Control

Provide a recording thermometer. Provide temperature alarm with connector to remote temperature alarm.

#### 6.7.8 Outdoor Condensing Unit

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.

#### 6.7.9 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.

#### 6.7.9 Drain Lines

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

#### 6.7.11 Installation Instructions

Submit a copy of installation instructions to the Contracting Officer covering both assembly and installation of the refrigeration equipment prior to start of work

#### 6.7.12 Testing

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.

#### 6.7.13 Operations & Maintenance

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.

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.

#### 6.7.14 Clean-up

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

### **6.8 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 m<sup>3</sup>/h / m<sup>2</sup> floor or 85 m<sup>3</sup>/h / toilet (WC). At extreme cold in winter these values can be reduced for short periods to 10 m<sup>3</sup>/h / m<sup>2</sup> or 40 m<sup>3</sup>/h / toilet (WC) to conserve heat.

## **6.8.2 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.

## **6.9 ELECTRIC HEATERS**

### **6.9.1 Unit Heater**

Electric resistance heaters shall be installed in small spaces where only heating is required. Provide a self-contained electric heating unit, suspended from ceiling or structure, with fan and heating elements. Provide control-circuit terminals and single source of power supply with disconnect. Heating wire element shall be nickel chromium. Include limit controls for overheat protection of heaters. Provide tamper resistant integral thermostat.

### **6.9.2 Cabinet Heater**

Cabinet heaters shall be installed in small spaces where only heating is required. Provide a self-contained electric heating unit, surface mounted on wall or structure, with fan and heating elements. Preferred location is directly under the window and centered on the wall. Provide control-circuit terminals and single source of power supply with disconnect. Heating wire element shall be nickel chromium. Include limit controls for overheat protection of heaters. Provide tamper resistant integral thermostat.

### **6.9.3 Infrared Heaters**

Infrared heaters shall be provided for spot heating of a large area such as maintenance bays and warehouses. Infrared heaters shall use electricity or propane fuel. Contractor shall determine which system is the most cost effective. Position the infrared heaters to direct the radiant heat to only those areas where people normally work. Coordinate with User. Provide control-circuit terminals and single source of power supply with disconnect.

### **6.9.4 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.

## 6.10 TEST ON COMPLETION

**6.10.1** 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 winter and 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.

**6.10.2** 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

## 6.11 ELECTRICAL REQUIREMENTS FOR HVAC EQUIPMENT

- (a) Note that electrical requirements for all HVAC systems 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 HVAC unit. 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.

## **6.15 OPERATIONS AND MAINTENANCE (O&M) FOR MECHANICAL**

- (a) Contractor is required to provide a 12 month supply of parts for operation and maintenance of equipment according to the manufacturer's recommendations. In addition to this, the contractors shall provide an inventory of all items, location/address stored and secured, and commissioning plans.
- (b) The O&M manuals must be provided prior to any training activities. Manuals shall be "tri-lingual" in Dari, Pashto and English.
- (c) All control panels shall have tri-lingual name plates in Dari, Pashto and English.
- (d) The contractor shall provide an outline of the training lesson plan (to be approved by the Government) prior to conducting training. CD recordings of training on video shall also be provided, after training is conducted.

## **7.0 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.

## **7.2 CODES, STANDARDS AND REGULATIONS**

The design and installation of equipment, materials and work covered under the plumbing services shall conform to the following standards, codes and regulations where applicable except where otherwise indicated under particular clause(s). 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.

IPC – International Plumbing Code

NFPA - National Fire Protection Association

ASHRAE – American Society of Heating, Refrigeration and Air-Conditioning Engineers

ASME – American Society of Mechanical Engineers

ASTM – American Society for Testing and Materials

AWS – American Welding Society

### **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, Polyethylene (PE) plastic pipe (schedule 40 or 80). 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. Western Style Water Closet with flush tank assembly. Provide vitreous china, siphon jet, floor mounted, floor outlet water closet. The water closet shall be furnished with solid plastic round closed-front seat with cover. Provide wax bowl ring including plastic sleeve. Provide dual flush toilet with second flushing option that shall not exceed 4.1 liters (1.1 gallons) per flush
- b. Lavatories. Enameled cast iron, wall or counter mounted. Chrome plated brass fittings provided for water supplies.
- c. Sink Faucets. Faucets shall be chrome plated brass material with individual knobs for hot and cold. No goose neck faucet fixtures shall be used.
- d. Shower. Showerhead and faucet handles shall be chrome plated brass material. Provide for manual mixing with hot and cold water valves. In addition to a shower head (mounted at 2.0 meter AFF), 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. Service Sink. Standard trap type, enameled cast iron. Service sinks provided in maintenance areas shall be metallic, and in battery rooms acid resistant.
- f. Floor Sink (Janitor Sink). Provide floor sink, circular or square, with 300mm overall width or diameter and 250mm nominal overall depth. They shall have acid resistant enamel interior with cast iron body, aluminum sediment bucket and perforated grate of cast iron. Outlet size as indicated on plans.
- g. 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.
- h. 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.

#### **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(s) shall be typically located inside a mechanical room, storage room, toilet/janitor room or similar type space. The unit(s) shall be of the commercially available tank type having low or medium watt density electric heating elements.

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

### **7.5 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.

## **8.0 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 DETECTION AND ALARM SYSTEM**

Smoke detection – see electrical section for more fire alarm and detection details. Alarm systems with manual and/or automatic activation and notification devices shall be installed only where required by NFPA 72, NFPA 101, IBC, or UFC 3-600-01. Required fire detection and alarm systems shall be designed and installed in accordance with NFPA 72, NFPA 101, UFC, and IBC. All alarm and sprinkler systems shall be monitored by a system compatible with the existing base alarm receiving system.

### **8.6 WATER SUPPLY FOR FIRE PROTECTION**

A dedicated fire protection water supply is unavailable for the Class I Warehouse and Entry Control Point project sites. Therefore, alternate methods of design and construction are being instituted. The RSOI Barracks, MWR/Admin/Training and Class I Cold Storage Warehouse facilities do require sprinkler protection (wet pipe type) and a dedicated water tank for sprinkler operation must be designed and constructed per the UFC 3-600-01 requirements. It is assumed that the base water system is not reliable for a wet pipe system; thus the contractor must size the water supply tank for the sprinklers with sufficient quantity as prescribed in the NFPA 13 reference.

### **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).

## **9.0 ELECTRICAL**

### **9.1 GENERAL**

Contractor shall design and construct all electrical systems for the facilities to be provided. This includes

design, construction, all necessary labor, equipment, and material for a fully functional system. All electrical work to be performed by the Contractor shall be directly supervised by an experience and licensed master electrician. Proposed individuals shall have a valid and current master electrician license or foreign equivalent (e.g, Master Craftsman's diploma). The license shall be issued by a US licensing authority (i.e. State of Texas, City of New York City), or equivalent foreign licensing authority. The Contractor shall submit resumes and copies of licenses (with licensing requirements) for proposed supervising master electricians to the Contracting Officer for review and concurrence. The US Government reserves the right to reject proposed supervising master electricians; decisions by the USG reference the acceptability of proposed supervision master electricians are final and not subject to review or appeal. Written rationale for rejection will be provided to the Contractor by the Contracting Officer. Rejected personnel shall not be permitted to work at the site in the capacity of supervising electrician.

All electrical work shall be performed by licensed journeyman electricians. No electrical work shall be performed by the Contractor without a supervising master electrician directly overseeing the work. All electrical work shall be certified in writing as meeting all applicable standards, codes, and contract specifications by the supervising master electrician.

## **9.2 DESIGN CRITERIA**

### **9.2.1 Applicable Standards**

- a. Design shall be in the required units as stipulated herein.
- b. Conflicts between criteria and/or local standards shall be brought to the attention of the Contracting Officer for resolution. In such instances, all available information shall be furnished to the Contracting Officer for approval.
- c. All electrical systems and equipment shall be installed in accordance with the requirements set forth in the documents referenced herein.
- d. Acceptance Testing: Contractor shall develop and submit for approval complete acceptance test procedures on all systems provided. As a minimum the testing procedures shall comply with the requirements of the National Fire Protection Association (NFPA) and the International Electrical Testing Association Inc. (NETA).

## **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, DIN listed material (or equivalent), but the contractor must prove equivalence and must provide the government with a full copy of the relevant specification(s)/standard(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.

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 the maximum ambient temperature and altitude of the construction site. Equipment that is altitude and temperature sensitive, such as generators, shall be derated according to the manufacturer's recommendations. Generic derating criteria for altitude and for ambient temperature may be used to approximate the required size of such equipment during the design phase, but a stipulation shall be placed on the construction plans to adjust the size according to the derating criteria specific to the manufacturer's equipment chosen before the equipment is ordered.

### 9.3.4 Restrictions

Aluminum conductors shall not be specified or used except as bare steel reinforced (ACSR) overhead conductors in an aerial primary distribution system. Aluminum windings shall not be used in transformers.

## 9.4 DESIGN REQUIREMENTS

### 9.4.1 Electrical Distribution System

The contractor shall provide generator power as described in the paragraph **Generator Power System** as a prime source.

The contractor shall provide a prime power distribution system to distribute power to the site's facilities and other loads as required. The distribution system shall be underground.

The underground portion of the distribution system shall be in concrete encased ductbanks with the ducts not less than 1220mm below grade. Manholes and handholes shall be provided at changes of direction of more than 40 degrees and elsewhere as required to limit the pulling tension and sidewall pressure on the cables during installation to acceptable levels as defined by the cable manufacturer. Manholes shall be provided for ductbanks with more than 2 ducts. Handholes shall be provided wherever a manhole is not required by quantity of ducts or by cable manufacturer's installation recommendations. Underground ducts shall be not less than 100mm diameter thin-wall PVC.

The contractor shall provide a power plant sized to contain the required generators and their associated an automatic transfer switch (ATS) and main distribution panel. The contractor shall provide all required conduit stub ups to connect all equipment and the future pad-mounted transformer to the ATS and main distribution panel.

The contractor shall provide a street lighting distribution system to supply power to the site's street lighting circuits. The street lighting system shall be underground in direct buried schedule 40 PVC not less than 27mm in diameter and not less than 660mm below grade. The street lighting ducts shall be concrete encased in areas subject to vehicular traffic, such as road crossings and parking areas.

Secondary electrical distribution system shall be 208/120 volt, 3-phase, 4-wire, 60 hertz. Design of the electrical system within facilities shall include, but is not limited to (a) interior secondary power distribution system, (b) lighting and power branch circuit and devices, and (c) fire detection and alarm system. All systems shall be designed for the ultimate demand loads, plus 25% spare capacity.

The contractor shall provide service entrance feeders from the distribution system to the service entrance equipment located inside of each facility and sized to the rating of the service entrance equipment. Service entrance equipment shall include a distribution panelboard sized to supply the total load of each facility. Service entrance feeder lengths shall be kept as short as possible to minimize voltage drop.

They shall be underground not less than 1220mm below grade in concrete encased 102mm minimum thin-wall PVC from an automatic transfer switch. A spare conduit of equal size shall be provided.

All panelboards shall be circuit breaker 'bolt-on' type panels. Minimum size circuit breaker shall be rated at no less than 20-amperes. Circuit breakers shall be connected to bus bar(s) within the panelboards. Daisy chain (breaker-to-breaker) connection(s) are not acceptable. Indoor distribution panels shall be flush mounted in finished areas and surface mounted in unfinished 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 bridge to make a 3-pole breaker. All branch circuit wiring shall be copper, minimum #4 mm<sup>2</sup> (#12 AWG) installed in metal conduit. Wiring shall be concealed in finished areas and surface mounted in unfinished areas. Flush mounted panels shall be provided with spare empty conduits from panel to unfinished area for future use. All panels shall be provided with a minimum of 25% spare capacity for future load growth. Power receptacles (outlets) shall be duplex type 120 V, NEMA 5-20R rated for 20A or better and shall be compatible with the required secondary power. All splicing and terminations of wires shall be performed in 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 NFPA 70 (National Electric Code). For large panels (225 Ampere and above) provide an ammeter, voltmeter and kilowatt-hour meter to monitor energy usage. Selector switches shall be provided for each meter to read all 3 phases. Receptacle locations shall be coordinated with architectural requirements.

Contractor shall design and provide circuits for all mechanical equipment and any other equipment that requires power and make the final connections.

All loads shall be coordinated to provide balanced loading. Phase imbalance at each panel shall not exceed 5%.

Voltage Drop for branch circuits shall be limited to no more than 3%; voltage drop for branch and feeder circuits combined shall be limited to no more than 5%.

All circuit breakers shall use down-stream coordination to ensure the breaker nearest a fault or overload is the first to trip.

#### 9.4.1.1 Generator Power System

The generator power system, whether serving as the backup source of power, shall be configured as an N+1 system with the N representing the number of generators needed to supply the site's total load and the +1 representing the number of additional generators of the same size required as spares. The site's total load is defined as the site's total demand load + 25% spare capacity.

Generators shall be derated as necessary for the ambient temperature and altitude of the site. Each generator shall be provided with an automatic load bank matched to 40% of its rated capacity (with load steps every 20% of the load bank's rating) to prevent the generator from "wet stacking" under low load conditions.

The generator power system shall be provided with a make-before-break, 4-pole, automatic transfer switch (ATS) rated for the capacity of the system. The ATS shall be capable of automatically and manually transferring the site's distribution system to generator power upon loss of local utility power and transferring back automatically and manually to local utility power upon its restoration.

The ATS shall be equipped with synchronizing/paralleling equipment to allow the generators to share the load of the site. When generator power is required at least one (1) generator shall be online at all times. When the site's load reaches 90% of the online generator's capacity, the standby generator(s) shall start. The generator that synchronizes first shall come online and share the load equally. When the site's load

drops below 80% of the online generators' combined capacity, the generator(s) shall drop off line, one at a time, keeping a minimum of one generator operating online.

Whenever a generator starts, it shall go through a cool down cycle prior to shutdown. All relaying shall be automatically reset for automatic restart and stopping of generators as the load increases or decreases. Load sharing by the standby generator(s) shall be adjustable between 50% and 95% of the load on the online generator(s). Sequence of operation shall be time clock controlled at smaller sites (2 or 3 generators) and shall be PLC controlled at larger sites. A properly sized main switchboard shall be provided to distribute the power produced by the generator(s) to the facilities on the site.

#### 9.4.2 Lighting

Design levels shall be per IES standards as a minimum. For convenience, the following lighting level table is listed. Note: all spaces listed below may not be within the work required within this contract.

Living room/Quarters	30 FC (320 Lux)
Toilets, Showers, Latrines, washrooms	20 FC (215 Lux)
Mechanical/Electrical rooms	15 FC (160 Lux)
Corridors and Stairways	10 FC (110 Lux)
Offices (private)	30 FC (320 Lux)
Office areas (open)	50 FC (540 Lux)
ECP work spaces (all)	50 FC (540 Lux)
ECP Guard Stations	30 FC (320 Lux)
Auditoriums (assembly)	20 FC (220 Lux)
Conference	30 FC (320 Lux)
All MWR facilities	50 FC (540 Lux)
Warehouse areas	30 FC (320 Lux)
Egress path (incl. exterior)	1 FC (10 Lux)
Areas adjacent to egress path	0.05 FC (0.5 Lux)

FC = FootCandle

Indoor lighting for all areas shall consist of fluorescent surface mounted light fixtures. Exterior lighting shall be HID (metal halide or high pressure sodium) as referenced. Moisture resistant/waterproof fluorescent light fixtures shall be provided in high humidity and wet areas such as latrines, showers and outside. Battery powered 'emergency' and 'exit' lights shall be provided within each building, as applicable, for safe egress during a power outage. All light fixtures shall be factory finished, complete and operational, to include but not be limited to, lens, globe, lamp, ballast etc. Industrial type fluorescent light fixtures shall not be used. Every room shall be provided with a minimum of one light switch. Light fixtures shall be mounted approximately 2.5-meters (8 feet) to 3.0 meters (10 feet) above finished floor (AFF) minimum unless a high ceiling facility such as a warehouse. Fixtures may be pendant or ceiling mounted, depending on the ceiling type and height. No street lighting is required for these facilities: only building security lighting is permitted.

#### 9.4.3 Light Fixtures

Lighting fixtures shall be a standard manufacturer's product. Fluorescent surface mounted light fixtures shall be power factor corrected and equipped with standard electronic ballast(s), except in medical facilities where magnetic ballast(s) shall be required. All light fixtures shall properly operate using standard lamps available locally. Fixtures shall be fully factory wired and designed for appropriate application i.e. appropriate for that location where installed.

#### 9.4.4 Emergency "EXIT" Light Fixtures

Emergency "EXIT" light fixture shall be provided in accordance with NFPA requirements. Fixtures shall be

single or double sided as required by the location and for wall/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/re-set button and failure indication lamp. Primary operating voltage shall be 120 volts. Lettering "EXIT" shall be color red and not less than 6 inches (150 mm) in height and on matte white background. Illuminations shall be with LEDs.

#### **9.4.5 Above Mirror Lights**

Above mirror lights shall be provided in toilet rooms.

#### **9.4.6 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/re-set button and failure indication lamp. Normal operating voltage shall be 120 volts. Emergency lighting fixtures shall be connected to the normal lighting system.

#### **9.4.7 Light Switches**

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. Three-way or four-way lighting shall be provided in all rooms / areas with multiple entrances.

#### **9.4.8 Receptacles**

General-purpose receptacles shall be as required herein. All receptacles shall be duplex, unless otherwise specified in this section, the NEC, or other referenced standard.

Receptacles shall be placed at a maximum of 3-meter (10 feet) intervals. Areas with computer workstations or similar equipment will have additional receptacles. Sinks will have a receptacle above, with one duplex 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 10 milliamperes or less. Total number of duplex receptacles shall be limited to six (6) per 20-ampere circuit breaker.

For the RSOI barracks, locate duplex receptacles on all walls, at 2500 mm intervals.

For the MWR facility, locate duplex receptacles on all walls, at 2500 mm intervals

For the existing RSOI admin bldgs, use the existing receptacles.

For the Class I warehouse admin areas, locate receptacles on all walls, at 2500 mm intervals,

For the Class I warehouse facility, locate receptacles at the entrances and as required by the refrigeration storage areas.

For the ECP facilities, locate two duplex at each guard house, two for each work station in the search and biometric buildings, two per workstation in the admin bldg, two for the kennels (GFCI rated), as directed by the contracting officer for the Scanner building, one waterproof for each waiting shelter.

#### **9.4.9 Conductors**

All cable and wire conductors shall be copper. Conductor jacket or insulation shall be color coded to satisfy NEC requirements. **Phase conductors - Phase A Black; Phase B Red; Phase C Blue; Neutral and grounded conductors as per code requirements** The use of 75 or 90 degree C (minimum) terminals and insulated conductors is required. Use of higher degree C rated conductors on circuits with protective device terminals rated at a lower degree C is allowed but must be derated to the rating of the device terminals.

#### **9.4.10 Grounding and Bonding**

Grounding and bonding shall comply with the requirements of NFPA 70. Underground connections shall be exothermally 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 20 millimeters (0.75 inches) in diameter and 3 meters (~10 feet) long made of copper-clad steel. Final measurement of the ground resistance shall be in compliance with the requirements of the local authority but shall not exceed 25 ohms when measured more than 48 hours after rainfall.

#### **9.4.11 Enclosures**

Enclosures for exterior and interior applications shall be NEMA Type 3S (IEC Classification IP54) and NEMA Type 1 (IEC Classification IP10) respectively.

#### **9.4.12 Fire Detection & Alarm System**

A Fire Detection and Alarm System shall be provided throughout the buildings only when and where required by NFPA 72, NFPA 101, IBC, or UFC and shall be installed in accordance with the requirements of those standards. System shall include, but not be limited to, a Fire Alarm Control Panel (FACP) with required battery backup, remote annunciator, manual pull stations, horns, strobes, and smoke and/or heat detectors (with alarm verification feature). The system shall be capable of automatically transmitting the alarm signal to the local fire department/fire station or other location designated by the Contracting Officer via a method compatible with the existing base system. Fire alarm system shall be complete and a standard product of one manufacturer and shall be compatible with the existing predominant standard system in place at the installation.

#### **9.4.13 Transient Voltage Surge Suppression (TVSS)**

Transient Voltage Surge Suppression shall be provided utilizing surge arresters to protect sensitive and critical equipment. As a minimum TVSS protection shall be provided at each panel serving electronic loads and shall be shown on the panel schedule. It is recommended that Metal Oxide Varistors (MOV) technology be used for such applications.

#### **9.4.14 Conduit Raceway System**

Metal conduit system shall be complete, to include but not limited to, necessary junction and pull boxes. Smallest conduit size shall be no less than 13mm (0.50 inch) in diameter. All empty conduits shall be furnished with pull wire or cord or rope (depending on the size of conduit and length of run). System design and installation shall be per NFPA 70 requirements. Exterior conductors below grade shall be installed in concrete encased PVC conduit at a depth of 1220 millimeters.

#### **9.4.15 Cable Tray Raceway System**

Cable trays shall be ladder type and provided with, but not limited to, splices, end plates, dropouts and miscellaneous hardware. System shall be complete with manufacturer's minimum standard radius and shall be free of burrs and sharp edges. Nominal width of cable tray shall be 300mm (12 inch) and rung spaced at 150mm (6 inch). Nominal depth shall be 103mm (4 inch). System design and installation shall be per NFPA 70 requirements.

#### **9.4.16 Identification Nameplates**

Major electrical equipment, such as transformers, panelboards, and load centers, etc. shall be provided

with (via screw connections) permanently installed engraved identification nameplates.

#### **9.4.17 Schedules**

All panel-boards and load centers shall be provided with a directory **installed on the interior access door behind and clear plastic sheet**. Directory shall be typed written in English.

#### **9.4.18 Single Line Diagram**

Complete single line diagrams shall be provided for all systems installed. All major items in each system shall be identified and labeled for respective ratings. Single line diagrams for each system, installed in a clear plastic frame, shall be provided **and installed with in the same room as the equipment**.

### **9.5 OPERATIONS AND MAINTENANCE (O&M) FOR ELECTRICAL**

- (a) Contractor is required to provide a 12 month supply of parts for operation and maintenance of equipment according to the manufacturer's recommendations. In addition to this, the contractors shall provide an inventory of all items, location/address stored and secured, and commissioning plans.
- (b) The O&M manuals must be provided prior to any training activities. Manuals shall be "tri-lingual" in Dari, Pashto and English.
- (c) All control panels shall have tri-lingual name plates in Dari, Pashto and English.
- (d) The contractor shall provide an outline of the training lesson plan (to be approved by the Government) prior to conducting training. CD recordings of training on video shall also be provided, after training is conducted.

### **10.0 COMMUNICATIONS – Telephone and Data Distribution**

#### **10.1 GENERAL – Refer to Appendix C for drawings**

##### **10.1.2 Communication Systems Design**

The communications systems for the ECP, Class 1 and RSOI Facilities at Kandahar Air Field, Afghanistan are to be designed, supplied and constructed by the Contractor. The design and construction of the systems shall be in accordance with the references and the requirements contained herein unless otherwise noted. The design and selection of materials and equipment shall be submitted to the ISEC Engineer at TAC through Contracting Officer for approval. The communication system related submittals including the conduit and fittings, shall be sent to the ISEC Engineer at TAC through the COR for review in lieu of the site office in accordance with AR 25-1 and the MOA between AMC and USACE.

10.2 The contractor shall install a manhole and duct system as described in this narrative. The manholes shall be constructed in accordance with the contract drawings. The maximum distance between manholes/handholes shall not exceed 150 meters. Hand-holes, when used, shall be constructed in accordance with the contract drawings. Manholes shall be equipped with the standard manhole covers as depicted on the drawings and a locking DISA approved secondary lid that fits in the collar under the standard lid. Handholes shall be equipped with a hasp for an external locking capability. The handhole lids shall be dual leaf, and H-20 rated with documentation to verify the H-20 rating. The handhole lids shall be an item manufactured by a firm that normally makes that kind of product.

##### **10.2.1 RSOI Facilities**

The Contractor shall install a new manhole and copper cross connect cabinet in the RSOI complex above Motor pool road and connect the manhole with a duct system to the U.S. Army Area Distribution Node (ADN) manhole that is located between Motor Pool Road and Tropic Lightning road. The duct system shall be direct buried PVC conduit in a 2x3 configuration. Two ducts shall be equipped with innerducts. The cross connect cabinet shall be adjacent to the manhole and connect the cabinet to the manhole with six each 100 mm PVC conduits. Conduits from the U.S. Army ADN manhole to the U.S. Army ADN copper cross connect cabinet shall provide a path for copper distribution connection to the RSOI and South Park areas. *Note: Fiber optic connectivity is from the Patch panels in the ADN building whereas copper connectivity is from the cross connect cabinet.*

10.2.1.1 Existing building, MWR/Admin/Training Renovation., The contractor shall install a manhole outside the existing building and install four PVC conduits (two with innerduct) to the downstairs communication room.

#### 10.2.1.2 RSOI (1000 Man Barracks)

The contractor shall install a handhole outside each new building and install two PVC conduits (one with innerduct) to the communications backboard on the first floor.

#### 10.2.2 Class 1 Storage facility

The Class 1 Storage facility will be relocated to the South Park Area between 6<sup>th</sup> Street and 7th street. The South Park infrastructure project will install a manhole and duct system (NATO) and the Contractor will have to install cables from the U.S ADN between Motor Pool Road and Tropic Lightning road to the Class 1 Storage Facility Office building.

The Contractor shall install a manhole and duct system in the facility to provide service as required. The duct system shall consist of two direct buried conduits, one with innerduct. The Contractor shall connect this manhole and duct system to the NATO system via core drilling and hammer drilling.

#### 10.2.3 ECP

The NATO Infrastructure project will install a manhole and duct system Along 6<sup>th</sup> street and this section of the manhole and duct system will be used to house the ECP cables. The Contractor shall install a manhole and duct system in the ECP area and connect it to the NATO manhole and duct system back to the NATO ADN.

#### 10.3 Exterior Conduit

The underground conduit for the manhole and duct system shall be direct buried (1 meter below surface); 110 mm schedule 40, PVC. Conduits shall be equipped with four RUS listed 25mm PVC or PE innerducts or RUS listed multi-duct that has factory installed 1.19 inch PVC conduits. The innerducts shall be installed as indicated in this design narrative. The inner ducts shall be installed in the duct face and secured with properly sized duct plugs which expand to seal the duct if field installed. If multi-ducts are used, the proper fittings shall be used to terminate the innerducts. ABS plastic duct terminators shall be cast into the walls of the manholes and handholes for termination of the conduits. The ducts shall be reinforced concrete encased where a road or taxi way is crossed if installed in a road cut. If the road cannot be cut, the ducts shall be installed by directional boring. The duct shall be listed on the RUS list of materials acceptable for use on RUS projects. Cable racking diagrams (manhole/hand-hole butterflies) shall be provided for all new and existing handholes and manholes that are utilized. The conduit, the conduit fittings (elbows, connectors, couplings etc.) and the solvent cement shall be the same brand. The conduit shall be solvent welded to the terminators. Cable racks with cable hooks, bonding ribbon and braid and all other necessary manhole/handhole hardware shall be installed in accordance with the referenced standards and drawings.

#### 10.4 Exterior Telephone Cable, (OSP)

The Contractor shall install (OSP) copper and fiber optic cable in accordance with this design narrative. The copper cable shall be sized in accordance with the requirements in this design narrative. The OSP

cable shall be 24 AWG, RUS PE89 type, foam skin polyolefin, with an outer layer of solid colored polyolefin and a copolymer coated 8 mil aluminum tape shield. The fiber optic cable shall be sized in accordance with the design narrative, and be single mode, RUS PE90 type, with a 6 mil, copolymer coated steel shield. The fiber shall not have any internal splices and have a maximum loss of .4dB/Km at 1310nm and .3dB/Km at 1550nm. The copper and fiber optic cable shall be installed, grounded/bonded, spliced and tested in accordance with RUS standards. 25 pair modules shall be used on copper splices 25 pairs or greater and discrete connectors shall be used on lesser cable splices. The copper splice closures shall be flash tested with nitrogen in accordance with the manufacturer's recommendations. The contractor shall provide encapsulant to encapsulate the closure in the future. The splicing modules/connectors, bonding hardware, splice closures and encapsulant shall be on the RUS list of material acceptable for use on RUS projects, IP 344-2. The fiber optic splice closures shall be equipped with splice trays that properly hold the fusion splice protectors (stainless steel rod with heat shrink tube). 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. 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 the ISEC Engineer at TAC or Fort Detrick (through the COR) before any cable is ordered or work is started.

## 10. Cable Entrance

### 10.5.1 Copper, Protected Entrance Terminals (PETs)

The Contractor shall install PETs in the communications room where the OSP cable enters the buildings or directly above the incoming conduits below the communications backboard. The PET shall be sized to terminate and protect all incoming outside plant pairs. All PETs above 12 pair (and preferably those below also) shall be constructed in a manner that prevents circuit completion unless a gas tube module is installed. The PETs shall be equipped with heavy duty gas tube protectors. The PETs shall be on the RUS list of material, (Publication IP 344-2). All PETs above 12 pairs shall be equipped with factory installed punch down blocks to terminate the incoming cable. The output from the protector fields shall be connected to factory installed punch down blocks on all PETs greater than 12 pairs. The Contractor shall mount a category 6, 110 blocks beside the PET block and cross connect all outside plant cables to that "subscriber PET block".

### 10.5.2 Fiber Optic Cable

The fiber optic cable shall be terminated in rack mounted combination unit that shall allow splicing and patching within the same enclosure. The outside plant fiber cable shall be fusion spliced to a single mode fiber pigtailed equipped with a factory terminated SC connector. The fusion splices shall be protected by a steel rod and heat shrink tube. The single mode pigtailed shall have an insertion loss of <.35dB and a return loss of better than -55dB. The maximum allowable fusion splice loss as measured by the splicing machine shall be .02dB and .3dB as measured by an OTDR. The fiber optic connectors shall be SC type. One factory manufactured single mode fiber optic patch cord, SC-SC, shall be provided per patch panel port. The patch cord shall have a mated pair insertion loss of <.35dB and a mated pair return loss of <-55dB.

## 10.6 Inside Plant Cable and Outlets

### 10.6.1 Voice/Data Outlets

The contractor shall install the inside plant cable and outlets. The subscriber cable and data cable shall be minimum 24 AWG, category 6 un-shielded twisted pair (UTP) for voice and data. The telephone/data outlets shall be RJ 45, T568A configuration category 6, UTP module type that snap into the wall plate. The standard outlet configuration shall be a quad plex plate with one voice and one data outlet with the other ports provided with a blank filler plates. The voice cable shall have a gray jacket and the data cable

shall have a green jacket. The Contractor shall install a 20 ampere, 120Vac, 60 Hz outlet adjacent to each voice/data outlet.

#### 10.6.2 Wall Phone Outlets

Outlets for wall phones (wall phone outlets) shall be stainless steel wall plates (for the keystone type modules) with phone mounting studs. This outlet module shall be, RJ45, category 6 and shall be the same module as is the one in the voice/data outlet configuration. Provide one wall outlet with telephone mounted close to the door for each communications and utility room. Where wall outlets are required to be weather proof, a NEMA 4 enclosure with integral wall phone jack shall be installed.

#### 10.6.3 SIPR net Outlets

The contractor shall install the SIPR net cable plant and outlets. The SIPR net cable shall be minimum 24 AWG; category 6 shielded twisted pair (STP). The SIPR net outlets shall be RJ 45, T568A configuration category 6, STP module type that snap into the wall plate. The standard outlet configuration shall be a duplex plate with two SIPR net outlets in a DISA approved lock box. The SIPR cable shall have a red jacket. The Contractor shall install a 20 ampere, 120Vac, 60 Hz outlet adjacent to each SIPR net outlet box.

#### 10.6.3 Coax Outlets/Cable

The coax outlets shall consist of a duplex plate, one keystone F type coax connector and one blank filler plate. The Coax cable shall be RG6 with an 18 awg solid copper conductor, and dual shield, (aluminum foil 100%coverage, tinned copper 65%), with a nominal attenuation of .3 dB/100 ft. at 1 Mhz, 2.1 dB/100 ft. at 100 Mhz, 3.1 dB/100 ft. at 200 Mhz, 4.5 dB/100 ft. at 400 Mhz, 6 dB/100 ft. at 700 Mhz, 6.9 dB/100 ft. at 900 Mhz and 7.3 at 1000 Mhz. The Contractor shall install a 20 ampere, 120Vac, 60 Hz outlet adjacent to each voice/data outlet.

#### 10.6.4 Power pole outlets, (open office areas).

Power poles shall be installed in open office areas that will have more than 4 desks. The power poles shall have dual raceways for power and communications and be equipped with two standard voice/data outlets with duplex electrical outlets per every 48 square ft. of open office space.

10.6.5 Printer outlets. There shall be a minimum of one voice/data outlet installed per every 5 outlets installed in the offices areas for printer connections. At minimum, one printer outlet shall be installed per building with communications requirements. The COR shall indicate the location of the outlets.

#### 10.6.6 Outlet Boxes

All telecom and cable television outlets shall be mounted in 119mm steel square boxes, 54mm deep with the proper steel extension/plaster rings to bring the box flush with the wall. SIPR net boxes shall be DISA approved for use on SIPR net systems.

#### 10.6.7 Copper Riser Cable, (Between Communication Rooms)

The copper riser cable shall have a fire-retardant PVC jacket and be CMR rated. The Cable shall have solid, soft bare copper, 22 awg Conductors insulated with foam polyethylene and a PVC skin. The cable shall be a minimum of 100 pair and the conductor colors shall meet the standard PIC color code. The cable shall have an outer Alvyne sheath and an 8 mil aluminum tape bonded to the Gray PVC outer jacket. The riser cable shall be installed in accordance with the NEC. The copper riser cables shall be terminated in all communications rooms on a factory manufactured category 6, 110 type cross connect distribution frame. The frame shall have a metal back frame with wiring blocks, connecting blocks, cable management troughs, designation strips and all other hardware necessary to make a neat and orderly installation. The Contractor shall

install a cross connect (jumper) between the voice block and the riser block to provide a path to the entrance blocks for cross connection to the outside plant.

#### 10.6.8 Fiber Optic Riser Cable (Between Communications Rooms)

The Contractor shall install a 12 strand 50 micron multimode fiber optic cable between the ground floor and first floor communications rooms. The multimode cable shall have a maximum loss of 3.5dB at 850nm and 1.5dB at 1300 nm and a guaranteed 1GBS Ethernet supportable distance of 300 meters @850nm and 1000 meters at 1300nm. The riser cable shall be installed in accordance with the NEC. The fiber optic riser cables shall be terminated in a wall mounted combination unit (splicing and patching) to factory manufactured 50 micron multimode fiber optic pigtails (connectors on one end, bare fiber on the other), via fusion splicing. The maximum splice loss shall be .02dB as measured by the splicing machine and .2 dB as measured by an OTDR. The fiber optic connectors shall be the same type/brand connectorized Duplex SC panel units as is in the OSP section. Provide twelve (12) each patch cords SC-SC for each patch panel. The length shall be as necessary to connect the patch panel portion of the combination unit to the data equipment in the relay racks. The Pigtails shall have a maximum insertion loss of <.5dB and a return loss of better than -25dB. The patch cords shall have a mated pair insertion loss of <.35dB.

#### 10.6.9 Coax, Riser

The Coax cable shall be RG6 with an 18 awg solid copper conductor, and dual shield, (aluminum foil 100%coverage, tinned copper 65%), with a nominal attenuation of .3 dB/100 ft. at 1 Mhz, 2.1 dB/100 ft. at 100 Mhz, 3.1 dB/100 ft. at 200 Mhz, 4.5 dB/100 ft. at 400 Mhz, 6 dB/100 ft. at 700 Mhz, 6.9 dB/100 ft. at 900 Mhz and 7.3 at 1000 Mhz. The riser cable shall be installed in accordance with the NEC. The coax riser cables shall be terminated on a wall mounted patch panel. The patch panel shall be mounted on a swing down bracket. Provide one factory manufactured patch cord, Type F male-Type F male for each patch panel port.

#### 10.7 Telephone Number Assignments

The contractor shall provide all information necessary to allow the base telephone office personnel to connect dial tone to buildings.

#### 10.8 Data Patch Panels

The contractor shall terminate data cables (from the data outlets) on a rack mounted, category 6, ANSI TIA/EIA T568A configuration UTP patch panel. The largest size patch panel shall be 48 port and the smallest shall be 24 port. One factory manufactured Category 6 rated UTP patch cord shall be provided per patch port.

#### 10.9 Voice Patch Panels

The contractor shall terminate voice cables (from the voice outlets) on rack mounted, category 6, ANSI TIA/EIA T568A configuration UTP patch panels. The largest size patch panel shall be 48 port and the smallest shall be 24 port. One factory manufactured Category 6 rated UTP patch cord (separated pairs – RJ 45) shall be provided per patch panel port to cross connect dial tone from the “Subscriber PET block” (110 block) or the riser blocks to the voice patch panel.

#### 10.10 Relay Racks

##### 10.10.1 Relay Racks, Wall Mounted

Wall mounted relay racks when used, shall be the swing out type. The racks shall be 19 units (972mm) high, 635mm deep, 503 mm wide and have a capacity of 68kg. The rack shall be equipped with 12-24 mounting holes in a 5/8, 5/8, 1/2 inch universal mounting pattern and come with 12 equipment mounting screws. A 20 amp, 120Vac, 60 Hz. duplex receptacle (dedicated circuit) shall be mounted next to each wall mounted relay rack.

#### 10.10.2 Relay Racks, Floor mounted Voice

Floor mounted voice system relay racks shall be a two post type relay rack, 483mm (19 inch) wide, painted welded steel, painted bolted steel or painted, bolted aluminum. One (1) nine (9) outlet strip (120 Vac, 60hz) shall be installed on each back rail. The outlet strips (2) on each relay rack shall not be powered from the same circuit.

#### 10.10.3 Relay Racks, Floor mounted, data systems

Floor mounted data system relay racks, shall be four post type racks, for 483mm (19 inch) wide, painted welded steel, painted bolted steel or painted, bolted aluminum. The four post racks shall be capable of supporting a minimum of 2000 lbs. One (1) nine (9) outlet strip (120 Vac, 60 hz.) shall be installed on each back rail. The outlet strips (2) on each relay rack shall not be powered from the same circuit.

10.10.4 Floor mounted SIPR net cabinet. The SIPR net cabinet shall be a minimum of 42 units high, 26 inches wide, 30 inches deep. The cabinet shall have solid sides, a smoked Plexiglas front with locks front and back, and a mesh back door. The cabinet shall be equipped with fans and two 120Vac 9 outlet strips powered by two separate 20 ampere circuits. The SIPR net cabinet, associated hardware and wiring shall be separated from the non-secure system components by the distances required by NSTISSAM TEMPEST/2/95, RED/BLACK Installation Guidance.

### 10.11 Cable Raceways

#### 10.11.1 Non-Secure System Cables

Solid bottom cable tray in various sizes and steel conduit shall be used to distribute the station cables. The cable tray shall be supported at manufacturers recommended distances and be sized so that the initial overall fill ratio does not exceed 40%. 25mm steel conduit shall be used to connect the outlets/station cable to the cable tray. No other material except steel shall be used for communications cable conduit. UL listed, Cable ladder rack, 300mm wide, with 50mm high rails and 150mm cable retaining posts shall be installed around the perimeter of the communications rooms and over the racks. Factory made "waterfall" cable ladder hardware shall be installed in the cable ladder over the relay racks to properly manage the exit of cable from the cable rack.

10.11.2 Secure System cable raceway. The SIPR net cable shall be installed in a visible metal cable tray (or other DISA approved raceway) and connected to the outlets via 27mm steel conduit (or other DISA approved raceway) with welded (weld or steel epoxy weld connections) configured as a protective distribution system, (PDS). The Contractor shall ensure that the proper on-base Security authorities in conjunction with TAC approve the PDS design before installation begins. The Contractor shall be responsible for obtaining the approval and certification on the PDS conduit system after installation. The Secure system cable raceways shall be installed in accordance with National Security Telecommunications And Information Systems Security (NSTISS) 7003, Protective Distribution Systems (PDS).

#### 10.12 Communications Rooms

There shall be at least one communication room in the MWR building on each floor. The doors shall swing out. The rooms shall be located so as to provide service within the distance limitations annotated in the latest version of ANSI/TIA/EIA 568B and be sized and outfitted in accordance with the ANSI EIA/TIA

569B, ISEC I3A and the requirements specified in this design narrative. A minimum distance of 1 meter front, back and side, shall be maintained between any cabinet and any other equipment or walls and 1 meter front and back and one side for the four post racks. For design purposes, a two post rack shall be considered the same size as a four post rack. For swing out wall racks, the one meter from the front and one side is required. On two story buildings unless otherwise noted, there shall be a minimum of one communications room on each floor in accordance with ANSI/EIA/TIA 569B and the ISEC I3A. The second floor communications room shall be over top of the first floor communications room.

#### 10.13 Antenna Television Coax Cable System

The system shall consist of coax cable, coax patch panel, patch cords, signal splitters and outlets. There shall be room reserved on the backboard for amplifiers. The Coax outlets in the buildings shall be connected to a patch panel mounted on the backboard. The patch panel shall be mounted on a swing down bracket. The patch panel shall consist of a patch panel frame and the same female type RG 6, F type modules that are used in the wall plates. Provide one, 2 meter RG 6 patch cord (male to male) for each patch panel port. The splitters shall be commercial rated for heavy duty use. A 20 amp, 120vac, 60hz. Duplex receptacle (dedicated circuit) shall be mounted within .5m of the "amplifier" area.

#### 10.14 Backboards

The communications rooms or rooms housing communication equipment shall have 20mm void free plywood installed on the wall above the entrance conduit. The backboard shall be painted with two coats of fire retardant paint. The plywood shall be installed 458mm aff and 305mm below the ceiling. There shall be at least four 120Vac, 20 ampere, duplex outlets installed on each wall divided over two circuits in communications rooms and four 120Vac, 20 ampere, duplex outlets divided over two circuits near the communications backboard.

10.15 Bonding, Grounding/Labeling. Bonding, grounding and labeling shall be done in accordance with the US. Army I3A requirements.

10.16 The Contractor shall install a Cross connect cabinet in the RSOI area in accordance with the drawing. The cross connect cabinet shall be a steel cabinet and capable of housing cross connect blocks for 5400 copper cable pairs. The cross connect blocks shall have tails and be spliced to the outside plant cables from

10.17 Building communications requirements. The communications requirements for the buildings follow:

10.17.1 RSOI Barracks Buildings (3) Twenty five outside plant copper cable pairs and 12 single mode fiber optic cable strands shall be installed and terminated in the RSOI barracks building on a plywood backboard above the entrance conduits. The fiber optic cables shall be from the ADN portion of the MWR communications room. The contractor shall install one wall mounted swing out relay rack for voice and one for data. There shall be a minimum of 8 wall outlets installed on each floor even spaced. Only communications backboards are required for this building but the rooms having the backboards must be stacked. Termination and riser hardware is required in accordance with ANSI/TIA/EIA/ 568B and the ISEC I3A guide. A minimum of 8 coax outlets per floor shall be installed at locations indicated by the COR.

##### 10.17.1.1 MWR Building, Renovated

The contractor shall calculate the required copper cable pair by taking the actual number of outlets and multiplying by 1.5, then choosing the next available size Outside plant cable to fit the requirement. Two 24 Single mode fiber optic cables, (SIPR and NIPR) shall be installed from the U.S. Army Area Distribution Node (ADN) manhole that is located between Motor Pool Road and Tropic Lightning road to the MWR first floor communications room. There shall be communications rooms installed on each floor sized as required to meet the ISEC I3A requirements and site specific requirements. The first floor

communications room shall be used as an ADN meaning that all fiber optic cables serving the RSOI facilities will originate from that room. This will require two relay racks, one SIPR net and one NIPR net. The MWR portion of the building shall be equipped with one voice/data and coax, outlet per every 48 sq. ft of office space, one voice data outlet plus one wall outlet by each door, and two coax outlets mounted on opposite corners 1 meter below the ceiling, for each exercise room, one voice data outlets per every 6 linear foot of wall space in game rooms, and one voice/data outlet per every phone/internet cafe desk space. TV rooms shall have one voice/data outlet on each wall and two Coax outlets on each wall in the location specified by the COR. The Administration Office area (second floor) shall have one voice data outlet or one power pole (for open office area) per every 48 square ft. of office space. The printer outlet numbers shall be as per paragraph 10.6.5 of this document. The Mayors office area shall be equipped with three SIPR net circuits in a PDS from the second floor communications room. The COR shall indicate the location of the outlets.

#### 10.17.2 ECP

The Contractor shall install a minimum 50 pair copper and a minimum 72 strand single mode fiber optic cable. The guard towers shall be equipped with 25 pair copper with all 25 pairs multiplied between the towers and an individual six strand single mode fiber optic cable per tower. The office areas in the ECP area shall be equipped with one voice/data outlet per every 48 square ft of office space. The buildings with offices shall be equipped with a communications room if the voice and data equipment cannot fit on wall mounted swing out racks. The ECP communication outside plant cable shall meet all of the termination requirements in this section. The contractor shall calculate the required outside plant cable requirement in accordance with the ISEC I3A guide and adjust the size of the cables accordingly. The Contractor shall choose one of the buildings to be used as a distribution point for the fiber optic cables.

#### 10.17.2 Class 1 Yard

A minimum of twenty five (25) outside plant copper cable pairs and 12 single mode fiber optic cable strands shall be installed and terminated in the office building. In offices there shall be one voice/data outlet installed per every 48 sq. ft of office space and meeting rooms shall have a minimum of two standard outlets installed on each long wall and one standard outlet installed on each short wall. The Contractor shall install a coax outlet in every office and meeting room. In large open office areas, power poles shall be installed.

10.18 Cross connect cabinet. The Contractor shall install a cross connect cabinet in the RSOI area by the new manhole connecting the RSOI area to the U.S. Army ADN located between Motor Pool Road and Tropic Lightning road. The cabinet shall be a metal cabinet, of the same manufacturer and type as the ADN cabinets now, and equipped with cross connect blocks for 5400 copper cable pairs. The cross connect blocks shall be equipped with self strip terminals and the same copper splice modules that are in use now by the U.S. Army. The Contractor shall install a 1200 pair copper cable from the U.S Army ADN Cross connect cabinet to the RSOI cross connect cabinet and terminate all 1200 pairs. The Contractor shall splice the outside plant cable to the cross connect block cable tails. All copper distribution cable pairs for the RSOI area shall originate from this cross connect cabinet.

#### 10.19 Testing

The Contractor shall develop and submit for approval, test plans for the following cable systems.

##### 10.19.1 Inside Plant (Premise) Voice/Data Cable

The Contractor shall perform Category 6 link tests in accordance with ANSI/TIA/EIA 568-B.1 and ANSI/TIA/EIA 568-B.2. Test shall include wire map, length, insertion loss, NESXT, PSNEXT, ELFEXT, PSELFEXT, return loss, propagation delay, and delay skew. Cables failing the tests shall be replaced at no additional cost to the Government.

#### 10.19.2 Inside Plant (Premise) Riser Cable

The Contractor shall perform testing on the riser cable pairs in accordance with ANSI/TIA/EIA 568-B.2 and ASTM D 4566. The tests as annotated by ASTM D 4566 shall include DC resistance, DC resistance unbalance, mutual capacitance and capacitance unbalance, pair to ground. Test for characteristic impedance and structural return loss in accordance with ASTM D 4566 Method 3. The Contractor shall test all binder groups for PSNEXT loss in accordance with ASTM D4566. Cables failing the tests shall be replaced at no additional cost to the Government. The riser cables shall not be cross connected during this test. Contractor shall provide the test data from the testing equipment in two (2) hard copies and one (1) Electronic to the Corps of Engineers or to the COR as a submittal

#### 10.19.3 Inside Plant (Premise) Fiber Optic Cable

The Contractor shall perform optical fiber end-to-end link tests in accordance with ANSI/EIA/TIA-568-B.3. The hard copy printouts shall be provided to the Government. Cables failing the tests shall be replaced at no additional cost to the Government.

#### 10.19.4 Coax

The coax cable shall be swept tested over the full frequency range that will be used. Cables failing the tests shall be removed and replaced at no additional cost to the Government.

#### 10.19.5 Outside plant cable copper and fiber optic

The outside plant cable shall be tested in accordance with RUS Bulletin 1753F-201.

#### 10.20 Communication System Personnel Requirements

10.20.1 Designers. The Designers shall have a minimum ten (10) years documented experience with U.S. Military standards and the RUS standards as well as a minimum of 5 years in category 6 cables and hardware design. The Design personnel shall be submitted through the Contracting Officer to TAC for approval. The design shall not be started until the design personnel are approved.

10.20.2 Installers. The inside plant (premise) installers and supervisors shall have a minimum five years documented experience with category 6 cable and hardware installation, and recent documented factory training and certification from the manufacturer of the category 6 hardware (outlets, patch panels etc.) being used. The Inside plant (premise) installation personnel shall be submitted through the Contracting Officer to TAC for approval. The installation shall not be started until the installation personnel are approved.

#### 10.20.3 Cable Splicers

The splicers shall have seven (7) years documented unsupervised experience with the RUS cable and RUS listed splice closures. The fiber optic splicers shall have 7 years documented un-supervised experience with fusion splicing, 5 years documented un-supervised experience with the brand of fusion splicing machine and 3 years documented un-supervised experience with the model number of fusion splicing machine used. The cable splicing personnel shall be submitted through the Contracting Officer to TAC for approval. The cable splicing shall not be started until the splicing personnel are approved.

-END OF SECTION-

(End of Summary of Changes)