

<b>AMENDMENT OF SOLICITATION/MODIFICATION OF CONTRACT</b>			1. CONTRACT ID CODE	PAGE OF PAGES
2. AMENDMENT/MODIFICATION NO. 0004	3. EFFECTIVE DATE 28-Dec-2008	4. REQUISITION/PURCHASE REQ. NO.		5. PROJECT NO.(If applicable) 1   81
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-0005	
		X	9B. DATED (SEE ITEM 11) 10-Oct-2008	
			10A. MOD. OF CONTRACT/ORDER NO.	
			10B. DATED (SEE ITEM 13)	
CODE	FACILITY CODE			
<b>11. THIS ITEM ONLY APPLIES TO AMENDMENTS OF SOLICITATIONS</b>				
<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 checked="" type="checkbox"/> is extended, <input 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)				
<b>13. THIS ITEM APPLIES ONLY TO MODIFICATIONS OF CONTRACTS/ORDERS. IT MODIFIES THE CONTRACT/ORDER NO. AS DESCRIBED IN ITEM 14.</b>				
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.)				
PROJECT: ANA, TRAINING RANGE, JALALABAD, AFGHANISTAN				
THE PURPOSE OF THIS AMENDMENT TO SOLICITATION W917PM-09-R-0005 IS TO MAKE CHANGES ON SECTION 00010, SECTION 00110, SECTION 00120, SECTION 01010, SECTION 01015 AND INCORPORATE THE ANSWERS FROM THE CONTRACTOR'S QUESTIONS.				
THE TECHNICAL AND PRICE PROPOSAL REVISED DUE DATE OF 10 JANUARY 2009 IS HEREBY EXTENDED. THE NEW PROPOSAL DUE DATE IS 24 JANUARY 2009.				
ALL OTHER TERMS AND CONDITIONS REMAIN UNCHANGED.				
Except as provided herein, all terms and conditions of the document referenced in Item 9A or 10A, as heretofore changed, remains unchanged and in full force and effect.				
15A. NAME AND TITLE OF SIGNER (Type or print)		16A. NAME AND TITLE OF CONTRACTING OFFICER (Type or print)		
		TEL:	EMAIL:	
15B. CONTRACTOR/OFFEROR	15C. DATE SIGNED	16B. UNITED STATES OF AMERICA		16C. DATE SIGNED
_____ (Signature of person authorized to sign)		BY _____ (Signature of Contracting Officer)		28-Dec-2008

SECTION SF 30 BLOCK 14 CONTINUATION PAGE

**SUMMARY OF CHANGES**

SECTION 00010 - SOLICITATION CONTRACT FORM

The following have been added by full text:

SECTION 00010

**SECTION 00010**

**PROPOSAL SCHEDULE – Jalalabad Range**

The Contractor shall provide a price for all items, including those labeled, "Optional Items." The Government will evaluate the Contractor's entire proposal to determine which CLINs represent the best value to the Government.

No.	Description	Qty	Unit	Unit Price	Total Amount
<b>0001 Base Proposal:</b>					
<b>0001 DESIGN:</b>					
0001A	Design Costs:	1	LS	\$ _____	
<b>0002</b>	<b>Mobilization Costs</b>	1	LS	\$ _____	
<b>0003</b>	<b>De-Mobilization Costs</b>	1	LS	\$ _____	
<b>0004</b>	<b>Preparation of As Builts+ O&amp;M Manual+ Spare Part</b>	1	LS	\$ _____	
<b>0005 SITE IMPROVEMENTS:</b>					
0005A	Demolition & Site Grading	1	LS	\$ _____	
0005B	Rifle Range	1	LS	\$ _____	
0005C	Pistol Range	1	LS	\$ _____	
0005D	Heavy Machine Gun Range	1	LS	\$ _____	
0005E	RPG/SPG Range	1	LS	\$ _____	
0005F	Mortar Range	1	LS	\$ _____	
0005G	Hand Grenade Familiarization Range	1	LS	\$ _____	
0005H	Fire and Movement Range	1	LS	\$ _____	

0005I Urban Assault Course	1	LS	\$_____
0005J UXO Demolition Area	1	LS	\$_____
0005K Gravel Roads, sidewalks, parking	20,000	M <sup>2</sup>	\$_____
0005L Site Electrical Distribution System	1	LS	\$_____
0005M Water Distribution System	1	LS	\$_____
0005N Sewer Collection System	1	LS	\$_____
0005O Fencing and Entrance Gate	10,800	M	\$_____

0005P Communication System	1	LS	\$_____
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**Sub-Total Site Improvements only** **\$\_\_\_\_\_**

**0006 BUILDINGS:**

0006A Permanent Latrine Facility	3	LS	\$_____
0006B Weapon Breakdown/Ammunition Dist Bldg	8	LS	\$_____
0006C Covered Mess	8	EA	\$_____ \$_____
0006D Observation Tower	8	EA	\$_____ \$_____
0006E Security Detail Office Building	1	LS	\$_____
0006F Guard Shack	1	LS	\$_____
0006G Utility & Storage Building	1	LS	\$_____
0006H Trash Point	1	LS	\$_____
0006I Covered Bleachers	8	EA	\$_____ \$_____

**Sub-Total Buildings only** **\$\_\_\_\_\_**

**0007 DBA INSURANCE:**

0007A DBA Insurance	1	LS	\$_____
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**TOTAL BASE PROPOSAL ITEMS** \$ \_\_\_\_\_  
 (total of all above costs - includes design and construction)

**0008 OPTIONS**

0008A Classroom	1	LS		\$ _____
0008B Lighting on roads and range areas	1	LS		\$ _____
0008C Gravel Access Roads	10,000	M <sup>2</sup>	\$ _____	\$ _____
0008D Gravel Range Perimeter Roads	50,000	M <sup>2</sup>	\$ _____	\$ _____
0008E Chlorination System	1	LS		\$ _____
0008F Electrical Utility Connection to ANA Base	1	LS		\$ _____
0008G Infantry Squad Battle Course	1	LS		\$ _____
0008H Second Generator + Synchronized System	1	LS		\$ _____
0008I Range Control Facility	1	LS		\$ _____
0008J Buidings 1, 2 & 3 for Station One of UCA	1	LS		\$ _____
0008K Buidings 1, 2,3,4,5,6 & 7 for Station Two of UCA	1	LS		\$ _____
0008L Building for Station Three of UCA	1	LS		\$ _____

**TOTAL OPTION PROPOSAL ITEMS** \$ \_\_\_\_\_

**TOTAL BASE and OPTION PROPOSAL ITEMS** \$ \_\_\_\_\_

**PROPOSAL SCHEDULE NOTES**

1. Offeror shall submit prices on all items.
2. Only one contract for the entire schedule will be awarded under this solicitation. This project will be awarded as a lump sum contract. This Proposal Schedule is an accounting tool for allocating funds to applicable budget.
3. Costs associated with this project shall include design and construction costs for site, facilities and utilities preparation but, no less than all items as shown in proposal schedule.
4. DESIGN COSTS DEFINITION: Design costs shall consist of preparation of master planning and site designs, plans, drawings, and specifications.

5. **NON-DESIGN COSTS DEFINITION:** Non-design costs shall include the following: initial site visits; field, topographic, property, boundary, utility, and right-of-way surveys; subsurface explorations and borings; feasibility, functional, and economic studies and other investigations; flow gauging and model testing; preparation or verification of as-built drawings; preparation of general and development criteria; preparation of general and feature design memoranda; services of consultants where not specifically applied to the preparation of working drawings or specifications; construction phase services; models, renderings, or photographs of completed designs; reproduction of designs for review purposes; and travel and per diem allowances in connection with the above excludable services.
6. **SEPARATION OF WORK:** All work for Design and Construction shall be included in all Proposal Items.
7. **EVALUATION OF OPTIONS:** The award will be made to the offeror whose proposal represents the best overall value to the Government. For pricing purposes the Government will evaluate both the Base Proposals and Option Proposals. The Government is not obligated to exercise the options.
8. **EXERCISE OF OPTIONAL BID ITEMS:** Optional bid items (if any) may, at the option of the Government, be added to the contract at any time within 90 calendar days after award of Base Proposal.

--END OF SECTION--

## SECTION 00100 - BIDDING SCHEDULE/INSTRUCTIONS TO BIDDERS

The following have been added by full text:

### SECTION 00110

### **SECTION 00110 PROPOSAL PREPARATION**

#### **1. OVERVIEW**

**1.1** This is a "Best Value" solicitation for the Design and Construction of one range complex with eight (8) new ranges and related road and support facilities for the ANA located at Camp Gamberi, Afghanistan. The Government will evaluate the proposals in accordance with the criteria described in section 00120, and award a firm fixed price contract to the responsible offeror, whose proposal conforms with all the terms and conditions of the solicitation and whose proposal is determined to represent the overall best value to the Government.

#### **1.2 INQUIRIES**

Perspective offerors should submit inquiries related to this solicitation by writing or calling the following: (collect calls will not be accepted):

All questions will be submitted in writing by letter or e-mail to:

U.S. Army Corps of Engineers (USACE)  
Afghanistan Engineer District (AED)  
Qalaa House, Attention: Marston Y. Guese  
Kabul, Afghanistan

E-MAIL ADDRESS: [Marston.Y.Guese@usace.army.mil](mailto:Marston.Y.Guese@usace.army.mil)

Please include the solicitation number, and project title with your questions. Written inquiries must be received by this office not later than 14 calendar days prior to the date set for receipt of offers.

Oral explanations or instructions are not binding. Any information given to an offeror which impacts the solicitation and/or offer will be given in the form of a written amendment to the solicitation.

As this is a competitive negotiation acquisition, there is no public bid opening and no information will be given out as to the number of offerors or the results of the competition until all awards are made.

### 1.3 DIRECTIONS FOR SUBMITTING PROPOSALS

Offers must be in sealed envelopes/packages, marked and addressed as follows:

**MARK PACKAGES:**

Solicitation No. W917PM-09-R-0007

Offer Closing Date: 24 January 2009

Offer Closing Time: 17:00 (LOCAL KABUL TIME)

**ADDRESS PACKAGES TO:**

U.S. Army Corps of Engineers (USACE)

Afghanistan Engineer District (AED)

Qalaa House, Attention: Contract Specialist: Marston Y. Guese

Kabul, Afghanistan

Special Instruction Pertaining to Hand Carried Offers: Hand-carried offers must be delivered to the USACE AED offices, Qalaa House, Kabul, Afghanistan. Offers who desire to hand-deliver their offers notify the Contract Specialist in advance in order to be met at the entrance gate to Qalaa House Compound.

### 1.4 PREPROPOSAL CONFERENCE / SITE VISIT

The Pre-proposal Conference was held on 27 October, 9:00 AM at USACE Qalaa House Compound Kabul, Afghanistan. The point of contact was William Mullery, email address: [William.d.mullery@usace.army.mil](mailto:William.d.mullery@usace.army.mil). The site visit was conducted on 12 November 2008. **Additional site visit will be at contractor's discretion.**

### 1.5 TELEGRAPHIC OFFERS - - TELEGRAPHIC OFFERS ARE NOT ACCEPTABLE.

However, offers may be withdrawn by written or telegraphic notice. Any telegram to withdraw an offer sent to this office must be received in the office designated in the Request for Proposal (RFP) for receipt of offers not later than the exact date and time set for receipt of proposals. A telegraphic withdrawal of an offer received in such office by telephone from the receiving telegraph office not later than the exact date and time set for receipt of proposals shall be considered. However, the telephone message shall be confirmed by the telegraph company by sending a copy of the written telegram that formed the basis for the telephone call. The written telegram shall be sealed in an envelope by a proper official and sent to the office designated in the RFP for receipt of offers. The official shall write on the envelope (1) the date and time of receipt and by whom, and (2) the number of the RFP, and shall sign the envelope. The offeror is responsible to inform the telegraph company of these requirements. No one from this office will be dispatched to the local telegraph office to pick up any telegram for any reason.

### 1.6 FACSIMILE OFFERS

Facsimile offers, modifications thereto, or cancellations of offers will not be accepted.

## **1.7 PROPOSAL FORMAT**

**1.7.1** (1) Submit only the hard-copy paper documents and the electronic files specifically authorized and/or required elsewhere in this section. Do not submit excess information, to include audio-visual materials, electronic media, etc.

(2) Use only 8 ½ by 11 inch paper for hard copy submissions, unless another paper size is specifically authorized elsewhere in this section for a particular submission. Contractor may use fold-outs (e.g., 11" x 14" or 11" x 17" sheets) only for concept drawings specifically authorized in Design Technical section for a particular submission. Do not use a font size smaller than 10, an unusual font style such as script, or condensed print for any submission. All page margins must be at least 1 inch wide, but may include headers and footers.

(3) The preferred method for assembling your proposals is to use three-ring binders; however, the use of pressboard or other report covers with compression or other type fasteners is acceptable. Do not use spring clamps or exceed the recommended capacity of the fastener or binder. Do not use plastic multi-hole/spiral binding systems, heat binding systems, or other systems which do not facilitate the ready insertion of additional pages.

(4) "Confidential" projects cannot be submitted to demonstrate capability unless all of the information required for evaluation as specified in section 00120 can be provided to the Government as part of the Offeror's technical proposal. Offerors that include in their proposals information that they do not want disclosed to the public for any purpose, or used by the Government except for evaluation purposes, must be clearly marked in accordance with the instructions at FAR 52.215-1, "Instructions to Offerors—Competitive Acquisition", paragraph (e), "Restriction on disclosure and use of data".

(5) In the case of an Offeror that is part of a large, multi-segmented business concern, provide information directly pertaining to the specific segment of the business concern (i.e., the division, group, unit, etc.) that will perform work under the prospective contract.

(6) For submissions with page limitations, the pages will be counted as follows: One side of the paper is one page; information on both the back and front of one sheet of paper will be counted as two pages. Where authorized, fold-out pages (11" x 14" or 11" x 17") will count as one page. Pages furnished for organizational purposes only, such as a "Table of Contents" or divider tabs, are not included in the page limitation.

(7) Number of copies: Submit one original and four (4) copies of drawings and printed matter (Bound Volumes), as well as Two (2) CDs.

## **1.8 SUBCONTRACTING PLAN/ UTILIZATION LOCAL AFGHAN LABOR CONCERNS**

Provide percentage of subcontractor contract amount utilizing local Afghan labor.

## **2.0 GENERAL**

Instructions for the preparation and organization of each proposal are included herein. The proposal submittal shall include (a) one original and four copies of Volume I and (b) one original and two copies of Volume II. The Volume II proposal and all copies thereof shall be sealed in a single package separate from the Volume I proposal and all copies thereof, and both packages shall be clearly marked. The proposal shall be submitted as required herein and elsewhere in the RFP.

Volume I shall be typed, with numbered pages and sections tabbed. A cover sheet shall identify the offeror and the project and the second sheet shall be a table of contents. The Volume I proposal is limited to no more than 70 single-sided or 35 double-sided pages, printed on 8-1/2" x 11" sheets, not including the cover sheet, designs/sketches, table of contents and letters of recommendation / evaluations / related certificates. Do not use condensed print. Do not submit any extraneous materials with your proposal.

## **2.1 VOL I - MANAGEMENT-TECHNICAL PROPOSAL PREPARATION**

The Management/Technical proposal shall include the information as described below and shall be presented in the sequence listed.

### **2.1.1 Factor 1 – Experience**

Factor 1 template format guidance provided at the end of section 00110.

The Contractor shall complete a minimum of five (5), but no more than ten (10), "Experience Information" forms, attached at the end of this section, in response to this factor. All blocks must be filled in and all data should be accurate, current, and complete. All projects submitted must have been underway or completed within the last 3 years. At least three (3) of the projects provided must be valued at over **\$3,000,000.00**. The projects submitted must demonstrate that the Contractor and/or team, including sub-contractors, has experience on projects that are the same or similar to that described in the solicitation. The projects submitted must have been performed by the offeror and/or same team member(s) who will be providing similar services under the prospective contract. For each project that included design, the offer may also submit up to 5 pages of information representative of the design efforts of the project. The list of projects shall include the following information (Template 1):

- a. Project name and location.
- b. Nature of firm's responsibility (design/build or design or construction).
- c. Project owner's name, address, telephone, email (to be contacted by the Government).
- d. Contractor a prime or sub-contractor for this project
- e. Project completion date (estimated if in progress, as well as current portion completed)
- f. Construction cost
- g. Brief explanation of experience that illustrates your design/build capabilities and relevant job experiences. Explain your technical approach in the referenced projects, design rationale, floor plan schematic, structural type of construction, mechanical system used, electrical system used, anti-terrorism force protection considerations, site utility design, and material shipment scheduling for long lead items where applicable to the proposed project.
- h. Schematic site/land use plan showing the proposed project facility placement and orientation, vehicular circulation, and other site improvements.

### **2.1.2 Factor 2 - Project Management and Security Plan**

Factor 2 template format guidance provided at the end of section 00110.

The Offeror shall 1) identify the major conditions, challenges and key issues on each of the following areas, 2) provide alternatives and solutions to the challenges and issues, and 3) describe the action plan and measures to ensure successful execution. The Project Management and Security Plan must address the following matters (Template 2):

#### **2.1.2.1. An Organizational Chart: (include key personnel Names and their titles:**

- a. Show the key design personnel

- b. Show the key construction personnel
- c. Show other firms involved such as partnerships and sub-contractors if applicable
- d. Show the relationship between the quality control and health & safety personnel, project level management and corporate management

**2.1.2.2.** An explanation of the quality control process for design.

**2.1.1.3.** An explanation of the quality control management throughout the construction process including;

- a. Testing
- b. Inspection
- c. Safety

**2.1.2.4.** An explanation of how the offeror plans to manage interactions with the Corps of Engineers and the roles that different team members will play when dealing with:

- a. Resolving problems with modifications to the contract (design and/or construction)
- b. Resolving potential design and/or construction delays
- c. Reviewing and approving submittals
- d. Attending progress meetings
- e. Facilitating contract completion and closeouts
- f. Explain process to control cost over runs while maintaining the project budget during design and construction.

**2.1.2.5.** Provide innovative but realistic and specific solutions to the following potential project management challenges:

- a. Identifying a qualified design firm and ensuring timely delivery of Design Plans and construction documents.
- b. Providing Site security, local community engagement, and access arrangement.
- c. Procuring the required materials and developing a transportation and security strategy that will ensure that the materials get to the construction site
- d. Organizing and using the engineering, technical, management personnel and local labor force in a manner that ensures successful completion of the project.
- e. Providing a construction and engineering methodology that will ensure success of the project.
- f. Provide a construction schedule that is efficient and effective.

**2.1.2.6 Capacity:** The contractor shall submit a list of ALL current ongoing contracts or projects. The list shall include the contract number, contract amount, original contract completion date, current official contract completion date, and the current progress. The contractor shall identify the key personnel assigned to each of those projects. See FACTOR 3, Personnel for the titles of the key personnel that should be identified. The contractor shall provide a narrative that explains how award of this contract will affect current contracts or projects and how the current contracts or projects will affect this contract if it is awarded to the contractor. The contractor shall provide a narrative that explains their capability and plan to implement an additional project and the resources available to them without adversely affecting current contract or projects.

The Offeror's commitments provided in the Project Management and Security Plan will be used as the basis for agreements between the government and the awardee. The government intends to enforce the agreement based on the awardee's Project Management and Security Plan and evaluate the contractor's performance accordingly.

### **2.1.3 Factor 3 – Personnel and Resources**

Factor 3 template format guidance provided at the end of section 00110.

#### **2.1.3.1 Personnel**

The Offeror must provide professional resume data on the following individuals who will be key personnel on the project team. Key personnel identified in this section should be senior working-level people who will be involved in design and construction on a day-to-day basis, as opposed to departmental level supervisors or executives. By identifying these personnel, the offeror makes a commitment that, barring unforeseen circumstances; they are the personnel who shall be assigned to the project.

**2.1.3.2.** All key personnel shall have a degree in the field of work governed by the position they are assigned to and a minimum of five (5) years of professional experience in their field. For example, a Civil Engineer must have a degree in Civil Engineering and 5 years of professional civil engineering experience.

- a. Project Manager for design and for construction
- b. Senior Civil Engineer
- c. Field Safety Officer
- d. Field Quality Control Manager
- e. Site Project Manager
- f. Site Foreman

#### **2.1.3.3. NOT USED**

**2.1.3.4.** Information to be provided for key personnel should be limited to no more than one page per person and shall include:

- a. Name and title

- b. Project assignment(s)
- c. Name of firm with which associated
- d. Years experience with this firm and with other firms
- e. Education degree(s), year, specialization
- f. Active registration, year first registered
- g. Other experience, accreditation, and qualifications relevant to the proposed project
- h. Provide the proposed use of Afghan contractors and labor in numbers or percentages.

#### **2.1.3.5 Resources**

The Offeror shall submit a list of ALL current ongoing contracts or projects. The list shall include the contract number, contract amount, original contract completion date, current official contract completion date, and the current progress. The Offeror shall identify the key personnel assigned to each of those projects. See FACTOR 3, PERSONNEL for the titles of the key personnel that should be identified. The Offeror shall provide a narrative that explains how award of this contract will affect current contracts or projects and how the current contracts or projects will affect this contract if it is awarded to the contractor. The Offeror shall provide a narrative that explains their capability and plan to implement an additional project and the resources available to them without adversely affecting current contract or projects.

#### **2.1.4 Factor 4 – Past Evaluations/Performance.**

Factor 4 template format guidance provided at the end of section 00110.

For the projects listed under Paragraph 1.1.2, Factor 1 - Experience, the Offeror shall provide the following information (Template 4):

- a. Project Manager's (for the customer) name, telephone, email.
- b. List the problems encountered and the corrective actions taken.
- c. List of change orders and circumstances associated with them.
- d. Construction time duration beyond the contract time and why.
- e. Construction cost in dollars beyond the contract amount and why.
- f. Safety record and accident report.
- g. The offeror may also provide letters of recommendation, references, performance evaluations or other evidence of successful performance of the project.

The Source Selection Evaluation Board may attempt to contact the references provided in the list of projects. They may also contact Government personnel who have worked with the offeror. References' comments may affect the scoring of proposals. It is important to verify that the points of contact listed are still available at the phone number and addresses provided and that they are individuals who have sufficient knowledge of the project and your performance to be able to offer meaningful comments.

In the event that an offeror does not have a record of past performance, a written explanation of the reasons why no record is available is requested. In the case of an offeror without a record of relevant past performance or for whom information on past performance is not available, the offeror will not be evaluated favorably or unfavorably on past performance. A neutral rating will be assigned.

## **2.2 NOTES**

### **2.2.1 JOINT VENTURE PROPOSAL REQUIREMENTS**

Any contractors submitted in the proposal as part of a joint venture must submit a legally binding joint venture agreement. The Government will not evaluate the capability of any contractors that are not included in the joint venture agreement. Joint ventures must include a copy of the legal joint venture signed by an authorized officer from each of the firms comprising the joint venture with the chief executive of each entity identified and a translation in English, if the original agreement is in a language other than English. Incomplete evidence of a joint venture results will not be considered.

If submitting a proposal as a Joint Venture, the experience, past performance, management plan and equipment submittal of each of the Joint Venture Partners can be submitted for the Joint Venture Entity. The experience for each Joint Venture Partner will be considered the experience of the Joint Venture entity.

The proposal may receive a higher rating if the proposal contains evidence of the Joint Venture Entity working successfully together previously on relevant projects.

### **2.2.2 Credit For Others**

If an Offeror wishes to be credited with a subcontractor or supplier, i.e. a firm that is not the prime contractor or part of the joint venture, a letter of commitment signed by the subcontractor must be submitted. The commitment letter must be submitted even if the firm is in some way related to a joint venture partner (for example, the subcontractor is a subsidiary of a joint venture partner, or a subsidiary of a firm to which the joint venture partner is also a subsidiary). In regard to the Experience and Past Performance factors, if an Offeror submits projects demonstrating experience in one of the factors or sub-factors, and that project was completed by a subcontractor, a subsidiary, or a supplier, as opposed to the prime or one of the joint venture partners, the Offeror **MUST** submit a signed letter of commitment from the contractor who performed and completed the work. If a letter of commitment is not submitted, the experience will not be considered.

## **3.0 VOLUME II - PRICE PROPOSAL PREPARATION**

### **3.1 Proposal Schedule**

Offeror's shall provide a signed cover letter and complete the Proposal Schedule by filling out the pricing data blanks. An executable Proposal Schedule is included in Section 00010. Overhead and profit shall be applied proportionally to each category and shall not be required to be shown separately. The proposal shall include allowances in the Price Proposal and shall schedule any contingency for weather delays for severe weather in accordance with weather requirements. All prices shall be firm.

## **4.0 CLARIFICATIONS AND FINAL PROPOSAL REVISION**

### **4.1 General**

Any conflicting criteria which cannot be resolved by the terms of this RFP shall be brought to the attention of the Government by the offeror as part of the written clarification requirement of the proposal. In the absence of such request for clarification, the offeror shall perform to the most beneficial criteria as determined by the Government.

#### **4.2 Written Clarification Requirement**

In the event that clarifications are required prior to submitting the proposal, contact the individuals listed on the RFP letter; such contact shall be in writing. All RFP holders shall be advised of significant clarifications affecting the scope of the project.

#### **4.3 Clarifications Submitted with Proposals**

If ambiguities remain in the RFP at the time and date that proposals are due, written clarifications may be included in the proposal for consideration by the Government. Clarifications submitted with proposals shall clearly identify the understanding of the RFP documents and how this understanding is reflected in the cost proposal. Qualifications, exclusions and exceptions in the form of clarifications may be considered by the Government to be non-responsive and may be grounds for rejection of the proposal.

#### **4.4 Final Proposal Revision(s)**

**4.4.1** The Government intends to award a contract on the basis of the initial offers received without further discussions or negotiations. Offers should contain the offeror's best terms from a cost and management standpoint.

**4.4.2** The Government may contact those firms whose proposals are within the competitive range and conduct discussions/negotiations concerning their proposal. Following resolution of the discussions/negotiations, offeror's in the competitive range shall be given the opportunity to submit their Final Proposal Revision (otherwise known as 'Best and Final offer').

- End of Section –

### **TEMPLATE FORMAT GUIDANCE ONLY**

#### **Template 1: EXPERIENCE**

- a. Project Name & Location:
- b. Contract Number if applicable:
- c. Project type: Construction: (Y/N) Design: (Y/N) Design/Build: (Y/N)
- d. Project owner's name:

Address:  
Telephone:  
eMail:

- e. Prime Contractor: (Y/N) Sub-Contractor: (Y/N)
- f. Project completion Date:
- g. Construction Cost:
- h. Brief explanation that illustrates your design/build capabilities and relevant experiences:
- i. Schematic site plans

**Template 2: PROJECT MANAGEMENT & SECURITY PLAN**

1. Provide an Organizational Chart: (include key personnel Names and their titles
  - a. Show the key design personnel
  - b. Show the key construction personnel
  - c. Show other firms involved such as partnerships and sub-contractors if applicable
  - d. Show the relationship between the quality control and health & safety personnel, project level management and corporate management
2. Explain the quality control process for design:
3. Explain quality control management throughout the construction process including;
  - a. Testing
  - b. Inspection
  - c. Safety
4. Explain the interactions with the Corps of Engineers and the roles that different team members will play when dealing with;
  - a. Resolving problems with modifications to the contract (design and/or construction)
  - b. Resolving potential design and/or construction delays
  - c. Reviewing and approving submittals
  - d. Attending progress meetings
  - e. Facilitating contract completion and closeouts
  - f. Explain process to control cost over runs while maintaining the project budget during design and construction.
5. Provide innovative but realistic and specific solutions to the following potential project management challenges:
  - a. Identifying a qualified design firm and ensuring timely delivery of Design Plans and construction documents.
  - b. Providing Site security, local community engagement, and access arrangement.
  - c. Procuring the required materials and developing a transportation and security strategy that will ensure that the materials get to the construction site
  - d. Organizing and using the engineering, technical, management personnel and local labor force in a manner that ensures successful completion of the project.
  - e. Providing a construction and engineering methodology that will ensure success of the project.
  - f. Provide a construction schedule that is efficient and effective.
6. Provide a list of all current ongoing contracts or projects:
  - a. Contract Number
  - b. Contract Amount
  - c. Original Contract Completion Date
  - d. Current Official Completion Date
  - e. Current Progress
  - f. Key Personnel assigned to each of those projects
  - g. The Offeror shall provide a narrative that explains how award of this contract will affect current contracts or projects and how the current contracts or projects will affect this contract if it is awarded to the contractor.
  - g. The Offeror shall provide a narrative that explains their capability and plan to

- h. implement an additional project and the resources available to them without adversely affecting current contract or projects.

### Template 3: PERSONNEL & EQUIPMENT RESOURCES PLAN

#### SUB-FACTOR 1: KEY PERSONNEL for the following:

- a. Project Manager for design and for construction
- b. Senior Civil Engineer
- c. Field Safety Officer
- d. Field Quality Control Manager
- e. Site Project Manager
- f. Site Foreman

All key personnel shall have a degree in the field of work governed by the position they are assigned to and a minimum of five (5) years of professional experience in their field. For example, a Civil Engineer must have a degree in Civil Engineering and 5 years of professional civil engineering experience.

Information to be provided for key personnel should be limited to no more than one page per person.

- a. Name:
- b. Project Title:
- c. Project Responsibilities:
- d. Years of Experience: with this Company: with other firms:
- e. Education: Degree(s) Year: Specialization:
- f. Active Registration: First year Registered:
- g. Other relevant experiences, accreditation, & qualifications:
- h. How many or the percentage of the Afghan contractors & laborers who will be working on this project:

### Template 4: PAST EVALUATIONS/ PERFORMANCE

(The following projects are to be the same projects submitted under Factor 1 Experience.)

1. Project Name & Location:
2. Customer Point of Contact: (Note: the Government may contact this customer to verify the information provided on this form)

Name:

Address:

Phone number:

Email Address:

3. Problems encountered and corrective actions taken:
4. List Change Orders and their circumstances:
5. Project scheduled Completion date Actual Completion date:

IF the above dates are different, explain reason for the change:

6. Initial Project Budget (US Dollars)
- Final Actual Project cost (US Dollars)

IF the above dates are different, explain reason for the change:

7. Safety record and accident reports:

8. References: Submit the following, Customer Satisfaction letters, Letters of Appreciation, Performance Evaluations, Certification of Achievements, Letters of Recommendations. (Note: A neutral rating will be assigned IF no past performance is submitted) ATTACHMENT-B4 (CONTRACTOR PERSONNEL'S EXPERIENCE & QUALIFICATION)

## SECTION 00120

### **SECTION 00120**

#### **PROPOSAL EVALUATION AND CONTRACT AWARD**

##### **A. BASIS FOR AWARD and prerequisite**

The Government intends to make one award for completion of the subject project. The award will be made to the offeror whose proposal represents the best overall value to the Government. Competing proposals shall be evaluated against the requirements of the solicitation in order to assess strengths, weaknesses and associated risks and deficiencies. The tradeoff process of evaluation between non-cost/price and cost/price aspects of the Offerors' proposals will be used to determine those offers that may result in award of a contract. Implicit in the Government's evaluation and selection process is its willingness to accept other than the lowest priced offers.

##### **B. PROPOSAL EVALUATION**

**B.1** Proposals will be evaluated by a Source Selection Evaluation Board (SSEB). The SSEB will be composed of Corps of Engineers personnel and a Customer representative. The identity of SSEB members is confidential and members will not be available for contact or discussion prior to submission of proposals.

**B.2** The Volume I (Management Technical) factors are listed in order of importance, with the Contractors Project Management and Security Plan the most important factor. There are no sub-factors under each factor. The four factors will be evaluated and assigned merit ratings using the adjectives of excellent (E), good (G), satisfactory (S), marginal (M), and unsatisfactory (U). Proposals that are determined to be non-responsive (lacking in mandatory information) will be determined to be unacceptable. The non-pricing Volumes (I, Management-Technical) taken together are significantly more important compared to the pricing factor (Volume II) in the evaluation and selection process.

#### **1.0 VOLUME 1 – MANAGEMENT-TECHNICAL PROPOSAL EVALUATION CRITERIA**

##### **1.1 CONTENT**

##### **1.1.1 Factor 1 – Experience**

The Government will evaluate the work experience of the contractor's company and designer, including subcontractors, on projects similar to that described in this RFP which use the design-build process. Contractor's experience with similar projects (type of construction, dollar value, design-build method, complexity, applicable standards such as EMS 385-1-1) will receive a higher rating than those with dissimilar projects. Offerors must provide a list three (3) projects valued at over **\$3,000,000.00**. Offerors with experience on same/similar relevant projects (type of services, similar dollar value, complexity, USACE design / construction requirements, and applicable quality standards) will receive a higher rating than those with dissimilar or non-relevant projects. The list of projects shall include the information required by Template 1. Offerors that fail to provide the required number of responsive, complete and accurate information regarding their experience may be considered non-responsive and not considered for award.

### **1.1.2 Factor 2 – Project Management and Security Plan**

The Government will initially evaluate and rate the Project Management and Security Plan for responsiveness and completeness in accordance with Template 2 in Section 00110. Offeror's proposals that fail to address all of the subjects identified in Template 2 may be considered non-responsive and not considered for award.

The Government will evaluate the Project Management and Security Plan by applying the following standards or criteria to the subjects identified in Template 2 of Section 00110:

- \* Did the Offeror identify and demonstrate a thorough understanding of the conditions, challenges, issues, and time constraints pertinent to performance of this contract.
- \* Did the Offeror provide realistic solutions or alternatives to the conditions, challenges, issues and time constraints that they identified.
- \* Was the Offeror's action plan feasible, viable, clear and demonstrate a commitment that would ensure successful execution of the Project Management Plan and Security Plan.

The offeror who identifies all the relevant conditions, challenges, issues or time constraints and provides the most specific and compelling solutions or alternatives that are most likely to ensure successful contract completion will receive the highest ratings.

The Offeror's commitments provided in the Project Management and Security Plan will be used as the basis for agreements between the government and the awardee. The government intends to enforce the agreement based on the awardee's Project Management and Security Plan and evaluate the contractor's performance accordingly.

### **1.1.3 Factor 3 – Personnel and Resources**

#### **1.1.3.1 Personnel**

The Government will initially evaluate the qualifications and experience of the contractor's and the designer's key personnel for this project in accordance with the requirements outlined in Template 3 in Section 00110. Contractor personnel with experience working on similar projects (type of construction, dollar value, design-build method, complexity) will receive a higher rating than those with dissimilar or non-relevant project experience.

Contractor's use of other workers will be evaluated, with greater credit being given for Afghan workers unless logistics of using foreign workers is fully detailed.

Proposals will also be evaluated by how completely the offeror addresses how they will have adequate personnel for the project described in this RFP in light of any other ongoing projects and contractual commitments it may have within Afghanistan.

Proposals with the most complete and detailed submissions will receive the highest ratings.

#### **1.1.3.2 Resources**

The Government will initially evaluate the proposal for compliance with the minimum requirements of this solicitation. Offeror's proposals that fail to address all of the subjects identified in Section 00110, Paragraph 1.1.3.5 may be considered non-responsive and not considered for award. In order to receive a satisfactory rating for this factor, the Offeror must meet the following requirements:

- \* The Offeror submitted a list of ALL current ongoing contracts or projects.
- \* The list included the contract number, contract amount, original contract completion date, current official contract completion date, and the current progress.
- \* The Offeror identified the key personnel assigned to each of those projects delineated in

FACTOR 3 – PERSONNEL for each of the current contracts or projects.

- \* The Offeror provided a narrative that satisfactorily explains how award of this contract will not adversely affect any current contracts or projects.
- \* The Offeror provided a narrative that satisfactorily explains how the current contracts or projects will not adversely affect this contract if it is awarded to the contractor.
- \* The Offeror provided a narrative that satisfactorily explains how they are going to assume the responsibility for this additional contract or project as well as an explanation of the resources they will use on this contract without adversely affecting current contract or projects.
- \* The contractor's responses will be evaluated to determine if the contractor has additional capacity to handle the project.

The Government will evaluate the adequacy of the Offeror's resources to successfully complete the project based on the completeness and realism of their narrative responses to the issues identified by this factor.

Proposals with the most complete and detailed submissions will receive the highest ratings.

#### **1.1.4 Factor 4 – Past Evaluations/Performance**

In order to be considered responsive to this factor, the Offeror must submit "Experience Information" forms for all the projects listed under Factor 1 – Experience, attached at the end of Section 00110, in response to Factor 1- Experience. All blocks must be filled in and all data should be accurate, current, and complete.

- \* The Government will evaluate past performance information to assess the level of performance risk associated with the Offeror's likelihood of success in performing the requirements stated in the solicitation.
- \* The currency and relevance of the information (as determined by the Government), the source of the information, context of the data, and general trends in the contractor's performance may be considered.
- \* Information submitted by the Offeror pertaining to recent, relevant contracts will be evaluated as well as data obtained from other sources, including automated databases and questionnaires.
- \* References other than those identified by the Offeror may be contacted by the Government . The Government may take into consideration the Offeror's performance of contracts with the agency; other Federal, State, and local government activities; and commercial concerns. The result will be a performance risk rating based on each Offeror's record of past performance.

For the purpose of the past performance evaluation, offerors shall be defined as business arrangements and relationships, such as Joint Venture participants, teaming partners, and major subcontractors. The past performance record of each firm in the business arrangement may be evaluated by the Government.

In the case of an Offeror without a record of recent, relevant past performance (and for which there is also no recent, relevant past performance information for its predecessor companies or key subcontractors), or for whom information on past performance is not available or cannot be verified, the Offeror will not be evaluated favorably or unfavorably on past performance. A neutral rating will be assigned. This does not preclude the Government from

making award to a higher-priced Offeror with a favorable past performance record over a lower-priced Offeror with a neutral past performance rating.

## **1.2 Format**

Proposal will be evaluated based on adherence to the requirements of Section 00110, Proposal Preparation.

## **1.3 Notes**

### **1.3.1 Joint Ventures and Teaming Arrangements**

Any contractors submitted in the proposal as part of a joint venture must submit a legally binding joint venture agreement. The Government will not evaluate the capability of any contractors that are not included in the joint venture agreement. Joint ventures must include a copy of the legal joint venture signed by an authorized officer from each of the firms comprising the joint venture with the chief executive of each entity identified and a translation in English, if the original agreement is in a language other than English. Incomplete evidence of a joint venture results will not be considered.

If submitting a proposal as a Joint Venture, the experience, past performance, management plan and equipment submittal of each of the Joint Venture Partners can be submitted for the Joint Venture Entity. The experience for each Joint Venture Partner will be considered the experience of the Joint Venture entity.

The proposal may receive a higher rating if the proposal contains evidence of the Joint Venture Entity working successfully together previously on relevant projects.

### **1.3.2 Credit For Others**

If an Offeror wishes to be credited with a subcontractor or supplier, i.e. a firm that is not the prime contractor or part of the joint venture, a letter of commitment signed by the subcontractor must be submitted. The commitment letter must be submitted even if the firm is in some way related to a joint venture partner (for example, the subcontractor is a subsidiary of a joint venture partner, or a subsidiary of a firm to which the joint venture partner is also a subsidiary). In regard to the Experience and Past Performance factors, if an Offeror submits projects demonstrating experience in one of the factors or sub-factors, and that project was completed by a subcontractor, a subsidiary, or a supplier, as opposed to the prime or one of the joint venture partners, the Offeror **MUST** submit a signed letter of commitment from the contractor who performed and completed the work. If a letter of commitment is not submitted, the experience will not be considered.

## **2.0 VOLUME II - PRICE PROPOSAL PREPARATION**

The Government will evaluate whether the Volume II price proposals are complete and reasonable. The price proposals will not be assigned adjective ratings but will be assigned a confidence/risk rating. The government will evaluate the proposed pricing and supporting information to determine the reasonableness and completeness of the proposed price.

## **C. METHOD OF PROPOSAL EVALUATION**

**C.1** Proposals will be reviewed to determine if they contain the required minimum procurement and technical data as required by sections 00110 and 00120. Incomplete proposals may be eliminated. All forms shall be filled in and all requested data must be provided.

**C.2** After the compliance review, the SSEB will begin evaluation and scoring the factors and sub-factors set forth herein. The Price proposal information will be evaluated (not scored) with regard to reasonable and complete pricing and associated risks.

**C.3** If necessary, a competitive range may be determined. The competitive range will consist of all proposals which are considered to have a reasonable chance of being selected for award. However, the offeror is reminded that the Government intends to award without discussions and that their best offer should be provided with the initial proposal. After the determination of the competitive range, written and/or oral discussions may be conducted with all Offerors within the competitive range. Upon completion of written and/or oral discussions, Final Proposal Revision will be requested.

**C.4** The Government may reject any or all proposals based upon irregularities in the proposal or waive minor informalities or minor irregularities in proposals.

#### **D. SELECTION and AWARD**

Award will be made to the offeror, that in the judgment of the Contracting Officer, provides the best combination of management and technical capability and reasonable cost. The Government reserves the right to make award to other than the lowest cost offeror, price and other factors considered under the provision of "best value" to the Government.

-- End of Section --

#### SECTION 00800 - SPECIAL CONTRACT REQUIREMENTS

The following have been added by full text:

SECTION 01010  
SECTION 01010

#### **SCOPE OF WORK**

##### 1.0 GENERAL

1.1 The project consists of design and construction of one range complex with 8 new ranges, and related roads and support facilities for the Afghanistan National Army at Camp Gamberi Afghanistan. Contractor shall use Government furnished 90% designs provided in Appendices A through W to complete design and construction documents and construct these facilities. The standard designs for the Bleachers, Latrine, Open Mess, Guard Shack Range Control Building, and the Observation Tower will be provided on a separate CD.

1.1.1 The project is defined as design, material, labor, and equipment to construct the following buildings, parking, utilities, and other infrastructure: observation towers, covered mess areas, water well with pumping station and water system with water storage tank, latrine facilities with sewer collection system, graveled road, sidewalks

and parking, classroom, weapon breakdown and ammo distribution building, security detail office building, utility storage building, covered bleachers, guard shack, and optional lighting and fencing to control and protect range support facilities.

1.1.2 Additional overall requirements include earthwork to build erosion control structures, construct and mark berms, and provide electric power. The contractor shall test and install government furnished targets for all ranges except for rifle ranges (The contractor shall provide targets for rifle range). The target boots shall be constructed and done by contractor. The contractor shall fill and grade the pistol, rifle, and machine gun ranges. The grading for the full area of the pistol, rifle, and machine gun ranges, and backstop berm construction shall be completed only after the final phase of the demining is completed. The contractor shall construct all the berms and areas to be filled with material located onsite.

1.1.3 The Contractor shall indicate in design any proposed areas for future expansion.

1.1.4 Design and construct site grading including drainage structures within the marked area demined, approximately 2 kilometers by 110 meters. Once the demining contractor has cleared the additional full areas for the pistol, rifle and machine gun ranges, the construction contractor may grade the full area of the ranges. All demining work should be completed in February 2009.

1.1.5 Contractor shall plan to run utilities from 5 meters beyond the edge of roadway for an average of 60 meters for each new building. Ties to existing buildings shall be closer to existing connections. Exact distances shall be verified by Contractor during design.

1.1.6 Include demolition of any existing facilities or related man made features and debris that interfere with work under the project, or which would create a hazard or interfere with the completion of this portion of the work

1.1.7 Existing Utilities that are located in the footprint of new buildings shall be relocated to route around the buildings.

1.1.8 For clarity in this document, unless a specific industry standard is specified, United States of America design, construction and material standards shall be used.

1.1.9 Work within this contract shall meet and be constructed in accordance with current U.S. design and International Building Codes (IBC), Life Safety Codes (NFPA-101), and Force Protection and security standards. A partial listing of references is:

IBC, International Building Codes 2003  
NFPA 101, Life Safety Codes  
UFC 4-010-01, DoD Minimum Anti-Terrorism Standards for Buildings.

## 1.2 ENGLISH LANGUAGE REQUIREMENT

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

## 1.3 SUBMITTALS

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

## 1.4 CQM TRAINING REQUIREMENT

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

Reed B. Freeman, PhD, PE  
Quality Assurance Branch  
Afghanistan Engineer District, USACE  
Email: ree.b.freeman@usace.army.mil  
Telephone: 079-760-4396

A copy of the course completion certificate shall be included in the Design Analysis submittal.

## 2.0 LOCATION

ANA Brigade Training Area Site Locations by Coordinates. Refer to maps with coordinates in Appendix I. The site latitude and longitude coordinates are provided in the rights of Entry for Each Range Complex.

Proposed Range Complex Area Coordinates for 201th 3rd Brigade (Jalalabad)

01. E70.34142	N34.60185
02. E70.43995	N34.60335
03. E70.4613	N34.59402
04. E70.46283	N34.58812
05. E70.49345	N34.56783
06. E70.48808	N34.53397
07. E70.46913	N34.53333
08. E70.39047	N34.52552
09. E70.37902	N34.52602
10. E70.35113	N34.52692
11. E70.3403	N34.53237
12. E70.31858	N34.5416
13. E70.30803	N34.55992
14. E70.31603	N34.58135
15. E70.33045	N34.5864

## 3.0 UNEXPLODED ORDNANCE (UXO) REMOVAL AND CLEARANCE

Demining and clearance will be performed by other firms in a phased sequence. After demining the UNMACA Certificates will be provided to contractor which will have the coordinates of cleared area. It is the responsibility of the Contractor to be aware of the risk of encountering UXO or mines and to take all actions necessary to assure a safe work area to perform the requirements of this contract. The Contractor assumes the risk of any and all personal injury, property damage or other liability arising out of or resulting from any Contractor action taken hereunder. The Contractor and its subcontractors may not handle, work with, move, transport, render safe, or disarm any UXO or mine, unless they have appropriate accreditations from the UNMACA MAC.

If a UXO or mine is encountered after a MAC-approved clearance certificate is provided to the Government, UXO or mine disposal shall be handled in accordance with Section 01015, Technical Requirements.

## 4.0 SUMMARY OF WORK

### 4.1 CONTRACTOR REQUIREMENTS

The contractor shall design and construct the facilities as a design-built contract and shall be in accordance with the requirements stated in Section 01015: Technical Requirements. Refer to attached appendices and standard drawings for more specifics for required spaces. Design and construction work shall include but not be limited to that shown within attached tables and described below.

#### 4.1.1 General Requirements for Facilities

All requirements set forth in the Section 01010 Scope of Work, but not included in the Section 01015 Technical Requirements, shall be considered as set forth in both, and vice versa. Provide heating for all indoor facilities unless otherwise stated in sections 1010 or 1015. All toilets shall be eastern style. All eastern-style toilets shall face North or South.

All standard construction amenities and details such as heating, lighting, site drainage, utility connections, etc. shall be implied as a design and construction requirement. Drawings referenced are contained in Section 01015 or Appendices. Gravel walkways shall connect all buildings, facilities, and features such as parking lots, generator pads, etc.

In general, this project consists of designing and constructing of the following:

#### 4.1.2 Base Bid Infrastructure

Observation Tower with safety flagpole at each range (8 per range complex)--- Observation Tower with safety flagpole at each range (8 per range complex)--- The observation tower will measure approximately 23.05 m<sup>2</sup>(please refer to Appendix A for detail), stand approximately 7m high, and be located approximately 15m behind the firing line in the center of each range. Provide appropriately sized power for intended load capacity. See Appendix A and standard design CD.

Ammunition Distribution Building (1 at each range ). At each live fire range, design and construct a 3.8m x 6.1m structure on a reinforced concrete pad consisting of a 3m x 3.6m ammunition room and a 3.1m x 3.8m covered patio area. The ammunition room shall be constructed of reinforced CMU block walls with a continuous bond beam and have one steel entry door and two service windows with steel shutters. One service window shall face the patio area and the other shall open on the opposite side away from the patio.

Covered Mess at each range (8 per range complex). The structure provides an area for troop messing at the range site. This facility is also used as a weapons cleaning area by troops using the range. The covered facility has a concrete floor and a standing seam metal roof supported on columns and wood framing system. Sides will be left open. Stand-up eating tables and serving tables will be provided by contractor. Provide appropriately sized power and lighting for intended load capacity.

Security Detail Office Building: Security Detail Office Building large enough for 20 personnel. Provide appropriately sized HVAC and power for intended load capacity.

Guard Shack: Guard Shack large enough for 3-4 personnel and equipment at the entrance to the range complex. Provide appropriately sized HVAC and power for intended load capacity.

Utility Storage Building: Utility Storage Building with site power generator and fuel storage tank. The fuel storage tank shall have capacity for 1 week's at full operation. The site shall be secured. The building will be a minimum size of 8mx8m, and located near the other range support buildings.

Water Well-- Water well, water pump and water storage & treatment (20,000 liters) for washing (no showers), latrine and cleaning.

Permanent latrine facilities—Permanent latrine facilities with 10 eastern toilets with hose bibs, and at least one outside fresh water and weather proof spigot. Provide 3 latrines for the range complex along the rear of the range complex.

Covered bleachers--- Covered bleachers, one per range, capable of containing 50 personnel at one time, facing down range behind the observation tower, offset left or right.

Sanitary and Septic system-- Design and construct sewer lines, septic tank, and absorption field. A soil investigation will be necessary to determine size and depth of absorption field.

Parking Area--Graded aggregate base material vehicle parking lot 50m x 50m, placed between the classroom and the nearest ammunition distribution building.

Entrance Road--Graded gravel road from the entrance of the range to the last (8th) range, estimated 17,500 SM.

Fencing-- Fencing around range complex (minimum length required to control and protect range support facilities);

Erosion control structures (drainage ditches, pipe culverts, washes, and small bridges as required).

#### Additional Overall Requirements

The firing lines for the machine gun range shall consist of a 1.25m high berm with a 2m plateau on top that is centered on and extend along the entire length of the zero meter line. The side of the berm shall be cut at a 1:2 slope with walk-in fighting positions so the front end of the fighting position is at the zero meter line. One meter wide steps made of concrete, mortared rock or timbers shall be placed into the side of the berm centered on the right firing lane limit of odd numbered lanes.

Boundary markers will be placed on each range to mark right and left limits.

Dirt berms will be constructed as backstops, as needed.

#### 4.1.3 Base Bid - Design, layout, and construct the following training ranges

- One (1) Rifle Range: 25 shooting lanes (3m between firing positions) using the “300 meter known distance Range, with 25 KDR 120 targets with bang board” as a general model in the Army’s range manual, TC 25-8 (need 3m between positions). Contractor shall clear, level and grade smooth the range site. Dig out target line to keep level with firing positions (see side view of target line- attachment). Construct concrete retaining walls at the excavated target line. A dirt berm will be constructed as the “back-stop” of the range. Approximate range area: 75m (width) x 300m (length).

- o Number of targets, and distance from firing points. 25, on target line, see Appendix J.
- o Type of targets will be the rail system. See Appendix J.
- o Firing points will be as laid out on range plan. See Appendix N.
- o In front of each target there will be a 50 mm x 100 mm slot to insert a target on a stick.

- One (1) Pistol Range: 5 shooting lanes (8m between firing positions) using the “Combat Pistol Qualification Course” as a model in the Army’s range manual, TC 25-8. Firing position markers will also be placed every 2m (a total of 22/23) to accommodate for alternate range configuration when needed. PVC target stands (request no concrete foundation), for the 22/23-position configuration, shall be placed at 10 meters and 25 meters. Contractor shall clear, level and grade smooth the range site. A dirt berm will be constructed as the “back-stop” of the range. Approximate range area: 45m (width) x 80m (length). Boundary markers will be placed on each range to mark right and left limits.

- One (1) Heavy Machine Gun Range: 5 firing positions using the “Automated Sniper Field Fire Range” as an approximation in the Army’s range manual, TC 25-8. Targets will be placed by ANA personnel. Contractor shall clear; level and grade smooth the range site. A dirt berm will be constructed as the “back-stop” of the range. Range area: Width = as small an area as possible (area may “fan out” from firing positions to targetry to minimize range firing position “footprint”); Length = 1,000m. Boundary markers will be placed on each range to mark right and left limits. The firing lines shall consist of a 1.25m high berm with a 2m plateau on top which is centered on the zero meter line.

- One (1) RPG/SPG Range: Five (5), 10-meter wide firing positions. Targets will be placed by ANA personnel. Soil berms will separate firing lanes. A soil berm will also be constructed as the “back-stop” of the range. Approximate range area: 50m (width) x 1000m (length). The soil berm width will also need to be accounted for in total range width. Boundary markers will be placed on each range to mark right and left limits.

- One (1) Mortar Range: Five (5) firing position mortar range. Targets will be placed in the impact area by ANA personnel. Range area: Width = based on safety evaluation (area may “fan out” from firing positions to targets to minimize range “footprint”); Length = approximately 2,000m.

- One (1) Hand Grenade Familiarization Range: Four (4) throwing bays using the “Hand Grenade Familiarization Range” as a model in the Army’s range manual, TC 25-8. Targets will be placed by ANA personnel. Approximate range area: 100m (width) x 50m (length). Boundary markers will be placed on each range to mark right and left limits. An additional protection is required for the observation tower of this range.

- One (1) Fire and Movement Range: Two (2) movement lanes using the “Fire and Movement Range” (Figure D-29) as a model in the U.S. Army’s Range Manual, TC 2-8. Targets will be placed by ANA personnel. Approximate range area: 150m x 150m. Boundary markers will be placed on each range to mark right and left limits

- One (1) Urban Combat Area: Three lane course using the “Urban Assault Course” (Figure D-21) model in the U.S. Army’s Range Manual, TC 2-8. Do not construct Stations 4 and 5. Place dirt berm 75m behind, and perpendicular to, the 4 dirt berms that make up the course lanes. This dirt berm will run the width of the entire course, and will extend at least 10m past the 2 dirt berms that mark the left and right perimeters of the course. Targets will be placed by ANA personnel. One dirt berm will also be constructed as the “back-stop” (perpendicular to the firing lane berms) of the maneuver area. Range Area: Approximately 150m (width) x 200m (length).

- Note: The construction of buildings 1, 2 & 3 for station One, buildings 1, 2, 3, 4, 5, 6 & 7 for station Two, and building for station Three shall be considered as option. Please refer to Appendix W.

- One (1) Un-Exploded Ordnance and Demolition pit or area. This area will be used to dispose of unexploded ordnance (UXO). The area shall be a circular area with a diameter of at least 50 meters and be surrounded with a 5 meter high berm. The pit area shall have one access road into the area through the berm on the down range side. There shall be a missile proof shelter located outside the berm to provide shelter for the soldiers during detonations. See Appendix P for details.

5. Option Items –

5.1.1 Graded gravel main road to the range facilities from the ANA garrison, estimated quantity 10,000 SM.

5.1.2 Graded gravel road from last (8th) range around the perimeter of the range complex, estimated quantity 50,000 SM.

5.1.3 Lighting on roads to ranges, mess areas, latrines, buildings, and towers, and between the fence and road surrounding the entire range complex (Lump Sum quantity).

5.1.4 Provide and install chlorination system to provide potable water in accordance with the provisions of Section 1015.

5.1.5 Provide and install electrical utility connection to the Afghanistan National Army Garrison at Camp Gamberi in accordance with the provisions of Section 01015.

5.1.6 Infantry Squad Battle Course (ISBC): The ISBC will be located as directed by the Contract Officer Representative (COR) in conjunction with the ARSIC engineer to ensure an adequate safety zone. The ISBC range will include a one meter high by 200 meter long berm at the range entrance and a two meter high by 200 meter long berm one KM from the entrance with metal signs (two meter by two meter at each end of the berm) mounted on top of the two meter berm with appropriate markings to identify the ISBC range limit. The ISBC range shall also include a covered mess and an observation tower equivalent to the covered mess and the observation towers to be constructed at the base bid ranges.

5.1.7 Classroom – Provide one concrete masonry unit or 3D Panel building of about 8m X 28m X 3.75 m high. The contractor shall provide the foundation, floor slab, electrical, mechanical, and related items for a functional facility. The building shall have ceiling, floor and wall insulation, interior wall finishes, windows with interior blinds, two interior office/storage areas 3m X 4.2m with a 3 meter ceiling height. Building lighting design shall allow for flexible set up and use of the main room. Provide ceiling fans and electric resistance fan type heating units. The main room shall be provided with a lecture area on one end and shall be designed to accommodate large group training or several small group activities. Provide building with water for janitorial use inside the building. Provide a minimum of two weather proof, freeze-proof hose bibs with concrete slabs outside the building. Protect hose bibs by four bollards. Contractor shall raise two existing communication and one electrical manhole to finished floor level and install new trap-door style covers to provide access.

The structure shall be constructed of reinforced CMU block or 3D Panel. If CMU walls are constructed, the walls shall have a continuous bond beam at the top and vertical reinforcement to meet seismic requirements. The exterior walls shall be finished with stucco, and the interior walls shall be plastered. The contractor shall paint the exterior and interior walls surfaces. The ceiling construction material will be subject to the approval of the COR. Windows shall be insulated pre-finished aluminum with a thermal break frame and sash. All doors shall be commercial solid core exterior grade in metal frames. Hardware shall be heavy duty and match the door use. The floor slab shall be a reinforced concrete slab with a grade beam to meet seismic requirements. Floor foundation and slab shall be designed based on geotechnical investigation by the Contractor. The roof structure shall be steel with metal roofing panels that are continuous from the ridge to the eave. The roof slope shall be at least 4:12.

The main room of the classroom facility shall be capable of holding 50 soldiers seated. Contractor shall provide a lockable office and storage room. The concrete floor shall be sealed or surfaced to protect the surface and to control dust. The general lighting shall be a system of light of which half can be turned off for lecture classes. The lighting over the speaker area shall be controlled separately from the general lighting.

5.1.8 Provide a second generator with a synchronizer to power to share load with the original generator providing power to the ranges.

5.1.9 Range Control Facilities:-- The Range Control Facility (Range Operations Center) provides office space for personnel conduct training exercises and space for the installation for required electronics and communications equipment. Please refer to Appendix V for more details.

No fiber optic is required for this building.

## 6.0 PROJECT INFRASTRUCTURE REQUIREMENTS

### 6.1 SITE PLANNING

The Contractor shall prepare a site boundary survey and site plan based on information contained in the Request for Proposal. The development of the master plan will include participation in several design charrettes conducted at the Afghanistan Engineer District Headquarters Office in Kabul. Contractor shall verify all space requirements and code compliance in accordance with sections 1010 and 1015 of this contract. The final layout of the ranges and support facilities will be determined at the design charrette, after the demining is complete for the entire area within the boundary, as well as the range road and surrounding area for the firing pits and support facilities.

The site coordinates of the range firing pits, range road, and range support facilities shall be provided by the COR after the area has been demined by the UXO Contractor. The individual range orientation and siting shall be adjusted during the charrettes to ensure safety clearances, and to maintain the safety fans within the ROE (Right Of Entry).

### 6.2 DEMOLITION AND GRADING

#### 6.2.1 Minor Site Demolition

Minor site demolition is required prior to construction of new work. Grading at the site is required and shall conform to requirements within references herein.

#### 6.2.2 Crushed Stone

Native crushed stone 100 mm thick shall be placed around all buildings, from the building wall or building landscaping out 2m and all areas of anticipated foot or vehicle traffic to reduce erosion and to provide dust control. Graded, aggregate paved walkways shall be installed between buildings and parking areas.

## 6.3 WATER SYSTEM

### 6.3.1 Non-potable Water

Design a non-potable Water System (WS), to include a groundwater well protected in an enclosed, heated water well house as a source for water, water storage tank, and to deliver the water booster pumps with hydro-pneumatic tank, and underground pipe distribution network system. The WS shall be constructed to deliver a minimum 345-414 kPa (50-60 psi) at a flow rate that is twice the required daily demand. Water Average Daily Demand (ADD) shall be calculated by multiplying the effective population given in paragraph 6.4.2 by daily per capita water for washing and sanitation (95 liters or 25 gallons). Then, to account for future growth and peak demand, this quantity shall be further multiplied by a "Capacity Factor" of 1.5 per UFC 3-230-07G, paragraph 1-3 and UFC 3-230-03G, paragraph 3-1. Well house and water distribution piping shall be designed for eventual conversion to a potable water system by means of adding a chlorination system. All safety setback from fuel and fuel storage and sanitary sewer piping and storage (UFC 3-240-04a) shall be observed.

### 6.3.2 Storage Tanks

Water storage tanks shall provide capacity for a minimum of 100 percent of the required daily demand. The ground storage tank (no elevated tanks) and distribution system shall be designed to provide a minimum 276 kPa (40 psi) at ground level at all points in the delivery system. Minimum pressures of 207 kPa (30 psi) under peak domestic flow conditions can be tolerated in isolated areas, as long as all peak flow requirements in the entire system can be satisfied. Maximum water pressures in distribution mains and service lines shall not exceed 517 kPa (75 psi) at ground elevation. Water demand required for fire fighting and for irrigation and landscaping needs shall not be included in design demand calculations.

#### 6.3.3 Availability

It is acknowledged that water may not be available at the site despite contractor good faith efforts to find it. The Contractor shall drill a minimum of two wells; each well shall be capable of 2,800 gpd, at the site to a minimum depth of 400 feet (122m). If this is done without result, the Contractor will be considered to have fulfilled the terms of the contract and will be entitled to the full price of the contract CLIN for well drilling. However, the Contractor must still furnish all other parts of the water distribution system as described in section 01015 of the specifications.

#### 6.3.4 Dry Wells

Dry wells must be de-commissioned in accordance with ASTM D 5299. The Contractor must submit a written plan for de-commissioning wells.

### 6.4 SANITARY SEWER SYSTEM

#### 6.4.1 Design & Construction

The sanitary sewer collection and treatment system shall be designed and constructed by the Contractor. The sanitary sewer collection system shall consist of gravity sewer pipe network and accessories such as manholes, cleanouts, and building service connections. Conduct surface terrain (sloping) and a soils investigation necessary to design and construct a septic tank and absorption field. Observe all safety separation and cross over measure with respect to water line to facilitate future conversion to a potable water system

#### 6.4.2 Population

The water and sanitary sewer systems shall be designed to accommodate demand for a population estimated at a Company level strength of 112 people.

#### 6.4.3 Geotechnical

Geotechnical investigation of the proposed sewage treatment site is required and the contractor shall design the sewage treatment system to be compatible with site and soil conditions.

#### 6.4.4 Capacity

System capacity shall be calculated based on a hydraulic waste load equivalent to 80 percent of the water usage rate.

#### 6.4.5 Gravity Collection System

The gravity sewer collection system shall connect to a septic tank and absorption field effluent disposal system.

##### 6.4.5.1 Site Survey

The Contractor shall conduct a topographic survey to determine existing site characteristics. The Contractor shall conduct a utility survey to determine the locations of any nearby water lines, wells, sanitary sewers, storm sewers and electrical lines.

#### 6.4.5.2 Percolation Testing

At proposed sites for holding ponds and the absorption field, the Contractor shall perform percolation tests. Percolation testing may be carried out with a shovel, posthole digger, solid auger or other appropriate digging instruments. Percolation tests shall be accomplished uniformly throughout the area where the absorption field is to be located. Percolation tests determine the acceptability of the site and serve as the basis of design for the liquid absorption. Test results for soil will determine the number of minutes required for water to drop a distance of 25mm, and results shall be provided in units of m<sup>2</sup>/liters/day.

#### 6.4.5.3 Sanitary System Layout

The Contractor shall design a sanitary system layout following requirements of Section 01015 this contract. Pipe, fittings, and connections shall conform to the respective specifications and other requirements as listed in Contract Section 01015 and all its referenced codes. System shall conform to all safety setbacks and crossing precautions with respect to water line, in order to facilitate eventual conversion to a potable water system.

#### 6.4.6 Septic System Design

The Contractor shall design a septic tank and absorption field system including all tank geometry, hydraulic loading, inlet and outlet configurations, number of compartments and related site preparation and earthwork. Design will be per specifications provided in Section 01015.

##### 6.4.6.1 Location of Central Septic Tank

Septic tank shall be provided and installed underground and positioned at a location with road access for pumping trucks. The Contractor shall provide protection for the septic system by ensuring that vehicles, material storage, and future expansion shall be kept away from the area. Signage or other prevention methods (i.e. pipe bollards) shall be used to provide this protection. Provide 5% slope for distance of 3m around tank to ensure that storm water runoff drain away from the site to prevent ponding, inflow, and infiltration.

##### 6.4.6.2 Septic Tank & Absorption Field

Design covers a septic tank & absorption field. However, if available real estate constrains construction of this facility, other engineering solutions shall be brought to the Contracting Officer for consideration and approval.

#### 6.5 SITE ELECTRICAL DISTRIBUTION SYSTEM

The contractor shall design an electrical power system to supply and distribute power (to include fuel storage tank, and underground electrical distribution) to all facilities included in the contract. The contractor shall provide: 1) generators with fuel storage to provide power to the site as the prime source; and 2) an underground electrical distribution system. For details of the electrical power system see Section 01015: TECHNICAL REQUIREMENTS.

All electrical design and installation shall meet NEC (NFPA 70) requirements. Conductors and circuits shall be sized for the specific loads. Primary voltage shall be 20,000/11,550 V, 50 hertz. Secondary voltage shall be 220/380 V, 50 hertz.

The contractor shall provide all necessary materials and equipment including temporary power, as required, to provide power to the new classroom, weapon breakdown/ammo distribution building, security detail office building, guard shack, observation towers, covered mess areas, security perimeter, roads, parking areas, other common areas, and latrines.

If the local electrical distribution system is used, contractor shall be responsible for step down transformer and grounding from the closest distribution line.

## 6.6 LIGHTING (OPTION)

General lighting shall be provided as indicated (length of road, covered mess, tower, generator bldg, latrines, offices areas, and to the 50 M line) and shall meet recommendations from IESNA for each building type and function within each building. Design and installation shall meet NEC 70 requirements.

Exterior lighting shall be high intensity discharge luminaries on 10 meter high minimum galvanized steel poles.

## 6.7 COMMUNICATIONS

A communication system shall be provided between the range control building and the guard towers and guard shack. In addition, an exterior public address system will be provided for the ranges, operated from the range control facility.

## 6.8 ROAD NETWORK, SIDEWALK, AND PARKING

### 6.8.1 Design & Construction

The Contractor shall design and construct the entire road and parking network. The roads shall be designed to carry traffic of up to a 7 ton, three-axle vehicle. A storm drainage system shall also be included. The road layout shall provide access to range facilities to include observation towers and covered mess areas, classroom, ammunition breakout building, utility & storage building, security detail office building, guard shack, water well, pump house, and water tank, septic tank, and trash collection point. Provide parking areas for vehicles for the following facilities at the compound: Control towers, covered mess areas, well pumping station and storage tank, latrine facilities, classroom, weapon breakdown and ammo distribution building, and rear areas of individual ranges.

### 6.8.2 Technical Requirements

Road design shall be designed per Section 01015, Technical Requirements. Roadways and sidewalks are required as shown in Appendix L and shall be designed and constructed based upon recommendations from geotechnical analysis required herein.

### 6.8.3 Project Requirements

Design and construct approximately 1 km of 9m-wide roadway connecting the ANA Garrison Camp Gamberi to its range complex. Roads shall also be provided to connect the ranges and encircle the range complexes. The road from the main base to the range complex shall consist of a sub-base to be scarified, reshaped and compacted before placing the top layer, then a 200mm aggregate surface course with a 3% slope off the crown for drainage. The roads within the range complex shall require only a 150mm aggregate surface course. New roads shall include drains and grading as required. See Appendix L.

## 6.8 TRASH POINT

The Contractor shall design, in a location convenient for easy removal, a trash collection point. It shall be located near the range mess area. The trash point shall be a 1.8 m x 1.8 m concrete pad with a minimum 100mm thickness and with a 1.8 meter tall chain link fence around the perimeter. One side shall have a 1.2 m wide gate entrance. Trash Point shall have a metal roof covering.

## 6.10 HVAC, HEATING VENTILATION AIR CONDITIONING

Environmental control of the facilities shall be achieved by HVAC equipment proposed by the contractor and approved by the U.S. Government. See section 01015 for scope of work required.

#### 6.11 LIFE SAFETY

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

#### 6.12 FENCING AND BARRICADES

Fencing shall consist of the types shown or described herein. Barricades shall be as shown. Refer to drawings for required types and locations. Barricades are not intended to resist a certain horizontal load and are not required to be permanently anchored to ground.

#### 6.13 FOUNDATION DESIGN

Foundations, including sub grade, shall be designed and constructed based on recommendations from the geotechnical investigation required herein.

#### 7.0 COMPLETION OF WORK

All work required under this contract shall be completed within 365 calendar days including government review time from Notice to Proceed for site work. Site work construction will not be allowed to proceed until demining is complete. Liquidated damages in the amount of \$1976.65 shall be assessed for every calendar day beyond the scheduled contract completion date and charged to the Contractor.

#### 8.0 SPARE PARTS

Contractor shall provide a list of spare parts to COR for approval.

#### 9.0 REFERENCES

Refer to Section 01015 for required references.

- End of Section –
- Appendices
- Appendix A- Observation Tower
- Appendix B- Covered Mess
- Appendix C- Modified Qualifying Pistol Range
- Appendix D- Layouts
- Appendix E- Modified Automatic Weapons Range
- Appendix F- Classroom
- Appendix G- Throwing Bay
- Appendix H- Target Photos
- Appendix I- Jalalabad Topography
- Appendix J- Target Line Dugout
- Appendix K- Latrine
- Appendix L- Road Cross Section Drawing
- Appendix M- Zero Surface Danger Zone
- Appendix N- Range Layout Presentation
- Appendix O- Shooting Range Plan Layout
- Appendix P- UAC Surface Danger Zone
- Appendix Q- QCS Certificate

Appendix R- KDR 120\_96  
 Appendix S- KD Target flyer  
 Appendix T- Range Clearance by Others  
 Appendix U- Guard Shack  
 Appendix V- Range Control Facility  
 Appendix W- Urban Combat Area

### SECTION 01015

#### SECTION 01015

#### TECHNICAL REQUIREMENTS

##### 1.0 GENERAL

##### 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.

##### 1.4 SAFETY

##### 1.4.1 Unexploded Ordnance (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, Hansie Heymans, Chief Information Officer,  
 Email: [sediq@unmaca.org](mailto:sediq@unmaca.org) Email: [hansie@unmaca.org](mailto:hansie@unmaca.org)  
 Cell: +93 070 295207 Cell: +93 070 294286

##### 1.4.2 Explosives Safety

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.

#### 1.4.3 Activity Hazard Analysis (AHA) briefings

Activity Hazard Analysis's shall be prepared in accordance with the Corps of Engineers Safety and Health Requirements Manual, EM 385-1-1.

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.

#### 1.4.4 Notification of Noncompliance

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

### 1.5 LIMITATION OF WORKING SPACE

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

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

### 1.6 TEMPORARY STRUCTURES

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

## 1.7 SUBCONTRACTORS

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

## 1.8 LIST OF CODES AND TECHNICAL CRITERIA:

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

AABC - Associated Air Balance Council (National Standards for total System Balance)  
 ACI 318 Building Code Requirements for Structural Concrete (latest edition), American Concrete Institute  
 Air Force Manual 32-1071, Security Engineering, volumes 1-4, 1 May 1994  
 American Water Works Association, ANSI/AWWA C651-99 standard  
 ARI - Air Conditioning and Refrigeration Institute  
 ASCE 7-02, Minimum Design Loads for Buildings and Other Structures, 2002  
 ASHRAE - American Society of Heating, Refrigeration and Air-Conditioning  
 Engineers 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), 2002 edition  
 NFPA 10, Portable Fire Extinguishers, 2002 edition  
 NFPA 30, Flammable and Combustible Liquids Code, 2003 edition  
 NFPA 70, National Electrical Code, 2005 edition  
 NFPA 72, National Fire Alarm Code, 2002 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, 2006 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

TM 5-811-1 Electrical Power Supply and Distribution  
 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 3-260-02, Pavement Design for Airfields, 30 June 2001  
 UFC 1-300-09N, Design Procedures, 25 May 2005  
 UFC 3-310-01, Structural Load Data, 25 May 2005  
 UFC 3-400-01, Design: Energy Conservation, 5 July 2002  
 UFC 3-410-01FA 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 4-021-01, Design and O&M: Mass Notification Systems, draft 1 May 2006  
 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 710, Exhaust Hood for Commercial Cooking Equipment, latest edition  
 UL 737, Fireplace Stoves, latest edition  
 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

## 1.9 DESIGN NOTES

Any floor plans that have been provided will need to be site adapted for orientation, access, utilities, etc. The plans provide a relationship of spaces and rough sizes. Resolve all conflicts with the Contracting Officer prior to finalizing the site plan.

## 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 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.

## 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 Boundary Survey of proposed range areas located at Camp Gamberi near the city of Jalalabad, of Nangarhar, Afghanistan. Site survey shall show closure of the property boundary consisting of identifying all property corners, establishing horizontal and vertical controls, and 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 41N in decimal degrees. Survey design shall include a topographic map showing locations of all existing 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, and Bunker locations. The Contractor shall identify and show any existing perimeter security walls, fences, hesco barriers, guard towers and entry control point structures.

On the site plan, the Contractor shall locate proposed facilities in general agreement with 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 easy access for maintenance, emergency, and fire fighting vehicles. 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 the 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 41 N

### 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 is property of the Afghan 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 Afghan Government to remove or salvage.

### 2.3.3 Site Grading and 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, the erosion protection is required. 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, 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 Range Roads

Aggregate roads are required. All roads shall be of wearing surface 9 meters 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

Contractor shall construct parking and storage areas using aggregate surface. Sub grade 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.

### 2.3.5 Fencing

#### 2.3.5.1 Fabric

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

#### 2.3.5.2 Gates

Fence gates shall be swing type. Vehicle gates shall be a pair of 3.65 m wide x 2.4 m high leafs, 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 leafs shall not rack or deflect when installed on its hinges. 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.

#### 2.3.5.3 Reinforced Barbed Tape or Concertina Wire

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

#### 2.3.5.4 Outriggers / Y-Channel

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

## 2.4 CIVIL UTILITIES

### 2.4.1 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.

### 2.4.2 Water

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) is derived from water needs for washing and sanitation only (no drinking) of 95 liters per capita per day (lpcd) or 25 gallons per capita day (gpcd) multiplied by the effective population given

in Section 1010, then by a capacity factor of 1.5 to account for future growth and peak demand, per UFC 3-230-07a, paragraph 1-3 and UFC 3-230-03a, paragraph 3-1. In the event potable or non-potable use water is required prior to completion of the water facilities infrastructure the Contractor may be issued a Request for Proposal to provide non-potable (tank truck) and potable (bottled or other reliable source) consumption. Provide a minimum of one (1) outside water hydrant (hose spigot) for any building or facility for which a water supply is provided for landscaping purposes.

2.4.2.1 Water Quality Sampling and Analysis

The Contractor shall perform water quality sampling and testing at the source. The Contractor shall utilize well-qualified and equipped testing capability in the project site area, if available. If professional testing services are not available in the area, the Contractor will submit an alternative practical testing source for approval. Raw water quality criteria for Water Quality and Criteria Standards, and shall address the following:

WATER QUALITY ANALYSIS TABLE

Physical Characteristics

Color	Temperature
Threshold odor number	pH value
Turbidity	

Chemical Characteristics (Expressed as mg/L)

Arsenic	Total Hardness as CaCO(3)
Barium	Cadmium
Chromium	Copper
Lead	Mercury
Selenium	Silver
Zinc	Sulphates as SO(4)
Fluoride as F	Chlorides as Cl
Manganese as Mn (dissolved and total)	Conductivity
Iron as Fe (dissolved and total)	Nitrites as NO(2)
Total Dissolved Solids	Nitrates as NO(3)
Total coliform/fecal coliform (bacteria)	

2.4.2.2 Well House

At new wells or springs, construct a permanent well house with concrete slab floor. The floor of the well house shall slope away from the casing approximately 3 mm per 300 mm (1/8" per foot) and drain to the outside. Floor of well house shall be minimum 150mm above adjacent grade. The well house design should be such that the well pump, motor and drop pipe could be removed readily. Provide an insulated roof hatch above with a hasp and lock. The well house shall protect valves and pumping equipment plus provide freeze protection for the pump discharge piping beyond the check valve. The well house shall be insulated and a heating unit installed. The entry door shall be made of heavy duty metal and metal frame with no louvers. The well shall be protected from unauthorized use by a security fence with lockable gate. Provide outriggers, barbed wire and concertina wire on fence and gate. See Appendix A for Well House design drawings. The piping and electrical utilities shall be designed so as permit future addition of a chlorination system.

2.4.2.3 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.

2.4.2.4 Service Booster Pumps  
(Direct Pressure System Pending Engineering Site Investigation)

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 hydro-pneumatic tank. Each booster pump, two (2), shall be capable of delivering 2 times (2x) the ADD. 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.

#### 2.4.2.5 Water Storage Tank

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

#### 2.4.2.6 Disinfection & Chlorination System (Optional Item)

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

#### 2.4.2.7 Chlorine Shelter (Optional Item)

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.

### 2.4.3 Water Distribution System

#### 2.4.3.1 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 140kPa (35psi) 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 flushing valves installed for periodic flushing of the line. Any pipe with a flush valve 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.

#### 2.4.3.2 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.

#### 2.4.3.3 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.

#### 2.4.3.4 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.

#### 2.4.3.5 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:

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

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.

#### 2.4.3.6 Bacteriological Disinfection

##### 2.4.3.6.1 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.

##### 2.4.3.6.2 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.

##### 2.4.3.6.3 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.

##### 2.4.3.6.4 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.

##### 2.4.3.6.5 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.

##### 2.4.3.7 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.

#### 2.4.3.7.1 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.

#### 2.4.3.7.2 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.

#### 2.4.3.7.3 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.

### 2.4.4 Sanitary Sewer

#### 2.4.4.1 General

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

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

#### 2.4.4.2 Protection of Water Supplies

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

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

2.4.4.2.2 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).

2.4.4.2.2 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 encased in concrete.

#### 2.4.4.3 Quantity of Wastewater

The Contractor shall derive average daily flow by taking 80% of the Average Daily Demand (ADD). 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.

#### 2.4.4.4 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.

#### 2.4.4.5 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.

##### 2.4.4.5.1 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.

#### 2.4.4.5.2 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.

#### 2.4.4.5.3 Pipe Connections

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

#### 2.4.4.5.4 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.

#### 2.4.4.5.5 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.

#### 2.4.4.6 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.

##### 2.4.4.6.1 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.

##### 2.4.4.6.2 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.

##### 2.4.4.6.3 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.

##### 2.4.4.6.4 Cover

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

##### 2.4.4.6.5 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."

##### 2.4.4.6.6 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 whenever possible.

#### 2.4.4.7 Field Quality Control

##### 2.4.4.7.1 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.

##### 2.4.4.7.2 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.

#### 2.4.5 Septic Absorption Field

Design an absorption field sized for an expected population of 112 peronnel per paragraph 2.4.5.5.2.

##### 2.4.5.1 Site Survey

The Contractor shall conduct a topographic survey to determine existing site characteristics. The Contractor shall conduct a utility survey to determine the locations of any nearby water lines, wells, sanitary sewers, storm sewers and electrical lines.

##### 2.4.5.2 Percolation Testing

At proposed sites for holding ponds and the absorption field, the Contractor shall perform percolation tests. Percolation testing may be carried out with a shovel, posthole digger, solid auger or other appropriate digging instruments. Percolation tests shall be accomplished uniformly throughout the area where the absorption field is to be located. Percolation tests determine the acceptability of the site and serve as the basis of design for the liquid absorption. - Percolation tests will be made as follows (see Figure 1).

6 Six or more tests will be made in separate test holes uniformly spaced over the proposed absorption field site. The average of the six tests shall be determined and will be used as the final result. The location of each test shall be clearly and accurately shown on the site plan submitted to AED.

7 Dig or bore a hole to the required depth of the proposed trenches or bed, with dimensions necessary to enable visual inspection during percolation testing.

Carefully scratch the bottom and sides of the excavation with a knife blade or sharp-pointed instrument to remove any smeared soil surfaces and to provide natural soil interface into which water may percolate. Add 50 mm of gravel (of the same size that is to be used in the absorption field) to the bottom of the hole. In some types of soils the sidewalls of the test holes tend to cave in or slough off and settle to the bottom of the hole. It is most likely to occur when the soil is dry or when overnight soaking is required. The caving can be prevented and more accurate results obtained by placing in the test hole a wire cylinder surrounded by a minimum 25 mm layer of gravel (of the same size that is to be used in the absorption field.).

Carefully fill the hole with clear water to a minimum depth of 300mm above the gravel or sand. Keep water in the hole at least 4 hours and preferably overnight. In most soils it will be necessary to augment the water as time progresses. Determine the percolation rate 24 hours after water was first added to the hole. In sandy soils containing little clay, this pre-filling procedure is not essential and the test may be made after water from one filling of the hole has completely seeped away.

2.4.5.3 The percolation rate measurement is determined by one of the following methods:

If water remains in the test hole overnight, adjust the water depth to approximately 150 mm above the gravel. From a reference batter board, as shown in Figure 1, measure the drop in water level over a 30-minute period. This drop is used to calculate the percolation rate.

2.4.5.3.1 If no water remains in the hole the next day, add clean water to bring the depth to approximately 150mm over the gravel. From the batter board, measure the drop in water level at 30-minute intervals for 4 hours, refilling to 150mm over the gravel as necessary. The drop in water level that occurs during the final 30-minute period is used to calculate the percolation rate.

2.4.5.3.2 In sandy soils (or other soils in which the first 150mm of water seeps away in less than 30 minutes after the overnight period), the time interval between measurements will be taken as 10 minutes and the test run for 1 hour. The drop in water level that occurs during the final 10 minutes is used to calculate the percolation rate.

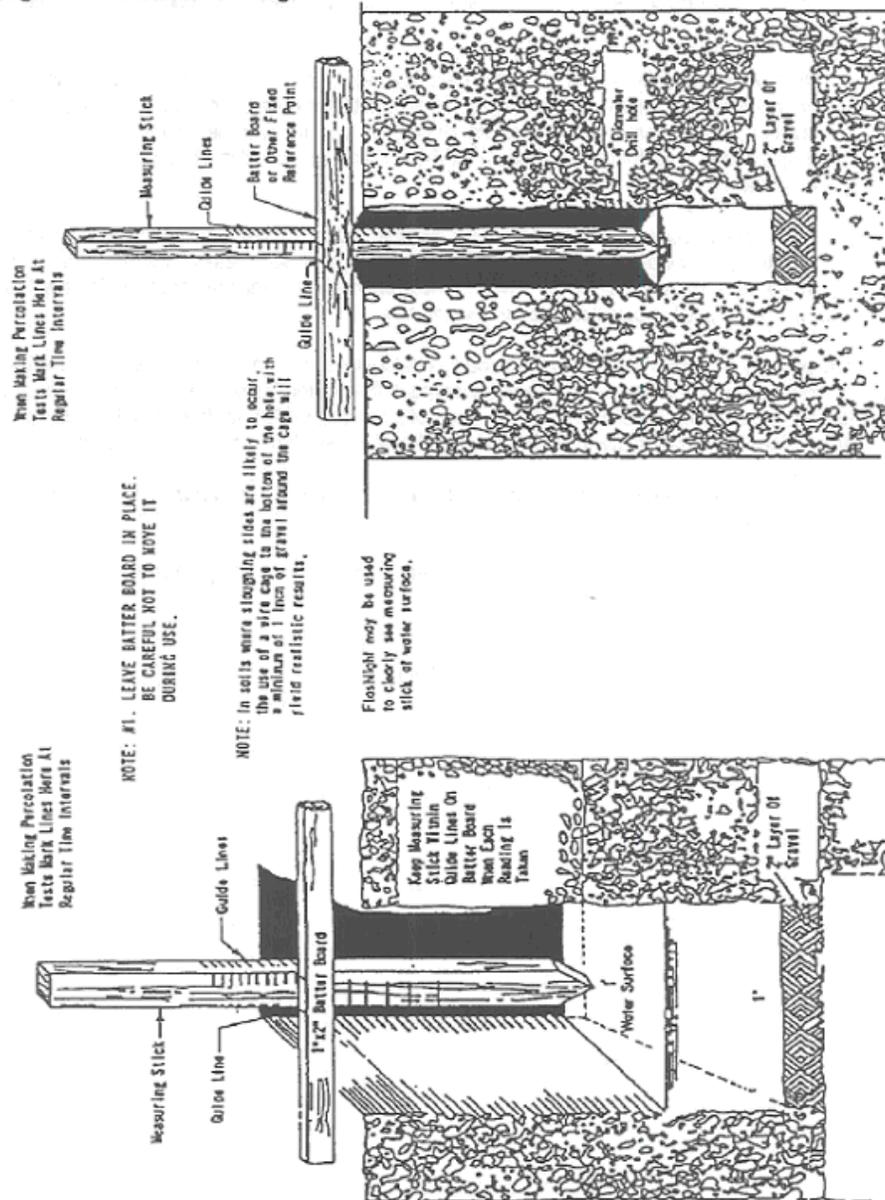
The percolation rate is the number of minutes it takes to drop 25 mm. Table 2 lists percolation rates and the corresponding absorption field sizing factor (liters/m<sup>2</sup>/day). The sizing factors are used, in conjunction with average daily demand (ADD), to determine the size of the absorption field.

2.4.5.4 Example: Calculating the percolation rate:

2.4.5.4.1 In 30 minutes, the measured drop in the water level is 15 mm.

2.4.5.4.2  $\text{Minutes}/25\text{mm} = \text{Time}/(\text{drop}/25\text{mm}) = 30 \text{ minutes}/(15\text{mm}/25\text{mm}) = 50 \text{ Minutes}/25 \text{ mm}$ , where  
 $\text{Minutes}/25\text{mm} = \text{Minutes for water to drop } 25 \text{ mm}$ .

Figure 1. Percolation Testing.



#### 2.4.5.5 Septic System

Generally when determining an appropriate septic tank location, the Contractor shall provide protection for the septic system by ensuring that vehicles, material storage, and future expansion shall be kept away from the area. Signage or other prevention methods (i.e. pipe bollards) shall be used to provide this protection. The finished grade for the site shall ensure that storm water runoff shall drain away from the site to prevent ponding, inflow, and infiltration. Once an appropriate site is located, the Contractor shall conduct soil investigations for the site to determine ground water levels, soil conditions, and the percolation rate.

#### 2.4.5.5.1 Septic Tank

Septic tanks are buried, watertight receptacles design and constructed to receive and partially treat wastewater. The tank separate solids from the liquid, provides limited digestion of organic matter, stores solids, and allows the clarified liquid to discharge for further treatment and disposal. Settle able solids and partially decomposed sludge accumulate at the bottom of the tank, while scum rises to the top of the tank's liquid level. The partially clarified liquid is allowed to flow through an outlet opening position below the floating scum layer. The clarified liquid will be disposed of to the absorption field for further treatment and disposal.

Factors to be considered in the design of a septic tank include tank geometry, hydraulic loading, inlet and outlet configurations, number of compartments and temperature. If a septic tank hydraulically overloaded, retention time may become too short and solids may not settle properly.

For Afghanistan, a balled multi-compartment or dual chamber design shall be utilized. Refer to Attachment A for further details. The septic tank shall be designed with a length-to-width ratio of 2:1 to 3:1 and the liquid depth should be between 1.2 m and 1.8m. This depth is determined by the outlet pipe invert elevation. If not specified in the contract, the septic tank shall be sized based on the average daily demand of 190 liters/capita/day, plus an additional 100% for sludge storage capacity and peak flows. The tank shall be constructed of reinforced, cast-in-place concrete, with a minimum compressive strength of 21MPa at 28 days. Wastewater influent and effluent shall enter and exit on the short sides of the tank, which will allow the wastewater longer detention and settling time. The baffle tank shall have two compartments, with the first compartment (influent entry point) having 2/3 thirds the volume capacity of the tank. The tank shall have a minimum earth backfill cover of 300mm. Access shall be provided at the entry (influent) and exit (effluent) points of the tank by installing reinforced concrete risers, with steel access hatches, that will rise 50mm above the finished grade. The following is an example of how to determine the volume and dimensions of the septic tank.

(a) Example: Size a Septic Tank – for a design population of 100 capita at 152 liters/capita/day (80% of 190 liters/capita/day)

Assume that tank volume and dimensions are not specified in the contract.

$V = ADDP * c * 2 = 152 \text{ liters/capita/day} * \text{Capacity Factor } 1.5 * 100(\text{personnel}) * 2 = 45,600 \text{ Liters (45.6 m}^3\text{)}$ , where  
ADDP – Average Daily Demand per Person (liters/capita/day)

$C =$  design population (capita)

$2 =$  represents an additional 100% storage for sludge and peak surges

Capacity Factor of 1.5 as required by UFC 3-230-07G Paragraph 1-3 and UFC 3-230-03G Paragraph 3-1

Assume 1.8 meter liquid depth and a tank length-to-width ratio of 2:1

$A = V / 1.8 \text{ meters (liquid depth)} = 45.6\text{m}^3 / 1.8\text{m} = 25.33\text{m}^2$

$L * W = A$

$2W * W = 25.33\text{m}^2$

$W^2 = 12.66 \text{ m}^2$

$W = 3.56\text{m}$ , so  $L = 7.11\text{m}$

Inside dimensions of tank – 3600mm x 7200mm x 1800mm (liquid depth)

Always round up to the nearest 100mm for final septic tank dimensions.

#### 2.4.5.5.2 Absorption Field

Absorption fields (also termed “leach fields”) are used, in conjunction with septic tank treatment, as the final treatment and disposal process for the septic system. Absorption fields normally consist of perforated distribution pipe laid in trenches or beds that are filled with rock. Refer to attachments B or C for minimum performance requires. The septic tank effluent is distributed by the perforate pipe and allowed to percolate through the ground, where it is filtered and treated by naturally occurring bacteria and oxygen.

Once effluent is released from the septic tank, it travels by gravity through a solid 100mm diameter PVC pipe, at a minimum 1.0% slope, to the distribution box. The distribution box is a reinforced concrete structure that distributes the septic tank effluent evenly throughout the absorption field through several 100mm diameter perforated pipes.

The distribution pipe is distributed evenly over the absorption trenches or beds; the perforated pipe shall have a maximum slope of 0.5% and shall be capped at the end of each pipe. Generally, distribution piping is spaced from the one meter to 1.8 meters apart and is not longer than 30 meters.

1 The first zone is the absorption zone, which is the layer of in-situ material that filters and treats the effluent. This zone is determined to be suitable material for wastewater treatment based on the percolation test results, with a minimum thickness of 600mm. Below the absorption zone, the material is considered unsuitable soil or bed rock or the seasonal water table is too high. If percolation tests determine that there isn't a minimum 600 mm of suitable soil, the Contractor can remove the unsuitable soil to the desired depth and replace it with material determined to be suitable; however, the Contractor must get approval from the COR before attempting this.

2 The second zone is the drainage zone, which is a 300 mm thick layer of rock fill, where the distribution pipe network lies. The bottom of this zone is filled with a minimum 150 mm of 19 mm to 38 mm diameter rock. The perforated distribution pipe is laid on top of the rock. A minimum of 50 mm of rocks placed carefully over the pipe network, and then a semi-permeable membrane (geotextile fabric) is placed over the rock to prevent fine-grained backfill from clogging it.

(c) The final zone is the backfill zone. This is the upper most part of the absorption field, where backfill material is placed and is a minimum 500mm thick. The backfill material protects the lower lying zones from storm water infiltration and freezing. The Contractor shall leave a mound of backfill material above the desired finished grade to allow for settlement.

#### 2.4.5.6 Sizing the Absorption Field

Table 2 lists percolation rates and the corresponding sizing factor (liters/m<sup>2</sup>/day). The sizing factors are used in conjunction with average daily demand (ADD), to determine the size of the absorption field. The following is an example of how to calculate the absorption field size for trenches and beds:

(a) Example: Size of Absorption field – Size an absorption field for a facility with an average daily demand of 19,000 liters/day and a percolation rate of 50 minutes.

$$A = ADD * \text{Water Absorption of Soil} = 19,000 \text{ liters/day} * 0.054 \text{ m}^2/\text{liters/day} = 1,026 \text{ m}^2$$

Where,

A = Area footprint needed for the absorption field in m<sup>2</sup>

ADD = Average Daily Demand (liters/day)

Water Absorption of Soil = by looking below, at Table 2, a percolation rate of 50 minutes falls in the 46 to 60 row and the correlating sizing factor is determined to be 0.054m<sup>2</sup>/liters/day

Dimensions for trenches:

-Assume a 1 meter wide trench bottom.

-Assume maximum trench length to be 30 meters

$$N_t = A / (T_w * T_l) = 1026 \text{ m}^2 / (1 \text{ m} * 30 \text{ m}) = 34.20, \text{ say } 35 \text{ trenches at } 1 \text{ m} \times 30 \text{ m}$$

Where

N<sub>t</sub> = Number of trenches

T<sub>w</sub> = Trench width

T<sub>l</sub> = Trench length

Trench bottom area can be reduced by 20 percent if 305 mm of rock is placed below the distribution pipe. The area can be reduced by 34 percent for 457 mm of rock being placed below the pipe, and by 40% for the maximum rock depth of 610 mm. Keep in mind that the additional rock added below the distribution pipe adds additional thickness required for the drainage zone. For example, there is normally 150 mm of rock placed below the pipe for a total 300mm thickness for the drainage zone. If 305mm of rock is placed below the pipe, the total thickness for the drainage zone increases to 455 mm of rock, including 305mm below the pipe, 100 mm around the pipe, and 50 mm above the pipe.

Dimensions for bed:

Absorption Bed Dimensions =  $\square A = \square 1,026m^2 = 32.03m$ , say 32 m per side

**Table 2. Soil Treatment Areas in Square Meters.**

Percolation Rate, Minutes for Water to Drop 25 mm	Water Absorption of Soil (m <sup>2</sup> /liters/day)
Faster than 0.1	Soil too coarse for sewage treatment
0.1 to 5	0.020
6 to 15	0.031
16 to 30	0.041
31 to 45	0.049
46 to 60	0.054
Slower than 60	Soil too fine for sewage treatment

2.4.5.7 As-Builts

Upon completion of installing the sanitary sewer and septic systems, the Contractor shall submit editable CAD format As-Built drawings. The drawings shall show the final product as it was constructed in the field, with the exact dimensions, locations, materials used, and any changes made to the original design.

2.4.6 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 3-240-03, referenced edition.

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. All building exterior walls shall be constructed with reinforced CMU, insulated concrete sandwich panels, reinforced concrete or approved equivalent.

3.2 DESIGN CRITERIA

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

### 3.3 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)

### 3.4 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.

### 3.5 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.

### 3.6 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 INSULATED CONCRETE SANDWICH WALL SYSTEM (3-D BUILDING SYSTEM)

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

conformance with ACI 506R-85. Concrete finishing shall be done by appropriate hand tools (darby, trowel, etc.) to provide the desired finish effect.

### 3.8 MASONRY

Storage of masonry materials shall be in a dry place or materials shall be covered with a plastic protective layer. Cover open walls each day to keep them protected and dry. Concrete masonry units (CMU) for exterior walls shall be either 190 mm or 290 mm wide x 390 mm x 190 mm high as shown on drawings. All cells shall be fully grouted 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.

### 3.9 METAL

#### 3.9.1 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.

#### 3.9.2 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.

### 3.10 CARPENTRY

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

#### 3.10.1 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.

#### 3.10.2 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.

### 3.11 ROOFING AND WEATHERPROOFING

#### 3.11.1 Sloped Roofs

On sloping roofs provide and install .70 mm (24 gauge) galvanized steel in either corrugated or standing seam design. Metal roofing shall be anchored to the steel "Z" purlins or wood deck sub-surface using exposed fasteners at

300 mm on center at all seams and at 600 mm on center in the panel field. Fasteners shall be placed at the top of the corrugation taking care not to dent panel. Roof sealant or adhesive shall be placed over each anchor head. Roofing system shall include all edge, ridge and penetration flashings necessary for a watertight installation and as described in this section. Roofing shall be galvanized mil finish. Panels shall be overlapped two corrugations side to side and be continuous sheets from ridge to eave. Provide continuous ridge vents on all gable roofs.

### 3.11.2 Flashing & Sheet Metal

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.

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

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

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

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

#### 3.11.2.3 Downspouts & Gutters

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

#### 3.11.2.4 Wall, Floor, Ceiling Expansion Joints Over Plaster

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

#### 3.11.2.5 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.

#### 3.11.2.6 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.

#### 3.11.2.7 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.

### 3.11.2.8 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.

#### 3.11.2.8.1 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.

#### 3.11.2.8.2 Wall Capping

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

## 3.12 SEALANTS

### 3.12.1 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.

### 3.12.2 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.

### 3.12.3 Floor Joint Sealant

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

### 3.12.4 Primers

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

### 3.12.5 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.

### 3.12.6 Backstops

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

### 3.12.7 Cleaning Solvents

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

### 3.12.8 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.

### 3.12.9 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.

### 3.12.10 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.

### 3.12.11 Primer

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

### 3.12.12 Bond Breaker

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

### 3.12.13 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.

### 3.12.14 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.

### 3.12.15 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.

### 3.13 WINDOWS

#### 3.13.1 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.

#### 3.13.2 Hardware

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.

#### 3.13.3 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.

### 3.13.4 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.

### 3.13.5 Finishes

Apply baked enamel in compliance with paint manufacturer's specifications for cleaning, conversion coating, and painting. Color shall be White meeting the requirements of DIN 50018

### 3.13.6 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.

### 3.13.7 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.

### 3.13.8 Adjusting

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

### 3.13.9 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.

## 3.14 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.

### 3.14.1 PVC Doors

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

### 3.14.2 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.

### 3.14.3 Accessories

#### 3.14.3.1 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.

#### 3.14.3.2 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.

#### 3.14.3.3 Not Used

#### 3.14.3.4 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.

#### 3.14.3.5 Standard Steel Frames

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

#### 3.14.3.6 Welded Frames

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

#### 3.14.3.7 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.

### 3.14.4 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.

#### 3.14.4.1 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

#### 3.14.4.2 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.

#### 3.14.5 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.

#### 3.14.6 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.

#### 3.14.7 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.

#### 3.14.8 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.

### 3.15 GLAZING

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

#### 3.15.1 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.

#### 3.15.2 Laminated Glass

Laminated glass shall be constructed out of two, 3mm glass panes bonded together with a minimum .75mm polyvinyl-butylal (PVB) interlayer.

#### 3.15.3 Insulated Glass

Insulated glass shall be constructed of two panes of laminated glass separated by hermetically sealed 12mm airspace.

#### 3.15.4 Glazing Accessories

##### 3.15.4.1 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.

##### 3.15.4.2 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.

##### 3.15.4.3 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.

##### 3.15.4.4 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.

##### 3.15.4.5 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.

##### 3.15.4.6 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.

#### 3.15.4.7 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.

### 3.16 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.

#### 3.16.1 Exterior Concrete & Masonry Walls

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

#### 3.17 Exterior Metal Walls

Prefinished exterior metal walls are preferred. Exterior metal walls which do not have a factory finish must be primed and painted in accordance with part 3.16.6, Exterior Ferrous Metals.

### 3.18 Interior Walls

#### 3.18.1 Wet Areas

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.

#### 3.18.2 Other Areas

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

### 3.19 Ceilings

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

### 3.20 Exterior Wood Trim

All exterior wood fascia, soffit, and trim shall be clad in prefinished architectural metal.

### 3.21 Exterior Ferrous Materials

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.

### 3.22 Floors

#### 3.22.1 Wet Areas

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.

#### 3.22.2 Classrooms

Floors in classrooms shall be 300 mm x 300 mm terrazzo tile with thin set mortar. Joints shall be 2-3 mm. Waterproof gray grout shall be applied the full depth of the tile. Color of tile shall be selected by the Contracting Officer from samples provided by the Contractor.

#### 3.23.3 Other Areas

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

### 3.24 SPECIALTIES

#### 3.24.1 Toilet Paper Holders

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

#### 3.24.2 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 showers as they occur.

#### 3.24.3 Paper Towel Dispensers

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

#### 3.24.4 Light Duty Metal Shelf

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

### 3.24.5 Robe Hooks

Robe hooks on all toilet and shower stalls are required.

## 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, shotcrete 3-D panels, or reinforced concrete unless otherwise stated in sections 1010 or 1015.

### 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	280.0 kg./sq.cm (f'c) (4000psi) a minimum specified compressive strength @ 28 days (ASTM- C 39 and ACI 318) with a maximum water-cement ratio of 0.5.
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 minimum, 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] [latest] edition. A minimum cylinder 28 day compressive strength of 21 MPa (3000 psi) shall be used for design and construction of all concrete, except that 24 MPa (3500 psi) shall be used for Shotcrete applications. Reinforcing steel shall be deformed bars conforming to American Society for Testing and Materials (ASTM) publication ASTM A 615, Deformed and Plain Billet-Steel Bars for Concrete Reinforcement. Concrete at or below grade shall have maximum water-cement ratio of 0.50. No concrete shall be placed when the ambient air temperature exceeds 32 degrees C (90 degrees F) unless an appropriate chemical retardant is used. In all cases when concrete is placed at 32 degrees C (90 degrees F) or hotter it shall be covered and kept continuously wet for a minimum of 48 hours. Concrete members at or below grade shall have a minimum concrete cover over reinforcement of 75 mm (3 inch).

#### 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.

#### 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.

#### 4.10 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, or SW-SC 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 tress, 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 to include conventional compression systems, indirect and direct evaporative cooling systems and knowledge in fabricating specialized units consisting of supplemental direct expansion (DX) cooling coils in satisfying the specified indoor design conditions. The HVAC 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 evaporative cooling. The edited specifications shall be submitted along with the 65% design submittal. The specifications shall be coordinated with the manufacturer of the evaporative cool/heat units.

6.3 CODES, STANDARDS AND REGULATIONS

The equipment, materials and works covered under the 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).

Jalalabad area:

[Latitude – (approx.) 34 deg. North  
 Longitude – (approx.) 70 deg. East  
 Elevation – (approx.) 580 M (1903 ft.)  
 Summer – 39.6 deg C (103 deg F)  
 Dry Bulb (DB) [& 25.6 deg C (78 deg F)] Wet Bulb (WB)]  
 Winter – (4.6 deg C/40 deg F)  
 Daily Range – data unknown

6.4.1 Indoor Design Condition

Environmental control of the facilities shall be achieved by HVAC equipment as listed below and approved by the U.S. Government.

Facility Type	Cooling	Heating	Type of HVAC System	Remarks
Administrative Buildings	25.6 C	20 C	Ductless Split Heat Pump & Ceiling Fans	
Security Buildings	25.6 C	20 C	Ductless Split Heat Pump & Ceiling Fans	
Toilets/Latrines	NA	20 C	Electric Heat with Mech Ventilation	
Maintenance Facilities	NA	12.7C	Electric Heat with Mech Ventilation & Ceiling Fans	
Warehouses & Armories	NA	12.7C	Electric Heat with Mech Ventilation	
Workshops	NA	12.7 C	Electric Heat with Mech Ventilation & Ceiling Fans	

6.4.2 Noise Level

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

6.4.3 Internal Loads

(a) Occupancy: Use ASHRAE standards to calculate sensible and latent heat from people. In general, light/moderate office work is 73watts sensible and 45watts latent.

(b) 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).

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 EQUIPMENT

### Heating/Refrigeration 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. As a general rule, buildings over 250 SM qualifies for evaporative heat/cool units. 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.

### 6.5.1 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 NOT USED

## 6.7 FEATURES

### 6.7.1 Wall Penetrations

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

### 6.7.2 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.

### 6.7.3 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.

## 6.8 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.

Toilet and Wash Area: Minimum exhaust ventilation shall be the largest 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.

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

### 6.8.1 Submittals

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

## 6.9 ELECTRIC RESISTANCE 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, recessed mounted in wall 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.

### 6.9.3 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 Adjustments

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 Tests

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. The following readings shall be taken:
  - (1) Supply, return & outside air CMH or (CFM) supplied by each air conditioning system.
  - (2) Total CMH or (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

### 6.10.3 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.

## 6.11 CEILING FANS

### 6.11.1 Ceiling Fan

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

### 6.11.2 Submittals

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

### 6.11.3 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; drawings indicating location and installation details.

## 7.0 PLUMBING

### 7.1 SCOPE OF WORK

#### 7.1.1 General

The Contractor shall design and build domestic cold 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 sub-contractor 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 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) Eastern Water Closet with flush tank assembly. . Provide acid resisting fired porcelain enameled cast iron water closet complete with rotating No-Hub 'P' trap and No-Hub coupling to meet piping requirements. Eastern Style water closet shall be furnished with integral non-skid foot pads and bowl wash down non-splashing flushing rim. The water closet shall be completely self supporting requiring no external mounting hardware and shall be flush with floor. The Eastern Style water closet shall incorporate waterproofing membrane flashing flange. Provide a cold water spigot 300mm above finished floor on the right (from a perspective of standing inside of the cubicle and looking out) sidewall of the cubicle. Spigot shall have a flexible hose and spray nozzle such that the occupant can wash over the water closet. Toilets shall be oriented north and south. Toilets shall not face east or west.
- (b) Lavatories. All sinks shall be trough type constructed of block and concrete with ceramic tile exterior and lining capable of withstanding abuse. Faucets shall be chrome plated brass single lever mixing type. Provide maintenance access to waste piping and P-traps from under the sink. Lavatories inside the prison cells shall be tamper-proof with integral spout, soap depression, and outlet connection to slip 40mm OD tubing.
- (c) Janitor's Sink. Floor mount janitor, enameled cast iron with copper alloy rim guard. Provide hot and cold water valves with manual mixing. Faucet handles shall be copper alloy. Include a stainless steel shelf and three mop holders.
- (d) Emergency Shower and Eye Wash Assembly. Provide emergency shower and or eye wash assembly in Power Plant and in other facilities where appropriate. Provide a floor drain in the area, if appropriate (where emergency water flowing on the floor may lead to additional safety or operational complications).
- (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) Ablution Trench. See building floor plans for size and construction of trench and number of stations. Provide trench drain with brass grating and strainer. Provide each station with hot and cold water valves with manual mixing. Faucet handles shall be copper alloy.
- (g) Floor Sink (P-13). 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.
- (h) Floor 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.
- (i) Floor Trench: Floor trench shall be concrete construction with a cast iron grate. The cast iron grate shall be sectionalized and hinged so that it can easily be opened to clean out the trench. The floor trench shall be provided with perforated aluminum pan inserts which can be removed to clean out large food particles. The floor trench drain shall be adjustable perforated or slotted chromium plated bronze, nickel-bronze, or nickel brass strainer consisting of a grate and threaded collar. This style of floor trench shall be installed in the kitchen area of the DFACs in response to kitchen cleaning practices of the local national staff.
- (j) Room hose bibs and floor drains shall be provided as required. Afghan dining facility kitchen area clean-up hose bib to be supplied with connecting hose on reel including approximately 12 meters of hose. Provide clean-up spray nozzle with hose assembly.
- (k) 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.

#### 7.4 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. In mechanical rooms, floor drains shall be provided to avoid running drain piping long distances above or over the floor. A trench drain shall be provided for the DFAC Kitchen. All waste and vent piping shall be provided in accordance with the latest edition of IPC. Drain outlet shall use p-trap system to trap sewer gases. P-trap drain should be a one-piece system without removable parts. Every trap and trapped fixture shall be vented in accordance with the IPC.

#### 7.5 GENERATOR FUEL STORAGE/DISTRIBUTION

Fuel Oil Storage and Distribution shall be provided to support operation of diesel engine generators at the Power Plant, emergency generators and other locations. The bulk storage of fuels shall consist of above-ground horizontal steel tanks sized to store a 28-day supply of fuel, with containment dikes. These tanks shall be complete with fill tube and cap, suction tube, tank gauge, vent, and other fittings and appurtenances required for full and safe operation. Tanks shall be provided with support saddles, platform/stair and concrete pad. Fuel shall be transferred from the bulk storage tanks by duplex transfer pumps into individual day tanks. Fuel piping shall be fiberglass for underground and steel for piping located above grade. Bulk storage capacity shall be based on minimum four-week full load operation of the plant. Metal fuel tank saddles should not be placed directly on fuel containment area slabs. They should be elevated on piers to avoid moisture corrosion. Fuel containment area should have a sump or manually controlled water release valves for water removal.

#### 7.6 TESTING AND COMMISSIONING

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

#### 8.0 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. Smoke detectors are required for each building. Smoke detectors shall have back up battery power and be installed according to all applicable fire protection codes. Fire detection and alarm systems shall be provided as required by NFPA 101 and UFC 3-600-01 and listed herein. Required fire detection and alarm systems shall be designed and installed in accordance with NFPA 72.

## 8.6 WATER SUPPLY FOR FIRE PROTECTION

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

## 8.7 PORTABLE FIRE EXTINGUISHERS

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

## 9.0 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.

### 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. Aluminum windings shall not be used in transformers.

### 9.4 DESIGN REQUIREMENTS

#### 9.4.1 Electrical Distribution System

(Option)(Provide and install electrical utility connection to the Afghanistan National Army Garrison at Camp Gamberi. The connection to Gamberi shall utilize the main feeders on the installation.)

If the option to connect to installation power is not exercised, 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 distribution system shall be in concrete encased duct banks with the ducts not less than 1220mm below grade. Manholes and hand holes 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 duct banks with more than 2 ducts. Hand holes 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 medium voltage 20kV primary distribution system. If the option to connect to the installation power is exercised then the 20kV system will be an extension of the installation system and no generators will be required. The primary distribution system shall supply power to pad mounted transformers that provide power the total load for each site or range. Each site or range shall also be supplied with a utility breakers

sized for the entire site or range load. The padmounted transformers shall be loop feed, dead front type with load break elbows. The system shall be configured as a loop system and the feeder or feeders used shall be routed back to the pad mounted load-break switch at the Gamberi installation to provide the original tie back configuration. Each padmounted transformer shall be sized to provide power for the total load of the facility served without being loaded to more than 110% of its rated capacity.

The contractor shall provide a generator shelter sized to contain the required generators and their associated switchgear.

Electrical secondary distribution system shall be 380/220 volt, 3-phase, 4 wire, 50 hertz. Design of the electrical system within and around the facilities shall include, but is not limited to (a) interior and exterior secondary power distribution system and, (b) lighting and power branch circuit and devices,. 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 for each facility and sized to the rating of the service entrance equipment. Service entrance equipment shall include a distribution panel board 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 100mm minimum thin-wall PVC from pad mounted transformers. A spare conduit of equal size shall be provided. If panelboards are mounted outside, the equipment shall be rated for exterior use.

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 panel boards. 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 220 V, 50 hertz, type CEE 7/7 with Earth Ground 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 reading 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.

#### 9.4.2 Generator Power System

The generator power system shall be configured as an N system with the N representing the number of generators needed to supply the site's total load. The site's total load is defined as the site's total demand load + 25% spare capacity. At the contractors option, more that one generator can be supplied to meet the entire load requirement. If

more than one generator is provided, all generators shall be the same size. The maximum generator size is limited to 1000 kVA. The generators shall generate power at 380 volts and utilize a step up transformer to bring the primary voltage to 20,000 volts. At each site or range the step down transformers shall be provide to bring the voltage down to the secondary voltage level of 380 volts. See paragraph 9.4.1 above.

Generators shall be derated as necessary for the ambient temperature and altitude of the site. Each generator shall be provided with a 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 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. If only one generator is supplied, the synchronizing equipment shall be supplied in the event a second generator is purchased in the future.

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. A properly sized main switchboard shall be provided to distribute the power produced by the generator(s) to the facilities on the site.

Generator fuel storage capacity shall be based on usage at total load for a minimum of 30 days. Fuel storage shall either be in aboveground single wall steel tank(s) with containment pit or underground double wall with leak detection.

9.4.3 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.

Mechanical/Electrical rooms	30 FC (300 Lux)
Guard Towers	30 FC (300 Lux)
Shelters or Generator Building	30 FC (300 Lux)

FC = FootCandle  
 h = horizontal component  
 v = vertical component

Indoor lighting for all areas shall consist of fluorescent surface mounted light fixtures. Exterior lighting shall be HID metal halide. 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) above finished floor (AFF) minimum. Fixtures may be pendant or ceiling mounted, depending on the ceiling type and height.

9.4.3.1

Lighting on Roads and Range Area (Option). If option exercised, the contractor shall provide an exterior lighting distribution system to supply power to the site’s street lighting circuits. The exterior lighting system shall be underground in direct buried schedule 40 PVC not less than 50mm in diameter and not less than 1220 mm below grade.

#### 9.4.4 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.

#### 9.4.5 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.

#### 9.4.6 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 work-stations 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] [4 to 6] milliamperes or less. Total number of duplex receptacles shall be limited to six (6) per 20-ampere circuit breaker.

#### 9.4.7 Conductors

All cable and wire conductors shall be copper. Conductor jacket or insulation shall be color coded to satisfy NEC 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.

#### 9.4.8 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.

#### 9.4.9 Enclosures

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

#### 9.4.10 Identification Nameplates

Major electrical equipment, such as transformers, panelboards, and load centers, etc. shall be provided with permanently installed engraved identification nameplates.

#### 9.4.11 Schedules

All panelboards and load centers shall be provided with a directory. Directory shall be typed written in English.

#### 9.4.12 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.

### 10.0 COMMUNICATIONS – Telephone

#### 10.1 General

The Contractor shall provide a dedicated telephone system between the range control building and all the guard towers and the guard shacks. The contractor shall provide all the equipment and cabling to make the stand alone phone system function. The guard towers shall be able to communicate with each other in addition to communicate with the range control building.

#### 10.2 Telephone/Data Cabling Distribution System for each building.

The Contractor shall provide central communications room in the range control building. All the equipment for the stand alone communications system shall be located in the communication room in the range control building. A dual RJ-45 outlet shall be provided at each guard tower in addition to a Protective Entrance Terminal (PET) on a backboard. Each guard tower shall have a 12 pair copper line run from the range control building communications room to the guard tower and terminated on the communications backboard with the PET in the guard house. The main control room of the range control building will have a minimum of two dual RJ-45 outlets. The outlets shall be connect to the main communications rooms in the building. Minimum conduit size shall be 20 mm inside diameter. All communications lines shall be run in PVC conduit in the exterior and in emt in the interior.

#### 10.3 Exterior Public Address System

The contractor shall provide an exterior public address system that allows the range control building to broadcast a message to the ranges. The exterior public address system shall meet the control and audibility requirements, for exterior speakers, for a Mass Notification System as outlined in UFC 4-021-01. A speaker array shall be installed at each range to meet the audibility requirements. The operator shall be able to control which range with which he is communicating.

--END OF SECTION--

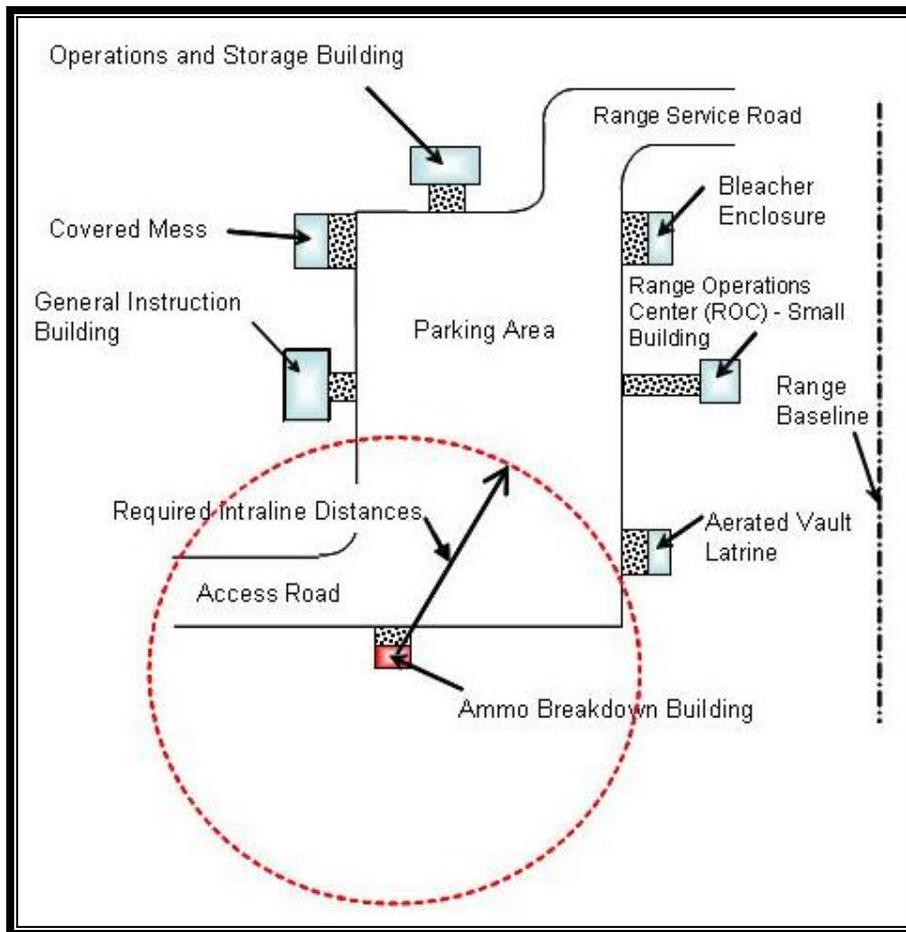
(End of Summary of Changes)



# RANGE OPERATIONS and CONTROL AREA (ROCA) – Small Arms



Typical ROCA-Small Arms



Example ROCA-Small Arms Layout

General: The Range Operations and Control Area (ROCA) is the center for overall control and operation of the range, training exercises, administrative services, and support facilities. From the range operations and control area, downrange target and simulation equipment are operated and activities are monitored for scoring and performance data review. The data is collected and distributed to the participants for an after action review. The following are the typical structures in the ROCA – Small Arms (refer to each specific range’s Narrative Description section to determine the buildings associated with that specific range): the Range Operations and Control (ROC) – Tower, an Operations/Storage Building, a General Instruction Building, an Ammunition Breakdown Building, an Aerated Vault Latrine, a Covered Mess, and a Bleacher Enclosure. The example ROCA layout on the previous page is only a representative example. Site adaptation is always required. An intraline distance of 50 feet/15 meters is required between the Ammo Breakdown Building and all other occupied buildings. A range flagpole will be required and will have a red "range is hot" light atop the pole, switched from the ROC-Tower. A ROC–Small may be substituted for the ROC-Tower if preferred by the Range Control Office. Other latrine options are allowable if water is available at the site or if the installation chooses to service portables.

Anti-Terrorism/Force Protection (ATFP): HNC analyzed the ATFP requirements set forth in UFC 4-010-01 and determined that, typically, the standard complement of ROCA buildings are not considered to be inhabited, are within a controlled perimeter, have guard force access control in place and are generally not routinely occupied; therefore, no ATFP measures are required in a project design. However, ultimately the Garrison Commander is responsible for the facilities and may mandate application of ATFP provisions, particularly if the facilities are considered routinely occupied.

Sustainable Project Rating (SPiRiT): SPiRiT was developed to “help the Army to achieve facilities that meet the needs of current missions, and infuse new technologies and innovative sustainability concepts in the design and construction process to improve the quality of facilities to support soldiers; readiness, training and well-being,” ([www.erd.usace.army.mil](http://www.erd.usace.army.mil)). This tool is realistically only for vertical construction; some criteria simply does not apply to or would not be cost efficient/practical to implement on downrange training areas. Therefore, training range projects are not required to achieve SPiRiT goals as established by Army policy. However, any climate controlled vertical construction (ROCA buildings) included in the range project shall be evaluated using the SPiRiT tool. While the designer should attempt to achieve a Gold rating, a specific level is not required. Documentation of the SPiRiT assessment shall be included in the project Design Analysis. The concepts of sustainable design will be included in the designs where possible.

Access Road: See Service/Maintenance and Access Roads section.

Vehicle Parking Area: For a small arms range, the parking area in the ROCA should accommodate approximately three (3) full-size buses and approximately twenty (20) military or private cars. The designer must coordinate with the Range Control Office to determine Installation-specific parking requirements. The parking area location must be planned based on the convenience and safety of walking troops.













## DOWNRANGE POWER & DATA DISTRIBUTION

For the UAC

**Function:** This section shall explain in general terms the basic design requirements for the UAC downrange power and data distribution required to control Next Generation Army Target System (NGATS) range targetry and its associated equipment.

**UAC General Summary:** Stations 1-4 shall be powered individually from a dedicated load center. Targetry for stations 1, 2, and 4 shall be provided without control network. The target emplacements in station 3 shall be “daisy-chained” or serially connected with the power and network data cables originating at the station observation platform control pedestal and continuing from emplacement to emplacement until they reach the façade. An optional shelter may be provided at installations with extreme climatic conditions at the observation platform control pedestal for protection of the target control pedestal. If communication cable distances between targetry and/or the station observation platform pedestal exceed 90m (295 feet), then fiber optical cable must be installed. Each station of the UAC shall have the capability to operate independently and concurrently. All target outlets shall have weatherproof covers and shall be weatherproof while the target is connected.

A network connection from the UAC to installation backbone is not required. A network connection between the Operations/Storage building and training stations is not required. Video collection is also not a requirement in the UAC.

**Site Power Summary:** Medium voltage primary power is run overhead from the line five feet outside of the Range Flagpole to a pad-mounted transformer located inside the Range Operations and Control Area near the Operations/Storage Building. 120/240V, single-phase power shall be fed underground from the pad-mounted transformer to the Operations/Storage power panel. The overhead primary power shall continue from the in-line riser pole to a dead-end riser pole near the first training station loadcenter. The primary power line shall continue underground to a pad-mounted transformer near the same training station loadcenter. The primary power line shall continue underground to pad-mounted transformers near the loadcenter for each of the remaining training stations. Where the site layout permits; the designer may elect to combine transformers to feed multiple training stations from one transformer. Each of stations 1-4 shall have a loadcenter, with integral transient voltage surge suppression, mounted on or near the training station location. The loadcenter shall feed the respective station targets with 120/240V. The size of the secondary power cables depends on the number of targets served, the circuit voltage drop, and the circuit protective device rating. Operating voltage at the most distant emplacement should be no less than 95 percent of the supplying transformer’s secondary voltage. The observation platform in station 3 shall have a 120V maintenance receptacle.

Power Requirements: Electrical power distribution shall conform to the American Electrical Institute (AEI) and Technical Manual (TM) 5-811-1. Three-phase or single-phase primary power shall be extended to the range site depending on range load. Voltage regulation and/or metering may be required. The voltage supplied must be maintained within 5% at a frequency of 60Hz, +/-0.5; the design agency shall verify the power supply for each site.

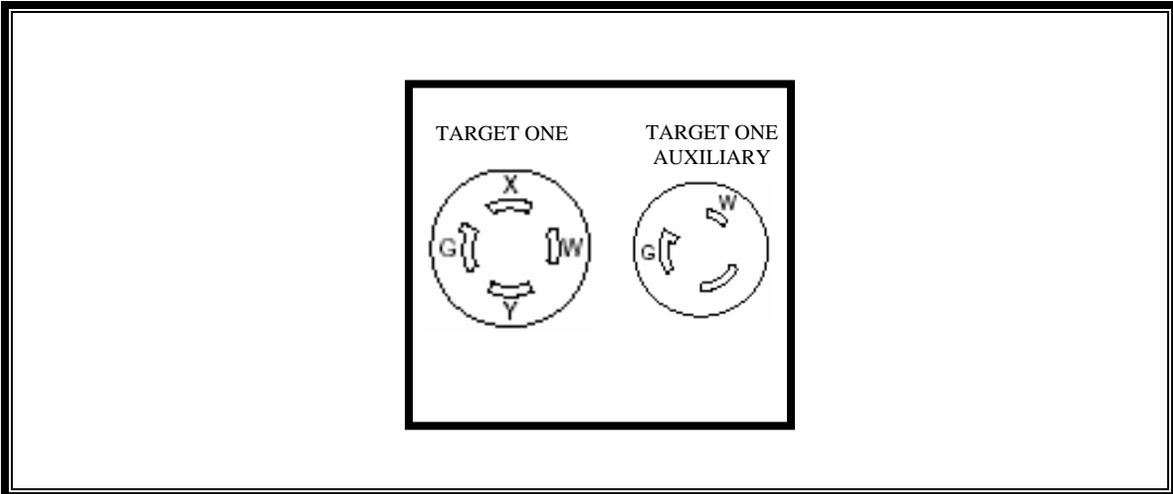
Data Summary: Training station 3 targets are controlled via an Ethernet-protocol-based network with Armor, Shielded Fiber, or standard Category 5e or better shielded twisted pair (STP). The type of cable required is dependant on the length of the data cable. The cable length criteria are provided in the Data Requirements table below. The target control cabling shall be installed underground in the same trench with the target power cable conduits. Provide surge protection for all copper data cables at each master target data panel (MTDP). This will require 4 surge protectors in the façade MTDP. All target outlets should have weatherproof covers and should be weatherproof while the target is connected. Data is not required on station 1, 2, and 4.

The Ethernet-protocol based network in station 3 is locally controlled through the observation control pedestal. The observation control pedestal is a NEMA 4 modular console system that houses the surge protectors for the data cables. The pedestal shall be a modular design consisting of a 26” high base unit, an 8” high plinth, and a hinged lid cover. The pedestal shall be provided with mounting rails for a 28 ½” high X 24” wide video screen and a data rail support kit that will allow for the installation of 19” mounting of electronic equipment. The lid and console door shall be provided with oil-resistant gaskets, shall be tamper resistant, and shall have locking latches. A 120V duplex outlet should be provided for electronic equipment installed by others in the pedestal. A ground lug should be provided in the pedestal with a connection back to the power ground. If fiber optic cables are required the fiber optic cables shall terminate on an SC style connector patch panel installed in the pedestal. The target installer will provide and install the network equipment and controlling equipment in this pedestal to control the targetry on station 3.

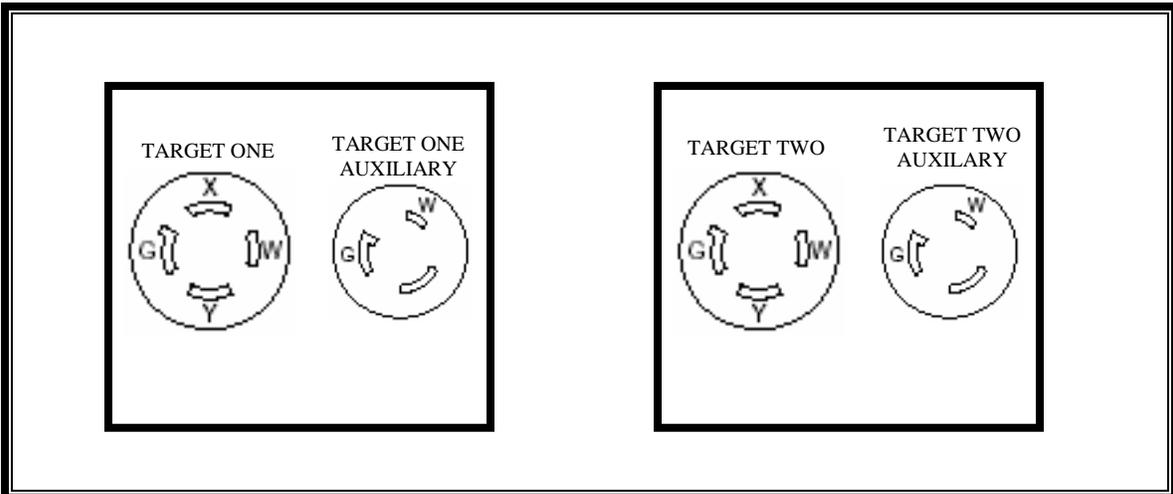
Data Requirements:

<b>DISTANCES</b>	<b>MEDIUM</b>	<b>SPEED</b>	<b>BANDWIDTH</b>	<b>WAVELENGTH/ FREQUENCY</b>
Over 90m	Singlemode Fiber Optic Cable	Minimum 10Mbps Maximum Unlimited	Unlimited	1310nm to 1550nm
90m & under	Category 5e or better Cable	Minimum 10Mbps	200Mhz	200Mhz

Targetry Interface Requirements:



Representative Single Target Outlet (Not to Scale)



Representative Double Target Outlet (Not to Scale)

TARGET POWER RECEPTACLE	AUXILIARY POWER RECEPTACLE	CAT 5E CABLE CONNECTORS	FIBER OPTIC CABLE CONNECTORS
NEMA L14-20R	NEMA L5-20R	RJ-45	Type "SC"

SIT Emplacement Target Interface Specifics



Representative Reactive and Non-Precision Targets



Representative Observation Platform Control Pedestal (Not to Scale)

Design Details: See the Layout Details for UAC stations and the Civil Details/Electrical Details for the SIT emplacement in the Appendix of this document.

Design Examples and Requirements:

Station #1-Individual and Team Trainer. See drawing layout for targetry and auxiliary power receptacles. All target outlets shall be mounted at a minimum 2134mm (7 ft) A.F.F. to the bottom of the outlet box. Conduits shall not be installed on the interior walls below 2134mm (7 ft) A.F.F. but are allowed to be placed on the

exterior walls if necessary. One 120-volt Ground Fault Circuit Interrupter (GFCI) maintenance receptacle shall be provided per training room with weatherproof covers. Data outlets are not required for targets on this station.

Station #2-Squad & Platoon Task-Technique. See drawing layout for targetry and auxiliary power receptacles. All target outlets shall be mounted at a minimum 2134mm (7 ft) A.F.F. to the bottom of the outlet box. Conduits shall not be installed on the interior building walls below 2134mm (7 ft) A.F.F., but are allowed on the exterior walls, excluding the center “alley” of the interior training building area. Two 120-volt Ground Fault Circuit Interrupter (GFCI) maintenance receptacles shall be provided per building and per floor with weatherproof covers. Data outlets are not required for targets on this station.

Station #3-Grenadier Gunnery. Target emplacements shall be “daisy-chained” or serially connected with the power and network data cables. The network cables shall originate from the observation platform control pedestal with a one meter service loop and continue from emplacement to emplacement until they reach the façade SIT emplacement NEMA 4 MTDP enclosure. The observation platform control pedestal shall require one duplex 120-volt outlet mounted inside the pedestal for use by the OPA-supplied electronic components. The power shall originate from the loadcenter in the observation platform control pedestal area. Two emplacements shall be dual target lifters in extra-wide emplacement pits. SIT emplacements require one duplex 120-volt receptacle in each MTDP or TDP for use by OPA. The façade requires a standard configuration SIT emplacement with MTDP and a loadcenter. Additional power and data outlets are required in the façade to control an additional 3 SIT lifters. See Façade Emplacement details for the complete power and data requirements in the façade.

Station #4-Offense/Defense. See drawing layout for targetry and auxiliary power receptacles. All target outlets shall be mounted at a minimum 2134mm (7 ft) A.F.F. to the bottom of the outlet box. Conduits shall not be installed on the interior building walls below 2134mm (7 ft) A.F.F., but are allowed on the exterior walls, excluding the center “alley” of the interior training building area. Two 120-volt Ground Fault Circuit Interrupter (GFCI) maintenance receptacles shall be provided per building and per floor with weatherproof covers. Data outlets are not required for targets on this station. Consult with local user requirements to determine the method of interior light switching. Lights will either be switched locally in each room with recessed mounted light switches or be all switched by a lighting contactor controlled by panic hardware installed at each building entrance.

Station #5-Underground Trainer. This station does not require instrumentation.

## STATIONARY INFANTRY TARGET (SIT)

General: The standard SIT emplacement utilizes a concrete emplacement with a geotextile/gravel drainage layer, a treated railroad tie front wall protection, and a protective earthen berm. Installations may prefer other materials, which are acceptable as long as compatibility with target equipment, equipment protection, and durability issues are satisfied. Low rounds are normally captured by the compacted earthen berm. All



SIT Emplacement

permanent electrical and communication boxes are to be mounted on the front wall of the emplacement; these boxes shall be mounted no higher than 50 mm (2”) from the top of the emplacement wall. This mounting height should protect them from rounds that might skim over the top lip of the emplacement. The target mechanism will be located on the floor of the concrete emplacement as far forward as practical to minimize its potential to be hit by a low round, yet still allow access to the electrical/data boxes. SITs can be placed above or below grade. See the Civil and Electrical Details in the Appendix of this document.

**Below-Grade Emplacement:** The utilization of below-grade emplacements is optimal. They blend with the natural terrain, and do not present an anthill profile to the soldier/firer. Unfortunately, below-grade emplacements present several design issues:

- a. **Drainage:** On flat or down-slope emplacements, a lower elevation to drain the emplacement must be available nearby; on up-slope emplacements, provisions must be made to prevent natural slope drainage from entering the emplacement. It is difficult with below-grade emplacements to achieve positive drainage.
- b. **Unexploded Ordnance (UXO):** Disturbance potential increases with the depth of excavation; while an above-grade emplacement might only require disturbing the surface to 150mm (6 inches) below natural grade, a below-grade emplacement will require approximately 1 meter of excavation.
- c. **Line-of-Sight (LOS):** LOS between the soldier/firer and the target emplacement may not be possible utilizing the natural terrain.
- d. **Other Debris:** Below-grade emplacements will also gather sand, dirt, trash, and any wind blown objects which can cause maintenance problems. Some installations have installed covers to help keep debris from accumulating in the emplacement. Coordinate with the installation Range Office for adjustments to the emplacement to facilitate debris accumulation prevention.

**Above-Grade Emplacement:** Above-grade emplacements are more common in range construction due to their ease of drainage, obtaining line-of-sight, and small

disturbance to the existing grade. The disadvantage of an above-ground emplacement is the target emplacement profile easily recognized by the soldier/firer.

The designer should discuss with the Installation whether they desire above- or below- grade SIT emplacements, while ensuring that the Installation understands the design issues and costs associated with either choice.

**Wall Height:** The minimum front wall height is 457 mm. The front wall must be high enough to protect the targetry equipment while still allowing a minimum of 90% of the target to be visible from the firing position. The minimum wall height of 457 mm provides target equipment protection up to a 15° angle of fire (The target arms and clamp are not protected above 10°). It also allows 90% visibility down to -2° angle of fire. A geometric analysis will be required for angles of fire greater than 15° or less than -2°. Angles of fire over 15° may require increasing the height of the front wall. Angles of fire less than -2° may require raising the target lifter or installing longer target arms. On ranges where targets are engaged from multiple points the designer must coordinate closely with the installation and the targetry provider to determine the correct front wall height.

**Berm Criteria:** Recommended widths for protective berms of SIT emplacements are determined from the Target Protection Design Curves in the Appendix of this document.

These berm widths are based upon weapon type, soil compactive effort, and the in-place soil density. However, the designer must also coordinate with the range trainer or user in order to determine the appropriate berm width for each target, since individual target sites may dictate added target protection. For example, when SIT emplacements are sited in front of or behind a Moving Armor Target (MAT) or Stationary Armor Target (SAT), the emplacements will need to be designed to withstand the largest weapon system that will engage that group of targets.

Historical experience shows that, under normal usage, well-compacted berms designed with the recommended widths require maintenance on 6-month cycles.

**Electrical/Communications:** This section discusses electrical/communication considerations unique to this specific emplacement type. Downrange power, communication, transformers, trenching requirements, etc., are discussed in the Downrange Distribution Section of this document.

**Target Emplacement Wall Configuration:** All conduits and/or cables should enter and exit from the side or rear of the emplacement. This cable routing helps to minimize damage to the cables from range operations and maintenance crews performing berm repair. The Load Center (LC) houses the secondary power cable and provides feed-through capability for the power cable to the next adjoining LC. The LC contains circuit breakers to provide power to the Target Power Receptacle (TPR), auxiliary receptacles (AR), maintenance receptacle (MR) and the Target Data

Receptacle (TDR). The MR shall be a Ground Fault Circuit Interrupter (GFCI) type receptacle. The Target Data Panel (TDP) shall house the fiber optic splicing, cross-connect panel, category 5e or better (copper) cabling, a combination of fiber and category 5e or better cables, or simply the category 5e or better cabling and the TDR. All fiber optic cabling will be terminated with SC type connectors, and the network cable will be terminated with category 5e or better rated RJ45 connectors. The TDP provides space for Other Appropriations-Army (OPA) funded equipment which can include the fiber optic jumpers, switch/media converter, target data outlet, and network cables; the designer needs to ensure the dimensions of the cabinet equipment provided are consistent with those dimensions stated on the detail plans for the MTDP and TDP equipment. A 120VAC power outlet is provided in the TDP for "Use by Others". The TDP and the GFCI maintenance receptacle (MR) may utilize the same power circuit, but the TDP equipment should be wired ahead of the MR to ensure no nuisance tripping occurs. All boxes and receptacles on the front wall of the emplacement should be mounted no higher than two inches from the top of the emplacement wall; this protects the boxes and receptacles from low rounds that might skim the top of the emplacement wall. Refer to Civil Details in the Appendix of this document for detailed mounting requirements.

**Grounding:** Grounding is required for safety at each downrange equipment location. A 19mm (3/4 in) by 3,050mm (10ft) copper-clad steel ground rod will be driven to a depth of 305mm (1 ft) below finished grade at each equipment location. The TDP and LC equipment will be connected to the emplacement's single ground rod with a #6 AWG bare copper conductor and exothermically welded connections. All data cable armor or shields are bonded to the ground bar in the TDP. The design will leave a 1829 mm (6') coil of #6 AWG bare copper that will be used to ground the target mechanism.

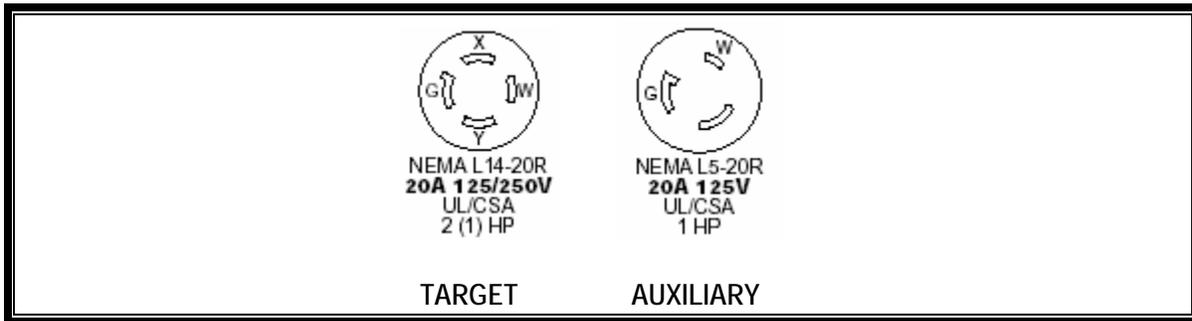
**Surge Suppression:** Power surge suppression equipment shall be provided in the LC, and data surge suppression equipment shall be provided on both ends of the CAT 5E or better data cables entering the TDP.

**Seals:** Ensure all penetrations into NEMA 4, NEMA 4X, and NEMA 6P rated enclosure are provided with the proper seal. Revised plan ED-01 illustrates a detail for the proper sealing method. **PLACING FOAM IN THE CONDUIT DOES NOT KEEP WATER STAYS OUT.** The SIT emplacement has been revised to require a NEMA 3R rated wall-mounted enclosure. The use of NEMA 3R equipment should negate the need for the more expensive seal illustrated on ED-01. Ensure all seals are provided as needed.

Target Outlets: All target power and target data receptacles shall be waterproof regardless of whether the outlet is in use. The standard TPR configuration is shown in the Table below:

TARGET POWER RECEPTACLE	AUXILIARY POWER RECEPTACLE	FIBER OPTIC CABLE CONNECTORS	CATEGORY 5e OR BETTER CABLE CONNECTORS
NEMA L14-20R	NEMA L5-20R	Type "SC"	MALE, RJ45

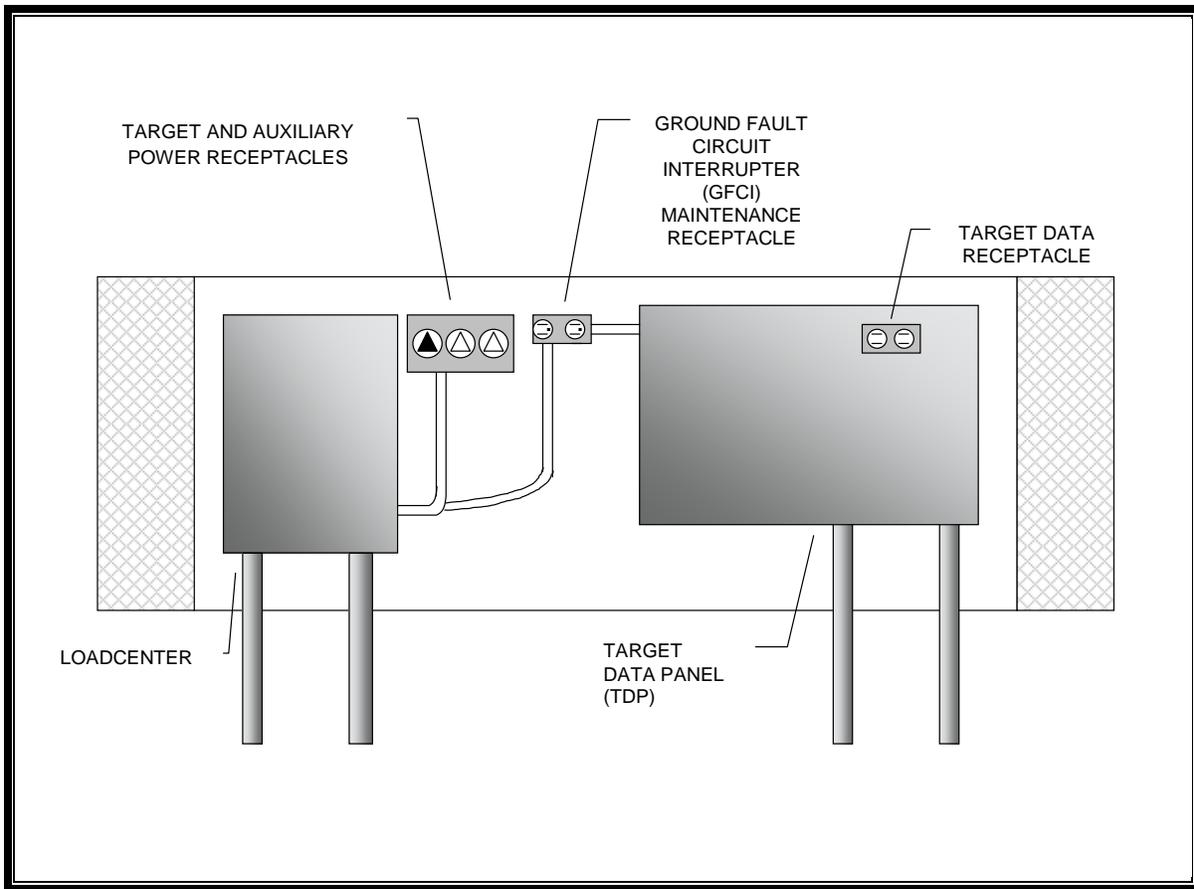
SIT Emplacement Target Interface Specifics



Target Power Receptacle (TPR) – Auxiliary Receptacle (AR)

EMPLACEMENT TYPE	POWER FEED TYPE	PEAK	STATIC LOAD	DESIGN LOAD
SIT with Thermal Blanket	120/240V, Single Phase	700VA while raising or lowering target. Add 260VA if Thermal Blanket is utilized	50VA Thermal Blanket 260VA	960VA
			<b>Total</b>	<b>960VA</b>

SIT Emplacement Target Power Table

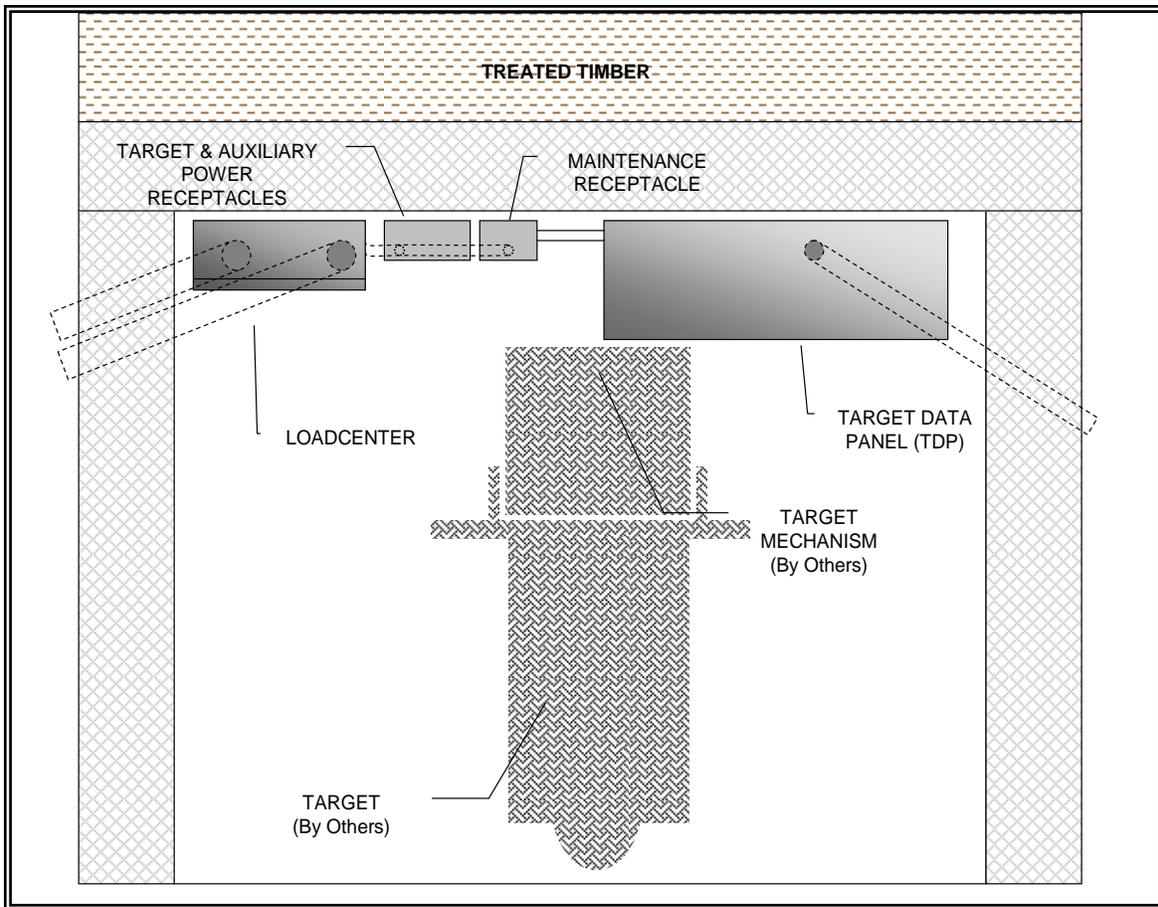


Representative SIT Elevation Drawing (Not to Scale)

Environmental Limits: The temperature and humidity limits for electronic equipment are as follows:

Outdoor:

- a. Non-operating and operating temperature:  $-34.44^{\circ}\text{C}$  ( $-30^{\circ}\text{F}$ ) to  $60^{\circ}\text{C}$  ( $140^{\circ}\text{F}$ ).
- b. Humidity: 5% to 95% RH (non-condensing).



Representative SIT Plan Drawing (Not to Scale)

Miscellaneous Information:

a. Construction Materials: SIT emplacements have been successfully deployed when made out of wood in non-rot regions (e.g., Alaska). Other materials may also be used to construct SIT emplacements.

b. Weather Considerations:  
 In regions with large quantities of blowing sand or snow, consideration should be given to providing elevated target mechanism platforms and emplacement covers. The elevated target mechanism platform allows for shoveling out snow and sand, while the emplacement cover keeps accumulation of blown or fallen material to a minimum.



c. **Emplacement Protection:** Though not endorsed by Army safety doctrine (DA PAM 385-63, DA PAM 385-64), some installations still favor skip plates on their SIT emplacements. Skip plates are hardened steel angles mounted to the top-front wall lip of a SIT emplacement. The concept is based on the theory that a round that hitting low will hit the skip plate and skip (ricochet) away from the target emplacement in lieu of hitting the emplacement's front concrete wall or protective treated timber beams, thus lowering long-term maintenance costs. Since the skip plate induces ricochet, it is not recommended. Installation Safety and ATSC must specifically approve the use of skip plates for the project.

d. **Simulation Devices:** Some types of training may require Night Muzzle Flash Simulators and Hostile Fire Simulators (HFS). These devices are to be utilized with the SIT emplacement. A night muzzle flash simulator is a flashlight-type device that is mounted on the target mechanism or coffin and flashes on the target to visually simulate enemy fire.



Night muzzle flash simulators are self-contained units provided and installed by the target provider; no special design is required. The Hostile Fire Simulators can be built into the SIT emplacement or have their own emplacement next to the SIT-type emplacement.

e. **Quality Control:** A design checklist is provided in the target design guide. The designer shall ensure all items listed under the SIT section are illustrated or verbally defined completely within the design.