

AMENDMENT OF SOLICITATION/MODIFICATION OF CONTRACT				1. CONTRACT ID CODE	PAGE OF PAGES	
				J	1	93
2. AMENDMENT/MODIFICATION NO. 0002		3. EFFECTIVE DATE 10-Jun-2011	4. REQUISITION/PURCHASE REQ. NO.		5. PROJECT NO.(If applicable)	
6. ISSUED BY AFGHANISTAN DISTRICT SOUTH (AES) US ARMY CORPS OF ENGINEERS APO AE 09355		CODE W5J9LE	7. ADMINISTERED BY (If other than item 6) See Item 6		CODE	
8. NAME AND ADDRESS OF CONTRACTOR (No., Street, County, State and Zip Code)				X	9A. AMENDMENT OF SOLICITATION NO. W5J9LE-11-R-0031	
				X	9B. DATED (SEE ITEM 11) 19-May-2011	
					10A. MOD. OF CONTRACT/ORDER NO.	
					10B. DATED (SEE ITEM 13)	
CODE		FACILITY CODE				
11. THIS ITEM ONLY APPLIES TO AMENDMENTS OF SOLICITATIONS						
<input checked="" type="checkbox"/> The above numbered solicitation is amended as set forth in Item 14. The hour and date specified for receipt of Offer <input 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)						
13. THIS ITEM APPLIES ONLY TO MODIFICATIONS OF CONTRACTS/ORDERS. IT MODIFIES THE CONTRACT/ORDER NO. AS DESCRIBED IN ITEM 14.						
A. THIS CHANGE ORDER IS ISSUED PURSUANT TO: (Specify authority) THE CHANGES SET FORTH IN ITEM 14 ARE MADE IN THE CONTRACT ORDER NO. IN ITEM 10A.						
B. THE ABOVE NUMBERED CONTRACT/ORDER IS MODIFIED TO REFLECT THE ADMINISTRATIVE CHANGES (such as changes in paying office, appropriation date, etc.) SET FORTH IN ITEM 14, PURSUANT TO THE AUTHORITY OF FAR 43.103(B).						
C. THIS SUPPLEMENTAL AGREEMENT IS ENTERED INTO PURSUANT TO AUTHORITY OF:						
D. OTHER (Specify type of modification and authority)						
E. IMPORTANT: Contractor <input type="checkbox"/> is not, <input type="checkbox"/> is required to sign this document and return _____ copies to the issuing office.						
14. DESCRIPTION OF AMENDMENT/MODIFICATION (Organized by UCF section headings, including solicitation/contract subject matter where feasible.) PROJECT NO. AES-11-014 IDIQ MATOC for CONSTRUCTION SERVICES, SOUTHERN AND WESTERN AFGHANISTAN. Contract Specialist: Raquel Blankenhorn, Raquel.O.Blankenhorn@usace.army.mil AND TAS.Contracting@usace.army.mil Solicitation No. W5J9LE-11-R-0031 is hereby amended to incorporate changes stated on the continuation pages.						
Except as provided herein, all terms and conditions of the document referenced in Item 9A or 10A, as heretofore changed, remains unchanged and in full force and effect.						
15A. NAME AND TITLE OF SIGNER (Type or print)				16A. NAME AND TITLE OF CONTRACTING OFFICER (Type or print)		
				TEL:	EMAIL:	
15B. CONTRACTOR/OFFEROR _____ (Signature of person authorized to sign)		15C. DATE SIGNED	16B. UNITED STATES OF AMERICA BY _____ (Signature of Contracting Officer)		16C. DATE SIGNED 10-Jun-2011	

SECTION SF 30 BLOCK 14 CONTINUATION PAGE

SUMMARY OF CHANGES

The following have been added by full text:

AMENDMENT 0002

The purpose of W5J9LE-11-R-0031 Amendment 0002 is to answer questions from Industry. **The proposal due date is hereby extended from 18 June 2011 to 21 June 2011, as a result of Amendment 0002.** No further questions shall be accepted by the Government, in accordance with Section 00100 Instructions to Offerors, 1.1.

Sections 00010, 01010 and 01015 are hereby replaced in their entirety, and attached herein.

Q.28. I need to bring to your attention that the files as posted on FBO are incomplete on part of the drawings have been provided. Can you please download them and take a look?

As I have opened the following files and below is what they contain:

- * Technical Package.pdf - The specs of the job, which has zero drawings
- * W5J9LE-11-R-0031 - The base RFP
- * RFP Memo - The cover letter
- * AppendixPt1
 - * Shorab Courthouse 41 Pages
- * AppendixPt2
 - * Battalion Storage
 - * POL Storage
 - * Personnel Bunker
 - * Trash Collection Point
- * AppendixPt3
 - * Trash Collection Points
 - * Small Arms Storage
 - * Fencing & Clothesline
 - * Flagpoles
- * Amendment 1

A.28. This is a Design/Build contract. Section 1.0 of the Solicitation, Design/Build Process states, "...Any building designs not included as part of this RFP, but stated as part of this contract, are the responsibility of the Contractor to design as well as build. The facility shall be designed and built by a single Contractor."

Section 4.3.1 of the solicitation; General Requirements For Facilities, lists the buildings that are to be Contractor Designed for which we have provided floor plans only, and the facilities that are Government Designed for which have provided detailed designs. The floor plans and detailed drawings are provided in the appendices.

Q.29. We have received Amendment 0001 but do not see all of our questions. Amendment 0001 Q&A No. 12 (submitted by others) deletes the requirement for Payment and Performance Bonds, answering our Question #1. Does this, in turn, apply to the Irrevocable Letter of Credit – or our Questions #2 thru #5 below? Will the Government be responding to the rest of our Questions? Please advice.

A.29. See Questions and Answers for Q.49., Q.50., Q.51. and Q52 below for previous Questions #2 thru #5.

Q.30. Since email submittal of proposals is acceptable, what is the maximum file size limit on electronic submittal of proposal volumes (Volume 1 Tech and Volume 2 Price to be submitted separately)? Will the Government allow for splitting the proposal, specifically Volume 1, into separate Factors to allow us to meet stated file size limits?

A.30. Submission requirements shall be in accordance with Section 00100 Instructions to Offerors. Item 1.b. provides for tabbing of sections. This may be accomplished by using separate folders for electronic submissions. Tabbing does not count toward the 100 page size limitation. Item 1.c. provides for separate submissions for Volumes I and II. Item 1.n. provides for a page limitation of 100 pages. Whether proposal submission is electronic or hard copy, the page limitation must be adhered to.

Q.31. Per Attachment 1, item "i" Magnitude of Construction Project, the magnitude of construction project is between \$10 million and \$25 million. In the RFP, under Factor 1 – Experience, the "Minimum Threshold" states the "Offeror must have completed at least one project within the last five (5) years with an awarded value of \$10 million or more. However, under "Areas of Interest", the RFP states "An Offeror should identify construction or design-build projects that are of the same magnitude as the expected task orders (between \$5 million and \$50 million). Please confirm that the magnitude of expected task orders is between \$10 million and \$25 million.

A.31. The Seed Task Order has a magnitude of construction between \$10M and \$25M (See DFARS 236.204). The magnitude of all task orders issued under this MATOC are expected to be between \$5M and \$50M. The Offeror must have completed at least one project within the last five (5) years with an awarded value of \$10 million or more.

Q.32. Can the Government please provide the drawings for the rest of the required structures for the seed project titled, Afghanistan Army 215th MI/MP/Courthouse at Camp Shorab, Design-Build Project Specification and Drawings. The aforementioned specification and drawings issued with the RFP only included drawings for the Court House, Battalion Storage, and Small Arms Storage.

A.32. See A.28. above.

Q.33. Para 1.20, "BONDING REQUIREMENTS", of the Section 00800, "Special Contract Requirements", indicates that the Contracting Officer will determine if Performance and Payment Bonds may be required at the task-order level. It also requires the Contractor to provide a Performance and Payment bond each in the amount of 100% of the minimum guaranteed amount if an initial task order is not awarded with the overall contract award – which will have their penal sum increased to 100% of the task order price once a Task Order is awarded. Based upon discussions with A+ rated sureties they are willing to consider providing bonding (on a case-by-case basis) for fixed price construction work in Afghanistan up to a 30% level for work performed on a secure military installation, and based upon acceptable contractual conditions, including: Cost and Schedule damages due to Acts of War and/or Terrorism are recoverable from the government, the Surety will have the option to pay out the bond in a default situation rather than be required to complete the work; and that the Bonds will be to the benefit of the US Government, administered subject to US Law and no Foreign Law or local jurisdictional issues or fees will be applicable. Will the total maximum Penal Sum of the Bonds be reduced to a 30% maximum value? Will contractual conditions required by the sureties noted above be incorporated into the RFP/Contractual documents?

A.33. As per W5J9LE-11-R-0031 Amendment 0001, A.12., There is no Payment and Performance Bond requirement for Basic MATOC, nor for the Seed Task Order. Paragraph number 1.20 BONDING REQUIREMENTS, is hereby deleted from the Basic MATOC.

Q.34. Section 01010, "Scope of Work", paragraph 2, "Location" states "The coordinates of the limits of work of the site are shown as one points coordinate on the Concept Plan found in Appendix." The Concept Plan, sheet 2 of AppendixPt1.pdf, indicates "x=612117.8592, y=3525880.068" but does not indicate the coordinate system used. Could USACE provide the coordinates in standard latitude/longitude or MGRS?

A.34. The Coordinates are in UTM, the contractor shall use UTM and convert to MGRS or lat and long for their needs.

Q.35. Section 01010, "Scope of Work", paragraph 4.3.3, "Courthouse" states "The Contractor shall design and construct a two story courthouse building approximately 11.6 meters x 30 meters with a total area of 640 square meters total for both floors." Two floors, each 11.6 meters x 30 meters would equal 696 SM. This paragraph also states "The design shall be based upon the drawings in the Appendix titled "ANA, New Courthouse for Camp Chorab RSC_SW, Helmand Province, Afghanistan, 17 December 2010" which is the set of drawings on sheets 4 through 34 of AppendixPt1.pdf. The dimensions from the 1st and 2nd floor plans indicate that the two floors are of different sizes (321 SM and 348 SM, respectively) and appear to require 669 SM. Should we use 669 SM, 696 SM or 640 SM for our estimate?

A.35. As per W5J9LE-11-R-0031 Amendment 0001, A.4., The total gross area is 696 SM (square meters), not 640. The 640 is a typographical error.

Q.36. Section 01010, "Scope of Work", paragraph 4.3.3, "Courthouse", states "The concrete framing system supports a lumber roof truss system that supports corrugated, galvanized sheet metal over 30# building felt and 20mm exterior grade plywood." Is an alternate roof type, such as steel truss, acceptable?

A.36. Provide roof truss system in accordance with the documents and drawings provided.

Q.37. Section 01010, "Scope of Work", paragraph 4.3.4, "Admin Building" states "The Contractor shall design and construct one (1) Admin Building per the floor plan titled "ADMIN BUILDING" in the Appendix" which is sheet 35 of AppendixPt1.pdf. The Legend indicates that the Total area included walls and hallways is 319.2 SM but the dimensions of the floor plan indicates that this building is 12 M x 27 M or 324 SM. Should we use 319.2 SM or 324 SM for our estimate?

A.37. The Contractor shall use the dimensions per the drawings in the Appendix.

Q.38. Section 01010, "Scope of Work", paragraph 4.3.9, "Small Latrine" states "The Contractor shall design and construct three (3) Small Latrine facilities per the floor plan titled "SMALL LATRINE" in the Appendix" which is sheet 41 of AppendixPt1.pdf. The Floor Plan Title states "Small Latrine 135 SM/100 PM" but the dimensions of the floor plan indicates that this building is 10.5 M x 20.575 M or 216 SM. Should we use 135 SM or 216 SM for our estimate?

A.38. The Contractor shall use the dimensions per the drawings in the Appendix.

Q.39. Section 01010, "Scope of Work", paragraph 4.3.16, "Motor Pool Areas" contains two subparagraphs: 4.3.16.1, "Vehicle Maintenance Building" and 4.3.16.2, "Pol Storage Building". Section 00010, "Solicitation Contract Form", contains CLIN 0003P for the Motor Pool Areas and CLIN 0003Q for POL Storage but contains no separate CLIN for the Vehicle Maintenance Building. Should we include costs for the Vehicle Maintenance Buildings in CLIN 0003P or will USACE be adding a separate CLIN?

A.39. An amended Bid Schedule-Amendment 0002, and Section 01010 (REVISED-Amendment 0002) shall be provided to the contractor.

Q.40. Section 01010, "Scope of Work", paragraph 4.4.3, "Foot Paths and Fire lanes", states "Concrete foot paths are required to connect all buildings, facilities, and features such as offices, classrooms, courthouse, etc. Foot Paths shall be compacted base, appropriately graded for drainage, and covered with a concrete surface." However, Section 01015, "Technical Requirements", paragraph 2.3 "Foot Paths and Aggregate Paved Areas", states "The Contractor shall provide a 100 mm thick by 3 m wide aggregate foot paths between buildings, parking areas, and other logically anticipated areas to serve as pedestrian foot paths and fire lanes." Is it correct that the foot paths should be aggregate paved?

A.40. Per the Scope of Work, the footpaths shall be concrete paved. Refer to Section 01010 (REVISED-Amendment 0002).

Q.41. Due to the following question regarding drawings that are missing from the FBO and RFP, we formally request a two (2) week extension from issuance of missing drawings to allow appropriate time for planning and coordination of our strategy for pricing to meet the missing drawing specifications/requirements. Without the drawings, our technical approach and execution strategy for the Sample Seed Project has been put on hold.

A.41. The proposal due date is hereby extended from 18 June 2011 to 21 June 2011.

Q.42. Can the Government please provide the drawings for the rest of the required structures for the seed project titled, Afghanistan Army 215th MI/MP/Courthouse at Camp Shorab, Design-Build Project Specification and Drawings. The aforementioned specification and drawings issued with the RFP only included drawings for the Court House, Battalion Storage, and Small Arms Storage. The files as posted on FBO are incomplete on part of the drawings that have been provided. The following files and contents of what has been provided are listed below for reference:

- Technical Package.pdf - The specs of the job, which has zero drawings
- W5J9LE-11-R-0031 - The base RFP
- RFP Memo - The cover letter
- AppendixPt1
 - Shorab Courthouse 41 Pages
- AppendixPt2
 - Battalion Storage
 - POL Storage
 - Personnel Bunker
 - Trash Collection Point

- AppendixPt3
 - Trash Collection Points
 - Small Arms Storage
 - Fencing & Clothesline
 - Flagpoles
- Amendment 1 (no drawings)

A.42. See A.28. above.

Q.43. RFP, Section 00100 Instructions to Bidders, paragraph 3. Key Subcontractors, states “a letter of commitment signed by the key subcontractor and the prime contractor must be submitted. It is noted under Factor 4 – Security Plan, Submission Requirements, that “The letter of commitment [for the security subcontractor] will not count against the page limitation. Will the Government please consider excluding from page count, all “Key Subcontractor” commitment letters?”

A.43. As per W5J9LE-11-R-0031 Amendment 0001, A.13. , The Letter of Commitment signed by the key subcontractor(s) and prime will be included in Factor 1 and **IS** included in the page limitation.

Q.44. RFP, Section 00100 Instructions to Bidders, Factor 2 – Resources, Sub-Factor 1 – Program Executive Team states that “...an organization chart [of the PET], depicting the superior/subordinate structure” is required. It is also noted under Factor 2 – Resources, Sub-Factor 2 – Resource Planning, Evaluation Criteria (using the Seed Task Order as the example) that, “7. An organizational flow chart that indicates clear lines of authority and responsibilities for each of the positions indicated” is required. Lastly, it is noted under Factor 3 – Management Approach, Submission Requirements that, “An organization chart that shows the lines of authority for the execution of this contract and clearly shows the reporting chain of the Offeror’s Quality Control and Safety Organization, including all Joint Venture Partners and Key Subcontractors. The chart must identify all offices involved in the contract from the Offeror’s Headquarters through the Offeror’s site office and how they are related, if applicable. Only a single organizational chart, comprehensive for the entire contract, shall be submitted.” Considering the various references to a program level “PET” and project level “Seed Task Order” org charts, where does the Government want us to place the “single organizational chart, comprehensive for the entire contract”? Can we cross-reference to the org chart across Factors to meet the submittal and evaluation criteria requirements as stipulated above?

A.44. As per W5J9LE-11-R-0031 Amendment 0001, A.15., The following sentence is deleted in its entirety, “Only a single organizational chart, comprehensive for the entire contract, shall be submitted.” To further clarify, the Government requires an organizational chart for the Program Executive Team and the Seed Project only.

Q.45. RFP, Section 00100 Instructions to Bidders, Proposal Format for Volume I, Factor 5 – Past Performance, Submission Requirements states: “Letters, Certificates, Commendations and Awards – Provide, if available, evidence of quality work such as letters, certificates, commendations and awards. Documentation provided must be for the projects listed on Form A1 and should be placed immediately behind Form A2.

Will the Government consider excluding from the Volume I, 100 page limit, “evidence” of Past Performance in the form of Letters, Certificates, Commendations, and Awards to be inserted behind Form A2 in Factor 1? Some bidders may want to submit various forms of “evidence” and would be unfairly restricted to submit said evidence in lieu of the overall 100 page limitation. Also, will CCASS Ratings

meet Factor 5 – Past Performance Submission Requirements and if so, will the Government also exclude CCASS Ratings from the overall, Volume I, 100 page limit.

A.45. The Government will not consider evidence of Past Performance in the form of Letters, Certificates, Commendations, and Awards shall be included in the overall 100 page limitation. Please refer to Factor 5 – Past Performance Evaluation Criteria, paragraphs 1 and 3.

Q.46. Kindly consider this request for a two week extension for Firm-Fixed Price, Indefinite Delivery Indefinite Quantity (IDIQ) Multiple Award Task Order Contract (MATOC) Construction and Design-Build Construction Services in support of Afghan National Security Forces (AFNS) Facilities Requirements in Southern and Western Afghanistan. We wish to create a bid that is highly competitive and would like more time to achieve this obtainable objective.

A.46. The proposal due date is hereby extended from 18 June 2011 to 21 June 2011.

Q.47. We respectfully request an extension to solicitation W5J9LE-11-R-0031, IDIQ MATOC Award Task Order Contract for Construction Services, Afghanistan Engineer District South. The overall response time is very short for such a high-dollar proposal with a great amount of risk. Because this is a significant and complex project it would be in the government's best interest to allow a nominal 7-10 day extension to the proposal due date. That would enable larger U.S. firms that are interested in bidding to coordinate procurement and produce strong technical and price proposals that will enable more competition. We understand the urgency in submitting proposals, but without an extension, we will not be able to work the many internal milestones necessary to provide an accurate bid for a high-dollar, time-sensitive FFP project.

A.47. The proposal due date is hereby extended from 18 June 2011 to 21 June 2011.

Q.48. Reference Bonding Requirements, under the Solicitation, the following is noted:

- a. On the SF1442, Block 12A indicates NO to the question “THE CONTRACTOR MUST FURNISH ANY REQUIRED PERFORMANCE AND PAYMENT BONDS?”.
- b. Block 18 states “The offeror agrees to furnish any required performance and payment bonds.”.
- c. Special Contract Requirements (page 105 of 118) Section 1.19 – Notice to Proceed, indicates that performance and payment bonds must be provided within 15 calendar days of the contractor’s receipt of the Task Order, and that the NTP will not be issued until proof of acceptable performance and payment bonds are received.
- d. Special Contract Requirements (page 105 of 118) Section 1.20 Bonding Requirements has us confused as it appears to contradict the SF1442 Block 18 and Special Contract Requirements Section 1.19 – in particular cases.
- e. Please advise if ALL task orders issued under this contract (including that issued with this Solicitation) will require 100% performance and payment bonds or an Irrevocable Letter of Credit (ILC) per Section 1.41.

A.48. See A.33 above.

Q.49. Reference Bonding Requirements (question above): Based on our understanding of the risk factors in Afghanistan, our bonding agent has indicated from an industry forum that this region would only require 30% performance and payment bonds. Please advise.

A.49. See A.33 above.

Q.50. In regard to the Solicitation Special Contract Requirements Section 1.41, Irrevocable Letter of Credit: The 3rd paragraph of this section states that the ILC is required for a minimum of 30% and at the KO's discretion, up to 100%. What is the requirement for the 'seed' project, ANA 215th MI/MP/Courthouse at Camp Shorab?

A.50. The Irrevocable Letter of Credit required for the Seed Project is 30%.

Q.51. In regard to the Solicitation Special Contract Requirements Section 1.41, Irrevocable Letter of Credit: The 4th paragraph of this section states "The payment ILC will remain in effect at an amount equal to 100 30 percent (10030%)....." Please advise the requirements intended percentage for this task.

A.51. The paragraph is hereby corrected to read:

From: The payment ILC will remain in effect at an amount equal to 100 30 percent (100 30 %) of the original task order price and shall be decreased in amounts equivalent to releases executed by subcontractors and suppliers for payment. It shall continue in effect for 120 days after the task order work has been finally accepted by the Government, after which time the ILC shall become null and void.

To: The payment ILC will remain in effect at an amount equal to 30 percent (30%) of the original task order price and shall be decreased in amounts equivalent to releases executed by subcontractors and suppliers for payment. It shall continue in effect for 120 days after the task order work has been finally accepted by the Government, after which time the ILC shall become null and void.

Q.52. Please advise if individual surety is allowed for bonding purposes.

A.52. See A.33 above.

Q.53. Reference "Technical Package E-file W5J9LE-11-R-0031TP.pdf" – ANA 215th MI/MP/Courthouse at Camp Shorab: This file does not contain a Table of Contents. Please provide.

A.53. A Table of Contents is not included as part of the Technical Package.

Q.54. Reference "Technical Package E-file W5J9LE-11-R-0031TP.pdf" – ANA 215th MI/MP/Courthouse at Camp Shorab, SECTION 00150, Paragraph 1.1 – Proposal Phase: The 2nd line of this paragraph says "The proposals to be submitted include a Management/Technical Proposal and a Cost/Price Proposal. The contents and organization of the proposal is described in SECTION 00100 – Instructions to Offerors." This E-file did not come with a SECTION 00100, only SECTION 00010 – PROPOSAL SCHEDULE, which does not require a Management/Technical Proposal or Cost/Price Proposal (more than the schedule given). Please advise if a Management/Technical and Cost/Price Proposal is required for the ANA 215th MI/MP/Courthouse at Camp Shorab. If so, please provide direction/specifications.

A.54. SECTION 00150, Paragraph 1.1 – Proposal Phase of the Seed Project, the sentence, "The proposals to be submitted include a Management/Technical Proposal and a Cost/Price Proposal" is hereby deleted. Neither a Management/Technical Proposal nor a Cost/Price Proposal are required for the Seed Task Order.

Q.55. Amendment 0001 provided an updated bid Sheet for the Seed Project (Section 00010, "Proposal Schedule – Amendment 0001") which deleted the separate CLIN for Home Office (G&A). However, Section 00100, "Bidding Schedule/Instructions to Bidders", Appendix C, "Price Breakdown – Binding

Rate Chart” requires the provision of the home office (Program Executive Team) proposed G&A rate that “will be binding for the term of the contract, as a maximum or ceiling rate, that may be proposed in any task order under this contract” and states “These charges may be negotiated downward, with award of individual task orders, but my never exceed the maximum.” Since the ceiling G&A rate will need to consider a wide range of Task Orders (from \$5 Million to \$50 Million), it may not be indicative of the rate required for the Seed Task Order. Will USACE Evaluation of Price exclude consideration of the G&A rate?

A.55. Please see corrected Bid Schedule, attached. (Section 00010, “Proposal Schedule – Amendment 0002).

Q.56. Amendment 0001 discusses a number of textual changes to various Solicitation Sections within response to individual questions but does not included updates to these sections. Will USACE be issuing updated versions these Sections in a future Amendment.

A.56. Offerors are to make appropriate pen and ink corrections. An updated version will be provided within the contract award documents.

Q.57. Reference: RFP Section 4 Delivery Instructions, page 11. Issue: Section 00100 – Instructions to Offerors, number 4 states "The Government PREFERS proposals submitted via email or on a CD."

May we assume that ONE copy of each volume is to be delivered if we chose email as our delivery method?

A.57. Correct. ONE copy of each volume is to be delivered, if email is the delivery method.

Q.58. Reference: Amendment 0001, Form A1, page 12. Issue: Page 18 of the RFP states "Minimum Threshold The Offeror must have completed at least one project within the last five (5) years, (determined based on the due date for receipt of proposals) with an awarded value of \$10 Million or more," and "Areas of Interest An Offeror should identify construction or design-build projects that are of the same magnitude as the expected task orders (between \$5 Million and \$50 Million), performed during the last five years." Furthermore, the amended Form A1 states "Projects Performed Within the Last Three Years."

- a) Is the minimum threshold date for past experience FIVE years from the submission date of our proposal, or is it THREE years?
- b) Is the minimum threshold for past experience contract value \$10 Million or \$5 Million?

A.58.

- a) Reference page 18, paragraph Minimum Threshold: The Offeror must have completed at least one project within the last five (5) years, (determined based on the due date for receipt of proposals) with an awarded value of \$10 Million or more. Reference page 18 and 19, Para B, The offer will receive additional weight for projects performed within the last three years. Amendment 0001, Form A1, page 12 requests you to identify which projects were completed within the last three (3) years.
- b) See See A.31. above.

Q.59. In the solicitation, page 11 of 118 Paragraph 4, It states "The Government PREFERS proposals submitted via email or on a CD. However, hard copy proposals will be accepted." In paragraph 5a. on the

same page it states "Proposals shall be submitted in the following format", which is hard copies send via postal mail. Please clarify which way is the acceptable format for this submission.

A.59. Both delivery methods are acceptable. However, the Government PREFERS proposals submitted via email or on a CD.

Q.60. Is a performance schedule required as part of the proposal submission?

A.60. A **Project Schedule** is required for the proposal submittal. See Section 00150, The Design/ Build Process, subpart 3.0, Project Schedule.

Q.61. Spec section 00555-4.4.3 calls for concrete foot paths; however spec section 01015-2.3 calls for 100mm thick crushed stone aggregate. Please clarify what material we are to use for the footpaths and fire lane.

A.61. Use concrete footpaths per Section 01010.

Q.62. In spec section 00555-4.4.4, it says to connect to the existing water distribution system under construction by others and to coordinate the design and construction of the water system with the contractor for the 215th Headquarter Phase 1 and Phase 2 project. For bidding purposes, can you please provide an approximate location of where these connections will take place, and the type and size of the waterline that we are connecting to.

A.62. Designs for Phase I and II are in progress, for bidding purposes assume tie-in along main road.

Q.63. In spec section 00555-4.4.5, it says to connect to the sewer collection system under construction by others and to coordinate the design and construction of the sewer system with the contractor for the 215th Headquarter Phase 1 project. For bidding purposes, can you please provide an approximate location of where these connections will take place, and the type and size of the sewer line that we are connecting to.

A.63. For bidding purposes assume tie-in to existing waste water treatment plant.

Q.64. In spec section 00555- 4.4.6, it says to connect to the existing electrical distribution system and to coordinate all distribution systems with the contractor for the 215th Headquarter projects. For bidding purposes, can you please provide an approximate location of where these connections will take place, and the type and size of the electrical lines that we are connecting to.

A.64. For bidding purposes assume tie-in to existing power plant.

Q.65. The project is 365 day duration, is the duration of the project calculated from Award of contract or from NTP?

A.65. The 365 Day period of performance is calculated from Notice To Proceed.

Q.66. Referring to RFP, scope of work, the costs for any demolition work shall be accounted for by the contractor in the bid item for which the demolition is associated. Please specify under which bid item in the proposal schedule it will be priced.

A.66. Refer to paragraph 4.4.1, Demolition, in Section 01010. There shall be no separate bid item for Demolition. Demolition should be associated with the bid items requiring demolition. For example, if demolition is required where a motor pool area is to be constructed, the demolition cost shall be included in the motor pool area construction bid item.

Q.67. Referring to section 01010 Para. 4.3.3 & 4.4.7, please confirm that the contractor's scope for the communication system is exterior infrastructure with conduits and manholes and no wiring, also interior backbone pathway with raceways and outlets but no wiring or equipment, otherwise kindly clarify the exact scope.

A.67. Refer to revised Technical Requirements.

Q.68. Referring to the communication system, please confirm that the buildings need communication outlets and connections are the only mentioned in 01010 Para 4 "Battalion Headquarters, Courthouse, Admin Building, Officers Barracks ,Small Officers Barracks, Nco Barracks", otherwise kindly specify what other buildings need communication outlets and connections.

A.68. Refer to revised Technical Requirements.

Q.69. Referring to section 01015 Para. 9.4 ,please confirm that the communication system conduits shall not be less than 100mm diameter.

A.69. Para 9.4 Exterior Conduit for communications.

Q.70. Referring to section 01015 Para. 8.5.1 indicates "Underground ducts shall be not less than 100mm diameter " , regarding the low voltage ducts please specify if all 2 should be 100mm diameter or according to the cable sizing following the NEC.

A.70. Install underground electrical ducts in accordance with the documentation.

Q.71. Referring to section 01015 Para. 8.5.1 indicates "The Contractor shall design and build a prime power distribution system to distribute power to the site's facilities and other loads as required", please confirm that the contractor's scope is the low voltage power distribution (step down transformers-low voltage ducts to buildings), otherwise kindly clarify the exact scope.

A.71. Design and build in accordance with the documents.

Q.72. Referring to section 01015 Para. 8.5.1 indicates "The Contractor shall design and build a prime power distribution system to distribute power to the site's facilities and other loads as required", please confirm that the power generation, switch gearing and medium voltage distribution are out of the contractor's scope, otherwise kindly clarify the exact scope.

A.72. Design and build in accordance with the documents.

Q.73. Please specify if the medium voltage distribution in our scope, if the answer is yes, please specify the required cable size and if it shall accommodate only the new facilities or other facilities as well not in the contractor's scope.

A.73. Design and build in accordance with the documents.

Q.74. Referring to section 01015 Para. 8.5.1 Indicates “Contractor shall provide step up transformers and the required conduits to connect the generators to their respective transformer and the transformers to the switchgear lineup”, please specify if the step up transformers are in the contractor’s scope and if it is yes please specify its rating and quantity.

A.74. Design and build in accordance with the documents.

Q.75. Referring to section 01015 Para. 8.5.1 Indicates “The Contractor shall provide all required conduit stub ups to connect all equipment (both present and planned) to the switchgear lineup.”, please specify which equipments are in the contractor’s scope is the power distribution and generation (generators- step up transformers switch gearing and synchronizing panel-site step down transformers...etc).

A.75. Design and build in accordance with the documents.

Q.76. Referring to section 01015 Para. 8.5.1, please specify if a new power plant is required.

A.76. Design and build in accordance with the documents.

Q.77. Referring to section 01010 Para. 4.4.6 Indicates “Existing electrical distribution lines (underground and aboveground) shall be used to accommodate existing facilities as required.”, please specify if the new facilities power shall be connected to existing power distribution or a separate new power distribution shall be installed.

A.77. Design and build in accordance with the documents.

Q.78. Referring to section 01010 Para. 4.4.6 Indicates “Existing electrical distribution lines (underground and aboveground) shall be used to accommodate existing facilities as required.”, please specify if the existing power generation is sufficient to accommodate the new facilities required power.

A.78. Design and build in accordance with the documents.

Q.79. Referring to section 01015 Para. 5.10.5 Indicates “Note that electrical requirements for all HVAC systems shall be designed and installed to operate on the secondary power standard required herein.”, please specify what is this secondary power which is required for the HVAC system.

A.79. 220/380V, 50Hz, as stated in the RFP Documents.

Q.80. Referring to Proposal schedule item 0005b, regarding the foot paths ,please confirm that no exterior lighting is required for these foot paths.

A.80. Design and build in accordance with the documents.

Q.81. Referring to section 01015 Para. 8.5.2 Indicates “Area lighting for the Motor Pool shall have photocell controlled switches.”, please confirm that area lighting is required only for the motor pool areas otherwise please specify which areas require exterior area lighting.

A.81. Provide exterior lighting in accordance with the documents and drawings provided.

Q.82. Referring to section 01015 Para. 7 & 8.5.12, please clarify if fire alarm system is required for all buildings or not, if not please specify which buildings.

A.82. Provide fire alarm systems in accordance with the documents and drawings provided.

Q.83. Referring to section 01015 Para. 8.5.12, please clarify if fire alarm system should be complete with control panels-pull stations....etc, or we can use stand alone hard wired detectors only.

A.83. Provide fire alarm systems in accordance with the documents and drawings provided.

Q.84. Referring to section 01010 Para. 4.3.3, please specify if lightning protection is required for all buildings or only for the Courthouse building.

A.84. Provide lightning protection in accordance with the documents and drawings provided.

Q.85. Please advice if overhead crane is required in vehicle maintenance bldg. if so, please provide capacity and specs.

A.85. Overhead crane is not required.

Q.86. Per section 01015 para 2.4.3.2, please confirm that PVC pipes are accepted for storm drainage purposes.

A.86. Refer to paragraph 2.4.2.4, Pipes, of Section 01015.

Q.87. Please provide the available and sufficient information in regard of the existing water distribution network and sewer collection system.

A.87. Refer to paragraph 4.4.4 of Section 01010. A list of the contractors will be provided by the Area Office for coordination and data to tie into the water and sewer system.

Q.88. Please confirm that no new water well/s, water storage tank/s, booster pumping station, disinfection unit is required in this project.

A.88. Confirmed. There are no new water well/s, water storage tank/s, booster pumping station, disinfection unit is required in this project.

Q.89. Please confirm that no new sewage lifting station is required in this project.

A.89. The Contractor is responsible to design and build a functional wastewater collection system for this project. It is incumbent upon the contractor to ascertain if a lift station is required to provide a complete and functional waste water collection system.

Q.90. Per section 01010 para 4.3.16.1, it is understood that the contractor is responsible to provide one low pressure compressed air system. Please confirm that there is no requirement of compressed air system in this project than this one in vehicle maintenance bldg. if no; please specify the bldg and the required air compressors.

A.90. Provide compressed air systems in accordance with what is required in the RFP. The compressed air system requirements of section 01015 pertain to the typical Vehicle Maintenance Building.

Q.91. Please confirm that no high pressure compressed air system, an engine driven air compressor is required in this project.

A.91. Compressed air systems shall be provided in accordance with the requirements of the RFP.

(End of Summary of Changes)

**SECTION 00010
PROPOSAL SCHEDULE – AMENDMENT 0002**

The Contractor shall provide a price for all items. The Government will award in accordance with the lowest price technically acceptable process in the basic contract which will be evaluated including the base item.

No.	Description	Qty	Unit	Unit Price	Total Amount
BASE PROPOSAL:					
0001	GENERAL				
0001A	Mobilization/Demobilization	1	LS	XXX	\$ _____
0001B	Security	1	LS	XXX	\$ _____
0002	DESIGN PROGRAM				
0002A	Site Survey/Existing Conditions Map	1	LS	XXX	\$ _____
0002B	A/E Design	1	LS	XXX	\$ _____
0002C	Geotechnical Investigation	1	LS	XXX	\$ _____
0002D	As-Built Drawings	1	LS	XXX	\$ _____
0003	FACILITIES				
0003A	Battalion Headquarters	1	EA	\$ _____	\$ _____
0003B	Courthouse	1	EA	\$ _____	\$ _____
0003C	Admin Building	1	EA	\$ _____	\$ _____
0003D	Officers Barracks	1	EA	\$ _____	\$ _____
0003E	Small Officers Barracks	1	EA	\$ _____	\$ _____
0003F	NCO Barracks	1	EA	\$ _____	\$ _____
0003G	Combination NCO/Enlisted Barracks	1	EA	\$ _____	\$ _____
0003H	Small Latrine	3	EA	\$ _____	\$ _____
0003J	Small Arms Storage Building	2	EA	\$ _____	\$ _____
0003K	Battalion Storage Building	2	EA	\$ _____	\$ _____
0003L	Training Building	8	EA	\$ _____	\$ _____
0003M	Classroom Building	2	EA	\$ _____	\$ _____
0003N	Flag Poles	3	EA	\$ _____	\$ _____
0003P	Trash Collection Points	6	EA	\$ _____	\$ _____
0003Q	Motor Pool Areas	2	EA	\$ _____	\$ _____
0003R	POL Storage	2	EA	\$ _____	\$ _____
0003S	Vehicle Maintenance Building	2	EA	\$ _____	\$ _____
0004	FORCE PROTECTION				

0004A	Personnel Bunkers	10	EA	\$ _____	\$ _____
0005	SITE DEVELOPMENT/IMPROVEMENTS				
0005A	Site Grading and Stormwater Management	1	LS	XXX	\$ _____
0005B	Foot Paths and Firelanes	1	LS	XXX	\$ _____
0005C	Water Distribution System	1	LS	XXX	\$ _____
0005D	Wastewater Collection System	1	LS	XXX	\$ _____
0005E	Site Electrical Distribution System	1	LS	XXX	\$ _____
0005F	Communication System	1	LS	XXX	\$ _____
0006	HOME OFFICE (G&A)				
0006A	G&A Expressed as a Percentage	1	%	XXX	% _____
0006B	G&A Expressed in Dollars	1	LS	XXX	\$ _____
0007	DBA INSURANCE				
0007A	DBA Insurance	1	LS	XXX	\$ _____

The amount listed by the offeror on this CLIN is the estimated DBA insurance premium (estimated payroll of the offeror and its subcontractors, multiplied by the applicable rate(s)). The actual amount paid by the government under this CLIN will be based on the amount of the Rutherford invoice submitted by the offeror after contract award. In the event of recalculation of the premium by CNA based on actual payroll amounts, the Contracting Officer will adjust this CLIN by contract modification to reflect actual premium amounts paid.

TOTAL PROPOSAL: \$ _____

PROPOSAL SCHEDULE NOTES

1. Offeror shall submit prices on all items. Scope of work on each items are described in Section 01010. The quantities shown in the bid schedule shall take precedence and be used for developing the proposal.
2. Only one contract for the entire schedule will be awarded under this solicitation. This project will be awarded as a single 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, site development, and utility installation.
4. DESIGN COSTS DEFINITION: Design costs shall consist of design analysis, drawings, and specifications for all facilities.
5. The government has the right to reduce the number of units in a bid item or choose to delete a base bid item entirely if necessary after the proposals are received.
6. ORDER of WORK: The following order of work shall apply before start of bid items:

See Section 00150 for Order of Work.

7. PERIOD OF PERFORMANCE AND LIQUIDATED DAMAGES: See Section 00150 for performance schedule and liquidated damages. Period of performance is defined as the number of calendar days from receipt of notice to proceed. Liquidated damages are assessed at the stated rate per day for every day of delay past the period of performance until contract completion for the Base Items.
8. Abbreviations:
 - LM = Linear meters
 - SM = Square meters
 - EA = Each
 - LS = Lump Sum
 - m² = square meters
 - kPa = kilopascals
 - m = meters
 - mm = millimeters
 - cm = centimeters
 - l = liters
 - kVA = kilo volt amps

-END OF SECTION-

SECTION 01010
(REVISED – AMENDMENT 0002)
SCOPE OF WORK

1. GENERAL

The project consists of the design and construction of the expansion of the Corp and brigade garrison at Camp Shor'ab, Washir district, Helmand, Afghanistan. This project consists of designing and constructing K-Span buildings and constructing CMU buildings. The project Concept Plan is located in the Appendix. The project is defined as the design, materials, labor, and equipment to construct buildings, utilities, and other infrastructure for a design end population of approximately 600 personnel. Final design drawings of most facilities, site work, construction, and related design shall be accomplished by the Contractor. The intent is to provide permanent basing standards using the most cost-efficient and expeditious construction methods.

The Contractor shall provide for this contract the design, materials, labor, and equipment to construct buildings, utilities and other infrastructure for the Corps and Brigade Expansion Camp Shor'ab project to include all facilities to be constructed with applicable drawings.

The work within this contract shall be designed and constructed in accordance with the current International Building Code (IBC), Life Safety Codes (NFPA-101), force protection and security standards.

The Contractor may be required to coordinate the efforts required under this contract with at least one other contractor at the site. Such coordination requirements will be required as part of this contract. The coordination effort may be significant and may include such tasks as the exchange of information with other contractors such as design data, drawings, calculations, and technical information. Additionally, it may be necessary for the contractor to conduct meetings, hold teleconferences, and prepare the submittal of additional information to the Contracting Officer (KO) that demonstrates the coordination and integration of new work with existing and future work of other contractors. All coordination shall be in agreement with the KO and approved prior to the commencement of any work.

Disclaimer: The term K-span refers to a proprietary arch span type structural system. Wherever the term K-span is used throughout this solicitation it refers to K-span type system or equivalent.

1.1 ENGLISH LANGUAGE REQUIREMENT

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

1.2 CQM TRAINING REQUIREMENT

Before project design and construction begin, the Contractor's Quality Control (QC) Manager is required to have completed the U.S. Army Corps of Engineers (USACE) Construction Quality Management (CQM) course, or equivalent. The CQM course will be offered periodically by the USACE Afghanistan Engineer District (AES). Additional approved CQM courses include those offered by the Commercial Technical Training Center (in Jalalabad) and the Champion Technical Training Center (in Kabul). The Quality Assurance Branch of the AES can provide information related to AES offerings of the CQM course, as well as contact information for training centers. Alternative CQM courses, other than those mentioned above, must be approved by the Quality Assurance Branch.

The Contractor's quality control plan, as defined in USACE Guide Specification 01451, entitled "Contractor Quality Control", shall include "The name, qualifications (in resume format), duties, responsibilities, and authorities of each person assigned a CQC function." For the QC Manager, qualifications must include a certificate demonstrating completion of an approved CQM course.

1.3 SUBMITTALS

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

1.4 COST ESTIMATE

The Contractor shall prepare a parametric construction cost estimate for AES data collection purposes. The Contractor shall prepare a thorough, well-supported, estimate reflecting the final design features, construction schedule, conditions, and any construction phasing requirements. The cost estimate shall be submitted as part of the 99% design submittal.

1.5 CONTRACTOR REQUIREMENTS

The Contractor shall design and construct the facilities as a site adapt contract and shall be in accordance with the requirements stated in Section 01015 TECHNICAL REQUIREMENTS. If there is any discrepancy between Section 01010 and Section 01015 in this RFP, Section 01010 shall supersede. In addition, USACE construction shall be notified.

All work including data collection, design, construction, equipment purchase, equipment installation, studies, and surveys as described in this Section 01010 of the RFP shall be accomplished by the Contractor unless otherwise stated.

2. LOCATION

All work under this task order is for the design build, and construction of the expansion of the Corp and Brigade Expansion at Camp Shor'ab located in Helmand, Afghanistan. The coordinates, in UTM, of the limits of work of the site are shown as one point coordinate on the Concept Plan found in Appendix.

3. UNEXPLODED ORDNANCE (UXO)/ MINES

3.1 UXO REMOVAL AND CLEARANCE

The Contractor is not responsible for the clearance or removal of mines and unexploded ordnance (UXO) from the site prior to the commencement of construction. The site has been cleared to a minimum depth of 1 m and the certificate of clearance is available for review. No construction activities are to be conducted without review of the written clearance certification for the site. If sub-surface construction activities will be performed on this site the clearance certification must state that the clearance depth was conducted to a minimum depth of 1 m.

NOTE 1: For previous UXO/mine information, and a copy of the clearance certification the following points of contact from the UN Mine Action Center (MAC) of Afghanistan are provided:

Mohammad Sediq, Chief of Operations,
Email: sediq@unmaca.org
Cell: +93 070 295207

Hansie Heymans, Chief Information Officer,
Email: hansie@unmaca.org
Cell: +93 070 294286

UXO Safety/ Demining COR, USACE
tan.uxo.demining.safety@usace.army.mil, Comm: 540-667-2127

NOTE 2: The Contractor should be aware that many areas demined by NGOs and other groups may have only been cleared to a depth of 13 cm for humanitarian purposes. If construction will take place, a minimum of 1 meter in depth is mandatory.

It is the responsibility of the Contractor to be aware of the risk of encountering UXO/mines and to take all actions necessary to assure a safe work area to perform the requirements of this contract. The

Contractor assumes the risk of any and all personal injury, property damage or other liability arising out of or resulting from any Contractor action taken hereunder. The Contractor and its subcontractors may not handle, work with, move, transport, render safe, or disarm any UXO/mine, unless they have appropriate accreditations from the MAC.

If a UXO/mine is encountered during project construction, the Contractor shall immediately stop work in the affected area, safely mark the area of the UXO/Mine and immediately notify the Contracting Officer, COR or the Government Construction Representative. UXO/Mine disposal will not be the responsibility of the Contractor unless the area exceeds the 1 meter clearance depth of the original clearance certificate.

4. SUMMARY OF WORK

4.1 GENERAL

4.1.1 MOBILIZATION/DEMobilIZATION

Mobilization and Demobilization shall consist of all labor, equipment, supplies and facilities required to stage all equipment and facilities needed for construction of this project. See Contract Clauses for more information.

The Contractor shall install temporary access points and roads, temporary parking, construction lay-down areas, and foot paths with compacted base, appropriately graded for drainage, and cover with a well graded, crushed stone aggregate surface capable of withstanding the anticipated construction traffic. At a minimum, the Contractor shall place 50 mm of crushed, well-graded, and compacted aggregate over areas to be used for drainage, pedestrian circulation (not including foot paths), and/or dust control.

Portable latrines: During construction, the Contractor shall furnish and install portable latrine units in locations as required. Portable latrines shall be a mix of western and eastern style units. Mix shall be determined by Contracting Officer.

Portable lavatories: During construction, the Contractor shall furnish and install handwash units in locations as required. Handwash units shall each include four (4) wash units. Each wash unit shall consist of a basin, foot controlled wash water dispenser, hand soap dispenser, and towel dispenser.

4.1.2 SECURITY

Security is critical to construction in Afghanistan, especially on roads and remote areas away from Coalition Force bases. The Contractor must have an appropriate amount of security/protection to match the threat in the project area and along the supply routes. A detailed security plan in accordance with Section 01040 SECURITY shall be approved by the Government before construction notice to proceed.

The Contractor shall be responsible for physical security of all materials, supplies, and equipment of every description, including property which may be Government-furnished or owned, for all areas occupied jointly by the Contractor and the Government, as well as for all work performed.

4.2 DESIGN PROGRAM

4.2.1 SITE SURVEY / EXISTING CONDITIONS MAP

The site survey and existing conditions map shall consist of all labor, equipment and supplies necessary to produce the topographical data in accordance with the requirements specified in Sections 01015 and 01335.

4.2.2 GEOTECHNICAL INVESTIGATION

Existing geotechnical information is not available at the project site. Any site-specific geotechnical data required to develop foundations, fill at elevated slabs, materials, earthwork, and other geotechnical related design and construction activities for this project shall be the Contractor's responsibility.

The geotechnical report shall contain the results of a geotechnical investigation conducted in accordance with the requirements specified in Section 01015. All labor, equipment and supplies necessary to conduct a geotechnical investigation shall be considered a part of the geotechnical report. **Contractor shall be aware that rock has been found at shallow depths. The contractor shall bid anticipation encountering shallow rock.**

4.2.3 A/E DESIGN

A/E (Architectural/Engineering) Design shall consist of all labor, equipment and supplies required to furnish the project design in accordance with the requirements specified in Section 01015 and Section 01335.

4.2.3.1 MASTER PLAN

As part of the A/E Design bid item, the Contractor shall prepare a site Master Plan based on information contained in the Request for Proposal. The Contractor shall submit the site Master Plan for review within 30 days from NTP. The Contractor shall participate in a Master Plan design charrette that will be conducted at the Corps of Engineers Headquarters Office in Kandahar. The Contractor shall use the results of the design charrette in preparing any changes to the Master Plan. The plan provided in the Appendix is only a Concept Plan. Not all features are shown on the Concept Plan. The Contractor is responsible for including all features for a complete design. The Contractor must verify the space requirements and code compliance in accordance of Section 01010 and Section 01015 of this contract. The site-specific Master Plan shall include the location of construction office/storage containers and lay-down and construction debris removal areas. The Contractor shall show all features on the Master Plan regardless of whether they are shown on the Government supplied Concept Plan.

4.2.4 AS-BUILT DRAWINGS

As-built drawings shall consist of all labor, equipment and supplies required to produce as-built drawings in accordance with the requirements specified in Section 01335 and 01780A.

4.3 FACILITIES

4.3.1 GENERAL REQUIREMENTS FOR FACILITIES

In general, this project consists of designing and constructing facilities as described in this Section, the Concept Plan as revised by the Contractor in the approved site-specific Master Plan, approved standardized design drawings, floor plans (for K-spans), and the requirements stated in Section 01015 TECHNICAL REQUIREMENTS. All standard construction amenities and details such as HVAC, lighting, site drainage, utility connections, etc. shall be implied as a design and construction requirement.

The construction of the Standard Building Designs and Non-Standard Building Designs listed below shall be done in strict accordance with the plans furnished, with no changes made to any feature of work shown in these design drawings, unless otherwise specified. All other Design Build work shall be the responsibility of the Contractor and submitted for review in accordance with Section 01335 of this Contract.

Attempts shall be made to match existing on-site architectural materials and colors. All construction shall be done in the same style and paint schemes as existing buildings, respective of sustainable construction and design. 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 2 years prior to bid opening. Construction shall provide for institutional (detention) grade vandal-resistant fixtures and valves in showers, toilets, and lavatories. All toilets shall be eastern style and shall face north or south.

The Contractor shall design and construct buildings and structures that provide a high level of sustainability. The Contractor shall provide potable water, toilets, ablution areas, electrical, and

communications equipment in buildings as specified, connecting to and integrating with existing systems and shall be responsible for installing all upgrades. Specification of equipment and materials that match stocked items by the facility or central Department of Public Works is highly desirable. The Contractor shall reference the Appendix for building-specific construction details.

The Contractor shall provide at all exterior doors at all buildings, concrete stoops with walk-off grates having removable galvanized steel grates and dirt wells. The Contractor shall provide boot scrapers for boot cleaning.

Barracks shall be spaced far enough apart to minimize noise (minimum 10m between barracks).

Native crushed stone, 100 mm thick, shall be placed around all buildings from the building wall out 3 m and all areas of anticipated foot or vehicle traffic to reduce erosion and to provide dust control. Crushed stone shall not be placed around buildings if asphalt pavement is to be placed around buildings.

The Contractor shall reference the Appendix for the Concept Plan, floor plans (for K-span buildings), and standardized design drawings for suggested facility location and construction details.

All parking areas, storage areas, and vehicle maneuver areas that are described as aggregate surfaced shall be constructed per the requirements of Section 01015.

This project consists of constructing and designing the following:

Contractor Designed (floor plans provided)

- Courthouse (CMU, drawings provided “for reference only”)
- Battalion HQ (K-Span)
- Training Buildings (150 PN) (K-Span)
- Officers Barracks (K-Span)
- Small Officers Barracks (K-Span)
- NCO Barracks (K-Span)
- Combination NCO/Enlisted Barracks
- Admin Building (K-Span)
- Small Latrine (120 PN) (K-Span)
- Vehicle Maintenance Facilities (K-Span)
- Battalion Storage (K-Span)
- Small Arms Storage (CMU)
- Classroom Building (K-Span)

Standard Building Designs (design drawings provided):

- POL Building
- Personnel Bunker
- Trash Collection Points

Standard Non-Building Designs (design drawings provided):

- Clotheslines
- Flag Poles
- Personnel Gate
- Fence and Double Swing Arm Gate
- Fence
- Personnel Bunker

Contractor Designed (design drawings are not included):

- Site Grading and Stormwater Management

- Motor Pool Area
- Parking, Maneuver Areas, and Foot Paths
- Water Distribution System
- Wastewater Collection System
- Communications System
- Underground Electrical site Distribution Sytem

4.3.1.1 LIFE SAFETY

The facilities shall comply with all other safety requirements as required within references. Design and construct of circulation pathways and exit stairs shall be in accordance with building code references herein. A fire sprinkler system is not required. The Contractor shall equip buildings with wall-mounted CO₂ fire extinguishers at a 1:100 SM density (minimum). Exit signs shall be placed above doors opening to the exterior and labeled in English, Dari, and Pashto. The Contractor shall install hardwired smoke detectors to provide local alarm only. Install carbon monoxide (CO) monitors in large occupancy areas, sleeping areas, and enclosed facilities. These CO monitors/alarms shall be hardwired for reliability and to prevent pilferage.

4.3.1.2 FOUNDATION DESIGN

Foundations, including sub-grade, for the CMU standard drawings are based on an assumed soil bearing value. The Contractor shall design and construct same, otherwise based on recommendations from geotechnical investigation required herein. **The Contractor shall design and construct foundations for all non standard design buildings (including K-Span buildings).**

Contractor shall be aware that rock has been found at shallow depths. The contractor shall bid anticipating encountering shallow rock.

4.3.1.3 INTERIOR LIGHTING

General lighting shall be provided for each building type and function within each building. Lighting shall be ceiling-mounted fluorescent.

4.3.1.4 HEATING, VENTILATION, AND COOLING

Environmental control of the facilities shall be achieved by natural ventilation, mechanical ventilation, cooling, and heating. Cooling shall be provided in only specified rooms of specified buildings. The following table lists the buildings and rooms that where cooling shall be provided in the form of ductless split pack heat pump units. Temperature requirements for various spaces are found in Section 01015-5.6.1 INDOOR DESIGN CONDITIONS.

<u>Building and Room</u>	<u>No.of Buildings</u>	<u>No. of Rooms Receiving Cooling per Building</u>	<u>Total No. of Rooms Receiving Cooling</u>
Battalion Headquarters, BN CDR Office	1	1	1
Battalion Headquarters, Comm/Elec Room	1	1	1
Admin Bldg., BN CDR Office	1	1	1
Classroom Building	2	1	2
Courthouse Bldg.	1	<u>18</u>	18 (21 split pack

			units as shown in <u>drawings)</u>
Small Arms Storage Bldg	2	1	2
Total	8		25

4.3.2 BATTALION HEADQUARTERS

The Contractor shall design and construct one (1) Battalion Headquarters per the floor plan titled "BATTALION HEADQUARTER" in the Appendix. The buildings shall be K-span type of construction. In addition to basic facility guidelines, include RJ-45 outlets to be installed in each office at workstations.

4.3.3 COURTHOUSE

The Contractor shall design and construct one (1) Courthouse. The design shall be based upon the drawings in the Appendix titled "ANA, New Courthouse for Camp Chorab RSC_SW, Helmand Province, Afghanistan, 17 December 2010". These drawings are for reference only and the Contractor shall design all aspects of the courthouse.

The building has an IBC occupancy classification of A-3 (per Chapter 3 – courtrooms) and a V-A construction type which requires the wood roof structure to be protected by a 1-hr fire-rated membrane of gypsum wallboard on metal furring channels per UL or Gypsum Association details. Large storage rooms, Stair 111 and Corridor 114 are protected by 1-hr rated wall construction. All stairs shall be designed wide enough for movement of desks and furniture.

The structure is special reinforced concrete moment frame with non-load bearing CMU interior and exterior walls, a reinforced concrete slab-on-grade, and a reinforced concrete elevated slab system. The concrete framing system supports a lumber roof truss system that supports corrugated, galvanized sheet metal over 30# building felt and 20mm exterior grade plywood.

Exterior and interior finish is painted stucco. Exterior doors are insulated hollow metal with primed and painted finish. Interior doors are stained, solid core wood in painted, hollow metal frames. Door hardware is described in further detail in this submittal. Windows are all aluminum windows with either fixed panes or in-swing casement, all with acrylic glazing. Ceiling is a suspended grid with lay-in 600mm x 600mm tiles. The wood roof structure is protected by a 1-hr rated construction of gypsum wallboard on furring strips per UL or Gypsum Association details. All interior and exterior finishes are to be coordinated with the Contracting Officer.

The work shall include all Design and Construction as required to provide a fully functional and operational courthouse. The courthouse shall be designed and constructed specific to the location selected in accordance with this section, the guide drawings attached, and the detailed construction documents to be produced by the Contractor.

The Contractor shall install data communication CAT-6 cabling as indicated on the attached conceptual plans. The data communication cables shall route to the Server Room with required length inside the server room to reach the server and / or data rack and /or patch panels and as noted on the drawings. Data / communications equipment to be provided by others. Provide cabling terminations. Test and document cables after terminations have been completed. Submit documentation with close-out documents. Provide a complete NFPA 780 compliant lightning protection system as described on the attached conceptual plans.

The Courthouse shall be surrounded with a 3 m high chain link fence with Y-channel and triple strand concertina wire and two (2) lockable double swing arm vehicle gates and two (2) lockable personnel

gates. Construct the fence and gates per the standard design drawings in the Appendix. Grade and level the area with appropriate slope and drainage shall tie into the storm drainage system.

4.3.4 ADMIN BUILDING

The Contractor shall design and construct one (1) Admin Building per the floor plan titled "ADMIN BUILDING" in the Appendix. The buildings shall be K-span type of construction. In addition to basic facility guidelines, include RJ-45 outlets to be installed in each office at workstations.

4.3.5 OFFICERS BARRACKS

The Contractor shall design and construct one (1) Officers Barracks per the floor plan titled "OFFICERS BARRACKS" in the Appendix. The buildings shall be K-span type of construction. In addition to basic facility guidelines, include RJ-45 outlets to be installed in each room.

4.3.6 SMALL OFFICER'S BARRACKS

The Contractor shall design and construct one (1) small officers barracks per the floor plan titled "SMALL OFFICERS BARRACKS" in the Appendix. The building shall be K-Span type of construction. In addition to basic facility guidelines, include RJ-45 outlets to be installed in each room.

4.3.7 NCO BARRACKS

The Contractor shall design and construct one (1) NCO Barracks per the floor plan titled "NCO BARRACKS" in the Appendix. The buildings shall be K-span type of construction. In addition to basic facility guidelines, include RJ-45 outlets to be installed in each room.

4.3.8 COMBINATION NCO/ENLISTED BARRACKS

The Contractor shall design and construct one (1) Combination NCO/Enlisted Barracks per the floor plan titled "COMBINATION NCO/ENLISTED BARRACKS" in the Appendix. The buildings shall be K-Span type of construction.

4.3.9 SMALL LATRINE

The Contractor shall design and construct three (3) Small Latrine facilities per the floor plan titled "SMALL LATRINE" in the Appendix. Each small latrine facility shall accommodate 120 persons. The buildings shall be K-span type of construction. The toilets shall be eastern style. Laundry facilities shall be hand wash sink type. Faucets shall be hose bibb type.

The Contractor shall construct three (3) clotheslines per small latrine building for a total of nine (9) clotheslines. The Contractor shall construct the clotheslines per the standard design drawings in the Appendix. The clotheslines shall be located adjacent to the small latrines.

4.3.10 SMALL ARMS STORAGE BUILDING

Design and construct two (2) Small Arms Storage Buildings per the floor plan titled "SMALL ARMS STORAGE" in the Appendix. The buildings shall be CMU type of construction.

The Contractor shall design and construct a small arm storage and vehicle maneuver area around each storage building. The storage building and associated storage and vehicle maneuver area shall be surrounded with a 3 m high chain link fence with Y-channel and triple strand concertina wire and one (1) lockable double swing arm vehicle gate and one (1) lockable personnel gate. Construct the fence and gates per the standard design drawings in the Appendix.

The Contractor shall pave the fenced area with 100 mm thick aggregate paving.

4.3.11 BATTALION STORAGE BUILDING

Design and construct two (2) Battalion Storage Buildings per the floor plan titled "BATTALION STORAGE BUILDING" in the Appendix. The buildings shall be K-Span type of construction.

Provide open storage and vehicle maneuver areas in support of the battalion storage buildings. The areas shall be surrounded with a 3 m high chain link fence with Y-channel and triple strand concertina wire and one (1) lockable double swing arm vehicle gate and one (1) lockable personnel gate. Construct the fence and gates per the standard design drawings in the Appendix.

Install area lighting over the loading dock areas. The fenced area shall be surfaced with 100 mm thick aggregate.

4.3.12 TRAINING BUILDING

The Contractor shall design and construct eight (8) Training Buildings per the floor plan titled "Training Building" in the Appendix. The buildings shall be K-span type of construction.

4.3.13 CLASSROOM BUILDING

The Contractor shall design and construct two (2) Classroom Buildings using the floor plan titled "Classroom Building" in the Appendix. The buildings shall be K-Span type of construction.

4.3.14 FLAG POLES

The Contractor shall construct three (3) Flag Poles per the standard design drawings titled "MISC. SITE DETAILS FLAGPOLES" in the Appendix. The flagpoles shall be located in the vicinity of the entrance to the Battalion HQ building. The Contractor shall design and construct directional lighting for Flagpole illumination at night.

4.3.15 TRASH COLLECTION POINTS

The Contractor shall construct six (6) Trash Collection Points. The trash collection points shall be located in the areas where trash collection is accessible and convenient. The Contractor shall construct the trash collection points per the standard design drawings titled "TRASH COLLECTING POINT" in the Appendix.

4.3.16 MOTOR POOL AREAS

The Contractor shall design and construct two (2) motor pool areas each with a area of 6650 SM. The Contractor shall locate the motor pool areas as shown on the concept plan in the Appendix. The Contractor shall design two motor pool areas in accordance with the drawings titled "MOTOR POOL AREA" in the Appendix.

The Motor Pools shall be surrounded with a 3 m high chain link fence with Y-channel and triple strand concertina wire and two (2) lockable double swing arm vehicle gates and two (2) lockable personnel gates for each motor pool area. Construct the fence and gates per the standard design drawings in the Appendix. Grade and level the area with appropriate slope and drainage shall tie into the storm drainage system. The Contractor shall pave the fenced area with 100 mm thick aggregate. At each Motor Pool the Contractor shall design and construct one (1) vehicle maintenance building and one (1) POL building.

4.3.16.1 VEHICLE MAINTENANCE BUILDING

The Contractor shall design and construct two (2) Vehicle Maintenance Buildings located within the Motor Pool area per the floor plan titled "VEHICLE MAINTENANCE" in the Appendix. The buildings shall be K-Span type of construction.

The Vehicle Maintenance Building shall have two (2), drive-through maintenance bays with coiling, overhead doors at each end. Coiling overhead doors shall be 4.5 m high by 3 m wide. Provide two (2)-200 mm diameter by 1,000 mm high concrete filled steel bollards at each jam of the coiling overhead doors. Provide a smooth finished concrete floor designed to support 7-ton vehicles and a 5 m wide concrete apron that runs the length of each end of the building. The clear distance between the finished floor and the bottom of the roof structure shall a minimum of 6 m. Provide a vehicle exhaust system with hose reel. Provide a maintenance pit with curbs for accessing the underside of the vehicles for one (1) drive-through maintenance bay. The pit shall be provided with a sturdy metal grate to be used when the

pit is not in use. The remaining maintenance bay shall have finished floor and no vehicle pit. Provide a waste oil collection system at each end of the maintenance bay.

Mechanical: Provide an overhead vehicle tailpipe exhaust removal system and coordinate the location of the system such that it does not interfere with vehicle access and the exhaust hose will connect to the vehicle exhaust tail pipe. Provide a low-pressure (≤ 862 KPa) compressed air system to include air compressor, piping, hose reel, and hose. Locate the air compressor outside and to the rear of the building and coordinate the location of hose reel and hose such that it will not conflict with vehicle access and the hose will easily access the maintenance bay. Provide an emergency eye-wash station on both sides of the maintenance bay. Floor drains shall not be provided in the vehicle maintenance bays.

Electrical: Provide switched lighting that will illuminate the entire area inside the vehicle bays. Provide lights capable of operating in the year-round temperature ranges expected to occur in building. Provide electrical receptacles, equally spaced, with three (3) receptacles on all walls. Provide receptacles on the garage walls for drop lights and other electrical power tools. Determine whether the outlets need to be single or three phase. Some power tools might require a higher voltage. Receptacles may be grouped together but shall have dedicated circuits and shall be configured to draw no more than 16 amperes. One dedicated circuit shall be installed for the use of a 10.5 kg/sq cm electric air compressor. Provide charging outlets in the Battery Room.

Provide exterior lighting on the corners of the vehicle maintenance building sufficient to light an area 30 m from the building.

4.3.16.2 POL STORAGE BUILDING

The Contractor shall construct a total of two (2) POL Storage Buildings in support of each vehicle maintenance building per the standard design drawings titled "POL STORAGE" in the Appendix. The POL Storage Buildings shall be located adjacent to the Vehicle Maintenance Building within the motor pool area.

4.3.17 FORCE PROTECTION

Construct force protection measures to include personnel bunkers. Force protection requirements shall be in accordance with UFC 4-010-01, *Minimum DoD Anti-terrorism Standards for Buildings*; and UFC 4-010-02, *DoD Minimum Anti-terrorism Standoff Distances for Buildings*. A standoff distance of 45 m is required for billeting and high-occupancy facilities. Provide protective concrete barriers around and between billeting building and high occupancy facilities.

4.3.17.1 PERSONNEL BUNKER

The Contractor shall construct ten (10) Personnel Bunkers per the standard drawings in the Appendix. The Contractor shall locate the personnel bunkers according to population location and ease of access into the bunkers.

4.4 SITE DEVELOPMENT/IMPROVEMENTS

4.4.1 DEMOLITION

The Contractor shall remove and dispose of all debris, concrete, buildings and foundations. The Contractor shall be responsible for locating and paying all fees associated with removal and relocation of all debris and shall verify the location of debris disposal with the KO (Contracting Officer). Scrap metal on site shall be moved to an area away from the site perimeter as directed by the COR and left for the host government to salvage. Demolished fencing and concertina wire shall be neatly rolled up and used fence posts and outriggers shall be neatly stockpiled for reuse by the host government. There will be no separate measurement or payment for demolition and the costs associated with any demolition work shall be accounted for by the Contractor in the bid item for which the demolition is associated.

4.4.2 SITE GRADING AND STORMWATER MANAGEMENT

Site grading and stormwater management features shall conform to the requirements and references specified herein for development of the facility. The Contractor shall design and submit a Site Grading and Stormwater Management Plan showing the location of all required drainage structures. Site grading shall be compatible with existing terrain/grading, provide adequate drainage to minimize flooding, and promote drainage to the nearest wadi for the entire enclosed perimeter and security measures on the exterior.

The Grading and Stormwater Management Plan shall be properly contoured showing existing and proposed contour lines, location of drainage structures, details of all drainage structures, and show direction of flow in drainage swales and ditches. There shall be spot elevations shown at the beginning and end of all drainage structures, at inflection points, and spaced every 25 meters along the alignment. Proposed contour lines shall meet with existing contour lines on the Grading and Drainage Plan. The Grading and Drainage Plan shall be at a scale that all lines and structures can be easily seen and ascertained.

Culverts and perimeter wall penetrations shall have personnel access denial system(s).

All new storm drainage (including stone and mortar or concrete lined canals, trenches, ditches, swales, etc) shall be lined with a stone and mortar finish to prevent future erosion. Details of the storm drainage structures shall be provided in the design drawings. Evaporation or indefinite detention of stormwater is not allowed as a design method. All stormwater piping and manholes shall meet the requirements of Section 01015 Technical Requirements.

4.4.3 FOOT PATHS AND FIRELANES

Concrete foot paths are required to connect all buildings, facilities, and features such as offices, classrooms, courthouse, etc. Foot Paths shall be compacted base, appropriately graded for drainage, and covered with a concrete surface. The Contractor shall design the concrete footpaths based upon the geotechnical investigation by the Contractor. Footpaths shall be shown on the Site Plan and a detail of the foot paths shall be provided in the design drawings.

For emergency access, each building shall have fire lanes on a minimum of three sides. Footpaths can be used for firelanes if the footpath is a minimum of 3 meters wide.

4.4.4 WATER DISTRIBUTION SYSTEM

The Contractor shall design and construct a new water distribution system to be tied into the existing water distribution system under construction by others for the 215th Headquarter Phase 1 project. The contractor shall coordinate design and construction with the contractor for 215th Headquarter Phase 1 project and the contractor for the 215th Headquarter Phase 2 project.

The Contractor shall design and construct underground pipe distribution system, and service connections and necessary appurtenances to all buildings and features requiring water supply. The water system shall be designed and constructed in accordance with the AED Design Requirements, latest version. See Section 01015 TECHNICAL REQUIREMENTS for design and construction criteria. Water demand required for fire fighting and for irrigation and landscaping needs will not be included in design demand calculations.

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.

4.4.5 WASTEWATER COLLECTION SYSTEM

Sanitary sewer collection system shall be designed and constructed by contractor. Sewer collection system shall consist of gravity sewer pipe and appurtenances such as manholes, cleanouts and building service connections. The gravity sewer collection system shall connect to the sewer collection system under construction by others for the 215th Headquarter Phase 1 project. The Contractor shall coordinate sewer system design and construction with the contractor for the 215th Headquarter Phase 1 project.

4.4.6 SITE ELECTRICAL DISTRIBUTION SYSTEM

The new electrical distribution system shall be underground. The electrical distribution system shall provide electricity to all facilities within the scope of this project. Existing electrical distribution lines (underground and aboveground) shall be used to accommodate existing facilities as required. All electrical design and installation shall meet NEC/BSI, 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.

All wiring shall be run and pulled through conduits. Electrical receptacles shall be provided as indicated. Primary voltage shall be 15kV, 50Hz. Secondary voltage shall be 220/380V, 50Hz. It is important to verify the primary voltage level of the site.

The Contractor shall connect to the existing Camp Shorab electrical distribution systems. The Contractor shall coordinate all distribution systems with the contractor for the 215th Headquarter projects.

Contractor shall design all interior electrical systems as described in Section 01015 TECHNICAL REQUIREMENTS.

4.4.7 COMMUNICATION SYSTEM

Communication infrastructure shall be designed in accordance with Section 01015 TECHNICAL REQUIREMENTS.

Backbone Pathway: Telecommunication pathways (conduit) from the telecommunications entrance facility to telecommunications room(s), and, telecommunications equipment rooms shall be installed. The Contractor shall not be responsible for supply or installation of telecommunications optic fiber, or wire.

5. 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.

-- END OF SECTION --

SECTION 01015
(REVISED – AMENDMENT 0002)
TECHNICAL REQUIREMENTS

1.0 GENERAL

1.1 COMPLIANCE

The Contractor's design and construction must comply with technical requirements contained herein. The senior designers of all engineering disciplines shall have a minimum of 10 years experience with the design and construction of the same magnitude and complexity as required in this project. 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

The design and product requirements stated in these documents are minimum requirements. Exceeding the minimum requirements as improvements to the design stated herein is highly encouraged at no additional cost and as approved by the government. Any deviation from the technical requirements shall be approved by the Contracting Officer. Request for deviations shall be submitted for approval. The Contractor is encouraged to propose alternate design or products (equipment and material) that are more commonly used in the region; but these variations shall be equal in performance from a technical standpoint as well as more cost effective or allow for more timely completion. Variations shall furnish the same system safety, durability, ease of maintenance and environmental compatibility. The Contractor will be required to submit information as specified in Section 01335, paragraph Variations, for all proposed variations with which to make a comprehensive 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)

1.4.1.1 UXO/MINE DISCOVERY DURING PROJECT CONSTRUCTION

It is highly recommended that all construction ground guide/ground observation personnel maintain a minimum 16 m buffer zone from all heavy equipment during excavation activities. A daily check of the area for signs of recently emplaced UXO/IED's is also highly recommended, to include unusual disturbed soil areas or mounds of soil from the previous day. If during construction, the contractor becomes aware of or encounters UXO/Mine or potential UXO/Mine, the contractor shall immediately stop work at the site of encounter, clearly mark the area of UXO/Mine, 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. UXO/Mine disposal will not be the responsibility of the Contractor.

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 Camp Shorab 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. If there is conflict in the criteria the most stringent requirement shall be applied. This list is not exhaustive and is not necessarily complete.

AABC - Associated Air Balance Council (National Standards for total System Balance)

ACI 301M Specifications for Structural Concrete (latest edition), American Concrete Institute

ACI 318 Building Code Requirements for Structural Concrete (latest edition), American Concrete Institute

ACI 530/ASCE 5/TMS 402, Building Code Requirements for Masonry Structures (latest edition)

Air Force Manual 32-1071, Security Engineering, volumes 1-4, 1 May 1994

American Institute of Steel Construction (AISC), Specifications for Structural Steel Buildings (latest edition)

American Petroleum Institute (API) Codes

American Water Works Association, ANSI/AWWA C651-99 standard

ARI - Air Conditioning and Refrigeration Institute

ASCE 7, Minimum Design Loads for Buildings and Other Structures (latest edition)

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

Engineers Handbooks latest editions: Fundamentals; HVAC Systems and Equipment; HVAC Applications; Refrigeration.

ASHRAE Standard 55-latest edition, Thermal Environmental Conditions for Human Occupancy

ASHRAE Standard 62.1-latest edition, Ventilation for Acceptable Indoor Air Quality

ASHRAE Standard 62.2-latest edition, Ventilation and Acceptable Indoor Air Quality for Low-Rise Residential

ASHRAE Standard 90.1-latest edition, Energy Standard for Buildings Except Low-Rise Residential Buildings

ASHRAE Standard 90.2-latest edition with Supplement, Energy-Efficient Design of Low-Rise Residential Buildings

ASME - American Society for Mechanical Engineering

ASTM - American Society for Testing and Materials

ASTM-D-1586 Standard Test Method for Standard Penetration Test

ASTM-D-5299 Standard Guide for Decommissioning Ground Water Wells

AWS D1.1, Structural Welding Code – Steel (latest edition), 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)

Design Standard per Memorandum for Record, Design Standards, DTD 16 August 2009 BT, Appendix B-1 and B-2

DoD Ammunition and Explosives Safety Standards

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

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

HESCO® Bastion Concertainer® Construct Guide for Engineers

IBC - International Building Codes, 2006 edition (and its referenced codes including those inset below)

IEEE C2, National Electrical Safety Code (NESC), latest edition

IFGC – International Fuel Gas Code, latest edition

IMC – International Mechanical Code, latest edition

IPC – International Plumbing Code, latest edition

Lighting Handbook, IESNA, latest edition

MIL-HDBK-1190, Facility Planning and Design Guide

National Association of Corrosions Engineers (NACE) Codes

Codes and Standards of the National Fire Protection Association (NFPA), as applicable and enacted in 2002 or later.

NFPA 1, General Fire Protection, latest edition

NFPA 10, Portable Fire Extinguishers, latest edition

NFPA 13, Fire Sprinkler Code, latest edition

NFPA 30, Flammable and Combustible Liquids Code, latest edition

NFPA 30A, Code for Motor Fuel Dispensing Facilities and Repair Garages, latest edition

NFPA 54, National Fuel Gas Code, latest edition

NFPA 58, Liquefied Petroleum Gas Code, latest edition

NFPA 70, National Electrical Code, latest edition

NFPA 72, National Fire Alarm Code, 2002 edition

NFPA 75, Standard for the Protection of Information Technology Equipment

NFPA 80, Fire Rated Doors and Windows, latest edition

NFPA 90A, Air Conditioning and Ventilating Systems, latest edition

NFPA 96, Fire Protection for Commercial Kitchens, latest edition
NFPA 101, Life Safety Code, latest edition
NFPA 110, Standard for Emergency and Standby Power Systems, 2005 edition
NFPA 1141, Site Fire Protection, latest 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 5-805-4 Noise and Vibration
TM 5-811-1 Electrical Power Supply and Distribution
UFC 1-200-01, Design: General Building Requirements
UFC 1-300-07A Design Build Technical Requirements
UFC 3-220-03fa Soils and Geology
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 3-230-09a, Water Supply: Water Storage, 16 Jan 2004
UFC 3-230-10a, Water Supply: Water Distribution, 16 Jan 2004
UFC 3-230-17FA, Drainage in Areas Other than Airfields, 16 Jan 2004
UFC 3-240-04a, Wastewater Collection, 16 Jan 2004
UFC 3-240-07fa Gravity Sewers 16 Jan 2004
UFC 3-240-04A Wastewater Collection 16 Jan 2004
UFC 1-300-09N, Design Procedures
UFC 3-310-01, Structural Load Data
UFC 3-310-02A, Structural Design Criteria for Buildings
UFC 3-410-01FA Heating, Ventilating and Air Conditioning, latest edition
UFC 3-410-02A, HVAC Control Systems, latest edition
UFC 3-410-04N, Industrial Ventilation, latest edition
UFC 3-420-01, Plumbing Systems Design, latest edition
UFC 3-420-02FA, Compressed Air, latest edition
UFC 3-430-01FA, Heating and Cooling Distribution Systems, latest edition
UFC 3-460-01, Petroleum Fuel Facilities, latest edition
UFC 3-501-03N, Electrical Engineering Preliminary Considerations, 16 Jan 2004
UFC 3-520-01, Interior Electrical Systems, 10 June 2002
UFC 3-520-05, Stationary Battery Areas, latest edition

UFC 3-530-01AN, Design: Interior and Exterior Lighting and Controls, 19 Aug 2005
UFC 3-550-03FA Design: Electrical Power Supply and Distribution Systems, 1 Mar 2005
UFC 3-600-01, Design: Fire Protection Engineering for Facilities, 14 Jul 2009
UFC 4-010-01, Design: Minimum DoD Antiterrorism Standards for Buildings, 22 Jan 2007
UFC 4-020-03, Security Engineering: Fences, Gates, and Guard Facilities, 14 June 2007
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
UFC 4-229-01N, Design: General Maintenance Facilities, latest edition
UFC 4-722-01, Design: Dining Facilities, 27 January 2003

UL Standards (as applicable)

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

UL 752, Bullet Resisting Equipment, 2000 or later

USCINCCENT OPORD 97-1

Overseas Environmental Baseline Guidance Document, Department of Defense, May 2007

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

In addition, technical criteria provided in USACE-AED Design Requirements (most recent version) shall be required for use in design and construction specifications as indicated in the following documents. The following design criteria shall be used:

AED Design Requirements - Site Layout Guidance, latest version

AED Design Requirements – Water Tank and Water Distribution Systems, latest version

AED Design Requirements – Hydrology, latest version

AED Design Requirements - Culvert and Causeway Design, latest version

AED Design Requirements - Sanitary Sewer and Septic Systems, latest version

AED Design Requirements - Vertical Curves, latest version

AED Design Requirements – Horizontal Curves & Super elevation , latest version

AED Design Requirements – Geotechnical Investigations for USACE Projects, latest version

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 AED DESIGN REQUIREMENTS DOCUMENTS

AED Design Requirements documents (latest version) listed above shall be adhered to in this contract. These documents are available from the COR. These documents shall be used as the basis for design and construction, and for selecting options within the United Facilities Guide Specifications (UFGS). It is the contractor's option to use specifications contained in the AED Design Requirements Documents, when provided, or to adapt the UFGS specifications to match the requirements provided in the AED

Design Documents and specifications. Site or project specific data and requirements in the AED Design Requirements documents shall supersede UFGS language where there are differing criteria which must be evaluated and selected.

2.0 SITE DEVELOPMENT

2.1 ENVIRONMENTAL PROTECTION

2.1.1 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.

2.1.2 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.

2.1.3 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.

2.1.4 DISPOSAL

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

2.2 CIVIL SITE DEVELOPMENT

2.2.1 EXISTING CONDITIONS MAP AND SITE PLAN

The Contractor shall prepare an Existing Conditions Map of the property including a Boundary and Site Survey. The survey shall show the closure of the property boundary consisting of identifying all property corners, establishing horizontal and vertical control, listing all bearing and distances of property lines from all property corners, and tie-ins (showing bearing and distance) from at least two (2) major offsite man-made or natural features. This survey shall meet the requirements of World Geodetic System 1984 (WGS 84 UTM Zone 41N in decimal degrees). The Existing Conditions Map shall include topographic information with existing contour lines and spot elevations of relevant topographic features, and show the locations of all on-site and nearby offsite existing features including but not limited to buildings, structures, major trees, road pavements and right of ways, names of roads, widths of roads, easements, right of way, setbacks, parking, paved areas, storage containers, stoops, sidewalks, walkways, walls, fences and gates, barriers, and existing underground and aboveground utilities, dry creek beds, drainage channels, etc. and hydrological, geological, and vegetative or other physical conditions that could impact design. If there are areas where offsite surface water runoff has the potential to affect this project, topographic information of these areas will be required to be provided.

Based on the Boundary Survey a separate Site Plan shall be prepared showing the property boundary, and all proposed surface features including but not limited to buildings, roads, setbacks, parking and

paving areas, storage containers, stoops, sidewalks and walkways, above ground utilities, bunker locations. The contractor shall identify and show perimeter walls, fences and gates. Also shown on the Site Plan shall be pertinent existing features (on-site and off-site) that will have an influence or impact on the development of the site. The Contractor shall locate the facilities in agreement with the associated drawings included and any requirements in Section 01010. All site features shall be clearly defined and dimensioned on the Site Plan. Buildings shall be located to provide access for emergency vehicles and fire fighting. Roads and parking areas shall be designed for turning radius of the largest vehicle entering the compound. The site plan shall show geometric design of the site, including applicable dimensions of all exterior facilities, mechanical equipment, utilities, etc. Required facilities are described in the following sections of this specification. All site plans and master plans shall be drawn in the following projection and datum for incorporation into the USACE GIS system:

WGS 1984 UTM Zone 41 N

2.2.1.1 SITE SURVEY AND PLAN REQUIREMENTS

The Contractor shall conduct a utility survey to determine the locations of any nearby security fences and buildings, water lines, wells, sanitary sewers, storm sewers and communication/electrical lines. The Contractor shall provide survey for all stormwater outfall piping locations where the contractor is tying into the existing stormwater drainage system.

2.2.2 DEMOLITION

Demolition shall include removal of all structures, foundations, pavements, and utilities, and clearing and grubbing.

Holes and depressions shall be backfilled.

2.2.3 SITE GRADING & DRAINAGE

The Contractor shall provide all necessary site grading to insure adequate drainage so that no areas will be flooded due to a rainfall of a 20-year frequency. Drainage of the area should be compatible with the existing terrain. Building floor elevation shall be a minimum 150mm above grade and slope away from the building on all sides at a minimum of 5% for 3 m. All other grading on site shall be a minimum of 1% to ensure proper drainage.

Proper drainage calculations shall be conducted in order to size drainage structures and channels properly.

Rainfall data shall be based on data obtained from meteorological records collected in Afghanistan. National agencies may be consulted for data. In the absence of site specific data, intensity-duration-frequency curves contained in the AED Design Requirements – Hydrology-most recent version shall be used by extrapolating the rainfall intensity information from the stations in closest proximity to the project.

Under no circumstances will relationships developed by extrapolation of hydrological data from foreign countries be used for hydrologic studies.

2.3 FOOT PATHS AND AGGREGATE PAVED AREAS

The Contractor shall provide a 100 mm thick by 3 m wide aggregate foot paths between buildings, parking areas, and other logically anticipated areas to serve as pedestrian foot paths and fire lanes. The Contractor shall assume these above stated standards throughout this document unless otherwise noted.

For emergency access, each building or facility shall have three (3) side of lane access for fire truck. Buildings shall be separated from another building by at least 10 m (32.8 ft). This is in compliance with NFPA 2008, Section 6.2.1. Both fire lane and pedestrian foot paths may be used as emergency lane.

The Contractor shall pave all areas listed in Section 01010 as requiring aggregate paving with 100 mm thick crushed stone aggregate.

The pavement structure dictated above are minimum requirements. Design of foot paths and aggregate paved areas shall be conducted based on geotechnical data. The geotechnical data shall be used to calculate the pavement structure using the minimum pavement structure as dictated above as a reference. Reference Section “Geotechnical” below.

Aggregate Base Course (ABC) material must be well graded, durable, 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 in ASTM D 1557.

2.3.1 FORCE PROTECTION DESIGN

The Contractor shall design and construct force protection measures. The Force Protection design shall incorporate minimum setbacks for new facilities to maximum extent possible as permitted by size of the site and the requirements of the user. Force Protection design shall also meet the requirements of UFC 4-010-01, Design: Minimum DoD Antiterrorism Standards for Buildings, 8 Oct 2003 and UFC 4-010-02, DoD Minimum Antiterrorism Standoff Distances for Buildings, 8 Oct 2003. For all fire lane design see International Fire Code (IFC) latest edition.

2.3.1.1 CHAIN-LINK FENCE AND GATES

Provide chain-link fences and gates where required. Chain link fence and gate fabric shall be No. 9 gage wires woven into a 50 mm diamond mesh. Fabric shall be coated with 366 grams per square meter zinc galvanizing. Posts shall be ASTM F 1083 Pipe, Steel, Hot Dipped Zinc Coated (Galvanized) Welded or equal. Top of fence and gates shall be provided with outriggers and reinforced barbed tape as indicated above. Post sizes shall be as shown on drawings.

The gates shall be swing type. Hinged gates shall be a pair of 3.65 m wide x 2.4 m high 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, anchor mounted to the exterior masonry walls, to support each gate leaf. Provide a locking mechanism that holds the gates together when in the closed position as well as a drop bolt that engages a steel sleeve embedded in the pavement.

2.3.1.2 OUTRIGGERS

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

2.3.1.3 REINFORCED BARBED TAPE

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

2.4 CIVIL UTILITIES

2.4.1 WATER

2.4.1.1 GENERAL

The Contractor shall provide water distribution mains, branches, service connections to include all pipe, valves, bends, thrust blocking, fittings and appurtenances. Exterior water line construction shall include service to all buildings as described in the Scope of Work Section 01010. The water system shall be designed to operate between 345-414 kPa. Minimum pressures of 207 kPa will be allowed at peak domestic flow conditions. The required average daily flow (ADF) shall be the average daily demand (ADD) per person - derived from 155 liters per capita per day (lpcd) – times a capacity factor (CF) of 1.5, times the effective population.

Provide a minimum of one (1) outside water hydrant (hose spigot) for all buildings with water service. Every hose spigot shall have a lockable valve on its water line located inside an adjacent building or in a valve box. All buildings with water supply shall have a water meter installed in a locked cabinet area inside the building.

2.4.1.2 PIPE

The Contractor shall provide Ductile Iron or PVC pipe of adequate strength, durability and be corrosion resistant with no adverse effect on water quality.

2.4.1.2.1 WATER MAINS AND BRANCHES

Water main diameter shall be based on the installation fixture unit flow or two times the ADF ($ADD \times c \times CF$) and velocity requirements per this guide unless a minimum diameter is specified which is adequate to provide flow and meet the specified maximum velocity. Pipe material for water mains and branches shall be PVC or Ductile Iron (DI). The exterior surface of the pipe must be corrosion resistant. Distribution lines shall not be less than 100mm in diameter. Pipe diameters shall be 100mm and larger. Pipe diameters shall be selected to meet the previously specified flow, velocity, and pressure conditions. If Ductile Iron (DI) pipe is installed underground the pipe shall be encased with polyethylene in accordance with AWWA C105. Ductile iron pipe shall conform to AWWA C104. DI fittings shall be suitable for 1.03 MPa 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. DI fittings shall be cement mortar lined (standard thickness) in accordance with C104. All pipes and joints shall be capable of at least 1.03 MPa leakage test and 1.38 MPa hydrostatic pressure test unless otherwise specified herein. 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, Schedules 40, 80 and 120. PVCu 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, PVCu (or uPVC) pipe and fittings shall have SDR that provide equal or superior strength properties to ASTM 1785 SCH 40 or SCH 80 pipe and fittings.

2.4.1.2.2 WATER SERVICE

Water service line diameter based on fixture units of the building serviced or per contract. Building service lines will be sized according to the following guidance. Water service connections from the mains to the buildings shall vary from 19mm, 25mm, 38mm, 75mm, to 100mm as calculated, depending on the maximum flow velocity and minimum pressure requirements as determined by hydraulic analysis of fixture flows. 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. PVC pipe couplings and fittings shall be manufactured of material conforming to ASTM D 1784, Class 12454B. Contractor shall not use HDPE for any of the water pipes.

2.4.1.3 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. Pressure and leakage testing shall be as specified in AED Design Requirements – Water Tank and Water Distribution Systems, latest version.

2.4.1.4 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. 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.

2.4.1.5 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 1.01 MPa. 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 34.5 kPa 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.

2.4.1.6 BACTERIOLOGICAL DISINFECTION

2.4.1.6.1 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.

2.4.1.6.2 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. Contractor shall submit a water sampling protocol for approval. This shall include at a minimum the name of the laboratory, parameters to be tested, the Company conducting the sampling, and the sample locations.

2.4.1.6.3 ACCEPTANCE REQUIREMENTS

The disinfection shall be repeated until tests indicate the absence of bacteria for at least 2 full days. The unit will not be accepted until satisfactory bacteriological results have been obtained. All retests shall be conducted at the Contractor's expense.

2.4.1.6.4 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.

2.4.1.6.5 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.

2.4.1.6.6 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 m square, for all valve boxes.

2.4.1.6.7 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.

2.4.1.6.7.1 BLOW-OFF VALVES

The Contractor shall provide 40-50 mm 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.

2.4.1.7 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.

2.4.2 SANITARY SEWER

2.4.2.1 GENERAL

Sanitary sewers less than 1.25 meters under road crossings shall have reinforced concrete cover at least 150 mm 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. Sewer collection capacity shall be based on the two times the average daily wastewater flow unless minimum diameter specified is adequate to provide flow and required maximum velocity; wastewater flow through the system shall be distributed on the basis of fixture unit flow in each the buildings serviced by multiplying the proportion of the total fixture flow from each building or facility times the total wastewater flow for the project or installation as determined above.

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.

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

- 1) Follow slopes of natural topography for gravity sewers.
- 2) 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.
- 3) Avoid routing sewers through areas which require extensive restoration or underground demolition.
- 4) 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.
- 5) 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.
- 6) Sewer lines shall have a minimum of 800 mm of cover for frost protection.

- 7) Locate manholes at change in direction, pipe size, or slope of gravity sewers.
- 8) Sewer sections between manholes shall be straight. The use of a curved alignment shall not be permitted.
- 9) If required by the design, locate manholes at intersections of streets where possible. This minimizes vehicular traffic disruptions if maintenance is required.
- 10) Sewer lines less than 1.25 m deep under road crossings shall have a reinforced concrete cover of at least 150 mm 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) m beyond the designated roadway.
- 11) Verify that final routing selected is the most cost effective alternative that meets service requirements.

2.4.2.2 PROTECTION OF WATER SUPPLIES

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

- 1) Sanitary sewers shall be located no closer than 30 m horizontally to water wells or reservoirs to be used for potable water supply.
- 2) Sanitary sewers shall be no closer than 3 m horizontally to potable water lines; where the bottom of the water pipe will be at least 300 mm above the top of the sanitary sewer, horizontal spacing shall be a minimum of 1.8 m.
- 3) Sanitary sewers crossing above potable water lines shall be constructed of suitable pressure pipe or fully encased in concrete for a distance of 3 m on each side of the crossing. Pressure pipe will be as required for force mains in accordance with local standards and shall have no joint closer than 1 m horizontally to the crossing, unless the joint is fully encased in concrete.
- 4) When sanitary sewers cross water lines the designer shall cross the water line above the sewer line whenever possible. In such cases the water line shall be located a minimum distance of 450 mm above the sewer line or shall be fully encased in concrete for a distance of 3 m on each side of the crossing.

2.4.2.3 GRAVITY SEWER

Sanitary sewers shall be designed in accordance with the AED Design Requirements for Sanitary Sewer and Septic Systems, latest version to flow at a maximum in the following way:

- 1) Sanitary sewer laterals, mains and trunk lines flow velocities shall be designed to provide a minimum velocity of 0.6 meters per second (mps).
- 2) A minimum velocity of 0.8 mps at the peak diurnal flow rate.
- 3) Flows shall be based on allocating the proportion of the average daily or peak daily flow to each building or facility on the basis of fixture unit flow developed for the plumbing design.
- 4) Minimum pipe slopes shall be provided regardless of the calculated flow velocities to prevent settlement of solids suspended in the wastewater. Minimum pipe slopes are provided in the AED Design Requirements for Sanitary Sewer and Septic Systems.

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 will be required to protect the sewer against freezing.

2.4.2.3.1 MANHOLES

The Contractor shall provide standard depth manholes (MH), (depth may vary) an inside dimension of 1.2 m. 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 cast iron frame that provides a minimum clear opening of 600 mm. 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. Sanitary sewer lines shall enter at the manhole flow line. Where the invert of the inlet pipe would be more than 0.5 meter above the manhole floor, a drop inlet shall be provided. No internal drop structures shall be permitted at lift stations. Inlet to lift station wet wells shall enter below the lowest water level of the pump operating range, and if necessary a drop inlet approach pipe external to the lift station may be used to avoid cascading influent flow. The angle between inflow and outflow pipes converging at a manhole shall not be less than 90°.

2.4.2.3.2 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. Manholes shall be installed at start of all main runs.

2.4.2.3.3 SPACING

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

2.4.2.3.4 PIPE CONNECTIONS

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

2.4.2.3.5 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.

2.4.2.3.6 STEPS FOR MANHOLES

Steps shall be cast iron, polyethylene coated, at least 15 mm thick, not less than 400 mm in width, spaced 300 mm on center.

2.4.2.4 PIPE

Pipe shall conform to the respective specifications and other requirements as follows: Provide Polyvinyl Vinyl Chloride (PVC) conforming to ASTM D 3034, Type PSM with a maximum SDR of 35, size 380 mm or less in diameter. PVC shall be certified as meeting the requirements of ASTM D 1784, cell Class 12454 B. Minimum pipe sizes for the main lines and laterals shall be 200 mm diameter and service lines shall be a minimum of 150 mm diameter. Contractor may use uPVC pipe provided the SDR and strength properties of the pipe equal or exceed the properties of ASTM D 1784 for PVC.

2.4.2.4.1 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.

2.4.2.4.2 JOINTS

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

2.4.2.4.3 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. The minimum depth of the cover over the pipe crown shall be 0.8 m.

2.4.2.4.4 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 30 m from the building cleanout. Tee connections to the main or branch are not allowed. Service connection lines will be a minimum of 150 mm diameter and laid at a minimum 1% grade. Laterals shall be 200 mm and sloped to maintain the minimum velocity as described in paragraph "Gravity Sewer."

2.4.2.4.5 CLEANOUTS

Cleanouts must be installed on all bends of 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. The cleanout will be of the same diameter as the building sewer, and never be smaller than 150 mm. If there are no bends in the sewer building connection, a cleanouts shall be installed within 1 m from the building.

2.4.2.5 FIELD QUALITY CONTROL

2.4.2.5.1 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.

Perform Low Pressure Air tests as follows:

- 1) Concrete pipe: Test in accordance with ASTM C 924M, ASTM C 924. Allowable pressure drop shall be given in ASTM C 924M ASTM C 924. Make calculations in accordance with the Appendix to ASTM C 924M, ASTM C 924.

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

2.4.2.5.2 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.

2.4.3 STORM SEWER SYSTEMS

2.4.3.1 DESIGN STORM RETURN PERIOD (BASELINE FREQUENCY)

Developed portions of the site installation such as administration, industrial and barracks areas, shall be based on a rainfall of 20-year frequency. Basic system design shall be in accordance with UFC 3-230-17A, Chapter 2. Potential damage or operational requirements may warrant a more severe criterion or in certain areas a lesser criterion may be appropriate. The design of roadway culverts and other on-site storm drainage features & structures will be based on 20-year rainfall event. Protection of installations against flood flows originating from areas exterior to the base installation shall be based on a minimum 25-year rainfall event.

2.4.3.2 STORM DRAINAGE SYSTEM DESIGN

The Contractor shall be responsible for the complete design of the storm drainage system. Drainage of runoff from unpaved areas onto pavements shall be minimized. If storm drain piping is required it shall comply with the requirements in this section. Where storm drain pipes are of different diameters, the pipe crown elevations should be matched at the drainage structure. Storm drain lines shall be located outside of paved areas to the extent possible. Under no circumstance shall storm drain lines be located beneath buildings. All open storm drainage channels shall be concrete lined. Erosion control shall be provided for all storm drain structures during construction. Water from roof down spouts shall be drained off building site. All storm drain pipe and structures shall comply with the requirements specified in Specification Section 33 40 00 Storm Drainage Utilities. Holding or evaporation of stormwater shall not be accepted as an acceptable design. All stormwater shall be conveyed either from Camp Shorab or into existing adequate ditches which convey water off of Camp Shorab.

2.4.3.3 HYDRAULIC DESIGN

New storm drain pipes shall be designed for gravity flow during the design storm baseline unless otherwise approved by the Government. The hydraulic grade line shall be calculated for the storm drain system and all energy losses accounted for. Design computations shall adhere to procedures contained in UFC 3-230-17A. Storm drain systems shall be designed to provide a maximum velocity of 2m/s.

2.4.3.4 AREA INLETS

Area inlets shall be properly sized and designed to accommodate the design flows. All grates shall be of a "bicycle safe" design.

2.4.3.4.1 CONCRETE PIPE

Reinforced concrete pipe shall be a minimum Class III. Type I cement may be used only when sulfates in the soil are 0.1 percent or less and dissolved sulfates in the effluent are 150 ppm or less. Type II cement may be used only when sulfates in the soil are 0.2 percent or less and dissolved sulfates in the effluent

are 1,500 ppm or less. Only Type V cement may be used if sulfates in the soil exceed 0.2 percent or dissolved sulfates in the effluent exceed 1,500 ppm. Concrete pipe shall be assumed to have a minimum design service life of 50 years unless the Contractor determines that conditions at the site will reduce the service life. Concrete culverts and storm drains shall be protected by a minimum of 1 m of cover during construction to prevent damage by heavy construction equipment.

2.4.3.4.2 PLASTIC PIPE

Stiffness of the plastic pipe and soil envelope shall be such that the predicted long-term deflection shall not exceed 7.5 percent. Plastic culverts and storm drains shall be protected by a minimum of 1 m of cover during construction to prevent damage by heavy construction equipment. Split couplers shall not be allowed for corrugated high-density polyethylene pipe. Plastic pipe shall be assumed to have a minimum design service life of 50 years unless the Contractor determines that conditions at the site will reduce the service life (then plastic pipe shall not be used).

2.5 EARTHWORK AND FOUNDATION PREPARATION

2.5.1 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 37.5 mm and no more than 2 percent by weight passing the 4.75 mm No. 4 size sieve and conforming to the soil quality requirements specified in the paragraph entitled "Satisfactory Materials."

Capillary water barriers shall be placed under floor slabs (not under footings) and be a minimum of 150 mm thick.

2.5.2 SATISFACTORY MATERIALS

Any materials classified by ASTM D 2487 as GW, GM, GC, GP, SP, SW, SM, and 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.

2.5.3 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 75 mm. The Contracting Officer shall be notified of any unsatisfactory materials.

2.5.4 CLEARING AND GRUBBING

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

2.5.5 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% 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 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% 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.

2.6 GEOTECHNICAL

2.6.1 SOIL INVESTIGATION

Existing geotechnical information is not available at the project site. Any site-specific geotechnical data required to develop foundations, fill at elevated slabs, materials, earthwork, and other geotechnical related design and construction activities for this project shall be the Contractor's responsibility.

Contractor shall be aware that rock has been found at shallow depths. The contractor shall bid anticipating encountering shallow rock. 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 that includes:

- a. Clear description of the anticipated construction including planned grading and structural details to provide an estimation of foundation loads (compression, uplift, lateral, and moment) and settlement tolerance.
- b. Detailed site and area reconnaissance that includes a description of local geology and origin of sediments, surface features (e.g., ditches or other excavations, existing structures, vegetation, rock outcrops, seeps or springs), surface soil type(s), and subsurface lithology).
- c. Justification of number and depth of borings.
- d. Site plan illustrating exploratory boring locations.
- e. Boring logs that include groundwater levels (if encountered).
- f. Field tests and analyses (e.g., Unified Soil Classification System, field density, SPT).
- g. Analytical laboratory test results in accordance with ASTM or other recognized standards (e.g., sieve analysis, Atterberg Limits (plastic and liquid), moisture content, hydrometer, consolidation/collapse potential, specific gravity of solids, direct shear, density, chemical [sulfate, chloride, pH, lime], K values) and any other tests as needed to properly conduct necessary calculations to determine the engineering properties of the soil.
- h. A summary of the results of the subsurface geotechnical conditions including allowable soil bearing capacity, foundation recommendations, pavement design criteria, and construction materials (e.g. concrete cement, asphalt, and aggregates).

Two copies of the geotechnical report shall be submitted to the COR. Foundations, including sub-grade, shall be designed and constructed based on calculations and recommendations from a licensed structural engineer provided by the Contractor.

For standard penetration test (SPT), the Contractor shall use ASTM D1586. All geotechnical laboratory and field work shall be based on standards set forth in the ASTM. Contractor shall not use any DIN standards for penetration tests in lieu of ASTM D 1586. Soil investigations shall be in accordance with AED Design Requirements: Geotechnical Investigations for USACE Projects, latest version, or most recent version.

For foundation design, allowable soil bearing pressures shall be determined by calculations made based on the physical and mechanical properties obtained from laboratory testing. The soil bearing pressures calculated shall be compared with the International Building Code (IBC) 2006 Table 1804.2. The lower of the two bearing pressures, calculated or Table 1804.2, shall be chosen for the allowable soil bearing pressure.

California Bearing Ration (CBR) tests shall be conducted on the existing soils throughout the proposed road alignment and vehicle parking and maneuver areas. Results from the tests shall be used to calculate the pavement structure using the minimum pavement structure as dictated in paragraph 2.3.4 as a reference. In the event that the calculations based on the CBR tests reveal that the pavement structure dictated in paragraph 2.3 is insufficient to carry the design load, the Contractor shall design and construct a subbase layer for the pavement structure.

The Contractor shall conduct soils classification per ASTM D 2487-06.

No design review submittal shall be considered complete without an approved geotechnical report. Geotechnical investigation plans and report of investigations shall be submitted promptly in accordance with Section 01335.

2.6.2 GEOTECHNICAL QUALIFICATIONS

A geotechnical engineer that is a member of a geotechnical firm responsible to the Contractor shall oversee all geotechnical engineering design parameters. The geotechnical engineer shall be qualified by:

- a. Education in geotechnical engineering;
- b. Professional registration;
- c. Minimum of ten (10) years of experience in geotechnical engineering design.

The geotechnical firm conducting the field investigation and laboratory work shall be certified by the Chief, Quality Assurance Branch USACE-AES or Chief, Quality Assurance Branch USACE-AEN. Certification document shall be submitted as part of the Geotechnical Report.

3.0 STRUCTURAL

3.1 GENERAL

The structures shall consist of reinforced concrete footings supporting a variety of structure types.

3.2 DESIGN

Design shall be performed by or under the direct supervision of the Contractor's structural engineer. The structural engineer shall be a registered Professional Engineer. All structural design documents shall be stamped and signed by the structural engineer. Calculations shall be in SI (metric) units of measurements.

3.3 STANDARDS

The Contractor should use the following American standards to provide structural design if local standards are not available, relevant, or applicable. All codes are latest edition.

Concrete	ACI 318 and ASTM C 39
Steel Reinforcement	ASTM A 615
Anchor Bolts	ASTM F 1554; Grade 36 steel.
Bolts and Studs	ASTM A 307.
Concrete Masonry Units	ASTM C 90; Type I (normal weight, moisture control).
Mortar	ASTM C 270; Type S (ultimate compressive strength of 13 MPa).
Grout	ASTM C 476; 14 MPa (2,000psi) minimum compressive strength @ 28 days (Slump between 200 mm to 250mm).
Structural Steel	ASTM A 36; 250 MPa ($F_y = 36,000$ psi).
Welding	AWS D1.1 (American Welding Society).
Cold-Formed Steel	AISI Specification for the Design of Cold-formed Steel Structural Members

3.4 DESIGN LOADS (DEAD & LIVE)

Dead loads shall be in accordance with ASCE 7-05 Minimum Design Loads for Buildings and Other Structures. Dead loads consist of the weight of all materials of construction incorporated in the buildings. Live loads shall be per Chapter 4. All facilities shall be classified as a minimum of Category II in accordance with Table 1-1.

3.5 WIND LOADS

Wind loads shall be calculated in accordance with ASCE 7-2005 using a "3-second gust" wind speed of 135 km/hr. Exposure = C. Importance Factor = 1.0.

3.6 SEISMIC

Seismic design of all structures in southern Afghanistan shall be in accordance with ASCE 7-05. Seismic Acceleration Parameters shall be $S_s = 1.28g$ and $S_1 = 0.51g$.

3.7 REINFORCED CONCRETE

All concrete members shall be designed and constructed in accordance with the provisions of the American Concrete Institute, Building Code Requirements for Structural Concrete, ACI 318. A minimum 28 day compressive strength of 28 MPa shall be used for design and construction of all concrete. Concrete shall have maximum water-cement ratio of 0.45. Reinforcing steel shall be deformed bars conforming to American Society for Testing and Materials publication ASTM A 615, Deformed and Plain Billet-Steel Bars for Concrete Reinforcement. The minimum yield strength F_y shall be 420 MPa.

No concrete shall be placed when the ambient air temperature exceeds 32 degrees C unless an appropriate chemical retardant is used. In all cases when concrete is placed at 32 degrees C or hotter it shall be covered and kept continuously wet for a minimum of 48 hours.

3.8 REINFORCED 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. A minimum cylinder 28 day compressive strength of 28 MPa shall be used for design and construction of all concrete, except that 24 MPa shall be used for Shotcrete applications. Reinforcing steel shall be deformed bars conforming to American Society for Testing and Materials publication ASTM A 615, Deformed and Plain

Billet-Steel Bars for Concrete Reinforcement. Concrete members at or below grade shall have a minimum concrete cover over reinforcement of 75 mm. Concrete shall have maximum water-cement ratio of 0.45. No concrete shall be placed when the ambient air temperature exceeds 32 degrees C unless an appropriate chemical retardant is used. In all cases when concrete is placed at 32 degrees C or hotter it shall be covered and kept continuously wet for a minimum of 48 hours. Except with authorization, do not place concrete when ambient temperature is below 5 degrees C or when concrete is likely to be subjected to freezing temperatures within 24 hours. When authorized, when concrete is likely to be subjected to freezing within 24 hours after placing, heat concrete materials so that temperature of concrete when deposited is between 18 and 27 degrees C. Methods of heating materials are subject to approval of the Contracting Officer. Do not heat mixing water above 74 degrees C. Remove lumps of frozen material and ice from aggregates before placing aggregates in mixer. Follow practices found in ACI 306.1.

3.9 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. All masonry used below grade shall be fully grouted. All cells of exterior reinforced CMU walls shall be fully grouted. For interior CMU walls, only the reinforced cells need to be grouted. All CMU walls shall have reinforced horizontal bond beams at a maximum spacing of 1,200 mm on center.

3.10 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.

3.11 COLD-FORMED LIGHT GAUGE STEEL

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.

3.12 K-SPAN COLD-FORMED LIGHT GAUGE STEEL ARCHES

Cold-formed light gauge steel K-span arch structures, or their equivalent, shall be constructed with the appropriate rolled steel arch forming machine. Fabrication shall be in accordance with the building machine manufacturer's recommendations. Finite element models and design calculations for cold-formed steel K-span shapes shall use effective section properties to account for localized buckling. Structural analysis and design calculations for K-span arch type structures shall use the building machine manufacturer's proprietary finite element software when available. Thickness of sheet metal shall be as required by design in accordance with manufacturer's recommendation for span of K-span, but in no case shall thickness be less than 1 mm.

Disclaimer: The term K-span refers to a proprietary arch span type structural system. Wherever the term K-span is used throughout this solicitation it refers to K-span type system or equivalent.

3.13 CORRUGATED METAL ROOFING

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.

3.14 FOUNDATIONS

All structures shall be provided with a reinforced concrete foundation properly placed on suitable native or compacted earth and shall be prepared in accordance with the recommendations from the geotechnical

investigation. The foundation shall be designed so that the bottom is 800mm below the local frost line depth.

4.0 ARCHITECTURAL REQUIREMENTS

4.1 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, international building code, and national fire protection agency life safety 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.

4.2 DESIGN CRITERIA

Schematic designs for the facility types requested in this proposal are provided in the Appendix. These designs shall be used to create a complete and usable facility meeting the minimum requirements stated in these documents. The Codes, Standards, and Regulations listed in these documents shall be used in the construction of this project. The publications shall be the most recent editions. Standards other than those mentioned may be accepted provided they meet the minimum requirements and the Contractor shall submit proof of equivalency to the Contracting Officer for approval.

IBC - International Building Code, latest edition

NFPA 101 - Life Safety Code, latest edition

4.2.1 PREMANUFACTURED K-SPAN COMPONENTS

It is recommended that all K-Span exterior penetrations shall be designed and pre-manufactured off-site using modular design techniques that shall be applied for both structural and finish construction components.

Provide complete architectural and engineering services from project inception through completion of construction.

Prior experience in design and support of major industrial complexes, military bases, ministry projects, as well as public and private projects and provides a wide range of engineering services in Afghanistan or other similar building environments is highly desirable.

Recommend minimal field assembly to the highest extent possible. Pre-manufactured elements are recommended to include Doors, Windows, Vent Louvers, stove through wall/roof sleeve and other exterior envelope penetrations.

Fabricate all pre-manufactured components to engineered design specifications under controlled conditions, to ensure consistent quality and maximum load bearing capabilities.

Specifications shall address the following criteria:

- High strength-to-weight ratio.
- Use of non-combustible material.
- Wind and seismic resistance.
- Compatibility with most decking and roofing systems.
- Modular design.

The K-Span system shall meet or exceeds local and international building codes and seismic standards.

Structural and architectural components shall be designed as integral components, so that the site erection is quicker.

The building system shall be fully insulated using non-flammable and non-toxic spray on systems and allow for fully heated, cooled, or refrigerated facilities.

4.2.2 LIFE SAFETY/ FIRE PROTECTION/ HANDICAPPED ACCESSIBILITY

A life safety and fire protection analysis shall be completed prior to construction commencement for all buildings designed by the Contractor. This analysis shall be documented in plans and in the design analysis. All spaces shall be classified following NFPA 101 or IBC. Whichever code is used shall be stated and referenced in the life safety plan. The facility shall comply with all other safety requirements of the NFPA 101. To the extent possible, all facilities shall be designed in accordance with recognized industry standards for life safety and building egress. An adequate fire alarm system, fire extinguishers, and smoke alarms shall all be included as required. Due to the lack of adequate water volume and pressure, sprinkler systems are not feasible. In keeping with the intended function of these facilities, handicapped accessibility will not be incorporated in this project. Due to the war contingency requirement, it is assumed that only able-bodied military and civilian personnel will use the facilities listed herein.

4.2.3 ANTITERRORISM / FORCE PROTECTION

Construct force protection measures to include gates and personnel bunkers. Force protection requirements shall be in accordance with UFC 4-010-01, *Minimum DoD Anti-terrorism Standards for Buildings*; and UFC 4-010-02, *DoD Minimum Anti-terrorism Standoff Distances for Buildings*. A standoff distance of 45 m is required for billeting and high-occupancy facilities. Provide protective concrete barriers around and between billeting building and high occupancy facilities.

4.3 CONCRETE

4.3.1 FINISH

Horizontally placed concrete shall be vibrated and floated prior to screening, followed by progressive troweling and edging with a radius profile edging tool as the concrete sets. Broom finished texture shall be applied to fully trowel finished surfaces and shall be re-edged after the broom finish is added.

Vertical work shall have a form finish. Exposed concrete shall be sealed with an approved sealer.

4.3.2 PRECAST

Storage of precast units shall be in a dry place or materials shall be covered with a plastic or protective layer. Units shall be detailed to provide size, shape and location of installation. Precast units shall meet the minimum concrete strength requirements.

4.4 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. Masonry construction systems shall be reinforced.

4.4.1 CONCRETE MASONRY UNITS

Concrete masonry units (CMU) for exterior walls shall be either 290 mm wide x 390 mm x 190 mm high or otherwise as shown on the standard drawings. They shall be reinforced and 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.

4.5 STONE

Stone type shall be identified for approval in design. Provide and use Type "S" mortar for all stone work. Provide weep holes at veneer installations and all cavity wall systems.

4.6 THERMAL PERFORMANCE OF EXTERNAL BUILDING ASSEMBLIES

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

Assembly	Minimum Thermal Value
Exterior walls (above grade)	RSI 2.280 (R 13)
Ceilings/roof	RSI 5.284 (R 30)
Floor (over unheated space)	RSI 3.346 (R 19)
Exterior doors	RSI 0.252 (R 1.43)
Exterior windows/(glazing within doors)	RSI 0.308(R 1.75)
Skylights	RSI 0.180 (R 1.02)

This table is a summary of ANSI/ ASHRAE 90.1 Table 5.5-5, Climate Zone 5 (A,B,C)

RSI measured in K-m²/W, R measured in SF-F-hr/BTU. 1 K-m²/W = 5.678 SF-F-hr/BTU.

The building design shall utilize solar heating by orientating the buildings and wind breaks, insulation and exterior window shading techniques to reduce building heat loss and heat gain. Contractors shall include energy efficient heating and cooling solutions to minimize energy consumption.

4.7 ROOFING AND WEATHERPROOFING

All buildings shall have a sloped metal roof. Buildings with pitched roofs shall be provided with metal eaves, and soffits. All exterior entry ways to be covered and protected by rain gutters and diverters as to not have water falling on the entry ways to all buildings.

4.7.1 SLOPED ROOFS

A sloping roof shall be as defined in the IBC. On sloping roofs provide and install 0.60 mm galvanized steel in either corrugated or standing seam design. Metal roofing shall be anchored to the steel "Z" purlins 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. All metal roof panel systems and associated trim/accessories shall be in the manufacturer's standard white color. Provide 600mm x 600mm white metal louvered vents with insect screen in all gable end walls. 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.

4.7.1.1 INSULATION

Provide sprayed on polyurethane insulation on underside of all K-span structures. For standard design drawings, provide a 50 mm thick extruded polystyrene rigid thermal insulation boards, conforming DIN, EN 13164 BS, EN 13164, k=0.2 @ 75 degrees F mean temperature, 2.82 kg/sq cm compressive strength, hydrophobic, Type VI. Provide thickness by multiple boards to meet the designed R-value. Comply with insulation manufacturer's instructions and recommendations for handling, installing, and bonding or anchoring insulation to substrate. Insulation boards shall be installed loose, without glue, in staggered manner. Attention should be paid not to leave separation along edges. Where overall insulation thickness is 50 mm or greater, install required thickness in two layers with joints of second layer offset from joints of first layer a minimum of 300 mm each direction.

4.8 CONNECTIONS AND JOINTING

4.8.1 SOLDERING

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

4.8.1.1 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.

4.8.1.2 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.

4.9 METAL

4.9.1 MATERIALS

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

4.9.1.1 STEEL SHEET, ZINC-COATED (GALVANIZED)

Zinc coated steel conforming to ASTM A 525, DIN BS or EN Standards. Cold-formed light gage steel K-span arch structures, or their equivalent, shall be constructed with the appropriate rolled steel arch forming machine. Fabrication shall be in accordance with the building machine manufacturer's recommendations. Finite element models and design calculations for cold-formed steel K-span shapes shall use effective section properties to account for localized buckling. Structural analysis and design calculations for K-span arch type structures shall use the building machine manufacturer's proprietary finite element software when available. Thickness of sheet metal shall be as required by design in accordance with manufacturer's recommendation for span of K-span, but in no case shall thickness be less than 1 mm.

4.9.1.2 ALUMINUM WALL CAPPING

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

4.9.2 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.

4.9.2.1 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.

4.9.2.2 LINTEL FLASHING

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

4.9.2.3 VALLEY FLASHING

Valley flashing shall be provided at intersections of roofs where a valley is formed. Flashing shall be a minimum of 500 mm centered on the valley (extending each direction a minimum of 250 mm). Valley flashing shall have a small ridge in the center to allow for expansion and contraction. Material shall be stainless steel, galvanized or match finished roofing metal.

4.9.2.4 SILL FLASHING

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

4.9.3 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. Soffits shall be a minimum width of 600mm extending from the building wall.

4.9.4 CONTINUOUS SOFFIT VENT

Enclose soffits and return to vertical wall. Provide continuous soffit venting of all overhangs on the underside of the soffit. The opening shall be no larger than 100 mm and set in a minimum of 50 mm from the exterior fascia edge.

4.9.5 RIDGE VENT

For sloping roofs, provide continuous metal ridge vent at the top of roof along the ridge. Ridge vent shall be sized to provide adequate ventilation of the roofing system. Provide all ridge vents in white to match the roof panel system.

4.9.6 SCREEN

Provide insect screen for all soffit, ridge, vents, louvers and all openings except for doors and windows unless otherwise specified.

4.9.7 EXPANSION JOINT PROFILES

Metal expansion joints shall have a profile to allow deflection and expansion in two directions. Metal shall be treated for exterior conditions. Expansion joints shall be water proof.

4.9.8 ROOF GUTTERS

Roof gutters shall be installed as indicated. Roof gutters shall be rigidly attached to the building. Supports for roof gutters shall be spaced according to manufacturer's recommendations. A 600 mm overlap, jointing with approved crimping or welding shall provide a continuous gutter along the building eaves. Provide all gutters in white to match the roof panel system.

4.9.9 DOWNSPOUTS

Downspouts shall be designed and fabricated for each specific application. Unless otherwise specified or indicated, exposed edges shall be folded back to form a 13 mm 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 and shall not block the flow of water to the downspout for low sloped roofs. Downspouts shall be rigidly attached to the building with supports a minimum of 1.5 m apart. At the base of each downspout, concrete splash block shall be placed to eliminate damage to the building due to rain water runoff toward the building. In rural locations, a layer of rock 10 - 80 mm in size, 100 mm thick, may be substituted upon governmental approval. Provide all downspouts in white to match the roof panel system. All downspouts shall be a minimum of 100mm in diameter or greater based on the projected rain amounts to be handled by the system.

4.9.10 WALL CAPPING

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

4.10 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 cannot 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. The Contractor shall 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.

4.10.1 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.

4.10.2 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.

4.10.3 FLOOR JOINT SEALANT

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

4.10.4 PRIMERS

Provide a non-staining, quick-drying type and consistency recommended by the sealant manufacturer for the particular application. Immediately prior to application of the sealant, clean out loose particles from

joints. Where recommended by sealant manufacturer, apply primer to joints in concrete masonry units, wood, and other porous surfaces in accordance with sealant manufacturer's instructions. Do not apply primer to exposed finish surfaces.

4.10.5 BOND BREAKERS

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

4.10.6 BACKING

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

4.10.7 SURFACE PREPARATION

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

4.10.8 MASKING TAPE

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

4.10.9 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.

4.10.10 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.

4.10.10.1 FINAL CLEANING

Provide cleaning solvent type(s) recommended by the sealant manufacturer except for aluminum and bronze surfaces that will be in contact with sealant. Upon completion of sealant application, remove remaining smears and stains and leave the work in a clean and neat condition.

4.10.10.1.1 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 hours then remove by wire brushing or sanding.

4.10.10.1.2 METAL AND OTHER NON-POROUS SURFACES

Remove excess sealant with a solvent-moistened cloth.

4.11 LOUVERS

4.11.1 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 0.90 mm thick steel and louver blades of a minimum 0.60 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.

4.11.2 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.

4.12 WINDOWS, DOORS & GLAZING

4.12.1 WINDOWS

Windows shall be operable. Operable windows shall be slider or awning type. A window with blackout film on the inside shall be provided only for the laundry space.

4.12.1.1 WINDOW SECURITY BARS

Provide 20 mm diameter steel bars, 100 mm on center spacing. Provide frame and secure with fasteners a minimum of 100 mm deep.

4.12.1.2 MATERIALS

4.12.1.2.1 ALUMINUM EXTRUSIONS

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

4.12.1.2.2 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.

4.12.1.2.3 REINFORCEMENT

Where fasteners screw-anchor into aluminum less than 3 mm thick, reinforce the interior with aluminum or nonmagnetic stainless steel to receive screw threads or provide standard non-corrosive pressed-in splined grommet nuts.

4.12.1.2.4 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.

4.12.1.2.5 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.

4.12.1.2.6 COMPRESSION-TYPE GLAZING STRIPS AND WEATHERSTRIPPING

Unless otherwise indicated, and at the manufacturer's option, provide compressible stripping for glazing and weather stripping such as molded EPDM or neoprene gaskets.

4.12.1.2.7 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.

4.12.1.2.8 WIRE FABRIC INSECT SCREEN

Wire Fabric Insect Screen shall be permanently fixed to the exterior of operable windows.

4.12.1.3 HARDWARE

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. Provide at a minimum one locking device on the interior of each window. Any operable window over 2 square meters shall have two locking devices as a minimum.

4.12.1.4 FABRICATION

Provide aluminum windows with factory finish in all buildings as indicated in the design drawings. Window openings shall be provided with insect screening permanently fixed to the exterior. Provide a minimum of 3 anchors on each side of the frame into the adjoining structure. Provide weather stripping system for all exterior windows and doors.

4.12.1.5 METAL WINDOW SILLS

Galvanized metal window sills, 0.90 mm, shall be installed on the exterior of all windows. The metal window sills shall have a turn down of 50 mm over the exterior masonry and stucco. Metal sills shall extend from side to side of the masonry opening in a single piece. Extend the metal window sill a minimum of 20 mm under the bottom of the aluminum windows. Install masonry mortar as required for a smooth surface under the window sills. Sills shall slope a minimum of 6 mm to the exterior and not allow water to puddle.

4.12.1.6 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

4.12.1.7 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.

4.12.1.8 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 weather tight 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.

4.12.1.9 ADJUSTING

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

4.12.1.10 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.

4.12.2 DOORS

Fire rated door assemblies including hollow metal frame and hardware shall be provided as indicated in the design drawings. Rated doors and frames shall be tested and approved as an assembly and shall be provided by a single manufacturer/distributor. Hardware for fire rated door assemblies shall be labeled as appropriate for fire rated applications and shall be coordinated with door manufacturer. All exterior doors shall be heavy duty metal doors with metal frames. Interior door shall be hollow metal doors with hollow metal frames. Commercial duty lock sets and hardware shall be used 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. Provide weather stripping system for all exterior doors.

4.12.2.1 OVERHEAD DOORS

Overhead doors shall be sized as required. Doors shall be fabricated from interlocking cold-rolled slats, designed to withstand building wind loading and be installed with wind locks. Curtain door slats shall be continuous for the width of the door and steel interlocking flat-profile design. Standard steel slats shall be made of roll-formed steel 18 gauge steel, either primed & painted galvanized, stainless steel or anodized aluminum as provided by manufacture. Channel or curtain door guides shall be provided on each side of door. Overhead doors shall have a weather stripping bottom bar, head and jambs. Weather stripping and astragals shall be natural rubber or neoprene rubber. A manual pull chain shall be connected to the operation of the rolling door to provide open and close operation. A locking pin shall be provided on each jamb of the interior side of the door. Door shall have manufacturer's standard five pin tumbler locks, keyed. Coiling housing shall be mounted above all opening, on the interior side. For rated openings, a fusible link shall be provided on the most hazardous side. The coiling shutter shall also be rated and designed accordingly by the manufacture for the required fire rating. Hoods shall be fabricated from steel sheets with minimum yield strength of 227.5 MPa. Doors shall be counterbalanced by an adjustable, steel, helical torsion spring mounted around a steel shaft in a spring barrel and connected to the door curtain with the required barrel rings.

Counterbalance-barrel components shall be as follows:

- 1) Spring barrels shall be hot-formed structural-quality carbon steel, welded or seamless pipe. Pipe shall be of sufficient diameter and wall thickness to limit deflection to a maximum of 1/360 of the span.

- 2) Counterbalance springs shall be oil-tempered helical steel springs designed with a safety factor of 4. Springs shall be sized to counterbalance the weight of the curtain at any point of its travel, and shall be capable of being adjusted to counterbalance not less than 125% of the normal curtain load. Spring adjustment shall be arranged in such a way that the curtain need not be raised or lowered to secure the adjustment.
- 3) Counterbalance shafts shall be case-hardened steel of the proper size to hold the fixed ends of the spring and carry the torsion load of the spring.
- 4) Barrel plugs shall be fabricated from cast steel machined to fit the ends of the barrel. Plugs shall secure the ends of the spring to the barrel and the shaft.
- 5) Barrel rings shall be fabricated from malleable iron of the proper in-volute shape to coil the curtain in a uniformly increasing diameter.
- 6) Shaft bearings shall be factory sealed ball bearings of the proper size for load and shaft diameters.

Door operators shall consist of an endless steel hand chain, chain-pocket wheel and guard, and a geared reduction unit of at least a 3:1 ratio. Required pull for operation shall not exceed 16 kg. Chain hoists shall have a self-locking mechanism allowing the curtain to be stopped at any point in its upward/downward travel and to remain in that position until moved to the fully open or closed position. Hand chains shall be cadmium-plated alloy steel with a yield point of at least three times the required hand-chain pull. Pretreated zinc-coated steel sheets shall be given the manufacturer's standard prime coat and an enamel finish coat applied to the exterior face after forming.

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

4.12.2.2 STEEL DOORS

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

4.12.2.3 FIRE AND SMOKE DOORS AND FRAMES

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

4.12.2.4 THRESHOLDS

All exterior doors (except Mech/Elect rooms) shall be provided with manufactured metal thresholds conforming to ANSI/BHMA A156.21. Doors at all wet areas with ceramic tile or terrazzo tile flooring shall be provided with solid marble thresholds with marble threshold set 13 mm above tile. Thresholds shall span continuously from jamb to jamb.

4.12.2.5 STANDARD STEEL FRAMES

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

4.12.2.6 WELDED FRAMES

Continuously weld frame faces at corner joints. Mechanically interlock or continuously weld stops and

rabbets. Grind welds smooth.

4.12.2.7 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 the fasteners approximately 300 to 400 mm on centers. Miter molded shapes at corners. Use butt or miter square or rectangular beads at corners.

4.12.2.8 WEATHER-STRIPPING, INTEGRAL GASKET

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

4.12.2.9 ANCHORS

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

4.12.2.9.1 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.

4.12.2.9.2 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.

4.12.2.10 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.

4.12.2.11 HINGES

Exterior hinges shall have non-removable pins and be satin-chrome steel or stainless steel; Grade 1 anti-friction or ball bearing; and 3 each of 115 mm x 115 mm per leaf up to 900 mm wide door 125 mm x 125 mm for doors 900 mm to 1,200 mm wide. Interior hinges shall be Grade 1; anti-friction or ball bearing; and 3 each of 115 mm x 115 mm per leaf up to 900 mm wide door 125 mm x 125 mm for doors 900 mm to 1,200mm wide. Hinges for labeled fire doors must be either steel or stainless steel. Hinges shall conform to ANSI/BHMA A156.1 and A156.7.

4.12.2.12 LOCKSETS, LATCHETS, EXIT DEVICES, AND PUSH AND PULL PLATES

Exterior doors shall have mortise locks conforming to ANSI/BHMA A156.13 for metal doors. Emergency exit devices shall be Grade 1, flush mounted type. Interior doors shall have mortise locksets conforming to ANSI/BHMA A156.13, Series1000, Grade 1. All locks and latchsets shall be the product of the same manufacturer. Locksets, padlocks and latchsets shall be provided, as required, with lever handles on each side. Provide heavy duty hasp and locks at all fuel storage tanks.

4.12.2.13 CLOSERS

Closers shall be provided on all exterior doors and fire-rated doors. All exterior doors and interior doors that require security or privacy such as toilet room shall be provided with heavy-duty hydraulic closers. Closers shall conform to ANSI/BHMA A156.4, Grade 1. Closers shall be surface-mounted, modern type, with cover. Closer shall be adjustable type and have slow-down control to prevent door leaf from slamming to frame. Provide door silencers on all door frames provided with closers.

4.12.2.14 DOOR STOPS

Door Stops: Door stops shall be provided on all exterior and interior doors. Door stops shall comply with ANSI/BHMA A156.16 and shall be satin chrome on bronze, Grade 1.

4.12.2.15 KEYING SYSTEM & LOCK CYLINDERS

Provide locks for all doors. A Master key system shall be provided. Master key system shall include a separate & different key for each door with a master key provided to open any & all doors.

Cylinders: Lock cylinders shall comply with BHMA A156.5. Lock cylinder shall have six pins. Cylinders shall have key removable type cores. All locksets, exit devices, and padlocks shall accept same interchangeable cores.

4.12.2.16 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 galv-annealed steel without primer. Where coating is removed by welding, apply touchup of factory primer. Provide door finish colors as selected by the Contracting Officer from the color selection samples.

4.12.2.17 WATER-RESISTANT SEALER

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

4.12.2.18 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 caulking compound.

4.12.2.19 INSTALLATION

Before installation, seal top and bottom edges of doors with the approved water-resistant sealer. Seal cuts made on the job immediately after cutting using approved water-resistant sealer. Fit, trim, and hang

doors with a 2 mm minimum, 3 mm maximum clearance at sides and top, and a 5 mm minimum, 6 mm maximum clearance over thresholds. Provide 10 mm minimum, 11 mm maximum clearance at bottom where no threshold occurs. Bevel edges of doors at the rate of 3 mm in 50 mm. Door warp shall not exceed 6 mm when measured in accordance with WDMA I.S. 1-A. Hang doors in accordance with clearances specified in SDI A250.8. After erection and glazing, clean and adjust hardware.

4.12.2.19.1 FRAMES

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

4.12.2.19.2 GROUTED FRAMES

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

4.12.2.20 PROTECTION AND CLEANING

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

4.12.2.21 WEATHER STRIPPING

Install doors in strict accordance with the manufacturer's printed instructions and details. Weather strip the exterior swing-type doors at sills, heads and jambs to provide weather tight installation. Apply weather stripping at sills to bottom rails of doors and hold in place with a brass or bronze plate. Apply weather stripping to door frames at jambs and head. Shape weather stripping at sills to suit the threshold. Insert gasket in groove after frame is finish painted.

4.12.2.22 PRE-FITTING

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

4.12.3 GLAZING

All glazing shall be tempered double laminated and insulating. Laminated glazing shall be constructed of two panes of minimum 3 mm tempered glass laminated to a minimum 0.75 mm polyvinyl-butylal (PVB) interlayer, in accordance with UFC 4-010-01. Two panes of laminated glazing shall be installed in each window with hermetically sealed 13 mm airspace between them. After installation of windows, the contractor shall install a minimum 3 mil tinted film (Scotch Shield Ultra Safety and Security Window Film or approved equal) to the inside face of the glazing in accordance with manufacturer's instructions.

4.12.3.1 TEMPERED GLAZING

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.

4.12.3.2 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.

4.12.3.3 GLAZING GASKETS

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

4.12.3.4 FIXED GLAZING GASKETS

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

4.12.3.5 WEDGE GLAZING GASKETS

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

4.12.3.6 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.

4.12.3.7 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.

4.12.3.8 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.

4.12.3.9 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.

4.12.3.10 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.

4.12.3.11 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.

4.13 FINISHES

All exterior metal surfaces, including container exterior shall be painted to match existing adjacent buildings. Provide color boards with all materials, paints and finishes for COR approval prior to ordering materials. Color boards shall remain on site in view or with the Contractor until completion of the facility.

4.13.1 PAINTS & COATINGS

Paints and coatings shall be provided as a Specification 09 90 00 Paints and Coatings.

4.13.2 CONCRETE HARDENER

Concrete sealers shall be a liquid chemical sealer-hardener compound. Apply a minimum of two coats. Sealer shall be compatible with climate temperatures and not reduce the adhesion of resilient flooring, tile, paint, roofing, waterproofing or other materials applied to the concrete.

4.13.3 PAINT

Paint shall be oil based or latex. A primer shall be placed prior to any coats of paint. A minimum of two (2) coats of paint shall be used for each surface. Existing painted material shall be cleaned, cracks patched, and prepared for new paint. Existing sealant shall be inspected, cleaned or removed and new sealant placed.

4.13.3.1 EXPOSED EXTERIOR STEEL

Exposed exterior steel shall include items such as trim, frames, door, pipe rails and other exposed steel surfaces. Provide manufacturers standard baked on finish where possible. For unfinished steel items, 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.

4.13.3.2 EXPOSED WOOD

Exposed wood shall include items such as trim, frames, doors and other exposed wood surfaces. Paint with one coat oil-based primer, 2 coats of gloss enamel, color to be selected by the Contracting Officer from the color board provided by the Contractor

4.13.4 EXPANSION JOINTS IN PLASTER & STUCCO

Expansion joints shall be provided as specified in ASTM, DIN 18339, BS or EN Standards for all walls, floors and ceilings.

4.13.5 EXTERIOR WALLS

The exterior of all buildings not scheduled to be K-span shall be stucco and/or plaster conforming to ASTM C926 where indicated in standard building design. 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 10 mm thick. Allow 7 days to cure. The second coat shall be finish stucco, smooth finish, approximately 10 mm 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 adjacent 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.

4.13.6 INTERIOR WALLS

4.13.6.1 INTERIOR WALLS FOR K-SPAN BUILDINGS (SANDWICH PANELS)

Interior walls shall be a standard manufacturer's noncombustible, Class "A" rated, panelized insulated wall system that has been in production a minimum of 5 years. The interior wall system may either be an interlocking composite panel system of foam core units, with color coated prefinished metal skins on both sides, and an integral metal frame system with prefinished face sheathing both sides. The interior wall panel system shall be a complete system including trims and shall be able to receive multiple options on door and frame assemblies. Assembly including doors should provide a composite Sound Transmission Class (STC) of at least 42. Panelized system shall provide fire separation rating where required by design. Rating shall be by Underwriters Laboratory (UL) or an approved international testing agency.

4.13.6.2 PLASTER WALLS

Interior walls (except K-Span) shall be plaster applied in a similar manner as exterior stucco. Paint with 2 coats of semi-gloss off-white with less than 0.06% lead by weight color to be selected by the Contracting Officer from the color board provided by the Contractor.

4.13.6.3 SOUND CONTROL

Walls between sleeping rooms shall have a Sound Transmission Class (STC) minimum 45-55 or better, An STC value is a single number rating used to characterize the sound insulating value of a partition (wall, floor, or ceiling). All walls shall be caulked at floor and ceiling prior to installing wall base. All openings between rooms shall be caulked or sealed. Doors shall have rubber seal around frames and threshold.

4.13.6.4 HARDENED (CMU) INTERIOR WALLS

Interior walls intended to be CMU (except K-Span) shall be a minimum thickness of 100 mm. Interior CMU walls shall be plaster applied in a similar manner as exterior stucco. Paint with 2 coats of flat off-white paint with less than 0.06% lead by weight color to be selected by the Contracting Officer from the color board provided by the Contractor.

4.13.7 INTERIOR CEILINGS

4.13.7.1 CONCRETE CEILINGS

Concrete ceilings shall be exposed concrete painted with 2 coats of flat white, with less than 0.06% lead by weight.

4.14 TILE WORK

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

coat of a non-corrosive soap or other approved method of protection.

Floors in wet areas 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. 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.

Floors in administration areas, living quarters, corridors, and all rooms unless otherwise stated in the standard drawings shall be sealed concrete. 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.

Walls in wet areas shall be tiled with 150 mm x 150 mm glazed ceramic tile up to 2000 mm 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.

The ablution drain areas shall be recessed below the floor level 200 mm and lined with ceramic tile. Ceramic tile shall extend up the wall past the water spigots to a height of 2000 mm above finished floor. Seats shall be formed concrete with terrazzo tile finish to match the floor, 300 mm x 300 mm x 300 mm high finished dimensions. Color of ceramic tile shall be selected by the Contracting Officer from samples provided by the Contractor. Spacing between tiles shall be similar to terrazzo tile.

4.15 SPECIALTIES

4.15.1 MIRRORS

600 mm x 900 mm, 6 mm plate glass shall be mounted above all lavatories. Mount bottom of mirrors 1100 mm above finished floor.

4.15.2 TOILET PAPER HOLDERS

Toilet paper holders with removable pin shall be stainless steel, installed approximately 200 mm above floor by eastern toilets and 600 mm above floor by western toilets.

4.15.3 SHOWER CURTAIN RODS & SHOWER CURTAIN

Shower curtain rods, stainless steel, heavy duty, 1.20 mm shall be mounted between the walls of each shower stall. Mount rod 2000 mm above finished floor. Provide a shower curtain with support rings for each shower stall.

4.15.4 GRAB-BARS

Stainless steel grab-bars, heavy duty, 1.20 mm, two each 900 mm and 1050 mm long, 40 mm diameter shall be mounted behind and beside all eastern toilets, and bathtubs as they occur. Mount grab-bars between 610mm - 900 mm height on the walls. Each bar shall support no less than 91 Kg in any direction.

4.15.5 PAPER TOWEL DISPENSERS

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

4.15.6 LIGHT DUTY METAL SHELF

Provide a 600 mm long x 150 mm wide, light duty stainless steel shelf with integral brackets over each lavatory and laundry sink.

4.15.7 ROBE HOOKS

Provide a minimum of two robe hooks on all toilet and shower stalls.

4.15.8 CLOTHESLINES

Fabricate clothes line assembly in the shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling imitations. Clearly mark units for reassembly and coordinated installation. Wire-rope assemblies (clothes line cable) shall minimize the amount of turnbuckle take-up used for dimensional adjustment so the maximum amount is available for tensioning wire ropes. Wire rope shall be nylon covered. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of ~1 mm, unless otherwise indicated. Remove sharp or rough areas on exposed surfaces. Form work true to line and level with accurate angles and surfaces. Fabricate connections that will be exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate. Cut, reinforce drill, and tap as indicated to receive finish hardware, screws, and similar items. Welded connections: cope components at connections to provide close fit, or use fittings designed for this purpose. Weld all around at connections, including at fittings.

4.16 FACILITY TYPES

All facility types shall be constructed according to the standard designs unless otherwise noted.

5.0 MECHANICAL

5.1 GENERAL

The work covered by this section consists of design, supply, fabrication, and installation of building heating, ventilation and air-conditioning (HVAC), electrical generators systems. It also includes the delivery to site, erection, setting to work, adjusting, testing, balancing and handing over in perfect operating and running condition all of the equipment including all necessary associated mechanical works. If tying to an existing electric system, the generator systems indicated mentioned can be removed. HVAC equipment will normally consist of split-pack heat pump units, ducted packaged heat pump units, industrial quality unit heaters, air ventilation systems, kitchen hood exhaust, and specialized industrial ventilation systems.

5.2 SPECIALIST SUB-CONTRACTORS QUALIFICATIONS

The HVAC works shall be executed by a heating and cooling specialist sub-contractor experienced in the design and construction HVAC equipment to include conventional refrigerant systems, heat pump units, space heaters and knowledge in fabricating specialized units consisting of supplemental electric resistance heaters in satisfying the specified indoor design conditions.

5.3 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.

5.4 CODES, STANDARDS, & REGULATIONS

The design and installation of equipment, materials, and work covered under the mechanical services shall conform to the standards, codes, and regulations provide in the paragraph, List Of Codes And Technical Criteria, 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 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.

5.5 EQUIPMENT PROTECTION

Provide exterior pad-mounted mechanical equipment with either protective fences and concrete-filled steel bollards or protective screen walls to prevent accumulation of debris and vandalism.

5.6 DESIGN CONDITIONS

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

Lashkar Gah (unconfirmed):

Latitude: 31.58 degrees N

Longitude: 64.37 degrees E

Altitude: 773m (2536ft)

Summer: 44.4 C (112F) db and 24.4° C (76° F) WB.

Winter: -5.5° C (22° F) db

Range of DB: Summer 17.8 (32)

Average Extreme Wind: 40 kph (25 mph)

Prevailing Wind Direction: Summer SE, Winter ENE

5.6.1 INDOOR DESIGN CONDITIONS

Facility Type	Summer Temperature	Winter Temperature
Battalion HQs	Cooling 25 C (78 F)	Heating 20 C (68 F)
Courthouse	Cooling 25 C (78 F)	Heating 20 C (68 F)
Admin Buildings	Cooling 25 C (78 F)	Heating 20 C (68 F)
Officers Barracks	No Cooling	Heating 20 C (68 F)
NCO Barracks	No Cooling	Heating 20 C (68 F)
Combination NCO & Enlisted Barracks	No Cooling	Heating 20 C (68 F)
Small Latrines	No Cooling	Heating 20 C (68 F)

Battalion Storage Buildings	No Cooling	Heating 20 C (68 F) for Satellite Offices Only
Vehicle Maintenance Buildings	No Cooling	Heating 20 C (68 F)
Training Buildings	No Cooling	Heating 20 C (68 F)
Classroom Buildings	Cooling 25 C (78 F)	Heating 20 C (68 F)
Weapon Storage Bldg	Cooling 25 C (78 F)	Heating 20 C (68 F)

5.6.2 NOISE LEVEL

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

5.6.3 INTERNAL LOADS

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

Lighting: 21.5 W/sq.m maximum (however lighting levels shall meet minimum requirements and shall be accounted for in the heating and cooling loads based on the actual lighting design).

Outdoor Air: Outdoor ventilation air shall be provided per ASHRAE Standard 62.1. In general this requires 9 cmh/person plus 1 cmh/ sq.m of floor space; outdoor air requirements can be satisfied by windows that open to the outside.

Toilet/Shower Exhaust: 85 cmh per toilet, urinal, and shower head.

Ablution Exhaust: 35 cmh/sq.m. At extreme cold in winter this value can be reduced for short periods to 10 cmh/sq.m to conserve heat. Provide two-speed fans.

Building Pressurization: 12.5 Pa (0.05" w.c.); Maintain negative pressure in latrine areas. This is only applicable for buildings provided with central ducted forced air systems

5.7 AIR COOLING & HEATING EQUIPMENT

Environmental control of the facilities shall be achieved by HVAC equipment as listed below and approved by the U.S. Government. Unless otherwise noted, the Contractor may choose any combination of equipment to achieve the inside design conditions specified for the floor plans that is the most Life Cycle Cost Effective to the government. Contractor shall size and select equipment based on equipment manufacturer's performance data at the project site elevation and temperature conditions and ensure the equipment's performance meets the design heating and cooling sizing requirements.

Facility Type	Type of HVAC System	Remarks
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Battalion HQs	Packaged or Split-Pack Heat Pump Units for Commander's Offices, Conference Rooms, & Comm Rooms Only	Provide Unit Heaters, Ceiling Fans, & Adequate Ventilation For All Other Rooms
Courthouse	Packaged or Split-Pack Heat Pump Units for all rooms	Provide Unit Heaters, and air conditioning for all room
Admin Buildings	Packaged or Split-Pack Heat Pump Units for Bn Commander's Offices, Conference Rooms, & Comm Rooms Only	Provide Unit Heaters, Ceiling Fans, & Adequate Ventilation For All Other Rooms
Officers Barracks	Unit Heaters	Provide Adequate Ventilation & Ceiling Fans
Small Officers Barracks	Unit Heaters	Provide Adequate Ventilation & Ceiling Fans
NCO Barracks	Unit Heaters	Provide Adequate Ventilation & Ceiling Fans
Combination NCO & Enlisted Barracks	Unit Heaters to Include the Smaller Open Bay Rooms	Provide Adequate Ventilation & Ceiling Fans
Small Latrines	Unit Heaters	Provide Adequate Ventilation & Exhaust
Battalion Storage Buildings	Unit Heaters for Satellite Offices Only	Provide Adequate Mechanical Ventilation For All Storage Areas
Vehicle Maintenance Buildings	Unit Heaters Or Infrared Heaters	Provide Adequate Ventilation For All Areas With Overhead Vehicle Tailpipe & Battery Room Exhaust Systems
Training Buildings	Unit Heaters	Provide Adequate Ventilation & Ceiling Fans
Classroom Buildings	Packaged or Split Pack Heat Pump Units	Provide Adequate Ventilation & Ceiling Fans
Small Arms Storage Buildings	Unit Heaters (Packaged or Split-Pack Heat Pump Units for one office per standard design drawings)	Provide Adequate Ventilation and Exhaust
POL Storage Buildings	No Heaters	Provide Adequate Ventilation & Exhaust

Laundry, buildings and vehicle maintenance bays shall be provided with ventilation to maintain the indoor conditions to 10 F above the summer ambient DB temperature. Vehicle maintenance bays shall be provided with infrared heaters or unit heaters.

5.7.1 UNITARY DUCTLESS (SPLIT-PACK) HEAT PUMP UNITS

Unitary ductless split-pack heat pump units shall be provided as indicated. 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. **Heat pump units shall be suitable for low ambient operation.** Interior evaporator fan coil units shall consist of a DX coil, blower, 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 exterior condensing units shall contain compressor, condenser coil, and all controls/fittings enclosed in a weatherized housing. Outdoor condensing unit shall be wall-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.

5.7.2 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 next to the main entrance door. For units serving more than one (1) area, the thermostat shall be located near the return of the space with the highest heat generation.

5.8 DUCTWORK

Air shall be distributed from packaged heat pump to achieve proper airflow throughout the facility and shall be removed by exhaust fans by means of ductwork. Air distribution system shall be comprised of supply and return ductwork, fittings, manual volume control dampers, grilles, registers, and/or diffusers. Ductwork shall be constructed of galvanized steel or aluminum sheets and installed as per SMACNA "HVAC Duct Construction Standards (Metal and Flexible)." Flexible non-metallic duct may be used for final unit/diffuser connection in ceiling plenums. These flexible duct run-outs shall be limited to 3 m (10') in length.

5.8.1 DUCT INSULATION

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

In general interior ducts shall be exposed to the rooms and will not be insulated. The heat lost or gained from the un-insulated ducts shall be considered as part of the heating or cooling of the conditioned space. Makeup duct systems shall be provided with insulation and vapor barrier to prevent condensation. Insulation exposed to weather or physical damage shall be protected with aluminum jacketing.

5.8.2 DIFFUSERS, REGISTERS, & GRILLES

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

5.8.3 BRANCH TAKE-OFFS

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

5.8.4 WALL PENETRATIONS

Building wall penetrations for fans, exhaust duct, vents, and louvers 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 walls. **The Contractor is encouraged to locate exterior wall louvers above doors, whenever possible, to take advantage of the structural framing void located above doors.** If the building manufacturer is not available, the Contracting Officer shall be consulted. In either case, the recommendations of the manufacturer and/or Contracting Officer shall be strictly adhered to.

5.8.5 WALL TRANSFER GRILLES

Wall penetrations for air transfer between two spaces shall be provided with a factory fabricated grille on both the inlet and outlet sides of the opening. For fire-rated walls in accordance with NFPA-90A with air transfer penetrations, fire dampers shall be installed between the inlet and outlet grilles.

5.8.6 OUTSIDE AIR INTAKE, MAKEUP, AND EXHAUST LOUVERS

Outside air louvers shall be factory fabricated of steel or aluminum and allow the specified air quantity into the space intended. Louvers shall be square or rectangular with rain-proof exterior face blades and internal grille. **To reduce sand and dirt migration, outside air intakes shall be installed as high as possible within architectural constraints or a minimum of 1.5 m (5') above the ground.**

Consideration shall be given to locating the louvers near the heating and cooling unit and encourage air flow across the room in conjunction with the exhaust fan. Outside air intake louvers shall be provided with air filter (See Air Filtration), insect screen, and motorized dampers interlocked to open when the exhaust fans operate. Minimum louver dimensions shall be submitted in the design analysis (DA) calculations.

All supply air shall be filtered using manufacturer's standard washable filters mounted inside the unit. In addition, all outdoor makeup air intakes shall be equipped with 50 mm (2") thick washable filters. Control wiring and protection of the air conditioning units being offered must be the manufacturer's standard, pre-wired, installed in the unit at the factory or as recommended. Thermostats shall be located near the unit return. For units serving more than one (1) area, the thermostat shall be located near the return of the space with the highest heat generation.

5.9 VENTILATION, EXHAUST, & AIR-MOVEMENT SYSTEMS

All fans used for building ventilation, exhaust, and pressurization shall be selected for minimum noise level generation. All fans used for supply or roof/wall exhaust, including toilets, showers, and ablutions, 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 wall exhaust fan shall be provided with motorized or gravity dampers which close automatically when the fan is not running. Each ventilation or intake air fan shall be provided with an interlocked motorized damper which closes automatically when the fan is not running and shall be sized for and provided with filter and insect screen. Each fan shall be provided complete with vibration isolator, external lubricators, individual wall on/off switches, and all accessories and sound attenuators as necessary.

Consideration shall be given to wall-mounted fans (except for battery rooms) to reduce roof penetrations and possibility for water leaks (especially for metal roofs).

Intake or makeup air openings ventilation and for exhaust fans shall be provided with motorized dampers which are interlocked with the exhaust fans and provided with air filters and insect screens. The

motorized dampers shall open or close when the ventilation or exhaust fan is on or off respectively. Louvered intake openings, or ventilation or exhaust fan system, shall be sized for a maximum static pressure (SP) drop (that includes filter resistance) of 25 Pa (0.10" of H₂O) to prevent excessive negative pressurization of the building. **Exterior outside door louvers and undercuts are not permitted except under special circumstances.**

Maintenance shops and similar spaces that use solvents and oils shall be provided with mechanical exhaust air systems. Intake or makeup air openings for an exhaust fan system shall be provided as indicated above. The exhaust systems shall consist of a fan, ductwork, exhaust grills, and interlock controls. Design shall be in compliance with the latest addition of the Industrial Ventilation UFC 3-410-04N or ACGIH Industrial Ventilation manual.

To reduce sand and dirt migration, outside air intakes shall be installed as high as possible within architectural constraints or a minimum of 1.5 m (5') above the ground.

5.9.1 BATTERY ROOM EXHAUST

Battery room exhaust shall comply with UFC 3-520-05. The exhaust fan for the lead acid shop shall be sized to maintain concentrations of hydrogen gas in the battery room to below 1.0 percent concentration. The exhaust fan shall be sized larger when required for mechanical ventilation cooling. The fan shall have a non-sparking wheel and the motor shall be located out of the airstream. Any components such as fan and ductwork in contact with the exhaust air shall be constructed out of fiberglass reinforced plastic (FRP) or polyvinyl chloride (PVC). The ventilation system for the shop shall be designed to provide a negative static pressure by exhausting 10% more air than is supplied. Supply air for the shop shall be 100% outside air.

5.9.2 OVERHEAD VEHICLE TAILPIPE EXHAUST SYSTEMS

Exhaust system shall provide adequate air exhaust quantities and velocities.

Duct shall be constructed of stainless steel sheets of the minimum gauge thickness for ducts as required in SMACNA. Ducts shall be constructed and sealed in accordance with SMACNA and shall be round with longitudinal lock seam (Steel spiral wound duct is not acceptable) for a negative pressure.

Tailpipe adapters shall be of the tapered-cone type with spring clips or other suitable devices for exhaust pipe attachment. The adapter shall fit the nominal diameter exhaust pipe.

Flexible exhaust hose shall be 0.30 mm (0.012") minimum stainless steel. The exhaust hose suspension system shall suspend the flexible tubing overhead when not in use; allowing it to be lowered to the operating level, when required. The suspension system shall be furnished complete with cable, and operating mechanism. The suspension system shall be counter-weighted or manually operated balancer type.

Fan system shall consist of a direct drive heavy duty radial blade blower capable of high static pressure vented to the outdoors. Fan shall be mounted high in space for roof discharge or high gable sidewall termination. Control fan with wall switch.

5.9.3 CEILING FANS

Ceiling fans shall be 5-bladed, 1320 mm (52"), minimum, in diameter, and provided at one per 40 sq.m of floor space unless indicated otherwise. Fans shall be centered or distributed evenly throughout the 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 a minimum 2.5 m (98") above the finished floor. The fan shall be provided without light kit. The finish shall be factory painted white. The controls shall be wall-mounted from either a single pole switch or from two (2) 3-way switches to provide on/off operation. The electrical supply shall be as indicated. Install per manufacturers' instructions.

5.10 ELECTRIC HEATERS

Electric trace heating cables for freeze protection shall not be provided as a substitute for space heating systems.

5.10.1 UNIT HEATERS

Electric resistance unit heaters shall be installed in spaces where only heating is required. Generally, unit heaters shall be mounted as high as possible. Unit heaters shall be of the industrial grade, durable, and securely fastened to the ceiling, wall or structure. Electric heating unit shall be self-contained with heating elements and fan with at least two (2) speeds. Unit shall be provide control-circuit terminals and single source of power supply with disconnect. Heating wire element shall be nickel chromium. Limit controls shall be provided for overheat protection. Hard-wired integral thermostats shall be generally located under the unit or in the return air flow stream.

5.10.2 INFRARED HEATERS

Infrared heaters shall be provided for spot heating of a large area such as maintenance bays and warehouses. Infrared heaters shall use electricity. Contractor shall position the infrared heaters to direct the radiant heat to only those areas where people normally work. Coordinate with User. Infrared heaters shall be provided with control-circuit terminals and single source of power supply with disconnect.

5.10.3 OVERHEAD DOOR CONTROL DEVICES

Control switch and wiring shall be provided to activate when the overhead doors open. The switch shall override the space thermostat and deactivate the space heating equipment. Minimum setpoint temperature to override the heating deactivation switch during door-open periods shall be 4 C (39 F). After the doors are closed, the room thermostat should assume control.

5.10.4 TEST ON COMPLETION

Upon 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. Contractor shall coordinate with the Contracting Officer on when the test shall be scheduled. Tests shall include all interlocks, safety cutouts, and other protective devices to ensure correct functioning. All such tests shall be carried out with full written records of the values obtained and the final settings and submitted to the Contracting Officer in writing.

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:

- 1) Ambient DB and WB temperatures.
- 2) Room Inside Conditions:
 - a) Inside room DB & WB temperatures.
 - b) Air flow supply, return, and/or exhaust.
 - c) Plot all temperatures on psychrometric chart.
- 3) Split-Pack Heat Pumps and Heaters the following readings shall be made:
 - a) Motor speed, fan speed, and input ampere reading for each fan.
 - b) Supply and return air temperature for each system.
- 4) Packaged Air Handling Equipment: Air quantities shall be obtained by anemometer readings and all necessary adjustments shall be made to obtain the specified quantities of air indicated at each inlet and outlet. Following readings shall be made:
 - a) Supply, return and outside air cmh (cfm) supplied by each air conditioning system.
 - b) Motor speed, fan speed, and input ampere reading for each fan.

- c) Supply, return, and outside air temperature for each air-conditioning system.
- 5) Exhaust air fans the follow reading shall be made:
 - a) Total cmh (cfm) by each fan.
 - b) Speed in rpm.
 - c) Amperes for each phase.
 - d) Power input in kW.
- 6) Electric Motors: For each motor:
 - a) Speed in rpm.
 - b) Amperes for each phase.
 - c) Power input in kW.

5.10.5 ELECTRICAL REQUIREMENTS FOR HVAC EQUIPMENT

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.

All thermostats shall be wall-mounted. 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. Wall-mounted thermostats shall be mounted 1.5 m (5') above the finished floor and be easily accessible. Thermostats for the latrine facilities shall be located near the unit return and mounted 1.5 m (5') above the finished floor. Operation of the control system shall be at the manufacturer's standard voltage for the unit.

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.

5.11 OPERATIONS & MAINTENANCE (O&M) FOR MECHANICAL

Contractor is required to provide a 12-month supply of parts for operation and maintenance of equipment according to the manufacturer's recommendations. In addition to this, the Contractor shall provide an inventory of all items, location/address stored and secured, and commissioning plans.

The O&M manuals must be provided prior to any training activities. Manuals shall be "tri-lingual" in Dari, Pashto, and English.

All control panels shall have tri-lingual name plates in Dari, Pashto and English.

The contractor shall provide an outline of the training lesson plan (to be approved by the Government) prior to conducting training. CD recordings of training on video shall also be provided, after training is conducted.

6.0 PLUMBING

6.1 GENERAL

The Contractor shall design and build domestic cold and hot water systems, waste, drain and vent systems, compressed air, fuel-oil storage and distribution systems and as required in the facilities identified in Section 01010 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, adjusting, testing and balancing, and handing over in full operating condition all equipment and associated works.

6.2 SUB-CONTRACTORS QUALIFICATIONS

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

6.3 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.

6.4 CODES, STANDARDS, & REGULATIONS

The design and installation of equipment, materials and work covered under the plumbing services shall conform to the standards, codes, and regulations provide in the paragraph, List of Codes and Technical Criteria, 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 and primarily in accordance with the ICC International Plumbing Code (IPC). Standards other than those mentioned 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.

6.5 EQUIPMENT PROTECTION

Exterior plumbing equipment shall be pad-mounted. In addition, security fences and traffic bollards for exterior equipment shall be provided.

6.6 PLUMBING SYSTEM REQUIREMENTS

6.6.1 WATER

Domestic cold and hot water shall be provided in the facilities to serve the water usage and plumbing fixtures provided for the facility. Water service to each facility shall enter the building in a mechanical, toilet, storage, or similar type space. The building service line shall be provided with a shut off valve installed either outside in a valve pit or inside the mechanical room or similar spaces. Water piping shall not be installed in or under the concrete foundation except for the service line. 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. Electric heat trace cable for freeze protection shall not be provided as a substitute for space heating systems.

6.6.2 PIPING MATERIALS

Domestic cold water shall be distributed by means of standard weight schedule 40 galvanized steel pipe, Polyvinyl Vinyl Chloride (PVC) or Polyethylene (PE) (ASTM D 2737) plastic piping. Domestic hot water shall be distributed by means of standard weight schedule 40 galvanized steel pipe, or Chlorinated Polyvinyl Vinyl Chloride (CPVC) piping. Domestic water joints shall be connected using either solvent cement or mechanical threads.

Waste and vent piping can be made of either galvanized steel pipe (schedule 40) or Polyvinyl Vinyl Chloride (PVC) conforming to ASTM D 2665. Flexible waste and vent lines from fixtures (i.e. Lavatories,

Water Closets, etc.) and inserted into an adjacent pipe are not allowed except for clothes washer installations.

Corrosion protection shall be provided if galvanized piping comes in contact with earth or masonry floors, walls or ceilings. The Contractor shall attempt to route all piping beyond the grasp of the occupants. **All exposed domestic water, waste, and vent piping shall be schedule 40 galvanized steel; wall mounting brackets for exposed domestic water, waste, and vent piping shall be spaced a maximum of 40 cm (16") apart to minimize vandalism.**

Polypropylene (PP) pipe is NOT allowed as a substitute (where plastic piping is allowed) because connections, many times, are made using the fusio-therm technique which requires special training and maintenance equipment for installation and repair.

6.6.3 PLUMBING WATER FIXTURES

The following typical plumbing fixtures shall be provided:

- 1) 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/hose bibb 300 mm (12") above finished floor on the right (from a perspective of standing inside of the cubicle and looking out) sidewall of the cubicle. Toilets shall be oriented north and south; toilets shall not face east or west.
- 2) Lavatories. All sinks shall be the trough-type constructed of block and concrete with ceramic tile exterior and lining capable of withstanding abuse. Provide maintenance access to waste piping and P-traps from under the sink. Lavatories inside prisoner cells shall be tamper-proof with integral spout, soap depression, and outlet connection to slip 40 mm (1.5") OD tubing.
- 3) Sink Faucets. Trough-type sink faucets shall be similar to service sink faucets with one-piece brass body construction, fixed short integral spout, hot and cold water manual mixing valves, and capabilities for withstanding abuse. Use cross handles or knob handles. **No goose neck faucet fixtures shall be used.**
- 4) Service-Janitor's Sink. All janitor's sinks shall be floor mounted, enameled cast iron, and be provided with copper alloy rim guard. Provide hot and cold water valves with manual mixing. Faucet handles shall chrome plated brass or bronze alloy. Service sinks provided in maintenance areas shall be concrete. Service sinks in battery rooms shall be acid resistant. Include a stainless steel shelf and three (3) mop holders with janitor sinks.
- 5) Showers, showerhead and faucet handles shall be chrome plated brass or bronze alloy. Provide hot and cold water valves for manual mixing. In addition to a shower head, provide each shower stall with a threaded faucet approximately 1.2 m (4') AFF with hot and cold-water controls, mixing valve, and diverter valve so water can be directed to either the shower or to the lower faucet. Shower shall be provided with low flow shower head. The shower head shall be heavy duty type and securely fastened to the wall.
- 6) Ablution Trenches. Provide trench drains with brass grating and strainer. Provide each station with hot and cold water valves with manual mixing. Faucet handles shall be copper alloy.
- 7) Floor Sinks. Provide floor sink, circular or square, with 300 mm (12") overall width or diameter and 250 mm (10") nominal overall depth. Sinks shall be provided with acid resistant enameled interior cast iron body, aluminum sediment bucket, and perforated grate of cast iron.

- 8) Floor or Shower Drains: Floor and shower drains shall consist of a cast iron or 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.
- 9) 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 m (40') of hose. Provide clean-up spray nozzle with hose assembly.
- 10) Provide P-Traps per IPC for all fixture drains, floor and trench drains, and shower drains. P-traps shall have minimum of 50 mm (2") water seal.

6.7 HOT WATER

Hot water shall be provided for the facility to supply 50 C (120 F) hot water to fixtures and outlets requiring heated water. Water of a higher temperature, 60 C (140 F) and above, shall be provided for special uses or processes as in kitchens (except hand wash lavatories) and for sterilization. All hot water piping shall be insulated. A hot water re-circulating pump shall be provided if hot water piping run exceeds 30 m (100) in accordance with the IPC.

6.7.1 WATER HEATERS

The hot water shall be generated by electric water heaters (WH). All WHs shall be factory insulated. Each water heater shall be equipped with a vacuum relief valve and temperature and pressure (T&P) relief valve that discharge into a nearby floor drain; discharge piping shall terminate 50 mm (2") above the floor drain. The larger floor-mounted units shall be located inside mechanical rooms, storage rooms, janitor rooms, or similar type spaces. Smaller wall-mounted units may be located in toilet-lavatory areas for single remote water closets. Multiply water heaters (two or more) shall be of equal size and connected by common inlet and outlet manifolds in a "**reverse return**" configuration to ensure equal flow and drawdown rates. All floor-mounted WHs shall be elevated on a 100 mm (4") raised concrete pads. In cases where the pressure of the water system violates the manufacturer's recommendations, a pressure reducer shall be installed in the line before the water heater.

Water heater storage capacity (liters) and recovery capacity elements (kW or liters per hour) shall be sized in accordance with ASHRAE Fundamentals Handbook-HVAC Applications, "Service Water Heating,".

6.8 WASTE, DRAIN, & VENT SYSTEMS

Every trap and trapped fixture shall be vented in accordance with the IPC. In order to minimize vent piping, incorporate either "Circuit Venting," "Combination Drain & Vent," or "Wet Venting" options systems in accordance with the IPC.

6.8.1 DESIGN & INSTALLATION CONSIDERATIONS

The Designer and installer shall have in mind a vent option (i.e. Fixture Venting, Circuit Venting, Wet Venting, etc.) before designing the route of the waste line(s) in a building in order to comply and avoid inconsistencies with the IPC. **Under no circumstances shall VENT PIPING be routed horizontally under the floor due to blockages over time.** Every dry vent connection shall rise up vertically from the waste pipe no less than 45-degrees with the horizontal (Note: In most cases, the connection will be 90 degrees for the horizontal or straight up. See IPC). Every dry vent shall rise up vertically at least 15 cm (6") above the flood level rim, of the fixture being vented, before going horizontally.

6.8.2 FLOOR DRAINS

Floor drains shall be provided in each room that contains a water source. Floor drains shall be provided in the mechanical equipment and toilet/shower/ablution rooms. Floor drains shall be provided next to

water heaters. In mechanical rooms, floor drains shall be provided to avoid running drain piping long distances above or over the floor. Drain outlet shall use a P-trap system to trap sewer gases and shall be a one-piece system without removable parts.

6.8.3 CLEANOUTS

Cleanouts shall be provided no more than 8 m (25') apart when measured from the upstream entrance of the cleanout.

6.9 SPECIAL PLUMBING SYSTEMS

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

6.9.1 PLUMBING FOR BATTERY ROOMS

Plumbing features for battery room shall comply with requirements in Part 6 of UFC 4-229-01N. Plumbing shall be provided as follows:

- Acid-resistant and alkali-resistant floor drains shall be provided in the lead acid and NICAD shops, respectively.
- Emergency shower and eyewash facilities shall be provided and be located within 16 m (25') of the battery handling areas.
- Fiberglass holding tank (above-ground) shall be provided for waste electrolyte. Underground tank shall be located in a concrete containment pit with removable waterproof cover. Above-ground tank shall be located on concrete slab with concrete berm around perimeter which provides containment' equal to tank volume plus 10 percent. Tank shall be located to provide gravity drainage from dump sinks. A float type level indicator, pump out connection, and vent on holding tank shall be provided.
- Acid-resistant and alkali-resistant dump sinks shall be provided in the lead acid and NICAD shops, respectively. The sinks shall empty into a holding tank before disposal. Caution shall be exercised when separately pouring acid or alkaline waste. Acid and alkaline waste shall never be poured together into the sinks.
- Facilities shall be provided with hose bibb, garden hose, and rack for flushing and neutralizing spilled electrolytes for shop.

6.9.2 COMPRESSED AIR SYSTEMS

Compressed air system shall be in accordance with UFC 3-420-02FA. Compressed air shall be provided using a packaged air-cooled electric motor driven compressor and ASME rated receiver with air cooler and moisture separator to remove moisture and oil. Compressed air system shall be capable of operation up to 10 kPa (200 psig) maximum for 6 kPa (125 psig) normal units. High-pressure system (above 10 kPa (200 psig)) shall be provided to supply compressed air to equipment where required. Provide an engine driven air compressor where generator electrical power is unreliable. Noise level of air compressor should not exceed acceptable db limits.

The air distribution system shall be provided with necessary regulator valves to maintain desired pressure. Compressed air drops shall be provided in each maintenance bay, tire shop, tool room, paint shop and other areas requiring compressed air service. Where required, line filters, lubricators, and/or hose reels shall be provided. Compressed air piping shall be black steel pipe and painted to match wall color.

6.9.3 WASTE/HAZARDOUS DRAINAGE

Waste or hazardous drainage from battery repair/charging areas shall be treated prior to entering the base general waste drainage system. Hazardous waste drainage piping shall be acid resistant. Smaller battery rooms shall have waste treatment available using an acid neutralizing tank.

7.0 FIRE PROTECTION

7.1 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). Fire extinguishers shall be located in an accessible location, free from blocking by storage and equipment, near room exits that provide an escape route. The top of the extinguisher shall not be more than 1.5m above the floor and not less than 101mm above the floor. The extinguisher shall be easy to reach and placed where it will not be damaged.

8.0 ELECTRICAL

8.1 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.

8.2 ELECTRICAL WORKERS QUALIFICATIONS

Electrical work shall be performed by qualified persons with verifiable credentials who are thoroughly knowledgeable with applicable code requirements. Verifiable credentials consist of a certificate of graduations from an approved trade school and required amount of experience, depending on work being performed, and should be identified in the proposal that is submitted. A qualified person is one who has received training in and has demonstrated skills and knowledge in the construction and operation of electrical equipment and installations and the hazards involved. This includes the skills and techniques necessary to distinguish exposed live parts from other parts of electric equipment, to determine the nominal voltage of exposed live parts, the clearance distances and corresponding voltages to which the qualified person will be exposed.

8.2.1 SUPERVISORY ELECTRICIAN

Supervisory electricians must be graduates of an approved trade school, and must have two years of relevant electrician experience. Approved programs include but are not limited to the Afghanistan Technical and Vocational Institute (in Kabul), the Kunar Trades Training Center, and the Commercial Technical Training Center (in Jalalabad). Work experience resumes and graduation certificates shall be submitted and approved prior to commencement of any design or construction involving electrical work. Approval is granted by the Contracting Officer's Representative with guidance by the Quality Assurance Branch and/or the Safety Office of the U.S. Army Corps of Engineers, Afghanistan Engineer District-South.

8.2.2 ELECTRICIANS

Electricians must be graduates of an approved trade school and must be able to provide upon request a certification of successful course work completion and graduation in addition to a resume of work experience.

8.3 DESIGN CRITERIA

8.3.1 APPLICABLE STANDARDS

Design shall be in the required units as stipulated herein. 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. All electrical systems and equipment shall be installed in accordance with the requirements set forth in the documents referenced herein.

8.3.2 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).

8.4 MATERIAL

8.4.1 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.

8.4.2 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.

8.4.3 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.

8.4.4 RESTRICTIONS

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

8.5 DESIGN REQUIREMENTS

8.5.1 ELECTRICAL DISTRIBUTION SYSTEM

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

The underground portion of the distribution system shall be in direct buried schedule 80 ductbanks, except for under roadways and heavy traffic areas, with the ducts not less than 1220mm below grade. Manholes and handholes shall be provided at changes of direction of more than 40 degrees and elsewhere as required to limit the pulling tension and sidewall pressure on the cables during installation to acceptable levels as defined by the cable manufacturer. Manholes shall be provided for ductbanks with more than 2 ducts. Handholes shall be provided wherever a manhole is not required by quantity of ducts or by cable manufacturer's installation recommendations. Underground ducts shall be not less than 100mm diameter Schedule 80 PVC for non roadway and light traffic areas and concrete encased schedule 40 for roadways and heavy traffic areas. The Contractor shall provide one additional duct per duct bank beyond the design for future growth.

The Contractor shall design and build a medium voltage primary distribution system with distribution feeders to supply power to distribution transformers. The transformers shall be loop feed, dead front type with load break elbows. Each 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 all required conduit stub ups to connect all equipment (both present and planned) to the switchgear lineup. Contractor shall provide stepup transformers and the required conduits to connect the generators to their respective transformer and the transformers to the switchgear lineup.

Transformers shall be strategically located close to the loads. Primary side load-break disconnecting means shall be provided with all transformers. Transformers shall come complete from manufacturer. Transformer selection, design, and installation shall be governed by NEC, NESC, ETL 1110-3-412, TM 5-684, UFC 4-510-01, UFC 3-550-03FA, UFC 3-550-03N, IEEE C57.12.28, ANSI/IEEE C57.12.22, IEEE C57.12.34, and C57.12.80.

Size of transformers and power feeds shall be governed by UFC 4-510-01, NFPA 99, and the NEC. In case of conflict between transformer design criteria between the above named standards, UFC 4-510-01 shall govern; in cases where UFC 4-510-01 cannot resolve the conflict, it shall be brought to the attention of the Contracting Officer for resolution.

Design of the electrical system within facilities shall include, but is not limited to (a) interior secondary power distribution system, (b) lighting and power branch circuit and devices, and (c) fire detection and alarm system. All systems shall be designed for the demand loads, plus 25% spare capacity. Low voltage distribution shall be 220/380V, 50Hz.

The Contractor shall provide feeders from the distribution system to each facility. Equipment shall include a distribution panel board shall be sized for the total load of each facility plus 25% spare capacity for future growth. Feeder lengths shall be kept as short as possible to minimize voltage drop.

All panelboards shall be circuit breaker 'bolt-on' type panels. Circuit breakers shall be connected to bus bar(s) within the panelboards. Daisy chain (breaker-to-breaker) connection(s) are not acceptable. Indoor distribution panels shall be surface mounted. 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. All building service entrance (service intake) panels shall be provided with kilowatt-hour (KWh) meters. A voltmeter and ammeter shall be provided also. All metering shall read true RMS values. Series rated equipment is not permitted. A digital power meter in lieu of a KWh meter, ammeter and voltmeter may be provided. Digital power meters shall meet or exceed ANSI/IEEE C37.90.1. Power receptacles (outlets) shall be 220 V, 50 hertz, 16 amp type CEE 7-7 three-wire grounded 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), British Standard (BS) Wiring Regulations, International Electrotechnical Commission (IEC) standards, or Deutsches Institut für Normung (DIN) standards. Receptacle locations are dictated by NEC, British, and other electrical standards.

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

Phase imbalance at each panel shall not exceed 5%.

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

8.5.2 LIGHTING

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

Living room/Quarters	35 FC (350 Lux)
Toilets, Showers, Latrines, washrooms	20 FC (200 Lux)
Mechanical/Electrical rooms	30 FC (300 Lux)
Corridors and Stairways	20 FC (200 Lux)
Offices (private)	50 h/5 v FC (500 h/50 v Lux)
Office areas (open)	30 h/5 v FC (300 h/50 v Lux)
Kitchens (commercial)	70 h/3 v FC (700 h/30 v Lux)
Dining Areas	20 h/3 v FC (200 h/30 h Lux)
Auditoriums (social)	5 h/3 v FC (50 h/30 v Lux)
Conference	30 h/5 v FC (300 h/50 v Lux)
Armories	30 h/3 v FC (100 h/30 v Lux)
Reading (at desk-serious)	50 h/10 v FC (500 h/100v Lux)
Patient Rooms (general)	Per UFC 4-510-01
Patient Rooms (critical)	Per UFC 4-510-01
Egress path (incl. exterior)	10 Lux
Areas adjacent to egress path	0.5 Lux
Areas Requiring Lighting Per Section 01010	0.5 Lux

FC = FootCandle

h = horizontal component

v = vertical component

Area lighting for the Motor Pool shall have photocell controlled switches.

8.5.3 INTERIOR AND EXTERIOR LIGHTING

Indoor lighting for all areas shall consist of fluorescent surface mounted light fixtures.

Exterior lighting such as light steel pole shall be HID (metal halide or high pressure sodium).

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. Every room shall be provided with a minimum of one light switch. Light fixtures shall be mounted approximately 2.5-meters above finished floor (AFF) minimum. Fixtures may be pendant or ceiling mounted, depending on the ceiling type and height.

8.5.4 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) are required. Ballasts shall be rapid start type. 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.

8.5.5 EMERGENCY "EXIT" LIGHT FIXTURES

Emergency "EXIT" light fixture shall be provided in accordance with NFPA requirements. Fixtures shall be single or double sided as required by the location and for wall/ceiling mounting. Unit shall illuminate continuously and be provided with self-contained nickel cadmium battery pack, to operate on floated-battery or trickle charge circuit. Fixture shall operate satisfactorily for 90 minutes during a power outage. Unit shall have test/re-set button and failure indication lamp. Primary operating voltage shall be 220 volts. Lettering "EXIT" shall be color red and not less than 150 mm in height and on matte white background. Illuminations shall be with LEDs.

8.5.6 EMERGENCY LIGHTING

Battery powered emergency lights shall be provided within each building per NFPA for safe egress during power outage. Fixtures shall be provided with self-contained nickel cadmium battery pack to operate on stand-by circuit for 90-minute minimum. Unit shall have test/re-set button and failure indication lamp. Normal operating voltage shall be 220 volts. Emergency lighting fixtures shall be connected to the normal lighting system.

8.5.7 LIGHT SWITCHES

Light switch shall be single pole. Minimum of one light switch shall be provided in every room. Lighting in rooms with multiple means of egress may be controlled from multiple switches.

8.5.8 RECEPTACLES

General-purpose receptacles shall be as required herein.

Areas with computer work-stations or similar equipment will have additional receptacles. Sinks may have a receptacle above. All receptacles shall be duplex, unless otherwise specified in this section, the NEC, or other referenced standard. Receptacles in wet/damp areas or within 1 meter of sinks, lavatories, or wash-down areas shall be ground fault circuit interrupter (GFCI) type or residual current disconnect (RCD) type. Total number of receptacles shall be limited to six (6) per 20-ampere circuit breaker.

8.5.9 CONDUCTORS

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

8.5.10 GROUNDING AND BONDING

Grounding and bonding shall comply with the requirements of NFPA 70. All exposed non-current carrying metallic parts of electrical equipment in the electrical system shall be bonded. Insulated equipment grounding conductor (separate from the electrical system neutral conductor) shall be installed in all feeder and branch circuit raceways. Equipment grounding conductor shall be green-colored, unless the local authority requires a different color-coded conductor. If required, ground rods shall be 20 millimeters in diameter and 3 meters long made of copper-clad steel.

8.5.11 ENCLOSURES

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

8.5.12 FIRE DETECTION & ALARM SYSTEM

A complete Fire Detection and Alarm System shall be provided throughout the buildings and installed in accordance with NFPA 72 requirements. System shall include, but not limited to, Fire Alarm Control Panel (FACP), manual pull stations, horns, strobes, and smoke and/or heat detectors (with alarm verification feature). Fire alarm system shall be complete and a standard product of one manufacturer.

8.5.13 CONDUIT RACEWAY SYSTEM

Metal conduit (EMT) system shall be complete, to include but not limited to, necessary junction and pull boxes for all surface mounted conduit systems. PVC conduit, junction and pull boxes are allowed for raceways not subject to severe damage. All empty conduits shall be furnished with pull wire or cord or rope (depending on the size of conduit and length of run). System design and installation shall be per NFPA 70 requirements.

8.5.14 CABLE TRAY RACEWAY SYSTEM

Cable trays shall be ladder type and provided with, but not limited to, splices, end plates, dropouts and miscellaneous hardware. System shall be complete with manufacturer's minimum standard radius and shall be free of burrs and sharp edges. Nominal width of cable tray shall be per NFPA 70 requirements. The cable tray shall be made of galvanized steel.

8.5.15 IDENTIFICATION NAMEPLATES

Major electrical equipment, such as transformers, panelboards, and load centers, etc. shall be provided with permanently installed engraved identification nameplates. The nameplates shall mention the source that feeds each major piece of electrical equipment.

8.5.16 TRANSIENT VOLTAGE SURGE SUPPRESSION (TVSS)

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

8.5.17 SCHEDULES

All panel boards and load centers shall be provided with a directory. Directory shall be typed written in English, Dari, and Pashto. The directory shall also indicate the source where the panelboard/loadcenter is fed from.

8.5.18 SINGLE LINE DIAGRAM

Complete single line diagrams shall be provided for all systems installed. All major items in each system shall be identified and labeled for respective ratings. Single line diagrams for each system, installed in a clear plastic enclosure, shall be provided. Most current version of design, based on current design review, shall be kept on project site at all times for reference, and updated with redline edits to show any and all variations from the drawings.

8.6 OPERATIONS AND MAINTENANCE (O&M) FOR ELECTRICAL

The O&M manuals must be provided prior to any training activities. Manuals shall be “tri-lingual” in Dari, Pashto and English. All control panels shall have tri-lingual name plates in Dari, Pashto and English. The Contractor shall provide an outline of the training lesson plan (to be approved by the Government) prior to conducting training. CD recordings of training on video shall also be provided, after training is conducted.

9.0 COMMUNICATIONS SYSTEM

9.1 DESIGN CRITERIA

9.1.1 APPLICABLE STANDARDS

Design shall be in the required units as stipulated herein. 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. All communications systems and equipment shall be installed in accordance with the requirements set forth in the documents referenced herein.

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

United States Department of Agriculture, Rural Utilities Service

RUS Bulletin 1751F-643 (2002) Underground Plant Design

RUS Bulletin 1751F-644 (2002) Underground Plant Construction

RUS Bulletin 1753F-151 (2001) Construction of Underground Plant, Parts II & III

ANSI TIA/EIA 606-A (2002) Administration Standard for The Telecommunications Infrastructure

ANSI TIA/EIA 607-A (2002) Commercial Building Grounding (Earthing) and Bonding Requirements for Telecommunications

ANSI TIA/EIA 568-C.1 (2009) Commercial Building Telecommunications Cabling Standard

ANSI TIA/EIA 568-C.2 (2009) Balanced Twisted-Pair Telecommunications Cabling and Components Standards

ANSI TIA/EIA 568-C.3 (2008) Optical Fiber Components Standard

ANSI TIA/EIA 569-B (2004) Commercial Building Standard for Telecommunications Pathways and Spaces

ANSI TIA/EIA 758-A (2004) Customer-owned Outside Plant Telecommunications Infrastructure Standard

UFC 3-580-01 Telecommunications Bldg Cabling Systems Planning/Design

9.2 COMMUNICATION SYSTEM

The Contractor shall design, provide, and install the exterior and interior communications infrastructure. The exterior communications infrastructure shall provide a looped communication system for perimeter security functions. The communications duct bank shall run to all facilities requiring connectivity. See

Section 01010 and the standardized drawings for each facility communications connectivity requirements. The interior communications infrastructure shall provide a pathway to all communications outlets and head-end equipment located in the building. Communications head-end equipment, cabling, RJ45 jacks, and faceplates shall be provided by others. The design and construction of the systems shall be in accordance with the references and the requirements contained herein.

9.2.1 EXTERIOR COMMUNICATION SYSTEM

The Contractor shall design, provide and install the exterior communications infrastructure system. The system shall include but is not limited to communications manholes, hand-holes, inner duct, and underground ductbank. The Contractor shall coordinate the communication system with the power distribution system to distribute communications to the site's facilities as required. The distribution system shall be an underground system. Communications manholes and hand-holes shall not be shared with other utilities. Manholes and hand-holes shall be cast in place or precast type. Manholes minimal interior dimensions shall be 3.66m L x 1.83m W x 2.13m H. Hand-holes minimal interior dimensions shall be 1.22m L x 1.22m W x 1.22m H. The minimum concrete thickness shall be 127mm for walls, 152mm for roof, and 127mm for the floor. The quality of the concrete pour and the construction of the manhole and hand-hole shall be such that the rebar or visible rock shall not be seen in the surface of a wall. In other words, the pour shall not have any voids. The maximum distance between manholes and/or hand-holes shall be 170 m. Place a manhole or hand-hole at all 90 degree turns. The ducts shall be direct buried with a minimum of 900 mm of properly tamped dirt/backfill on the top. Hand-holes shall be installed in laterals between manholes and buildings only where the distance between manhole and the building is 100 meters or more. The maximum number of ducts in a hand-hole wall shall be two, with one having four (4) inner ducts installed unless there are two buildings close by and can be fed from one hand-hole. In this case, four (two with inner ducts) conduits can be installed in the walls. Manholes and hand-holes shall be installed on a leveled, crushed, washed gravel base of sufficient depth, i.e., a minimum thickness of 150 mm under the entire manhole or handhole, to allow for drainage and stability. Where manholes and hand-holes are installed in roadways or areas subject to vehicular traffic, the structure and lid (cover) shall support heavy vehicular traffic. Manholes and hand-holes shall be equipped with corrosion-resistant pulling irons and cable racks that are grounded and with a sump for drainage. Cable racking diagrams (manhole/hand-hole butterflies) shall be provided for the manholes and hand-holes. See accessories chart below for additional requirements.

Manhole and Hand-hole Accessories	HANDHOLE 1.22m X 1.22m X 1.22m	MANHOLE 3.66m X 1.83m X 2.13m
Bonding Ribbon 16mm	20	65
Bonding Ribbon Clamps	12	20
Cable Rack 762mm	4	
Cable Rack 47 Hole		14
Corner Cable Rack Support		8
Cable Rack Hook 191mm	8	14 minimum
Cable Rack Standoff Bracket	9	12
Concrete Collar 152mm	1	1
Cover (Lid) 762 Diameter	1	1
Frame Support Structure for Lid	1	1
Ground Rod 19mm X 3m	1	1
Ground Rod Clamp 19mm	1	1

Metal Hit Anchor	10	20
Pull-In Irons	4	4
Sump	1	1

9.2.1.1 EXTERIOR CONDUIT

The underground conduit for the manhole and duct system shall be direct buried (900 mm below surface), 100 mm DB type PVC or schedule 80, PVC. Inner ducts shall be four (4) 25 mm PVC or PE inner ducts field installed in the outer-duct. The inner ducts shall be installed in the duct face and secured with properly sized duct plugs which expand to seal the duct. The ducts shall be stubbed up, sealed, capped and tagged in the communications equipment room, and shall be sealed, capped, tagged and marked at the other end. Empty ducts shall be sealed with a mechanical, screw-type, reusable duct plug. The ducts shall be concrete encased when install under roadways or areas subject to vehicular traffic. The ducts (inner and outer) shall be listed on the RUS list of materials acceptable for use on RUS projects. The minimum duct configuration in the main duct system shall be a six way duct, being three conduits wide by two conduits deep (3 X 2) with two of the conduits having inner-ducts installed. Laterals off of the main duct system manhole to manhole shall be a minimum of a 4 way (1x4) with one duct having inner ducts. The duct system from the manhole/hand hole to a building with cable installed shall be a 1x2, 100 mm PVC duct bank with one duct having inner ducts. The duct system from a manhole/hand-hole to a building with allocations only shall be two (2), 100 mm DB type PVC conduits stubbed out 3 meters from the manhole/hand hole. All conduits shall be terminated in ABS plastic terminators cast into the walls of the concrete structures. In manholes, all conduit windows shall be recessed. Pull wire/rope must be provided in all conduits. Conduits shall enter the manholes and hand-holes in the lower portion of the knockout window to simplify future conduit additions..

9.2.2 MAIN DISTRIBUTION FRAME

The Contractor shall route all communications to the Main Distribution Frame located in central Communications Room.

9.2.3 BUILDING INTERIOR COMMUNICATIONS SYSTEM

The Contractor shall design, provide and install the building communications infrastructure system. The system shall include but is not limited to communications equipment racks, conduit, pull boxes, communications outlet boxes, plywood backboards, and communications grounding/bonding infrastructure. For standardized facilities, the contractor shall provide communications outlet boxes in locations shown on the standard drawings. For non-standardized facilities, the contractor shall provide outlets at a density rate of one outlet per 15 square meters of floor space in occupied rooms (minimum of one per occupied room).

9.2.3.1 OUTLET BOXES

Outlet boxes shall be a single gang box (51 mm x 102 mm x 57 mm) or double gang box (119 mm x 119 mm x 57 mm boxes). The contractor may use an equivalent sized outlet box.

9.2.3.2 CONDUIT SYSTEM

The Contractor shall design, provide, and install the horizontal and backbone conduit system. Conduit shall be installed from each outlet box location to the communications equipment rack location. Conduit shall be sized and installed in accordance with ANSI TIA/EIA 569-B. Provide all empty conduits with a pull rope. Properly sized metallic conduit and cable tray shall be used as appropriate to distribute the telephone/data cabling throughout the building. Minimum conduit size shall be 20 mm inside diameter. Label the conduit on both ends with room number and outlet box number.

9.2.3.3 PULLBOXES

Pull boxes shall be placed in conduit runs where a continuous conduit length exceeds 30 meters or where there are more than two 90-degree bends. Pull boxes shall be placed in straight runs of conduit and shall not be used in lieu of a bend. Pull boxes shall be sized and installed in accordance with ANSI TIA/EIA 569-B.

9.2.3.4 EQUIPMENT RACKS

Contractor shall coordinate the location of the communications rack to be installed in Communications Room. Equipment racks shall be standard floor mounted 475mm steel telecommunications racks. Equipment racks shall have a minimum 900 mm of space both in front of and behind the rack and behind any installed equipment. A minimum side clearance of 600 mm shall be provided on end racks.

9.2.3.5 PLYWOOD BACKBOARD

A minimum of one wall of the Telecommunications Room shall be covered with 19 mm A-C plywood, void free, 2.4 m high, and securely fastened to the wall. Plywood shall be fire-rated (fire retardant) to meet applicable codes. To reduce warping, fire-rated (fire retardant) plywood shall be kiln-dried to a maximum moisture content of 15%.

9.2.3.6 GROUNDING

The contractor shall provide a grounding and bonding system in accordance with ANSI TIA/EIA 607-A. The grounding system shall include but is not limited to a Telecommunications Main Grounding Busbar (TMGB), Telecommunications Grounding Busbars (TGB) where applicable, Telecommunications Bonding Backbone (TBB), Grounding Equalizer (GE), and Bonding Conductors.

9.3 LOUDSPEAKER AND ALARM SYSTEM

Install Loud Speaker & Alarm System that can alert the entire compound via panic button from any tower or guard post station. Loud Speaker & Alarm System shall include, but is not limited to central control stations, high power speaker arrays (HPSA), communication links, and ancillary equipment. Central control stations shall operate and control the system. Loud Speaker & Alarm System shall be capable of providing intelligible live and pre-recorded voice signals. The system shall include tones for conventional attack warning, non-conventional attack warning, all clear, and a system test tone. Speaker & Alarm System shall be exterior grade components to withstand severe weather conditions of cold, heat, rain, sleet, and dust storms and to be completely understandable during these conditions from any point within the compound. All wires shall be installed in conduits.

9.3.1 CENTRAL CONTROL STATIONS

Loud Speaker & Alarm System shall be provided with at least one primary and one redundant central control station. The locations of the central control stations shall be coordinated with the Contracting Officer's Representative. The primary central control station should be located at the command post or similar location. The redundant central control center should be located at a physically separate location such as a security forces building, military police station, fire station, or emergency services office. The central control stations shall control the operation of outdoor speakers. Each central control station shall be equipped with batteries to supply power for a minimum of 4 hours of full-load operation. Control stations shall be capable to provide automatic status reporting for each HPSA and for all activations and the status of the activations. The controls shall provide an alarm summary report that provides a historical report for all changes of status, including all troubles, equipment failure, power system trouble (including normal and emergency power), unsolicited messages, tamper/supervision of the enclosure for the HPSA electronics, amplifier status, last activation and synchronization error, operator log on and log off, and configurable reports for time-based events such as "report all troubles from 1/01/04 to 6/30/04." Control

stations shall feature multiple levels of password protection, including levels for system operators, maintainers, supervisors, and military commanders. The control stations shall be capable to deliver at least two essentially concurrent voice messages: one for threatened areas or buildings and one for adjacent areas or buildings. This includes the capability for two pre-recorded voice messages, or one live and one pre-recorded voice message. The control station shall have the capability to target specific messages to any individual HPSA, zone of HPSAs, or to all areas on the installation.

9.3.2 HIGH POWER SPEAKER ARRAYS (HPSA)

HPSAs shall be arranged into zones so that each zone can be individually controlled by the control station. HPSAs shall be designed with directional characteristics that will minimize the distortion of voice signals by interface from other zones. HPSAs shall be designed to maintain the intelligibility of voice signals within the zone at a level no less than 0.8 on the Common Intelligibility Scale (CIS) or 0.7 on the Speech Transmission Index (STI) during normal weather conditions in special outdoor areas such as those with a high concentration of multi-story buildings in close proximity. Parade grounds, training fields, and similar outdoor areas should also be provided with this higher intelligibility. Intelligibility may be less than 0.8 CIS in areas of the zone if personnel can determine that a voice signal is being broadcast and could walk less than 25 m to find a location in the zone with a CIS score of at least 0.8. It is necessary to control the occupational noise exposure to personnel from the HPSA. Sound levels at any location where personnel may be located, including directly underneath the HPSA, shall not exceed 120 decibels (adjusted) (dBA) when measured on the A-scale of a standard sound level meter at slow response. Do not exceed 85 dBA at the location of the individual HPSA equipment cabinet for those HPSAs designated to be furnished with a local microphone. Each HPSA site for each zone shall include a field-mounted local control unit, microprocessor, amplifier, standby batteries, charger, power supply, radio, mounting brackets and loudspeaker assembly for pole or building mounting. Designated HPSA sites shall be capable of microphone input and shall be provided with a microphone designed to prevent feedback at that particular microphone location. All external conductors (conductors passing outside of the HPSA equipment cabinet) shall be provided with surge suppression tested to Underwriters Laboratories, Inc. (UL) standards. The HPSA control units shall feature a digitally addressable controller. The HPSA control units shall receive and store messages via the primary (and redundant, if required) communication link with a confirmation signal sent back to the primary and redundant central control stations. Provide a charger/power supply that will accept alternating current (AC) input, backup electrical power generator input, battery input, or solar power cell input. The HPSA control units shall have the capability of storing pre-recorded messages. The HPSA control units shall provide a minimum of 7 standard tones. In addition, the systems shall have the capability to provide custom tones. Provide a tamper switch that will signal the central control station that the HPSA enclosure door is open. All equipment for each HPSA speaker site shall be housed in modular, mountable cabinets suitable for the local environmental conditions, including space heaters and ventilation fans, as appropriate. Speakers shall be able to operate between temperatures of -40 degrees Celsius (C) (-40 degrees Fahrenheit (F)) to +60 degrees C (+140 degrees F). Enclosures shall protect the HPSA control unit from external temperatures ranging from -40 degrees C (-40 degrees F) to +60 degrees C (+140 degrees F). The height shall not be less than 9 m (30 ft) or greater than 18 m (60 ft) above ground level. HPSA equipment cabinets shall be mounted on the elevated supporting structure with the top of the enclosure no more than 3 m (10 ft) above ground level. The equipment cabinet and power boxes must be capable of being locked shut.

9.3.3 COMMUNICATIONS LINKS

Primary communications shall use radio frequency-type systems that comply with National Telecommunications and Information Administration (NTIA) requirements. The systems shall be designed to minimize the potential for interference, jamming, eavesdropping, and spoofing. Confirm that the devices conform to regulations and obtain the approval from the authority having jurisdiction prior to using radio frequency-type devices. Redundant communication means (when required) should be established using several alternate wireless radio frequency paths to the radios. The redundant communication means might be accomplished by using the communications backbone network (e.g., optical fiber cable). In this case, the central control units should accomplish this by being directly connected to the backbone network. Communications equipment furnished as part of the wide area MNS shall be commercial off-the-

shelf (COTS). All programming codes or passwords required to access, update, modify, and maintain the communications equipment shall be provided no later than the date of final system acceptance. Full system supervision shall be provided. Notification of system alarm, supervisory, and trouble signals shall be provided to the central control stations within a time period not to exceed 200 seconds. The communications systems shall provide self-test and diagnostics capabilities. Local diagnostics information shall be transmitted to the central control stations.

-END OF SECTION-