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SECTION 01 11 00

SUMMARY OF WORK
REVISED BY AMENDMENT 0004

PART 1 GENERAL

1.1 PROJECT DESCRIPTION

The purpose of this Repair and Site-Adapt project is to perform comprehensive repairs of Runway 13/31 at Muwaffaq Salti Air Base (MSAB) located near Azraq, Jordan. A topographic survey of the existing pavement, slopes and profiles, and a survey of all markings on the runway and taxiways shall be completed prior to construction. Repair to Runway 13/31 includes repair of the touchdown zones, runway interior, associated taxiways and overruns. Project scope also includes replacement of the North/South Barrier Housing (vaults), airfield lighting fixtures, refurbishment of the lighting vault and airfield directional markings for Runway 13/31 as necessary. The repaired runway and taxiways shall receive permanent markings as noted in the specifications. Electrical ductbank and communication conduit will be install under identified runway and taxiways.

The repair/construction work will need to be completed in phases (Reference Section 01 15 00.12 10, Paragraph 1.6 and Section 01 80 00.12, Paragraph 2.2). The Contractor will be responsible for determining the sequence of the construction segments. The intent is to complete the required scope of work while maintaining airfield operations to the greatest extent possible. In preparation for conducting each construction segment, the Contractor shall provide temporary lighting, markings and barricades for active and operational segments of the runways.

The intent of this Repair and Site-Adapt project is to be awarded with base bid items and will include one (1) option to provide base escorts during the construction period.

1.2 SUMMARY OF WORK

1.2.1 Runway and Taxiway Surveys

Prior to the start of construction, the Contractor shall perform a topographic survey as necessary to define the limits of construction, and determine runway and taxiway elevations for determining accurate milling depths, slopes and profile. The Contractor shall also survey the existing airfield markings to note location and types for replacement to prepare a pavement marking plan and to verify as-built conditions.

The Contractor shall conduct a pavement conditions survey prior to and after repair work. All existing pavement damage that is not part of the repair shall be identified and documented.

1.2.2 Runway 13/31 Repairs

The Contractor shall mill and overlay the asphalt sections of Runway 13/31. After milling, but prior to repair, the Contractor shall conduct a survey to determine the volume of crack repair and submit a conditions report to the Contracting Officer for review and to determine the extent of crack repair required.

The asphalt shoulders will have vegetation removed, cracks sealed, and the entire shoulder oversprayed. Overruns will have vegetation removed, cracks sealed, and the entire area oversprayed, Touchdown 31 will have a full depth keel replacement, other sections of Touchdown 31 will have joint and spall repair, Touchdown 13 will be fixed by joint and crack repair, rubber removal and replacement of individual concrete slabs.

The Contractor shall survey the existing runway lighting system and compare the condition to ICAO requirements. The Contractor shall report findings to the Contracting Officer then make repairs as directed.

The Contractor shall refurbish the Runway 13-31 Airfield Lighting Vaults A and B. Refurbishment includes replacement of existing HVAC units, lighting and associated wiring and cleaning, repair, and painting of the vault interior and exterior surfaces.

1.2.3 Taxiway Repairs

The Contractor shall mill and overlay taxiways Alpha 2, Lima 4 and Lima 5. The finished elevations (profile and longitudinal) shall remain the same. The Contractor shall survey the existing taxiway lights and compare the condition to ICAO requirements. The Contractor shall report findings to the Contracting Officer then make repairs as directed.

1.2.4 Replace/Site-Adapt North and South Barrier Arrestor Vaults

The Contractor shall demolish the existing arrestor vaults damaged during arrestor equipment removal and construct new vaults by site-adapting the design drawings provided. The Contractor shall provide arrestor system cable UHMW panels and construct supporting foundations. Arrestor equipment will be installed by others. The Contractor shall provide site-adapt grading for the arrestor pits and all elements of the arrestor system.

1.2.5 Repair Lighting on Taxiways Alpha, Alpha 1, Alpha 3 and Alpha 4

The Contractor shall survey the existing taxiway lighting system and compare the condition to ICAO requirements. The Contractor shall report findings to the Contracting Officer then make repairs as directed.

1.3 Optional Items

The project will be awarded with base bid items and options as specified in the contract. Option 1 is for the Contractor to provide all required force protection escorts while the Contractor staff are on MSAB. (Reference Section 01 14 00, Paragraph 1.5.1). Option 2 is for the Contractor to provide spare parts per the list included in Section 01 80 00.12 10, paragraph 9.8.32. Pricing of spare parts will be "not to exceed" as indicated in the Proposal Schedule.

-- End of Section --

SECTION 01 80 00.12 10

TECHNICAL REQUIREMENTS
REVISED BY AMENDMENT 0004

PART 1 GENERAL

1.1 Contractor's Design and Construction

The Contractor's design and construction must comply with technical requirements contained herein. The Contractor shall provide design and construction using the best blend of cost, construction efficiency, system durability, ease of maintenance and environmental compatibility.

1.1.1 Design and Product Requirements

These design and product requirements are minimum requisites. Variations shall be submitted in accordance with Section 01 33 00.12 10 entitled SUBMITTAL PROCEDURES FOR DESIGN-BUILD PROJECT. All variations must be approved by the Contracting Officer. Unless otherwise specified, all of the materials and equipment to be installed in this project shall comply with a recognized standard for the intended use. The Unified Master Reference List for ASTM, ASME, etc., located at <https://www.wbdg.org/ffc/dod/unified-master-reference/umrl> identifies the titles and approval dates.

1.1.2 Asbestos Containing Materials

Asbestos containing material (ACM) will 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.

1.1.3 Limitation of Working Space

The Contractor shall, except where required for service connections or other special reasons 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.

1.1.4 Subcontractors

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

1.1.5 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. All utilities required to

support temporary structures during the contract period of performance shall be provided by the Contractor.

1.2 Specifications

All specifications except for those included in this RFP shall be developed by the Contractor in accordance with this specification and Section 01 33 00.12 10 SUBMITTAL PROCEDURES FOR DESIGN-BUILD PROJECT. The specifications included in this RFP shall be used verbatim and not edited by the Design-Build Contractor.

2. CIVIL SITE DEVELOPMENT

2.1 General

The civil designs shall be based on the International Civil Aviation Organization (ICAO) Criteria/Standards, Unified Facilities Criteria/United States Air Force/Army Technical Manuals, and the Jordanian rules and regulations. Any conflicts between the referenced standards shall be noted by the Contractor, a proposed design solution shall be proposed by the Contractor and submitted to the Contracting Officer for approval. All required documents, including drawings, specifications, and design analysis, shall be prepared in accordance with this section and Section 01 33 00.12 10 SUBMITTAL PROCEDURES FOR DESIGN-BUILD PROJECT. Specific submittal requirements in these sections supplement the requirements of Section 01 33 00.12 10. The design analysis shall include detailed calculations and any additional information required, and the information listed below, when applicable. The Contractor shall review the details and make adjustments, if necessary, before applying them to the project.

2.2 Phasing

The work shall be broken down into five construction segments as shown in the RFP drawings. Each construction segment shall be completed, and accepted by the Contracting Officer in writing, in its entirety, except permanent pavement markings, before the next construction segment can commence. The contractor shall determine the sequence (phasing) of the construction segments. The contractor shall plan to phase the project so that the full length of Runway 13/31 is usable, completely functional, and fully marked prior to the closing of Runway 08/26. The contractor shall plan to phase the project so that the construction activities of the middle of Runway 13/31 occurs during that time of the year when the remotely piloted aircraft (RPA)'s can use Runway 08/26 based on crosswind conditions. The crosswind limitation of the RPA's while utilizing Runway 08/26 is 13 kts. See Attachment A for historical wind data.

2.3 Design Criteria

The designs and construction shall be in accordance with the following design manuals, unless otherwise shown on the drawings or stated in the specifications:

Middle East District Design Instructions Manual

Overseas Environmental Baseline Guidance Document (March 2000)

UNIFIED FACILITIES CRITERIA (UFC)

Section 01 80 00.12 10 Page 2

UFC 3-260-01 Airfield and Heliport Planning and Design, Nov 08
 UFC 3-260-02 Pavement Design for Airfields, Jun 01

ARMY ENGINEERING MANUAL (EM)

EM 385-1-1 Safety and Health Requirements Manual,
 Sept 08
 EM 1110-1-1002 Survey Markers and Monumentations, Mar 12
 EM 1110-1-1003 NAVSTAR Global Positioning System Surveying,
 Feb 11
 EM 1110-1-1005 Engineering and Design: Control and Topographic
 Surveying, Jan 07

AIR FORCE ENGINEERING TECHNICAL LETTER (ETL)

ETL 04-02 Standard Airfield Pavement Marking Schemes, Jul 04
 With Change 2
 ETL 97-5 Proportioning Concrete Mixtures with Graded Aggregates
 For Rigid Airfield Pavements, Apr 97 with Change 1

AIR FORCE INSTRUCTION (AFI)

AFI 11-208 IP Department of Defense Notice to Airmen (NOTAM) System,
 Jun 11
 AFI 32-1042 Standards for Marking Airfields, Oct 16
 AFI 32-1043 Managing, Operating, and Maintaining Aircraft Arresting
 Systems, Mar 15

FACILITIES CRITERIA (FC)

FC 3-260-18F Aircraft Arresting Systems (AAS)
 Installation, Operation, and Maintenance
 (IO&M), OCT 2015

FEDERAL AVIATION ADMINISTRATION (FAA) ADVISORY CIRCULAR (AC)

AC 150/5200-28 Notices To Airmen (NOTAMS) For Airport Operators,
 including Errata, Apr 08
 FAA Form 7460-1 Notice of Proposed Construction or Alteration, Feb 12
 AC 150/5370-2F Operational Safety on Airports During Construction,
 Sept 11
 AC 150/5345-55A Lighted Visual Aid to Indicate Temporary Runway
 Closure, Jun 07

INTERNATIONAL CIVIL AVIATION ORGANIZATION (ICAO)

ICAO Annex 14, Vol 1 Aerodrome Design and Operations, July 16

2.4 Environmental Protection

2.4.1 Applicable Regulations

The Contractor shall comply with all Jordanian Government laws, rules,
 and regulations or standards concerning environmental pollution control
 and abatement, and the Department of Defense's Overseas Environmental

Baseline Guidance Document, version dated 2007. Internet links to the Overseas Environmental Baseline Guidance Document is <https://www.denix.osd.mil/portal/page/portal/denix/international>.

2.4.2 Notification

The Contracting Officer will notify the Contractor in writing of any observed non-compliance with the paragraph entitled ENVIRONMENTAL PROTECTION. 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.

2.4.3 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.

Any spill that threatens or enters the sewer system should be reported immediately to the Fire Department. These spills can be categorized in two (2) groups: hazardous chemicals and other materials (e.g., paint, tar). The other materials, as well as the hazardous materials, may have potential negative impact to the environment, as well, specifically to the storm water system. Any type of spill shall be reported to the Fire Department.

2.4.4 Sediment and Erosion Control

2.4.4.1 As applicable to the project area and staging area(s), sediment and erosion control measures shall be included to minimize site erosion. Current Best Management Practices (BMP) shall be incorporated into the design to insure that silt laden storm water does not leave the construction site.

2.4.4.2 The Contractor is required to prepare and submit a Storm Water Pollution Prevention Plan twenty (20) days prior to construction. The storm water pollution plan must be prepared and approved by the Contracting Officer. The plan must be submitted to the Contracting Officer.

Temporary storm water pollution prevention measures provided for the site will meet the requirements of the USACE Handbook for the Preparation of Storm Water Pollution Prevention Plans for Construction Activities. The measures used are as follows:

- a. Silt fence
- b. Silt fence drop inlet protection

The location of the measures shall be in two (2) phases. Phase 1 shall consist of construction of the silt fence, construction entrance, and inlet protection. These items will be in place prior to any clearing and grading operations. Phase 2 will consist of placing additional erosion-control measures to protect new construction in addition to the surrounding environment. These will remain in place until permanent stabilization is

achieved.

2.4.5 Disposal

All spoil materials, wastes, effluents, trash, garbage, oil, grease, chemicals, etc., shall be disposed of outside of the project area and staging area(s) in an approved disposal area and in accordance with all applicable regulations. Contractor shall be responsible for obtaining all necessary permits for hauling and disposing of such material. Burning at the project site for the disposal of refuse and debris will not be permitted.

2.5 Existing Conditions

2.5.1 General

The Contractor shall perform topographic survey as necessary to define the limits of construction, to determine runway and taxiway elevations, slopes and profile, to prepare the pavement marking plan and to verify as-built conditions, as required.

2.5.2 Topographic Survey

The Contractor shall perform topographic survey and establish all necessary permanent bench marks for vertical and horizontal controls. The Contractor shall perform all necessary topographic surveying/mapping as required for the design of site, grading, and drainage. Minimum surveys required are described in Section 01 33 00.12 00 SUBMITTAL PROCEDURES FOR DESIGN-BUILD PROJECT. The topographic survey shall be performed in accordance with the technical requirements described in Attachment B of this section and shall be in accordance with EM 1110-1-1002, EM 1110-1-1003, and EM 1110-1-1005. The existing features topographic survey shall be submitted in accordance with Section 01 33 00.12 10 no later than 30 days after Notice to Proceed.

2.6 Civil Design and Construction Requirements

2.6.1 Site Plans

The Contractor shall use the attached drawings for reference only, they were not developed from any topographic data. The Contractor's topographic survey shall be used to develop the site plan; the site plan prepared by the Contractor shall show the geometric layout of the site, including applicable dimensions of runway, taxiways, pavement markings, structures, roads, etc.

2.6.2 Demolition

2.6.2.1 General

The Contractor shall comply with all Jordanian Government laws, rules, regulations or standards concerning environmental pollution control and abatement. In the interest of conservation, salvage shall be pursued to the maximum extent possible.

All USACE Construction projects are required to comply with occupational safety and health codes; therefore, the work shall be performed in accordance with EM 385-1-1, Section 23, Demolition and other applicable Sections.

Use of explosives will not be permitted.

All known items to be demolished have been identified on the drawings; however, the contractor shall identify on the demolition plan any other items requiring to be demolished or relocated. Buried utilities exist on the site; however, utilities have not been surveyed and are not shown in the RFP documents. When utilities are encountered, the contractor shall trace and identify the utility and recommend options for action, if required. The Contracting Officer will evaluate and direct the Contractor on the course of action.

Do not begin demolition until authorization is received from the Contracting Officer. The Contractor shall submit a demolition plan clearly showing the limits of demolition and all items to be demolished. The plan shall also include a schedule, haul routes, storage areas and all existing items that are to remain in place. The work includes demolition, salvage of identified items and materials, and removal of resulting rubbish and debris and broken pavement. Existing structures to be demolished shall be removed to include the foundations. Where applicable, the resulting excavation will be brought back to natural grade and fill material shall comply with Specification 31 00 00 EARTHWORK.

2.6.2.2 Removal of Concrete Pavement

Construction methods will be used that will prevent damage to adjacent pavements that are to remain. Pavement removed shall be in accordance with Section 32 13 11 CONCRETE PAVEMENT FOR AIRFIELDS AND OTHER HEAVY DUTY PAVEMENTS. Debris shall be removed and transported in a manner that prevents spillage on airfield pavement, streets or adjacent areas.

2.6.2.3 Disposal of Demolition Debris

Rubbish and debris shall be removed from the project site daily, unless otherwise directed. Do not allow accumulations inside or outside buildings or on airfield pavements. Materials that cannot be removed daily shall be stored in areas approved by the Contracting Officer. Debris shall be removed and transported in a manner that prevents spillage on streets or adjacent areas.

Items to be demolished, as shown on the drawings and stated in the specifications, shall be disposed of outside government controlled land at Contractor's responsibility. No material shall be disposed of to obstruct the flow of any stream, endanger a partly finished structure, impair the efficiency or appearance of any structure, or be detrimental to the completed work in any way. The Contractor shall comply with all Jordanian Government laws, rules, regulations or standards concerning environmental pollution control and abatement, and the Department of Defense's Overseas Environmental Baseline Guidance Document. See the Environmental Protection paragraph for regulations regarding hauling and disposal.

2.6.3 Excavation, Filling, Backfilling

All excavations, filling and backfilling required for the work shall be the responsibility of the Contractor, including allowance for working space, hauling, increase in bulk in the excavated materials, fixing, planking and strutting, and also for the additional width of concrete and earth filling occasioned thereby. Use of explosives will not be permitted for any

excavations.

Excavations shall include:

- a. Excavation in all type of ground.
- b. All necessary planking, strutting and shoring and close boarded sheeting to the sides of excavations.
- c. Keeping the site and excavations free from water by pumping or any other means.
- d. Keeping excavation areas free from mud and loose and foreign matter. Keeping excavations level, grading and compacting the bottoms of excavations.
- e. Loading and removing surplus excavated material off the base, including all spoil heaps.
- f. Keeping haul roads clear of spilled or tracked excavation material. If hauling occurs along a route across earth surfaces, with or without turf, any dust that is generated by the hauling operation shall be mitigated by watering or other approved methods to the satisfaction of the Contracting Officer. Haul routes shall include a stabilized construction entrance/exit.

2.6.4 Pavements

2.6.4.1 Airfield Pavements

Unless otherwise stated in the contract documents, the airfield pavements shall be repaired and constructed in accordance with the contract drawings and specifications. The airfield pavement thickness shall be as shown on the drawings. Spall repair work shall be in accordance with Sections 32 13 11 CONCRETE PAVEMENT FOR AIRFIELDS and 32 01 29.61 PARTIAL DEPTH PATCH OF RIGID PAVEMENT. Rigid pavements shall be plain- jointed concrete pavement with joint sealant in accordance with Specification 32 01 19 FIELD MOLDED SEALANTS FOR SEALING JOINTS IN RIGID PAVEMENTS.

2.6.4.2 Materials and Specifications

The material used for constructing the airfield pavements shall be in accordance with the specifications of this contract. These specifications shall be used verbatim and not edited by the Design-Build Contractor. Any additional material specifications required shall be developed by the Contractor using UFGS Specifications and submitted to the Contracting Officer and USACE Engineer for approval.

2.6.4.3 Airfield Pavement Marking and Signage

During construction activities, all pavement markings and markers shall be consistent with the actual active surface of the runway. During each construction phase, any marking that is not being used, except the runway center line, shall be obliterated or obscured, in accordance with ETL 04-2 and ICAO Annex 14, Vol 1. The contractor shall take into consideration the timing of final permanent markings to keep the amount of temporary markings placed on new pavement to a minimum. The Contractor shall coordinate the marking for the various construction segments with the Contracting Officer, to be coordinated with the Airfield Management.

All temporary pavement markings shall be in accordance with ETL 04-2 (Change

2): Standard Airfield Pavement Marking Schemes. The Contractor shall submit a Temporary Marking Plan to the Contracting Officer for approval prior to commencement of work. For temporarily closing of runway, the Contractor shall use lighted "X" as described in FAA AC 150/5370-2F and FAA AC 150/5345-55. Temporary marking plan shall include displaced threshold, runway designators, temporarily closed pavements, etc. Temporary pavement markings shall be painted with white wash, not permanent paint. Contractor shall replace temporary markings after a rain event or at the direction of the Contracting Officer.

The distance remaining markers shall be coordinated with the active runway configuration. The Contractor shall obtain/use a signage kit and coordinate the markers for the various construction segments with the Contracting Officer, to be coordinated with the Airfield Management. Any existing signs not being used in the active phase shall be covered.

The contractor shall use low profile barricades for temporarily closed taxiways in accordance with ETL 04-2 (Change 2). Use of barricades for temporarily closed taxiways shall be coordinated with the Contracting Officer, 332 ECES and Airfield Management.

Permanent pavement marking is required on all pavements. The contractor's topographic survey shall be used to determine the location of permanent markings. New markings shall match current existing markings, be in conformance with, ICAO Annex 14, Vol 1, including any referenced documents, and Specification 32 17 23 PAVEMENT MARKINGS. In instances where existing marking is not in compliance as specified in ICAO Annex 14 Vol 1, the CO shall be notified. All permanent markings on concrete shall be outlined with black paint, which shall extend at least 150 mm beyond the outside edge of the markings. Permanent aircraft arresting system warning markings shall be in conformance with ETL 04-2 (Change 2): Standard Airfield Pavement Marking Schemes, using warning marking arrangement for sacrificial panels. Overrun chevrons shall be reflectorized.

2.6.4.4 Rubber Removal

Prior to applying the airfield marking on touchdown areas, the existing rubber shall be removed in accordance with SECTION 32 01 11.51 RUBBER AND PAINT REMOVAL FROM AIRFIELD PAVEMENTS.

2.6.5 BAK-12 Aircraft Arresting System

There are two permanent Aircraft Arresting Systems on Runway 13/31. The Contractor shall demolish existing aircraft arresting system sites and replace with new; not to include the fairlead beam or fairlead tube. The existing arresting system equipment (fairlead beam and fairlead tube) has been removed from the site by others. The new sites shall be constructed in accordance with USAF Typical Installation Drawings 67F2013 and FC 3-260-18F, Air Force Aircraft Arresting Systems (AAS) Installation, Operation, and Maintenance (Attachments C and D) for permanent installation. Installation of the fairlead beam and fairlead tube will be completed by others.

Currently, Runway 13/31 does not have ultra-high molecular-weight polyethylene panels under the cable. The Contractor shall install under the cables the ultra-high- molecular-weight polyethylene panels with concrete foundations, in accordance with FC 3-260-18F.

2.6.6 Grading

2.6.6.1 Pavement

The topographic survey shall be used in designing the grading and profile of surfaces to be replaced. The Contractor shall match/tie into the elevations of existing adjacent edge of the saw cut pavement. The profile and cross sections of new pavement shall be adjusted to match the requirements listed in UFC 3-260-01, USAF Typical Installation Drawings 67F2013 and FC 3-260-18F where possible and subject to the approval of the Contracting Office.

2.6.6.2 Aircraft Arresting System

The Contractor shall grade all surfaces of the AAS components as described in USAF Typical Installation Drawings 67F2013 and FC 3-260-18F. Additionally, the Contractor shall remove any existing paved surfaces and replace with grading that complies with USAF Typical Installation Drawings 67F2013, UFC 3- 260-01 and adjacent slabs.

The center 23 meters of pavement extending out for 60 meters on both the approach and departure sides of the arresting system pendant are critical areas. Within this critical area, protruding objects, excessive paint build- up, and undulating surfaces are detrimental to successful tailhook engagements and are not allowable. The maximum permissible longitudinal surface deviation in this area is ± 3 millimeters in 4 meters.

The Contractor shall provide grading adjacent to the pit to provide for positive drainage.

2.6.6.3 Work in Critical Areas

Earthwork and grading operations on the airfield shall be conducted in conformance with special safety requirements during construction in the vicinity of navigational aids as specified in UFC 3-260-01. The Contractor shall notify the Air Base Management seventy-two (72) hours prior to working in navigation aid critical areas or in areas where cables and facilities serving navigation aids are located. The Contractor shall identify all special safety requirements in the Safety Plan.

2.6.7 Utility Infrastructure

2.6.7.1 General

There are existing runway lighting on the existing runway. The Contractor shall verify their existence and location, both horizontally and vertically, and determine relocation of utilities will required. The Contractor shall also be responsible for determining whether any other utilities exist in the project area. See Section 9, Electrical for more information.

However, prior to commencing work on utilities, the contractor shall coordinate the work with the Contraction Officer.

2.6.7.2 Protection of Utilities

Prior to construction, the Contractor shall notify the Contracting Officer of the Contractor's plans for utility protection. In the event of an unexpected utility interference during construction, the Contractor shall

immediately notify the Contracting Officer.

2.6.7.3 Interruption of Utilities

The Contractor shall notify the Contracting Officer and the appropriate Air Base personnel immediately upon the disturbance of any existing utility during construction. Any utility disturbed by the Contractor's operations shall be restored immediately at no cost to the Government. Any interruption of a utility service, including airfield electrical systems, that is necessary for construction must be coordinated and receive prior approval.

2.7 Contractor Haul Routes

2.7.1 Air Operations Area (AOA) Pavements

Waste and loose material on pavements open to aircraft operations can cause damage to aircraft landing gear, propellers, or engines foreign object damage (FOD). If material hauling to and from the construction site occurs across an active airfield pavement, the haul route shall be continuously cleaned by vacuum brooming during hauling operations to keep the pavement clean.

2.7.2 Closed Airfield Pavements (Existing or New)

If hauling occurs over airfield pavements that are temporarily closed, care shall be taken as to not damage airfield pavements with construction equipment and vehicles. The pavements shall be cleaned as necessary during the hauling operation to prevent pavement damage by hauling traffic over loose rock or debris. The pavements shall be cleaned by the Contractor and inspected by Air Base Management before reopening the pavement to aircraft traffic.

2.7.3 Haul Roads

The Contractor shall provide maintenance and upkeep to haul roads. Any haul route upgrades shall be coordinated and approved by the Contracting Officer. Note that the haul route used during the construction activities of this project, will be used by others, and maintenance and upkeep will be this contractor's responsibility regardless.

a. Paved

If the existing Air Base roadway system is used for hauling or access, the Contractor shall maintain the roads under use in a clean condition by power- brooming or other methods to the satisfaction of the Air Base Management.

b. Unpaved

If hauling occurs along a route across earth surfaces, with or without turf, any dust that is generated by the hauling operation shall be mitigated by watering or other approved methods to the satisfaction of the Contracting Officer.

2.7.4 Unsatisfactory Cleaning

If the airfield and roadway cleaning is considered inadequate by the Contracting Officer or Air Base Management, the Contracting Officer may stop construction operations until any cleaning deficiencies are corrected.

2.8 Foreign Object Debris (FOD)

This project is in close proximity to operating runway, taxiways and ramps. Contractor shall install and maintain appropriate FOD control fences to prevent blowing dust and debris onto runway, taxiways and ramps. Contractor shall be responsible for maintaining appropriate buffer distances from operating runway, taxiways and ramps. Keep all personnel and equipment away from this buffer zone.

3. ARCHITECTURAL

3.1 General Architectural Requirements

The work involves refurbishment of existing buildings. There is no architectural.

3.2 List of Facilities.

- a. Vault A
- b. Vault B

3.3 Project Requirements

Refinish Vault A and B.

The contractor shall protect any exposed equipment, hardware, accessories, and surfaces in contact with surfaces to be coated.

Only surfaces completely free of moisture shall be coated. Coat surfaces the same as surfaces having similar conditions of exposure. Coat existing damaged surfaces including new patches in existing surfaces to match adjacent surfaces. Coating products shall comply with applicable environmental and safety regulations. Locally available products may be utilized where evidence can be presented that the products conform to recognized industry standards for safety and quality.

Interior finishes shall be appropriate for the intended function of the space in which they are applied. Paints shall not contain over 0.06 percent lead content by weight of nonvolatile content. Materials shall they contain any other hazardous substances such as chromate, mercury, asbestos or suspected human carcinogens.

Unless noted otherwise, all materials used shall be in compliance with the requirements of applicable British Standard (BS). In the event BS Material is unavailable, contractor may then select comparable German (DIN) Standard or Underwriters Laboratories Inc. (UL) listed material. Material and equipment installed under this contract shall be for appropriate application.

All products shall be stored in original packaging.

Do not paint the following unless indicated otherwise:

- Surfaces concealed and made inaccessible by panelboards, fixed ductwork, machinery, and equipment fixed in place.
- Copper, stainless steel, aluminum, brass, and lead except existing coated surfaces.
- Hardware, fittings, and other factory finished items.

3.3.1 Joint Sealants

Remove existing caulking before sealing joints. Reseal all joints after finish painting. Joint sealants shall be complete systems to include sealant, bond breakers, backstops and primers as necessary. Ambient temperature shall be between 4 and 32 degrees Celsius when sealants are applied. Use single-component sealants. Latex sealants and oil or resin-based caulking shall be utilized on interior applications only. Elastomeric sealants should be used for interior or exterior applications where maximum joint movement is anticipated to be between 25% and 50% of the joint width. Pourable or self-leveling sealants shall be used for horizontal applications. Primers shall be compatible with the sealant. Bond breakers shall be as recommended by the sealant manufacturer. Backstops shall be provided for deep joints as recommended by the sealant manufacturer and shall be compatible with the sealant and of an appropriate material for the application.

3.3.2 Doors

Protect the door hardware before painting. Sand blast existing finish of the doors and frames. Paint doors and frames with metal paint in color to match the existing.

3.3.3 Floors

Clean and remove loose matter and substances deleterious to coating before application of concrete sealant or surface treatment. Surfaces with Minor Defects will be sanded, spackled, and minor defects will be treated. Repair joints, cracks, holes, surface irregularities, and other minor defects prior to application of concrete sealant. Reseal concrete floor.

3.3.4 Walls

Sand blast existing finish. Existing Coated Surfaces with Minor Defects will be sanded, spackled, and minor defects will be treated to render them smooth. Prior to painting, plaster and stucco shall be clean and free from loose matter. Paint the interior walls with latex paint in bone white color (sheen). Paint the exterior walls with acrylic paint, the color to match existing.

3.3.5 Ceilings

Follow the cleaning and coating procedure for the walls. Paint the underside of the structural deck above with latex paint in white color (satin).

3.3.6 Building Specialties

Replace Fire extinguishers as required in according to NFPA 10.

3.3.7 Signage

Provide and install building signs for Vaults A and B. Building signs font and color shall match in-kind building identification standards of the installation.

3.3.8 Equipment

All existing equipment shall stay.

4. STRUCTURAL

4.1 Design

Any required structural design shall be performed, verified and signed by a structural engineer with a minimum of five years of experience in structural design, see specification section 01 33 00.12 10 Submittal Procedures for Design Build Projects.

The publications listed below form a part of this specification to the extent referenced. Other international standards that comply with these standards may be used upon approval by the Contracting Officer. The publications are referred to within the text by the basic designation only.

All required documents, including drawings, specifications, and design analysis, shall be prepared in accordance with Section 01 33 00.12 10 Submittal Procedures for Design Build Projects. Specific submittal requirements in these sections supplement the requirements of Section 01 33 00.12 10.

All structures and all parts of the structures, including structural repairs after construction, shall be analyzed and constructed in accordance with UFC 3-301-01 to support safely all loads without exceeding the allowable stress for the materials of construction in the structural members and connections.

The design analysis shall include detailed calculations, sketches, computer-based analyses and design output analyses output, and any additional information required, and the information listed below, when applicable.

4.2 References. Note: conformance with documents incorporated into the codes, standards and criteria described below by reference shall be considered a requirement of this contract.

UFC 1-300-02 Unified Facilities Guide Specifications (UFGS) Format Standard, 01 April 2014

UFC 3-260-01 Airfield and Heliport Planning and Design, 17 November 2008

UFC 3-301-01 Structural Engineering, 3-301-01 Structural Engineering, with change 2, 31 January 2011

FC 3-260-18F, Air Force Aircraft Arresting Systems (Attachment C)

AF BAK-12 Standard Drawings, Sheets 1-20 67F2013-04 MAY 2016 (Attachment D)

ACI-318-2008, Building Code Requirements for Structural Concrete

ACI 305R-2010, Guide to Hot Weather Concreting

ACI 306R-2010, Guide to Cold Weather Concreting

AISC 360-10, Specification for Structural Steel Buildings

ASTM C150/C150M - 2011, Portland Cement

ASTM A 615-2009b, Deformed and Plain Billet-Steel Bars for Concrete Reinforcement

ASTM A36/A36M-2014, Standard Specification for Carbon Structural Steel

ASTM A992/A992M-2011, Standard Specification for Structural Steel Shapes

ASTM A53/A53M-2012, Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless

ASTM C260 - 2010, Air-Entraining Admixtures for Concrete

ASTM C494/C494M - 2011, Chemical Admixtures for Concrete

ASTM C1240 - 2011, Silica Fume in Cementitious Mixtures

ASTM C1260-2007, Test Method for Potential Alkali Reactivity of Aggregates (Mortar-Bar Method)

4.3 Dead, Live, and Vehicle Loads

Dead and live loads used for design shall be determined in accordance with the UFC 3-301-01. Aircraft wheel loads for design of site structures shall be in accordance with UFC 3-260-01.

4.4 Concrete

Concrete shall be a combination of cementitious material, water, fine aggregate, coarse aggregates, and admixtures and shall be in accordance with the provisions of ACI 318. Concrete having a cylinder compressive strength of 28 MPa minimum at 28 days (cube compressive strength of 35 MPa minimum at 28 days) shall be used for design and construction of all structural concrete. Concrete shall have a water to cementitious material ratio of not less than 0.38 nor more than 0.45.

Cementitious materials may consist of Portland cement in combination with silica fume. Silica fume may make up not more than 9.0 percent of the cementations material by mass. Portland cement shall conform to ASTM C150, Type I or V and shall have a maximum water-soluble chloride ion content for corrosion protection of 0.15 percent by mass of the Portland cement content of the concrete. Silica fume shall conform to ASTM C1240. Where aggregates are alkali reactive, as determined by Appendix XI of ASTM C1260, cement containing less than 0.60 percent by mass alkalis (as Na₂O equivalent) shall be used. The total cementitious materials content shall be at least 390 kg/cubic meter.

Admixtures shall consist of an air entraining admixture and a high-range water reducing admixture (HRWRA). Air entraining admixtures shall conform with ASTM C260 and shall be used in a quantity which shall reliably produce concrete with a total air content of 3 to 5 percent. HRWRA shall conform to

ASTM C494M, Type "F" or Type "G". The dosage of the HRWRA shall be determined during mixture proportioning study.

Reinforcing steel shall be deformed bars conforming to ASTM A615/615M, grade 60.

Hot weather concreting shall comply with the recommendations of ACI 305R. Cold weather concreting shall comply with the recommendations of ACI 306R. Protective measures shall be taken if freezing temperatures are anticipated before the expiration of the specified curing period. All concrete shall be cured for a minimum of 7 days.

Concrete members at or below grade shall have a minimum concrete cover over reinforcement of 75 millimeters.

Concrete placed in contact with the ground shall be protected with a blinding layer or polyethylene sheeting. Concrete in contact with backfill material shall be coated with bituminous damp-proofing paint.

4.5 Miscellaneous Metal Fabrications

Miscellaneous metal fabrications shall be assembled in accordance with AISC 360, from materials conforming to ASTM A53/A53M, ASTM A36/A36M or ASTM A992/A992M. Connections shall be bolted or welded.

4.6 BAK-12 Aircraft Arresting System Components

New Aircraft Arresting System Components shall be based the standard drawings provided, AF BAK-12/Sheets 1-20 67F2013-04MAY2016 for Permanent Installation. Absorber Pit Cover shall be site-cast concrete type, designed to support UFC 3-260-01 wheel loads. Coordinate pit dimensions and equipment anchor layout with the GFCI arrester equipment provided. Design loads shall conform to Paragraph 4.3. Concrete shall conform to Paragraph 4.4. Miscellaneous metal fabrications shall be in accordance with Paragraph 4.5.

4.7 Arresting System Cable UHMW Panel Foundations

Foundations for the Arrester System Cable UHMW Panels shall conform to the requirements of FC 3-260-18f. Minimum foundation thickness shall be 570 mm (22.5 in.) thick. Minimum reinforcement shall be five (5)-D16 top and bottom continuous with one (1)-D12 stirrups @300. Place reinforcement so as not to interfere with panel anchors. Design loads shall conform to Paragraph 4.3. Concrete shall conform to Paragraph 4.4.

4.8 Coordination with Other Disciplines

The Structural Engineer shall provide appropriate input to the work of other disciplines such as architectural, mechanical and electrical as required on drawings and specifications. Written documentation in the structural design analysis of coordination of the various disciplines on structural items is mandatory.

4.9 Specifications

Specifications shall be provided in Unified Facilities Guide Specification format in conformance with UFC 1-300-02, Unified Facilities Guide Specifications (UFGS) Format Standard. The structural engineer shall prepare

construction specifications that will include the following as appropriate to construct the structures as designed:

UFGS 03 30 00.00 10 Cast-In-Place Concrete
UFGS 03 11 13.00 10 Structural Cast-In-Place Concrete Forming
UFGS 03 20 00.00 10 Concrete Reinforcing
UFGS 03 15 00.00 10 Concrete Accessories
UFGS 03 35 00.00 10 Concrete Finishing
UFGS 03 39 00.00 10 Concrete Curing
UFGS 05 50 13 Miscellaneous Metal Fabrications

5. AIRFIELD PAVEMENTS AND GEOTECHNICAL

5.1 General

The pavement repairs for this project include:

- a. Mill and overlay of Runway 13/31 asphalt pavement
- b. Mill and overlay of Taxiways Alpha 2, Lima 4, and Lima 5 asphalt pavements
- c. Keel replacement for Touchdown 31 rigid pavements
- d. Repair, seal and spray application of Overruns 13 and 31 and all associated shoulder asphalt pavements
- e. Spall repair and joint sealant for Touchdowns 13 and 31 rigid pavements

The geotechnical portions of this project include:

- a. Arrestor System underground vault replacement
- b. Electrical and communications conduit installation

5.2 Design Criteria

Air Force Engineering Technical Letter

AF-ETL 04-4 Trenchless Technology (TT) for Crossing Air Force Pavements.

Corps of Engineers Specification

CRD-C 655-95 Standard Test Method for Determining the Modulus of Soil Reaction

Asphalt Surfaced Airfields Paver Distress Identification Manual

Concrete Surfaced Airfields Paver Distress Identification Manual

Unified Facility Criteria (UFC)

UFC 3-250-03 Standard Practice Manual for Flexible Pavements
UFC 3-250-04 Standard Practice for Concrete Pavements
UFC 3-250-06 Repair of Rigid Pavements Using Epoxy Resin Grout, Mortars, and Concretes
UFC 3-250-08FA Sealing Joints and Cracks in Rigid and Flexible Pavements
UFC 3-260-02 Pavement Design for Airfields
UFC 3-270-01 Asphalt Maintenance and Repair
UFC 3-270-02 Asphalt Crack Repair
UFC 3-270-03 Concrete Crack and Partial Depth Spall Repair
UFC 3-270-04 Concrete Repair

5.3 Mill and Overlay of Runway 13/31 Taxiway Asphalt Pavements

The asphalt section of Runway 13/31 is approximately 2,400 meters in length, 45 meters in width, and 225 - 250 millimeters in thickness. Milling operations shall consist of the removal of 125 millimeters of asphalt surface course. After milling, but prior to repair, the Contractor shall conduct a survey to determine the volume of crack repair and submit a conditions report to the Contracting Officer for review and to determine the extent of crack repair required. Cracks in the milled surface less than 6 millimeters in width do not require sealing. Cracks in the milled surface greater than 6 millimeters in width shall be repaired in accordance with UFC 3-270-02 and sealed in accordance with contract section 32 01 17.16 Sealing of Cracks in Bituminous Pavements and UFC's 3-250-08FA. Cracks greater than 19 millimeters in width shall be inspected by the Contracting Officer's Representative (COR) before proceeding. After sealing, the milled surface shall be approved by the COR before HMA placement. After approval, 125 millimeters of new hot mixed asphalt (HMA) shall be placed in at least 2 lifts. Tack coats shall be placed between each lift. HMA shall be in accordance with ~~contract s~~ Section 32 12 15.13 Hot Mixed Asphalt for Airfields. Pavement distresses shall be identified in accordance with the Asphalt Surfaced Airfields Paver Distress Identification Manual.

5.4 Mill and Overlay of Taxiways Alpha 2, Lima 4, and Lima 5

a. Taxiway Alpha 2: Alpha 2 is approximately 300 meters in length, 30 meters in width and 85 to 115 millimeters in thickness. Milling operations shall consist of the removal of the asphalt surface to a depth of 50 millimeters. Cracks in milled surface will not be filled. After milling, the surface shall be approved by the COR before HMA placement. After approval, 50 millimeters of new hot mixed asphalt (HMA) shall be placed. HMA shall be in accordance with section 32 12 15.13 Hot Mixed Asphalt for Airfields.

b. Taxiway Lima 4: Lima 4 is approximately 150 meters in length, 19.5 meters in width and 160 millimeters in thickness. Milling operations shall consist of the removal of the asphalt surface to a depth of 75 millimeters. Cracks in milled surface will not be filled. After milling, the surface shall be approved by the COR before HMA placement. After approval, 75 millimeters of new hot mixed asphalt (HMA) shall be placed in two lifts. HMA shall be in accordance with section 32 12 15.13 Hot Mixed Asphalt for Airfields.

c. Taxiway Lima 5: Lima 5 is approximately 800 meters in length, 23.0 meters in width and 175 millimeters in width. Milling operations shall consist of the removal of the asphalt surface to a depth of 75 millimeters. Cracks in milled surface will not be filled. After milling, the surface shall be approved by the COR before HMA placement. After approval, 75 millimeters of new hot mixed asphalt (HMA) shall be placed. HMA shall be in accordance with section 32 12 15.13 Hot Mixed Asphalt for Airfields.

5.5 Keel Replacement - Touchdown 31 Rigid Pavements

a. Existing Rigid Pavements: Touchdown 31 is approximately 300 meters in length, 45 meters in width, and 350 millimeters in thickness. The Contractor shall remove the keel section of Touchdown 31 and replace with 400 millimeters of new Portland Cement Concrete. The "keel" section is defined as slabs along the centerline of Touchdown 31. For this project the keel consists of two portions, a 145 meter portion and a 155 meter portion. The

145 meter portion consists of four 5.0 meter wide lanes and the 155 meter portion consists of ~~six 7.35 meter~~ six (6) 3.75 meter wide lanes. See sheets for more details. Portland Cement Concrete shall be in accordance with section 32 13 11 Concrete Pavement for Airfields. The Contractor shall take care to prevent damage to the existing pavements. The Contractor shall dowel into existing pavements. Where the new pavements meet existing asphalt, a thickened edge joint shall be placed. A bituminous tack coat shall be applied to the thickened edge.

b. Existing Base Material: The Contractor shall remove ~~150 millimeters~~ 200 millimeters of the existing base material and replace with 150 millimeters of new graded-crushed aggregate base course (GABC) in accordance with section 32 11 23 Graded Crushed Aggregate Base Course. After removal of existing base material, the Contractor shall conduct plate bearing testing in accordance with CRD-C-655-95 to verify assumed modulus of subgrade reaction (k) value of 50 kPa / mm at 3 location determined by the COR. After testing, the Contractor shall proof roll the existing base course to check for weak spots. Any weak spots shall be repair as specified in section 32 11 23 Graded Crushed Aggregate Base Course. Before placing the new GABC, the existing base material must be approved by the COR. Prior to PCC placement, the GABC shall be approved by the COR. GABC shall be compacted to 100% of the maximum laboratory density.

5.6 Repair, Seal and Spray Application of Overruns and Shoulders

a. Overruns 13 and 31: Overruns 13 and 31 are each approximately 300 meters in length and 75 meters in width. Repairs to Overruns 13 and 31 consist of ~~joint cleaning, joint sealing, crack cleaning, crack sealing,~~ distress repair and either a Gilsonite or rejuvenator spray application in accordance with section 32 01 13.63 Gilsonite Modified Asphalt Emulsion Seal Coats and 32 01 13.64 Bituminous Pavement Liquid Rejuvenating, respectively. The Contractor shall assume 80% by area of each pavement requires repair. Cracks in the ~~milled~~ surface less than 6 millimeters in width do not require sealing. Cracks in the surface greater than 6 millimeters in width shall be repaired in accordance with UFC's 3-270-02 and sealed in accordance with section 32 01 17.16 Sealing of Cracks in Bituminous Pavements and UFC 3-250-08FA. Cracks greater than 19 millimeters in width shall be inspected by the Contracting Officer's Representative (COR) before proceeding. Typical distresses are potholes and fatigue (alligator) cracking and shall be repair in accordance with UFC 3-270-01. Prior to spray application, pavements shall be approved by COR. Equipment/ fixtures associated with the overruns shall be removed or protected during repair operations.

b. Shoulders: Shoulders consist of approximately 7,300 linear meters of asphalt pavement and will be repaired for Touchdowns 13 and 31, Runway 13/31, Alpha 2, Lima 4, and Lima 5. The Contractor shall assume 730 meters of linear crack repair and 10 %, by area, of the pavement require repair. Cracks in the ~~milled~~ surface less than 6 millimeters in width do not require sealing. Cracks in the surface greater than 6 millimeters in width shall be repaired in accordance with UFC's 3-270-02 and sealed in accordance with section 32 01 17.16 Sealing of Cracks in Bituminous Pavements and UFC 3-250-08FA. Cracks greater than 19 millimeters in width shall be inspected by the Contracting Officer's Representative (COR) before proceeding. Pavement distresses shall be identified in accordance with the Asphalt Surfaced Airfields Paver Distress Identification Manual. Typical distresses are potholes and fatigue (alligator) cracking and shall be repair in accordance with UFC 3-270-01. Prior to spray application, pavements shall be approved

by COR. Equipment/ fixtures associated with the shoulders shall be removed or protected during repair operations.

c. Rejuvenator Availability: If rejuvenators or Gilsonite fog seals are not available, the Contractor shall use a fog seal in accordance with UFC 3-250-03 chapter 3 and section 32 01 13 Bituminous Fog Coats. If fog seals are not available, the Contractor shall contact the COR for guidance.

5.7 Spall Repair and Joint Sealant - Touchdowns 13 and 31

a. Spall Repair: ~~Some~~ All joints for touchdown 13 and 31 require spall repair. Spalling is the disintegration of rigid material at joints. Joint spalls shall be repaired in accordance with UFC 3-270-03. Repair all joint spalls prior to joint sealant installation. Pavement distresses shall be identified in accordance with the Concrete Surfaced Airfields Paver Distress Identification Manual. The following is a list of propriety repair materials approved for use by the United State Air Force (USAF):

Cementitious:

DOTLine - CeraTech Inc.
Fast Trac 246 Concete - Western Material and Design, LCC
HD-50 - Dayton Superior Corp
Pavemend SLQ - Ceratech Inc
Pavemend TR - Ceratech Inc
Pavepatch 3000 - Dayton Superior Corp
ProSpec Premium Patch 200 - H.B. Fuller Construction Products Inc
Fast Set DOT Concrete Mix - Quikcrete Companies
Rapid Set Concrete Mix - CTS Cement Corp.
Rapid Set Mortar Mix - CTS Cement Corp.
Master Emaco T545HT - BASF
Master Emaco T545 - BASF
SikaQuick 2500 - Sika Corp
Ultimax Concrete Mix - Ultimax Cement
Ulti-Pave 3 - Buzzi-Unicem USA, INC
MasterEmaco T1060 - BASF
MasterEmaco T1060 - BASF

Polymeric:

MasterEmaco S6000 - BASF

The Contractor shall follow the spall repair procedures outlined in UFC 3-270-03, section 32 01 19.61 Partial Depth Patching of Rigid Pavements, and patch material manufacturer recommendations closely to ensure proper and complete repair. Failure to repair spalls as specified will be corrected by the Contractor at no cost to the Government.

b. Joint Sealant: All joints for touchdowns 13 and 31 require sealant. The Contractor shall use a jet blast resistant cold-applied sealant material. Sealant shall be installed in accordance with UFC 3-250-08FA and contract section 32 01 19 Field Molded Sealants. The Contractor shall use a jet blast resistant single component non-sag silicone sealant material.

5.8 Arrestor Gear Vault Foundation

See section 4 Structural

5.9 Electrical and Communication Conduits

Electrical and Communications conduits shall be installed in accordance with AF-ETL 04-4. If AF-ETL 04-4 cannot be applied, the Contractor shall contact the COR for guidance.

5.10 Surveys

The Contractor shall conduct a pavement conditions survey prior to and after repair work. ~~An~~All existing pavement damage that ~~in not is not~~ part of the repair shall be identified and documented. Survey measurements (X, Y, Z) shall be referenced to existing airfield survey monuments and proper horizontal and vertical datum per contract specifications. Survey measurements shall be performed on a 10 meter x 10 meter grid pattern.

6. MECHANICAL

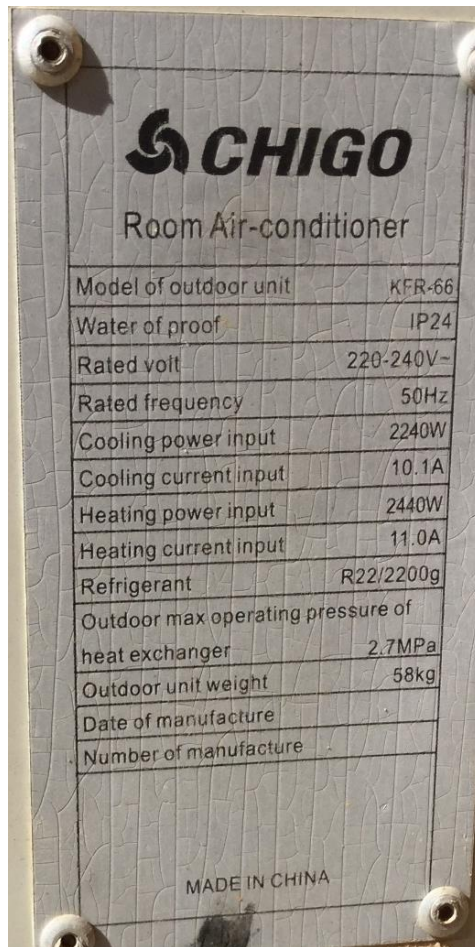
6.1 General

The Contractor shall design, supply, fabricate, install at Muwaffaq-Salti Air Base (MSAB) in Jordan new heating, ventilation and air-conditioning systems as specified herein.

The work also includes the delivery to site, erection, setting to work, adjusting, testing and balancing, commissioning, and handing over in full operating conditions all of the equipment and associated mechanical and plumbing works.

The scope of this project will include:

a. Replace "in-kind" the 6 ductless mini-split heat pumps located in the existing lighting vaults A and B on site. There are 3 units per vault (2 units in the CCR room and 1 in the electrical room in each vault). Current Nameplate of units is shown below:



b. In addition, the Contractor shall provide all necessary HVAC (exhaust fans, louvers, ductwork, etc.) and plumbing items and equipment (pipes, sump pump, etc.) as specified in the replacement aircraft arrestor system vault drawings found in attachment D (AF BAK-12 Standard Drawings) of this contract.

6.1.1 Sub-Contractors Qualifications

The ventilating, heating and works shall be executed by a specialist subcontractor with two or more years of experience in the design and construction of these types of systems.

6.1.2 Seismic Requirements

All mechanical and plumbing equipment and piping shall be installed to meet the seismic requirements as defined by the International Building Code, IBC 2012 and seismic response coefficients as identified in Paragraph 4 "Structural."

6.2 Design Criteria and Requirements

6.2.1 Codes, Standards and Regulations

The design and installation of equipment, materials and works shall comply with the following codes:

IBC - International Building Code
IMC - International Mechanical Code
IPC - International Plumbing Code
UFC - 3-410-01 Heating, Ventilating, and Air Conditioning
UFC - 3-420-01 Plumbing Systems
NFPA - National Fire Protection Association
ASHRAE - American Society of Heating, Refrigeration and Air-Conditioning Engineers
AABC - Associated Air Balance Council (National Standards for Total System Balance)
SMACNA - Sheet Metal and Air Conditioning Contractors' National Association
MED - Design Instructions Manual

6.2.2 Outside Design Temperature

Dry Bulb (summer) 35.5 C (96 F)
Wet Bulb (summer) 19 C (66 F)
Dry Bulb (winter) 1 C (34 F)

6.2.3 Design Conditions

Cooling- Temperature: 24 C (75 F)

Relative Humidity: 50% RH,

Heating Temperature: 20 C (68 F)

6.2.4 Noise

The sound levels for various applications for both centrifugal and propeller type fans shall be as set forth in the ASHRAE Handbooks. Specialized areas such as conference rooms, theaters, etc. shall be evaluated to ensure that proper acoustic treatment has been provided. Noise levels generated by HVAC systems shall not exceed NC 35 in occupied areas.

6.2.5 Testing and Commissioning.

The contract shall include specifications and requirements for testing and commissioning of all HVAC systems and equipment including air balancing, pressure testing and temperature controls. Complete testing shall be required of all systems. Government shall witness all testing, balancing and commissioning. The Contractor shall provide reports of all tests and commissioning results. The TAB report shall be confirmed by the Contracting Officer prior to acceptance. TAB agent shall be NEBB, TABB or AABC certified.

6.2.6 Demolition and Relocation of Existing Mechanical Systems.

Contractor will be required to remove the 4 existing units in the current lighting vaults in order to install the new units. New units shall be installed with all new refrigerant piping and control wiring.

6.3 Air Conditioning

6.3.1 Temperature Controls. All thermostats shall be integral to units and provided by the manufacturer.

6.3.2 Refrigeration System

6.3.2.1 Refrigerant

All refrigerants used shall conform to the "Montreal Protocol on Substances That Delete the Ozone Layer" September 1987, sponsored by the United Nations Environmental Programme and shall have Ozone Depletion Allowance (ODA) if 0.05 or less. Existing units utilize refrigerant R-22, R-22 shall not be used.

6.4 Wall Penetrations

Building wall penetrations for new return ductwork shall be carefully made so as not to deteriorate the structural integrity of the wall system. The contractor shall consult with a structural engineer. The recommendations of the engineer shall be strictly adhered to. Wall and roof penetrations shall be weather tight.

6.5 Electrical Requirements for HVAC Equipment

Note that electrical requirements for all HVAC systems shall be designed and installed to operate as specified in Paragraph 9 "Electrical."

6.6 Air Conditioning

Condensate from all cooling units will need to be discharged in an approved manner to plumbing waste or outdoors. Connect condensate of new units to current condensate system.

7. PLUMBING - NOT USED

8. FIRE PROTECTION - NOT USED

9. ELECTRICAL

9.1 General

Following Design-Build Electrical Technical Requirement is for Runway 13/31 Repair at MSAB, Jordan. Work mainly consists of, but not limited to, testing of equipment, minor repair, 'in-kind' replacement of existing airfield lighting fixtures and construction of underground aircraft Arresting Gear Vaults. Type of equipment in brief includes, but is not limited to, replacement of airfield lighting fixtures, replacement of lamps (bulbs) in approach lighting fixtures, some airfield lighting cable and in addition replacement of light fixtures and receptacles inside Airfield Lighting Vaults A and B. Runway 31 is provided with Category 1 (CAT1), Instrumentation Landing System (ILS). Detail work requirements are noted in the Scope of Work (SOW) below.

9.1.1 Construction Segments Plan/Schedule

Overall repairs of the Runways 13/31, to include but not limited to, pavement repair and airfield lighting replacement, will be accomplished in segments in order for the Runway to be operational throughout the construction period.

Therefore, Contractor shall be responsible for establishing and maintaining required 'pavement markings' for 'Displaced Threshold(s)' and active runway segments, per the Contractor's Phasing Plan. Temporary airfield lighting for the displaced threshold(s), active segment(s) of the Runway and Runway 31 Approach Lighting will not be required during the construction period. However, during construction Contractor shall be responsible for providing and maintaining required temporary airfield lighting, mandatory and informative signage and necessary equipment for all active taxiway(s), which will include Parallel Taxiway Alpha and Taxiways Alpha 2, Lima 4 and Lima 5. Complete lighting design and installation (temporary and/or permanent), for during and after completion of the Project, shall be in compliance with the requirements of ICAO and UFC 3-535-01.

9.1.2 Survey Report

Soon after Contracting Officer's issuance of 'Notice To Proceed' and prior to start of construction work, Contractor shall prepare a Survey Report outlining deficiencies in the existing Airfield Lighting System, within the limits of construction, with respect to ICAO's requirements and/or not covered in this SOW, for the Contracting Officer's information and action. Survey Report findings shall be limited to Runways 13/31, to include, Thresholds, Runway 31 Approach, Parallel Taxiway Alpha, connecting Taxiways Alpha 1 thru Alpha 4, Taxiways Lima 4 and Lima 5 and all of the associated equipment. Survey Report need not include Runway 13 Overrun, currently provided with solar lights.

9.1.3 Existing 'As-Built' Condition Drawings

Airfield Lighting System for Runways 13/31 was upgraded in 2010. As-Built condition drawings are provided in Attachment E to the Contractor 'For Information Only (FIO)' in order to assist in the bidding process. As-Built drawings shall not be considered as a design requirement or final design. Reference Attachment F (For Information Only) for as-built conditions of Taxiways Lima 4 and Lima 5.

9.1.4 Discrepancies or Conflicts

Any discrepancies, conflicts and/or non-compliance with ICAO requirements uncovered during the Survey in the existing conditions or noted in the SOW below, shall be brought to the Contracting Officer's attention for immediate resolution.

9.1.5 Architectural Work Requirements

Refer to Architectural Section for details of work required at Airfield Lighting Vaults A and B.

9.1.6 Mechanical Work

Refer to Mechanical Section for details of work required at Airfield Lighting Vaults A and B.

9.2 Applicable Standards

(a) National Fire Protection Association, NFPA 70 (National Electric Code, latest edition).

- (b) National Fire Protection Association Life Safety Code, NFPA 101, latest edition.
- (c) National Fire Protection Association, NFPA 780 - Standard for the Installation of Lightning Protection System`, latest edition.
- (d) Illuminating Engineering Society of North America (IES).
- (e) British Standard, BS 7671, Requirements for Electrical Installations, Latest Edition.
- (f) British Standard, BS 1363-2, Plugs, Socket-Outlets and Adapters.
- (g) International Civil Aviation Organization (ICAO) Standards.
 - (i) International Standards and Recommended Practices, Aerodromes, Annex 14.
 - (ii) Aerodrome Design Manual, Part 4, Visual Aids.
 - (iii) Aerodrome Design Manual, Part 5, Electrical Systems.
- (h) Unified Facilities Criteria (UFC 3-535-01), Visual Air Navigation Facilities
- (i) Air Force Engineering Technical Letter, ETL 04-4, Trenchless Technology (TT) for Crossing Air Force Pavements, with Change 1
- (j) 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 and/or recommendations shall be furnished to the Contracting Officer for approval.
- (k) 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 NFPA 70 (NEC), International Electrical Testing Association Inc., (NETA) and FAA.
- (l) Design shall be in metric units.
- (m) All Systems designed for exterior installation shall be rated for 50 Degree Centigrade operation.

9.3 Site Conditions

- (a) Site Location: MSAB.
- (b) Site Elevation: 519 Meters above Sea Level.
- (c) Ambient Temperature: Maximum 37 Degrees C; Minimum 0 Degrees C.
- (d) Peak Wind Velocity: 47 km/h. at ground level.
- (e) Prevailing Wind Direction: West / North West.
- (f) Atmospheric Conditions: Dry, Dust-laden and Corrosive.

9.4 Material

9.4.1 General

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 5 years prior to bid opening. Equipment installed shall be capable of being serviced by an organization that is, in the opinion of the Contracting Officer, reasonably convenient to the site. Materials and equipment shall be installed in accordance with recommendations of the manufacturer. Major components of equipment shall have the manufacturer's name, address, type or style, voltage and current rating, and catalog number on a non-corrosive and non-heat sensitive plate, securely attached to the equipment. All equipment delivered and placed in storage, prior to installation, shall be protected from the weather, humidity and temperature variation, dirt and dust, and any other contaminants. Mixing/Matching of same type and/or rating of equipment by different manufacturers shall not be acceptable.

9.4.2 Material Standards

Unless noted otherwise, all material used shall be in compliance with the requirements of applicable British Standard (BS). In the event BS Material is unavailable, contractor may then select comparable German (DIN) Standard or Underwriters Laboratories Inc. (UL) listed material. Equipment enclosure types shall be in compliance with the National Electrical Manufacturer's Association (NEMA) or the International Electro-Technical Committee (IEC) standards. Material and equipment installed under this contract shall be for appropriate application. All airfield lighting equipment shall be FAA Approved.

9.5 Restrictions

- (a) Aluminum conductors shall not be specified or used.
- (b) LED Airfield Lighting shall not be acceptable.

9.6 Design Conditions

All equipment shall be rated and designed for: 40 Degree Centigrade for interior installation and 50 Degree Centigrade for exterior installation and for elevation of 519 meters above sea level.

9.7 Existing Conditions:

9.7.1 General

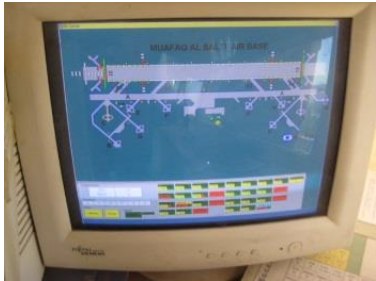
Airfield Lighting System for Runways 13/31 was upgraded in 2010 with equipment by OCEM, Italy. Runways are currently serviced from Vaults A and B, with Mimic Panel located in the Air Traffic Control Tower (ATCT). Following is a brief description with photos depicting condition of the existing equipment and respective facilities.

9.7.2 Air Traffic Control Tower (ATCT)

ATCT is a three (3) story facility, with good visibility of Runways 13/31 from the Cab. Lighting Mimic Panels and Air Traffic Communication Equipment (radios) are old, but in good working condition.



View from ATCT



Runways 13/31 Airfield Lighting Master Control/Mimic Panel in ATCT.

9.7.3 Airfield Lighting Vaults A and B

All equipment in Vaults A and B, to include, CCRs were upgraded in 2010. CCRs are manufactured by O.C.E.M, Italy. Generally, equipment in the vaults was found to be in good working condition and well-maintained. In-vault general lighting fixtures need to be replaced. Vault A equipment is in need of good housekeeping/cleaning, to remove soot buildup due to an earlier fire. Some of the CCRs need replacement fuses. Stop-Bar CCR is inoperative and is in need of a new circuit board. No physical damage to the airfield lighting equipment was noticed.



Vault A: CCRs and MDP in good working condition.



Vault A: Emergency stand-by generator well maintained.



Vault A: MDP in good working condition, but needs good surface cleaning.



Vault A: R/W 31 Approach Lighting Sequenced Flashing Light transformer is burnt and needs replacing.



Vault A: Remote Control/Mimic Panel for local control is operational.



Vault B: Remote Control/Mimic Panel for local control is not operational.



Vault B: Exterior view.



Vault B: CCRs operational and in good working condition.



Vault B: MDP operational and in good working condition.



Vault B: Airfield lighting cables in good condition.



Vault B: Emergency stand-by generator well maintained and operational.

9.7.4 Runway 31 (Primary)

Runway Threshold Lights and Runway Edge Lights are operational. Approach lighting is operational, however, some fixtures need replacement lamps/bulbs. Sequenced Flashing Lights are not operational due to a damaged (burnt) transformer.



R/W 31 Approach lights operational. Some need new lamps.



R/W 31 Sequenced Flashing Light not operational.

9.7.5 Runway 13 (Seldom Used)

Runway Threshold Lights and Runway Edge Lights are operational. However, Approach Lighting is radio controlled solar lights by Avlite, Australia. Solar approach lights are not operational from the ATCT Cab. However, the lights do operate when the remote radio controller is brought closer (+/- 2000 Ft) to the lights. Problem could be due to the absence of power to the signal booster antenna provided at the overrun for the solar light fixtures.



R/W 13 Solar lighting operational.



R/W 13 Solar lighting RF Antenna not operational.

9.7.6 PAPI System

There are sixteen (16) PAPI units with three (3) lamps each. Each Approach (13 and 31) are provided with eight units, four (4) units each for either side of the runway approach.



PAPI System, four (4) unit set, typical.



PAPI Unit with 3 Lamps each.

9.7.7 Taxiways Lima 4 and Lima 5

Following photos represent existing condition of Taxiways Lima 4 and Lima 5.



Taxiway Lima 4 Stop-Bar for Runway 26



Taxiway Lima 4, Solar Taxiway Edge Light supplementing missing permanent light fixture.



Taxiways Lima 4 / Lima Intersection. Taxiway Lima 5, Straight Ahead.



Taxiway Lima 5, Temporary Solar taxiway Edge Light supplementing permanent light fixture.

9.8 Design Requirements

9.8.1 Runway 31 'Elevated' Approach Lighting (Light Fixtures and Towers)

All existing light fixtures shall be cleaned inside and out and provided with new lamps (bulbs), respective isolation transformers and connectors shall be replaced with in-kind rating/type device for each unit. Existing elevated light fixtures, towers and light bases (cans) shall remain in place and not be replaced. Damaged elevated light fixture(s) and/or tower(s) shall be noted in the Survey Report and referred to the Contracting Officer for action.

9.8.2 Runway 31 Overrun Approach Lighting (Inset Light Fixtures)

Replace all existing inset light fixtures and corresponding isolation transformers with in-kind devices. Existing light bases in the overrun shall remain on place and not replaced.

9.8.3 Runways 13/31 Thresholds

Replace both threshold and Runway 13 Runway End Identification Lights (REIL) light fixtures, to include, corresponding isolation transformers and connectors, with in-kind light fixtures and equipment.

9.8.4 Runway 31 Edge Lighting

Replace all existing Runway 31 Edge lighting fixtures, to include corresponding isolation transformers and connectors, with in-kind light fixtures and equipment. Inset light fixtures shall be provided at the intersection(s) of runway and taxiways and at the runway areas swept by the 'arrestor cables'. Runway Inset Edge Lights shall be provided no less than +/- 152 m (+/- 500ft) on either side of the Aircraft Arrestor Cable(s). Last two thousand feet of runway edge light fixtures shall be yellow/white, in compliance with ICAO requirements.

9.8.5 Runway 13 Overrun Approach Lighting (Solar Light Fixtures)

Existing Approach Solar Light Fixtures for Runway 13 shall remain in place. However, Contractor shall check and repair power supply for Solar Light Antenna on the overrun to ensure that lights operate from the Control Tower (ATCT). Currently, lights operate from a hand-held remote control unit, but from close range to the lights and not from ATCT.

9.8.6 PAPI System, Runways 13 and 31

All existing PAPI units shall be cleaned from the inside of the unit to remove dust and debris. All existing lamps (bulbs), to include, corresponding isolation transformers and connectors for each unit shall be replaced with in-kind lamps and equipment. Existing PAPI units shall not be replaced.

9.8.7 Taxiway Edge Lighting

Replacement of Taxiway Edge Lighting fixtures extends to Parallel Taxiway Alpha, Taxiways Alpha 1 thru Alpha 4, Taxiways Lima 4 and Taxiway Lima 5. Replace all existing taxiway light fixtures, to include corresponding isolation transformers and connectors, with in-kind fixtures and devices. Existing light bases for the taxiways light fixtures shall remain in place and not be replaced. However, light bases which are found to be damaged shall be repaired. Light bases which cannot be repaired shall be replaced with similar size and type bases. Existing temporary 'solar' taxiway light fixtures provided on these taxiways shall be removed. All removed light fixtures, to include solar light fixtures, shall be cleaned, tested and

inventoried. Fixtures in good operating condition shall be turned over to the Contracting Officer. Damaged light fixtures shall also be turned-over to the Contracting Officer or disposed-off per the Contracting Officer's direction.

9.8.8 Taxiway Lima 4 Edge Lighting

Existing permanently installed light fixtures along Taxiway Lima 4 are not in compliance with ICAO requirements. Hence, temporary solar light fixtures are installed to supplement missing permanent light fixtures. Contractor shall replace existing solar light fixtures (approx. 4 fixtures, 2 on each shoulder) with permanently installed taxiway edge light fixtures and connect the new fixtures to the existing taxiway edge lighting circuit.

9.8.9 Taxiway Lima 4 (Taxiway Centerline Lights OR Runway Entrance Lights)

It is not clear if the existing Taxiway Lima 4 is provided with Taxiway Centerline Lights OR Runway Entrance Lights (REL) at Lima 4 and Runway 26 intersection, approximately four (4) fixtures. In the event existing lights are REL, Contractor shall then replace all existing light fixtures and isolation transformers with in-kind devices and test the system for proper desired operation.

However, in the event these lights were installed as Taxiway Centerline Lights, then these lights are not installed per ICAO requirements and should be removed. Contractor shall remove Taxiway Centerline Light fixtures and isolation transformers and cap all lighting cans with blank covers.

9.8.10 Light Bases and Handhole(s)

Existing damaged light bases shall be replaced with in-kind type and size light bases. Existing damaged handholes shall be repaired, if beyond repair then shall be replaced with in-kind type and size handholes with appropriated covers.

9.8.11 Taxiway Stop Bar and Runway Guard Light (RGL) Lighting

Taxiway Stop Bar Lighting and RGL fixtures, transformers and connectors for all taxiways included in this Project shall be replaced with in-kind fixtures and devices.

9.8.12 Signage and Distance Markers

All Mandatory and Information Signage, Distance Marker Units and Arrester Cable Marker(s) relevant to this Project shall be cleaned from inside with high air pressure to remove dust and dirt. All units shall be provided with new in-kind lamps, transformers and connectors.

9.8.13 Airfield Lighting Vaults A & B

9.8.13.1 General

Vaults A and B consists of three (3) rooms each, to include Main Transformer Room, Generator Room and Constant Current Regulator (CCR) Room. All equipment in the vaults, to include but not limited to, electrical Main Distribution Panel (MDP), Sub-Panelboards, Constant Current Regulators (CCRs), transformers, control cabinets and cable trenches shall be cleaned using high pressure air to remove dirt and dust from inside/outside of the equipment.

Build-up of soot on equipment in Vault A, from an apparent fire, shall be cleaned. Missing in-floor cable trench covers shall be replaced with in-kind covers. Each panelboard shall be provided with a new 'Panel Schedule', typed in English and with current information. Vaults also require Architectural and Mechanical upgrades for which Contractor shall refer to Architectural, Mechanical and other Disciplines Technical Requirements for details.

9.8.13.2 Floor and Composite Plans

Glass framed equipment layout floor plan for the CCR Room, to include CCR 'One-Line' Diagram shall be mounted on the wall for each Vault. One-line Diagram shall include CCR rating (volt, amp, KW) and the loads served. In addition, each Vault shall also be provided with a framed MSAB 'composite' Airfield Lighting Plan, to include, Runways 13/31 and 08/26, associated taxiways, approach lighting for each runway and locations of Vaults A, B, C and D. Tabulated list for all CCRs shall be provided in each Vault listing respective CCR name plate KW rating, current 'measured' demand load reading to indicate available spare capacity, if any, and load serviced. E.g. taxiway, threshold, approach lighting etc.

9.8.13.3 Lighting Fixtures

All general purpose interior and exterior lighting fixtures shall be replaced with new in-kind gasketed fluorescent light fixtures. Roof top red obstruction light fixtures shall not be replaced. However, fixtures shall be re-lamped with in-kind rated lamps/bulbs.

9.8.13.4 Receptacles

All existing receptacles inside and outside the vaults shall be replaced with 'duplex switched' receptacles. Exterior mounted receptacles shall be 'weatherproof' type.

9.8.13.5 Sequenced Flashing Lights Transformer (Vault A)

Existing transformer for Runway 31 Approach Sequenced Flashing Lights in Vault A was damaged due to fire. Transformer shall be replaced with a new in-kind rated/type transformer. Contractor shall ensure that complete Sequenced Flashing Light System, to include the CCR, is operational.

9.8.14 Sequenced Flashing Light Units

All existing Sequenced Flashing Light Units for Runway 31 Approach shall be cleaned using high pressure air to remove dirt and dust from inside of the equipment. All units shall be tested for proper operation.

9.8.15 CCRs

All CCRs in Vaults A and B shall be cleaned, inspected and tested for proper operation. CCR with defective fuses and/or circuit boards shall be repaired, as necessary. Details on CCRs beyond repair shall be provided to the Contracting Officer for corrective action. Each CCR shall be provided with a permanently installed stencil indicating number/servicing load. E.g. taxiway, threshold, approach lighting etc.

9.8.16 Remote Control and Operating System

Existing Remote Control and Operating System in Vaults A and B shall be cleaned, inspected and checked for proper remote operations of the Airfield Lighting System. Existing Remote Control unit in Vault B is inoperative, possibly due to defective hard drive. Contractor shall repair the existing unit in Vault B to make it operational.

9.8.17 Lightning Protection System

Existing Lightning Protection Systems for Vaults A and B shall be inspected and repaired, as necessary, to ensure compliance with the requirements of NFPA 780.

9.8.18 Grounding System

Existing Grounding Systems at Vaults A and B shall be inspected, tested and repaired, if necessary, to ensure compliance with the requirements of NFPA 70 (NEC). Measured ground resistance shall not exceed 25 Ohms, when measured twenty-four (24) hours after the rainfall.

9.8.19 Airfield Lighting Counterpoise

Existing Airfield Lighting Counterpoise System shall be tested for continuity and shall be repaired, as necessary.

9.8.20 Emergency Stand-By Generators (Vaults A and B)

Existing generators in Vaults A and B are in good operating condition. However, Contractor shall inspect and test generators for proper operation and provide a report on the results to the Contracting Officer.

9.8.21 Automatic Transfer Switch (ATS)

Existing ATS in Vaults A and B are in good operating condition. However, Contractor shall inspect and test the ATS for proper operation and provide a report on the results to the Contracting Officer.

9.8.22 Airfield Lighting Cables

All Airfield Lighting circuit cables affected by this Project shall be tested for proper continuity and performance. Above ground airfield lighting cables between fixtures, if any, installed as a temporary fix/repair, shall be re-routed thru existing underground installed conduits. Existing conduits shall be cleaned with wire brush/mandrel prior to installing cable(s).

9.8.23 Arresting Gear Vault(s)

Existing underground Arresting Gear Vault(s) shall be replaced with new underground vaults at the current locations. Standard Vault Design is included in the Contract for the Contractor's Design-Build effort. Vault Electrical Design is based on US Standard voltages and shall need to be modified to reflect local MSAB Secondary Voltage rating of 380/220V, 3P, 4W, 50Hz. Refer to Paragraph Secondary Power Distribution System for electrical installation requirements. Existing Electric Service and Control wiring connections to the current vaults shall be transferred over to the new vaults to make new vaults operational. New secondary service cables shall be installed in the existing conduit(s) between the vaults, after first cleaning the conduit(s) with steel brush/mandrel to remove dirt and debris.

9.8.24 Cables & Conductors

All interior and exterior secondary voltage cables shall be copper, designed for appropriate installation and shall have appropriate Secondary Voltage ratings. Conductor jacket or insulation shall be color coded to satisfy local utility requirements.

9.8.25 Secondary Power Distribution System

Existing Secondary Power Distribution System at MSAB is rated at 380/220V, 3P, 4W, 50Hz. All panelboards and/or load centers shall be factory fabricated, 'bolt-on' circuit breaker type and each provided with a Main Circuit Breaker. Panelboard/load center installed inside the arresting gear vaults shall be surface mounted. Minimum size circuit breaker shall be rated at 20 amperes. Circuit breakers shall be connected to bus bar(s) within the panelboard or load center. Daisy chain (breaker-to-breaker) connection(s) shall not be acceptable. All circuit breakers shall be labeled with an identification number corresponding to the panel schedule. A 3-pole circuit breaker shall be a single unit and not made up of 3 single pole circuit breakers connected with a wire or bridged to make a 3-pole breaker. All wiring shall be copper, minimum # 12 AWG (4mm sq.), surface mounted in metal conduits. All panelboards/load centers shall be provided with a minimum of 20% spare capacity for future load growth. All splicing and terminations of wires shall be performed in junction or device boxes. Proper wire nuts/connectors shall be used for splicing wire. Twist-wire connections with electrical tape wrapped around it shall not be acceptable. All electrical installation shall be in accordance with the requirements of NFPA 70, National Electric Code (NEC). All surface mounted conduits shall be braced at no more than 3 meter intervals. Light fixtures installed in the vaults shall be gasketed, light switches and receptacles shall be weatherproof type and panelboard/load center/disconnect switch shall be NEMA Type 3 (IP54), minimum. It is recommended that all electrical installation inside underground arresting gear vaults be close to the ceiling/high up on the walls for protection against flooding.

9.8.26 Receptacles and Light Switches

General purpose power receptacles (outlets) shall be duplex, grounding (earthed) type, 240 volts, 50 HZ, British Standard (BS). Light switch shall be single pole.

9.8.27 Lighting

Light fixtures shall be a standard manufacturer's product. Fluorescent light fixtures shall be provided with electronic ballasts. All light fixtures shall be capable of receiving standard lamps used and locally available in Jordan. Lighting levels for underground vaults shall be calculated at no less than 20FC (200 Lux). All fixtures shall be fully factory wired.

9.8.28 Airfield Lighting Remote Control and Monitoring System

Contractor shall check the existing Airfield Lighting Remote Control and Monitoring System for Runways 13/31 for proper operation and prepare a report of the findings. Any defects and/or deficiencies noted in the existing System shall be brought to the Contracting Officer's attention for corrective action. System's Master Control is located in the Air Traffic Control Tower

(ATCT), with local controls located in Vaults A and B, respectively. Currently, local control in Vault B is not operational.

9.8.29 Identification Tags & Stencils

All airfield lighting fixtures and circuits shall be provided with permanent stenciled tags in every can to indicate fixture number/ID and CCR circuit number. Tags shall also be provided for every lighting circuit cable passing thru every can, handhole and manhole.

9.8.30 Removed Equipment

All removed lighting fixtures and isolation transformer shall be tested for proper operation. Damaged or defective items shall be discarded per Contracting Officer's direction. Equipment in good operating condition shall be inventoried, cataloged and separated according to type/size/rating and turned over to the Contracting Officer for storage as spare parts.

9.8.31 Trenchless Ductbank Installation

Ductbank installation shall be in compliance with the requirements of ETL 04-4. Contractor shall construct two (2) each, 2 Way, 150mm (6 inch) conduit ductbank crossings across Runway 13, with a manhole (6ft x 6ft x 6ft) at each end. Ductbank shall be no less than one (1) Meter deep below the surface of the runway pavement, provided with 'pull string' in each conduit and all conduits capped at each end. Ductbank shall extend 3 m beyond the runway shoulders. Refer to Civil and Pavement Sections Technical Requirements and drawings for details and exact location. Ductbank shall be used for extension of taxiway edge lighting circuits to future Hot Cargo Ramp and Taxiway.

9.8.32 Spare Parts

Upon completion of Project, following items shall be provided to the Contracting Officer as spare parts. All spare parts shall be new with exact same type and rating of items installed. All spare parts shall be furnished in the manufacturer's original packaging.

- a. Runway Edge Lights (Elevated Type): 20
- b. Runway Edge Lights (Inset Type): 10
- c. Taxiway Edge Lights (Elevated Type): 50
- d. Taxiway Edge Lights (Inset Type): 10
- e. Threshold Lights (Inset Type): 5
- f. Isolation Transformers for runway edge lights: 20
- g. Isolation Transformers for taxiway edge lights: 20
- h. Isolation Transformers for threshold lights: 5
- j. Isolation Transformers for Runway 31 elevated approach lights: 20
- k. Isolation Transformers for inset taxiway stop bar lights: 10
- l. Isolation Transformers for Runway 31 overrun inset lights: 10
- m. PAPI Lamps: 5
- n. Elevated Approach Lighting Lamps: 25
- o. Glob for elevated runway edge light (for white light): 10
- p. Glob for elevated runway edge light (for yellow/white light): 10
- q. Glob for elevated taxiway edge light (for blue light): 10
- r. Lamps for runway elevated edge light: 10
- s. Lamps for runway inset edge light: 10
- t. Lamps for Signage: 10

u. Lamps for approach light flashers: 5

10. COMMUNICATIONS

10.1 Applicable Specifications

The publication listed below form a part of this specification.

United States Air Force

Engineering Technical letter (ETL) 04-4 (Change 1) Trenchless
Technology (TT) for Crossing Air Force Pavement.

10.2 Ductbank Installation

The Contractor shall install two (2) duct banks, one (1) under Runway 13/31 and the other under Taxiway Lima 5. The duct banks shall be two (2) conduits high by two (2) conduits wide and installed in accordance with ETL 04-4. The conduits shall be rigid galvanized steel, a minimum of 114 mm OD. The duct banks shall extend 3 meters from the edge of the pavement in both directions and be properly capped for future use by the site communications personnel. The location of the two (2) duct banks are annotated on Drawings B-101, B-102 and B-104. The Contractor shall submit the duct bank design to include the methods, procedures and material to MED and the USAF for approval before any work is started.

11. ATTACHMENTS

C-001 Project Location and Vicinity Plan
C-002 Haul Route and Contractor Laydown Plan
C-101 Overall Site Plan
C-111 Construction Segment A
C-112 Construction Segment A
C-113 Construction Segment B
C-114 Construction Segment C
C-115 Construction Segment D
C-116 Construction Segment D
C-117 Construction Segment E
C-118 Construction Segment E
C-501 Pavement Marking Details
B-101 Existing Joint Layout Plan/Touchdown 13
B-102 Existing Asphalt Runway Section
B-103 Existing Joint Layout Plan/Touchdown 31
B-104 New Joint Layout Plan/Touchdown 31
B-301 Runway 13-31 Asphalt Section
B-302 Taxiway Alpha 2 Limas 2 and 4 Sections
B-303 Pavement Sections
B-304 Rigid Pavement Sections
B-305 Touchdown 31 Joint Mismatch Interface
B-501 Details
B-502 Details

Attachment A - Historical Wind Data

Attachment B - Topographic Survey Scope of Work

Attachment C - FC 3-260-18f, Air Force Aircraft Arresting Systems

Attachment D - AF BAK-12 Standard Drawings, Sheets 1-20 67F2013-04 MAY 2016

Attachment E - Airfield Lighting System As-Built Drawings - For Information
Only (59 Sheets)

Attachment F - Runway 08-26 Airfield Lighting System As-Built (FYI)

-- End of Section --