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of Engineers
Mobile District

DEPARTMENT OF THE ARMY
FACILITIES STANDARDIZATION
PROGRAM

UNMANNED AIRCRAFT SYSTEMS
(UAS) GROUP 4 HANGAR

STANDARD DESIGN

October 1, 2019

UNMANNED AIRCRAFT SYSTEMS HANGAR STANDARD DEFINITIVE DESIGN

PART II

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1.0 PROJECT OBJECTIVES

The project objective is to design and construct facilities for the military that are consistent with the design and construction practices used for civilian sector projects that perform similar functions to the military projects. For example, a Company Operations Facility has the similar function as an office/warehouse in the civilian sector; therefore the design and construction practices should be consistent with the design and construction of an office/warehouse building.

Military Facility	Civilian Facility
UAS Maintenance Hangar (HGR)	Aircraft Maintenance Hangar

It is the Army's objective that these buildings will have a 25-year useful design life before a possible reuse/re-purpose or renovation requirement, to include normal sustainment, restoration, modernization activities and a 50-year building replacement life. Therefore, the design and construction should provide an appropriate level of quality to ensure the continued use of the facility over that time period with the application of reasonable preventive maintenance and repairs that would be industry-acceptable to a major civilian sector project OWNER.

The site infrastructure will have at least a 50-year life expectancy with industry-accepted maintenance and repair cycles.

The government is required by Public Law 102-486, Executive Order 12902, and Federal Regulations 10 CFR 435 to design and construct facilities in an energy-conserving manner while considering life cycle cost over the life of the facilities.

The project site should be developed for efficiency and to convey a sense of unity or connectivity with the adjacent buildings and with the Installation as a whole.

Requirements stated in this contract are minimums. Innovative, creative, and life cycle cost effective solutions, which meet or exceed these requirements are encouraged. Further, the OFFEROR is encouraged to seek solutions that will expedite construction (panelization, pre-engineered, etc.) and shorten the schedule. The intent of the Government is to emphasize the placement of funds into functional/operational requirements. Materials and methods should reflect this by choosing the lowest Type of Construction allowed by code for this occupancy/project allowing the funding to be reflected in the quality of interior/exterior finishes and systems selected.

2.0 SCOPE

2.1. UNMANNED AIRCRAFT SYSTEMS (UAS) HANGAR (Category Code 21115)

Provide an Unmanned Aircraft Systems (UAS) Hangar. This project provides a facility for aircraft storage, limited aircraft maintenance, flight operations and company operations for the Gray Eagle UAS Aviation Company.

This project includes hangar space, a shop, tools storage and supply space, company administration space, a 5-ton bridge crane, oil water separator, standalone oil and hazardous material storage buildings, standalone aircraft container storage shed, concrete pads and utilities for UAS support equipment, rigid pavement apron and hardstands, vehicle parking, information systems, fire protection and alarm systems, to include a standalone fire protection pump house and water tanks as required, intrusion detection installation and Energy Monitoring Control Systems (EMCS) connection. This hangar is to accommodate one hundred and twenty-eight (128) Army personnel with nine (9) total MQ-1C Gray Eagle aircraft. Of the nine (9) MQ-1C Gray Eagle aircraft, four (4) are to be fully assembled and parked in modules on the

hangar floor and five (5) are to be stored in their shipping containers at the exterior free standing covered storage building.

Table 1. Authorized Net and Gross Square Footages

This table includes a summary of spaces with their authorized and approximate net amount, Not to Exceed (NTE), and Gross Square Footage (GSF) amount as defined in the Functional and Operational Requirements Paragraph 3.2.

The maximum building gross area limits cannot exceed the Authorized Programmed Amount of 52,100 SF for the primary UAS Hangar facility however; a smaller overall gross area is permissible if the established net program area requirements are met.

Primary Spaces	Authorized Net Sq. Ft.
Hangar Floor Area, Allied Shop and Storage	28,277
Aircraft Maintenance and Contractor Support Spaces	2,085
Flight Platoon, Operations and Planning Areas	1,966
Common Company Space	1,835
Company Operations Area	5,135
Authorized Net Sq. Ft. Sub-Total	39,298
Common Areas	Approx. Net. Sq. Ft.
Circulation Space	3,648
Break Room/Restrooms/Janitor's Closet	1,495
Mechanical / Fire Protection Space	2,398
Electrical / Telecommunications	
Approximate Net Sq. Ft. Sub-Total	7,541
Covered Entrance Allowance	100
Interior and Exterior Walls/Partitions SF Allowance	5,098
Adjusted Sub-Total	5,198
Net to Gross Sq. Ft.	52,037
Programmed Amount NTE for the Hangar	52,100

Other Standalone Primary Facilities

NTE GSF POL Storage Building	180
NTE GSF Hazardous Material Storage Building	120
NTE GSF Aircraft Container Storage Shed	2,888
NTE GSF Fire Protection Pump House (If required)	1,600

2.2 SITE:

Provide all site design for construction necessary to support the new building facilities as shown in Attachment A- *Schematic Site Plan*. In addition, supporting facilities include; but are not limited to rigid pavement hangar access apron, UAS support equipment siting, rigid pavement hardstands, POV parking area, organizational vehicle hardstand area, bituminous concrete site access road(s) for POV use and heavy duty pavement access for deliveries, site roadway signage, utilities, electric service, exterior and security lighting, fire protection and alarm systems, security fencing and gates, water, gas, sewer, oil water separators, storm drainage systems, storm water management area as applicable, and miscellaneous site improvements as necessary. Include Antiterrorism/Force Protection measures in the facility/site design in accordance with applicable criteria. Include applicable storm water Best Management Plans (BMPs). Provide appropriate site vegetation for unpaved areas.

Maintain the construction site and haul route. Repair/replace damage to existing sidewalks, pavements, curb and gutter, utilities, and/or landscaping within the construction limit, adjacent to the construction site, and along the Contractor's haul route resulting from the Contractor's construction activities at no additional cost to the Government. Prior to construction activities, the Contractor and Contracting Officer Representative shall perform an existing condition survey. At the completion of the Task Order/contract, the Contractor and Contracting Officer Representative shall perform a final condition survey to determine repair/replacement requirements.

Provide all site improvements necessary to support the new building facilities.

2.3 GOVERNMENT-FURNISHED, GOVERNMENT-INSTALLED EQUIPMENT (GFGI):

Coordinate with Government on GFGI item requirements and provide suitable structural support, brackets for projectors/VCRs/TVs, all utility connections and space with required clearances for all GFGI items. All Computers and related hardware, copiers, faxes, printers, video projectors, VCRs and TVs are GFGI.

The following are also GFGI items:

Facility Data (e.g., routers, switches, modems) equipment, facility telephone switch equipment, and any required UPS systems; radio transmitting equipment, and associated antenna and wiring (raceway to be provided by design); front end equipment and equipment racks associated with CATV/CCTV/Satellite TV, and separate front end audio equipment not associated with a Combined Mass Notification and Paging System.

2.4 FURNITURE REQUIREMENTS:

Provide furniture design for all spaces listed in Chapter 3 and including any existing furniture and equipment to be re-used. Coordinate with the user to define requirements for furniture systems, movable furniture, storage systems, equipment, and existing items to be reused. Early coordination of furniture design is required for a complete and usable facility.

The procurement and installation of furniture is NOT included in this contract. Furniture will be provided and installed under a separate furniture vendor/installer contract. The general contractor shall accommodate that effort with allowance for entry of the furniture vendor/installer onto this project site at the appropriate time to permit completion of the furniture installation for a complete and usable facility to coincide with the Beneficial Occupancy Date (BOD) of this project. The furniture vendor/installer contract will include all electrical pre-wiring and the whips for final connection to the building electrical systems however; the general contractor shall make the final connections to the building electrical systems under this contract. Furthermore, the general contractor shall provide all Information/Technology (IT) wiring (i.e. LAN, phone, etc.) up to and including the face plate of all freestanding and/or systems furniture desk tops as applicable, the services to install the cable and face plates in the furniture, the coordination with the furniture vendor/installer to accomplish the installation at the appropriate time, and all the final IT connections to the building systems under this contract.

The Government reserves the right to change the method for procurement of and installation of furniture to Contractor Furnished/Contractor Installed (CFCI). CFCI furniture will require competitive open market procurement by the Contractor using the Furniture, Fixtures and Equipment (FF&E) package

3.0 FUNCTIONAL AND AREA REQUIREMENTS FOR THE Unmanned Aircraft System Hangar (UAS) HANGAR

3.1. GENERAL REQUIREMENTS:

Each hangar shall include an aircraft maintenance hangar floor area, shop areas, parts storage, and administrative offices for aircraft maintenance, flight, and company operations personnel, co-located within one facility. The ideal site development maintains a comfortable and useful environment for both administrative and maintenance functions.

3.1.1. FACILITY RELATIONSHIPS:

Each site shall be designed in accordance with Antiterrorism Force Protection requirements. Each hangar facility, runway, and taxiway is to be sited and oriented in accordance with current UFC 3-260-01 AIRFIELD AND HELIPORT PLANNING AND DESIGN. Aviation Complex Planning and Design Criteria for Army Unmanned Aircraft Systems (UAS) and UFC 3-260-02 Pavement Design for Airfields for shared aircraft facilities as applicable.

3.1.2. ACCESSIBILITY REQUIREMENTS:

The entire Hangar facility shall be handicap accessible for civilian employees and visitors, and Warriors-in-Transition that may be assigned in accordance with the Architectural Barriers Act (ABA) Standard for Department of Defense Facilities.

3.1.3. BUILDING AREAS:

Computation of Areas: Compute the "gross area" and "net area" of facilities in accordance with Table 1, Table 2 and the following subparagraphs:

A. FULL SCOPE SPACES:

Gross area calculations shall be computed in accordance with the latest published UFC 3-101-01, Section 2-2, Building Area Calculations. Areas of the following spaces shall count as full scope when calculating "gross area"

- 1) UAS Hangar

- 2) POL Storage Building
- 3) Hazardous Material Storage Building
- 4) Aircraft Container Storage Shed
- 5) Fire Protection Pump House

B. HALF-SCOPE SPACES:

Areas of the following spaces shall count as one-half scope when calculating “gross area”:

- 1) Porches
- 2) Covered exterior loading platforms or facilities that are attached to the hangar
- 3) Covered but not enclosed spaces, canopies, training, and assembly areas that are attached to the hangar
- 4) Covered but not enclosed passageways and walks
- 5) Covered ramps

C. EXCLUDED SPACES:

The following spaces shall be excluded from the “gross area” calculation:

- 1) Crawl spaces
- 2) Uncovered exterior loading platforms or facilities
- 3) Exterior insulation applied to existing buildings
- 4) Open courtyards
- 5) Open paved terraces
- 6) Uncovered ramps
- 7) Uncovered stoops
- 8) Utility tunnels and raceways
- 9) Roof overhangs and soffits as per the latest UFC 3-101-01 Architecture

D. NET FLOOR AREA:

Where required, “net area” is calculated by measuring the inside clear dimensions from the finish surfaces of walls. If required, overall “assignable net area” is determined by subtracting the following spaces from the “gross area”:

- 1) Basements not suited as office, special mechanical, or storage space
- 2) Elevator shafts and machinery space
- 3) Exterior walls
- 4) Interior partitions
- 5) Mechanical equipment and water supply equipment space
- 6) Permanent corridors and hallways
- 7) Stairs and stair towers
- 8) Janitor closets
- 9) Electrical equipment space
- 10) Electronic/communications equipment space

3.1.4 ADAPT BUILD MODEL

An Adapt Build Model for the UAS Group 4 Hangar is available upon request to the U.S. Army Corps of Engineers, Mobile District, Center of Standardization. This model matches Attachment A *Schematic Plans* in the

UAS Standard found at <https://mrsi.erd.c.dren.mil/cos/sam/uas/>. This model is provided as guidance that incorporates mandatory functional/operational requirements specific to UAS Group 4. Examples from various climatic regions in PDF, BIM, and CADD format are also available upon request.

3.2. FUNCTIONAL AND OPERATIONAL REQUIREMENTS:

The UAS Hangar facility and support structures accommodate a total of 128 personnel at peak times. During normal operations, this hangar will be in use five (5) days per week, 18 hours per day, in two (2) shifts. The occupancy load during these shifts is split by two-thirds during the day and one-third at night between the hours of 0430 and 2230

Paragraph 2.1, Table 1 includes the Authorized Programmed Amount NTE and Paragraph 3.2.1. Table 2 includes the Authorized Net square footage per primary spaces and common areas. Attachment A- *Schematic Floor Plan* illustrates the functional layout and adjacency requirements.

3.2.1. FUNCTIONAL SPACES:

A. GENERAL AREA:

The UAS Hangar is composed of primary spaces and common areas. The primary spaces include the Aircraft Maintenance Bay, Allied Shop and Storage, Aircraft Maintenance and Contractor Support Spaces, Flight Platoon Operations and Planning Areas, Common Company Space, and Company Operations Area. The common areas include Circulation Space, Break Room, Restrooms, Utility and Building Support Spaces.

B. PRIMARY SPACES:

The primary hangar spaces defined in the following subparagraphs are based on the authorized square footages indicated in the following Table 2. Where a workstation is specified, provide 110 VAC receptacles, voice and data receptacle in addition to what may be specified in Table 3.

- 1) **Hangar Floor Area:** The hangar floor area is a clear and open area for the maintenance, limited repair, assembly/disassembly and parking of the fully fueled (JP-8) MQ-1C Extended Range (ER) Gray Eagle aircraft. The Hangar Floor Area is composed of the Aircraft Maintenance Bay, a Safety Lane, Transverse Corridor and an Access Lane as described in the following subparagraphs. In this area provide:
 - a) **Aircraft Maintenance Bay.** The UAS repair parking module sizes for the hangar floor space are to be sized based on the following table.

Hangar Parking Modules Table

AIRCRAFT	MODULE DEEP	MODULE WIDTH	NUMBER OF MODULES	NO. OF AIRCRAFT PER MODULE
MQ-1C ER Gray Eagle (*Fully Assembled, Fully Fueled)	40'	68'-4"	4	1
Note: Fueling and defueling procedures aren't permitted in this hangar. Fuel used in aircraft is J-P8.				

In the Aircraft Maintenance Bay provide:

- (1) **Parking Module:** Space for four (4) Aircraft parking modules for fully fueled MQ-1C Gray Eagles.
 - (2) **Equipment and Furniture:** Space for workbench and workstations as Paragraph 3.19 and provide utility connections per Paragraph 3.10 B.1).
- b) **Safety Lane:** A five (5) foot safety lane at the perimeter of the Aircraft Maintenance Bay, Transverse Corridor and Access Lane. The vertical clearance at this safety lane is no less than 80 inches above finished floor unless otherwise required by code.
 - c) **Transverse Corridor:** A seven-foot four-inches (7'-4") foot clear circulation corridor between aircraft park modules.
 - d) **Access Lane:** One 70'-0" clear access lane at the hangar door as shown in Attachment A Schematic Floor Plan. The centerline of this lane is to be marked at noted in paragraph 3.5.1.A.3) INTERIOR FINISHES.
 - e) **Floor Scrubber:** Space and power for a floor scrubber. Coordinate power requirements of the floor scrubber with end user in accordance with building codes.
 - f) **Floor markings:** Defined in Paragraph 3.5.1.B.3)).
 - g) **Bridge Crane:** One (1) five (5) ton bridge crane. Provide a minimum crane hook height clearance of 20 feet above finished floor (AFF). Provide crane hook floor coverage to the full extent of the maintenance bay to the 5-foot safety lane as shown on the floor plan in Attachment A – *Schematic Plans*.
 - h) **Floor Drains:** Appropriate floor drainage system connected to Oil Water Separator(s). See Plumbing and Fire Protection requirements under Paragraph 3.8.E, Floor Slope requirements under UFC 4-211-01 and the layout as shown on the floor plan, Attachment A *Schematic Plans*.
 - i) **Handwash and Drinking Fountains Stations:** A minimum of one (1) hand wash station and one (1) drinking fountain at the demising hangar wall near the administration offices. See Paragraph 3.8.C
 - j) **Grounding:** Grounding system throughout the floor area, see Paragraph 3.10.F.
 - k) **Bird Deterrent:** Provide a bird deterrent system for the hangar bay that best suites the end user. This bird deterrent is to be reviewed by the Centers of Standardization.
- 2) **Allied Shop and Storage:** The allied shop and storage spaces are maintenance support spaces located adjacent to the hangar floor area.
 - a) **Allied Shop:** Allied Shop to accommodate maintenance areas, fixed storage bins for miscellaneous parts, supplies, and maintenance tool kits. The location is on the first floor adjacent to the hangar floor. In this room provide:
 - (1) **Workstation:** Space for one workstation with an internet drop.
 - (2) **Workbench:** Space along the perimeter wall for GFGI workbench height workstations per Paragraph 3.19. Provide utility connections along the wall for each workbench to include compressed air, electrical and telephone/data lines per Paragraph 3.10.B.2) and 3.9.
 - (3) **Equipment:** Space for Installation Furnished Installation Installed (IFII) equipment per Paragraphs 2.3 and 3.19.
 - (4) **Room Access:** Two (2) overhead roll-up doors, one on the exterior wall and the other for direct access at the hangar wall as shown on the Attachment A, *Schematic Floor Plans*.

- (5) **Sink:** Deep sink with foot operated faucet connected to an oil water separator.
 - (6) **Water Supply:** Two (2) ½" domestic water drops with a ½" ball valve capped on perimeter wall opposite each other. Terminate one water drop with a hose bibb.
 - (7) **Compressed Air:** Compressed air piping shall be routed around the perimeter of the shop space. Provide two drops along wall where workbenches are located and one drop on adjacent wall.
 - (8) **Grounding:** Equipment grounding bar around room. Electrostatic discharge with either grounded wrist straps at work benches or grounded discharge plates at doors. Fully coordinate location with user.
- b) **Bench Stock/Technical Supply (Class IX Air):** Bench Stock/Technical Supply is for storage of (Class IX Air) parts and is located on the first floor adjacent to hangar floor. In this room provide:
- (1) **Open Floor Area:** Open floor space for large industrial supply shelves.
 - (2) **Issue Window:** One (1) 4-foot by 4-foot turn-in/issue window and counter. At this issue counter provide power and space for a workstation as per Paragraph 3.19.
 - (3) **Room Access:** One (1) overhead roll-up door for easy forklift or pallet jack access to the hangar floor area.
- c) **Secured Storage:** Secured Storage is for securing high value accountable items and containers. The location is on the first floor near the hangar floor.
- (1) **Open Floor Area:** Open floor space for IFII equipment to include: twelve (12) aircraft payload containers and space for an upright classified safe. The actual size of each piece of equipment is to be verified with the user.
 - (2) **Room Access:** A pair of personnel doors for easy pallet jack access.
 - (3) **Special Construction:** AR 190-51 and AR 190-13 shall govern construction standards for this space. For a permissible wall construction type, see Paragraph 3.5.B.
- d) **Small Tools Room:** The Small Tools Room is centrally located on the first floor adjacent to the hangar floor. This room to be near the shop and aircraft maintenance repair section.
- (1) **Personnel:** Space for two (2) persons in this room.
 - (2) **Issue Window:** A 4-foot by 4-foot turn-in/issue cased opening with customer service counter located on the hangar bay wall. The opening sized to pass small common non-accountable parts and bench stock. Provide an automatic fire rated overhead shutter door at the pass-through opening as required by code.
 - (3) **Room Access:** The personnel door to this room is to be 3'-4" x 7'-0" in size, large enough to move a workbench and storage cabinets.
- 3) **Aircraft Maintenance and Contractor Support Spaces:** Aircraft maintenance spaces generally include, production control, quality control, maintenance platoon, and contractor logistics directly related to performing maintenance and supervision of aircraft components. Maintenance shop spaces shall be sized based on the sizes indicated in Paragraph 3.2.1.D Table 2 Space Allocation Table Primary Spaces
- a) **Production Control (PC):** The Production Control is to be located on the first floor near the Hangar Floor Area and the Quality Control/Quality Assurance with a view of the hangar floor through a minimum 4-foot wide by 4-foot high window. In this area provide:
- (1) **Personnel:** Space for four (4) admin workstations separated from common work area and an open meeting space for ten (10) persons at a conference type setting, see Paragraph 3.19.

- (2) **Utilities:** Provide power, voice and data to the conference table.
 - (3) **Wall Mounted Equipment:** Wall space and support for a CFCI marker board.
- b) **Quality Control / Quality Assurance (QC/QA):** The Quality Control / Quality Assurance is located on the first floor near PC and the hangar floor with a view of the hangar floor through a minimum 4-foot high by 4-foot wide window. In this area provide:
- (1) **Personnel:** Admin reception workstation space for one (1) Officer in Charge/ Non-Commissioned Officer (OIC/NCOIC) and admin workstation space for four (4) personnel; see Attachment A for the FF&E *Schematic Plan*.
 - (2) **Open Floor Area:** Space for library for storage of various Technical Manuals in hardcopy and compact disk.
 - (3) **Wall Mounted Equipment:** Wall space and support for a CFCI marker board.
- c) **Maintenance Platoon:** The Maintenance Platoon is to have an open admin space for two workstations, a waiting area and a file storage area. Provide an interior window to view the vestibule as shown in Attachment A, *Schematic Floor Plan*. Within the maintenance platoon provide two private offices.
- d) **Contractor Logistics Support (CLS/LARS):** This room is located on the first floor near the QC/QA and PC rooms. Provide space for admin workstations for five (5) persons.
- 4) **Flight Platoon Operations and Planning Areas:** Flight planning and flight operations areas are for operators to prepare flight planning, mission planning, briefing, debriefing and flight simulation.
- a) **Flight Platoon:** The Flight Platoon area is located on the second floor. In this area provide:
- (1) **Personnel:** A total of three (3) private office spaces. In each of the three private offices provide two (2) spaces for admin workstations.
 - (2) **Open Floor Area:** Open admin space for UAS Operator personnel.
- b) **Flight Planning:** The Flight Planning to be located on the second floor. In this area provide:
- (1) **Personnel:** Space for four (4) to sit at table top planning workstations and a space for one admin workstation with power and NIPR drops.
 - (2) **Wall Mounted Equipment:** Wall space and support for a CFCI marker board.
 - (3) **Issue Counter:** A 4-foot high by 6-foot wide cased opening to the Flight Operations space. At this cased opening provide a built-in customer service counter and below provide shelving for maps and various publications storage as per Millwork, Paragraph 3.5.1.C.4)).
 - (4) **Room Access:** The personnel door to this room is to be large enough to move a planning workstation.
 - (5) **SIPRNET:** One PDS enclosure with two SIPRNET drops.
- c) **Flight Operations:** The Flight Operations is to be located on the second floor adjacent to flight planning and have a view of the hangar floor through a 4-foot high minimum by 4-foot wide window.
- (1) **Personnel:** Space for four (4) admin workstations.
 - (2) **Wall Mounted Equipment:** Wall space and support for a CFCI marker board.

- (3) **Issue Counter:** At the Flight Planning customer services counter provide a (LAN/voice) one class A phone.
 - (4) **Security:** CCTV monitoring as noted in Paragraph 3.9.F.
 - (5) **SIPRNET:** One PDS enclosure with two SIPRNET drops.
- d) **Flight Simulator Room:** Flight Simulation is located on the first floor near the CLS/LARS.
- (1) **Open Floor Area:** The floor is to support a GFGI Gray Eagle Universal Mission Simulator (UMS) at a weight of 2,245 lbs. The operational footprint of the Gray Eagle UMS is approximately 12'-4" x 7'-6" x 7'-6". The height when installed is 6'-6". See Attachment A, Drawing Sheet A-101 for the room size and configuration. This equipment also includes two (2) instructor servers and an instructor workstation.
 - (2) **HVAC:** Provide this room with a dedicated HVAC unit. The required temperature is noted in Paragraph 3.11.
 - (3) **Room Access:** The personnel door to this room is to be 3'-4" x 7'-0" in size.
- di) **Common Company Space:** Common Company Spaces include the Briefing Room, Multipurpose Training Room, Conference Room, the UAV Standardization Office, and the Safety Office.
- a) **Briefing Room:** The Briefing room is located on the second floor In this room provide the following:
- (1) **Personnel:** Space to accommodate fifty-five (55) people utilizing stackable seating and folding tables.
 - (2) **Floor Area:** Floor space for a lectern station.
 - (3) **Utilities:** Power and wall space for a wall-mounted LCD television and (3) digital clocks. In this room provide dimmable lighting. Near the lectern station provide power and data connections for a data transfer system, and microphone. At the lectern provide controls for room lighting levels, sound levels, and visual/projection operations.
 - (4) **Wall Mounted Equipment:** Wall space and support for a CFCI marker board.
 - (5) **Ceiling Mounted Equipment:** Ceiling-mounted projector supports with power and data connections, Recessed ceiling mounted motorized screen and audio system (wireless microphones and speaker system).
 - (6) **SIPRNET:** One PDS enclosure with one SIPRNET drop at the lectern location
 - (7) **Adjacency Requirement:** A Separate adjacent storage room for chairs and tables.
- b) **Multipurpose Training Room:** The Multipurpose Training Room will be for distributed/computer-based training similar to Classroom XXI (Category Code 17136) and for dedicated computer enabled digital training room similar to a small Resource Center (Category Code 17120) for ten (10) students. Reference paragraphs 2-4.6 and 2-4.9 of the General Instruction Building (GIB) Standard Design Criteria:
<https://mrsi.erd.c.dren.mil/cos/nao/gib/>
- (1) **Personnel:** Space to accommodate ten (10) students and one (1) instructor.
 - (2) **Floor Area:** Space for a lectern.
 - (3) **Utilities:** Dimmable light fixtures.
 - (4) **Wall Mounted Equipment:** Wall space and support for a CFCI marker board.
 - (5) **Ceiling Mounted Equipment:** Ceiling-mounted projector supports with power and data connections, Recessed ceiling mounted motorized screen.
 - (6) **SIPRNET:** One PDS enclosure with one SIPRNET drop at the lectern location.

- c) **Conference Room:** The Conference Room is located on the second floor near the Company Operations Area. Provide brackets and power for a GFGI wall-mounted LCD television. Provide wall space and support for a CFCI marker board. Provide power, voice and data to the conference table in this room. The wall separating this room from the restrooms is to have an STC rating of 53.
- d) **UAV Standardization Office and Safety Office:** In each private office provide space for one (1) person and two (2) guests.
- 6) **Company Operations Area:** The company administration area consists of offices, storage to accommodate personnel within the battalion. See Table 2 for net square footages each type of administration/readiness space
 - a) **First floor Arms Vault:** Centrally located and is for storage of arms, ammunition, and explosives (AA&E). This vault to be designed in accordance with physical security requirements contained in AR 190-11, Appendix G. An option exists for use of prefabricated, modular vaults conforming to Fed. Spec. AA-V-2737 requirements.
 - b) **Second floor Company Commander Suite for the Commander, First Sergeant, and Executive Officer:** This area is to include space for printer and fax machines, waste and paper recycling receptacles, and supply closet for storage. Provide millwork as per Paragraph 3.5.1.C.4)). The Company Commander's (CO CDR) office shall require one PDS enclosure with one SIPRNET communications drop.
 - c) **Second floor TA-50 Gear Storage:** To accommodate individual CFCI combat equipment (TA-50) lockers for all unit personnel, plus co-located area for equipment. These lockers are to be permanently installed as per Paragraph 3.5.1.C.5). These lockers are to allow each soldier to securely store current TA-50 as well as future Soldier Systems equipment. Interior mud wash utility sinks shall be provided. Sinks shall be allocated on the basis of one utility sink for every 50 soldiers. Access to the hangar is through the adjacent convenient stairway as shown on Sheet A-101 of Attachment A.
 - d) **Nuclear, biological, and chemical (NBC) equipment storage.**
 - e) **Communications equipment storage.**
 - f) **Consumable unit storage.** The area for this space is split between the first and second floors. The first floor space is located adjacent to an exterior wall for truck delivery purposes.

C. COMMON AREAS:

- 1) **Lobby and Vestibule:** Provide a vestibule at each entrance to the support spaces as shown on Sheet A-101 of Attachment A- Schematic Design.
- 2) **Circulation:** Circulation to include corridors, stairs and an elevator are to be code compliant and as follows:
 - a) **Corridors:** All major corridors to be a minimum of six (6) feet wide except at corridors to be accessible by pallet jacks. Corridors to be accessible by pallet jacks are to be eight (8) feet wide.

- b) **Stairs and Elevator:** There are three (3) stairways for access to the second floor office and storage areas. Two of the stairways are exit access stairways. The third stairway labeled S103 from the TA-50 Gear Storage to the Hangar Bay is a convenience stair for readiness duty. Both the second floor door to stairway S103 and the door entering the hangar bay at the base of this S103 stairway are not to be labeled emergency exit doors. Only the door to the exterior is to be an emergency exit door. All stairways are to be fire rated and constructed as required by Code. There is one (1) passenger elevator located for easy access to the building entrance and to the second floor offices, training and briefing spaces.
- 3) **Break Room:** In this room provide a base and wall mounted millwork cabinet. In the countertop provide a double compartment stainless sink and garbage disposal. The garbage disposal may be eliminated as directed of the installation. Provide space and utilities for miscellaneous FF&E equipment as per Table 3 Provide brackets for GFGI wall-mounted LCD television. Provide wall space and support for a CFCI marker board.
- 4) **Restrooms and Janitor's Closet:** Except where indicated otherwise, provide restrooms and janitor's closets on each floor with fixture counts per IPC with fixture distribution calculated for 80% male and 20% female.
- a) **Restrooms & Shower (First Floor):** The first floor restrooms and showers are based on a maximum occupancy load of 128 personnel which 80% are male and 20% are female. At a minimum provide:
- (1) **Showers:** Showers to accommodate administrative, maintenance, and off-post personnel. The purpose of these showers will be for personal hygiene from daily PT and for the maintenance personnel during normal work hours. Provide 6 shower for males and 2 for female. In remote locations increase showers to 7 total.
 - (2) **Lockers:** Space for 28 double tier personnel lockers as noted in the FF&E Table 3.
 - (3) **Millwork:** Millwork benches as noted in Paragraph 3.5.1.C.4).
 - (4) **Partitions:** Screens and walls should be installed for privacy as required.
- b) **Restrooms (Second Floor):** The second floor restrooms are to accommodate a maximum occupancy load of 55 personnel from the training and briefing rooms. The restrooms shall be divided 80% for males and 20% for females.
- c) **Janitor's Closet:** Provide a janitor's closet centrally located on each floor. Each janitor closet shall have a mop sink, mop rack and space for buckets, vacuum and storage for janitorial supplies.
- d) **Maintenance and General Purpose Storage.** For these areas provide small spaces for general purpose admin supplies.
- 5) **Recyclables Storage:** Provide space to accommodate recycling receptacles and space for a recycling storage closet on each floor. Provide closet with dedicated exhaust fan.
- 6) **Utility and Building Support Space:** Utility and support space includes mechanical, fire suppression, electrical, telecommunications and SIPRNET rooms. The personnel doors to these rooms are to be keyed separately for access by Installation maintenance personnel. Exterior access is required for mechanical and electrical rooms located on the first floor.
- a) **Mechanical Rooms:** Mechanical rooms shall accommodate space for HVAC equipment maintenance/repair access without having to remove other equipment. This room is to include but not limited to: boilers, fan motors, air handling units and pumps with adequate

maneuverability to service equipment. Consider the use of a separate boiler room if the layout of the mechanical room has limited exterior wall space. Provide ventilation, heating and cooling for these spaces as required for proper equipment operation. Provide a separate compressor room with personnel door for separate key access as required by the installation.

- b) **Fire Suppression Room:** Include space for sprinkler system riser, foam tanks, foam pumps, headers and expansion tanks. This room is to be adjacent to the hangar floor. Exterior access is required for this room.
- c) **Electrical Rooms:** Space for Service Rated Entrance Equipment, transformers, Distribution Panels, Lighting Panels, etc. Provide additional space for any proposed renewable energy electrical equipment.
- d) **Telecommunications Rooms (TR):** All communications rooms shall be conditioned space equivalent to office space and with access into the facility from the interior of the building. Provide ventilation, heating and cooling for these spaces. In this room provide space and power for three (3) racks with integral wire management systems and one (1) TBB.
- e) **SIPRNET Room:** This room is to be located on the second floor adjacent to the TR and to be constructed to meet the requirements of ICD 705 and the USAISEC Technical Guide for the Integration of Secret Internet Protocol Router Network. Additional requirements for this room includes:
 - (1) **Floor Load:** Floor to be capable of carrying load of SIPRNET safe.
 - (2) **HVAC:** A separate air-conditioning unit.

D. SPACE ALLOCATION TABLE:

Net area requirements for functional spaces are included in following table. The gross area space shall be sized to accommodate the required function, comply with code requirements and other requirements of the Facility.

Table 2
Space Allocation Table, Primary Spaces

ROOM NAME	AUTHORIZED NET SQ FT
HANGAR FLOOR AREA, ALLIED SHOP AND STORAGE (1st Floor)	
Hangar Floor Area to include: Aircraft Maintenance Bay, Safety Lane, Transverse Corridor, Access Lane , Fire Suppression Room	24,952
Allied Shop	1,780
Bench Stock / Tech. Supply (Class IX Air)	1,110
Secured Storage	215

ROOM NAME	AUTHORIZED NET SQ FT
Small Tools Room	220
	TOTAL SF = 28,277
AIRCRAFT MAINTENANCE AND CONTRACTOR SUPPORT SPACES (1st Floor)	
Production Control (PC)	545
Quality Control/Quality Assurance (QC/QA)	500
Maintenance Platoon	570
Contractor Logistics Support (CLS/LARS)	470
	TOTAL SF = 2,085
FLIGHT PLATOON, OPERATIONS AND PLANNING SPACE (1st and 2nd Floor)	
Flight Simulator	266
Flight Platoon	995
Flight Ops	373
Flight Planning	277
Small Storage Room	55
	TOTAL SF = 1,966
COMMON COMPANY SPACE (2ST Floor)	
Briefing Room	865
Multipurpose Training (Classroom XXI (DT/CBT Room))	390
Storage	150
Conference Room	230
UAV Standardization Office	100
Safety Office	100
	TOTAL SF = 1,835
COMPANY OPERATIONS AREA (1st and 2ND Floor)	
Unit Storage 1 st and 2 nd Floor	440

ROOM NAME	AUTHORIZED NET SQ FT
Arms Vault	410
First Sergeant	150
Company Commander	150
XO	150
TA Gear Storage	3,535
NBC Storage	150
Comm Storage	150
	TOTAL SF 5,135

Space Allocation Table, Common Areas

COMMON AREAS	Approx. SQ FT
Circulation	3,648
Break Room	170
Restrooms, Showers and Lockers	1,325
Janitor's & Recycle Closets	
Utility and Support Space	2,398
	TOTAL SF =7,541
NET AREA TOTAL =	46,838

3.3. SITE FUNCTIONAL REQUIREMENTS:

A. GENERAL:

- 1) **Site Work Scope:** Reference project specific DD Form 1391 for required site primary and support facilities. Some site support facilities are presented herein Paragraph 3.3 may not be applicable to each project.
- 2) **Site Criteria:** Site selection and real property master planning for all Active Component HGR Complexes (and Reserve Component complexes when applicable) shall comply with all safety, obstruction, and airspace boundaries as stipulated by AR 95-2. The hangar facility and airfield components shall be sited in accordance with the applicable criteria contained in, but not necessarily limited to UFC 3-260-01 Airfield and Heliport Planning and Design.

3) **Primary Facility (Buildings) Siting:**

- a) **UAS Group 4 Hangar (Category Code 21115):** Due to adverse wind effects on the Gray Eagle aircraft, the prevailing wind direction and wind velocity from the environment and adjacent aircraft activities are to be considered when orienting the UAS hangar. For UAS only airfields the hangar door may be oriented facing the UAS runway. For dual use airfields the designer should site the hangar with the hangar door faced to minimize the effects from aircraft wing-tip vortices. The hangar may be rotated 90-degrees from normal to the runway. Refer to UFC 3-260-01 AIRFIELD AND HELIPORT PLANNING AND DESIGN for minimum offset distances from adjacent airfield facilities.
- b) **POL Storage Building (Category Code 21470):** Site adjacent to the hangar facility. Specific siting shall be per Installation and user preference as best suited for operational functionality. Maintain a minimum separation from other site structures in accordance with IBC and local building codes to avoid the need for sprinkling this facility.
- c) **Hazardous Material Storage Building (Category Code 21470):** Site adjacent to the hangar facility. Specific siting shall be per Installation and user preference as best suited for operational functionality. Maintain a minimum separation from other site structures in accordance with IBC and local building codes to avoid the need for sprinkling this facility.
- d) **Aircraft Container Storage Shed (Category Code 44222 or Category Code 44224 for cold climates):** See Paragraph 3.3.D.3). Site adjacent to or in vicinity of the hangar as best suited for operational functionality.
- e) **Fire Protection Pump House (Category Code 89144):** If required, site this stand-alone building adjacent to the hangar facility to best suit the fire protection system and the local fire department. Maintain minimum separation from other site structures in accordance with IBC, NFPA and local building codes.

B. **PARKING:**

- 1) **POV Parking:** Provide an asphaltic bituminous or PCC (Portland Cement Concrete) POV parking area sized for 123 spaces. This Includes provisions for contractor personnel spaces, ABA, and Leeds "Silver" required parking. Locate near or adjacent to the hangar facility in accordance with AT/FP criteria. Minimum size parking stalls shall be in accordance with listed criteria. Minimum isle shall be 26-foot or per current NFPA 1141 standards. POV parking design shall be in accordance with applicable criteria found in UFC 3-201-01. Pavement thickness and required layers shall be based on traffic loadings and geotechnical investigation data. Pavement thickness shall be in accordance with the current USACE PCASE pavement design program and UFC 3-250-01.
- 2) **Organizational Parking:**
 - a) **Organizational Parking:** Provide PCC (Portland Cement Concrete) rigid pavement as required by the Tactical Equipment Maintenance Facility (TEMF) Standard Design for the 128 man Gray Eagle UAS Company.
<https://mrsi.usace.army.mil/cos/savannah/SitePages/temf.aspx>
 - b) **Organizational Parking at Hangar:** Provide five (5)-spaces for Official-Use organizational parking adjacent to hangar for Government vehicles. Minimum size parking stalls shall be in accordance with UFC 3-201-01. Provide access drive as necessary. Pavement may be PCC or bituminous concrete as most economical for project.

C. ACCESS DRIVES AND LANES

- 1) **POV Access Drives and Lanes:** Access road to the POV parking area shall be separate from the heavy duty service drive(s). POV access road shall be a minimum of 24-foot width. POV parking area access road shall receive concrete curb and gutter with curb inlets and underground storm conveyance systems. Minimum pavement thickness shall be 1.5" asphaltic bituminous concrete wearing layer over 2" binder layer over 6" crushed aggregate or stabilized aggregate base course. Additional thicknesses and layers may be required based on final pavement design and geotechnical investigation data. Pavement thickness shall be in accordance with the current USACE PCASE pavement design program and UFC 3-250-01.
- 2) **Heavy Duty Service Access Drives:** Service access drives shall be a minimum of 26-foot width roadway. Additional pavement widening shall be provided as required per current AASHTO criteria based on design curves. A 30-foot commercial throat shall be provided at intersections with appropriate curve radii per AASHTO criteria. Minimum pavement thickness shall be 2" asphaltic bituminous concrete wearing layer over 3" binder layer over 6" crushed aggregate or stabilized aggregate base course. Additional thicknesses and layers may be required based on final pavement design and geotechnical investigation data. Pavement thickness shall be in accordance with the current USACE PCASE pavement design program and UFC 3-250-01.
- 3) **UAS Support Equipment Areas:** Provide service drives to all UAS support equipment areas. Type of service drive surfacing shall be in accordance with installation requirements. Drives shall be sized for expected UAS equipment vehicles and maintenance vehicles.

D. HARDSTANDS:

Geometric layout and turning movements shall be provided based on vehicle types and in accordance with the applicable criteria contained in UFC 3-201-01. Pavement thickness shall be in accordance with the current USACE PCASE pavement design program and UFC 3-250-01 and actual geotechnical investigation "K" value.

- 1) **Hardstand- Allied Shop and Bench Stock:** Provide PCC rigid pavement. Hardstands for Shipping and receiving to be at the Allied Shop, Bench Stock and Tech Storage areas. Hardstand area may be consolidated with the Aircraft Container Storage Shed hardstand.
- 2) **Universal Ground Control Stations (UGCS) Pads (Category Code 85225):** See Paragraph 3.3.F.1.(a).
- 3) **Hardstand- Aircraft Container (Bird Box) Storage and Internal Airlift/Helicopter Slingable Container Units (ISU).** Provide rigid PCC pavement for aircraft storage boxes, propeller boxes and (4) four military supply containers (ISU 90) adjacent to the hangar facility. Hardstand shall be sized to allow "ATLAS" forklift geometry to transport boxes to and from main hangar entrance or transport truck to be unloaded in vicinity of aircraft storage shed. Access drives and gates shall be sized to allow egress of 31'-6" width boxes. See Paragraph 3.2.2.A.1) for size and weight.

E. HANGAR ACCESS APRON (Category Code 11340):

Provide rigid PCC pavement sited and sized in accordance with current UFC 3-260-01 AIRFIELD AND HELIPORT PLANNING AND DESIGN.. Shoulders shall be provided per ETL. Apron shall be sized and marked for tow ways in accordance with referenced ETL. Provide one maintenance/run-up stall (65-foot wide by 40-foot deep) on each side of the hangar entrance tow way. Each stall shall receive grounding points, mooring devices and markings per ETL. Emergency, transport, and forklift vehicles that utilize the

apron may govern the pavement geometry design. Access pavement to the apron shall be sited to provide adequate clearance for transport and loading operations. Provide clearance around the aircraft maintenance/runup stall as required per the latest published Technical Manual TM DTM 1-1550-697-10-1, Figure 2-85 Danger Area.

The following traffic mix shall be evaluated in addition to aircraft loading to determine the pavement thickness:

- (1) ATLAS forklift – 50,000 passes
- (2) HEMTT (2500GAL) Fuel Truck T58318 – 10,000 passes
- (3) Installation Fire Truck – 1200 passes
- (4) Transport Truck M1088 and M871A3 Trailer – 2,500 passes

Pavement thickness shall be determined in accordance with UFC 3-260-02. The Traffic mix used for UAS only pavements shall be, as a minimum, the same as the traffic used for an Army Class I Helipad (20,000 passes of a 16,300-lb UH-60 aircraft). Pavement thickness shall be determined utilizing the current USACE PCASE pavement design program and an actual geotechnical investigation "K" value. Drainage layer shall be provided if applicable per UFC 3-260-02. Drainage layer drains shall be tied to storm drainage conveyance system. Apron storm drainage system shall be in accordance with current applicable UFCs for Airfield Drainage.

F. UAS SUPPORT EQUIPMENT (SITING REQUIREMENTS):

Provide utilities, grounding and concrete pads for the following GFGI equipment at various locations around the airfield as per the site requirements from the PM-UAS site survey and referenced airfield criteria. Quantities of each piece of equipment are site dependent unless otherwise noted. For a site layout see Attachment A – *Schematic Plans*. For electrical and communications requirements see Paragraphs 3.9, 3.10 and Attachment C- *Electrical and Communications Requirements*.

UAS Support Equipment: Siting and Power provisions for UAS Support Equipment that will be fielded with the GFGI UAS packages need to be included. Several of these GFGI equipment items require MILCON funded utilities, grounding, and/or foundation slabs. The utilities and slabs should be included as Supporting Facilities line items in the 1391. See telecommunications and electrical sections for utilities requirements. This GFGI equipment includes the Universal Ground Control Stations (UGCS), Ground Data Terminals (GDT), and Satellite Ground Data Terminal (SGDT) unit.

- 1) **GFGI Universal Ground Control Stations (UGCS):** Provisions for siting locations for four (4) GFGI UGCSs shall be provided per each hangar facility per company. Siting shall be coordinated with the official UAS Runway Operational Site Survey, the installation Airspace Office (AT&A), and USACE COS-CESAM office.
 - a) **Pads:** Pads for GFGI UGCSs shall be Portland Cement Concrete pavement 6-inch thickness sized to accommodate each 8-foot wide by 16-foot long ground control station. The Minimum pad slope shall be provided for drainage but shall not exceed 1-degree (or 1.75% slope). Top of concrete pad shall be a maximum of 3-inch above adjacent ground per airfield criteria.
 - b) **General siting criteria:** Site the four (4) UGCSs in accordance with the UAS Runway Operational Site Survey, Airspace Office direction, and criteria for the UGCSs herein. UGCSs, if clustered, shall be a minimum of 10 to 20-foot apart each with individual grounds. Ideal siting would be as close to the hangar facility as possible for ease of personnel access while meeting UAS Runway Operational Site survey requirements and airfield clear zone criteria. Line of sight from the UGCS to the aircraft/airfield is preferred but not required.

- c) **Site Expansion:** Site the UGCS farm to allow additional operational site development. Allow room for two (2) additional UGCS pads.
- 2) **GFGI Universal Ground Data Terminal (UGDT):** Provisions for siting locations for four (4) UGDT/tower trailer units will be provided per each hangar facility per company. UGDT may be sited with or without an accompanying tower trailer assembly. Type of siting shall be coordinated with the official UAS Runway Operational Site Survey, the Installation Airspace Office (AT&A), and USACE COS-CESAM office.
- a) **Siting:** UGDTs shall have line of sight (LOS) to aircraft when the UGCS receives control of the aircraft and can maintain LOS through the airspace/ground area that has been assigned. The UGDTs shall be located outside of limits of Lateral Clear Zone as well as transitional surface. For multiuse airfields the lateral clearance requirement for the most stringent aircraft shall apply. UGDT pads elevations shall be within 5 to 8-foot of runway centerline elevation normal to the pad location. UGDTs shall have a minimum separation of 125-foot (optimum 150-foot) between UGDTs provided the operators ensure the two antennas do not directly point at each other otherwise a minimum separation of 1500-foot is required. UGDTs shall be cable hardwired to each operational UGCS. A safety zone of 20-foot shall be provided around UGDT. UGDTs shall not penetrate the transitional surface when operationally extended.
 - b) **GFGI UGDT Tower Trailer Assembly Siting:** When UGDT Tower Trailer Assemblies will be provided for each operational UGDT siting of UGDTs shall be adjusted as defined as herein. UGDTs and trailer towers siting shall be coordinated with the official UAS Runway Operational Site Survey and the Installation Airspace Office. Height of the UGDT tower assembly when extended is per the current manufacturer's specification. Manufacturer's specifications information will be provided by PM-UAS office. Siting shall not penetrate the transitional surfaces when extended to operational height. Provide a graded pad with a minimum of thirty-foot (30') diameter. Provide 150-foot optimum / 125-foot minimum clearance between UGDT towers. Pad shall be compacted graded for minimum drainage but shall not exceed 4-percent slope. Pad surface may be either compacted graded crushed aggregate surface material or rigid pavement. When elevated the maximum lookdown angle is 5-degrees or 8.75 percent (aircraft must be located 11.43-foot from UGDT for each foot of height of UGDT between antenna and aircraft). A safety zone equal to the height of tower and equipment shall be provided. . Typical and trailer assembly currently used is the Spawar Tower. See Attachment B for typical tower and equipment information. This is provided for information only.
- 3) **GFGI Satellite Ground Data Terminal (SGDT) Unit:** In general provide clear view of south horizon as specified in PM-UAS site survey. Provide a crushed aggregate surfaced pad 30-foot by 35-foot pad for the SGDT. Provide clear zone around pad of 78-foot.

G. CENTER OF EXPERTISE AIRFIELD CLEARANCE REVIEW:

The designer is required to submit all design drawing, specifications, calculations and design analysis of the airfield to the Transportation Systems Center (TSC) for airfield clearances review. All comments from the TSC must be incorporated into the design in order to obtain final government approval of construction documents. The designer shall contact the TSC as early as possible to establish a design and review schedule to minimize impact on the project schedule. The government will pay the review fee required by the TSC. Points of contact for the TSC are as follow:

Position: Transportation Systems Center
 Address: 1616 Capitol Ave.
 Omaha, NE 68102
 Website: <https://transportation.erd.c.dren.mil/tsmcx/>
 DESIGN REVIEW

H. MISCELLANEOUS SITE WORK:

- 1) **Fencing:** Provide fencing that meets current and applicable AT/FP criteria, physical security, safety, obstruction, and airspace boundary regulations per AR 95-2 as well as a 40-foot minimum wide gate as shown on Attachment A *Schematic Plans*, Drawing Sheet C-102.
- 2) **Bollards:** Provide pipe bollards at the buildings listed in the Primary Facility and at the miscellaneous site equipment specific to UAS. These pipe bollards shall be located at all vehicle door openings and building corners where frequent vehicle access/egress increases the risk of damage by vehicle impact. These pipe bollards shall be placed not to impede any clear door opening and are to be galvanized steel, schedule 80, concrete filled and painted safety yellow. Bollard footings shall be designed to withstand organizational vehicular impact. Locate and provide the appropriate bollard size as follows:
 - At the Allied Shop and where the ATLAS forklift will typically be used, provide twelve (12)-inch diameter bollards by five-foot high.
 - At the hangar door, provide bollard type per the Installation Design Guide.
 - At all free standing utility stands and other miscellaneous equipment. Provide four (4)-inch diameter bollards by four-foot high.

3.4. SITE AND LANDSCAPE REQUIREMENTS

Free standing storage buildings located outside and adjacent to the hangar for miscellaneous shipping containers and storage. See Paragraph 2.1. Table 1 for size.

A. SITE STRUCTURES: Exterior Storage and Support Buildings

- 1) **Aircraft Container Storage Shed** (Category Code 44222 or 44224 depending upon the climate):

Provide a stand-alone roofed structure for the storage of nine (9) UAS aircraft transportation containers and nine (9) propeller cases adjacent to the hangar building. Of the nine containers, five (5) will be fully loaded with aircraft and four (4) will be empty. Location of this storage shed is to be verified with the fire protection requirements. At locations with extreme weather conditions, this storage shed is to be a fully enclosed, weather tight, conditioned, and insulated structure with doors. See the following table for temperature extremes. At this shed provide weatherproof GFI convenience receptacles. The ceiling clearance for this shed is no less than 12-foot.

Container Sizes	Container Weight	Extreme Temperature Conditions
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Aircraft Container 95"H x 52"W x 378" L	Loaded Container 7,100 lbs (estimated)	Empty Container 6,460 lbs (estimated)	High Temp +160F (71°C)	Low Temp -28F (-33°C)
Propeller Cases 69" L x 85"W x 37" H (Note: These cases may be stacked two high)	Loaded Container 450 lbs (estimated)	Empty Container 900 lbs (estimated)		

2) POL Storage Building (Category Code 21470):

Provide a compliant standalone prefabricated structure. This structure is for temporary storage of used lubricants, flammable solvents, and dry sweep.

3) Hazardous Material Storage Building (Category Code 21470):

Provide a compliant standalone prefabricated structure. This structure is for storage drums of hazardous materials within a prefabricated facility outside of the hangar.

4) Fire Protection Pump House (Category Code 89144):

If required, provide a fire pump house based on an estimated fire water demand of 5,500 gpm.

5) Water Storage Tanks:

If required, provide water storage capacity for an estimated 400,000 gallons.

B. SITE UTILITIES:

1) **Oil-Water Separator System:**

Provide drains in the hangar bay spaces or shops/storage rooms tied to either the facilities industrial sewer, or to an oil/water separator, or to a collection system that will capture and hold these materials for proper disposal. Drainage from interior hangar door trench drains shall be included in this system. Design in accordance with all applicable environmental codes. Coordination of the collection system is required with the base or station to determine the size of the collection system based on the frequency of evacuating it (weekly, bi-monthly, monthly, etc.), volume of potential liquid spill, and the size of the site where it is to be located.

The design of the separator system will account for the normal peak demand from the trench drains, shop sinks, and hand wash stations designed in accordance with ETL 1110-3-466. Operational effects of the fire protection system per ETL 1110-3-481 shall be bypassed from oil-water separator system in accordance with ETL 1110-3-481 and NFPA 409.

C. LANDSCAPING\HARDSCAPING:

Turf vegetation as per the Installation Design Guide. No irrigation is to be required.

3.5. ARCHITECTURAL REQUIREMENTS

A. GENERAL:

Building construction, materials and finishes shall comply with the latest UFC 3-101-01 *Architecture*, UFC 4-211-01 *Aircraft Maintenance Hangars*, UFC 4-010-01, *DoD Minimum Antiterrorism Standards for Buildings*, IBC, and NFPA 101 requirements. Interior and exterior architectural features of the facility shall be designed in accordance with the established Installation Design Guide.

B. WALLS AND PARTITIONS:

Exterior and Interior Walls and partitions shall be in accordance with UFC 4-211-01.,

1) Exterior Walls:

- a) **Hangar Maintenance Bay Walls:** The interior face of the wall finish from the required minimum specified in UFC 4-211-01 to the top of each wall shall be moisture resistant metal liner panels solid or perforated. Painted or prefinished.
- b) **Fire Protection Pump House (Category Code 89144):** If this building is included, the exterior walls are to match the hangar and adjacent buildings.

2) Interior Partitions:

- a) **Hangar Demising Wall, Allied Shop, Bench Stock, and Lockers Rooms:** For the protection against incidental damage caused by the movement of aircraft parts, fixtures, and equipment the lower portion of all partitions shall be constructed of a durable, impact resistant, corrosive resistant CMU or approved equal material finished with a low maintenance paint. At the hangar demising wall, this partition type shall be CMU or concrete and shall extend from the first finished floor elevation to the second floor elevation. See UFC 4-211-01 for Internal Fire Rated Separations and Paragraph 3.6.D in this Standard Design for structure. At the Allied Shop and Bench Stock rooms this durable material shall extend from the finished floor elevation to a minimum of 8'-8" above. The walls from this elevation to the structure above may be a light gauge frame finished in gypsum board.
- b) **Secured Storage:** The minimum acceptable wall construction permissible is impact resistant gypsum board with metal lath backing on metal studs. All walls to go to structure above.
- c) **Restrooms:** Ceramic tile / porcelain tile from the finished floor elevation to no less than 5'10" AFF (Utilize water resistant/ mold resistant cement board backer board).
- d) **Showers:** Ceramic tile / porcelain tile (Utilize cement backer board or moisture resistant gypsum board).
- e) **Offices, Training Room, Briefing Room and Conference Room:** Non-load bearing partitions to the greatest extent possible. Painted gypsum board finish unless otherwise noted.
- f) **Corridors, Vestibules, Stairs and Other Auxiliary Spaces:** Non-load bearing partitions in office areas to the greatest extent possible. Painted gypsum board finish unless otherwise noted. CMU walls at corridors adjacent to the Allied Shop and Storage spaces that are due to receive incidental damage caused by moving large parts by hand trucks, pallet jacks, and/or forklifts. These CMU walls are to extend from finished floor to structure above. CMU walls at each stair and elevator shaft walls.

C. FLOORS:

- 1) **Floor Elevations:** The second floor elevation of the hangar support area to include the TA-50 Gear Storage, Flight Op and Planning, Briefing, Training, Flight Platoon, and Company Operations rooms shall be no less than 15'-9" above the first floor elevation.
- 2) **Floor Slope:** See UFC 4-211-01 and Paragraph of this Standard Design.
- 3) **Floor Finishes and Markings:** See Paragraph 3.5.1.B.1) for floor finishes and Paragraph 3.5.1.B.3 for markings.

D. ROOF SYSTEM:

To be in accordance with the Installation Design Guide and UFC 4-211-01. The highest roof obstruction is to comply with lateral clearance criteria as defined in UFC 3-260-01. Avoid skylights over the hangar floor area and other rooftop penetrations to the greatest extent possible. Coordinate walkways with end user.

E. CEILINGS:

Ceilings are to be either painted exposed structure, acoustical ceiling tile or painted gypsum board as follows and as shown in the Adapt-Build model. The listed ceiling height is from the floor finish below to either the ceiling finish above or to the underside of any suspended fixture or equipment.

- 1) **Hangar and Shop Spaces (unless otherwise noted):** Paint exposed structure. Minimum ceiling height of 11'-6" in the Allied Shop and Bench Stock spaces.
- 2) **Secured Storage Room:** Painted exposed structure. Minimum ceiling height of 14'-0" AFF.
- 3) **Offices:** Acoustical ceiling tile with a minimum ceiling height of 9'-0" AFF.
- 4) **Briefing Room:** Acoustical ceiling tile with a minimum ceiling height of 12'-0" AFF.
- 5) **Training Room and Flight Simulator Room:** Acoustical ceiling tile with a minimum ceiling height of 10'-0" AFF.
- 6) **Restrooms & Lockers and Showers:** Moisture-resistant acoustical tile or moisture-resistant gypsum board-painted. Where acoustical tile is used, extend perimeter walls to ceiling/roof above. Ceiling height a minimum of 8'-0" AFF.
- 7) **Corridors:** Acoustical ceiling tile with a minimum ceiling height of 9'-0" AFF.
- 8) **Vestibules:** Acoustical ceiling tile with hold-down clips or painted gypsum board.
- 9) **Auxiliary Spaces:** Acoustical ceiling tile, or painted gypsum wall board.

F. DOORS AND FRAMES:

Doors and door frames assemblies are to comply with UFC 3-600-01 *Fire Protection Engineering for Facilities* and UFC 4-010-01, *DoD Minimum Antiterrorism Standards for Buildings* where required.

- 1) **Hangar Door System:** The hangar door system is to completely clear the doorway at a height of 20 feet above the finished floor (AFF) and a clear width of 76-foot 4-inches. See Paragraph 3.6.C. for structural requirements.

- 2) **Service Doors:** Insulated metal motorized overhead coiling doors. Coiling doors to have a clear opening height of 10'-0" high minimum by 10'-0" wide minimum in the Allied Shop and Bench Stock/Technical Supply. Provide automatic fire door closing hardware at door in hangar wall as required by code.
- 3) **Exterior Insulated Hollow Metal Personnel Doors & Frames:** Painted insulated hollow metal as per UFC 4-211-01.. Doors to the hangar floor and to corridors are to include a vision panel.
- 4) **Exterior Aluminum Personnel Doors:** Located at hangars main entrance. See UFC 4-211-01 for type and construction.
- 5) **Interior Personnel Doors & Frames:** Doors are to be hollow core metal, insulated metal, or solid core wood doors. Doors to the first floor Allied Shop and Bench Stock Storage are to be hollow core metal. Doors to the first floor offices to be hollow core metal. Doors on the second floor in the Administrative spaces are to be solid core wood. Doors to service stairways are to be hollow core metal. Doors from the hangar floor to the offices & shop spaces as well as doors to stairways are to include a vision panel with fire-rated glazing. See para. 3.2.1.B for rooms to receive wider than standard personnel doors. See UFC 4-211-01 for Physical Performance levels, types and grades.
- 6) **Arms Vault Door:** For the Company Operations Arms Vault provide a GSA approved Class 5 Armory vault door with a Dutch style day gate with an issue port.
- 7) **Hardware:**
 - a) **Door Hardware:** See UFC 4-211-01 for hardware ANSI/BHMA grade requirements. The Arms Vault door is to receive a X09 lock in accordance with Fed. Spec. AA-D-600D. The Secured Storage door is to receive a deadbolt with a one inch throw and a set of top and bottom door bolts for the inactive leaf.
 - b) **Robe Hooks:** Provide robe hook near the first floor showers and restroom locker areas.
 - c) **Electronic Key Card Access System:** Prep doors and frames requiring an electronic access system in accordance with the Installation Physical Security Office and as per Security Infrastructure Systems Paragraph 3.9.F.
 - d) **Non-Destructive Emergency Access System (KNOX Box):** Telecom and security room doors are to be prepped as noted in Security Infrastructure Systems Paragraph 3.9.G.

G. **WINDOWS:**

Window frames and glazing assemblies are to comply with UFC 4-211-0, UFC 3-600-01 and UFC 4-010-01 where required.

- 1) **Storefront/Curtain Walls and Exterior Windows:** Provide aluminum, thermally broken, pre-finished with Polyvinyl Fluoride (PVF) systems. Glazing must be with tinted, low-e glass.
- 2) **Natural Lighting and Ventilation:**
 - a) **Hangar Floor Area and Shop Space:** Provide High-Bay aluminum windows, clerestory windows, or insulated translucent wall systems and avoid skylights over the hangar floor area where possible. For spaces to receive view windows provide fixed hollow metal frames with fire or safety glazing at interior fire-rated partitions as required by code. The spaces to receive these view windows are noted in Paragraph 3.2.1.B and shown in Attachment A – *Schematic Plans*.
 - b) **Office Spaces:** Provide windows for natural lighting and ventilation in all shop, offices, and TA-50 Gear Storage to the greatest extent possible. All operable windows to have locks and insect screens.

H. ACOUSTICAL REQUIREMENTS:

Provide sound insulation in all administration areas to meet a minimum rating at walls and ceiling assemblies of STC 53 in the conference room, classroom and briefing room, STC 50 in restrooms and showers, STC 45 in private offices, stairways, and elevator shafts, STC 39 in open offices, and a rating of no less than STC 33 for doors in a metal frame assemblies.

I. ELEVATOR/CONVEYING SYSTEMS:

The passenger elevator is to be ABA accessible and is to be rated for a load of 2500 lbs. The fire protection features of the elevator, hoist ways, machine room, and lobby as required by UFC 3-600-1.

3.5.1. FINISHES AND INTERIOR SPECIALTIES

A. GENERAL

Interior Design, materials and finishes shall comply with the latest UFC 3-120-10 *Interior Design*, UFC 4-211-01 *Aircraft Maintenance Hangars*, IBC, and NFPA 101 requirements. Interior features of the facility shall be designed in accordance with the established Installation Design Guide.

B. INTERIOR FINISHES:

Select interior finishes that are durable, impact resistant to maintenance spaces, and attractive, economical, and low maintenance to office spaces.

1) Floors:

- a) **Hangar and Allied Shop floors:** See UFC 4-211-01 for Fuel Resistive Resinous Floor Coating system, The color of the finish is to be light gray.
- b) **Restroom floors:** ceramic tile / porcelain tile.
- c) **Shower floors:** ceramic tile
- d) **Office floors:** carpet tile on the second floor and luxury vinyl tile on the first floor.
- e) **Corridors / Vestibules:** Porcelain tile in common corridors on the first floor, luxury vinyl tile on the second floor and concrete sealer in the Allied Shop/Bench Stock corridor. Porcelain tile in the main building's entrance vestibule.
- f) **Bench Stock and Other auxiliary spaces:** Sealed concrete.

2) Walls: See UFC 4-211-01 for wall finishes.

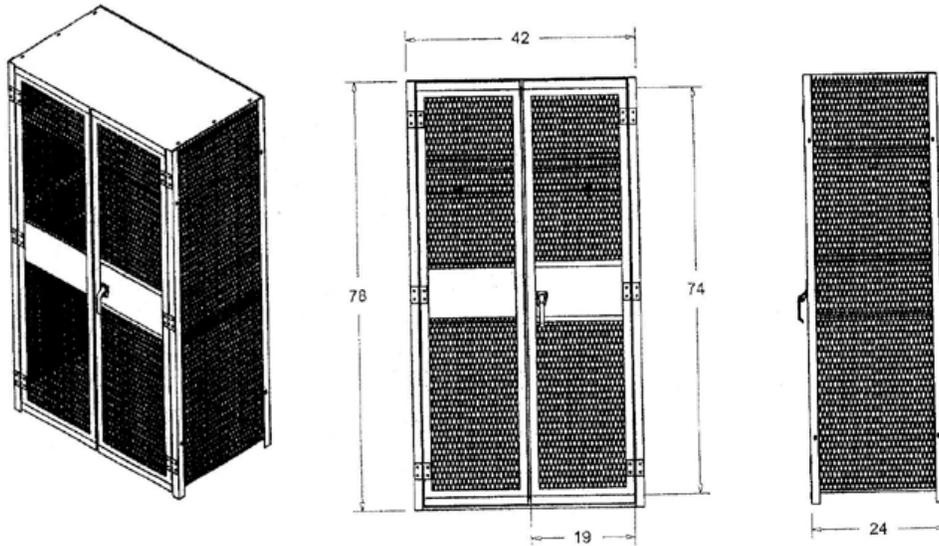
3) Wall and Floor Markings: Provide safety markings on vertical surfaces and floor markings on horizontal surfaces to the hangar floor, shop spaces and at all hazardous equipment areas in accordance with UFC 4-211-01 and as shown on the Schematic Floor Plan, Attachment A.

4) Wall Bases

- a) **Hangar:** Painted CMU
- b) **Shop Spaces:** Painted CMU/Rubber base
- c) **Restrooms:** Ceramic tile, porcelain tile
- d) **Showers:** Ceramic tile
- e) **Offices / corridors, Vestibules:** Rubber base
- f) **Other auxiliary spaces:** Rubber base

C. INTERIOR SPECIALITIES:

- 1) **Marker boards:** Liquid writing marker boards. Prefer these marker boards to be magnetic.
- 2) **Bulletin boards:** Bulletin boards shall consist of a natural cork tack board with aluminum tubular frame.
- 3) **Signage:** Comply with requirements of UFC 3-120-01, UFC 4-211-01, and ABA Accessibility Standards. Fully integrate interior signage as a design element with the architecture and interior design.
- 4) **Millwork:** Provide built-in accessories, shelves, benches, worktops, and countertops in spaces noted throughout Paragraph 3.2.1. Cabinets to be of custom quality in visible areas and of economy quality in non-visible areas in accordance with the Architectural Woodwork Institute (AWI). Countertops are to be impact resistant and of a solid composite material. Locker Room benches shall be solid oak wood with natural finishes anchored to the floor and wall with structural supports. The Flight Planning Room to receive map storage casework below counter and wall cabinet and base cabinet in the second floor Company Commanders Suite.
- 5) **TA-50 Storage Lockers:** Lockers shall be in the second floor TA-50 Gear Storage Room with size and appearance similar to that shown below. TA-50 lockers shall be single tier, heavy duty; all welded ventilated type and meet the following minimum requirements:
 - a) **Locker Construction:** All tops, bottoms, and shelves shall be constructed of minimum 16 gauge thick cold rolled sheet steel. All sides, intermediate partitions, and backs shall be constructed of minimum 14 gauge flattened expanded metal or perforated metal with a minimum free area of 50%, welded to angle iron frames. Frames shall be constructed of minimum 1" X 1" X 1/8" angle iron steel. Thickness of metal and details of assembly and supports shall provide strength and stiffness.
 - b) **Locker Doors:** Double doors shall have a three-point three-sided cremone latch and shall be pad lockable. Doors shall be hinged with minimum five knuckle heavy duty steel pin butt hinges welded to both door and locker frame – provide three hinges per single tier door.
 - c) **Accessories:** Each locker shall include: one aluminum number plate (numbered in sequential order), one full width shelf located 12" from the top with clothes hangar rod and three locker hooks mounted below.
 - d) **Finish:** Lockers shall be galvanized and coated with a high quality durable finish with color to be manufacturer's standard tan or gray.
 - e) **Installation:** Locker shall be anchored to concrete floor in accordance with manufacturer's recommendations. Maintain an eight (8) foot clearance between locker rows.



3.6. STRUCTURAL REQUIREMENTS

A. GENERAL:

Comply with UFC 1-200-01 (*General Building Requirements*), UFC 3-301-01 (*Structural Engineering*), and UFC 4-211-01 (*Aircraft Maintenance Hangars*) except as clarified by this Standard Design document.

B. DESIGN LOADS:

Use UFC 3-301-01, *Structural Engineering*, for structural-specific design and loading requirements. Use UFC 4-211-01, *Aircraft Maintenance Hangars* for facility-type specific design and loading requirements.

- 1) **Foundations:** The UAS Hangar foundation design shall be appropriate for the geology of the site.
 - a) **Primary Spaces and Common Areas:** The Aircraft Maintenance Bay structure and the Office/Shop/Storage Area structure shall be designed as separate structures sharing a common foundation. The movement of the Aircraft Maintenance Bay structure framing shall not be perceptible to occupants in the Office/Shop/Storage structure. This applies to motion caused by wind, cranes, door operations, vehicular movement or similar loads.
 - b) **Exterior Storage and Support Buildings:**
 - The Aircraft Container Storage Shed is typically founded upon a shallow foundation system.
 - The POL and Hazardous Material Storage Buildings are typically pre-fabricated buildings delivered and set on concrete pads adjacent to the PCC hardstand area. The concrete pads are typically flush with the surface of the adjacent PCC hardstand pavement. The size of the concrete pads shall be coordinated with the building size specified.
- 2) **Slabs-On-Ground:** Design in accordance with UFC 4-211-01, *Aircraft Maintenance Hangars*.
- 3) **Wind Loads:**
 - a) **Aircraft Maintenance Bay:** The Aircraft Maintenance Bay structure shall be designed to resist the wind loads determined in accordance with paragraph 2-1.5.2 of UFC 3-301-01.
 - b) **Other Primary Spaces:** The Office/Shop/Storage structure adjacent to the Aircraft Maintenance Bay shall be designed to resist the wind loads determined in accordance with UFC 3-301-01.

4) **Bridge Crane Loads:**

- a) **General:** The Aircraft Maintenance Bay structure shall be designed to support a five (5) ton bridge crane. The bridge crane is typically supported from multiple runway beams hung from the roof structure above. See Paragraph 3.2.1.B.1)g) for the minimum hook height and hook coverage area.
- b) **Additional Loading:** The roof structural framing shall be designed to accommodate the additional loading from the required periodic load testing of the overhead bridge crane. The crane runway support framing shall be designed to limit deflections to a maximum of L/450. All crane hardware and lifted loads shall be treated as live loads in the load combinations defined in ASCE 7, except for patented tracks, tracks, supports, sway braces, and similar elements which are immobile and may be defined as dead loads.

C. **AIRCRAFT HANGAR DOOR SYSTEM:**

Provide a Vertical Lift Fabric Door System or a Horizontal Steel Sliding Door System in accordance with UFC 4-211-01, *Aircraft Maintenance Hangars*. See Paragraph 3.5.1.F.1) for acceptable hangar door size.

D. **HANGAR SUPERSTRUCTURE:**

- 1) **General Configuration:** Design in accordance with UFC 4-211-01, *Aircraft Maintenance Hangars*.
 - a) **Isolation Joint:** The Aircraft Maintenance Bay superstructure shall be isolated from the Office/Shop/Storage Area superstructure through the use of a building isolation joint.
 - b) **Demising Wall:** The Office/Shop/Storage areas must be separated from the adjacent Aircraft Maintenance Bay by a fire rated wall constructed in accordance with UFC 4-211-01, *Aircraft Maintenance Hangars*.
 - c) **Structural Bracing:** Structural bracing shall be located so as not to impair functionality of facility areas. Exposed structural bracing shall not be permitted in office areas without prior COS approval.
- 2) **ATFP Requirements:**
 - a) **Aircraft Maintenance Bay:** The Aircraft Maintenance Bay shall be treated as a “low occupancy building” for considerations of UFC 4-010-01, DoD Minimum Antiterrorism Standards for Buildings.
 - b) **Other Primary Spaces:** The Office/Shop/Storage Area shall be treated as a “primary gathering building”.

3.7. THERMAL PERFORMANCE:

Thermal performance is required per Paragraph 5.6 of the MILCON Requirements and Standardization Integration (MRSI) Adapt-Build Criteria Document. As noted in Paragraph 5.6.2 all areas are to be tested for building air tightness. However, due to the large hangar door, air tightness testing is not required in the hangar floor area. Even without the testing of this space, the construction documents are to include specifications and drawing details of all air barrier components of each envelope assembly to include joints, interconnections and penetrations of the air barrier components appropriate for a heated space.

3.8. PLUMBING REQUIREMENTS:

Provide plumbing design in accordance with UFC 3-420-01 PLUMBING SYSTEMS and the International Plumbing Code.

A. WALL HYDRANTS:

- 1) **Exterior Hydrants:** Provide freeze proof wall hydrants around perimeter of building. Wall hydrants shall have a maximum spacing of 100 feet. Provide freeze proof exterior yard hydrants in mechanical yards containing chillers, condensers, condensing unit, and cooling towers. All hydrants shall be provided with a vacuum breaker to prevent back flow.
- 2) **Interior Wall Hydrants:** Provide a wall hydrant in all mechanical rooms and one in the Allied Shop. All hydrants shall be provided with a vacuum breaker to prevent back flow.

B. DOMESTIC HOT WATER SYSTEM:

- 1) **Location And Sizing:** Locate the main water heating equipment within a mechanical room, on the ground floor level only. Instantaneous water heaters are permissible for remote fixtures. Size system storage and recovery for delivery of hot water at every shower head over a continuous operation of all heads for a duration of 90 minutes. Usage diversity factor for the showers shall be one. Determine the energy source for the domestic water heating system by Life Cycle Cost Analysis.
- 2) **Solar Water Heating:** If life-cycle cost effective, provide 30% of hot water demand with solar water heating or other renewable energy source in accordance with UFC 2-200-2.

C. SINKS & LAVATORIES:

- 1) **Janitors Sink** Provide corner floor mounted terrazzo mop receptor in each janitor's closet. Mop receptor shall be provided with stainless steel rim guards and service faucet with vacuum breaker and pale hook. Both hot and cold water shall be provided to the sink.
- 2) **Breakroom Sink:** Provide 18 gauge double bowl stainless steel sink in all Break areas. Faucet shall be single control goose neck type. Both hot and cold water shall be provided to the sink.
- 3) **Lavatories:** Provide lavatories in the men's and women's restrooms per requirements of the International Plumbing Code. Counter top lavatories shall be under mount vitreous china or integral to the counter top. Faucets shall be low flow, sensor controlled type. Coordinate the use of battery power or electrical supply faucets with the base requirements.
- 4) **Shop Sink:** Provide single compartment stainless steel sink in the Allied Shop. Compartment size shall be 24" long, 21" wide and 14" deep with a single 18" wide drain board. Sink shall be constructed of 16 gauge 304 stainless steel. Provided foot operated faucet with hot and cold water. Drain from sink shall not be connected to main sanitary. Connection shall be to an oil/water separator or storage tank.
- 5) **Urinals:** Urinals shall be wall mounted, water use, sensor flush type with a maximum flow rate of 0.125 gallons per flush cycle. Coordinate the use of battery power or electrical supply faucets with the base requirements.

- 6) **Toilets:** Toilets shall be wall mounted, tank-less, sensor flush type with a maximum flow rate of 1.25 gallons per flush cycle. Coordinate the use of battery power or electrical supply faucets with the base requirements.
- 7) **Mud Sinks:** Provide mud wash utility sinks with single lever goose neck faucet with cold water connection. Provide an under sink sediment trap. Convey waste to exterior oil/water separator prior to discharge to the sanitary sewer system. Provide one but not more than three sinks, one for every 50 soldiers.
- 8) **Hand Wash Station:** Provide a 36" semi-circular 3 station hand wash fountain in hangar with foot operated control bar. Supply hand wash fountain with tempered water.
- 9) **Drinking Fountains:** Provide drinking fountains with bottle fill attachment as required.

D. **EMERGENCY EYEWASHES/SHOWERS:**

Provide eye wash-and emergency eye wash/shower in the hangar, shop, and bench stock areas. Locate emergency eye wash and showers stations in accordance with OSHA standard 1910.151(c) and ANSI Z358.1. Do not locate showers in hangar's 5 foot safety lanes. Tankless electric water heaters may be used to supply tempered water to emergency eye wash. Emergency showers shall have hot water piped to them from the main storage water heating system and circulated if over 50 feet in developed length from water heaters. Floor drains are not required at emergency shower locations. Since hazardous materials are used in the aircraft maintenance process, if floor drains are provided in hangar and shop spaces for the emergency showers stations they must be tied to either the stations industrial sewer or to a collection system that will capture and hold these materials for proper disposal.

E. **TRENCH DRAINS:**

Trench drains primarily serve to remove fluids spills and prevent puddles from forming on the hangar floor. Provide trench drains in the hangar bay to comply with NFPA 409 floor drainage requirements, except as modified by UFC 4-211-01, for the removal of hazardous fuels and fire suppression system discharges. Trench drains may also be used to convey compressed air and water service lines to support other operational functions of the maintenance hangar. Size trench drains to account for a 15 minutes flow of the overhead sprinkler system in the hangar bay and the hose stream demand. Do not include the Hi-Ex foam system fire water flow. The trench drain system shall be designed to allow the aircraft movement without posing a risk to the tire/wheel assemblies. Keep small openings to a maximum of one (1) inch in size. For the hangar trench drains provide:

- Provide ductile iron or galvanized steel trench covers, manufactured to withstand a minimum proof-load of 50,000 pounds from a tire with a 250 psi pressure or the most critical of the aircraft wheel loads listed in this UFC whichever is greater. .
- A bypass valve to divert fire suppression effluent from entering oil/water separator to the effluent capture tanks. Suppression effluent tanks shall have a minimum of 25,000 gallons of storage capacity. Bypass valve shall be actuated by the fire detection system to automatically divert drainage to the effluent tank upon actuation of any hangar fire suppression system.

F. **HANGAR DOOR SURFACE DRAINS:**

For a horizontal sliding hangar door assembly, the rail support system is to include surface drains. The maximum drain spacing is 20 feet apart. Drainage shall be directed to an interior or exterior collection system and routed to the trench system. Space drains so to avoid locating drains in-line with the aircraft landing gear.

G. COMPRESSED AIR:

Provide a duplex horizontally mounted reciprocating air compressor. The air compressor shall be a minimum of 20HP (2-10hp compressor) and have a minimum free air delivery capacity of 65 cfm's at 175 psig. Provide compressor with lead-lag control, dual pressure switches and alternators, air cooled after coolers, low oil level shutdown, automatic tank drain, simultaneous compressor operation and auto start/stop capability through the DDC system. Provide air compressor with a minimum 200 gallon integral horizontal air storage tank, a compressed air dryer capable of producing a minimum 50 degree F dew point, an isolation valve, filters and a pressure regulator. Provide compressed air outlets with four quick disconnect couplings in shop area and two quick disconnects at utility stand drops. Each drop (one drop per aircraft utility stand and three drops per shop) shall include an isolation valve, filter, pressure regulator and condensate trap with drain cock. Size each compressed air drop to accommodate 20 SCFM at 100 psig. The air compressor shall be installed building equipment.

3.9. COMMUNICATIONS AND SECURITY SYSTEMS

A. GENERAL:

Coordinate all telecommunications with COR and NEC during the design process. NEC must be informed of required inspections before walls or ceilings are closed that house classified pathways. At least a minimum 5 business days must be given for scheduling purposes. A Communications QA must be assigned to the project to provide with assisting in the Quality Assurance. The Contractor shall assume responsibility for ensuring that the communications systems shall be constructed IAW with all applicable criteria listed in the military criteria list. An electronic copy of all test results shall be provided to NEC. An As-built copy of communication pathways must be turned over at the time the building is turned over.

1) **Installation wide area network system (WAN):**

Connect the facility to the Installation wide area network system (WAN) and voice systems. Allocate communications system resources IAW UFC 3-580-01 regarding outlet amounts based on the functionality of the facility's various component floor spaces. Design in accordance with UFC 3-580-01.

2) **Cabling System:**

An acceptable building telecommunications cabling system encompasses, but is not limited to, copper and fiber optic (FO) entrance cable, termination equipment, copper and fiber backbone cable, copper and/or fiber horizontal distribution cable, workstation outlets, racks, cable management, patch panels, cable tray, cable ladder, grounding, and labeling. Provide telecommunications outlets per UFC 3-580-01 based on functional purpose of the various spaces within the facility as modified by user special operational requirements. Provide each utility space, such as mechanical, electrical and telecommunications rooms with at least one wall mounted telecommunications outlet, with a wall mounting lug face plate near the entrance door.

3) **Telecommunications Rooms (TR):**

Provide telecommunications rooms (TR) and telecommunications entrance rooms (TER) for unclassified network and voice equipment and cabling infrastructure throughout the facilities. There shall be a minimum of one telecommunications room on each floor, located near the center of the

building, and stacked between floors. Provide one telecommunications entrance capability for each facility in the TER. Size TR's for the area supported and per UFC 3-580-01 requirements. TIA/EIA-569 compliant Telecommunications Enclosures (TE) may be used in hangar areas where the horizontal cable distance exceeds 90 meters.

4) **Outside Plant Telecommunications Systems:**

Connect the project's facilities to the Installation telecommunications (voice and data) system through the outside plant (OSP) underground infrastructure per UFC 3-580-01 requirements. Connect to the OSP cabling system from each facility main cross connect located in the main telecommunications room or telecommunications equipment room to the closest OSP access point. Components include the physical cable plant and the supporting structures. Items included under OSP infrastructure encompass, but are not limited to, maintenance hole and duct infrastructure, copper cable, fiber optic cable (FOC), cross connects, terminations, splices, cable vaults, and copper and FO entrance facilities.

5) **Additional Pathways:**

Provide an empty pathway with pull rope from Flight Ops to the exterior of the facility (roof or side) to support GFGI RF communications systems. Stub out and label below the lay-in ceiling in Flight Ops. Provide weather head and/or required mounting equipment for the RF antenna on the exterior of the facility.

B. **TELECOMMUNICATION SYSTEMS:**

1) **Unclassified Communications:** Provide pre-wired voice and LAN systems throughout the facility to support all workstations, office equipment, audio/video equipment, etc. Homerun each outlet to the nearest telecommunications room (TR). Coordinate additional outlet requirements and locations with Paragraph 3.2.1 of this document and with proposed furniture and equipment layout.

2) **Secure Communications (SIPRNET):** Provide a SIPRNET room in accordance with ICD/ICS 705 Technical Specifications for Construction and Management of Sensitive Compartmented Information Facilities (current version). The SIPRNET room shall be a minimum of 8-foot by 8-foot and have a dedicated HVAC system. The SIPRNET building infrastructure shall use Category 6 UTP copper cables with red cable jacket and red outlet modules unless otherwise directed by the local NEC. Cables shall be terminated in the SIPRNET room and at the outlet in accordance with UFC 3-580-01 criteria for data cables. Provide SIPR drops where indicated in Paragraph 3.2.1. Rooms indicated are not authorized for open storage. Provide a dual channel square type Protective Distribution System (PDS), not EMT conduit.

3) **(IFII) Installation Furnished Installation Installed Gray Eagle UMS Flight Simulator:** Provide one (1) quad data outlet for each flight simulator sled.

C. **COMMUNICATIONS FOR UAS SUPPORT EQUIPMENT:**

Provide additional communications to support exterior onsite and offsite UAS systems and support equipment. Careful coordination with the specific project and site will be required to ensure proper tailoring of requirements. See Paragraph 3.3 F of this document for site criteria and pad requirements. See Schematic Site Plan in Attachment A for reference in routing communications to support equipment and Attachment C for additional equipment communications requirements. Provide exterior utility stand(s) as needed and dictated by the number and/or locations of the equipment listed below. Communications and power receptacles may be mounted on the same stand. See sample exterior utility stand in Attachment C.

1) **Universal Ground Control Station (UGCS) Connections:** Each UGCS requires an FOC connection to the SIPR room in the Hangar via the TER/TR. Each connection shall consist of eight (8) strands SM FOC terminated with ST connectors in a weatherproof enclosure mounted to a utility stand near the UGCS unit(s). The User shall provide the connection from the utility stand connectors to the UGCS units. Provide a 20ft slack loop in the TER. The FOC and connectors must be compatible with the User's down range equipment. Coordinate the FOC and connector specifications with the PM-UAS Office. Additionally, provide an emergency phone at the UGCS pad location mounted to the exterior utility stand in a weatherproof enclosure for communication direct with the Hangar. Provide supporting underground pathways in accordance with UFC 3-580-01. Provide pull ropes in all empty conduits.

2) **Universal Ground Data Terminal (UGDT):** Each GDT requires an FOC connection to one UGCS unit. Each connection shall consist of a hybrid four (4) strand FOC (2-SM, 2-MM) terminated in a four (4) channel hermaphroditic receptacle (Amphenol Fiber Solutions TFOCA-II, Optical Cable Corporation Pierside, or equal) mounted to the utility stand at each end. Label the FOC receptacles at each end with the equipment it connects to; UGCS1, GDT1, etc. The User shall provide the connection from the utility stand receptacles to the GDT/UGCS units. The FOC and receptacles must be compatible with the User's down range equipment. Coordinate the FOC specifications and the receptacle model/keyed arrangement with the PM-UAS Office. Provide a direct buried pathway consisting 4" schedule 40 PVC conduits with inner ducts from the GDT units to the UGCS units. Provide pull ropes in all empty conduits. Provide concrete encasement if/where passing under roadways.

3) **Satellite Ground Data Terminal (SGDT):** The SGDT requires an FOC connection to two (2) UGCS units. Each connection shall consist of a hybrid four (4) strand FOC (2-SM, 2-MM) terminated in a four (4) channel hermaphroditic receptacle (Amphenol Fiber Solutions TFOCA-II, Optical Cable Corporation Pierside, or equal) mounted to the utility stand at each end. Label the FOC receptacles at each end with the equipment it connects to; UGCS1, SGDT1, etc. The User shall provide the connection from the utility stand receptacles to the GDT/UGCS units. The FOC and receptacles must be compatible with the User's down range equipment. Coordinate the FOC specifications and the receptacle model/keyed arrangement with the PM-UAS Office. Provide a direct buried pathway consisting 4" schedule 40 PVC conduit with inner ducts from the SGDT to the UGCS units. Provide pull ropes in all empty conduits. Provide concrete encasement if/where passing under roadways.

D. **CABLE TELEVISION:**

Provide a completely operational CATV cabling system including, but not limited to, all necessary raceways, cabling, terminations, jacks and faceplates will be provided. The horizontal cable for the CATV system will be RG-6 with "F" type connectors on the terminal end. Terminate the CATV cabling on splitters in the telecommunications room, or in a location indicated by the Network Enterprise Center (NEC – formerly the DOIM). CATV riser cable will be RG-11 type. Locate splitters on the CATV backboard in the telecommunications room, or in a location indicated by the NEC. Coordinate CATV drop locations with proposed furniture layouts and Paragraph 3.2.1. Homerun all CATV all drops to the CATV backboard. Coordinate service requirements to the building with the local CATV service provider.

E. **AUDIO/VISUAL SYSTEMS & INFRASTRUCTURE:**

Provide the infrastructure including power and raceways to support all GFGI Audio/Video systems where indicated in Paragraph 3.2.1, Paragraph 3.19 and Table 3 for projectors, sound systems, and video teleconferencing equipment and appliances. Coordinate with the architectural and interior designs.

F. SECURITY SYSTEMS & INFRASTRUCTURE:

Design Secure Access Systems (SAS), Intrusion Detection Systems (IDS), Closed Circuit Television (CCTV) to only provide infrastructure for installation of these systems, unless otherwise specified for Project specific requirements.

- 1) **SAS System:** The SAS shall be designed to provide coverage of the building perimeter outside the airfield fence line, classified spaces and where indicated in Paragraph 3.2.1. Coordinate with the Installation's Physical Security Office the anticipated locations of devices for the installation of a secure access system. Provide raceways, door prep, back boxes, power cables, etc. Designate a programming station location in Production Control.
- 2) **IDS System:** The IDS shall be designed to provide coverage of the classified spaces and where indicated in Paragraph 3.2.1. Coordinate with the Installation's Physical Security Office the anticipated locations of devices required for a complete IDS system. Design raceways, power cables, and back boxes for installation of a complete system.
- 3) **CCTV System:** The CCTV system shall be designed to provide coverage of the building perimeter and hangar apron. Provide additional coverage if/where indicated in Paragraph 3.2.1. Coordinate with the Unit Physical Security Office the anticipated locations of devices required for a complete CCTV system. The design shall be for an IP based system. Provide raceways, back boxes, power cables, fiber optic cables, and monitoring stations in Production Control and Flight Ops.

G. FIRE ALARM & DETECTION:

Provide a fire alarm and detection system in accordance with UFC 4-021-01, UFC 4-211-01, UFC 3-600-01 and NFPA 72. The system shall be fully addressable and compatible with the local Installation wide Fire Alarm Systems. Provide a Non-Destructive Emergency Access System (KNOX Box) **at a location designated by the installation Authority Having Jurisdiction (AHJ)**. All components and circuits in the hangar bay and foam equipment room shall be NEMA 4 rated in accordance with ECB 2015-17

H. MASS NOTIFICATION SYSTEM:

Provide a Mass Notification System in accordance with UFC 4-021-01 Design and O&M: Mass Notification Systems. The system shall be fully compatible with and integrated with the local Installation wide Mass Notification System.

I. CYBERSECURITY:

Provide controls systems which meet or exceed the requirements of UFC 4-010-06; Fire Alarm and Mass Notification (FAMNS), Utility Monitoring Control System (UMCS), Electronic Security System (ESS), etc.

3.10. ELECTRICAL REQUIREMENTS

A. GENERAL:

Design facility power in accordance with UFC 3-501-01, UFC 4-211-01 and NFPA 70. At a minimum provide with the following: 3-phase wye-connected underground secondary service rated at 480VAC with sufficient capacity for future growth; approximately 15% and 25% on 480V and 208V distribution equipment, respectively. Provide surge suppression on all service entrance equipment. Use 480VAC

for mechanical equipment and larger building specific loads. Generally, use 277VAC for lighting. Use dry type step down transformers to provide 208Y/120VAC service for miscellaneous loads. Consider exterior loads, which may vary by site, for each project. Consider some of the following, as applicable: any airfield lighting or taxiway requirements, exterior facility lighting, and power connections for exterior ground support equipment. Careful coordination by the installation, users, COS, and DORs will be required to size incoming service appropriately based upon the type and number of aircraft.

- 1) **Hazardous Locations:** Define and design hazardous classified spaces in accordance with UFC 4-211-01 and NFPA 70 Article 513.

B. **POWER:**

Provide power receptacles per NFPA 70 and in conjunction with all proposed equipment and proposed furniture layouts. Coordinate the furniture type and layout with the electrical design. Provide one duplex receptacle for every 12 feet of wall length in all admin spaces with a minimum of one per wall. No more than six duplex receptacles or three quad receptacles per circuit. Power circuits shall not serve receptacles in multiple spaces or rooms. Provide additional power requirements as specified in the following paragraphs.

- 1) **Aircraft Maintenance Hangar Bay:** Provide one Aircraft Utility Stand for every aircraft parking module. The stands shall be mounted to the hangar bay floor located just inside the five foot clear zone and connections shall be routed up through the slab. See Aircraft Utility Stand requirements below. Provide one GFI 120V/20A quad receptacle for every 25 feet of wall minimum. Provide power receptacles for additional equipment in Paragraph 3.2.1.

Aircraft Utility Stand:

- (1) – 208V/1Φ/20A Receptacles (L6-20R)
- (1) – 208V/3Φ/100A/4-Pole/5-Wire Receptacles (NEMA 5100R9W)
- (1) – 120V/1Φ/20A GFI Quad Receptacles (Double Duplex)
- (1) – Dual Data Outlet
- (2) - Quick Connect Compressed Air Outlets (One Drop)

*See sample stand in Attachment C- *Electrical and Communications Requirements* of this Standard Design.

- 2) **Allied Shop:** Provide a dedicated 208/120V distribution panel to power all equipment and receptacles in each shop. Provide adequate 208V/3Φ/100A/4-pole/5-wire receptacles (NEMA 5100R9W) to allow for coverage of the entire shop when using the 75-foot power cart cord. Provide one GFI 120V/20A quad receptacle for each 15 feet of wall minimum. See additional work bench requirements below. Provide power receptacles for additional equipment in Paragraph 3.2.1.

Allied Shop Workbenches:

- (1) – 208V/1Φ/20A Receptacles (L6-20R)
- (1) – 120V/1Φ/20A GFI Quad Receptacle (Double Duplex)
- (1) – Dual Data/Phone Outlet
- (1) – Quick Connect Compressed Air Outlet

- 3) **(IFII) Installation Furnished Installation Installed Gray Eagle UMS Flight Simulator:** Provide two (2) 120V/20A quad receptacles with each on a dedicated circuit each flight simulator sled.

4) **Telecommunications Room (TR):** Provide one (1) 120V/20A double duplex rack mounted receptacle with each duplex on a dedicated circuit and one (1) 208V/1 Φ /30A (L6-30R) receptacle for each communications rack. Additionally, provide one (1) general-purpose 120V/20A duplex receptacle for each 6 feet of wall space.

5) **Telecommunications Enclosure (TE):** Provide one (1) 120V/20A double duplex receptacle with each duplex on a dedicated circuit for each TE.

6) **Universal Ground Control Station (UGCS) Connections:** There will be UGCS units located on site adjacent to the facility. Provide one 208V/3 Φ /100A/4-Pole/5-Wire receptacle that is "in-use" weatherproof rated for use with the GFGI plug of the UGCS (Hubbell P/N 5100P9W) and one GFI 120V/20A weatherproof rated duplex receptacle for each UGCS location; each on dedicated circuits. Provide exterior utility stand(s) as needed and dictated by the number and/or locations of UGCS's. Provide equipment grounding capability on the stand(s), See sample exterior utility stand in appendix.

7) **Apron Warm-Up Pads:** Provide an Aircraft Utility Stand at each warm-up pad located on the right side of the aircraft. Provide two 208V/3 Φ /100A/4-Pole/5-Wire receptacles that are "in-use" weatherproof rated for use with the GFGI plug of the Hobart Starter Cart (Hubbell P/N 5100P9W), one 208V/1 Φ /20A/ L6-20R weatherproof rated receptacle, and one GFI 120V/20A weatherproof rated duplex receptacle on each stand; each on dedicated circuits. Provide a ground point/rod within 2 to 4-feet of the receptacles.

C. **POWER FOR UAS SUPPORT EQUIPMENT:**

Provide additional power and grounding to support offsite UAS systems and support equipment listed below. Careful coordination with the specific project and site will be required to ensure proper tailoring of requirements. Supporting equipment shall require power from the facility distribution system or a separate primary feed depending on the location. See Paragraph 3.3 F of this document for site criteria and pad requirements. See Schematic Site Plan in Attachment A for reference in routing power to support equipment and Attachment C for additional equipment power requirements. Provide exterior utility stand(s) as needed and dictated by the number and/or locations of the equipment listed below units. Communications and power receptacles may be mounted on the same stand. See sample exterior stand in Attachment C.

1) **Universal Ground Control Station (UGCS) Connections:** As defined in Paragraph 3.3.F.1) there will be UGCS units located offsite away from the hangar facility. Provide one (1) 120/208 VAC, 3-phase, 60 Hertz, 100 Amp circuit with a 208V/3 Φ /100A/4-Pole/5-Wire receptacle that is "in-use" weatherproof rated for use with the GFGI plug of the UGCS (Hubbell P/N HBL5100P9W) and one (1) 120 VAC, 1-phase, 60 Hz, 20 Amp circuit with weatherproof rated GFI duplex receptacle within 35-feet of each unit. Each UGCS unit shall be provided a ground point within 8-feet of unit. Provide a separate ground point within 8-feet of the supporting 30kW emergency backup generator pad for each unit.

2) **Universal Ground Data Terminal (UGDT) & Tower:** There will be one (1) UGDT with tower to support each UGCS discussed above. Provide one (1) 208 VAC, 1-phase, 60 Hz, 30 Amp circuit with a 208V/1 Φ /100A/3-Pole/4-Wire receptacle that is "in-use" weatherproof rated for use with the GFGI plug of the UGDT in Attachment C and one (1) 120 VAC, 1-phase, 60 Hz, 20 Amp circuit with weatherproof rated GFI duplex receptacle within 50-foot of each unit. Provide a ground point within 2 to 4-foot of the tower.

3) **Satellite Ground Data Terminal (SGDT):** Provide one (1) 120/208 VAC, 3-phase, 60 Hz, 60 Amp circuit with a 208V/3 Φ /100A/4-Pole/5-Wire receptacle that is "in-use" weatherproof rated for use with the GFGI plug of the UGCS (Hubbell P/N HBL5100P9W) and (1) one GFI 120V/20A

weatherproof rated GFI duplex receptacle within 50-feet of the unit. Provide a ground point within 2 to 4-feet of the unit.

D. LIGHTING:

The lighting design and levels shall be in accordance with UFC 3-530-01 and UFC 3-535-01. Provide building perimeter, hangar apron, and hangar bay lighting that will be compatible with any future security cameras and security requirements. Provide additional lighting for any/all outbuildings or covered storage spaces. Provide time switch with manual on/off switch controls for any/all apron, outbuilding, and covered storage lighting. Provide interior lighting controls in accordance with UFC 3-530-01. Utilize daylighting where applicable to conserve energy; hangar, shop, etc.

E. LIGHTNING PROTECTION:

Provide a lightning protection system based on a risk assessment analysis in accordance with NFPA 780. Provide the lightning protection system for the facility shall be IAW UFC 3-575-01. Provide a ground counterpoise around the building perimeter for grounding incoming service, building steel, telecommunications service, piping, lightning protection, aircraft static grounding grid, and facility internal grounding requirements (e.g. shop areas).

F. GROUNDING:

Provide a grounding system for the facility shall be IAW UFC 3-575-01. Provide additional grounding based on project-specific requirements and UFC 3-580-01. Aircraft grounding points in the Hangar Floor Area shall be IAW UFC 3-575-01 Paragraph 2-3.3.2 for a "general purpose hangar" (grid with 50 ft max spacing) with grounding receptacles in Figure 2-3. Provide an equipment grounding bar around the perimeter of shops or one at each workbench. Provide ground straps in shop/bench stock where required by function connected to the building grounding system.

G. CATHODIC PROTECTION:

Provide a cathodic protection system for the facility and supporting fire protection systems IAW UFC 3-570-02 and UFC 3-570-06.

3.11. HEATING, VENTILATING AND AIR CONDITIONING (HVAC) REQUIREMENTS:

A. STANDARDS AND CODES:

Comply with the requirements of UFC 3-410-01 and other applicable UFCs. Additional criteria specific to aircraft hangar mechanical systems is included herein.

B. HVAC DESIGN CRITERIA:

Heat gain and loss calculations shall be, as a minimum, in accordance with the ASHRAE Handbook of Fundamental and ASHRAE Standard 183. Computer load calculations shall be provided, and shall include complete input and output summaries. Pre-approved computer load analysis programs are ENERGY PLUS, Trane TRACE, or Carrier HAP. If the designer wishes to use a different load analysis program, the load program shall be specifically listed in the proposal and requires approval by the Contracting Officer's Representative. Inside design conditions shall be based on the data shown in INDOOR DESIGN DATA TABLE below.

3.11.1. HANGAR FLOOR AREAS:

A. DESIGN:

Install heating equipment in accordance with UFC 4-211-01. For the hangar floor areas, consider heating and ventilating units, radiant heating, or some combination of the two. Where overhead radiant heating is provided, design and installation shall comply with applicable provisions of NFPA 409. In colder climates, consider supplemental heating at the floor level or under slab radiant floor heating in the hangar bay aircraft modules. Coordinate system selection with the user. Base the system selection on energy compliance, life cycle cost, reliability, operating considerations, and the maintenance capabilities and resources of the user. Consider all viable alternative systems meeting the functional requirements of the hangar bays.

B. OVERHEAD RADIANT HEAT SYSTEMS:

Overhead radiant heat systems may be either low or high intensity radiant heating. Provide radiant heaters with shielding that shield the heating element or flame from optical flame detectors or heat detectors as required to prevent activation of optical flame detectors or heat detectors and accidental release of the fire suppression system.

C. SNOW/ICE-MELTING SYSTEM:

A snow/ice-melting system at the hangar door tracks, when rolling hangar doors are used, must be installed when outside design temperature is +15°F (-4°C) or lower and when historical snow accumulation data supports the requirement.

3.11.2. ADMINISTRATIVE AREAS:

A. DESIGN:

Conditioning for the administration areas shall be in accordance with UFC 3-401-01 MECHANICAL ENGINEERING. The HVAC distribution system serving the administration areas shall be served by an air-handling unit dedicated to the administration areas only. The design for these spaces should include flexible zoning, such that the system can be modified to address future changes to the mission and occupant densities. Administrative areas shall be temperature-controlled by the DDC system compatible with the existing base systems. Temperature set point adjustment shall be accomplished via DDC System by authorized personnel.

B. COMMUNICATION ROOMS, ARMS VAULT, FLIGHT SIMULATOR ROOM:

Provide dedicated ductless splits type DX equipment for each Communication Room, Arms Vault, Flight Simulator Closet spaces. Provide a dehumidification unit in the Arms Vault capable of maintaining a 45% relative humidity. Internal loads in the Communication Rooms, Arms Vault, and shall be coordinated by the user. The equipment load in the Flight Simulator is 25,000 Btu's.

3.11.3. SHOP AREAS:

Conditioning for shop and bench stock areas shall be in accordance with UFC 3-401-01. The air distribution systems serving the shop area shall be a dedicated air-handling unit to these spaces. Return air from this area shall not be mixed, re-circulated or transferred into the administration spaces.

3.11.4. BUILDING EXHAUST and HANGAR VENTILATION/ EXHAUST SYSTEMS:

Provide building exhaust systems at heat sources, restrooms, locker/shower rooms, break rooms, shop space, and contamination sources, i.e. printer/ copy areas. Exhaust systems will operate continuously while the building is occupied. Route exhaust air through an Energy Recovery Unit if it is shown to be Life Cycle Cost Effective or as required by ASHRAE 189.1. Exhaust systems shall be in accordance with NFPA 90A.

In the hangar, local ventilation should be considered where contaminants are generated; however general ventilation is required in accordance with UFC 4-211-01 paragraph 3-5.3.1.5. Under floor pits, duct, and tunnels shall be ventilated, exhausting 30 air-changes per hour and controlled by a continuous detection system in accordance with NFPA 409.

Ventilation may be operated in economizer cycles for increased thermal comfort where climatic conditions are appropriate. Natural air movement through locating louvers and dampers near the ceiling and floor should be evaluated for life cycle cost effectiveness versus a fan powered economizer cycle. Evaporative cooling is not allowed in Army hangar maintenance bays.

3.11.5. DESIGN CONDITIONS:

A. WEATHER DATA, INDOOR DESIGN CONDITIONS:

Design shall be based on weather data from UFC 3-400-02 for outdoor design conditions. Indoor design conditions shall conform to Indoor Design Data Table below. Indoor air quality shall comply with the current ASHRAE Standard 62.1 and OSHA requirements.

Indoor Design Data Table

HEATING		
Indoor Design Temperature	Admin and Offices –	68°F
	Shop Spaces –	65°F
	Hangar Floor Area–	55°F
	Flight Simulator Room –	68°F max
	Unoccupied Space –	45°F
COOLING		
Indoor Design Temperature	Admin and Offices –	75°to78°F
	Shop Spaces –	78°F
	Hangar –	Ambient (unless conditioned for mission. Then as required for equipment)
	Flight Simulator Room –	65°F min
	Unoccupied Space –	85°F

B. HIGH HUMID AREAS:

In geographical areas of high humidity to prevent mold formation in buildings, air conditioning systems must be designed to maintain space humidity at reasonable levels. Include the following considerations in the design of the air conditioning systems. Avoid over sizing of cooling equipment. Design single zone systems and multi-zone systems to maintain an indoor design condition of 50% relative humidity. Size cooling coils for the greater of the cooling load calculated at the design dry bulb temperature condition or the design humidity condition. Where fan coil units are used, provide a non-permeable wall covering behind the unit. Provide ventilation air from a separate dedicated air handling unit. Do not condition outside air through fan coil units. Avoid the use of direct expansion cooling coils in air handling units with constant running fans that handle outside air.

3.12 ENERGY CONSERVATION REQUIREMENTS:

Energy conservation shall be in accordance with UFC 1-200-2 HIGH PERFORMANCE & SUSTAINABLE BUILDING REQUIREMENTS and as outlined in Paragraph 5, GENERAL TECHNICAL REQUIREMENTS, of the RFP Statement of Work (SOW), subparagraph ENERGY CONSERVATION. An energy efficiency and sustainability study, jointly conducted by the US Army Corps of Engineers and the Department of Energy, has been completed and the draft summary report is available at: <https://mrsi.ercd.dren.mil/sustain>

This report is available to designers as a reference tool to aid in meeting energy conservation mandates and targets. Any measures that exceed the requirements of ASHRAE 189.1 must be justified by a life cycle cost analysis.

3.13 FIRE PROTECTION REQUIREMENTS:

3.13.1 Standards and Codes For Fire Protection Systems.

A. GENERAL:

Provide a fire protection system in accordance with the Standards and Codes in the following paragraphs. The Army's first priority after life safety is to minimize collateral damage to aircraft which would affect full "mission ready" status after a fire incident. Follow aggressive application of Standards and Codes to minimize damage, down-time, clean-up, and return of aircraft to "fully mission capable" readiness state. Aircraft hangar bay shall use a fire suppression system that meets all the following requirements.

B. STANDARDS AND CODES:

Fire protection and life safety features shall meet UFC 3-600-01 *Fire Protection Engineering For Facilities*, UFC 4-211-01 *Aircraft Maintenance Hangars*, Applicable provisions of NFPA 409 *Standard On Aircraft Hangars*, and the additional requirements of this Standard Design. Code references to authority having jurisdiction (AHJ) shall be interpreted to mean the office of responsibility, US Army HQ USACE/CECW-CE.

C. CONFLICTS IN CRITERIA:

If a conflict exists between this Standard Design and any other DOD document, referenced code, standard, or publication, UFC 4-211-01 shall take precedence followed by UFC 3-600-01 and then this Standard Design.

D. FIRE PROTECTION AND LIFE SAFETY ANALYSIS: Provide design documents for Fire Protection as described in Sub Paragraph 3.13.4.A.1)

E. BUILDING SEPARATION DISTANCE:

Separation distances from adjacent structures shall comply with NFPA 409.

F. BUILDING CONSTRUCTION:

- 1) **Allowable Building Height and Area Limitations:** The occupancy type is S-1 for this hangar and shall not exceed the height and area limitations as set forth in IBC.
- 2) **Type of Construction:** Type IIB construction for hangars in accordance with IBC.
- 3) **Separation Wall (Demising Wall):** Internal separation wall between hangar bay areas and non-hangar bay areas shall comply with UFC 4-211-10.

G. EGRESS:

- 1) **Hangar Floor Area:** The means of egress from the aircraft hangar floor area shall be in accordance with UFC 4-211-01 for the Army, NFPA 101 and IBC.
- 2) **Exit Doors:** Intervals between exit doors at hangar exit access corridors and hangar bay exterior doors shall be in accordance with UFC 4-211-01 for the Army.
- 3) **Exit Access Corridor:** All rooms within the office/shop/equipment section shall have at least one exit into an exit access corridor.

3.13.2 ADMINISTRATION AND SHOP AREAS:

A. FIRE SUPPRESSION CRITERIA:

Provide automatic sprinkler systems IAW UFC 3-600-01, applicable NFPA standards, and other requirements contained in this Standard Design-

B. TYPE OF CONSTRUCTION:

Meet the requirements of Paragraphs 1.0 PROJECT OBJECTIVES, IAW UFC 3-600-01 and 3.13 FIRE PROTECTION in this Standard Design.

C. EXTERIOR HOSE STREAMS:

Exterior hose stream demand shall be in accordance with UFC 3-600-01 and NFPA 409. Exterior hose stream demand shall be included in the sprinkler system hydraulic calculations.

D. BACKFLOW PREVENTER:

For fire protection systems using potable water supply provide a back flow preventer in accordance with UFC 3-600-01.

E. FIRE DEPARTMENT CONNECTION:

A fire department connection shall be provided for each building with sprinkler protection. These shall be located so as to be directly accessible to the fire department.

F. ELEVATOR:

The fire protection features of elevators, hoist ways, machine rooms and lobbies shall be in accordance with UFC 3-600-01, ASME A17.1, NFPA 13 and NFPA 72.

G. SEISMIC PROTECTION OF SPRINKLER SYSTEMS:

Sprinkler and fire pump piping systems shall be protected against damage from earthquakes. Seismic protection shall include flexible and rigid couplings sway bracing, seismic separation assemblies where piping crosses building seismic separation joints, and other features as required by NFPA 13 for protection of piping against damage from earthquakes.

3.13.3. AIRCRAFT HANGAR BAY FIRE SUPPRESSION DESIGN REQUIREMENTS:

Design of the fire protection systems for aircraft hangars requires specialized design knowledge and expertise. To assure the adequacy of the design, it is essential that such systems be designed and specified by engineers with extensive experience in the specialized area of aircraft hangar fire protection system design. As such the design engineers shall address crucial consideration affecting the fire protection system design at each design submittal stage. This includes but not limited to water supply systems, proposed types of sprinkler and foam generator systems, foam concentrate proportioning systems, fire detection and controls systems. Of particular importance is the water supply system which must meet the fire system demands. Lessons learned from past designs indicate the need for more comprehensive water demand and water supply analyses. After the initial design submittal, each succeeding submittal should be a further elaboration and refinement of what was previously submitted. Whereas the concept submittal may include only rough approximation of system water demand, the intermediate and final submittals shall include detail hydraulic calculation to confirm that calculated system demands can in fact be met with the existing or proposed water systems. This analysis should be correlated with the design for substantiation of pump selection, pipe sizes, foam generators selections, sprinklers orifice size, etc. The fire protection systems design analysis for the hangar shall be submitted for review at each design submittal stage.

A. FIRE SUPPRESSION DESIGN CRITERIA:

The aircraft hangar fire suppression design shall comply with NFPA 409, Engineering Construction Bulletin UFC 4-211-01 *Aircraft Maintenance Hangars* and UFC 3-600-01 except as modified in this standard. The requirements of this Standard Design govern in the event of a conflict between specific provisions of this Standard Design and applicable NFPA Standards.

B. AIRCRAFT CLASSIFICATION:

The classification of the Aircraft Hangar Bay shall be as described in NFPA 409.

C. PROTECTION OF AIRCRAFT HANGAR BAY:

Provide a combination of an automatic wet sprinkler system(s) and an automatic low level high-expansion foam system (HEF) in accordance with UFC 4-211-01, this Standard Design, and applicable provisions of NFPA 409 specifically referred to herein. No other foam system is allowed.

D. DRAFT CURTAINS:

Draft curtains shall be required. Draft curtain area shall be in accordance with NFPA 409 and not enclosed more than two aircraft service module and shall not exceed 15,000 sqft. Draft curtains shall use structural features of the building in lieu of specially constructed draft curtains provided they meet the dimensional requirements in NFPA 409.

E. INTERIOR HOSE DEMAND:

Do not provide interior hose stations or fire hose connections in the hangar bay.

F. EXTERIOR HOSE STREAMS:

Exterior hose stream demand shall be in accordance with UFC 3-600-01 and NFPA 409. Exterior hose stream demand shall be included in the sprinkler system hydraulic calculations.

G. FIRE DEPARTMENT CONNECTION:

Do not provide fire department connection on foam water sprinkler system.

H. SEISMIC PROTECTION OF SPRINKLER SYSTEMS:

Sprinkler, high expansion foam system and fire pump piping systems shall be protected against damage from earthquakes. Seismically brace foam/water solution piping regardless of geographic location. Provide an S_s of 0.95 or as indicated by the seismic analysis, whichever is greater. Seismic protection shall include flexible and rigid couplings sway bracing, seismic separation assemblies where piping crosses building seismic separation joints, and other features as required by NFPA 13 for protection of piping against damage from earthquakes.

I. SPRINKLER HEADS:

Provide upright quick-response sprinklers at the roof or ceiling level with temperature ratings of 175°F. In areas where extremely high temperatures normally occur upright quick-response sprinklers at the roof or ceiling level with temperature ratings of 200°F may be used. Sprinklers shall be as per UFC 3-600-01s

J. HIGH-EXPANSION FOAM GENERATORS:

High-expansion foam generators may be designed to use air from inside the hangar. Air from inside the hangar can be employed successfully and requires no additional increase in foam discharge rates.

K. HIGH-EXPANSION FOAM PERFORMANCE REQUIREMENTS:

Performance of the HEF system is greatly affected by the physical shape of the aircraft servicing modules, the aircraft placement in servicing modules and the placement of the generators. Failure to achieve the following requirements during the acceptance testing shall be considered a design deficiency. The timing of the foam system discharge shall be measured beginning at the time of system actuation. Provide the following coverage:

- 1) **Aircraft Silhouette Area:** The HEF system shall cover 90 percent of the aircraft silhouette area projected on the floor in one minute or less actuation. For fixed winged aircraft, the area under engines extending beyond the wing edge and under the rear elevators is not considered part of the silhouette for this compliance criterion. For helicopters, the main-rotors' sweep circle is included in the silhouette. Design professional providing performance specifications and requirements shall include calculations and a preliminary foam-generator (hangar) layout demonstrating this compliance as part of the water demand calculations for the building fire service.

2) **Hangar Bay Floor Area:** The HEF system shall cover the aircraft servicing area and adjacent floor areas not cut off from the hangar bay with Hi-Ex foam to a depth of 3.2 feet (1 meter) within four minutes of actuation.

L. FOAM CONCENTRATE:

The quantity of foam concentrate shall be calculated to operate the system at the required discharge rate as determined in accordance with UFC 4-211-01.

M. OPTICAL FLAME DETECTORS:

Provide infrared optical flame detectors in the hangar bay in accordance with UFC 4-211-01 Aircraft Maintenance Hangars. The specific manufacturer and model indicated must be provided. Obtain necessary approvals for sole source specification of devices.

3.13.4. FIRE PROTECTION / LIFE SAFETY DESIGN ANALYSIS, FIRE PROTECTION PLANS, DIAGRAMS, SHOP DRAWINGS AND DESIGN DOCUMENTS:

A. FIRE PROTECTION AND LIFE SAFETY DESIGN ANALYSIS:

1) **Design Analysis:** Submit a fire protection and life safety design analysis IAW UFC 3-600-01, UFC 4-211-01, and compliant with IBC, NFPA 101, and NFPA 409 for all buildings in the project. The analysis shall be submitted with the interim design submittal and shall be in full coordination with the drawings and specifications. The Design Analysis shall include the following:

- a) A fire protection site plan that clearly shows building separation and clearances, fire department access, fire water supply, location of all fire hydrants and distances to the fire department connections, fire water tanks and fire pumps.
- b) Life safety floor plans that clearly show the following items necessary to exhibit compliance with life safety codes:
 - (1) Occupant loading,
 - (2) Occupancy classifications,
 - (3) Construction type,
 - (4) Egress travel distances,
 - (5) Exit capacities,
 - (6) Areas with sprinkler protection,
 - (7) Fire extinguisher locations,
 - (8) Ratings of fire-resistive assemblies (fire rated walls) and
 - (9) Location of draft curtains NFPA 409,
 - (10) Emergency Shower / Eyewash locations as per Paragraph 3.8.D4,
 - (11) Safety Lane as per Paragraph 3.2.1.B.1) b)
- c) A Fire Protection Code review and analysis summary to include a list of applicable codes, the classification of occupancy and other fire protection features listed below and in UFC 3-600-01 Paragraph 1-4.
 - (1) Life safety provisions to include exit travel distances, common path distances, dead end distances, areas of refuge, exit access, required exit unit width, exit stairway configurations, elevator protection, vertical enclosure continuity and protection, opening protection and through wall/floor/ceiling/roof penetrations;
 - (2) Fire alarm system, including connection to the base-wide system;

(3) Hazard classification plans and sections IAW NEC 70.

2) **Flow test data:**

Include hydrant flow test data IAW NFPA 291 and/or fire pump flow test data IAW NFPA 20. Use appropriate size gages calibrated within six months from the date of flow test. Include calibration certificates for gages.

3) **Hydraulic Calculations:**

Calculations in the absence of a specific design will constitute, at best, rough approximations. While such approximations may suffice for the concept submittal, subsequent submittals shall include calculations based on an actual layout of discharge devices and corresponding piping configuration. Perform hangar fire protection system hydraulic calculations manually or using commercially available recognized fire protection software similar to "HASS" (Hydraulic Analyzer of Sprinkler Systems) as acceptable to reviewing authority.

4) **System Sketch:**

Include a sketch representative of the overall fire protection system. It should show all pipes and nodes in the sprinkler, foam and underground water distribution systems. Assure that the sketch corresponds to what is indicated on the project drawings as well as in the hydraulic calculations.

5) **Manufacturer's Catalog Data:**

Include catalog information for all major items of equipment upon which the design is based. This includes, but is not limited to, fire pumps, jockey pumps, foam concentrate tanks, foam pumps, automated foam concentrate valves, foam proportioners, foam generators, automatic water control, back flow preventers, strainers, FSCP, FACP, horns, strobes, manual pull stations, manual foam discharge stations etc.

6) **Diagrams, Plans, And Sections:**

Strobe coverage diagram, Fire pump system plans, sections and schematic diagrams.

7) **Details:**

Include details of critical system components including valve headers, foam generators, nozzles, concentrate tanks, test headers, etc.

B. FIRE PROTECTION PLANS:

Include the following separate sheets. Symbols shall be in accordance with NFPA 170.

- 1) General notes, symbols and abbreviations.
- 2) Sprinkler system in aircraft area.
- 3) Foam liquid travel time and foam spread diagrams
- 4) Foam system.
- 5) Foam system detection and controls (FSCP).
- 6) Facility fire detection and alarm system (FACP).
- 7) Mass notification system (MNS).
- 8) Longitudinal and transverse sections.
- 9) IR Detectors
- 10) Manual pull foam discharge stations.
- 11) Dead-man type foam abort stations

C. PIPING/RISER DIAGRAM :

Provide a consolidated fire suppression system single line piping/riser diagram showing all major components from PIV to discharge devices, such as foam generators, nozzles, strainers, backflow preventer, fire pumps, jockey pump, flow meter, foam proportioners, foam concentrate tank etc. Show all devices

such as tamper switches, flow switches, pressure switches, flow meter, strainers, etc. Indicate pipe sizes, all valving, all appurtenances etc.

- 1) Devices connected to FSCP.
- 2) Devices connected to FACP.
- 3) Devices connected to MNS.

D. FIRE PROTECTION SHOP DRAWINGS:

Prepare shop drawings IAW NFPA standards including foam liquid travel time and foam spread diagrams, riser/piping diagrams, conduit layout diagrams, complete point to point wiring diagrams (typical point to point wiring diagram in lieu of complete wiring diagrams are not acceptable), hydraulic calculations, foam calculations, seismic calculations, voltage drop calculations and battery calculations. Prepare shop drawings only after completion of fire protection design documents. Hydraulic calculations shall be performed using commercially available, recognized fire protection software similar to "HASS" (Hydraulic Analyzer of Sprinkler Systems). Update drawings AND calculations throughout construction of building to match all field modifications and changes.

E. FIRE PROTECTION DESIGN DOCUMENTS:

1) **Seismic protection:**

Protect fire suppression systems and equipment against damage from earthquakes. Seismic protection shall include flexible and rigid couplings sway bracing, seismic separation assemblies where piping crosses building seismic separation joints and other features as required by UFC 3-600-01, IBC 2009, NFPA 13, and ASCE 7 for protection of piping against damage from earthquakes.

2) **Underwriters Laboratory (UL) listed or Factory Mutual (FM) approved:**

All equipment and material shall be UL Listed or FM Approved for the purpose it is used.

F. FIRE PROTECTION PIPING:

1) **Underground Piping:**

a) Do not install any piping (including the fire protection water service entrance into the building) that allows pressurization of the space below the floor slab. Minimize piping under paved exterior operational surfaces (taxiways and aircraft parking, vehicle pavement, etc.). Do not install piping carrying foam concentrate or foam-water solution underground.

b) Provide ductile iron pipe or other pipe listed for buried fire service application for all underground uses.

c) Fire water service main must enter the building in accordance with one of the following. Do not install any fire protection piping under the floor slab.

(1) In geographic locations having a 99.6% dry bulb temperature greater than 40°F (5°C) per UFC 3-400-02 Engineering Weather Data, water service piping is permitted to rise above grade outside the facility and enter the facility through the exterior wall.

(2) Enter the facility below grade with a continuous section of welded stainless steel fire water service piping. The pipe must be continuous from a point outside the building perimeter to a flanged fitting located at least 1 ft. (305 mm) above finished floor. Non-welded fittings are not permitted within this section of pipe (e.g. flanges, mechanical couplings, push-on fittings,

etc). Weld and hydrostatically test the stainless steel pipe at the fabrication shop or manufacturer. Welding in the field is not permitted. Perform hydrostatic pressure testing in accordance with NFPA 24.

- (3) Enter the facility below grade and directly into a concrete pit with open steel grating. Do not bury fire water service piping below the slab. Only flanged or welded fittings are permitted to transition the piping from horizontal to vertical within the pit. Provide thrust restraint bracing where the piping transitions from horizontal to vertical. A minimum 2 ft. (610 mm) clearance is required around the piping in the pit. Provide drainage from pit.
- d) Size underground mains to ensure the maximum flow velocity does not exceed 3 meters per second (10 feet per second).

2) **Interior Piping Systems:**

- a) Provide a UL Listed/FM Approved strainer in the water supply for all foam systems.
- b) Do not use galvanized piping for foam-water system piping. Threaded, flanged, or grooved fittings shall be used for foam-water systems. Pipes 6" and below shall be schedule 40. Shop fabricated or field fabricated fittings, and fittings which require making a hole in the pipe are not permitted. Air exhausters are not permitted in high expansion foam systems. Valves 65 mm (2.5 inch) and larger shall be flanged outside screw and yoke (OS&Y) type. Do not use fittings that couple plain-end pipe or welded sprinkler fittings or outlets for foam-water solution.

3) **Foam Concentrate Pipe:**

Foam concentrate pipe shall be one of the following:

- a) Stainless steel pipe shall be grooved, welded, or flanged; or, filament-wound fiberglass conforming to ASTM D2996, designation code "RTRP-11 FF-3121," installed in accordance with ASME/ANSI B31.4-1996, Process Piping.
- b) Exposed interior piping marking: Mark all exposed interior piping at 8.2 meter (27-foot) intervals with plastic wraparound-type pipe labels conforming to ASME/ANSI A13.1-1996, Scheme for the Identification of Piping Systems, indicating the type of fluid carried and direction of flow. Do not use labels on sprinkler system branch lines and pipes less than 51 millimeters (2 inches) in nominal size. Follow the following labeling scheme:
 - (1) FIRE SPRINKLER or SPRINKLER FIRE – Use on lines supplying standard water-only sprinkler systems.
 - (2) HEF WATER – Used on lines supplying combination high expansion foam (HEF) water systems
 - (3) FOAM CONCENTRATE – Use on lines supplying low-expansion foam Concentrate.

G. **CONTAINMENT AND DISPOSAL OF FOAM SOLUTION:**

Consider the local environmental regulations to determine the control, treatment and/or remediation measures for the discharge of fire suppression effluent from the hangar bay. Discharge effluent from the containment system as directed by the department overseeing environmental policy for the installation. Base conditions for disposal upon the capability and location of the facility that would treat the effluent from the containment system. Verify fire suppression effluent containment discharge requirements with the appropriate installation environmental engineer, including local and state environmental requirements.

- 1) Route the wet-pipe and foam/water system runoff from the hangar to an automatically discharge in an underground containment tank, unless required otherwise by the local environmental regulations. Provide capacity to contain 15 minutes of the hydraulically calculated demand from the overhead sprinkler system in the hangar bay, plus the hose stream demand. Do not include the Hi-Ex foam system fire flow in the containment capacity Provide calculations to determine volume of foam solution discharge. Do not use the trenches, piping to the containment system, etc. to contain any of the required volume.
- 2) Provide the containment system with a remote capacity monitoring panel. Provide monitoring panel with audible and visual (yellow strobe or beacon) alarms. Automatically activate audible and visual alarms when the capacity level exceeds 5%. Provide a silence switch for the audible alarm. Constantly illuminate visual alarms at the panel until the level condition is returned to normal. Locate containment system monitoring panel in the hangar bay. Coordinate containment methods with base.
- 3) The tank shall be emptied according to environmental regulations. Install the sump pump inside the tank and operate the pump manually. The sump pump shall discharge the fire suppression effluent according to environmental regulations. Controls for the sump pump must be located near the inspection port to the containment tank. Any devices, conduits, or electrical enclosures installed below grade will be rated for a submersible environment.
- 4) Where a containment system diverter valve is used, automatically actuate the valve upon release of the fire suppression system in the hangar bay. Provide indication of the diverter valve position at the monitoring panel through the use of limit switches. Provide indication of when the valve is fully open or closed. Provide the valve with remote manual reset capability through a "Valve Position Restore" button. Provide the panel with a visual alarm (yellow strobe or beacon) which automatically illuminates when the valve position is "off normal" or "closed", and remains illuminated until valve is restored to the full normal "open" position. Locate diverter valve panel in the hangar bay adjacent to the containment system monitoring panel. Install the diverter valve motorized operator above grade or list it for a submersible environment.
- 5) The containment system monitoring panel and diverter valve panel may be combined. Provide NEMA 4X rated panels. Rate any devices, conduits, or electrical enclosures installed below grade for a submersible environment.

H. FIRE WATER SUPPLY:

The fire water supply shall be IAW UFC 3-600-01, NFPA 409 and NFPA 24 except as modified in this document. Perform a detailed water supply and demand analysis.

I. FIRE PROTECTION WATER STORAGE SYSTEM:

- 1) Provide storage capacity equal to 120 percent of the maximum demand for the required duration. Divide the required storage capacity between two equal-sized water tanks, each storing one-half of the required volume. The piping configuration shall allow water to be supplied by both reservoirs, and either of the reservoirs if the other is out of service. The water supply for the high expansion foam (HEF) system and the wet pipe sprinkler system shall have a minimum duration of 30 minutes.
- 2) Provide each tank with a low-water-level alarm and a low-temperature alarm, each transmitting back to the fire department as separate supervisory signals.
- 3) In areas with a 90% dry bulb temperature of 0.5 °C (33 °F) or less per UFC 3-400-02, Design: Engineering Weather Data, provide appropriate freeze protection IAW NFPA 22.

- 4) Provide an external visual water-level gauge on each tank.
- 5) Provide automatic tank refill from the base water distribution system. The maximum duration for the replenishment of fire protection water storage shall not exceed the limits identified in UFC 3-600-01. The heating system shall be reliable and of such capacity that the temperature of the coldest water in the tank or riser, or both, will be maintained at or above 42 degrees F (5.6 degrees C).
- 6) A single water storage system may be used, when practical, for multiple aircraft facilities. Water supply distribution mains from a fire pump station to an aircraft hangar shall not exceed 457.2 meters (1500 feet).

J. FIRE PUMPS:

- 1) Note that foam concentrate injection pumps are fire pumps and must comply with this part and all related provisions of UFC 3-600-01.
- 2) Determine the requirement for a fire pump installation based on fire flow test data from the project site and fire protection system design requirements for the project. Select pumps at a flow not exceeding 120% of fire pump rated flow. At no time shall the system pressure exceed 175 PSI (1,200 kPa). Do not use pressure regulating valves to control discharge pressure. Do not use pressure relief valves to control discharge pressure of electrical fire pumps without an electric variable speed pressure limiting control driver. If there is a potential of system pressure exceeding 175 PSI (1,200 kPa), use variable speed fire pumps. Submit fire pump design analysis, calculations, and drawings during the design phase.
- 3) Provide one redundant pump for every fire water pump system. Pumps shall have electric motor drivers conforming to NFPA 20, supplied by a single reliable power source. Use dual power sources when a single reliable power source is not available. Use diesel engine drivers only when the installation electrical service fails to meet the reliable standard and dual power sources are not available. (For pump systems with one primary and one redundant pump, provide one electric and one diesel if the electrical service fails to meet the reliability standard and dual power sources are not available.)
- 4) The designer shall determine and document the reliability of the existing power sources. A power source is adequate when it meets the reliability requirements of UFC 3-600-01.
- 5) Provide "soft start" or variable frequency pump controllers when electric-driven pumps are installed. (Exception: Soft starting is not required for drivers less than 100 horse power (75 kW) unless required for electrical services available.)
- 6) Limit the maximum rated pump size to 9,463 Lpm (2500 gpm) at 862 kPa (8.62 bar) (125 psi).
- 7) Ensure the pumping system will have capacity to meet the maximum demand when the largest capacity pump is out of service.
- 8) Provide pressure maintenance pumps ("jockey pumps") to maintain normal operating pressure on the system and to compensate for normal system leakage IAW NFPA 20.
- 9) Arrange multiple-pump installations for sequential starting at 10-second Intervals until the operating pumps maintain the required pressure. The starting sequence will begin automatically as follows:
 - Pump start signal transmitted from the foam system control panel in the protected facility.
 - Drop in system water pressure IAW NFPA 20.

- 10) Required monitoring of fire pumps shall be through the FACP and transmitted to the fire department to notify the fire department of pump running signals, pump system trouble, and tamper and supervisory signals provided by the pump controllers. Jockey pumps shall not transmit an operating signal. The FACP shall monitor Jockey pump power supply

K. SURGE ARRESTOR:

- 1) Provide surge arresters to moderate the potentially destructive effects of pressure surges or water hammer due to pump starting and stopping and valve opening and closing. Surge arrestors must be listed/approved for fire protection systems with a minimum rated working pressure of 275 psi (1895 kPa). Provide each arrester with an indicating isolation valve to separate it from the system. Supervise this valve in the normally open position unless otherwise noted. Provide a drain after the isolation valve to relieve pressure from the surge arrester for testing and maintenance. After surge arrestors are installed and pressurized per the manufacturer's written recommendations, permanently mark the set pressure on each arrester. Do not pressurize surge arrestors during hydrostatic testing of the system.
- 2) Evaluate the water supply to determine if surge arrestors are required to prevent damage from hydraulic transit (water hammer). Where the distance from the fire pump discharge to the most remote riser exceeds 2,000 ft. (610 m), include a hydraulic transient analysis in the design calculations. Address the following items in the hydraulic transient analysis:
 - a) Length, size, and velocity of the water column in the fire water distribution system.
 - b) Pressure limitations of the least resilient component in the system.
 - c) Fire pump start-up, shutdown, and power failure.
 - d) Quick opening deluge operation and control valve opening and closure.
 - e) Provide recommendation for fire pump ramp up and ramp down durations.
 - f) Provide the location and minimum sizing of required surge arrestors
- 3) Provide the following surge arrestors where fire pump(s) are not located in the same building as the system it serves.
 - a) Provide a surge arrester for each riser located on the riser manifold (e.g. wet-pipe, dry-pipe, pre-action, foam/water), located immediately downstream of the riser shut-off valve.
 - b) Provide a surge arrester for each fire pump, located immediately downstream of the discharge check valve.
 - c) Where supported by a hydraulic transient analysis, the cumulative minimum capacity of each required surge arrester may be combined into a common single surge arrester. For fire pumps, locate this common surge arrester immediately downstream of the discharge check valves on a common header. For risers, locate this common surge arrester on the riser manifold immediately upstream of all protected risers.
 - d) Where surge arrestors are 100 gal (380 L) or larger in capacity, provide floor stands.
- 4) The manufacturer shall engineer each surge arrester installation due to the complex effects of system variables on satisfactory performance. Provide manufacturer prepared sizing calculations.

L. FOAM CONCENTRATE PUMPS:

- 1) Provide foam concentrate pumps IAW UFC 4-211-01 Aircraft Maintenance Hangars and NFPA 20.

- 2) Provide connection through the installation fire reporting system to notify the fire department of pump running signals, pump system trouble, and tamper and supervisory signals provided by the pump controllers. Jockey pumps shall not transmit an operating signal. The FACP shall monitor Jockey pump power supply. Jockey pumps for foam injection systems may be omitted where allowed by UFC 4-211-01

M. FOAM CONCENTRATE TANKS:

- 1) Provide an atmospheric closed cell double wall polyethylene storage tank IAW UFC 4-211-01 Aircraft Maintenance Hangars.
- 2) Provide independent concentrate storage and proportioning systems for each aircraft hangar facility. Locate foam concentrate storage, foam proportioning, foam injection, and system risers in a dedicated fire protection equipment room isolated from the aircraft servicing area by construction rated for at least one hour. These rooms shall have direct exterior access.

3.13.5. SPECIAL REQUIREMENTS:

A. MANUAL FOAM-WATER/WATER FIRE HOSE STATIONS: Not Required.

B. FIRE DEPARTMENT CONNECTIONS:

Do not use fire department connections on high expansion foam (HEF) systems. Provide only for the sprinkler system(s).

C. FOAM SYSTEM TEST HEADER:

Provide a linear test header for all HEF overhead low-level foam water systems. Provide one 2-1/2 inch (64 mm) hose valve connection for each 375 gpm (1420 Lpm) of flow, rounding up. Locate test header inside the aircraft servicing area within 20 ft. (6.1 m) of an exterior door or directly outside the fire protection room on an exterior wall. Locate test header to discharge effluent to a hard surface within 100 ft. hose lay. Configure the test header to permit each proportioner to be individually tested.

D. SPRINKLER SYSTEM SIMULATION TEST HEADER:

Provide sprinkler system simulation test headers for simulating hangar sprinkler system maximum flow based on supply calculations during the foam system discharge test. Route all sprinkler system drains, including main drains, test drains, and auxiliary drains to a 2-foot by 2-foot splash block at exterior grade.

E. DETECTION AND ACTUATION SYSTEMS:

- 1) Fire Detection and Alarm Control Panel (FACP): Provide a single FACP for all detection and fire alarm functions in the facility not part of the foam-water fire suppression system. The system shall be fully compatible with and integrated to the local installation central monitoring system. The FACP shall supervise all control valves. Plug type tamper switches are not permitted.
- 2) Foam System Detection and Control Panel (FSCP): Provide a separate FSCP for the control and release of the foam/water system. Combining the FACP and FSCP is not permitted. Do not network the FSCP to any other panel, and the loss of any other panel must not prohibit the FSCP from functioning as intended. A common releasing panel may control multiple releasing systems or agents.

- a) Locate all fire control panels in a clean, condition environment having temperature and humidity control. Maintain a room temperature between 60 degrees F and 80 degrees F and a humidity level not to exceed 60%. Do not locate fire control panels inside the hangar bay or in an un-conditioned space.
- b) The FSCP shall be fully compatible with the installation fire alarm receiving system without field modifications to any system hardware or software. A separate and distinct fire signal shall be transmitted to the fire department upon activation of any portion of a foam system.
- c) Separate fire alarm transmitters/receivers are permitted when they are fully compatible with the FACP and the installation fire alarm receiving system without field modifications to the FACP.
- d) Define the specific number of alarm signals (e.g., fire, supervisory, tamper) to be annunciated and transmitted in a system matrix.

F. MASS NOTIFICATION SYSTEMS (MNS):

Provide a Mass Notification System in accordance with UFC- 4-021-01.

G. HEAT DETECTORS (FOR PRE-ACTION SYSTEMS):

Provide automatic thermal fire detection systems to activate any pre-action sprinkler systems. Locate detectors at the underside of the roof of the aircraft servicing area. The detection system shall consist of rate-compensated fire detectors having a temperature rating between 71 °C (160 °F) and 76 °C (170 °F). The spacing between detectors shall not be greater than 12.2 meters (40 feet) or as specified by the manufacture's specifications. The area covered by the fire detection system shall correspond with its affiliated roof-level sprinkler system and shall be bounded by draft curtains.

- 1) First Detector-Alarm. Upon activation of any one heat detector, the releasing panel shall send a signal to the FACP. The building FACP in turn shall sound a general building alarm, and transmit a building fire alarm signal over the base wide fire reporting systems. The first activation of any heat detection device in the sprinkler zone shall immediately:
 - a) Activate the foam system annunciation signal.
 - b) Actuate the appropriate suppression system pre-action valves for the floor area covered by the detection system.
 - c) Activate the fire evacuation alarm signal throughout the facility.
 - d) Activate the visual foam system activation signals.
 - e) Transmit a fire alarm signal to the base fire alarm communications center (fire department). The number and type of signals transmitted to the fire department shall be locally determined based on the current fire alarm receiving equipment and planned upgrades.
- 2) Activation of any second heat detection device and/or optical flame detector, and/or water flow switch shall in addition to the above immediately:
 - a) Send a start signal to the fire pumping system (if any).
 - b) Activate the visual foam system activation signals.
 - c) Send a HEF foam discharge signal to the FSCP

H. WATER FLOW DEVICES: ACTIVATION OF HANGAR BAY

- 1) First Detector-Alarm. Upon activation of any water flow switch, the releasing panel shall send a signal to the FACP. The building FACP in turn shall sound a general building alarm, and transmit a building fire alarm signal over the base wide fire reporting systems. The first activation of any water flow device in the sprinkler zone shall immediately:
 - a) Send a start signal to the fire pumping system (if any).
 - b) Activate the foam system annunciation signal.
 - c) Activate the fire evacuation alarm signal throughout the facility.
 - d) Transmit a fire alarm signal to the base fire alarm communications center (fire department).

The number and type of signals transmitted to the fire department shall be locally determined based on the current fire alarm receiving equipment and planned upgrades.

- 2) Activation of any second detection device an optical flame detector or heat detector switch shall in addition to the above immediately:
 - a) Release the foam suppression and
 - b) Activate the visual foam system activation signals.

I. OPTICAL FLAME DETECTORS:

Provide automatic Optical flame detection systems IAW UFC 4-211-01 Aircraft Maintenance Hangars.

- 1) First Detector-Alarm. Upon activation of any one optical flame detector, the releasing panel shall send a signal to the FACP. The building FACP in turn shall sound a general building alarm, and transmit a building fire alarm signal over the base wide fire reporting systems. The first activation of any heat detection device in the sprinkler zone shall immediately:
 - a) Activate the foam system annunciation signal.
 - b) Activate the fire evacuation alarm signal throughout the facility.
 - c) Activate the visual foam system activation signals.
 - d) Transmit a fire alarm signal to the base fire alarm communications center (fire department).
The number and type of signals transmitted to the fire department shall be locally determined based on the current fire alarm receiving equipment and planned upgrades.
- 2) Activation of any second optic flame detector device and/or heat detector, and/or water flow switch shall in addition to the above immediately:
 - a) Send a start signal to the fire pumping system (if any).
 - b) Actuate the appropriate suppression system pre-action valves for the floor area covered by the detection system.
 - c) Activate the visual foam system activation signals.
 - d) Send a HEF foam discharge signal to the FSCP

J. WIRING:

Connect all initiating devices to Class A initiating device circuits, and Class A and signal line circuits IAW NFPA 72. Connect alarm notification appliances to Class A notification appliance circuits IAW NFPA 72. All wiring in unfinished areas such as hangar and shop space shall be in electrical metallic tubing (EMT) or metallic conduit. Paint all EMT, conduits and junction boxes connected to FSCP, FACP and MNS red or prefinished red from the factory. Label all conduits "FSCP", "FACP" or "MNS" every 10' as appropriate.

Make connections and splices using screw terminal blocks. Do not use wire nut type connectors in the system.

K. FIRE SYSTEM RISER DIAGRAM:

Identify and group the various inputs and outputs associated with the fire alarm control panels (FACP and FSCP). This will include alarm initiating and supervisory input circuits as well as alarm notification output circuits.

- 1) Alarm Initiating Device Circuits--includes water-flow switch, low level foam fire suppression system manual discharge station, heat detector, triple infrared flame detector, etc.
- 2) Supervisory Device Circuits-- includes valve supervisory (tamper) switches, pump controllers, low liquid level, etc.
- 3) Release Device Circuits--includes circuits to solenoid valves for actuation of automatic water control/deluge valves controlling foam solution flow to foam generator systems and pre-action sprinkler system.
- 4) Alarm Notification Device Circuits-- includes alarm bells, horns, speakers, sirens, strobe lights, rotating beacons, etc.

L. FIRE ALARM SYSTEM MATRIX:

Define and indicate the specific alarm signals to be annunciated and transmitted in a system matrix.

M. FIRE PUMP BUILDING OR ROOM:

Fire pumping systems for most hangar fire protection systems often involve multiple, high capacity, diesel or electric engine driven fire pumps. It is preferred to locate and arrange such pumping systems in a separate pump house or building adjacent to the water storage tanks from which the pumps take suction. This pump facility will house the pumps, drivers, controllers, fuel tanks, fire pump test headers, altitude valve if provided and associated equipment. The configuration of the equipment space should consider the need to test, maintain and even replace major components of the system. If the fire pump installation shall be co-located with the foam concentrate tank, proportioning equipment, valve header and control panels, assure that adequate space is allocated to facilitate maintenance of all subsystems.

N. FIRE PROTECTION EQUIPMENT POWER:

Clearly indicate power to fire pumps, fire pump controllers, foam concentrate pumps and controllers, foam system and fire alarm system control panels on the electrical drawings. Assure that power supply arrangements to pumps are in compliance with NFPA 20 including centrifugal fire pumps (water) and pumps used for foam concentrate.

3.13.6. INSPECTION AND TESTING:

Test the entire fire protection system to ensure that all equipment, components, and subsystems function as intended. Provide a safety plan for conducting the test of the High Expansion Foam system. Provide a sketch of safe egress paths from all test viewing areas to the building's exterior.

A. TEST PLAN AND PROCEDURE:

Provide an initial test plan with test procedures 60 days prior to final acceptance test. Include the following information:

- 1) Schedule of tests for each day, Example: Day 1, Day 2, Day 3 etc.
- 2) List of tests.
- 3) Blank forms for recording test data for each test.
- 4) Test procedure for each test.
- 5) List of equipment required for each test.
- 6) Calibration certificate for testing equipment

B. PRELIMINARY ACCEPTANCE TEST :

Perform preliminary acceptance tests for the entire fire protection system.

- 1) Provide written confirmation of all preliminary test results. A professional videographer shall record digitally or on videotape all preliminary tests to document the methods and equipment employed to conduct the test. This digital record shall be provided by the Contractor. The preliminary test shall include stray voltage test and loop resistance tests. Perform 100% of system testing including foam discharge.
- 2) The High Expansion Foam hangar fire suppression system flow tests shall include the following:
- 3) Simultaneous flow of simulated overhead sprinkler system maximum demand and foam generators flowing water only. Take pressure readings at each foam generator and risers with calibrated liquid filled gages.
- 4) Simultaneous flow of simulated overhead sprinkler system maximum demand and foam generators flowing foam for one minute. Take foam tank level readings at beginning and at end. Overhead sprinkler system maximum demand shall be simulated by using a simulation test header, UL listed play pipes and liquid filled pressure gages.
- 5) Flow foam from foam generators for one minute only. Foam tank level readings shall be recorded at the beginning and at the end.

C. SAFETY PLAN:

- 1) Path for persons conducting and witnessing the test to exit the building without entering the foam blanket. Obtain approval from the installation Safety Manager.
- 2) Foam Disposal Plan: Provide Foam Containment Plan and Procedures and Foam Disposal Plan and Procedures.
- 3) Protective Measures: Provide procedures for taking protective measures to avoid damage to property during and after the test protection of property during the Final Acceptance Test .

D. PRELIMINARY ACCEPTANCE TEST REPORT:

Submit the preliminary acceptance test report to the Contracting Officer and to USACE Fire Protection Engineer before requesting a Final Acceptance Test. Provide the preliminary acceptance test report, digital recording or videotape of the preliminary test, a "Punch List" (list of deficiencies prepared at the completion of preliminary test), and a Final Acceptance Test plan 15 days prior to final acceptance test.

E. FINAL ACCEPTANCE TEST:

- 1) The Final Acceptance Test shall begin only after approval of the preliminary test report.

- 2) The final test will be a repeat of all preliminary test requirements except do not repeat flushing and hydrostatic tests. The Contractor's Fire Protection Engineer and manufacturer's representatives shall conduct the Final Acceptance Test and shall provide a complete demonstration of the operation of the system.
- 3) The USACE Fire Protection Engineer and the installation fire department representative will witness tests. A professional videographer will record or videotape final acceptance tests.
- 4) A failed final acceptance will be treated as a preliminary acceptance test. Correct and retest all system failures or other deficiencies identified during the testing.

F. FINAL ACCEPTANCE TEST REPORT:

- 1) Provide the Final Acceptance Test Report within 15 days after the completion of the Final Acceptance Test.
- 2) Provide the final acceptance test report in booklet form showing field tests performed with the digital or videotape of the final test to document compliance with the specified performance criteria. Provide documentation of readings, test results, and indicate the final position of control valves. Include all required Final Acceptance Test NFPA forms.
- 3) The Final Acceptance Test report shall include the resolution of punch list items developed during preliminary acceptance testing.

G. TRAINING:

- 1) The Contractor Fire Protection Engineer and manufacturer's representatives shall conduct four 6-hour training courses: two for operators and two for maintenance personnel designated by the Contracting Officer.
- 2) Lesson plans, operating instructions, maintenance procedures, and training data shall be furnished in manual format for the training courses.
- 3) The operations training course shall familiarize designated government personnel with proper operation of the fire protection systems.
- 4) The maintenance training course shall provide designated government personnel adequate knowledge required to diagnose, repair, maintain, and expand functions inherent to the system.
- 5) The training sessions shall be given for two different work shifts.
- 6) The schedule of training shall be approved by the Contracting Officer. Training sessions shall start after successful completion of the Final Acceptance Test. The field instruction shall cover all of the items contained in the approved O&M manual. Film or tape all training sessions and provide to the Government.

Provide a safety plan for conducting the test of the High Expansion Foam system. Provide a sketch of safe egress

H. SPARE PARTS:

Submit spare parts data for each different item of material and equipment specified. Include a complete list of parts and supplies, with current unit prices and source of supply (with address and telephone number), and a list of parts recommended by the manufacturer to be replaced after 1, 5 and 10 years of service. Include a list of special tools and test equipment required for maintenance and testing of the products supplied by the Contractor.

- 3.14. SEE PARAGRAPHS 5.12 AND 6.14 SUSTAINABLE DESIGN – NOT USED
- 3.15. SEE PARAGRAPH 6.15 ENVIRONMENTAL – NOT USED
- 3.16. SEE PARAGRAPH 6.16 PERMITS – NOT USED
- 3.17. SEE PARAGRAPH 6.17 DEMOLITION – NOT USED
- 3.18. SEE PARAGRAPH 6.18 ADDITIONAL FACILITIES – NOT USED
- 3.19. EQUIPMENT AND FURNITURE REQUIREMENTS

3.19.1 FURNISHINGS:

Administrative workstations shall include appropriate work surface area, upper cabinets or shelves, file cabinet(s) with file/file and box/box file storage, pencil drawer, space for computer and monitor, telephone, ergonomic administrative chair and task lights. Provide centralized areas for photocopier, laser printer and fax machine with waste and paper recycling receptacles and paper storage cabinet storage in each office area. Operations are normal business day except where indicated otherwise. See Paragraph 3.2.1 for more information.

Table 3

FURNITURE, FIXTURE AND EQUIPMENT (FFE) LISTING

See Attachment A-*Schematic Plans* for the Schematic Furniture Plan.

AIRCRAFT MAINTENANCE BAY (HANGAR FLOOR), ALLIED SHOP AND STORAGE (1st Floor)			
Hangar Floor Area	4	24"Wx24"D Technical Standing Height Mobile Workstation on hard surface casters.	GFGI
	4	Lockable Tool Storage Cabinet w/Drawers 36"Wx24"Dx72"H	GFGI
	4	Lockable Tool Storage Shelving 48"Wx24"Dx72"H	GFGI
	5	Stool w/ hard surface casters	GFGI
	1	72"Wx30"D with ESD worktop Standing Height Workstation. Provide: center drawer; Box/Box File & File/File Storage; Overhead Storage & task lighting	GFGI
Allied Shop	1	L-Shaped Admin Workstation. Provide: center drawer; Box/Box File & File/File Storage; Overhead Storage & task lighting	GFGI
	2	Adjustable Height Work Table 72"W x 36"D with 1 ½" thick durable shop top and electrical knockouts	GFGI
	1	Ergonomic Task Chairs	GFGI
	1	4 H Lockable Lateral File 36"W x 24" D x 54" H	GFGI
	9	Lockable Tool Storage Cabinet w/Shelves 48Wx24"Dx72"H	GFGI

	4	Technical Workbench Height Workstations 72"Wx30"D w/ESD worktop and CFCI grounding points; wrist straps; four (4) drawers below and a shelf with lockable doors above for small parts boxes and repair materials; task lighting; an area to accommodate a laptop and metal power strip w/minimum 6 receptacles.	GFGI/ CFCI
	2	Portable fume extractors for soldering	IFII
	4	Operable Stools w/hard surface casters	GFGI
	1	21.7 cu.ft. Refrigerator	GFGI
	1	107"Wx24"Dx47"H box & pan break machine	IFII
	1	48"Wx72"Dx56"H metal rack	IFII
	1	45"Wx20"Dx40"H foot shear	IFII
	1	Drill Press 19"Wx33"Dx67"H	IFII
Secured Storage	1	4 Drawer Safe	GFGI
	12	48"X48"X48" Payload Containers	IFII
Bench Stock/Tech. Supply (Class IX Air)	1	Mobile Storage System 36"Wx24"D	GFGI
	1	Workbench with lockable tool storage w/ cabinet drawers 72"Wx30"D x adjustable high. CFCI grounding points wrist straps,	GFGI/ CFCI
	1	72"W x 30"D w/ 42" Return L-Shaped Desk	GFGI
	1	Ergonomic Task Chair	GFGI
	9	Rugged, high-strength steel repair parts shelving 36"Wx24"Dx72"H	GFGI
	16	Industrial Shelving Unit 48"Wx48"Dx72"H	GFGI
	1	Bins for small parts distribution adjacent to counter, 48"Wx18"D	GFGI
Small Tools Room	1	Small Receiving Desk for check-out of tools w/box/box file Storage 72"Wx24"D	GFGI
	2	Lockable Tool Storage Cabinet w/Drawers 36"Wx24"Dx72"H	GFGI
	2	Lockable Tool Storage Shelving 48"Wx24"Dx72"H	GFGI
	1	Ergonomic Task Chair	GFGI
	3	48"Wx24"Dx72H" Shelving Units	GFGI
	1	Workbench with lockable tool storage w/ cabinet drawers 72"Wx30"D x adjustable high. CF/CI grounding points wrist straps,	GFGI/ CFCI
	1	Operable stool w/hard surface casters	GFGI
AIRCRAFT MAINTENANCE AND CONTRACTOR SUPPORT SPACE (1 ^S FLOOR)			

Production Control (PC)		4	L-Shaped Admin Workstations. Provide: center drawer; Box/Box File & File/File Storage; Overhead Storage & task lighting	GFGI
		4	Ergonomic Task Chairs	GFGI
		10	Task chairs	GFGI
		1	Printer Storage Cabinet 72"Wx30"Dx30"H	CFCI
		2	2-High Lateral File Cabinets with Counter Top,42"Wx24"D	GFGI
		1	Small Marker Board 72"Wx48"H.	CFCI
		1	Conference table to seat 10 comfortably.	GFGI
Quality Control/ Quality Assurance (QC/QA)		5	L-Shaped Admin Workstations. Provide: center drawer; Box/Box File & File/File Storage; Overhead Storage & task lighting—1 of 5 to be receptionist	GFGI
		4	Guest Chair	GFGI
		5	Ergonomic Task Chair	GFGI
		1	Printer Storage Cabinet 72"Wx30"Dx30"H	GFGI
		2	Small Marker Board 72"Wx48"H	CFCI
		2	4-Shelf Bookcase with three adjustable shelves for manuals 36"Wx15"DX60"H	GFGI
		2	Storage shelves for larger technical references. , 36"Wx24"Dx42"H.	GFGI
Maintenance Platoon	Private Office Space	2	Private Office Workstations w/Overhead storage w/task lighting, center drawer, box/box/file & file/file storage	GFGI
		2	Task Chairs	GFGI
		2	Guest Chairs	GFGI
		2	4-High Lateral Files, 36"Wx24"Dx54"H	GFGI
	Open Office Space	2	L-shaped workstations	GFGI
		2	Ergonomic task chair	GFGI
		2	4-High Lateral File Cabinets, 36"Wx24"Dx54"H	GFGI
		2	Guest Chairs	GFGI
		1	Printer Storage Cabinet 72"W x 30"D x 30"H	GFGI
Contractor Logistics Support (CLS/LARS)		5	L-Shaped Admin Workstations. Provide: center drawer; Box/Box File & File/File Storage; Overhead Storage & task lighting	GFGI
		5	Ergonomic Task Chair	GFGI
		1	Printer Storage Cabinet 72"Wx30"Dx30"H	GFGI
		4	4-High Lateral File Cabinets, 36"Wx24"Dx54"H	GFGI

COMMON AREAS				
Break Room	1	36" round table	GFGI	
	4	Stack chairs	GFGI	
	1	microwave	GFGI	
	1	Bracket CF/CI for wall mounted IFII LCD television	CFCI/	
	2	Vendor provided and serviced vending machines	IFII	
	1	21.7 cu ft top mount Freezer/Refrigerator	GFGI	
	1	Small Marker Board, 72"Wx48"H	CFCI	
	1	LCD Monitor/TV	IFII	
Locker/Shower/Latrine	22	12"x72" Double tier; Metal lockers with raised base and sloped top for the Men's Restroom	CFCI	
	6	12"x72" Double tier; Metal lockers with raised base and sloped top for the Women's Restroom	CFCI	
Janitor's Closet (each floor)	1	mop rack, 36"Wx18"Dx72"H open industrial shelving for janitorial supplies	GFGI	
FLIGHT PLATOON, OPERATIONS AND PLANNING SPACE (2nd FLOOR)				
Flight Platoon	Semi- Private Office Space	6	L-Shaped workstations (2) two in each of the three semi-private offices. Provide: Overhead storage w/ task lighting; center drawer; Box/Box File, & File/File Storage.	GFGI
		6	Ergonomic Task Chair Chairs	GFGI
		3	4-High Lateral File Cabinets 36"W x 24"D x 54"H	GFGI
		3	4-Drawer File Cabinet 15"W x 30"D x 60"H	GFGI
		6	Guest Chairs	GFGI
	Open Office Space	4	L-Shaped Admin Workstations for open office space. Provide: center drawer; Box/Box File & File/File Storage; Overhead Storage & task lighting. 1 Grommet per work surface	GFGI
		2	4 Drawer File Cabinets 15"Wx30"Dx60"H	GFGI
		4	Guest Chair	GFGI
		4	Ergonomic Task Chair	GFGI
		1	Printer Storage Cabinet 72"Wx30"Dx30"H	GFGI
		2	4 High Lateral File Cabinets 36"W x 24"D x 54"H	GFGI
		2	4 Shelf Bookcase with three adjustable shelves for 36"W x 15"D x 60"H	GFGI
		1	3-Seater Sofa, 84"Wx34"D	GFGI
	1	End Table	GFGI	

Flight Planning	2	Table top planning workstations. Box/Box File, & File/File Storage, 48"Wx48"Dx44"H.	GFGI
	1	Ergonomic Task Chair	GFGI
	2	Stools with hard-surface casters	GFGI
	1	Guest Chair	GFGI
	1	60"x30" Admin Workstation. Provide: center drawer; Box/Box File & File/File Storage; Overhead Storage & task lighting	GFGI
	1	Wall-mounted sliding panel system for display of GFCI planning maps, 48"x48" sections—total of 3 sliding sections—combo tack board and marker board	CFCI
	1	Marker Board, 72"Wx48"H	CFCI
	1	Printer Storage Cabinet 72"Wx30"Dx30"H	GFGI
Flight Ops	4	L-Shaped workstation with overhead storage and task lighting; center drawer; Box/Box File, & File/File Storage.	GFGI
	4	Ergonomic Task Chair	GFGI
	2	4 Shelf Bookcase with three adjustable shelves for 36"W x 15"D x 60"H	GFGI
	1	Printer Storage Cabinet 72"Wx30"Dx30"H	GFGI
	2	4 High Lateral File Cabinets, 36"Wx24"Dx54"H	GFGI
	1	Small Marker Board 72"Wx48"H	CFCI
Flight Simulator	1	Gray Eagle Universal Mission Simulator and Instructor workstation as per Para.3.2.1.B.4)(d)	IFII
	2	Guest Chair	GFGI
COMMON COMPANY SPACE (2 nd floor)			
Briefing Room	55	Stackable Chairs w/ Upholstered Seat	GFGI
	1	Large Marker Board 96"W x 48"H	CFCI
	1	Lectern with space for a laptop and data transfer system	GFCI
	1	Large Ceiling Mounted Motorized Projection Screen 140"W x 105"H and associated ceiling mounted projector supports	CFCI
	1	CFCI Brackets for wall mounted IFII LCD television	CFCI
	3	Digital clocks	IFII
	1	LCD Monitor/TV	IFII
Storage (Adjacent to Briefing Room)	15	Folding Tables w/storage rack 72"W x24"D	GFGI
Multipurpose Training	10	Ergonomic Task Chairs	GFGI
	10	Training Tables, 36"Wx24"D	GFGI

Classroom XXI (DT/CBT Room)	1	Large Marker Board 96"W x 48"H	CFCI
	1	Lectern / Instructor Workstation with digital access to each student computer and projector, lighting, sound system controls and power source	GFCI
	1	Small Ceiling mounted motorized projector screen and associated ceiling mounted projector supports 69'H x92"W	CFCI
	1	Projector	IFII
Storage	4	36"Wx18"Dx72H" open industrial shelving units	GFGI
Conference Room	1	Conference Table to seat 8	GFGI
	8	Ergonomic Conference Chairs w/casters	GFGI
	1	Credenza	GFGI
	1	Bracket CFCI for wall mounted IFII LCD television	CFCI
	1	Large Marker board 96"W x 48"H	CFCI
	1	LCD Monitor/TV	IFII
Safety Office	1	L-Shaped Administrative workstation w/overhead storage, box/box file, file/file storage, w/task lighting, center drawer	GFGI
	2	Guest Chairs	GFGI
	1	Ergonomic Task Chair	GFGI
	1	4-High lateral file cabinet, 36"Wx24"Dx54"H	GFGI
UAV Standardization Office	1	L-shaped administrative workstation w/overhead storage, Box/box/file, file/file storage, w/task lighting, center drawer	GFGI
	1	Ergonomic Task Chair	GFGI
	1	4-High lateral file cabinet, 36"Wx24"Dx54"H	GFGI
	2	Guest Chairs	GFGI
COMPANY OPERATIONS AREA (1ST AND 2ND FLOOR)			
Unit Storage (1st and 2 nd floors)	1	Desk unit w single pedestal metal desk w/box/box file pedestal, 60"Wx30"D on first floor	GFGI
	1	Ergonomic Task Chair	GFGI
	1	4 Shelf Bookcase with three adjustable shelves for 36"W x 15"D x 60"H. Located on the first floor.	GFGI
	10	Lockable Metal Cabinets with shelves, 48"Wx24"Dx72"H located on the second floor.	GFGI
	2	4-High Lockable Lateral File Cabinets, 36"Wx24"Dx54"H	GFGI
	10	36"Wx24"dx72"H Open Industrial Shelving located on the first floor.	GFGI
Arms Vault	1	Desk Unit w single pedestal metal desk w box/box file 60"Wx30"D	GFGI
	1	Ergonomic Task Chair	GFGI

	1	4 Shelf Bookcase with three adjustable shelves for 36"W x 15"D x 60"H	GFGI
	1	4-Drawer File Cabinet, 15"Wx30"Dx60"H	GFGI
	1	Workbench with lockable tool storage w/ cabinet drawers 72"Wx30"D x adjustable high.	GFGI
	1	Operable stool w/hard surface casters	GFGI
First Sergeant	1	L-shaped 72"Wx 30"Dx30"H Wood Desk Unit w/single pedestal desk, box/box file. file/file storage,48" return with file pedestal, w/task lighting, center drawer w/grommet	GFGI
	1	Ergonomic Task Chair	GFGI
	1	4- H Lateral File Cabinet, 36"Wx24"Dx54"H	GFGI
	2	Guest Chairs	GFGI
Company Commander	1	U-shaped 90"x102"(30"Dx30"H) Executive Wood Desk w/hutch w/overhead storage and doors, box/box file and file/file storage, w/task lighting, center drawer w/grommet	GFGI
	1	Ergonomic Task Chair	GFGI
	2	Wood Guest Chairs	GFGI
	1	Credenza w/2drawer lateral file	GFGI
XO	1	L-shaped 72"Wx30"Dx30"H wood desk with single pedestal , box/box file and file/file storage, 48"return with file pedestal, hutch w/doors and task lighting, center drawer w/grommet	GFGI
	1	Ergonomic Task Chair	GFGI
	1	4-H lateral file cabinet, 36"Wx24"Dx54"H	GFGI
	2	wood guest chairs	GFGI
TA Gear Storage	128	TA-50 Lockers 42"wx24"d x78"H as per para 3.5.2.B.10)	CFCI
NBC Storage	1	Desk unit 60"Wx30"Dx30"H single pedestal metal desk w/box/box file pedestal	GFGI
	1	Ergonomic Task Chair	GFGI
	1	4 High Lockable Lateral File, 36"Wx24"Dx54"H	GFGI
	4	Lockable Metal Cabinets w/shelves,48"Wx24"Dx72"H	GFGI
Comm Storage	1	Desk Unit w single pedestal metal desk w box/box file 60"Wx30"D	GFGI
	1	Ergonomic Task Chair	GFGI
	1	4 Shelf Bookcase with three adjustable shelves for 36"W x 15"D x 60"H	GFGI
	4	Lockable Metal Cabinets w/ shelves,48"Wx24"Dx72"H	GFGI
	2	4 High Lockable Lateral File 36"Wx24"DX54"H	GFGI

Waste and Paper Recycling Receptacles	As required.	GFGI
Fire Extinguisher Brackets & Cabinets	As required by code	CFCI
Fire Extinguishers	As required by code	GFGI

3.20. **REFERENCES:**

Note: In addition to general references in Paragraph 4, the following publications are applicable to the UAS Hangar Facility type to the extent specifically mentioned in Paragraph 3 and/or the remainder of the Solicitation:

- (1) 10 CFR 436, Sub Part A, Methodology and Procedures for Life Cycle Cost Analyses.
- (2) ABA. Architectural Barriers Act Standard for Department of Defense Facilities
- (3) ANSI/IESNA RP-1-04. American National Standard Practice for Office Lighting.
- (4) ANSI/TIA/EIA 569-B, Commercial Building Standards for Telecommunications Pathways and Spaces.
- (5) ANSI Z358.1, Standard for Emergency Eyewash and Shower Equipment
- (6) ASHRAE Underfloor Air Distribution (UFAD) Design Guide, 2003
- (7) ASHRAE Hdbk-IP Handbook, Refrigeration I-P Edition.
- (8) ASHRAE Hdbk-IP Handbook, HVAC Applications I-P Edition.
- (9) ASHRAE Hdbk-IP Handbook, HVAC Systems and Equipment I-P Edition.
- (10) ASHRAE 55 Thermal Environmental Conditions for Human Occupancy
- (11) ASHRAE Standard 62.1 The Standard for Ventilation and Indoor Air Quality
- (12) ASHRAE Standard 90.1 Energy Standard for Buildings Except Low-Rise Residential Buildings
- (13) ASHRAE Standard 183 Peak Cooling and Heat Load Calculations in Buildings
- (14) ASHRAE Standard 189.1 Standard for the Design of High-Performance Building 2009
- (15) AR 190-11, Physical Security of Arms, Ammunition and Explosives
- (16) AR 190-51, Security of Unclassified Army Property (Sensitive and Nonsensitive).
- (17) AR 380-381 Special Access Programs (SAPS) and Sensitive Activities.
- (18) AR 380-40 Policy For Safeguarding And Controlling Communications
- (19) AR 95-2, Air Traffic Control, Airspace, Airfields, Flight Activities, and Navigational ACCTV
- (20) ASME B31.1 Power Piping.
- (21) Clean Air Act Amendment of 1990
- (22) Costing for MILCON Design (March 1996)
- (23) DCID 6/9 Manual for Physical Security Standards for Sensitive Compartmented Information Facilities.
- (24) Discount Factors for Life-Cycle Cost Analysis, Annual Supplement to NIST Handbook 135.

- (25) DoD MIL-STD-188-124B, Grounding, Bonding, and Shielding for Common Long Haul/Tactical Communication Systems Including Ground Based Communications-Electronics Facilities and Equipments, Notice 3, 18 December 2000.
- (26) DoD MIL-HDBK-419A, Grounding, Bonding, and Shielding for Electronic Equipments and Facilities, Volume 1, Theory, Volume II, Applications, 29 December 1987.
- (27) DOD Unified Facilities Criteria Memorandum, 29 May 2002
- (28) DoD 5105.21-M-1 Sensitive Compartmented Information Administrative Security Manual.
- (29) DoD Regulation 5200.1-R, Information Security Program, Appendix 7 – Physical Security for Vault and Secure Room Construction Standards.
- (30) DOE Guidance on Life Cycle cost Analysis Required by Executive Order 13123.
- (31) DTM 1-1550-697-10-1 Technical Manual Operator's Manual for MQ-1C Unmanned Aircraft System
- (32) ETL 1110-3-481, Containment and Disposal of Aqueous Film -Forming Foam Solution
- (33) Energy Star Program
- (34) Executive Order 12902: Energy Efficiency and Water Conservation at Federal Facilities.
- (35) Executive Order 13123: Greening the Government through Efficient Energy Management.
- (36) Executive Order 13423: Strengthening Federal Environmental, Energy and Transportation Management.
- (37) Executive Order 13514: Federal Leadership in Environmental, Energy and Economic Performance
- (38) Federal Energy Management Program (FEMP)
- (39) ICD 705 Intelligence Community Directive Number 705
- (40) ICS 705-1 Intelligence Community Standard Number 705-1
- (41) IEEE Standard 519-1992, IEEE Recommended Practice and Requirements for Harmonic Control in Electrical Power Systems
- (42) Information Systems Facility Design Criteria (FDC) developed by USAISEC
- (43) Memorandum of Agreement (MOA) on Criteria/Standards for Economic Analyses/Life Cycle.
- (44) MIL-HDBK-232A, Red/Black Engineering-Installation Guidelines
- (45) MILCON Requirements and Standardization Integration (MRSI) Adapt-Build Criteria Document. <http://mrsi.usace.army.mil/rfp/SitePages/AdaptBuild.aspx>
- (46) Military Standard (MIL-STD)-3007B, Standard Practice for Unified Facilities Criteria (UFC) and Unified Facilities Guide Specifications, 1 April 2002
- (47) NEMA PE 1 Uninterruptible Power Systems.
- (48) NFPA 11 Standard for Low-Medium- and High-Expansion Foam
- (49) NFPA 13 Standard of the Installation of Sprinklers Systems
- (50) NFPA 30 Flammable and Combustible Liquids Code
- (51) NFPA 70 National Electrical Code
- (52) NFPA 70E Standard for Electrical Safety in the Workplace
- (53) NFPA 90A Standard for the Installation of Air Conditioning and Ventilating Systems
- (54) NFPA 90B Standard for the Installation of Warm Air Heating and Air Conditioning Systems

- (55) NFPA 110 Emergency and Standby Power Systems
- (56) NFPA 409 Standard On Aircraft Hangars
- (57) NIST Handbook 135 (with the annual supplement of discount factors)
- (58) NSTISSI NO 7003, National Security Telecommunications and Information Systems Security Instruction, Protected Distribution System (PDS).
- (59) NSTISSAM/2-95, National Security Telecommunications and Information Systems Security Advisory Memorandum, Red/Black Installation Guidance.
- (60) OSHA Standard 1910, Occupational Safety and Health Standards
- (61) SECURITY-- (COMSEC) MATERIEL
- (62) TB- 380-41 Procedures for Safeguarding, Accounting and Supply Control of COMSEC Material
- (63) Technical Manual (TM) 5-690 Grounding and Bonding in Command, Control, Communications, Computer, Intelligence, Surveillance, and Reconnaissance (C4ISR) Facilities, 15 February 2002.
- (64) Testing and Balancing Bureau
- (65) TIA/EIA 568-C Commercial Building Telecommunications Cabling Standard
- (66) TIA/EIA 569 Commercial Building Standard for Telecommunications Pathways and Spaces
- (67) TIA/EIA 606-A Administrative Standard for Telecommunications Infrastructure
- (68) Tower Trailer Assembly Technical Requirements Document For MQ-1C Gray Eagle™ Unmanned Aircraft System (UAS) Rev A dated 8/9/12
- (69) UFC 1-200-1 General Building Requirements
- (70) UFC 1-200-02 High Performance and Sustainable Building Requirements
- (71) UFC 3-201-01 Civil Engineering
- (72) UFC 3-250-01FA Pavement Design for Roads, Streets, Walks, and Open Storage Areas
- (73) UFC 3-260-01 Airfield and Heliport Planning and Design
- (74) UFC 3-260-02 Pavement Design for Airfields
- (75) UFC 3-400-02 Design: Engineering Weather Data
- (76) UFC 3-401-01 Mechanical Engineering
- (77) UFC 3-410-01 Heating, Ventilation, and Air Conditioning Systems
- (78) UFC 3-420-01 Plumbing Systems
- (79) UFC 3-501-01 Electrical Engineering
- (80) UFC 3-530-01 Design: Interior and Exterior Lighting and Controls
- (81) UFC 3-580-01 Telecommunications Interior Infrastructure Planning and DesignUFC 3-600-01 Fire Protection Engineering for Facilities
- (82) UFC 3-601-02 Operations and Maintenance: Inspection, Testing and Maintenance of Fire Protection Systems
- (83) UFC 4-021-01 Design and O&M: Mass Notification Systems
- (84) UFC 4-211-01 Aircraft Maintenance Hangars, 13 April 2017
- (85) UL 1008 Transfer Switch Equipment.

- (86) UL 1440 Transient Voltage Surge Suppressors.
- (87) UL 1778 Uninterruptible Power Systems.
- (88) UFGS 41 22 13.15 Bridge Crane, Overhead Electric, Under Running
- (89) USAISEC Lightning Protection, Power Quality analysis, Grounding, Bonding, and Shielding, V1.0, Nov 2006 or latest version.

3.14. GLOSSARY:

AAF	Army Airfield
ABA	Architectural Barriers Act
ACOM	Army Command (FORSCOM)
ACSIM	Assistant Chief of Staff for Installation Management.
ADAAG	Americans with Disabilities Act Accessibility Guidelines
AFF	Above Finished Floor
AHJ	Authority Having Jurisdiction
AHP	Army Heliport
AMC	U. S. Army Materiel Command
AR	Army Regulation
AA&E	Arms, Ammunition, and Explosives
The Army Standard	The Army Standard for Echelons Above Brigade (EAB) Current edition is 13 April 2012.
ASHRAE	American Society of Heating, Refrigeration and Air Conditioning Engineers
ASME	American Society of Mechanical Engineers
AT/FP	Anti-Terrorism/ Force Protection
ATLAS	All Terrain Lifter Army System
AVN	Aviation
AVUM	Aviation Unit Maintenance
AWI	Architectural Woodwork Institute
BN HQ	Battalion Headquarters
CATV	Cable Television
CBT	Computer-Based Training
CCTV	Closed-Circuit Television
CFCI	Contractor Furnished/Contractor Installed
Classroom XXI	A fully networked multimedia classroom with interoperable video tele-training, internet access, and full distance learning capability. The classroom is specified in the GIB and ACES GENERAL INSTRUCTION BUILDING (GIB) and ARMY CONTINUING EDUCATION SYSTEM (ACES) Standard Design Criteria authored by the U. S. Corps of Engineers, Norfolk District.
CLS	Contractor Logistics Support
CMU	Concrete Masonry Unit
CO CDR	Company Commander
COS	Center of Standardization
DA	Department of the Army
DA PAM	Department of Army Pamphlet
DAA	Designated Approving Authority

DAC	Department of the Army Civilian
DAIM-FDC	Department of the Army, Assistant Chief of Staff for Installation Management, Construction Division.
DDC	Direct Digital Control
DT/CBT	Distributed/Computer-Based Training Program
EMI Bleed	Electromagnetic Interference (causing information to migrate).
ER	Engineer Regulation
ER	Extended Range
ER	Entrance (Communications) Room
ER/MP	Extended Range/Multi-Purpose
ESD	Electrostatic Discharge
FACP	Fire Alarm Control Panel
FB-6 Fence	Fence utilizing green knitted fabric for visual screening.
FE-6 Fence	Fence detailed in U.S. Army Corps of Engineers Protective Design Center Website (https://pdc.usace.army.mil/library/drawings/fencehttps://pdc.usace.army.mil/library/drawings/fence)
FCC	Facility Category Code
FDC	Facility Design Criteria
FDT	Facility Design Team
FFE	Furniture, Fixtures, and Equipment
FM	Frequency Modulation
FO	Fiber Optic
FY	Fiscal Year
G-3, G-5, G-7	Designation of general staff sections.
GDT	Ground Data Terminal
GFCI	Government Furnished Contractor Installed
GFGI	Government Furnished, Government Installed
GFI	Ground Fault Interrupter
GPM	Gallons Per Minute
GSF	Gross Square Feet
HF	High Frequency
HVAC	Heating Ventilation Air Conditioning
IAW	In Accordance With
ISU	Internal Airlift/Helicopter Slingable Container Units
IT	Information Technology
ICIDS	Integrated Commercial Intrusion Detection System
IDS	Intrusion Detection Systems
IESNA	Illumination Engineering Society of North America
IEEE	Institute of Electrical and Electronics Engineers, Inc.
IFII	Installation Furnished Installation Installed
LARS	Logistics Assistance Representative
LCCA	Life-Cycle Cost Analysis
LEED-NC	Leadership in Energy and Environmental Design New Construction.
LMOC	Logistics and Movement Operations Center
METS	Meteorological Sensor
MNS	Mass Notification System

MILCON	Military Construction
MTOE	Modified Table of Organization and Equipment
NAC	Notification Appliance Circuits
NFPA	National Fire Protection Agency
NBC	Nuclear, biological, and chemical
NIC	Not In Contract
NIPR	Non-Classified Internet Protocol Router
NMT	Not More Than
NLT	Not Less Than
NSA	National Security Agency
NSF	Net Square Footage
NTE	Not To Exceed
OIC/NCOIC	Officer in Charge/ Non- Commissioned Officer
OS&Y	Outside stem & yoke (a type of plumbing gate valve)
OSP	Outside Plant
OTOE	Objective Table of Organization and Equipment
PC	Production Control
PCC	Portland Cement Concrete
PDS	Protective Distribution System
PIV	Pressure Indicator Valve
POL	Petroleum, Oil, & Lubricants
POV	Privately-owned vehicle
PT	Physical Training
PVF	Polyvinyl Fluoride
QC/QA	Quality Control / Quality Assurance
RFP	Request for Proposal
RH	Relative humidity
SAS	Secure Access Systems
SGDT	Satellite Ground Data Terminal
SIPR	Secret Internet Protocol Router
SM Fiber	Single-Mode Fiber
SLC	Single Line Circuits
SOW	Scope of Work
STAMIS	Standard Army Management Information System
STC	Sound transmission coefficient
STP	Shielded Twisted Pair
TBB	Telephone Back Board
TCX	Technical Center of Expertise
TDA	Table of Distribution and Allowance
TE	Telecommunications Enclosure
TEMF	Tactical Equipment Maintenance Facility
TER	Telecommunications Equipment Room
TIA/EIA	Telecommunications Industry Association/Electronic Industries Alliance
TOE	Tables of Organization and Equipment
TR	Telecommunications Room
UAS	Unmanned Aircraft Systems

UAV	Unmanned Aerial Vehicle
UFAD	Underfloor Air Distribution
UFC	Unified Facilities Criteria
UGDT	Universal Ground Data Terminal UGDT
UGCS	Universal Ground Control Station
UMS	Universal Mission Simulator
UPS	Un-interrupted Power Supply
UTP	Unshielded Twisted Pair
VAV	Variable air volume
VTC	Video tele-conferencing
VTOL	Vertical Take Off and Landing
VTP	Video tele-training

ATTACHMENT A

Schematic Plans



**US Army Corps of
Engineers®**

MOBILE DISTRICT
MOBILE, ALABAMA

DEPARTMENT OF THE ARMY FACILITIES STANDARDIZATION PROGRAM UNMANNED AIRCRAFT SYSTEM (UAS) HANGAR

US ARMY

CONTRACT NUMBER :-

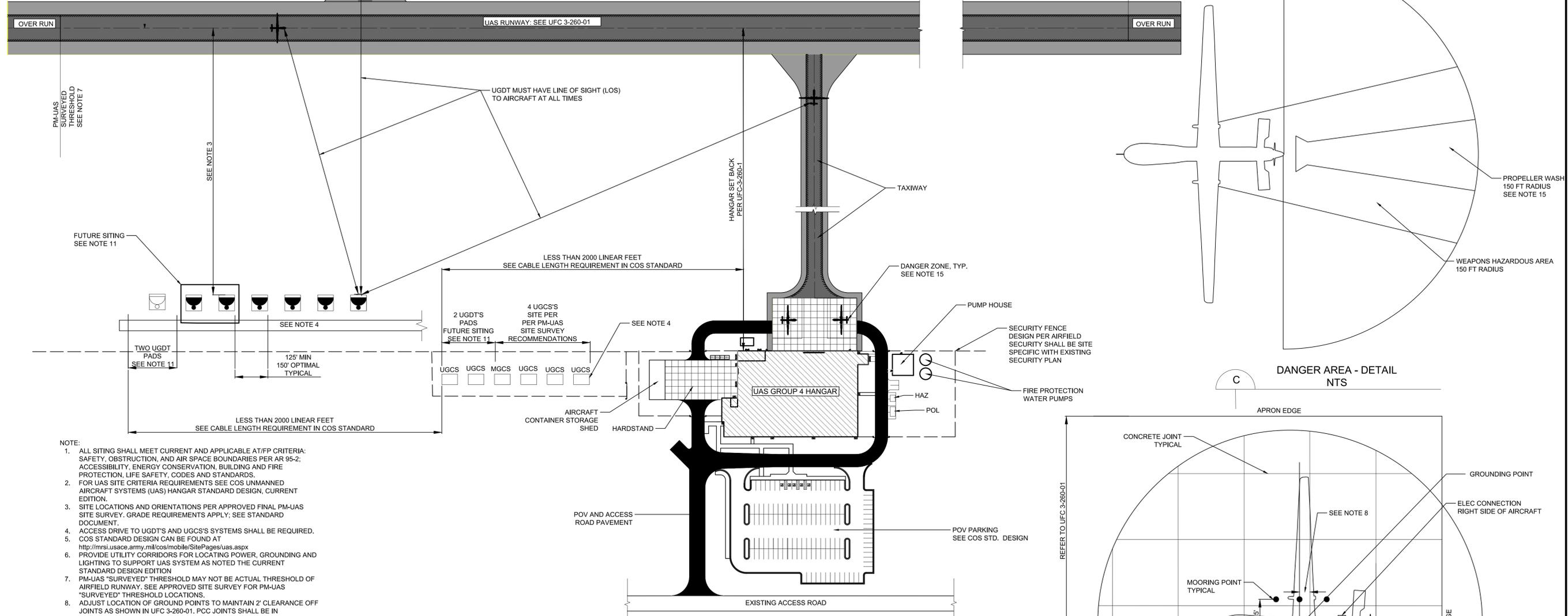
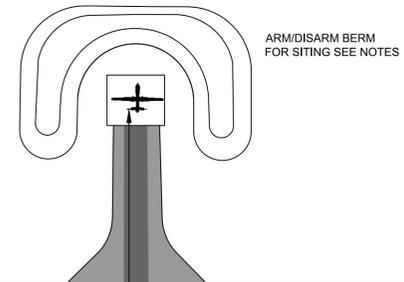
SOLICITATION NUMBER :-

October 2019

SHEET INDEX

C-101	HANGAR SCHEMATIC SITE PLAN
C-102	HANGAR SCHEMATIC SITE PLAN
A-101	SCHEMATIC 1ST FLOOR PLAN
A-102	SCHEMATIC 2ND FLOOR PLAN
A-103	AIRCRAFT CONTAINER STORAGE SHED
ID-101	HANGAR SCHEMATIC FURNITURE PLAN - 1ST FLOOR
ID-102	HANGAR SCHEMATIC FURNITURE PLAN - 2ND FLOOR
ID-401	1ST FLOOR ENLARGED FURNITURE PLAN A
ID-402	1ST FLOOR ENLARGED FURNITURE PLAN B
ID-403	HANGAR ENLARGED FURNITURE PLAN
ID-411	2ND FLOOR ENLARGED FURNITURE PLAN A
ID-412	2ND FLOOR ENLARGED FURNITURE PLAN B

Standard Design



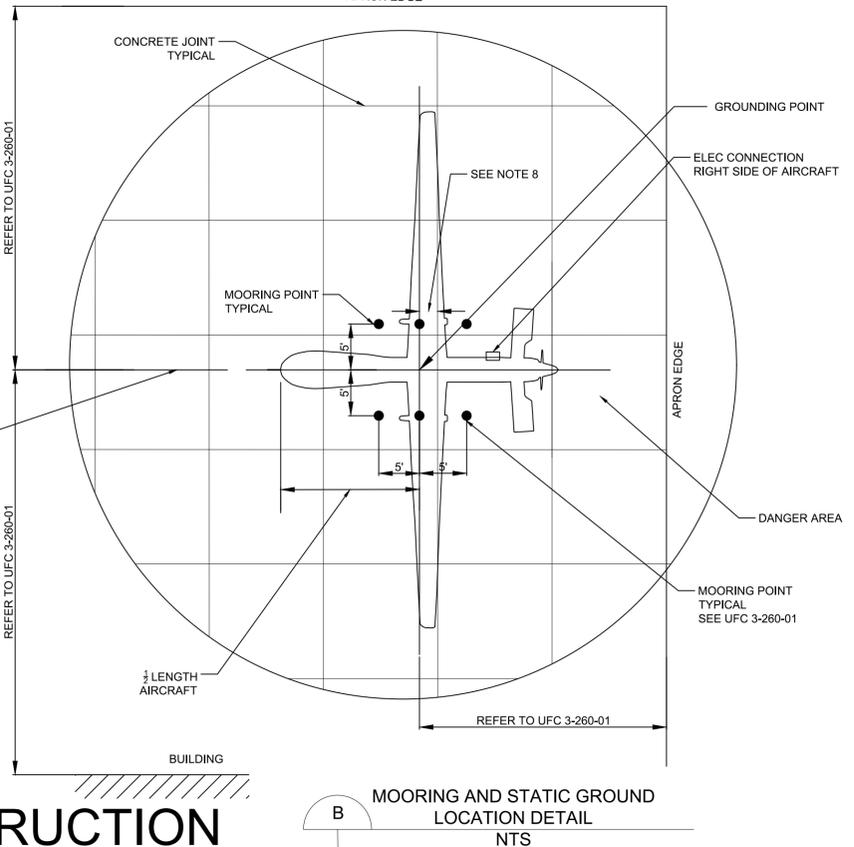
- NOTE:
- ALL SITING SHALL MEET CURRENT AND APPLICABLE AT/FP CRITERIA: SAFETY, OBSTRUCTION, AND AIR SPACE BOUNDARIES PER AR 95-2; ACCESSIBILITY, ENERGY CONSERVATION, BUILDING AND FIRE PROTECTION, LIFE SAFETY, CODES AND STANDARDS.
 - FOR UAS SITE CRITERIA REQUIREMENTS SEE COS UNMANNED AIRCRAFT SYSTEMS (UAS) HANGAR STANDARD DESIGN, CURRENT EDITION.
 - SITE LOCATIONS AND ORIENTATIONS PER APPROVED FINAL PM-UAS SITE SURVEY. GRADE REQUIREMENTS APPLY; SEE STANDARD DOCUMENT.
 - ACCESS DRIVE TO UGDT'S AND UGCS'S SYSTEMS SHALL BE REQUIRED. COS STANDARD DESIGN CAN BE FOUND AT <http://mrsi.usace.army.mil/cos/mobile/SitePages/uas.aspx>
 - PROVIDE UTILITY CORRIDORS FOR LOCATING POWER, GROUNDING AND LIGHTING TO SUPPORT UAS SYSTEM AS NOTED THE CURRENT STANDARD DESIGN EDITION
 - PM-UAS "SURVEYED" THRESHOLD MAY NOT BE ACTUAL THRESHOLD OF AIRFIELD RUNWAY. SEE APPROVED SITE SURVEY FOR PM-UAS "SURVEYED" THRESHOLD LOCATIONS.
 - ADJUST LOCATION OF GROUND POINTS TO MAINTAIN 2' CLEARANCE OFF JOINTS AS SHOWN IN UFC 3-260-01. PCC JOINTS SHALL BE IN ACCORDANCE WITH UFC 3-260-01 AND UFC 3-260-02.
 - OPTIONAL PADS SHALL BE BASED ON APPROVED PM-UAS SITE SURVEY REQUIREMENTS.
 - SEE SHEET C-102 FOR THE ENLARGED HANGAR SITE PLAN.
 - SITE UGCS AND UGDT FARMS SUCH THAT FUTURE EXPANSIONS TO SIX UGCS AND SIX UGDT CAN BE ACCOMMODATED.
 - REFER TO COS STANDARD DESIGN PARAGRAPH 3.3.A3(a) "UAS HANGAR" SITTING WITH REGARDS TO ADVERSE WIND EFFECTS FOR DUEL USE AIRFIELDS.
 - LOS BETWEEN THE UGDT'S AND AIRCRAFT IS ALWAYS A MANDATORY REQUIREMENT. ONCE THE AIRCRAFT EXITS THE HANGAR AND IS POSITIONED IN A MAINTENANCE RUN UP STALL, LOS IS REQUIRED FROM THAT POINT ON FOR ALL OPERATIONS. SIGNIFICANT OBSTRUCTIONS SHOULD NOT BE PLACED OR BUILT BETWEEN THE MAINTENANCE STALL AND RAMP, TAXIWAYS, OR RUNWAYS AREAS.
 - IF ARM/DISARM PAD IS REQUIRED, THE DESIGN OF THE ARM/DISARM PAD SHALL BE IN ACCORDANCE WITH UFC 3-260-01. PAD SHALL BE SITED TO PROVIDE LOS FROM UGDT TO AIRCRAFT.
 - DANGER AREA: NO PERMANENT SITE FIXTURES SHALL BE LOCATED WITHIN THE 150-FOOT RADIUS DANGER ZONE.

LEGEND	
	UGDT (UNIVERSAL GROUND DATA TERMINAL) CONCRETE PAD
	MGCS (MOBILE GROUND CONTROL STATION) CONCRETE PAD
	SGDT (SATELLITE GROUND DATA TERMINAL) AGGREGATE PAD
	UGDT (UNIVERSAL GROUND DATA TERMINAL) AGGREGATE PAD
	UNDERGROUND COMMUNICATIONS
	UNMANNED AIRCRAFT SYSTEMS

ABBREVIATIONS	
UGCS	UNIVERSAL GROUND CONTROL SYSTEM
MGCS	MOBILE GROUND CONTROL STATION
UGDT	UNIVERSAL GROUND DATA TERMINAL
SGDT	SATELLITE GROUND DATA TERMINAL
RLM	REMOTE LINK MODULE
LOS	LINE OF SITE

REFERENCES	
1.	DTM 1-1550-697-10
2.	UFC 3-260-01
3.	USACE COS GROUP 4 HANGAR STANDARD DESIGN

UAS GROUP 4 HANGAR SCHEMATIC SITE PLAN NTS



MOORING AND STATIC GROUND LOCATION DETAIL NTS

SCHEMATIC -NOT FOR CONSTRUCTION

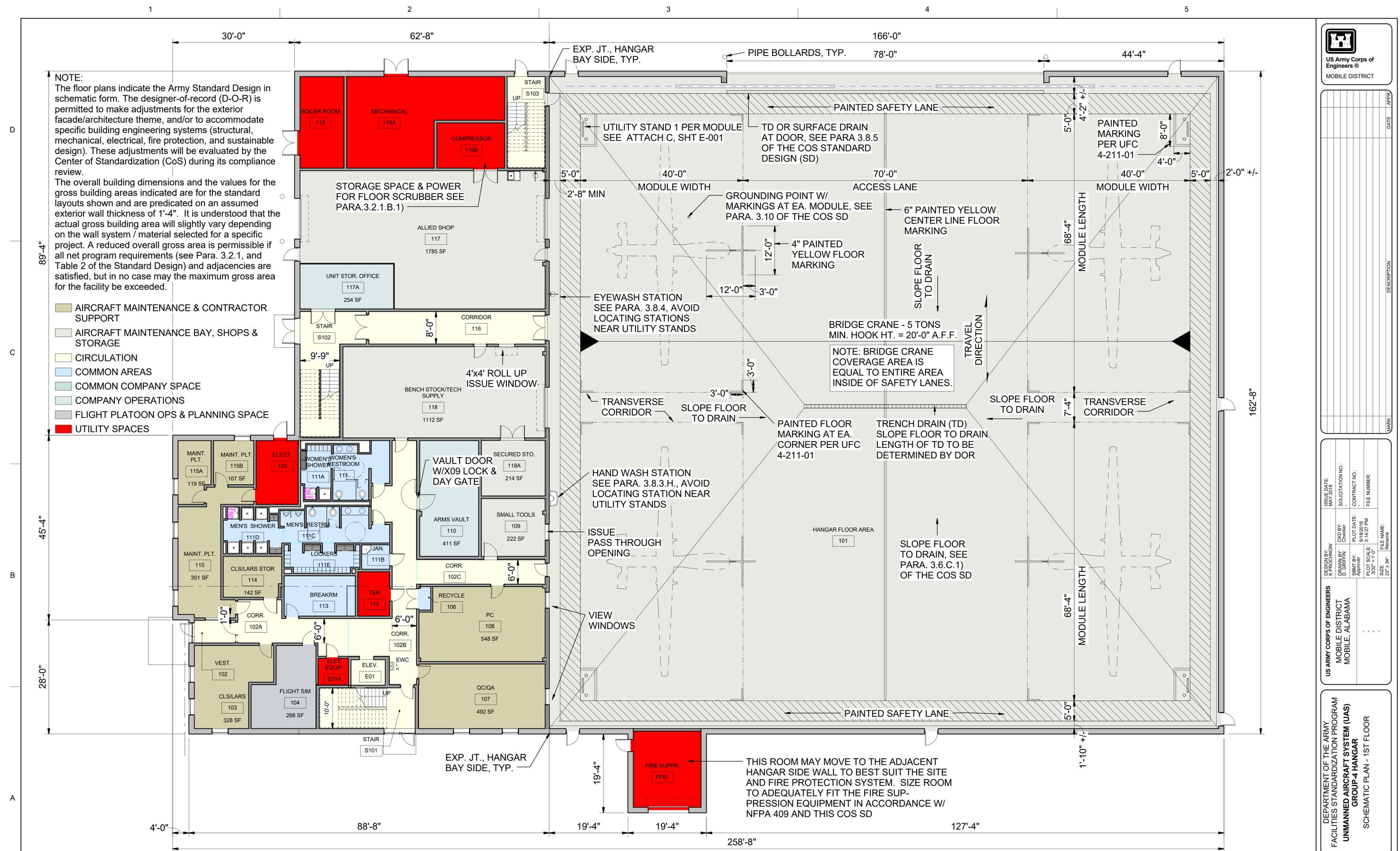
US Army Corps of Engineers

ISSUE DATE:	DATE
DESIGNED BY: J.LLONG	
DRAWN BY: J.CLONG	
CHECKED BY: J.CLONG	
SUBMITTED BY: KAP	
SIZE: ANS X	

U.S. ARMY CORPS OF ENGINEERS
MOBILE DISTRICT
MOBILE, ALABAMA

DEPARTMENT OF THE ARMY
FACILITIES STANDARDIZATION PROGRAM
UNMANNED AIRCRAFT SYSTEM (UAS)
GROUP 4 HANGAR
SCHEMATIC SITE PAN

SHEET ID
C-101



PLAN - FIRST FLOOR
3/32" = 1'-0"

TOTAL GROSS SQUARE FOOTAGE (NO MORE THAN 52,100GSF)		
Name	Level	Area
FIRST FLOOR	1ST FLR ELEV.	39754 SF
SECOND FLOOR	2nd FLR ELEV.	12282 SF
		52036 SF

NOTE:
ALL EXTERIOR WALLS ARE 1'-4" THICK
UNLESS OTHERWISE APPROVED BY COS.

SCHEMATIC - NOT FOR CONSTRUCTION



DATE	APPROVED	DESCRIPTION

ISSUE DATE: MAY 2018	SOLICITATION NO.:
DESIGN BY: A. BRADSHAW	CHECKED BY: D. GRIFFIN
DESIGNED BY: A. BRADSHAW	APPROVED BY: [Signature]
ISSUE DATE: 01/18/2019	FILE NAME: [Filename]
DESIGNED BY: A. BRADSHAW	FILE NAME: [Filename]
ISSUE DATE: 01/18/2019	FILE NAME: [Filename]
DESIGNED BY: A. BRADSHAW	FILE NAME: [Filename]

US ARMY CORPS OF ENGINEERS
MOBILE DISTRICT
MOBILE, ALABAMA

DEPARTMENT OF THE ARMY
FACILITIES STANDARDIZATION PROGRAM
UNMANNED AIRCRAFT SYSTEM (UAS)
GROUP-4 HANGAR
SCHEMATIC PLAN - 1ST FLOOR

SHEET IDENTIFICATION
A-101
SHEET OF 0

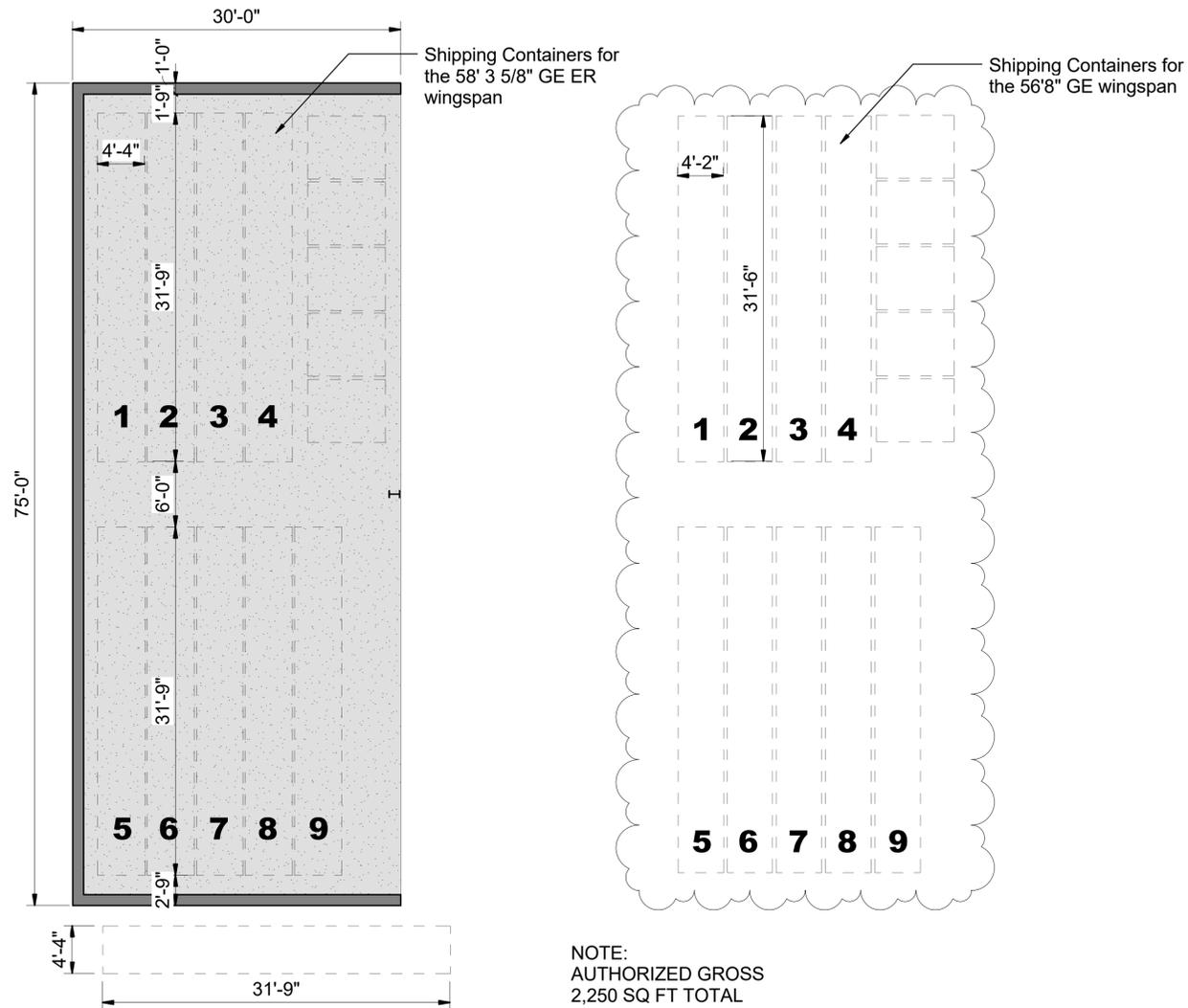
3 A-101-XXX

D

C

B

A



1 AIRCRAFT CONTAINER STORAGE SHED
A-103 1/8" = 1'-0"



MARK	DESCRIPTION	DATE	APPR
1	Enter Revision Description under Manage Tab		

DESIGN BY: Designer: Admin: CHECKED BY: Checker: SUBMIT BY: Approver: PLOT SCALE: 1/8" = 1'-0" SIZE: 22" x 34"	ISSUE DATE: MAY 2018 SOLICITATION NO.: CONTRACT NO.: FILE NUMBER: FILE NAME:
--	---

DEPARTMENT OF THE ARMY
FACILITIES STANDARDIZATION PROGRAM
UNMANNED AIRCRAFT SYSTEM (UAS)
GROUP-4 HANGAR
AIRCRAFT CONTAINER STORAGE SHED

SHEET IDENTIFICATION
A-103
SHEET OF 0

SCHEMATIC - NOT FOR CONSTRUCTION

ATTACHMENT B
Tower for the
Universal Ground
Data Terminal
(UGDT)

UGDT Size and Weight

Transit Case No.	Description	Outside Dimensions			Volume (ft ³)	Total Weight (lb)	3 Ft Lift and 33 ft Carry Requirements per Mil-1472
		L (in)	W (in)	H (in)			
1	LEA with W2 Cable and tie-downs	33.4	28.4	18	9.9	101.1	2-Man/3-Person
2	REA	33.4	29.4	16.5	9.4	109.7	2-Man/3-Person
3	RFE, Antennas, Cables	28.4	28.4	18	8.4	80.3	2-Person
4*	Pedestal/Weights (MALIBU)	39	20	18	8.1	106.0	2-Man/3-Person
5*	Petals (MALIBU)	26	30	24	10.8	65.0	2-Person
6*	Feed Receiver (MALBIU)	28	25	18	7.3	79.0	2-Person
7	Tripod (collapsed volume)	48	10	10	2.8	25.0	1-Person
8	Local Cable Bag (collapsed volume)	24	15	20	4.2	28.5	1-Person
9	Remote Cable Bag A (collapsed volume)	30	21	-	6.0	38.1	1-Person
10	Remote Cable Bag B	36	21	-	7.2	31.5	1-Person
11	UPS	17	21	7	1.4	135.0	2-Man/3-Person
12	500m Fiber Optic Reel				TBD	80.0	2-Person
13	Extender plates	18	3	-	0.1	55.5	1-Man/2-Person
TOTAL:					75.6	934.6	

MAX Height with GDT Antenna installed: 28.6FT

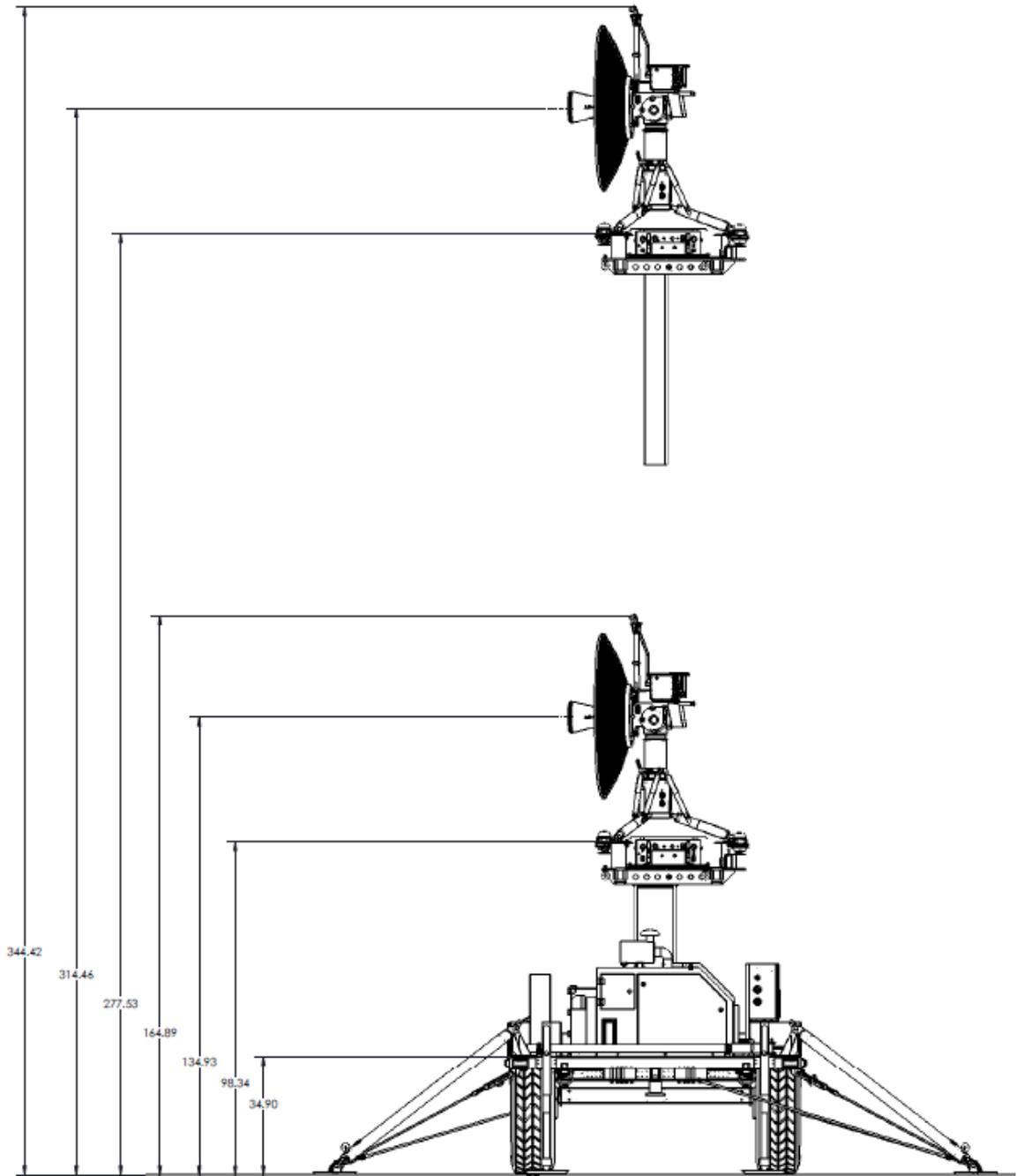
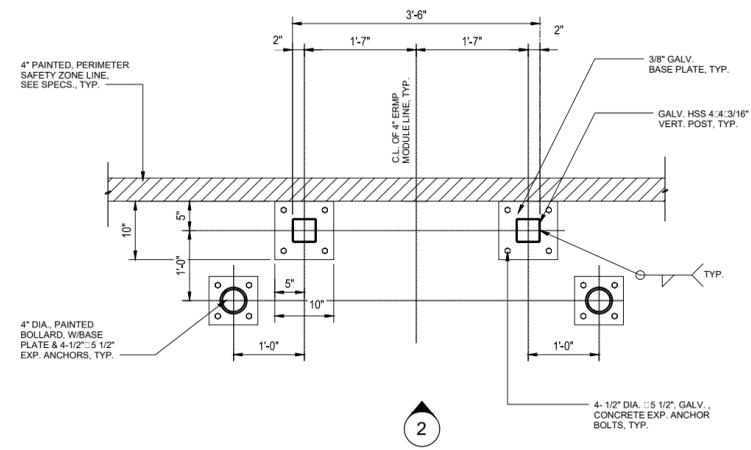
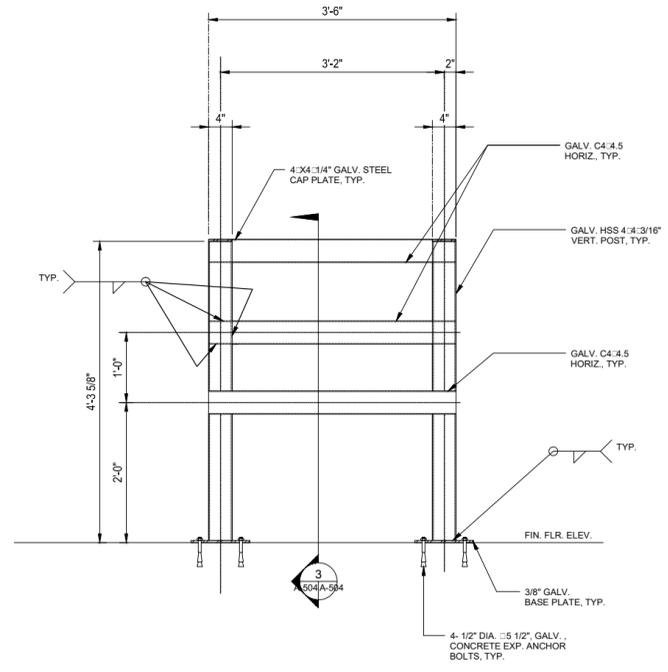


Figure 1 – Tower Trailer Assembly UGDT Heights (inches)

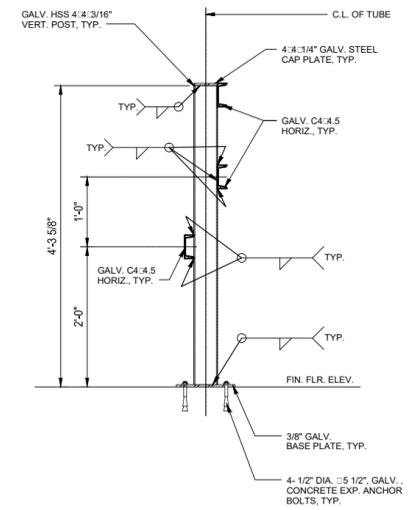
ATTACHMENT C
Electrical /
Telecommunications
Requirements



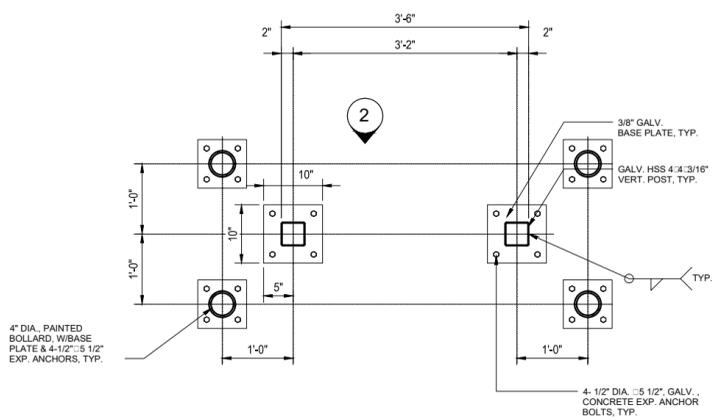
1 LAYOUT PLAN - INTERIOR STAND
E-001 N.T.S.



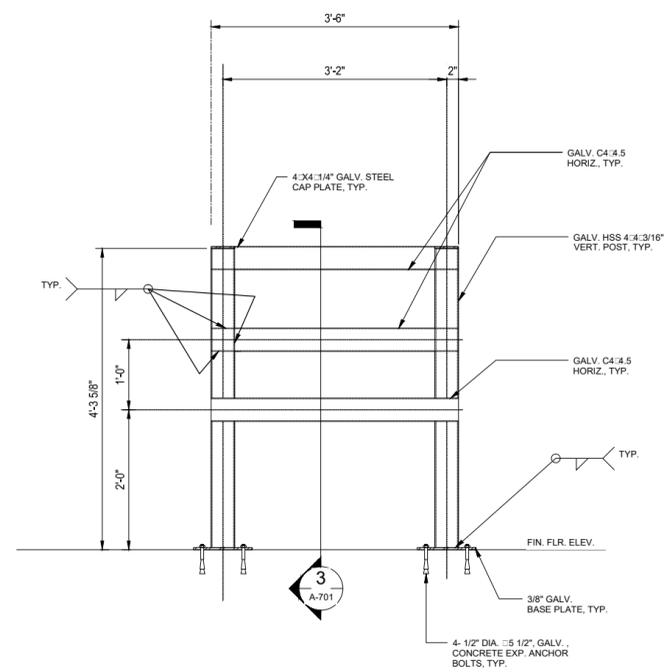
2 FRAME ELEVATION - INTERIOR STAND
E-001 N.T.S.



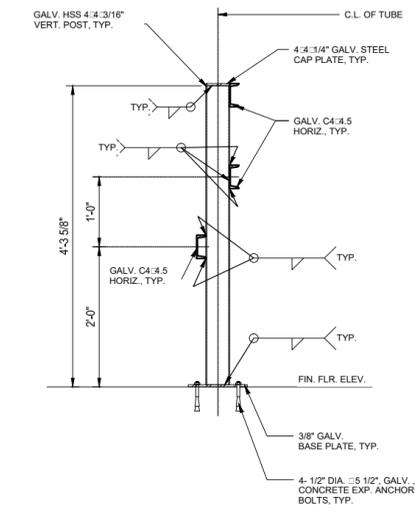
3 SECTION - INTERIOR STAND
E-001 N.T.S.



4 UTILITY PLAN - EXTERIOR STAND
E-001 N.T.S.



5 UTILITY ELEVATION - EXTERIOR STAND
E-001 N.T.S.



6 SECTION - EXTERIOR STAND
E-001 N.T.S.

- NOTES:**
1. MOUNT ELECTRICAL AND COMMUNICATIONS RECEPTACLES ON THE HORIZONTAL CROSS CHANNELS. SPACE CONDUITS EVENLY AS THEY PENETRATE UP THROUGH THE SLAB.
 2. WHEN NO SLAB IS AVAILABLE TO MOUNT TO FOR EXTERIOR STANDS, PROVIDE 18" LONGER POSTS EMBEDDED IN 1'X2' CONCRETE ENCASEMENT BELOW GRADE.
 3. SEE ELECTRICAL AND COMMUNICATIONS SECTIONS OF THE RFP FOR REQUIREMENTS ON EACH TYPE OF STAND.
 4. STANDS LOCATED ON THE AIRFIELD SHALL MEET AIRFIELD FRANGIBLE REQUIREMENTS IN ACCORDANCE WITH UFC 3-260-01 DEPENDANT ON LOCATION.

(SHEET IS FOR REFERENCE ONLY)

Symbol No.	Description	Date	Approved

Date:	AUGUST 2012
Contract No:	
CAID CODE:	
Solicitation Number:	
FILENAME:	
Designed By:	
Drawn By:	EN - DE
Checked By:	
Reviewed By:	
SIZE:	30" x 42"

MOBILE DISTRICT OFFICE
CENTER OF STANDARDIZATION
ROTARY MAINTENANCE HANGARS

ELECTRICAL UTILITY
AIRCRAFT STANDS

SHEET IDENTIFICATION
E-001

Examples of Utility Stand for UAS Support Equipment





DWG NO.	0210592	SH	1	1
REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVED
	-	INITIAL RELEASE, 2006/10/09		
	A	REVISED WITH CHANGE, 2006/11/14		
	B	REVISED WITH CHANGE, 2007/10/25		
		ECR-MIUW-TSP-SSC-SD-006		

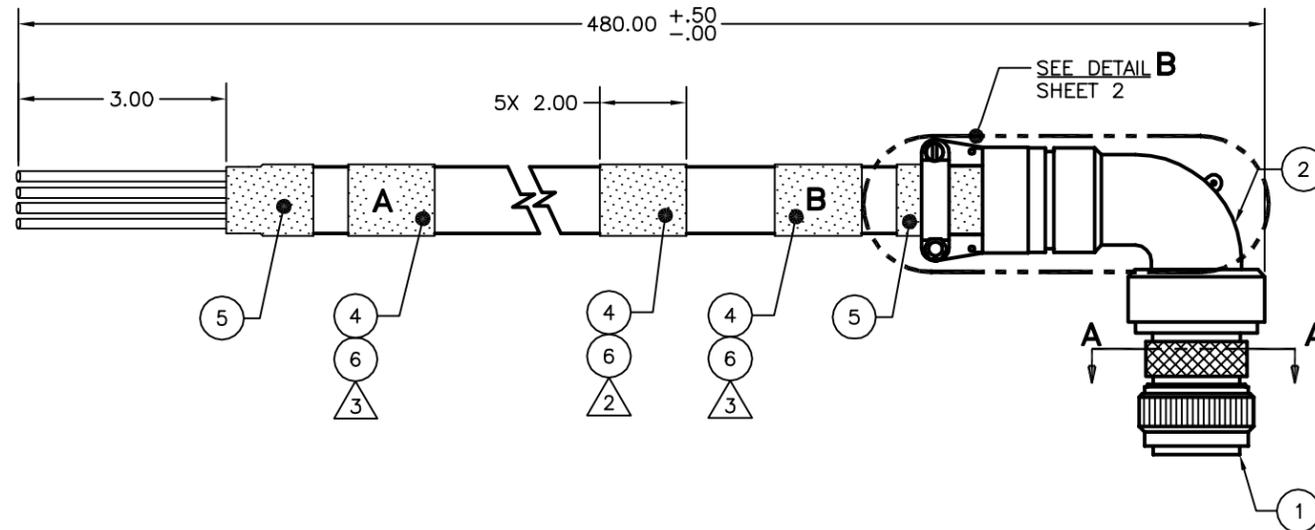
THIS DRAWING HAS BEEN GENERATED AND IS MAINTAINED BY A CAD SYSTEM. CHANGES SHALL ONLY BE INCORPORATED AS DIRECTED BY THE COGNIZANT DESIGN ACTIVITY.

NOTES:

- ASSEMBLY SHOULD BE IAW THE FOLLOWING SECTIONS OF MIL-HNBK-454:
5 SOLDERING
9 WORKMANSHIP
10 ELECTRICAL CONNECTORS
- MARK ITEM NUMBER 4 WITH PART NUMBER "55910-0210592" AND APPLICABLE DASH NUMBER AND (W2) IN .09 HIGH GOTHIC CHARACTERS IAW MIL-STD-130. LOCATE LABEL IN CENTER OF CABLE.
- MARK ITEM NUMBER 4 WITH REFERENCE DESIGNATION SHOWN ON TABLE 1 IN .09 HIGH GOTHIC CHARACTERS. LOCATE BEHIND CONNECTOR AS SHOWN.
- CABLE ASSEMBLY SHALL BE INSTALLED PER INTERCONNECTION DIAGRAM AS SHOWN.

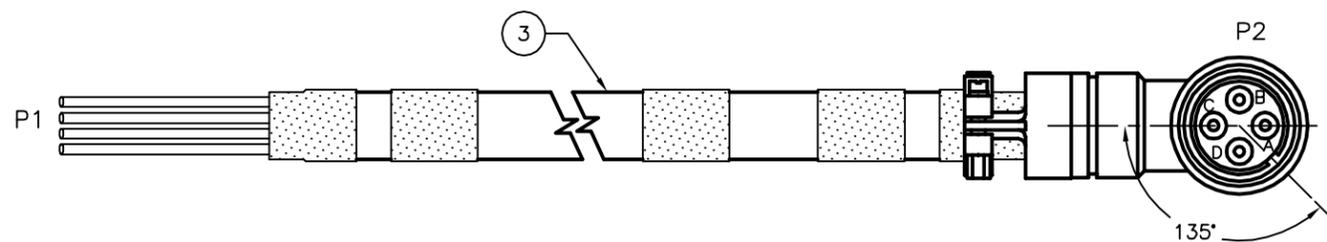
TABLE 1 ³

A	B
W2, P1	W2, P2
SHORE POWER	PDU - J2
TO	TO
PDU - J2	SHORE POWER



QTY	CAGE CODE	PART OR IDENTIFYING NUMBER	DESCRIPTION OR NOMENCLATURE	MATERIAL/SPEC/REF DESG	FIND NO.
AR	(02660)	(MS3456W22-22S)	INSERTION PIN, FEMALE	(PART OF ITEM 1)	7
AR		M23053/5-212-C	INSULATION SLEEVING HEAT SHRINK, CLEAR	SAE AMS-DTL-23053/5	6
AR		M23053/5-112-0	INSULATION SLEEVING HEAT SHRINK, BLACK	SAE AMS-DTL-23053/5	5
3	85480	DAT-39-292	LABEL SELF-LAMINATING	W.H. BRADY COMPANY	4
480	1XKNO	M3432-04HOF (4/8) 1000	WIRE, 8 AWG. (4/8)	GOVERNMENT LIQUIDATION	3
1	06324	M85049/9-58W	BACKSHELL, 1.313-18 UNEF-2B	GLENAIR	2
1	02660	MS3456W22-22S	COUPLING, STRAIGHT PLUG, 1.375-18 UNEF-2A	AMPHENOL	1

PARTS LIST



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PL0212420		0210559 TSP		NEXT ASSY USED ON		APPLICATION RELEASED DATE		INTERPRET DRAWING IN ACCORDANCE WITH ASME Y14.100, ASME Y14.24, ASME Y14.34, ASME Y14.35, ASME Y14.5M-1994 DO NOT SCALE THIS DRAWING		APPROVED		APPROVED		APPROVED		APPROVED		PREPARED M. NGUYEN 20050823		PROJECT NUMBER COGNIZANT CODE 2372		APPROVED FOR BY DIRECTION		SPACE AND NAVAL WARFARE SYSTEMS CENTER SAN DIEGO, CA 92152-5000	
UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES BREAK ALL EDGES .03 MAX. REMOVE ALL BURRS TOLERANCES ARE: .XX ± .13 .XXX ± .060 ANGLES ± .5° FILLETS MAX. SURFACE ROUGHNESS 125/√		SCALE NONE		SHEET 1 OF 2		SIZE D 55910		CAGE CODE 0210592		DRAWING NUMBER 0210592		REV B		0210592_01_B.DWG 2007/10/25		SHEET 1 OF 2									

A	B	REVISION	REVISION STATUS OF SHEETS
2	1	SHEET	

8

7

6

5

4

3

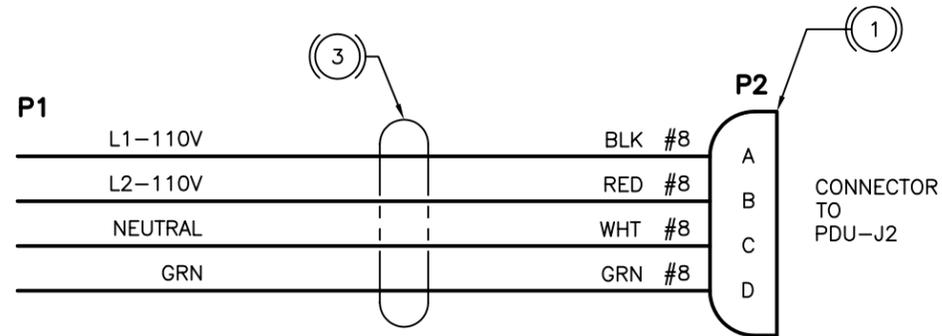
DWG NO. 0210592

SH2

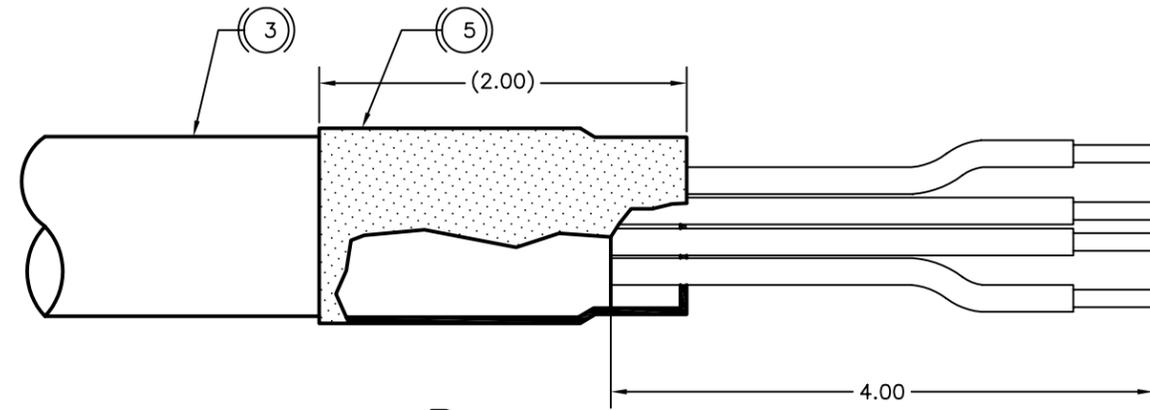
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REVISIONS

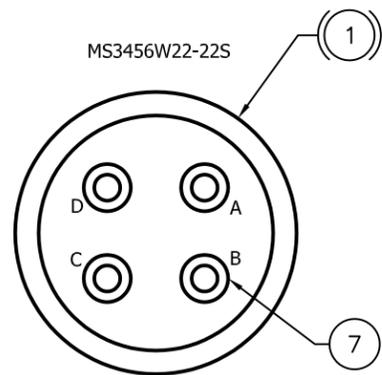
ZONE	LTR	DESCRIPTION	DATE	APPROVED
-		INITIAL RELEASE, 2005/11/21		
A		REVISED WITH CHANGE, 2006/11/14		



W2 WIRING DIAGRAM



DETAIL B



BACK SIDE OF P2

SECTION A-A

D

D

C

C

B

B

A

A

8

7

6

5

4

3

SIZE	CAGE CODE	DRAWING NUMBER	REV
D	55910	0210592	A
SCALE	NONE	SHEET	2

1

4

3

2

1

NOTES: UNLESS OTHERWISE SPECIFIED

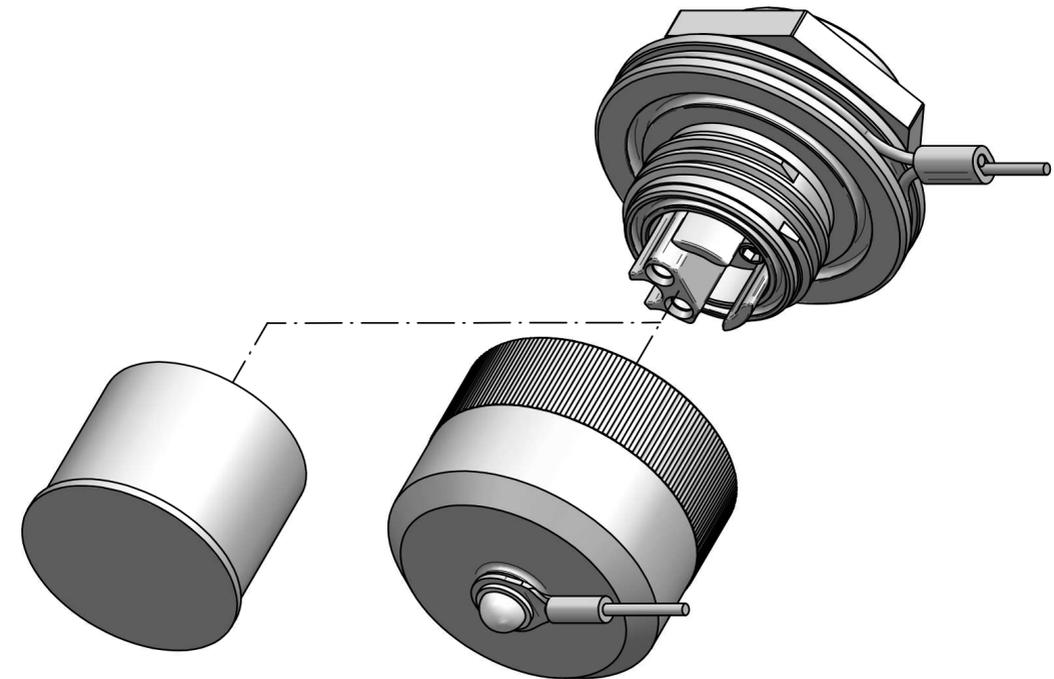
- 1. TERMINI AND ALIGNMENT SLEEVES ARE ORDERED SEPERATELY
 - MULTIMODE: TERMINI P/N MTFPI000, SLEEVE P/N MTFPI150
 - SINGLEMODE: TERMINI P/N MTFPI100, SLEEVE P/N MTFPI175
- 2. TOOLS FOR USE IN CONJUNCTION WITH THIS CONNECTOR
 - FSTF0645 TERMINI INSERTION TOOL
 - FSTF0066 INSERT RETAINING NUT SPANNER WRENCH
- 3 TORQUE INSERT CAP SCREWS TO 4.75±.25 IN.-LBS.
- 4 TORQUE JAM NUT TO 110 IN.-LBS. MAX

REVISION HISTORY - ALL SHEETS ARE THE SAME REVISION			
REV	DESCRIPTION	DATE	APPROVED
D	REPLACE DRAWING FS4H800-X-Y REV C W/CHANGE, INC ECN 060612-1112 XLT	10-25-06	SML
E	ECN 120910-0910, XLT	2012/09/10	JW
F	ECN140627-1427, XLT	2014/06/27	JW

TABLE I PRODUCT NUMBER DEFINITION

PART NO.	DESCRIPTION
FS4H8000-####	
	DASH NUMBER COLUMN 1 = MATERIAL & FINISH
FS4H8000-2###	2 = 6061-T6 AL ALY Zn-Ni COLOR OD
FS4H8000-3###	3 = 6061-T6 AL ALY GLOSS BLACK HARD ANODIZE PTFE
FS4H8000-4###	4 = 6061-T6 AL ALY MATTE BLACK HARD ANODIZE PTFE
FS4H8000-5###	5 = 6061-T6 AL ALY Zn-Co COLOR OD
FS4H8000-6###	6 = 6061-T6 AL ALY Zn-ALLOY COLOR OD
FS4H8000-7###	7 = 6061-T6 AL ALY Ni-PTFE
FS4H8000-A###	A = C63000 MARINE BRONZE
FS4H8000-B###	B = C36000 BRASS 360 1/2 HARD
FS4H8000-C###	C = 303 STAINLESS STEEL PASSIVATED
FS4H8000-D###	D = 303 STAINLESS STEEL MATTE PASSIVATED
FS4H8000-E###	E = 304 STAINLESS STEEL PASSIVATED
FS4H8000-F###	F = 316 STAINLESS STEEL PASSIVATED
FS4H8000-G###	G = 316 STAINLESS STEEL NICKEL PLATED
FS4H8000-####	
	DASH NUMBER COLUMN 2 = SEAL MATERIAL (ORING) / PANEL SEAL CONDUCTIVITY REQUIREMENTS
FS4H8000-#A##	A = NITRILE ORINGS / NITRILE NON-CONDUCTIVE PANEL SEAL (ORING)
FS4H8000-#B##	B = EPDM ORINGS / EPDM NON-CONDUCTIVE PANEL SEAL (ORING)
FS4H8000-#C##	C = NITRILE ORINGS / FLUOROSILICONE CONDUCTIVE PANEL SEAL (ORING)
FS4H8000-#D##	D = EPDM ORINGS / EPDM CONDUCTIVE PANEL SEAL (ORING)
FS4H8000-####	
	DASH NUMBER COLUMN 3 = KEY OPTION
FS4H8000-##1#	1 = KEY 1, GREY
FS4H8000-##2#	2 = KEY 2, BLUE
FS4H8000-##3#	3 = KEY 3, RED
FS4H8000-##4#	4 = KEY U, GREEN
FS4H8000-##5#	5 = 2 CHANNEL
FS4H8000-####	
	DASH NUMBER COLUMN 4 = DUST CAP STYLE
FS4H8000-###3	3 = DUST CAP ASSY, FEMALE, 4/6CH, LANYARD LENGTH 10"
FS4H8000-###4	4 = DUST CAP, PLASTIC (CAPPLUGS)
FS4H8000-###E	E = DUST CAP ASSY, FEMALE, 4/6CH, PLASTIC, LANYARD LENGTH 10"

EXAMPLE: FS4H8000-2A13 DESCRIBES:
 RECEPTACLE ASSY, JAM NUT, EXTERNAL MOUNT, TFOCA-II® 4CH WITH :
 6061-T6 AL ALY Zn-Ni COLOR OD,
 NITRILE ORINGS / NON-CONDUCTIVE NITRILE PANEL SEAL (ORING),
 KEY OPTION 1,
 DUST CAP STYLE FEMALE



PRODUCT DRAWING

DFTR	XLT	2006/06/12			TITLE RECEPTACLE ASSY, JAM NUT, EXTERNAL MOUNT, TFOCA-II® 4CH	
CHK	SML	2006/06/12				
ENG	SML	2006/06/12				
APPVD	BDC	2006/06/12				
DO NOT SCALE THIS DRAWING UNLESS OTHERWISE SPECIFIED ALL DIMENSIONS ARE IN INCHES. TOLERANCES ON 3 PL = ±.010 2PL = ±.020 ANGLES = ±1° INTERPRET DIM AND TOL PER ASME 14.5.1M-1994			SIZE C	CAGE CODE ØYPM2	DWG NO FS4H8000	REV F
Copyright © 2006 Fiber Systems International. Non published work. All rights reserved.			SCALE 1.5/1	SHEET OF 3		

TOP ASSY: FS4H-020
TOP ASSY: FS4H-023

4

3

2

1

4

3

2

1

D

D

C

C

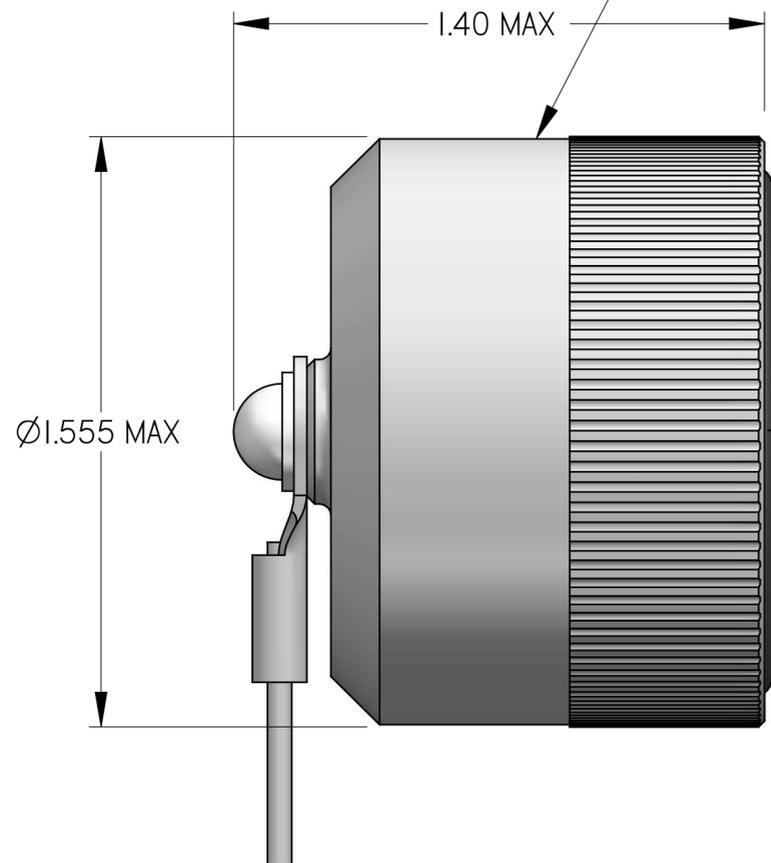
B

B

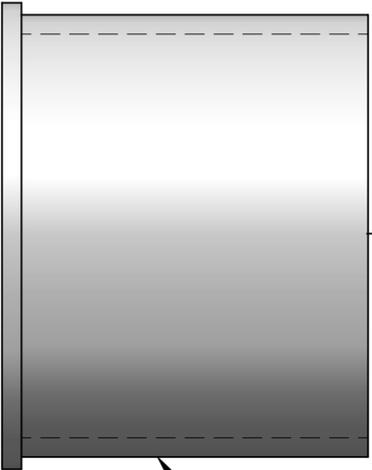
A

A

DUST CAP STYLE 3 & E
 DASH NUMBER COLUMN 1=MATERIAL & FINISH
 DASH NUMBER COLUMN 2=SEAL MATERIAL (ORING)
 DASH NUMBER COLUMN 4=DUST CAP STYLE
 SEE TABLE I

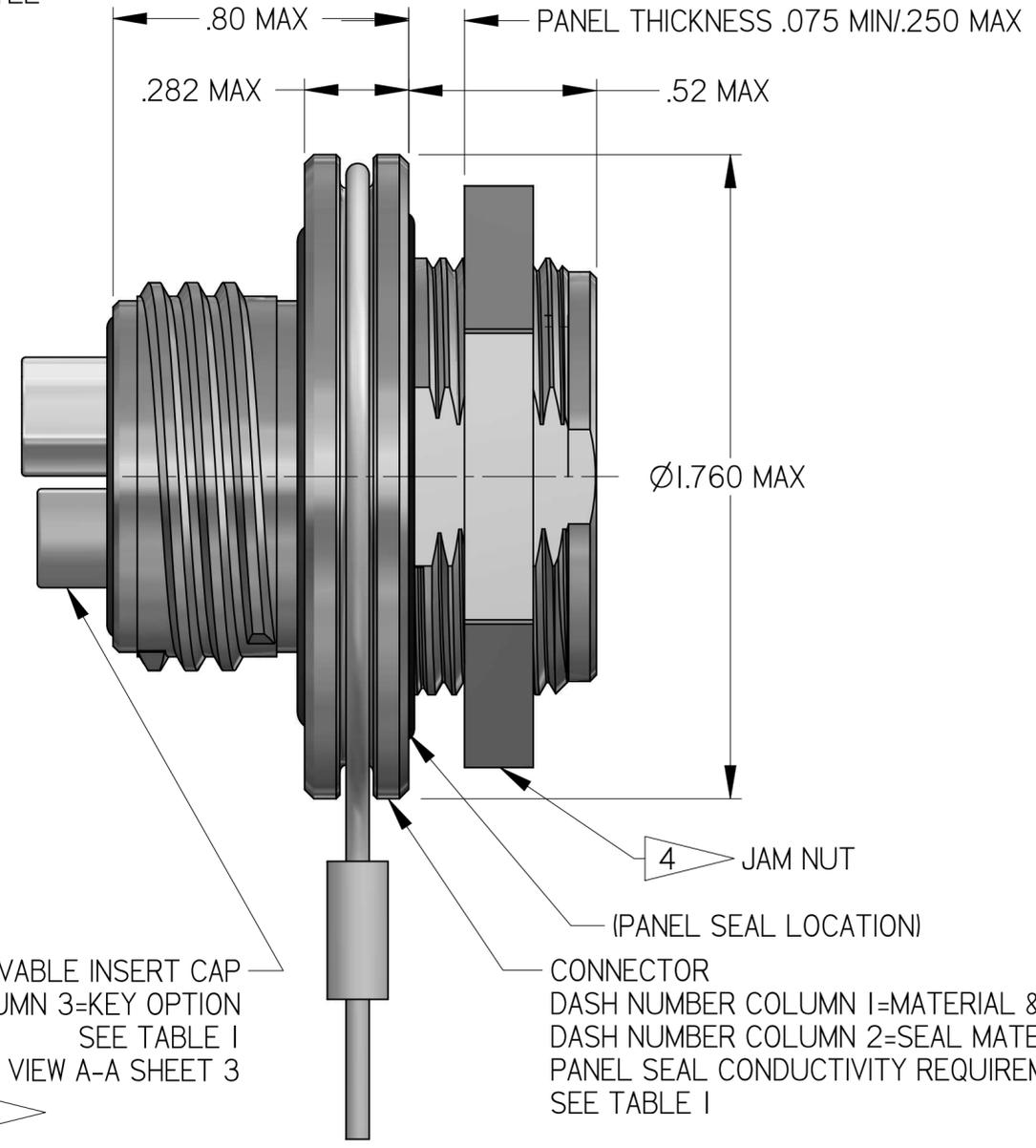
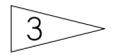


OR



DUST CAP STYLE 4
 DASH NUMBER COLUMN 4=DUST CAP STYLE
 SEE TABLE I

REMOVABLE INSERT CAP
 DASH NUMBER COLUMN 3=KEY OPTION
 SEE TABLE I
 SEE VIEW A-A SHEET 3



4 JAM NUT

(PANEL SEAL LOCATION)

CONNECTOR
 DASH NUMBER COLUMN 1=MATERIAL & FINISH
 DASH NUMBER COLUMN 2=SEAL MATERIAL (ORING)/
 PANEL SEAL CONDUCTIVITY REQUIREMENTS
 SEE TABLE I

SIZE C	CAGE CODE ØYPM2	DWG NO FS4H8000	REV F
SCALE 3/1	SHEET 2 OF 3		

4

3

2

1

4

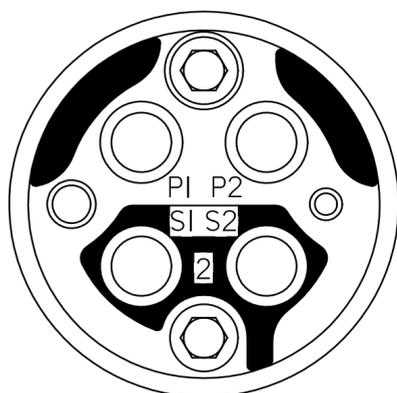
3

2

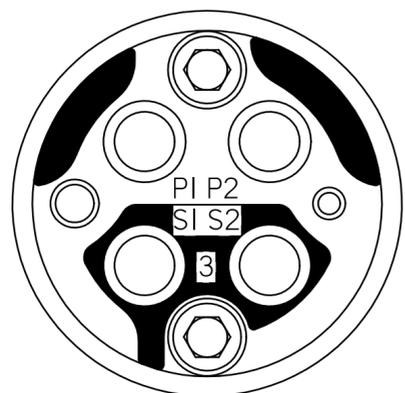
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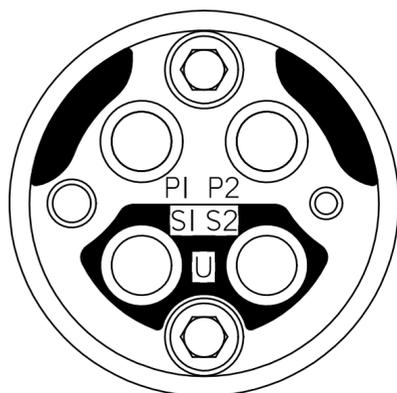
KEY OPTION 1



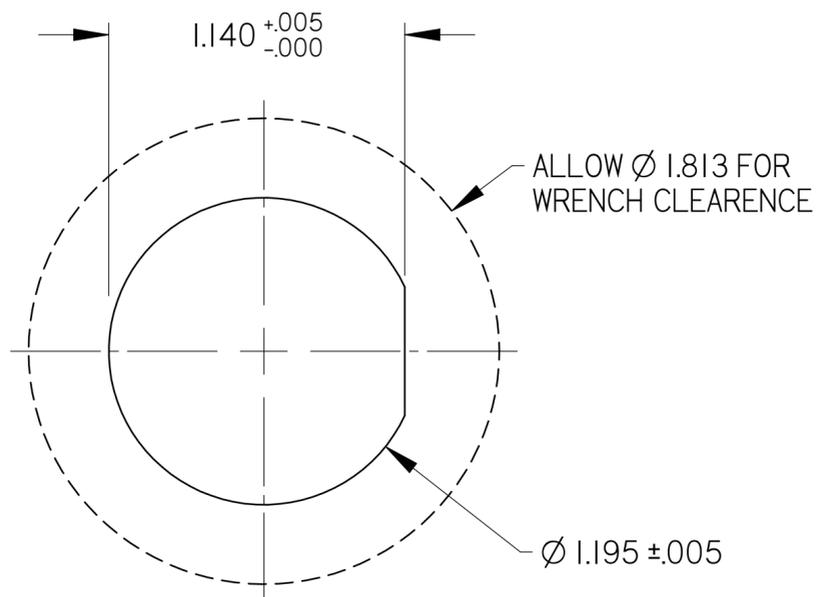
KEY OPTION 2



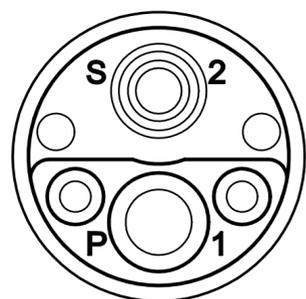
KEY OPTION 3



KEY OPTION UNIVERSAL



PANEL CUT-OUT DIMENSIONS



2 CH, OPTION 5

VIEW A-A

SHEET 2
(SEE TABLE I)

SIZE C	CAGE CODE ØYPM2	DWG NO FS4H8000	REV F
SCALE NONE		SHEET 3 OF 3	

4

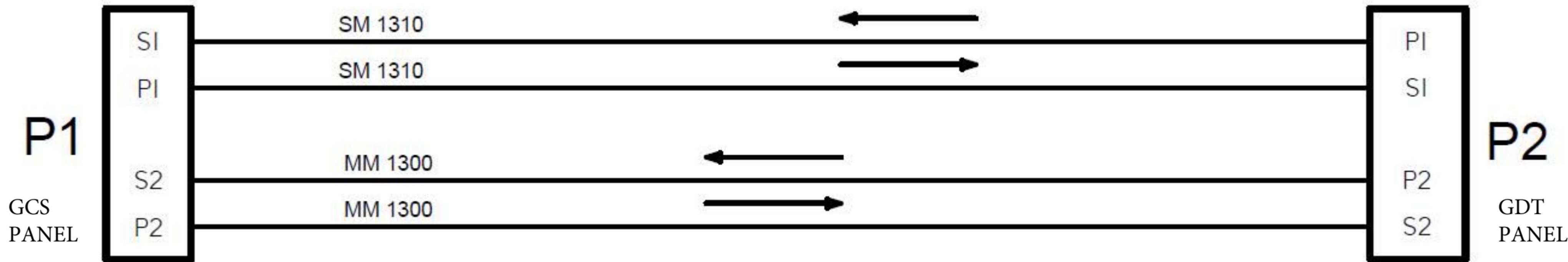
3

2

1

MIXED MODE TACTICAL FIBER OPTIC NETWORK

4 CHANNEL TACTICAL CABLE (2-CH SM, 2-CH MM)



CONNECTORS: TFOCA-II JAM-NUT RECEPTACLES WITH KEY OPTION 1 RECOMMENDED VENDORS: FSI P/N FS4H8000-2A13 or OCC P/N CCTB21B31C