

**DEVELOPMENT of ARMY  
STANDARDS / STANDARD  
DESIGN for MANNED/UNMANNED  
HANGARS**

**GROUND SUPPORT AVIATION  
BATTALION (GSAB)**

**AVIATION VERTICAL CONSTRUCTION  
CENTER of STANDARDIZATION**

**U. S. ARMY CORPS of ENGINEERS  
MOBILE DISTRICT**

**CONTRACT NO.: W91278-07-D-0004-0005**

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### 3.0 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
GSAB 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.**

### 3.1 SCOPE

#### 3.1.1: AIRCRAFT MAINTENANCE HANGAR (HGR):

Provide rotary-wing aircraft operations and maintenance hangars. This project type is to provide facilities for the purpose of maintaining and repairing rotary-wing aircraft, complete with parts and tool storage, administrative operations, aviation (flying) operations, and all support equipment and facilities. It is intended for these facilities to be similar to aviation operations and maintenance hangars in the private sector community with the addition of administrative spaces.

The project will include a hangar for a Ground Support Aviation Battalion (GSAB). Table 3.1 indicates the companies that will be accommodated in the hangar. The table also shows the number of personnel and aircraft assigned.

**Table 3.1  
Ground Support Aviation Battalion**

<u>Unit</u>	<u>Unit Type</u>	<u>Aircraft</u>	<u>OFF</u>	<u>WO</u>	<u>TOTAL</u>	<u>E1-E9</u>	<u>Unit Total</u>
Ground Support Aviation Battalion	AVN	8 UH-60	3	13	16	19	38
		12 HH-60	10	26	36	49	85
		13 CH-47	4	20	24	28	52
GSAB Aviation Support Company	AVUM		3	3	6	139	145
			<hr/>	<hr/>	<hr/>	<hr/>	<hr/>
			20	62	82	235	317

NOTES:

AVN Aviation (Flying)  
AVUM Aviation Unit Maintenance

Approximate net square footage (NSF) and gross square footage (GSF) for hangar type is indicated in Table 3.1.1:

**Table 3.1.1 – Approximate Net Square Footages**

<u><b>GSAB</b></u>	
<b>Aircraft Maintenance</b>	<b>120,239</b>
Hangar Bay	77,913
Maintenance Shops & Offices	10,270
Maintenance Support	7,460
Company Support	15,520
ALSE & Other Areas	9,076
<b><u>Aviation Unit Operations</u></b>	<b><u>8,970</u></b>
<b>Approximate Net Sq. Ft.</b>	<b>129,209</b>
<b><u>Net to Gross Conversion</u></b>	
Electrical (1% of Net Area)	1,292
Telecomm. (2% of Net Area)	2,584
Adjusted Sub-Total	133,085
Circulation (20% Adj. S/T w/o hangar bay net area)	11,034
Adjusted Sub-Total	144,120
Mechanical (7% Net)	10,088
<b>Approx. Total Gross Sq. Ft.</b>	<b>154,208</b>

Table 3.1.1 Notes:

- 1 GSAB – General Support Aviation Battalion
- 2 Space allocations per individual shops, storage and admin/support areas to be determined.
- 3 Parts and Storage space excludes space for exterior covered storage.
- 4 Hangar shall accommodate 25% of assigned aircraft.

3.1.2 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, associated equipment racks/cabinets, and any required UPS systems; radio transmitting equipment, racks/cabinets 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.

3.1.3 FURNITURE REQUIREMENTS:

Provide furniture design for all spaces, including existing furniture and equipment to be re-used. Coordinate with the user to define requirements for furniture systems, movable furniture, equipment, existing items to be re-used, storage systems, etc. Early coordination of furniture schedule is required so the facility is complete and usable at turnover. Furniture procurement is not included in this contract.

**3.2 AIRCRAFT MAINTENANCE HANGAR (HGR)**

3.2.1 GENERAL REQUIREMENTS:

Each hangar shall include administrative areas, aviation operations, maintenance areas, parts storage and maintenance shops co-located within one facility. The ideal site development maintains a comfortable and useful environment for both administrative and maintenance functions. Each site shall be designed in accordance with Antiterrorism Force Protection requirements. Each GSAB Hangar consists of the following functional areas.

- Hangar Company Administration and Readiness (Paragraph 3.3.1)
- Hangar Aircraft Maintenance; Hangar floor and shop space (Paragraphs 3.3.3 & 3.3.4)
- Support Space (Paragraph 3.3.5)
- Aviation Unit Operations (Paragraph 3.3.6)

3.2.2 AIRCRAFT MAINTENANCE HANGAR (HGR) REQUIREMENTS:

Aircraft repair parking module sizes for hangar floor space should be sized based on UFC 3-260 01. Table 3.2 summarizes parking module requirements for each hangar. Safety lanes are in addition to the module sizes indicated. (Note: UH-60 and HH-60 aircraft are similar) The UH-60 module size shall be used to accommodate the AH-64 aircraft and two OH-58 aircraft. The utilization of a single module for these aircraft shall facilitate future changes of mission and aircraft at all facilities.

**Table 3.2 – Hangar Modules and Sizes**

AIRCRAFT GROUP	MODULE LENGTH	MODULE WIDTH	NO. OF MODULES GSAB
TYPE	LENGTH	WIDTH	
Blackhawk (UH-60)	84'	64'	5
Chinook (CH-47)	110'	70'	4

3.2.3 ACCESSIBILITY REQUIREMENTS:

Able-bodied soldiers occupy and manage HGR facilities. The Americans with Disabilities Act (ADA) requirements does not apply to HGR facilities, except as follows:

3.2.3.1. Site Plan Design and Construction:

- (a) Provide ADA compliance access from the parking lot to the building.
- (b) Provide two (2) ADA compliant vehicle parking stalls for each HGR building for visitor parking.
- (c) Provide handicapped vehicle parking signage and pavement markings.

3.2.3.2. Facility Design and Construction:

- (a) The main building entrance on the ground level and at least one emergency egress, designed per applicable code, shall be handicapped accessible. Electronic exterior door push buttons are not required.
- (b) Provide ADA clearances and door accesses in the building lobby being used by visitors and in administrative office areas where civilian contractors may be located or Warriors-in-Transition that may be assigned.
- (c) Provide a handicapped accessible drinking fountain in the lobby and in administrative office areas where civilian contractors may be located or Warriors-in-Transition that may be assigned.
- (d) Provide handicapped accessible public toilet(s), which may be unisex, in the lobby area and in administrative office areas where civilian contractors may be located or Warriors-in-Transition may be assigned.
- (e) Do not include provisions outlined within the ADA requirements for the vision or hearing impaired.
- (f) Provide one disabled accessible passenger elevator in facilities over one story in height. Elevator cab must meet emergency ambulance requirements.

3.2.4 ARMY STANDARD REQUIREMENTS AND PROJECT-SPECIFIC REQUIREMENTS:

The functional and technical requirements of Chapter 3 are specific to rotary wing hangars. The functional and technical requirements in Chapters 4 and 5 of this Section are requirements that apply to all Army projects. Functional and technical requirements unique to a specific project that add to, delete or modify these requirements in Chapters 3 through 5 shall be in the RFP for a specific project and shall take precedence over the requirements in Chapters 3 through 5.

3.2.5 GROSS BUILDING AREA:

Gross building area shall be as calculated by IBC, which is the area included within surrounding exterior walls exclusive of vent shafts and courts. Areas of the building not provided with surrounding walls shall be included in the building area if such areas are included within the horizontal projection of the roof or floor above. Approximate area limits indicated in Table 3.1 are net square footages with calculated gross square footages. Net square footages do not include circulation space, wall partition thicknesses or mechanical /communications/electrical rooms.

3.2.6 UTILITY AND SUPPORT SPACE:

Mechanical, electrical and communications rooms shall be provided. Mechanical rooms shall accommodate space for equipment maintenance/repair access without having to remove other equipment. Mechanical, electrical and communications rooms shall be keyed separately for access by Installation maintenance personnel. Exterior access is required for mechanical and electrical rooms located on the first floor. All communications rooms shall be conditioned space equivalent to office space and with access into the facility from the interior of the building; unless otherwise noted, exterior access on the ground level is desired.

3.2.7 OFFICE AND ADMINISTRATIVE AREAS:

Each administrative (admin) workstation is to include appropriate work surface area, upper cabinets or shelves, file cabinet(s), 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 supply cabinet for paper storage in each office area. Hours of operation are normal business day except where indicated otherwise.

### 3.2.8 CONFERENCE ROOMS AND CLASSROOMS:

Provide, as a minimum, a dry-erase whiteboard a motor operated projector screen, a ceiling-mounted projector bracket ceiling mounted 110 VAC receptacle and data receptacle in each conference/training and classroom of appropriate size.

### 3.2.9 RESTROOMS and SHOWERS:

Except where indicated otherwise, provide restrooms on each floor with fixture counts per IPC with fixture distribution calculated for 80% male and 20% female.

### 3.2.10 JANITOR CLOSET:

Provide, as a minimum, a janitor closet on each floor of each facility. Each janitor closet shall have a mop sink, mop rack and space for buckets, vacuum and storage for janitorial supplies.

### 3.2.11 HANDICAPPED ACCESS:

The GSAB Hangar is to be handicapped accessible for civilian visitors, contract employees and Warriors-in-Transition that may be assigned. Provide one disabled accessible passenger elevator in facilities over one story in height. Elevator cab must meet emergency ambulance requirements. See paragraph 3.2.3 above.

### 3.2.12 OIL-WATER SEPARATOR SYSTEM:

The design of the separator system will account for the operational effects of the fire protection system per ETL 1110-3-481.

## 3.3 FUNCTIONAL AND AREA REQUIREMENTS

### 3.3.1 HANGAR COMPANY ADMINISTRATION AND READINESS AREA:

The company administration readiness area consists of offices, storage, etc., to accommodate personnel within the battalions. See Table 3.2 for specific hangar functions/space requirements and Table 3.3 for net square footages for each type of administration/readiness space for the companies in each battalion. Where specified for workstation, provide 110 VAC receptacles, voice and data receptacle in addition to what may be specified in table above.

### 3.3.2 AIRCRAFT MAINTENANCE AREA:

A consolidated multipurpose space for the maintenance, repair, and major overhaul of military aircraft and includes maintenance bays, tech supply, shop space, production control, and quality control areas directly related to the maintenance and supervision of aircraft, component and assembly rebuilding, and quality control of aviation maintenance. The area can be broken down into two primary functions, aircraft maintenance bay and shop space. See Table 3.3 for specific hangar function/space requirements and Table 3.4 for net square footages for each type of maintenance area space. Where a workstation is specified, provide 110 VAC receptacles, voice and data receptacle in addition to what may be specified in table above.

### 3.3.3 AIRCRAFT MAINTENANCE BAY:

Hangar floor space should be sized based on UFC 3-260-01 except as modified herein. Table 3.2 summarizes parking module requirements for the hangar. Safety lanes are in addition to the module sizes indicated. See paragraph 3.2.2 regarding standard maintenance module to be used for all rotary wing aircraft except the CH-47.

### 3.3.4 AIRCRAFT MAINTENANCE SHOP SPACE:

Aircraft maintenance shop space shall be sized based on the sizes indicated in Table 3.4.

### 3.3.5 AIRCRAFT MAINTENANCE SUPPORT SPACE:

Maintenance support spaces generally include storage rooms for maintenance tools, parts and POL materials. Maintenance support spaces shall be sized based on the sizes indicated in Table 3.4.



### 3.3.6 AVIATION UNIT OPERATIONS AREA:

Aviation Unit areas for pilots and air crews to prepare flight plans, mission planning and briefing, debriefing and workroom. Aviation Unit spaces shall be sized based on the sizes indicated in Table 3.4.

TABLE 3.3 - GSAB HANGAR FUNCTIONAL REQUIREMENTS		
SPACE	GSAB HANGAR FUNCTIONAL REQUIREMENTS	PERSONNEL
AIRCRAFT MAINTENANCE	Provide the following consolidated multipurpose space for the maintenance, repair, and major overhaul of military aircraft and includes maintenance bays, tech supply, shop space, production control, and quality control areas directly related to the maintenance and supervision of aircraft, component and assembly rebuilding, and quality control of aviation maintenance. The area can be broken down into two primary functions, aircraft maintenance bay and shop space.	
AIRCRAFT MAINTENANCE BAY (Hangar Floor)	Provide space for five UH/HH-60 and four CH-47 aircraft modules with safety lanes at perimeter of modules representing 25% of assigned aircraft per UFC 3-260-01 Provide workstation for each aircraft module with utility connections - compressed air, electrical, and telephone/data lines (including Logistics STAMIS). May be shared between two aircraft maintenance modules. Utility connections must be accessible providing least safety hazard to maintenance personnel. Minimum of four dedicated 110VAC power outlets. Aircraft Electric Power Supply (200/115VAC/400 Hz, 3Phase system and 28VDC). Provide a minimum of two 10 ton overhead bridge cranes that covers the entire length and width of the multiple UH-60/AH-64/OH-58 aircraft modules and one 35 ton overhead bridge crane to cover the CH-47 aircraft modules. Provide clear structure span over a minimum of two adjacent aircraft modules as indicated on the block diagrams. Provide access lanes where required by design. Provide space for three GFCI high pressure (3000 psi) hydraulic oil delivery systems. These systems are used to check hydraulic systems and one is to be located in the hangar bay in the proximity of each airframe type and the pneudraulic shop where feasible. The system shall have the capacity and fittings to test all standard airframes.	
SHOP SPACES (GENERAL INFORMATION)	Provide space required for maintenance function of the shop. Provide work surfaces, fixed storage bins for miscellaneous parts, supplies, and maintenance tool kits. Provide space for desks or modular work stations where required. Provide required utility connections - air, electrical, telephone/data lines, and water where required. Provide all shops with grate and drainage to Oil Water Separator. Provide eye wash at all shops. Emergency showers at shops where personnel are exposed to hazardous materials or POL. Every shop needs pneumatic. All shops require space for one workstation with internet and Logistics STAMIS drops. Tool storage -preference for caged tool-room for each shop for individual tool boxes and shop tools and test sets. Partitions between shops to allow flexibility for future organizational/mission changes.	
PRODUCTION CONTROL	Provide two private/semi-private offices with admin workstations (Logistics STAMIS) separated from common work area. Provide space for five admin workstations (Logistics STAMIS) in a common work area. Provide space for file storage, fax machine and copier(s). Provide progress/scheduling marker board(s) or flat screen monitor(s). Provide customer service counter restricting access to admin area. Provide open meeting space for 20 persons at conference type table integrated in the common work area. Locate adjacent to Tech Supply and Logistics STAMIS comm hub/server room.	11

<b>TABLE 3.3 - GSAB HANGAR FUNCTIONAL REQUIREMENTS</b>		
<b>SPACE</b>	<b>GSAB HANGAR FUNCTIONAL REQUIREMENTS</b>	<b>PERSONNEL</b>
QUALITY CONTROL / ASSURANCE	<p>Provide semi-private/private office for OIC/NCOIC with space for admin workstations (Logistics STAMIS).</p> <p>Provide customer service counter restricting access to common admin area. The counter shall have three Logistics STAMIS connections.</p> <p>Provide admin workstation space for 11 personnel (two of the workstations shall have Logistics STAMIS connection.)</p> <p>Provide space for file storage, fax machine and copier(s).</p> <p>Provide progress/scheduling marker board(s) or flat screen monitor(s).</p> <p>Locate adjacent to Production Control and Tech Supply.</p>	13
TECHNICAL LIBRARY	<p>Provide space for table and chairs, storage shelves for Technical References.</p> <p>Provide bookshelf space for 24 sets aircraft tech manuals and 60 binders / company.</p> <p>Co-locate with Quality Control.</p>	
TECHNICAL ASSISTANCE REPRESENTATIVE (LARS/CLS)	<p>Provide space for admin workstation for five people.</p> <p>Provide space for file cabinets, fax machine(s), copier(s).</p> <p>Locate adjacent to QC and PC.</p>	5
AIRCRAFT MAINT PLATOON HQ	<p>Platoon Leader and Sgt: See platoon offices in Company Admin/Readiness area below.</p> <p>One Logistics STAMIS connection.</p> <p>Locate in proximity to maintenance platoon shops.</p> <p>Provide open admin space for Maintenance Officer.</p> <p>May be combined within Platoon Offices.</p> <p>Locate adjacent to maintenance platoon shops.</p>	3
UH-60 REPAIR SECTION	<p>Provide semi-private office with space for four squad leader workstations (Logistics STAMIS).</p> <p>Provide common training/work area to accommodate 50% of assigned personnel.</p> <p>Provide bench-height work stations (Logistics STAMIS) with 110VAC power to accommodate 50% of personnel at a time.</p> <p>Provide space for large bench height table (Logistics STAMIS drop) in the middle of the shop area with 110VAC power drop.</p> <p>Provide secure storage for shop tools.</p> <p>Provide double door to hangar bay.</p>	20
CH-47 REPAIR SECTION	<p>Provide semi-private office with space for four squad leader workstations (Logistics STAMIS).</p> <p>Provide common training/work area to accommodate 50% of assigned personnel.</p> <p>Provide bench-height work stations (Logistics STAMIS) with 110VAC power to accommodate 50% of personnel at a time.</p> <p>Provide space for large bench height table (Logistics STAMIS drop) in the middle of the shop area with 110VAC power drop.</p> <p>Provide secure storage for shop tools.</p> <p>Provide double door to hangar bay.</p>	52
AIRCRAFT COMPONENT REPAIR PLATOON HQ	<p>Platoon Leader and Sgt: See platoon offices in Company Admin/Readiness area below.</p> <p>One Logistics STAMIS connection. Locate in proximity to component repair shops.</p> <p>Provide open admin space for Maintenance Officer.</p> <p>May be combined within Platoon Offices.</p> <p>Locate adjacent to component repair shops.</p>	3
POWER PLANT	<p>Provide space for one admin workstation (Logistics STAMIS) [Note: Separate space preferred but could be combined with power train.]</p> <p>Provide space for two engine repair stand(s).</p> <p>Provide five bench height work stations with power.</p> <p>Provide secure storage for shop tools.</p> <p>Provide a two-ton bridge crane that can cover entire shop area.</p> <p>Provide roll-up doors large enough for passage of engine stands from Aircraft Maintenance Bay to Shop.</p> <p>Provide 110VAC power. Provide two compressed air connections.</p> <p>Provide deep sink connected to containment/oil water separator.</p>	6

<b>TABLE 3.3 - GSAB HANGAR FUNCTIONAL REQUIREMENTS</b>		
<b>SPACE</b>	<b>GSAB HANGAR FUNCTIONAL REQUIREMENTS</b>	<b>PERSONNEL</b>
POWERTRAIN	<p>Provide space for one admin workstation (Logistics STAMIS) [Note: Separate space preferred but could be combined with power plant.]</p> <p>Provide space for two rotor head repair stand(s).</p> <p>Provide four bench height work stations with power.</p> <p>Provide secure storage for shop tools.</p> <p>Provide a two-ton bridge crane that can cover entire shop area.</p> <p>Provide roll-up doors large enough for passage of rotors and rotor heads on stands from Aircraft Maintenance Bay to shop.</p> <p>Provide 110VAC power. Provide two compressed air connections.</p> <p>Provide deep sink connected to containment/oil water separator.</p> <p>Provide NDI (fluorescent penetrant) "dark room" (Note: curtain-type is adequate).</p> <p>Provide appropriate Industrial ventilation.</p>	5
STRUCTURAL REPAIR (AIRFRAME)	<p>Provide space for one admin workstation (Logistics STAMIS).</p> <p>Provide six bench height work stations with drawers/cabinets with power (one Logistics STAMIS), and compressed air.</p> <p>Provide space for GFCI: 48" box and pan break machine(s), 48" foot shear, shrinker/stretcher machine, one drill press.</p> <p>Provide secure storage for shop tools.</p> <p>Provide space above work station for bench stock.</p> <p>Provide downdraft workstations for spray can painting and composite repair.</p> <p>Provide double doors or overhead roll-up door.</p> <p>Provide work surface(s) to accommodate one ~ 6' X 8' stabilator.</p> <p>Provide deep sink connected to an oil water separator.</p> <p>Provide space for repair of one rotor blade at a time within heated/cooled space.</p> <p>Provide space for GFGI refrigerator for adhesive storage.</p> <p>Provide space and power for conventional oven.</p> <p>Provide space for two VIDMARS.</p>	8
PNEUDRAULICS REPAIR	<p>Provide separate shop - however, may be combined with Airframe.</p> <p>Provide space for one admin workstation (Logistics STAMIS).</p> <p>Provide two bench height work stations with drawers/cabinets.</p> <p>Provide separate secure storage for special tools and equipment.</p> <p>Provide workspace for large GFGI/GFCI equipment (e.g. bender).</p> <p>Provide deep sink connected to oil/water separator.</p> <p>Provide one compressed air connection per workstation, and 110VAC power in surface metal raceway. Provide containment/floor drain to Oil Water Separator.</p> <p>Provide space for hose cutting saw(s), one GFGI solvent tank, and two VIDMARS. Provide storage bins/racks for raw material (tubing and hoses).</p>	3
AVIONICS/ELECTRICAL REPAIR	<p>Provide one admin workstation (Logistics STAMIS).</p> <p>Provide bench height work stations along two walls with 110 VAC power in surface metal raceways and equipment ground bar above bench height work stations.</p> <p>Provide shelf above bench work stations for small parts boxes.</p> <p>Provide four dedicated - 28VDC outlets in surface metal raceway evenly distributed at bench height work stations.</p> <p>Provide equipment grounding bar. Equip one bench height work station with 115VAC/400Hz, 3 Phase power.</p> <p>Provide for electrostatic discharge with either grounded wrist straps at work benches or grounded discharge plates at doors.</p> <p>Provide local downdraft exhaust ventilation for soldering.</p> <p>Provide secure storage for shop tools and test equipment.</p> <p>Provide space for three VIDMARS.</p> <p>Provide rubber mats @ bench height work stations.</p>	15
POL FUEL HANDLERS	<p>Provide space for one shared admin workstation. Co-locate with Flight Ops.</p>	2
HANGAR PARTS & TOE STORAGE (Tech Supply)	<p>Locate adjacent to Production Control, Aircraft Maintenance Bay floor, and Exterior Storage</p> <p>Provide issue and turn-in counters.</p> <p>Provide private admin work area with space for two admin work stations.</p> <p>Provide space for one common workstation (Logistics STAMIS).</p> <p>Provide shelving for parts, equipment, etc. - automated storage systems preferred.</p> <p>Provide 10' w x 12' h exterior overhead coiling door with dock access for delivery of parts.</p> <p>Provide visual access to dock.</p>	

TABLE 3.3 - GSAB HANGAR FUNCTIONAL REQUIREMENTS		
SPACE	GSAB HANGAR FUNCTIONAL REQUIREMENTS	PERSONNEL
SPECIAL TOOL ROOM	<p><u>Tool room (small tools):</u> Provide centrally located secure room adjacent to hangar bay floor with customer service counter. Provide space for one administrative work station (no Logistics STAMIS), VIDMARs, and shelving. Locate adjacent to Aircraft Maintenance Bay, Shops, and Maintenance Repair Sections. Provide doors large enough to move VIDMARs.</p> <p><u>Equipment Storage:</u> Provide secured open floor space area for large equipment and tools (e.g. maint. stands, jacks, torque adapters) Provide shelving (~3' depth) for larger tools. The equipment storage shall be located adjacent to Aircraft Maintenance Bay Floor. Provide connection to small tools room for control (caged area inside the hangar is acceptable).</p>	
HAZARDOUS/FLAMMABLE/OIL STORAGE	<p>Provide compliant storage area for six 55-gal drums of hazardous materials either within the hangar or as a prefabricated facility outside of the hangar. A separate pre-fabricated compliant facility is preferred. Provide compliant space for six (6) metal hazardous material storage cabinets adjacent to hangar maintenance bay and special tool room.</p>	
HAZARDOUS WASTE STORAGE	<p>Provide compliant space for temporary storage of used lubricants, flammable solvents, dry sweep, etc. Provide space for six 55-gallon barrels. This space may be combined with 55-gallon drum hazardous material storage.</p>	
WASTE OIL STORAGE TANK	<p>Provide compliant above-ground 300-gallon waste oil storage tank. The tank shall be constructed of non-corrosive material. Provide secondary containment in compliance with applicable state environmental regulations. Tank construction and location shall comply with IBC and NFPA code requirements. Provide 12-inch diameter x 5'-4" high, concrete-filled, schedule 80 galvanized steel pipe bollards, painted safety yellow, around the perimeter of above-ground tank areas. The preferred location is adjacent to the end of the Aircraft Maintenance Bay.</p>	
WASTE FUEL STORAGE TANK	<p>Provide compliant above-ground 300-gallon waste fuel storage tank. The tank shall be constructed of non-corrosive material. Provide secondary containment in compliance with applicable state environmental regulations. Tank construction and location shall comply with IBC and NFPA code requirements. Provide 12-inch diameter x 5'-4" high, concrete-filled, schedule 80 galvanized steel pipe bollards, painted safety yellow, around the perimeter of above-ground tank areas. The preferred location is adjacent to the end of the Aircraft Maintenance Bay.</p>	
S-280 AIRCRAFT MAINTENANCE SHELTER	<p>Provide space for five mobile shops ~ 8 X 15 located outside hangar. Provide power and exterior rated plug connection(s).</p>	
EXTERIOR COVERED STORAGE	<p>Provide a load-bearing pad, base, apron, or platform upon which various types of equipment are positioned. SPAMs, generators, MILVANs, shop sets (M109), power generation, ground support equipment, and transformers are equipment frequently placed on such pads. Locate adjacent to Aircraft Maintenance Bay and Tech Supply</p>	
AVIATION UNIT OPS	<p>Provide space for administration, pilot briefing, pilot lockers, lounge, latrines, and storage for Air Life Support Equipment (*ALSE). Provide the following spaces for each of the flying companies unless noted otherwise:</p>	Heavy - 52 Command - 37 Medical - 85
FLIGHT PLANNING	<p>Provide BN-level shared space. Provide nine table top planning workstations with power and NIPR drops. Provide one admin workstation. (Potential location for SIPR would require private office rather than cubicle). Provide wall-mounted sliding panels for display of GFCI planning maps. Provide white boards. Provide shelving for manuals. Locate adjacent to briefing room and flight operations.</p>	
SECURE PLANNING ROOM	<p>Provide space for two admin workstations with secure voice, SIPRNET and power. Provide secure access.</p>	

TABLE 3.3 - GSAB HANGAR FUNCTIONAL REQUIREMENTS		
SPACE	GSAB HANGAR FUNCTIONAL REQUIREMENTS	PERSONNEL
FLIGHT OPERATIONS	Provide BN-level shared space. Provide space for four admin workstations. Provide customer service counter restricting access to admin workstations (LAN/voice) 1 class A phone. Provide one Logistics STAMIS drop at service counter. Provide conduit(s) for antennas to roof from one of the admin work stations. Provide shelving for publications storage. Provide white boards and digital presentation capability. Provide secure storage for Night Vision Goggles (180 total) Locate adjacent to briefing room and flight planning room. Flight line view is preferable (CCTV could be an option).	4
BN-Level Pilot Briefing Room	Provide two ceiling-mounted projectors supports, one recessed ceiling-mounted screen, large white boards, and PA system. Provide space to accommodate 150 people utilizing stackable seating for briefing. Provide storage space for chairs and tables. Provide voice/data drops. Provide moveable lectern.	
AVIATION OPS BREAKROOM	Provide BN-level shared break room with a small kitchen with microwave(s), refrigerator, and double sink. Provide space for seating of 8-12 people at tables. Provide phone. Provide TV cable drop and wall-mount for TV.	
CREW CHIEF WORKROOM	Provide company-level shop adjacent to aircraft maintenance bay floor and Platoon Sgt's office. Provide minimum 60 lf bench height 24-inch deep counter with whiteboard above with Logistics STAMIS and power to accommodate 20 laptops. Provide means to secure two individual tool boxes (kits) per three lf of counter. Provide 4' X 8' bench-height worktable with metal surface - locate in center of room. Provide space for eight VIDMARS and bench stock.	96
ALSE LOCKERS	Provide 195 dual lock or pass thru ALSE lockers (approximately 2.5' x 2.5' x 2.5') for flight crew members. Locate immediately accessible to ALSE Shop.	
ALSE SHOP	Provide minimum 6' customer service counter. Provide space for one admin workstation. Provide space for training (approx 12' x 16'). Provide separate space for a refrigerator, a washing machine, and a dryer with storage shelves. Provide secure area with: 1) two 8' workbenches with rubber top for inspection and maintenance; 2) floor to ceiling shelving for storage of ALSE and related equipment; 3) two 4' x 8' non-porous work tables free from rough or abrasive materials; and 4) four lockers. Provide a utility support area for a fixed or portable vacuum source and low-pressure, high-volume compressed air (moisture and oil free). Locate adjacent to ALSE lockers. Preferred location is 1st floor.	2
MAINTENANCE TEST PILOTS	Provide two admin workstation for each company integrated into Platoon Sgt office adjacent to crew chiefs.	2
COMPANY ADMINISTRATION / READINESS		
COMPANY OFFICES (3 flying companies and 1 aviation support company)	Each company should have a command suite to include the following spaces.	
COMMANDER	Private office for Commander. Provide for small conferencing table and side chairs.	1x4=4
1ST SGT	Provide space for desk, files and chairs for four persons waiting to see Commander. Locate adjacent to Commander office.	1x4=4
AVIATION SAFETY OFFICER (Flying Companies Only)	Private office for Aviation Safety Officer.	1x3=3
AVIATION STANDARDIZATION OFFICER (Flying Companies Only)	Private office for Aviation Standardization Officer.	1x3=3
AVIATION TAC OPS OFFICER	Private office for Aviation Tactical Operations Officer.	1x3=3
ADMIN STORAGE	Provide shelving for administrative supplies. Locate centrally within command suite.	

TABLE 3.3 - GSAB HANGAR FUNCTIONAL REQUIREMENTS		
SPACE	GSAB HANGAR FUNCTIONAL REQUIREMENTS	PERSONNEL
COMMAND STAFF OPEN OFFICE / ORDERLY ROOM	Provide open office space for unit administrative functions. For Flying Companies, provide space for one workstation for each Plt Ldr and each Plt Sgt. For Aviation Support Companies, provide three workstations. Provide space for a centralized area for printer and fax machines, waste and paper recycling receptacles. Provide mail slots (CO, 1st Sgt, Operations Officer, Aviation Safety Officer, Aviation Standardization Officer, Aviation Tactical Operations Officer, Supply Sgt, Armorer, NBC Sgt, each Platoon Leader, each Platoon Sgt, each Maint. Test Pilot) Locate adjacent to Company Commander and 1st Sgt Offices.	2x3=6 3x1=3
PLATOON OFFICES	Locate platoon offices in the corresponding work area. For flying companies, locate adjacent to or with Aviation Unit Operations. For the aviation support company, locate in proximity to corresponding shops. For each platoon provide shared office space for platoon leader and Sgt. Each 150 sq ft office requires two desks to accommodate computers, two task chairs, two bookcases for manuals, two 4-drawer file cabinets. Aviation Support Company: Aircraft Maintenance Platoon, Component Repair Platoon CH-47 Company: 3 Platoons Medical Evac. Company: 4 Platoons Command Company: 2 Platoons	2x2=4 3x2=6 4x2=8 2x2=4
READINESS SUPPLY CUSTOMER SERVICE AREA	Provide space for desk and counter.	
COMPANY READINESS STORAGE	Provide storage for Company's readiness equipment.	
ARMS VAULT	Provide arms vault(s) to accommodate storage of arms, ammunition and explosives (AA&E) for each company. Arms vault(s) are not intended to provide space for aircraft armaments. These vaults shall 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. Provide electronic security system to arms vault(s). Electronic system shall include electronic access control system and intrusion detection system. May provide one for the entire battalion if the arms storage area is sub-divided into companies for control considerations. Provide customer service counter(s) for armorer. Provide BN space for two shared workstations, bookcases for manuals, one 4-drawer file cabinet, and two work benches.	
SECURE STORAGE	Provide secure storage room for non-sensitive items (high value items, other than AA&E, for which accountability is a concern). AR 190-51 and AR 190-13 shall govern construction standards for this space. The minimum acceptable wall construction permissible is impact resistant gypsum board with metal lath backing on metal studs. Provide space for four lockable metal cabinet with shelves and industrial shelving approximately 10'w x 4'd x 6'h each - one for small COFs, two for medium, and three for large.	
NBC STORAGE	Wire Cage may be utilized to sub-divide. Provide space for one desk to accommodate a computer, one task chair, one 4-drawer file cabinet, and four lockable metal cabinets with shelves	
COMMUNICATIONS EQUIP	Wire Cage may be utilized to sub-divide. Provide space for one desk to accommodate a computer, one task chair, one 4-drawer file cabinet, and four lockable metal cabinets with shelves	
CONSUMABLE UNIT STORAGE	Wire Cage may be utilized to sub-divide. Provide customer service counter. Provide space for three admin workstations. Provide space for bookcases for manuals, four lockable metal cabinets with shelves, two 4-drawer file cabinets, and industrial shelving approximately 10'w x 4'd x 6'h - two total for small COFs, four for medium, and six for large.	
TA50 LOCKERS	Provide a 42" w x 24" d x 78" h permanently installed individual steel lockable locker with base and sloped top for each assigned personnel. There shall be a shelf and clothes rod at the top and a removable shelf at midpoint.	
OTHER AREAS		

TABLE 3.3 - GSAB HANGAR FUNCTIONAL REQUIREMENTS		
SPACE	GSAB HANGAR FUNCTIONAL REQUIREMENTS	PERSONNEL
MULTI-PURPOSE / BREAK / CONFERENCE	<p>Provide one multi-purpose conference room per company.</p> <p>Provide 4' x 8' marker board, recessed ceiling mounted projection screen, and ceiling mounted projector support.</p> <p>Provide dimmable lights.</p> <p>Consider grouping all hangar training/conference rooms in a common area and providing enough flexibility to open two or more training/conference into one large training/conference room.</p> <p>Provide break room(s) adjacent to training/conference room(s).</p> <p>Provide millwork, double compartment sink, and garbage disposer.</p> <p>Provide space for refrigerator, microwave, and two vending machines.</p>	
DISTRIBUTED/COMPUTER BASED TRAINING ROOM (DT/CBT)	<p>Locate in central location to accommodate maximum personnel on stackable chairs or maximum personnel at 24" wide study tables.</p> <p>Provide one training room that can be divided into two training areas.</p> <p>Provide 4' x 8' marker boards, recessed ceiling mounted projection screens, and ceiling mounted projector supports.</p> <p>Provide storage for tables and chairs. Provide space for lectern.</p> <p>Provide dimmable light fixtures.</p> <p>Dedicated, computer enabled digital training room providing a maximum of two 6-person stations equipped with Classroom XXI technology for Soldier skills or small group training using computer terminal linkage with training and knowledge centers across the Global Information Grid (GIG). DT/CBT.</p>	
RESTROOMS	<p>Provide separate restroom space for administrative personnel.</p> <p>80% male and 20% female of administrative personnel.</p>	
SHOWERS (administrative PERSONNEL)	<p>May be adjacent to administrative restrooms and/or integrated with showers/latrines (maintenance personnel).</p> <p>Provide personnel lockers (12" x 72") with raised base and sloped top for administrative personnel at conclusion of Physical Training (approximately ½ of assigned personnel).</p> <p>Provide benches.</p> <p>80% male and 20% female of administrative personnel.</p>	
SHOWERS/LATRINES (MAINTENANCE PERSONNEL)	<p>Provide required showers/latrines fixtures to accommodate maintenance personnel in the Aviation Maintenance or Support Company.</p> <p>Provide personnel lockers (12" x 72") for maintenance personnel. Provide benches.</p> <p>May be adjacent to for administrative personnel.</p> <p>80% male and 20% female of maintenance personnel.</p>	
SUPPORT SPACES:		
MECHANICAL	<p>Include space for sprinkler system riser, boilers, fan motors, etc. with adequate maneuverability to service equipment.</p>	
ELECTRICAL	<p>Provide space for Service Rated Entrance Equipment, transformers, Distribution Panels, Lighting Panels, Fire Alarm System Control, etc.</p>	
COMMUNICATIONS	<p>Telephone and Data Racks and distribution equipment (including future accommodation for a Secure Internet Protocol Routing Network (SIPRNET)) with four workstations and associated equipment.</p>	
JANITOR CLOSET(S)	<p>Minimum one/floor centrally located.</p>	
CORRIDORS / HALLWAYS	<p>Minimum width 6'.</p>	

### 3.4 ROOM SUMMARY MATRIX

#### 3.4.1 FUNCTIONAL SPACES:

Net area requirements for functional spaces are included in Table 3.4. The gross area space shall be sized to accommodate the required function, comply with code requirements and other requirements of the Facility.

**Table 3.4  
GSAB NET AREA SUMMARY**

ROOM NAME	AREA (SF)	SPECIAL REQUIREMENTS
	<b>HANGAR</b>	
Hangar (Assigned: 20 UH-60; 12 Medevac, 8 Support. 13 CH-47)	77,913	Hangared: 5 UH-60; 4 CH-47. ( 25% assigned aircraft)
Modules:		Modules: UH-60, 84'L x 64'W; CH-47, 110'L x 70'W
UH-60, 84'L x 64'W x 5	26,880	
CH-47, 110'L x 70'W x 4	30,800	
Interior Tow Lane & Hangar Doors	13,263	
Perimeter 5'W Safety Lane (1394LF x 5')	6,970	
<b>MAINTENANCE SHOPS &amp; OFFICES</b>	<b>10,270</b>	
Powertrain Shop (Prop & Rotor)	900	
Structural Shop (Airframe/Composite/Sheet Metal)	1,600	
Avionics / Communications Equipment Repair	600	
Avionics Float Equipment / COMSEC Storage	300	
Pneudraulics	600	
Electrical	350	
Power Plant (Engine)	900	
Armament Subsystem	600	
Component Cleaning Area	100	
Production Control	600	
Quality Control/Quality Assurance (QA/QC)	600	
Technical Library	300	
Contractor Logistics Support (CLS)	420	
Night Vision Device	200	
Fuel Service & POL	1,000	
UH-60 Repair Section Workroom	400	
CH-47 Repair Section Workroom	800	
<b>MAINTENANCE SUPPORT</b>	<b>7,460</b>	
Special Tools Room	500	
Repair Parts Storage Room (Tech Supply)	600	
Accessory Equipment Storage	900	
Bench Stock Storage	120	
Arms Vault (Aircraft Mounted)	300	
Controlled Waste Facility	300	
Bulk POL Storage	240	
Flammable / Combustible Storage	400	
Contractor Logistics Support	1,200	
Non-Sensitive Secure Storage (Aircraft Mounted Systems)	300	
Medical Equipment & Supply	2,000	
NBC Storage (4 x 150)	600	



<b>COMPANY ADMIN/READINESS &amp; PLATOON OFFICES</b>	<b>15,520</b>	
Company Commander (4 x 150)	600	
1st Sergeant (4 x 100)	400	
Safety Officer (3 x 120)	360	
Aviation Standards Officer (3 x 120)	360	
Aviation TAC OPS Officer (3 x 120)	360	
Orderly Room (5 x 200)	1,000	
Training Office (4 x 120)	480	
General Purpose Storage (4 x 96)	384	
Printer/Copier Station (4 x 96)	384	
Conference/Mission Planning & Briefing Room/Assembly Area	600	
Distributed/Computer-Based Training (Classroom XXI (DT/CBT Room))	572	
Maintenance Test Pilots (8 x 80)	640	
Platoon HQs. x 11: Aircraft Maintenance, Component Repair, CH-47 (3), Med EVAC (4), Command (2) (11 @ 150SF)	1,600	
Arms Vault (Soldier Weapons) (4 x 480)	1,920	
Company Readiness Storage (4 x 1200)	4,800	
Consumables Storage (4 x 120)	480	
Common ADP Space	480	
ADP Support Activities (RCAS)	100	
<b>AVIATION LIFE SUPPORT EQUIPMENT (ALSE) SHOP</b>	<b>4,350</b>	
ALSE Administration Area	150	
ALSE Maintenance Shop	1,000	
ALSE Storage (195 Lockers)	3,200	
<b>Aviation Unit Operations</b>	<b>8,970</b>	
Pilot Briefing Room (150)	1,050	
Flight Planning	1,200	
Secure Planning Room	120	
Flight Operations	600	
Crew Chief Workroom (96)	2,000	
Pilot Workroom (3 Companies w/ 174 Pilots; 52 Heavy, 37 Command, 85 Med)	4,000	

<b>OTHER AREAS</b>		<b>4,726</b>	
Break Room		200	Alcove area off of a corridor or within an assembly room for cabinets, countertop, sink and space for a refrigerator (NIC)
Toilets / Showers		1,000	Includes toilets for administrative and maintenance personnel. Showers to accommodate maintenance personnel and off-post personnel (25% of the non-maintenance population). Quantities based on 80% male and 20% female.
Locker Room		1,500	Includes lockers for maintenance personnel and off-post personnel (25% of the non-maintenance population). Lockers shall be 12"w x 18"d x 72" h w/ benches. Quantities based on 80% male and 20% female.
Facility Maintenance & Storage		1,900	
Janitor Closet (2)		126	
<b>NET AREA</b>		<b>129,209</b>	
<b>ANCILLARY SPACE</b>			
<b>Net to Gross Conversion</b>			
Electrical (1% of Net Area)		1,292	
Telecommunications (2% of Net Area)		2,584	
Elec & Telecom S/Total		3,876	
<b>Adjusted S/Total</b>		<b>133,085</b>	
Circulation (20% of Adjusted Net w/o hangar bay net area )		11,034	
<b>Adjusted S/Total</b>		<b>144,120</b>	
Mechanical (7% of Adj S/Tot)		10,088	
	<b>GSF</b>	<b>154,208</b>	
<b>TOTAL</b>		<b>154,208</b>	

### 3.5 FUNCTIONAL ADJACENCIES

See Table 3.5 following this Section.

### 3.6 GENERAL TECHNICAL REQUIREMENTS

#### 3.6.1 SITE:

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 and implemented by the Transportation Systems Mandatory Center of Expertise (TS MCX) for DCS G-3, HQDA. The major components of a HGR Complex and minimum siting requirement for any hangar project (inside the five-foot line) includes the primary facility FCC 211 xx, Hangar Access Apron FCC 113 40, and Aircraft Wash Apron FCC 113 70. ASB hangars also include Aircraft Parts Storage Building FCC 211 13 external storage space allocations. All other hangar complex space is contained within the confines of these facility categories.

The outer boundary of the hangar complex (outside the five-foot line) abuts the Rotary Wing Aircraft Parking Apron FCC 113 20, Hover Taxilanes FCC 112 21, and Taxiways FCC 112 31. This assures safe and efficient transition from the power-on components of an AAF/AHP (primary landing surface (i.e., runway or helipad) and aircraft parking) to non-power ingress/egress into the hangar.

### 3.7 ARCHITECTURE AND INTERIOR DESIGN

#### 3.7.1 GENERAL:

Overall architectural goal is to provide a functional, quality, visually appealing facility that is a source of pride for the Installation and delivered within the available budget and schedule.

#### 3.7.2 BUILDING EXTERIOR:

Design buildings to enhance or complement the visual environment of the Installation. Where appropriate, reflect a human scale to the facility. Building entrance should be architecturally defined and easily seen. When practical, exterior materials, roof forms, and detailing shall be compatible with the surrounding development and adjacent buildings on the Installation and follow locally established architectural themes. Use durable materials that are easy to maintain.

3.7.2.1 BUILDING NUMBERS: Each building shall have exterior signage permanently attached on two faces of the building indicating the assigned building number or address.

#### 3.7.3 BUILDING INTERIOR:

##### 3.7.3.1 SPACE CONFIGURATION:

Arrange spaces in an efficient and functional manner in accordance with area adjacency matrices.

##### 3.7.3.2 SURFACES:

Appearance retention is the top priority for building and furniture related finishes. Provide low maintenance, easily cleaned room finishes that are commercially standard for the facility occupancy specified, unless noted otherwise.

##### 3.7.3.3 COLOR:

The color, texture and pattern selections for the finishes of the building shall provide an aesthetically pleasing, comfortable, easily maintainable and functional environment for the occupants. Coordination of the building colors and finishes is necessary for a cohesive design. Color selections shall be appropriate for the building type. The use of color, texture and pattern shall be used to path or way find through the building. Trendy colors that will become dated shall

be limited to non-permanent finishes such as carpet and paint. Finishes should be selected with regards to aesthetics, maintenance, durability, life safety and image. Limit the number of similar colors for each material. Color of Ceramic and porcelain tile grout shall be medium range color to help hide soiling. Plastic laminate and solid surface materials shall have patterns that are mottled, flecked or speckled. Finish colors of fire extinguisher cabinets, receptacle bodies and plates, fire alarms / warning lights, emergency lighting, and other miscellaneous items shall be coordinated with the building interior. Color of equipment items on ceilings (speakers, smoke detectors, grills, etc.) shall match the ceiling color.

#### 3.7.3.4 CIRCULATION:

Circulation schemes must support easy way finding within the building.

#### 3.7.3.5 SIGNAGE:

Provide interior signage for overall way finding and life safety requirements. A comprehensive interior plans set shall be from one manufacturer and shall include the following sign types: (1) Lobby Directory, (2) Directional Signs; (3) Room Identification Signs; (4) Building Service Signs; (5) Regulatory Signs; (6) Official and Unofficial Signs (7) Visual Communication Boards. Use of emblems or logos may also be incorporated into the signage plan.

#### 3.7.3.6 WINDOW TREATMENT:

Treatment shall be provided in all exterior windows or locations where control of day light coming in windows or privacy at night is required. Uniformity of window covering color and material shall be maintained to the maximum extent possible within a building.

#### 3.7.4 MATERIAL AND FINISHES:

##### 3.7.4.1 FLOORS:

- (a) Hangar floors: Non-skid, light reflective, non-oxidizing dry shake surface hardened or light reflective epoxy or polyurethane coating.
- (b) Shop floors: Sealed concrete, non-skid, light reflective, non-oxidizing dry shake surface hardener or light reflective epoxy or polyurethane coating.
- (c) Restroom floors: ceramic tile / porcelain tile.
- (d) Shower floors: ceramic tile
- (e) Office floors: carpet or vinyl composition tile.
- (f) Corridors / Vestibules: Vinyl composition tile, concrete sealer.
- (g) Other auxiliary spaces: Concrete sealer.

##### 3.7.4.2 BASES:

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

##### 3.7.4.3 WALLS: (STC and fire rated where required)

- (a) Hangar and shop Spaces:
  - Up to 10'-0" Above Finished Floor: Durable, impact resistant, corrosive resistant, and easily cleaned material. The lower portion of the walls to be protected against incidental damage caused by movement of aircraft parts, equipment, etc. Exterior surface is to be protected against incidental damage. Painted.
  - Above 10'-0": Moisture resistant gypsum board, exposed vinyl faced insulation, metal liner panels solid or perforated. Painted.
- (b) Restrooms: ceramic tile / porcelain tile (Utilize water resistant/ mold resistant cement board backer board).
- (c) Showers: Ceramic tile / porcelain tile (Utilize cement backer board or moisture resistant gypsum board).

- (d) Offices: Painted gypsum board.
- (e) Corridors, Vestibules: Painted gypsum board.
- (f) Other Auxiliary spaces: Painted gypsum board, CMU.

#### 3.7.4.4 CEILINGS:

- (a) Hangar and Shop Spaces unless otherwise noted: Painted exposed structure.  
Note: Exposed vinyl faced insulation, if used, is not to be painted.
- (b) Offices & Technical Shops: Acoustical Ceiling Tile.
- (c) Restrooms & Lockers: Moisture resistant Acoustical Tile
- (d) Showers / Lockers: Painted moisture resistant gypsum board.
- (e) Corridors: Acoustical Ceiling Tile.
- (f) Vestibules: Acoustical Ceiling Tile with hold-down clips, Painted Gyp Bd.
- (g) Auxiliary Spaces: Acoustical Ceiling Tile, Painted Gyp Bd.
- (h) Arms Vault: Painted.

#### 3.7.4.5 DOORS / FRAMES: (STC and fire rated where required)

- (a) Painted Insulated Galvanized Hollow Metal (corrosive resistant at Hangar and Shop Areas).
- (b) Aluminum Entrance System – color PVF finish.
- (c) Plastic Laminate, hollow core metal, insulated metal, or solid core wood doors (Administrative spaces).
- (d) Hangar Doors: Motorized Fabric; Motorized Insulated Metal Horizontal Sliding– color to complement other exterior finishes.
- (e) Service Doors: Insulated metal motorized overhead coiling doors.
- (f) Folding partitions: Manually operated vinyl, pantograph acoustical folding partitions. Provide minimum 42 STC rating.
- (g) Movable wall panels: Single or paired panels. Provide minimum 42 STC rating. Provide hinged doors in panels where access through the movable wall is required for function or code.

#### 3.7.4.6 WINDOWS / GLAZING: (Fire rated where required)

- (a) Hangar Floor or Shop Space: Fixed High-Bay windows, clerestory windows, or insulated translucent wall system where required.
- (b) Offices, exterior and Vestibule interior: Aluminum, insulated windows, fixed, color PVF finish.
- (c) Interior Windows: Hollow core metal with fire or safety glazing as required.

#### 3.7.4.7 SPECIALITIES:

- (a) Marker boards: Liquid writing marker boards.
- (b) Bulletin boards: Bulletin boards shall consist of a natural cork tack board, and aluminum tubular frame.
- (c) Signage: Comply with requirements of ADAAG and UFAS. Interior signage shall be fully integrated as a design element with the architecture and interior design.
- (d) Fire Extinguishers, Cabinets or Supports.
- (e) Millwork: Built-in accessories / worktops / counters.

#### 3.7.5 COMPREHENSIVE INTERIOR DESIGN:

##### 3.7.5.1 COMPREHENSIVE INTERIOR DESIGN (CID):

CID includes the Structural Interior Design (SID) and the Furniture, Fixtures and Equipment (FF&E) Design. SID requires the accommodation of required FF&E within the building and the design, selection and coordination of interior finish materials that are integral to or attached to the building structure. The SID provides basic space planning for anticipated FF&E requirements in conjunction with the functional layout of the building and design issues such as life safety, privacy, acoustics, lighting, ventilation, and accessibility. Completion of an SID involves the selection and specification of applied finishes for the building's interior features including, but not

limited to, walls, floors, ceilings, trims, doors, windows, window treatments, built-in furnishings and installed equipment, lighting, and signage. The SID package will include furniture floor plans, finish schedules, finish samples and any supporting interior elevations, details or plans necessary to communicate the building finish design and build out. The FF&E includes the design, selection, specification, color coordination and procurement documentation of the required items necessary to meet the functional, operational, sustainability, and aesthetic needs of the facility. The FF&E package will include placement plans, ordering and finish information on all freestanding furnishings and accessories, and cost estimates and will be coordinated with the Structural Interior Design (SID) interior finish materials. The selection of furniture style, function and configuration will be coordinated with the defined requirements. Examples of FF&E items are workstations, seating, files, tables, beds, wardrobes, draperies and accessories as well as markerboards, tack boards, and presentation screens. Criteria for furniture selection will include function and ergonomic considerations, maintenance, durability, sustainability, comfort and cost. Structural Interior Design (SID) is required for all facility types. FF&E package is required.

#### 3.7.5.2 COLOR, SURFACE AND SIGNAGE:

Provide a signage package for all reception desks if not provided for in the buildings' overall signage package.

### 3.8 STRUCTURAL DESIGN

#### 3.8.1 STANDARDS AND CODES:

The structural design shall be in conformance with the current versions of the Unified Facilities Criteria UFC 1-200-01 Design: General Building Requirements and other relevant codes and criteria listed in APPLICABLE CRITERIA.

#### 3.8.2 GENERAL:

The structural system needs to be compatible with the intended functions and components that allows for future flexibility and reconfigurations of the interior space. Select an economical structural system based on facility size, projected load requirements and local availability of materials and labor. The structural design shall be based on accurate site specific geotechnical information and anticipated loads for the building type and geographic location.

#### 3.8.3 STRUCTURAL LOADS:

Structural loads (including, dead, live, hydrodynamic, earth, vehicular, snow, wind, seismic loads, crane loads and ATFP) and design shall be in accordance with UFC 1-200-01 Design: General Building Requirements and all codes referenced in APPLICABLE CRITERIA.

### 3.9 PLUMBING

#### 3.9.1 EXTERIOR WALL HYDRANTS:

Wall hydrants shall be provided around perimeter of building as well as one inside of the Mechanical Room(s).

#### 3.9.2 DOMESTIC HOT WATER SYSTEM:

The main water heating equipment shall be located within a mechanical room, and also located on the ground floor level only. Instantaneous water heaters are permissible. System storage and recovery shall be sized 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. Size water heater(s) based upon usage anticipated and accounting for this diversity factor. The energy source for the domestic water heating system shall be determined by Life Cycle Cost Analysis.

### 3.9.3 TRENCH DRAINS:

Design trench drains for easy cleaning. Provide basket strainers to facilitate trash removal where trench drains discharge to piping systems. Convey waste to exterior oil/water separator prior to discharge to the sanitary sewer system. When a dedicated, walled welding area is provided, provide a solid cover to the trench drain where it runs through the welding area.

### 3.9.4 EMERGENCY SHOWERS AND EYEWASHES:

See Paragraph 5 for eye wash, hand wash and emergency shower requirements within the hangar and shop areas. Locate emergency wash stations in accordance with OSHA standard 1910.151(c) and ANSI Z358.1.

### 3.9.5 COMPRESSED AIR:

Provide the compressed air outlets with quick disconnect couplings in all structural bays. Each drop shall include an isolation valve, filter and pressure regulator, condensate trap with drain cock. Provide air compressor with receiver, refrigerated air dryer, filtration and pressure regulation. The air compressor shall be installed building equipment. Size air compressor for 30 SCFM per outlet, with a 60 percent diversity, plus any additional compressed-air equipment in the facility. Unless otherwise indicated by the user requirements, provide compressed air at 120 psi. In AH-64 bays, provide regulators that provide service at 40 psig.

### 3.9.6 SUMP PUMP:

Provide sump pump in maintenance pit. Determine if sump pump shall be explosion proof type and provide explosion type, if required. Sump pump shall be submersible type and shall be capable of handling small amounts of oil and anti-freeze.

## **3.10 ELECTRICAL AND TELECOMMUNICATIONS**

### 3.10.1 FACILITY POWER:

Facility power shall be designed in accordance with NFPA 70. At a minimum the facility shall be provided with the following: 3-phase wye-connected, underground secondary service rated at 480VAC with sufficient capacity for future growth. 480VAC will be utilized for mechanical equipment and larger building specific loads, such as 400HZ Converters and 28VDC Rectifiers. Generally, 277VAC will be utilized for lighting. Dry type step down transformers will be utilized to provide 208Y/120VAC service for miscellaneous loads. 200Y/115VAC, 400HZ Power converter(s) and 28VDC Rectifier(s) will be provided to support A/C maintenance functions in the shop areas as well as in the hangar bay. Exterior loads may vary by site and must also be considered for each project. Some of the following should be considered any airfield lighting or taxiway requirements, exterior facility lighting, power connections for exterior ground support equipment, or portable trailers. As many as nine trailers each utilizing 208Y/120VAC, 100A, 3-phase service may require power from the facility distribution system. Coordinate project specific requirements for the trailers and their load and connection requirements. Specific load requirements for the hangar and shop areas will vary by airframe type and specific shop equipment and will require vary by specific hangar type design. Careful coordination will be required to size incoming service appropriately based upon the type and number of aircraft. Utilize an appropriate diversity factor for sizing 400Hz and 28VDC conversion equipment. Use Table 3.10 for consideration:

Table 3.10

Ground Service	Aviation Platform Ground Service Baseline Requirements							
	AH-64A	AH-64D	UH-60A/L	UH/MH-60M,X	CH-47D	CH/MH-47E,F,G	OH-58D	ARH
400 Hz 200/115V	28kW (35kVA)	34.4kV A 93kVA (270A) for 0.014 sec	45kVA	45kVA	20kVA	40KVA	10kVA	?
28 VDC Start	none	none	none	none	none	none	500-750 A start	500- 800 A start
28 VDC Servicing	none	none	none	none	200 A servicing	200 A servicing	200 A servicing	200 A servicing
Hydraulic Start	none	none	none	none	16.5 gpm @ 3350 psig	16.5 gpm @ 3350 psig	none	None
Hydraulic Servicing	6 gpm @ 3000 psig (dual system)	6 gpm @ 3000 psig (dual system)	8 gpm @ 3000 psig (triple system)	8 gpm @ 3000 psig (triple system)	10 gpm @ 3000 psig (triple system)	10 gpm @ 3000 psig (triple system)	3 gpm @ 3000 psig (single system)	2.4 gpm @1000 psig
Pneumatic Start	30 lb/min @ 30 - 50 psig	30 lb/min @ 30 - 50 psig	30 lb/min @ 30 - 50 psig	30 lb/min @ 30 - 50 psig	none	none	none	None
Pneumatic Servicing	ECU PAS hyd press	PAS only	none	none	none	none	none	None



### 3.10.2 STANDBY POWER SYSTEMS:

Standby Generator and UPS Back-Up Power Systems generally will not be required for these facilities. Government Furnished – Government Installed (GFGI), UPS systems may be considered for communications and data systems but will generally not be large in nature and will not be provided by the design.

### 3.10.3 GROUNDING:

The ground counterpoise around the building perimeter will be utilized for grounding incoming service, building steel, telephone service, piping, lightning protection, aircraft static ground points, and facility internal grounding requirements (e.g. shop areas). Ground straps will be provided where required by function and will be connected to the building grounding system. A grounding point will be provided under each raised access floor. Additional grounding may be provided based on project-specific requirements and the US Army I3A Guide.

### 3.10.4 LIGHTNING PROTECTION:

Lightning Protection generally will be required for all facilities and shall be designed in accordance with NFPA 780.

### 3.10.5 POWER DISTRIBUTION:

Power receptacles will be provided per NFPA 70 and in conjunction with proposed equipment and furniture layouts. 110VAC Power will be required at each work station in the office and shop areas. In addition, work stations in the hangar bay and shop areas will require consideration for 200/115VAC 400HZ, 28VDC as well as 110VAC/60HZ.

### 3.10.6 LIGHTING:

The exterior and hangar bay lighting shall be compatible with any future security cameras and security requirements as applicable. Interior lighting controls shall be provided in accordance with ASHRAE 90.1. Local manual controls shall supplement automatic controls in offices and specialized areas such as conference rooms. Occupancy sensor controls shall be provided in restrooms, electrical rooms, telecommunication rooms and similar spaces. Interior ambient illumination shall provide a generally glare free, high quality lighting environment conforming to be provided in conference rooms and training rooms.

### 3.10.7 TELECOMMUNICATIONS:

#### 3.10.7.1 GENERAL:

The facility shall be connected to the Installation wide area network system (WAN) and telephone system. Communications system resources will be allocated IAW the I3A Technical Guide regarding outlet amounts based on the functionality of the facility's various component floor spaces. Design will be in accordance with UFC 3-580-01 and the I3A Technical Guide.

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.

Telecommunications outlets will be provided per the I3A technical guide based on functional purpose of the various spaces within the facility as modified by user special operational requirements. Telecommunications infrastructure will meet the Installation Information Infrastructure Architecture (I3A) Guide and ANSI/TIA/EIA requirements.

#### VOICE/DATA OUTLETS:

Voice/data outlets shall be two 8-pin modular (RJ45 type) outlet/connector in a double gang outlet faceplate, one connector labeled voice use and one labeled data use. Copper outlet/connector must be TIA/EIA Category 6 for all projects. All connectors must be 8-pin/8-position insulation displacement terminations wired per T568A (default configuration). One Cat 6 UTP cable must be installed to each standard 8-pin modular connector provisioned at the faceplate. Copper

distribution cable must be terminated at the TR on Cat 6 cabinet or rack mounted patch panels with 110-type compliant connectors on the back and 8-pin modular connectors on the front. Provide wireless access point (WAP) outlets in the hangar bay areas with one-Cat 6, unshielded twisted pair (UTP) cable, each to a standard 8-pin modular connector for each wireless WAP outlet. Provide a minimum of one WAP outlet in each aircraft module.

#### OUTSIDE PLANT TELECOMMUNICATIONS SYSTEMS:

The project's facilities must connect to the Installation telecommunications (voice and data) system through the outside plant (OSP) underground infrastructure per I3A guidance. Connections to the OSP cabling system shall be 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, cross connects, terminations, splices, cable vaults, and copper and FO entrance facilities.

#### TELECOMMUNICATIONS ROOMS (TR):

Telecommunications rooms and telecommunications entrance facilities must be provided 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. The telecommunications rooms will be designed and provisioned in accordance with the I3A Guide and ANSI/EIA/TIA-569-B. One telecommunications entrance capability shall be provided for each facility. The telecommunications entrance may be collocated with the main TR for the facility. TR's shall be sized for the area supported. TIA/EIA-569-B compliant Telecommunications Enclosures (TE) may be used in hangar areas where the horizontal cable distance exceeds 90 meters.

#### SIPRNET:

Provide a SIPRNET room as indicated on the facility drawings for future use. Refer to the USAISEC Technical Guide for the Integration of Secret Internet Protocol Router Network (SIPRNET) for detailed information and references regarding SIPRNET. Section 6.2.5 of the USAISEC SIPRNET Tech Guide provides guidance on physical security. The SIPRNET room will be a minimum of six foot by six foot, constructed in accordance with AR 380-5, Section III, Chapter 7. The room requires an intrusion detection system. The SIPRNET tech guide recommends a steel entrance door, with a CD-X09 lock, minimum width of 32" to accommodate a cabinet, if necessary. Connect the SIPRNET room to the main telecommunications room via a single 2" trade size steel conduit. Provide a 20A branch circuit for future equipment. Ventilation ducts to be barred per security requirements of AR 190-11 App G.

#### CATV:

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. The CATV cabling will be terminated on splitters in the telecommunications room, or in a location indicated by the DOIM. CATV riser cable will be RG-11 type. Splitters will be located on the CATV backboard in the telecommunications room, or in a location indicated by the DOIM. All CATV horizontal cabling will be homerun between CATV jacks and the CATV backboard. Service requirements to the building will be coordinated with the local CATV service provider. At a minimum provide one 4' empty conduit stubbed out of the building to facilitate the CATV service entrance.

Each utility space, such as mechanical, electrical and telecommunications rooms will be provided with at least one wall mounted telecommunications outlet, with a wall mounting lug face plate near the entrance door.

### 3.10.8 MISCELLANEOUS SYSTEMS:

Secure Access Systems, Intrusion Detection Systems (IDS), Closed Circuit Television (CCTV) shall typically be designed to only provide raceways and back boxes for installation of these systems. Project specific requirements must be coordinated.

3.10.8.1 Coordinate anticipated locations of devices and provide raceways and back boxes for installation of a secure access system per Army Installation Design Standards paragraph 3.5.11, "Locks and Locking Devices".

3.10.8.2 Coordinate anticipated locations of devices required for a complete IDS and CCTV system. The design shall provide raceways and back boxes for installation of a complete system.

### 3.10.9 FIRE ALARM DETECTION AND NOTIFICATION:

Provide a complete detection and notification system that is able to interface with all facility fire protection systems, including, but not limited to the Hangar Suppression System, Fire Pumps, Mass Notification System and Installation Fire Station. Design will be in accordance with NFPA 72, UFC-3-600-01, ETL 1110-3-485 and the local authority having jurisdiction. See section 5.10.13 for additional requirements.

### 3.10.10 MASS NOTIFICATION AND PAGING SYSTEMS:

Provide a Mass Notification System in accordance with UFC- 4-021-01 in administrative spaces. Hangar Bay areas shall comply with exterior criteria. Provide the speakers, raceways and back boxes for a complete Paging System, typically, amplifiers and pre-amplifiers are provided separately. In some instances, it may be more efficient to the specific project to design an integrated Fire Alarm, Mass Notification and Paging System. Specific project requirements will determine.

## 3.11 HEATING, VENTILATING AND AIR CONDITIONING

### 3.11.1 STANDARDS AND CODES:

The HVAC system shall conform to APPLICABLE CRITERIA.

### 3.11.2 HANGAR AREAS:

For hangar bay areas, consider heating and ventilating units, radiant heating, or some combination of the two. In colder climates, consider supplemental heating at the floor level of repair shops and maintenance shops. Coordinate system selection with the Installation. Base the system selection on energy usage and life cycle cost, reliability and operating considerations, and the maintenance capabilities and resources of the user.

### 3.11.3 ADMINISTRATIVE AREAS:

See Table 3.11 for heating and cooling of administrative areas. HVAC system design should consider including flexibility in zoning to where it can address future changes in occupant densities. Administrative areas shall be temperature-controlled by the DDC system. Temperature setpoint adjustment shall be accomplished via DDC System by authorized personnel. Consider all viable alternative systems meeting the functional requirements of the hangar bays.

### 3.11.4 SHOP AREAS:

The shops shall be mechanically ventilated, heated, and air conditioned. Consider packaged equipment, split systems or systems utilizing chilled/heating water from either a central plant or decentralized sources. Independent and dedicated packaged A/C units shall be provided for the Arms Vaults and Non-Sensitive Secure Storage Areas. Communication rooms will be served by an independent and dedicated air-handling system and shall be conditioned. Air handling unit system(s) shall not be floor-space mounted within the actual spaces served. Administrative-type areas located within the shops shall be conditioned per Paragraph 5 requirements.

3.11.5 BUILDING EXHAUST SYSTEMS:

Provide exhaust systems at heat sources, restrooms, battery rooms, and contamination sources. Battery room systems will be ducted exhaust system with explosion proof fans. Exhaust systems will operate continuously while the building is occupied. Exhaust systems shall be in accordance with NFPA 30 and 30A.

3.11.6. DESIGN CONDITIONS:

3.11.6.1 Design shall be based on weather data from recognized and authoritative sources weather data. Indoor design conditions shall conform to Table 3.11. Indoor air quality shall confirm with the current ASHRAE Standard 62.1 and OSHA requirements.

**TABLE 3.11 – INDOOR DESIGN DATA**

**HEATING:**

Indoor Design Temperature 70°F

Unoccupied Space Design Temperature 55°F

**COOLING:**

Indoor Design Temperature 75°F

Unoccupied Space Design Temperature 85°F

3.11.6.2 In geographical areas of high humidity, take appropriate measures to control moisture. In areas of high humidity, provisions will be made for cure rooms/spaces to have dehumidification procedures to bring ambient relative humidity in the cure rooms/spaces down to 40 percent relative humidity to allow for acceptable cure times.

3.11.6.3 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 BUILDING AUTOMATION SYSTEM**

3.12.1 GENERAL:

The Building Automation System (BAS) shall be a single complete non-proprietary Direct Digital Control (DDC) system for control of the heating, ventilating and air conditioning (HVAC) and other building systems. The BAS shall be based on an Open implementation of LONWORKS® technology using ANSI/CEA 709.1B as the communications protocol and use only LonMark® Standard Network Variable Types, as defined in the LonMark® Resource Files, for communication between DDC Hardware devices to allow multi-vendor interoperability. The building BAS shall include integration to a base-wide supervisory monitoring and control (M&C) system (often referred to as a Utility Monitoring and Control System – UMCS) as defined in this RFP.

3.12.1.1: The system shall be open in that it is designed and installed such that the Government or its agents are able to perform repair, replacement, upgrades, and expansions of the system without further dependence on the original Contractor. This includes, but is not limited to the following:

- (a) Install hardware such that individual control equipment can be replaced by similar control equipment from other equipment manufacturers with no loss of system functionality.

- (b) Necessary documentation (including rights to documentation and data), configuration information, configuration tools, programs, drivers, and other software shall be licensed to and otherwise remain with the Government such that the Government or its agents are able to perform repair, replacement, upgrades, and expansions of the system without subsequent or future dependence on the Contractor.

3.12.1.2: All DDC Hardware shall:

- (a) Be connected to a TP/FT-10 ANSI/EIA 709.3 control network.
- (b) Communicate over the control network via ANSI/CEA 709.1B exclusively.
- (c) Conform to the LonMark® Interoperability Guidelines.
- (d) Be locally powered; link power (over the control network) is not acceptable.
- (e) Be fully configurable via standard or user-defined configuration parameter types (SCPT or UCPT), standard network variable type (SNVT) network configuration inputs (nci), or hardware settings on the controller itself to support the application.
- (f) Provide input and output SNVTs required to support the application and supervisory monitoring and control functionality such as system start/stop and overrides.
- (g) To the greatest extent practical, not rely on the control network to perform its control loop application functions.

3.12.1.3. LonMark® Certified DDC Hardware devices and those with LNS plug-ins are preferred.

3.12.1.4. Gateways may be used provided that each gateway communicates with and performs protocol translation for control hardware controlling one and only one package unit.

3.12.1.5. If there is not an existing UMCS that meets the following requirements provide one:

- (a) The UMCS shall perform supervisory control and monitoring of a base-wide ANSI/CEA-709.1B (LonWorks®) network using LonWorks® Network Services (LNS). The UMCS shall maintain the LNS database(s) for the entire network.
- (b) The UMCS shall include a 100 Mbps (minimum) IP network installed in one of the following methods:
  - (1) Share existing base-wide IT LAN operated by the DOIM (IT group).
  - (2) Use spare existing IT infrastructure to install a physically independent IP network.
  - (3) Install all new networking.
- (c) Coordinate installation of this network with the DOIM (IT Group)
- (d) The monitoring and control (M&C) software shall be a LonWorks® Network Services (LNS)-compatible client-server software package that performs supervisory monitoring and control functions including but not limited to Scheduling, Alarm Handling, Alarm Generation, Trending, Report Generation and Electrical Peak Demand Limiting. The software shall be expandable in both number of points and number of clients supported in order to support system expansion. The M&C Software may include drivers to other (non-ANSI/CEA-709.1B) protocols. In addition:
  - (1) It shall incorporate a programming (scripting) language capable of reading and writing data as Standard Network Variable Types (SNVTs) that can be used for creating custom applications.
  - (2) It shall be capable of scheduling SNVTs such that it can change the value of a SNVT according to an internal schedule.
  - (3) It shall be capable of handling alarms by providing an alarm notification via a pop-up to a user display, printing to a printer, sending an email and sending a numeric page.
  - (4) It shall include a Graphical User Interface which allows for hierarchical graphical navigation between systems, graphical representations of systems, access to real-time data for systems, ability to override points in a system, and access to all supervisory monitoring and control functions. Each system display shall clearly distinguish between the following point data types and

information: Real-time data, User-entered data, Overridden or operator-disabled points, Devices in alarm (unacknowledged), and Out-of-range, bad, or missing data. The software shall allow the user to create, modify, and delete displays and graphic symbols.

- (e) Provide a network configuration tool. This software shall use LonWorks® Network Services (LNS) for all network configuration and management of ANSI/CEA-709.1B devices, be capable of executing LNS plug-ins, and be capable of performing network database reconstruction of an ANSI/CEA-709.1B control network.

3.12.1.6. Perform all necessary actions needed to fully integrate the building control system to the UMCS. These actions include but are not limited to:

- (a) Install IP routers or ANSI/CEA-852 routers as needed to connect the building control network to the UMCS IP network. Routers shall be capable of configuration via DHCP and use of an ANSI/CEA-852 configuration server but shall not rely on these services for configuration. All communication between the UMCS and building networks shall be via the ANSI/CEA-709.1B protocol over the IP network in accordance with ANSI/CEA-852. Any IP network work including access to existing networks shall be coordinated with the Installation Directorate Of Information Management (DOIM).
- (b) Configure M&C Software functionality including: graphical pages for System Graphic Displays including overrides, alarm handling, scheduling, trends for critical values needing long-term or permanent monitoring via trends, and demand limiting.

3.12.1.7. Provide the following upon acceptance of the system:

- (a) The latest version of all software and user manuals required to program, configure and operate the system.
- (b) Points Schedule drawing that shows every DDC Hardware device. The Points Schedule shall contain the following information as a minimum:
  - (1) Device address and NodeID.
  - (2) Input and Output SNVTs including SNVT Name, Type and Description.
  - (3) Hardware I/O, including Type (AI, AO, BI, BO) and Description.
  - (4) Alarm information including alarm limits and SNVT information.
  - (5) Supervisory control information including SNVTs for trending and overrides.
  - (6) Configuration parameters for devices without LNS plug-ins.
- (c) Riser diagram of the network showing all network cabling and DDC Hardware. Label hardware with IP addresses, ANSI/CEA-709.1 addresses and network names.
- (d) Control System Schematic diagram and Sequence of Operation for each controlled system.
- (e) Operation and maintenance instructions, including procedures for system start-up, operation and shutdown, a routine, maintenance checklist and a qualified service organization list.
- (f) LONWORKS® Network Services (LNS®) database for the completed system.
- (g) The Contractor's quality control organization shall complete the following checklist:

**TABLE 3.12 - QUALITY CONTROL CHECKLIST**

Instructions: Initial each item, sign and date verifying that the requirements have been met.

# Description Initials

1. All DDC Hardware is installed on a TP/FT-10 local control bus. \_\_\_\_\_
2. Communication between DDC Hardware is only via EIA 709.1B using SNVTs. Other protocols and network variables other than SNVTs have not been used. \_\_\_\_\_
3. All sequences are performed using DDC Hardware. \_\_\_\_\_
4. LNS Database is up-to-date and accurately represents the final installed system. \_\_\_\_\_
5. All software has been licensed to the Government. \_\_\_\_\_
6. Final As-built Drawings accurately represent the final installed system. \_\_\_\_\_
7. O&M Instructions have been completed and submitted. \_\_\_\_\_

Complete items 8-9 if integration to a UMCS was performed. \_\_\_\_\_

8. M&C software monitoring displays have been created for all building systems, including all override and display points indicated on Points Schedule drawings. \_\_\_\_\_
9. Connections between the UMCS IP network and ANSI/CEA-709.1B building networks are through ANSI/CEA-852 Routers. Complete item 10 if new M&C software was provided. \_\_\_\_\_
10. M&C software is LonWorks® Network Services (LNS) based and uses LNS for interfacing to ANSI/CEA-709.1B networks. \_\_\_\_\_

By signing below I verify that all requirements of the contract, including but not limited to the above, have been met.

Signature: \_\_\_\_\_ Date: \_\_\_\_\_

3.12.1.8. The Contractor shall perform a Performance Verification Test (PVT) under Government supervision prior to system acceptance. The PVT shall demonstrate that the system performs as specified, including but not limited to demonstrating that the system is Open and correctly performs the Sequences of Operation.

3.12.1.9. Provide a one year unconditional warranty for the installed building automation system and on all service call work. The warranty shall include labor and material necessary to restore the equipment involved in the initial service call to a fully operable condition.

3.12.1.10. Provide training at the project site on the installed building automation system. Upon completion of this training each student, using appropriate documentation, should be able to start the system, operate the system, recover the system after a failure, perform routine maintenance and describe the specific hardware, architecture and operation of the system.

**3.13 TESTING, ADJUSTING AND BALANCING**

Test and balance air and hydronic systems, using a firm certified for testing and balancing by the Associated Air Balance Council (AABC), National Environmental Balancing Bureau (NEBB), Testing Adjusting, and Balancing Bureau (TABB). Perform TAB in accordance with the requirements of the standard under which the TAB Firm's qualifications are approved, i.e., AABC MN-1, NEBB TABES, or SMACNA HVACTAB unless otherwise specified herein. All recommendations and suggested practices contained in the TAB Standard shall be considered mandatory. Use the provisions of the TAB Standard, including checklists, report forms, etc., as nearly as practicable to satisfy the Contract requirements. Use the TAB Standard for all aspects of TAB, including qualifications for the TAB Firm and Specialist and calibration of TAB

instruments. Where the instrument manufacturer calibration recommendations are more stringent than those listed in the TAB Standard, adhere to the manufacturer's recommendations. All quality assurance provisions of the TAB Standard such as performance guarantees shall be part of this contract. For systems or system components not covered in the TAB Standard, the TAB Specialist shall develop TAB procedures. Where new procedures, requirements, etc., applicable to the Contract requirements have been published or adopted by the body responsible for the TAB Standard used (AABC, NEBB, or TABB), the requirements and recommendations contained in these procedures and requirements are mandatory.

### **3.14 COMMISSIONING**

Commission all HVAC systems and equipment, including controls, and all systems requiring commissioning for LEED Fundamental commissioning, in accordance with ASHRAE Guideline for the Commissioning Process and LEED. The Contractor shall hire the Commissioning Authority, certified as a Commissioning Authority by AABC, NEBB, or TABB, as described in the ASHRAE Guideline for the Commissioning Process. The Contracting Officer's Representative will act as the Owner's representative in performance of duties spelled out under OWNER in Annex A2 of the ASHRAE Guideline for the Commissioning Process.

### **3.15 ENERGY CONSERVATION**

#### **3.15.1 DESIGN:**

Design the buildings, including the building envelope, HVAC systems, service water heating, power, and lighting systems to achieve an energy consumption that is at least 30% below the consumption of a baseline building meeting the minimum requirements of ANSI/ASHRAE/IESNA Standard 90.1-2004. Energy calculation methodologies and substantiation requirements are defined in Section 01 33 16, Design After Award. Base the selection of solutions and technologies to achieve the above energy performance requirements on life cycle cost analysis. Life Cycle Cost Analyses shall follow the requirements set forth in NIST Handbook 135 Life-Cycle Costing Manual using an automated calculation tool such as BLCC. Cyclical and annual maintenance costs used shall come from ASHRAE recommendations or other similar Industry Standard sources.

#### **3.15.2 ENERGY STAR:**

The contractor shall purchase Energy Star or FEMP designated products. The term "Energy Star product" means a product that is rated for energy efficiency under an Energy Star program. The term "FEMP designated product" means a product that is designated under the Federal Energy Management Program of the Department of Energy as being among the highest 25 percent of equivalent products for energy efficiency. In the case of an electric motor of 1 to 500 horsepower the Contractor shall select only a premium efficient motor.

### **3.16 FIRE PROTECTION**

#### **3.16.1 STANDARDS AND CODES:**

All fire protection and life safety features shall be in accordance with UFC 3-600-01 and the criteria referenced therein. HGRs shall be classified as mission essential and shall be provided with sprinkler protection. 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. As such, the aggressive application of Standards and Codes to minimize damage, down-time, clean-up, and return of aircraft to "fully mission capable" readiness state is a high priority. Aircraft hangars shall use a fire suppression system that meets ALL the following requirements, in the order of priority shown. At no time will water systems be used as the primary suppression system without waiver approval:

1. Maximum protection of personnel (least risk to personnel within hangars during dispensing).
2. Maximum protection of airframes (least potential loss of airframes resulting from dispensing and cleanup).



3. Fastest return of airframes to operational/mission ready state after discharge.
4. Minimal use of water (least use of water system (quantity and content) from dispensing through cleanup).
5. Least infrastructure/lifecycle sustainment requirements.
6. Maximum protection of the facility (least replacement impact).

#### 3.16.2 QUALIFICATIONS OF FIRE PROTECTION ENGINEER:

The design of the fire protection features shall be by a qualified fire protection engineer meeting one of the conditions indicated in UFC 3-600-01.

#### 3.16.3 FIRE PROTECTION AND LIFE SAFETY ANALYSIS:

A fire protection and life safety design analysis shall be provided for all buildings in the project. The analysis shall be submitted with the preliminary design submittal. The analysis shall include classification of occupancy (both per the IBC and NFPA 101); type of construction; height and area limitations (include calculations for allowable area increases); life safety provisions (exit travel distances, common path distances, dead end distances, exit unit width required and provided); building separation or exposure protection; specific compliance with NFPA codes and the IBC; requirements for fire-rated walls, doors, fire dampers, etc.; analysis of automatic suppression systems and protected areas; water supplies; smoke control systems; fire alarm system, including connection to the base-wide system; fire detection system; standpipe systems; fire extinguishers; interior finish ratings; and other pertinent fire protection data. The submittal shall include a life safety floor plan for all buildings in the project showing occupant loading, occupancy classifications and construction type, egress travel distances, exit capacities, areas with sprinkler protection, fire extinguisher locations, ratings of fire-resistive assemblies, and other data necessary to exhibit compliance with life safety code requirements.

#### 3.16.4 SPRINKLER SYSTEM:

The facility shall be fully protected with automatic sprinkler systems. All floors and all areas of the facilities shall be protected. In particular, the hangar bay areas shall be protected by either a high-expansion foam system or a closed-head aqueous film forming foam (AFFF) system per NFPA 409. Hangar bay fire suppression system shall have an objective goal of returning 85% of any damaged systems to duty within 24 hours after a fire event and a threshold goal of returning 90% of any damaged systems to duty within 72 hours after the event. The sprinkler system design shall be in accordance with UFC 3-600-01 and NFPA 13. The sprinkler hazard classifications shall be in accordance with UFC 3-600-01, NFPA 13, and other applicable criteria. Design densities, design areas and exterior hose streams shall be in accordance with UFC 3-600-01. The sprinkler systems shall be designed and all piping sized with computer generated hydraulic calculations. The exterior hose stream demand shall be included in the hydraulic calculations. A complete sprinkler system design, including sprinklers, branch lines, floor mains and risers, shall be shown on the drawings. The sprinkler system plans shall include node and pipe identification used in the hydraulic calculations. All sprinkler system drains, including main drains, test drains, and auxiliary drains, shall be routed to a 2-foot by 2-foot splash block at exterior grade.

3.16.4.1 Sprinkler Service Main and Riser: The sprinkler service main shall be a dedicated line from the distribution main. Sprinkler service and domestic service shall not be combined. The Contractor shall make the connection to the sprinkler service main provided by the site development contractor. The Contractor shall make the required electrical connection to the tamper switch on the PIV provided by the site development contractor. The Contractor shall route this conductor to and make the connection to the building fire alarm control panel (FACP). The ground floor entry penetration shall be sleeved per NFPA 13 requirements for seismic protection. The sprinkler entry riser shall include a double check backflow preventer, a fire department connection, and a wall hydrant for testing of backflow preventer. The sprinkler system shall include an indicating control valve for each sprinkler system riser, a flow switch reporting to the FACP, and an exterior alarm bell. All control valves shall be OS&Y gate type and shall be provided with tamper switches connected to the FACP. Facilities with multiple floors shall be

provided with floor control valves for each floor. The floor control valve assembly shall be in accordance with UFC 3-600-01, Figure 4-1.

3.16.4.2 Exterior Hose Stream: Exterior hose stream demand shall be in accordance with UFC 3-600-01. This shall be 250 gpm for light hazard and 500 gpm for ordinary hazard. Exterior hose stream demand shall be included in the sprinkler system hydraulic calculations.

3.16.4.3 Backflow Preventer: A double check backflow preventer shall be provided on the fire water main and shall be located within the building. An exterior wall hydrant with dual hose connections with OS&Y valve shall be provided to allow testing of backflow preventer at design flow as required by NFPA 13.

3.16.4.4 Fire Department Connection: A fire department connection shall be provided. These shall be located to be directly accessible to the fire department.

#### 3.16.5 SYSTEM COMPONENTS AND HARDWARE:

Materials for the sprinkler system, fire pump system, and hose standpipe system shall be in accordance with NFPA 13 and NFPA 20.

#### 3.16.6 PROTECTION OF PIPING AGAINST EARTHQUAKE DAMAGE:

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.

#### 3.16.7 FIRE WATER SUPPLY:

Fire flow test data is provided in the appendix. The Contractor shall be responsible for coordinating with the geographic district in acquiring fire flow test data for preliminary fire protection system design. The Contractor shall verify the fire flow data by conducting necessary fire flow tests at the project site during project design and shall base the design of fire protection system on the results of this test.

#### 3.16.8 FIRE PUMP:

The requirement for a fire pump installation shall be determined by the Contractor based on fire flow test data from the project site and fire protection system design requirements for the project. If required, a complete fire pump installation shall be provided for the facility. It shall comply with the requirements of UFC 3-600-01, NFPA 13 and NFPA 20. The Contractor shall submit fire pump design analysis and drawings in the design requirements.

#### 3.16.9 FIRE DETECTION AND ALARM:

A fire alarm and detection system shall be provided for this facility. It shall comply with the requirements of UFC 3-600-01 and NFPA 72. The system shall be fully compatible with and integrated with the local base wide central monitoring system.

#### 3.16.10 BUILDING CONSTRUCTION:

Construction shall comply with requirements of UFC 3-600-01, the International Building Code and NFPA 101.

3.16.10.1 Fire Extinguishers: Portable fire extinguishers shall be provided where required by NFPA 101. Portable fire extinguishers shall be located and installed in accordance with NFPA 10, Portable Fire Extinguishers.

3.16.10.2 Interior Wall and Ceiling Finishes: Interior wall and ceiling finishes and movable partitions shall conform to the requirements of UFC 3-600-01 and NFPA 101.

**3.16.11: INSPECTION AND TESTING:**

Inspect and test all fire suppression equipment and systems, fire pumps, and fire alarm and detection systems in accordance with the applicable NFPA standards. The fire protection engineer of record shall witness final tests. The fire protection engineer of record shall certify that the equipment and systems are fully operational and meet the contract requirements. Two weeks prior to each final test, the contractor shall notify, in writing, the Installation fire department and the Installation public work representative of the test and invite them to witness the test.

**3.16.12: FIRE EXTINGUISHER CABINETS:**

Provide fire extinguisher cabinets and locations for hanging portable fire extinguishers in accordance with NFPA 10 Standard for Portable Fire Extinguishers.

**3.16.13: FIRE ALARM AND DETECTION SYSTEM:**

Sprinkler water flow alarms shall be zoned by building and by floor. Supervisory alarm initiating devices, such as valve supervisory switches, fire pump running alarm, low-air pressure on dry sprinkler system, etc. shall be zoned by type and by room location.