Appendix C

Kandahar
Fire Hazard Analysis
Phase 4 - PN 74127

Fire Hazard Analysis

Discipline:	Fire Protection	**Date:**	September 15, 2010

Design Submittal: Corrected Final Design Submittal
Site Location: Kandahar, Afghanistan – PHASE 4 - PN 74127
Prepared By: Tetra Tech / Fire Risk Management

I. Fire Hazard Analysis - Barracks

Fire Protection Construction and Features

As described in the Design Analysis, the building is of non-combustible construction and is provided with 1- hour fire resistance rated floor/ceiling assembly between the Ground and First Floors. Two exterior stairs are provided for occupants on the First Floor. The exterior stairs and exterior exit access walkway are not required to be separated from the interior of the building since the two stairs are remote. The non-combustible construction will limit exterior fire spread between adjacent buildings. In addition, the separation distances required by the IBC also limits these issues.

The building is provided with single station smoke detectors with sounder bases in all sleeping rooms. Standard smoke detectors are provided in adjacent accessory areas, such as electrical, communication, and janitor rooms. Heat detectors are provided in the Latrine area to prevent possible unwanted alarms if smoke detectors were installed adjacent to showers. In addition, fire extinguishers are provided in all sleeping rooms and in the mechanical and communication rooms. Operation of any smoke detector located in a sleeping room will activate the sounder bases located within that compartment. Operation of any heat detector or smoke detector in electrical, communication, and mechanical room will cause notification to the occupants within the entire building through activation of all fire alarm speaker/strobe notification devices. In addition, the manual pull stations will allow occupants to notify other occupants within the building through activation of all fire alarm speakers. In conjunction with the fire rated separations, the notification provides adequate time for occupants to exit.

Although not required by code, each sleeping room is provided with at least two remote doors to the exterior/ exterior exit access walkway. Since each room on the Ground Level is provided with doors to the exterior, once an occupant has left the room, they are considered in a safe location. Occupants on the First Floor travel to one of the two (2) exterior stairs via an exterior exit access walkway. The time from notification of occupants to safely exiting the building is less than a code compliant building with corridors and fire resistant features due to the reduced travel distance to the exits and the complete automatic detection system. The travel distance within each sleeping room is approximately 50% less than that permitted by NFPA 101 for the maximum travel distance within a guest room. The building meets the requirements for travel distance from the guest room door to the nearest exit and contains no dead end corridors. Based on an average walking speed, it would take an occupant approximately 7 seconds to leave the sleeping room once the occupant reacts to the alarm and decides to evacuate. Since the Latrine is provided with one exit instead of two, it would take approximately 12 seconds to exit the room. The time it takes occupants to react to an alarm will be shortened in the Latrine as compared to

the sleeping rooms since occupants will be awake. On the First Floor, the maximum time from occupants exiting the sleeping room until they are completely off of the structure is approximately 46 seconds.

Fire Protection Procedures

In addition to the physical features of the building, the following procedures are to be followed for the Barrack:

- Smoking areas will be outdoors and at least 15 m from any building. A minimum of two designated areas will be established, one on each side of the building.
- Where exterior water services are provided, a water hose at least 15 m in length will be provided.
- The building will be furnished with one (1) set of minimal firefighting equipment: a rake, a shovel, and an axe. The equipment will be located where most accessible, adjacent to, and exterior of the building.
- Combustible landscaping (mulch, etc.) will be prohibited immediately adjacent to the building.
- Fire escape routes will be posted in the Barrack that shows the site rally areas for personnel to report to in case of a fire or incident for accountability purposes.
- Physical inspections will be performed monthly by the Facility Fire Marshal (or their designee).
- No cooking or other small heat producing appliances (i.e. – coffee makers, microwaves, toasters, etc.) will be allowed in the building.
- Personal storage will be located in non-combustible cabinets or footlockers.
- Fire drills will be executed quarterly.
- Fire alarm will be tested quarterly in accordance with AR 420-1.

Other Fire Safety Concerns

As required by the ARCENT Policy, we have reviewed other possible impacts to fire safety, such as natural hazards (earthquake, wind, flood) and potential toxic/biological/radiological incident from a fire. Since the building does not contain any major quantities of hazardous material, there was very little potential for the toxic/biological/radiological incident. Although natural hazards, such as earthquake, wind, and flood, have caused issues in other buildings, we do not expect these to affect this building as the building is in a low seismic zone and is not prone for floods or large wind events.

Discussion/Analysis

The typical ignition sources associated with residential buildings include faulty appliances/ equipment and occupant negligence (careless smoking, inappropriate use of electrical appliances, etc.). Combustibles contained in typical residential occupancies include mattresses, other furniture, carpets, and window treatment.

The building is designed as an austere building with minimal furnishings, wall coverings, or other combustible material. Both ignition sources and combustibles are limited. The ignition sources are severely reduced by smoking prohibitions in the building, limiting appliances (e.g. -

coffee makers), and increased inspections. The combustibles are also limited by the reduction of the amount of furniture and no carpeting or window treatments.

The increased inspection frequency, the reduction in combustibles, and the reduction in ignition sources reduces the risk from fire in the building. The non-combustible construction of the building reduces the risk of fire from the exterior. The fire ratings, fire alarm system, and access to the exterior of the building increases the level of safety for the occupants. Each floor is provided with over 350% of the required exit capacity for the floor thereby reducing egress times. In addition, the remoteness of the exits prevents occupants from traveling past a fire to get to an exit.

Based on the overall approach for this building, the level of risk exposure to occupants would not be increased in comparison to a building with a NFPA 13R sprinkler system. In addition, because a NFPA 13R system is a life safety system and not a property protection system like NFPA 13, the impact on the structure could be similar to a building without sprinkler protection.

II. List of Attachments:

- ARCENT Memorandum on Sprinkler Protection (Appendix A)
- Acceptance Form of Fire Hazard Analysis

Signed Acceptance Form of Fire Hazard Analysis

FIRE HAZARD ANALYSIS ACCEPTANCE FORM
AUTHORITY HAVING JURISDICTION

As the local Authority-Having-Jurisdiction (AHJ) related to the fire and life safety within buildings under their command, Kandahar Air Field Base Commander (or authorized representative) has completed the review of the Fire Hazard Analysis (FHA) for the following project:

Austere Standard Designs FY11 Barracks
PN 74127

Based on this review, the AHJ understands with the implementation of the items listed below will allow for the omission of automatic sprinkler protection within the project scope and confirms that the Fire Hazard Analysis is consistent with the requirements in the Fire Safety Management & Design Policy for Contingency Construction in the USARCENT AOR, Memorandum, dated July 15, 2009.

- Smoking areas will be outdoors and at least 15 m from the building. A minimum of two designated areas will be established, one on each side of the building.
- Where exterior water services are provided, a water hose at least 15 m in length will be provided.
- The building will be furnished with one (1) set of minimal firefighting equipment: a rake, a shovel, and an axe. The equipment will be located where most accessible, adjacent to, and exterior of the building.
- Combustible landscaping (mulch, etc.) will be prohibited immediately adjacent to the building.
- Fire escape routes will be posted in the Barrack that shows the site rally areas for personnel to report to in case of a fire or incident for accountability purposes.
- Physical inspections will be performed monthly by the Facility Fire Marshal (or their designee).
- No cooking or other small heat producing appliances (i.e. – coffee makers, microwaves, toasters, etc.) will be allowed in the building.
- Personal storage will be located in non-combustible cabinets or footlockers.
- Fire drills will be executed quarterly.
- Fire alarm will be tested quarterly in accordance with AR 420-1.

Any deviation from the requirements contained in the FHA is not permitted without a complete review by the Engineer of Record.

(Signature)	Title	(Date)
	CHIEF FIRE PREVENTION	21 SEP 10

Appendix A
ARCENT Memorandum on Sprinkler Protection

DEPARTMENT OF THE ARMY
THIRD ARMY
UNITED STATES ARMY CENTRAL
1881 HARDEE AVE SW
FORT MCPHERSON, GA 30330

REPLY TO
ATTENTION OF:

ACEN-OME

JUL 15 2009

MEMORANDUM FOR SEE DISTRIBUTION

SUBJECT: Fire Safety Management & Design Policy for Contingency Construction in USARCENT AOR

1. References:

a. AR 420-1, Facilities Engineering Army Facilities Management, 12 February 2008.

b. NFPA 409, Standard for Aircraft Hangars, 2004 Edition (Revision due Fall 2009)

c. U.S. Central Command Construction and Base Camp Development in the U.S. Central Command AOR, "The Sand Book", 12 December 2007.

d. U.S. Command Lead Component/BOS Integration Matrix, 1 March 2005.

e. DA Pam 385-16 System Safety Management Guide, 13 November 2008.

2. The purpose of this memorandum is to outline mandatory minimum USARCENT fire safety standards in the U.S. Central Command Area of Responsibility (AOR) for all contingency construction. Agencies will complete a Fire Hazard Analysis (FHA) to capture hazard assessments and mitigations. The FHA examines the specifics of the hazards involved, the level of risk and the appropriate control mechanisms. This policy provides the Major Subordinate Commander the ability to construct facilities by incorporating the minimum mandatory fire safety measures that include fire protection and fire notification for specific design criteria. Any facilities that do not meet these minimum requirements or meet the Life Safety Code are not authorized for construction under this policy. The policy will be applied for all contingency military construction for which USARCENT/CFLCC possesses Base Operating Support responsibility as detailed in reference 1.c. above.

3. A fire suppression system is defined as an automatic system consisting of devices that apply various extinguishing agents (water, foam, dry and wet chemical, gaseous) on a fire without any action on the part of people and usually arranged to transmit an alarm to a fire communication center. Reference 1.a. above outlines fire suppression standards for construction in non-contingency areas. Appropriate fire protection in facility and system designs guarantees the most economical and least interruption of essential missions. Installations will not omit fire protection from contingency construction designs and plans for the sake of economy or expediencies, since add-ons are expensive and often less effective. However, ongoing operations in the U.S. Central Command

AOR dictate a risk management approach in order to accommodate the special circumstances of contingency construction in an active theater of war. It is important that these modifications provide as much force protection to our force as possible – even in consideration of the conditions. Reference 1.b. above outlines facility design criteria in the U.S. Central Command AOR. This policy is in addition to reference 1. b.

4. In the U.S. Central Command AOR, the UFC 3–600–01, Fire Protection Engineering for Facilities provides the guidelines for the design for fire suppression for real property and personal property in temporary, semi-permanent and permanent construction. When fire suppression is used, sprinkler systems will comply with NFPA 13 requirements. For barracks and housing buildings that are four stories or less, sprinkler systems will comply with NFPA 13R. During the Design Charrettes, the design and construction agent and the end-user will complete a Fire Hazard Analysis (FHA) (see attached) for the commander. The FHA will be reviewed by a registered professional fire protection engineer. The Fire Hazard Analysis will include a fire protection design analysis per Section 1-4 of UFC 3-600-01. This document will be included in the Project Management Plan and forwarded to USARCENT G7 as part of the FHA notification prior to final contract award. The fire protection engineer will provide equivalent fire safety measures along with justification for any requirement which compliance is not possible.

5. The fire hazard analysis will apply to the below construction as outlined in the AR 420-1. Regardless of the submission of the FHA, there are mandatory fire notification, fire suppression and fire mitigation actions that shall be implemented and which cannot be waived. See paragraph 6 below for these mandatory actions.

a. **New Construction:** Defined as "The erection, installation, or assembly of a new real property facility. This includes utilities, equipment installed and made a part of the unit, and related site preparation (demolition, excavation, filling, landscaping, or other land improvement)." New construction will comply with UFC 3-600-1, Fire Protection Engineering for Facilities.

b. **Existing Construction:** For repair projects, only the new work is required to comply with the requirements for new construction. As a minimum, existing buildings will comply with the requirements of NFPA 101, Life Safety Code. Repair is:

(1) Restoration of a real property facility (RPF) to such condition that it may be used effectively for its designated functional purpose.

(2) Correction of deficiencies in failed or failing components of existing facilities or systems to meet current Army standards and codes where such work, for reasons of economy, should be done concurrently with restoration of failed or failing components.

(3) A utility system or component may be considered "failing" if it is energy inefficient or technologically obsolete.

c. **Relocatable Buildings (Real Property):** Personal property used as a structure, that would have a building category code if it was real property, designed to be readily moved, erected, disassembled, stored, reused, and meets the 20 percent rule. The sum of building disassembly, repackaging, and non-recoverable building components, including typical foundation costs must not exceed 20 percent of the purchase cost of the relocatable building. If the percentage is greater than 20 percent, then the facility must be acquired as real property and follows real property project approval authorities. Personal property is managed as equipment. Relocatable buildings will comply with the requirements of UFC 3-600-01, Fire Protection Engineering for Facilities or this policy.

6. The following fire notification, fire suppression and fire mitigation strategies are **MANDATORY** for use in contingency construction for barracks/housing and other facilities in contingency locations where it is not possible to provide an automated fire suppression system. These measures provide adequate protection in the event of a fire in barracks/housing or other facilities. These mandatory measures cannot be waived. They are:

a. **For barracks and housing buildings.**

(1) The building complies with the requirements of NFPA 101, Life Safety Code, for non-sprinklered buildings. These requirements include providing an exterior exit from each sleeping room. Exterior exit balconies are required for rooms on upper floors.

(2) An alternative to providing exterior exits from each sleeping room, as required by the Life Safety Code for non-sprinklered buildings, are as follows:

(a) Limit the building up to three stories in height. Occupancy of the upper floor shall be limited to able-bodied personnel, who are able to use fire escape ladders in the event of an emergency.

(b) Provide fixed ladders with grated ledge and openable windows from each sleeping room, similar to the system depicted in enclosure, "Fire Escape Ladders". For a 3-story building, the fixed ladder will extend to the third floor.

(c) All designs require openable windows that lead to the exterior when there are no exterior door exits.

(d) For two-story buildings, access will be no more than 20 ft off of the ground to enable an able-bodied person to hang and drop to the ground.

b. **For non-housing buildings.**

(1) Limit the building to two stories in height and

(2) Limit the gross floor area to 15,000 square feet for buildings of noncombustible construction, and to 5000 square feet for building of combustible (e.g. wood) construction. Building separation shall be per UFC 3-600-01 and

(3) Provide direct exits to the exterior from each floor.

c. **Fire Notification**

(1) A fire detection and fire alarm system will be provided in accordance with NFPA 101, Life Safety Code (LSC). The LSC requires single-station smoke alarms in each sleeping room. Single-station smoke alarm will be powered by the building electrical system. In barracks that are not protected with an automatic fire sprinkler system, the LSC requires a corridor smoke detection system connected to the building fire alarm system.

(2) For relocatable building (RLB) barracks, each sleeping room will be provided with a smoke alarm powered by the building electrical system in accordance with NFPA 101, Life Safety Code (LSC). In RLB barracks that have an interior corridor and that are not protected with an automatic fire sprinkler system, the corridor will be provided with a smoke detection system in accordance with the LSC. The corridor smoke detection system will be connected to the building fire alarm system and connected to the local post/camp/station fire department, if one is present.

(3) A fire marshall will be appointed, in writing, for each facility. A posting of the appointment will be displayed in each facility with a means to contact the fire marshall. The designated Fire Marshall shall receive fire safety training of duties and responsibility by the local post/camp/station fire department.

d. Fire Suppression

(1) Operable fire extinguishers will be emplaced in all facilities at entrances, exits, both ends of hallways and corridors, and in each common area. Where feasible, place a fire extinguisher in each room of a barracks.

(2) Smoking areas will be out of doors and at least 50 ft. from the facility. Cigarette "Butt cans" will be provided and regularly maintained.

(3) Where exterior water services (faucets) are provided, a water hose at least 50 ft. in length will be provided.

(4) All barracks facilities will be furnished with one set of minimal firefighting equipment: a rake, a shovel, and an axe. This equipment will be located where most accessible adjacent to and exterior of the building.

(5) **New Aircraft Hangars:** Including fabric hangars with a floor area of 10,000 square feet or less and with 75 feet separation between hangars do not require sprinkler protection. New Aircraft hangars, including fabric hangars that meet these criteria, will comply to the latest edition of NFPA 409, Standard for Aircraft Hangars, in lieu of complying with UFC 3-600-1.

e. Fire Mitigation

(1) Establish a minimum of two designated smoking areas; one on each side of the building.

(2) Fire escape routes will be posted in all buildings with rally areas for personnel to report to in case of a fire or incident for accountability purposes.

(3) Facility Fire Marshalls will physically inspect buildings monthly. A report of their inspection will be sent to the Safety Officer and the first commander in the chain of command responsible for the facility. Deficiencies shall be corrected on the spot where possible, but not later than 24 hours after identification. Monthly inspection reports will be maintained for one year after the date of the inspection.

(4) Fire drills will be executed quarterly. These drills may be combined with other evacuation practices such as indirect fire drills.

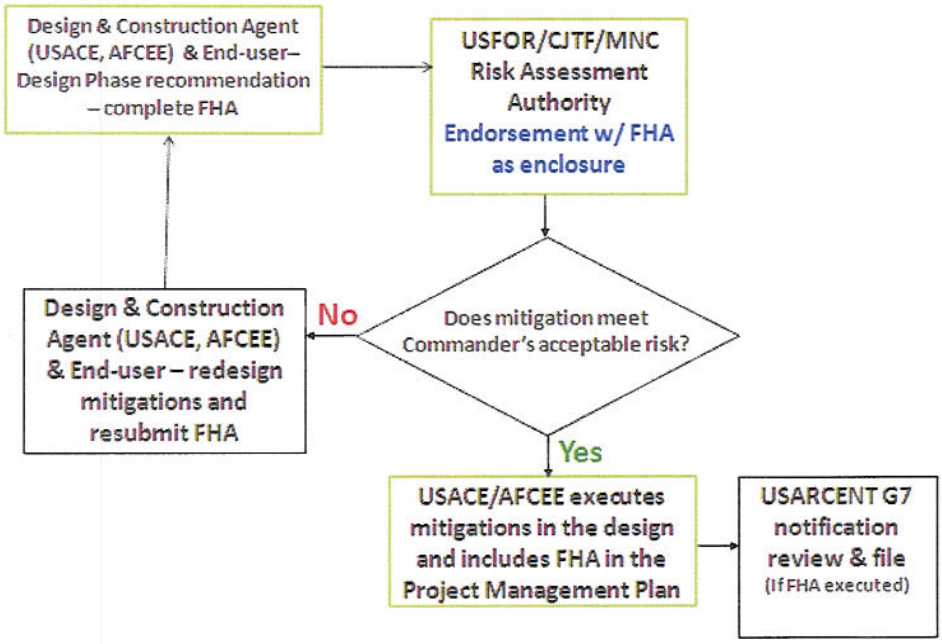
(5) The post/camp/station fire department will participate in all facility pre-final and final inspections as part of the construction closeout and facility turnover procedures. The fire department will also conduct periodic fire-safety inspections of all facilities on the installation, and will coordinate with both the facility Fire Marshall and the post/camp/station Safety Officer all necessary corrections to deficiencies found.

(6) The Fire Marshall will witness operational testing of the fire alarm and detection system at least quarterly. This can be done in conjunction with required fire drills. At least semiannually, operational testing will be conducted using secondary power i.e. battery power.

(7) Occupants of the upper floors of barracks that are equipped with fire escape ladders will be trained on the proper use of the fire escape ladders.

7. **Routing:**

Fire Safety FHA Approval & Notification Process



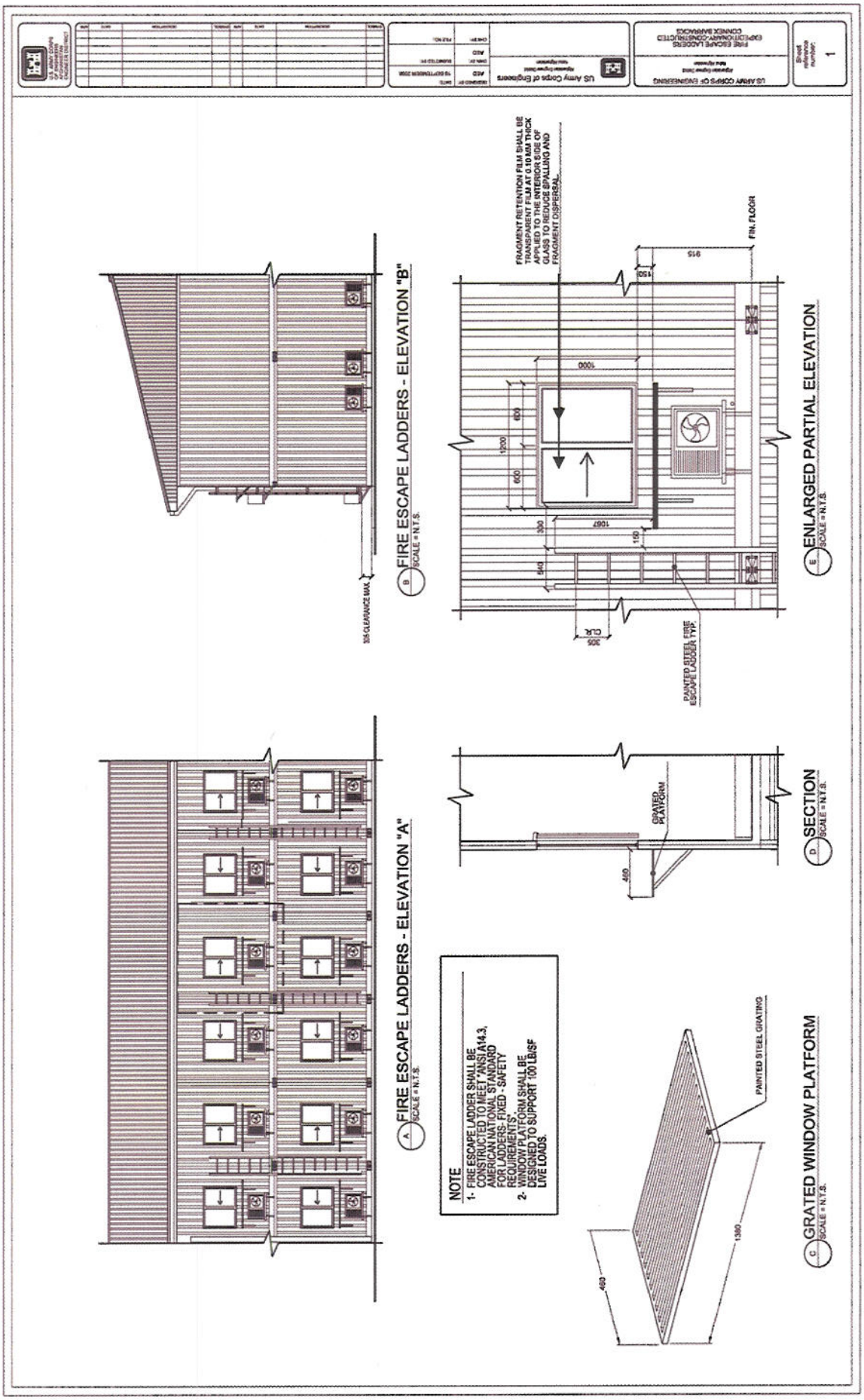
8. For additional information, contact USARCENT G7, 404-464-0413.

STEPHEN M. TWITTY
Colonel, GS
Chief of Staff

Enclosures
1. Fire Ladders
2. Fire Hazard Analysis

DISTRIBUTION:
ACSIM
HQUSACE
Transatlantic Programs Center (TAC)
CENTCOM CCJ4-E
CJTF-101 CJ7
MNC-I C7
AFCEE
AFCENT
MARCENT
NAVCENT

ENCLOSURE 1. FIRE LADDERS to FIRE SAFETY MANAGEMENT & DESIGN POLICY FOR CONTINGENCY CONSTRUCTION IN USARCENT AOR



Enclosure 2. Fire Hazard Analysis to Fire Safety Management & Design Policy for Contingency Construction in USARCENT AOR

1. The FHA must include an assessment of the risk from fire and related hazards (direct flame impingement, hot gases, smoke migration, fire fighting water damage, fire exposure to structural members, etc.) in relationship to existing or proposed fire safety features to ensure that the facility can be safely controlled and stabilized during and after a fire.

2. As a minimum, the FHA must contain information describing the following elements.

- Description of construction
- Protection of essential safety class and safety significant equipment
- Fire protection features
- Description of fire hazards
- Life safety considerations
- Fire department response
- Recovery potential
- Potential for a toxic, biological, and/or radiological incident due to a fire
- Emergency planning
- Security considerations related to fire protection
- Natural hazards (earthquake, flood, wind) impact on fire safety
- Exposure fire potentials, including the potential fire spread between fire areas
- Reference the fire department needs assessment baseline document.
- Deficiencies or "recommendations' that are required to be corrected to meet fire protection objectives.
- Risk of fire and related hazards (direct flame impingement