MEMORANDUM FOR DISTRIBUTION

FROM: NGB/A7


1. PURPOSE: This ANGETL provides guidance in implementing the fire protection design policy.

2. APPLICABILITY

2.1. Effective date: Immediately

2.2. Intended Users: Base Civil Engineers (BCE) and Architect-Engineering contractors (A-E).

2.3. This ETL shall be applicable for all new designs, designs for which NGB/A7O formal approval of the Type A-2 Concept Development Submittal has not yet been issued and for all code and criteria review. Application of this ANGETL for projects that have obtained formal approval of the Type A-2 Submittal shall be on a case-by-case basis and as directed by the NGB/A7O Project Manager.

3. REFERENCE PUBLICATIONS: Refer to Attachment 1 for a list of referenced publications and active links, if available.

4. GENERAL

4.1. Air National Guard (ANG) fire protection policy is based on current Federal and Department of Defense criteria. Items noted in this document include guidance, clarifications and preferences for issues specific to ANG facilities. All fire protection designs shall follow current Unified Facilities Criteria (UFC) requirements.

4.2. Any deviation from minimum criteria must have written approval from NGB/A7OC Civil Engineering Technical Services Center (CETSC). The request for deviation approval must include justification, hazard analysis, cost comparison, criteria used and other pertinent data. Should approval be granted, it shall apply only to the specific request under consideration and not to cases with similar circumstances. Lack of funds shall not be considered sufficient justification for deviation below established ANG minimum fire protection standards.
5. DESIGN CRITERIA

5.1. All design, and construction projects which involve or impact fire detection and suppression systems for ANG facilities, especially those involving the design of aircraft hangar fire suppression systems, require the designer (A-E or in-house), and contractor to have on staff, or under contract, a qualified and experienced Fire Protection Engineer (FPE). For the purpose of meeting qualification requirements, a qualified FPE is defined as an individual meeting the requirements of UFC 3-600-01, Fire Protection Engineering for Facilities.

5.2. UFC 3-600-01, Fire Protection Engineering for Facilities requirements regarding renovations, alterations, rehabilitations and modernizations shall be followed, in addition to more specific guidance provided in this document. Changes in occupancy are required to comply with requirements for new construction.

5.3. All fire protection systems shall use equipment that is Underwriter’s Laboratory (UL) listed or Factory Mutual (FM) approved for its intended fire protection service.

6. FIRE ALARM AND MASS NOTIFICATION SYSTEMS

6.1. Automatic detection systems shall be kept to the minimum required by the referenced standards from this document.

6.2. The fire alarm system shall provide radio based, fiber optic or landline based, remote system reporting to the base central system, and a secondary central receiver. Provide radio based transmission systems for all new base-wide systems. Retrofit installations shall use system equipment that is listed by a nationally recognized testing laboratory, and is compatible with the existing equipment to include the central base transmitting and receiving system. All facility fire alarm systems must also transmit appropriate signals to the responding (host or other) fire department, which in most cases is the ANG fire station.

6.3. All fire detection and alarm system conductors shall be run in minimum 3/4 in. electrical metallic tubing (EMT) conduit. Exception would be those locations deemed unsuitable for EMT conduit. In such cases, use rigid or PVC type conduit. Use of flexible metal conduit (FMC) or liquid-tite conduit is not permitted except in areas subject to extreme vibration, and where used, shall be limited to 6 ft. lengths.

6.4. Systems shall utilize supervised non-proprietary generic type detection devices and notification appliances and shall be interchangeable with other brands that are readily available to the extent practical.

6.5. Notification circuits in sleeping areas, and indicating device circuits for sleeping quarters, shall be on Class A or X circuits as defined in National Fire Protection Association (NFPA) 72.
6.6. All detection and terminal devices shall have engraved plastic or metallic alphanumeric identification, which shall be keyed to the posted operations and maintenance instructions.

6.7. Manual pull stations shall be provided, at a minimum, at each exit as defined in NFPA 72. Do not provide pull stations on the hinged side of doors except in the case of double doors.

6.8. At all locations that a duct detector is installed, provide remote test switch (install at a maximum of 7 feet above finish floor (AFF) elevation) and LED indicator for maintenance and alarm identification.

6.9. The fire alarm control panel for each facility’s detection system shall be located in a room with outside access, either the fire protection, mechanical, or electrical rooms. Coordinate the locations of the fire panel and annunciator panel (if required) with the BCE and Fire Chief.

6.10. Fire Alarm panels shall be field expandable. Panels may be field programmable provided that this can be accomplished at the unit (panel) level, without the use of proprietary software, keys, the changing of electronic hardware, or use of any proprietary device. Any software, device, password or other element used to program any component of the fire alarm system shall be specified to become property of the government, along with the installed program.

6.11. Emergency eyewash and shower station connection to the fire alarm system will be determined by the Base Fire Chief. If provided with connections to the fire alarm system, these stations shall report as a supervisory alarm and not as a trouble alarm.

7. FIRE SUPPRESSION SYSTEMS

7.1. For all projects that involve a building addition to an unsprinklered building, both the addition and the existing building shall be sprinklered. This requirement exceeds that of UFC 3-600-01, Fire Protection Engineering for Facilities.

7.2. Fire suppression systems shall be wet pipe or dry pipe, and the design shall be based on the hazard involved. Pre-action systems are strongly discouraged, and wet pipe systems are recommended in lieu of pre-action systems.

7.3. In no case shall the A-E use any source data (fire department, water purveyor, or BCE) for water supply information other than an actual test witnessed and accepted by the A-E representative.

7.4. The following component details shall be designed into all suppression systems.
7.4.1. All steel piping for the fire suppression system shall be minimum schedule 40 thickness.

7.4.2. Instructions shall be provided to installers to provide piping with flow markings.

7.4.3. Installation of cleated (e.g. Uni-Flange) flanges on any piping is prohibited.

7.4.4. Provide dedicated fire service entrance with back-flow prevention device and indicating shut off valve. All fire service utility entrance shall be separate from facility domestic water supply utility entrance. ANG preference for incoming service is a single stainless steel service.

7.4.5. Fire suppression system auxiliary drain valves shall be fully accessible and located no higher than 7’-0” AFF.

7.4.6. For all projects, design of supports for fire protection systems shall comply, as a minimum, with seismic criteria as outlined in the UFC requirements.

7.4.7. All wall and floor penetrations for fire protection piping shall be fully sleeved and sealed.

7.4.8. Sprinklers shall be located symmetrically within ceiling tiles. Provide architecturally coordinated, single piece sprinkler trim rings in occupied spaces.

7.4.9. For fire hydrants, on Air Force and Reserve bases where the ANG is a tenant, follow host base style and color policy.

7.4.10. The use of CPVC is allowed for light and ordinary hazard group 1 in accordance with its listing.

7.4.11. Sprinklers for server rooms shall be standard response intermediate temperature classification.

7.5. All fire sprinkler risers shall be located in rooms with direct access to the exterior of the building, such as mechanical rooms.

8. PASSIVE FIRE PROTECTION SYSTEMS (LIFE SAFETY SYSTEMS)

8.1. Provide emergency ballast packs in a standard lighting system.

8.2. SCIF spaces shall comply with NFPA 101 requirements for life safety.
9. **HIGH EXPANSION FOAM (HEF) HANGAR FIRE PROTECTION**

9.1. The HEF system releasing panel shall have output capability which emulates all inputs on a zone by zone basis. All system components shall be listed for their operating and environmental conditions.

9.2. The HEF system shall incorporate the use of cross-zoned, minimum Class A; supervised heat detection configurations used in conjunction with either a pre-action or wet-pipe sprinkler system. The cross-zoned heat detection shall be spaced at 25 ft. x 25 ft. spacing (625 sq. ft.) with no one side measurement to exceed 25 ft. Detector spacing shall be based on the requirements of NFPA 72 with no de-rating factor applied. Detectors shall be wired with adjacent detectors on opposite zones. Detectors shall be of the rate compensated type with a temperature range of 160 – 170 degrees Fahrenheit. (UL or FM listed). The use of linear type wire or beam detection is prohibited.

9.3. No addressable modules for the releasing system shall be located outside of the climate controlled area.

9.4. Manual foam activation stations shall be provided with NEMA 4x enclosures, with conduit routed into the bottom of the back box.

9.5. The A-E shall layout the HEF Generators based on the approved “normal” Base parking plan.

9.6. HEF systems shall include automatic trench drain closure and automatic shutoff of gas supply to aircraft servicing bay. The automatic closure valve controller shall be of the type that must be manually reset. A key type switch or similar device, mounted in close proximity and exterior to the control panel shall control the bypass valve reset. HEF systems do not require independent containment systems.

9.7. The following component details shall be designed into the Hangar suppression systems.

9.7.1. All HEF system piping shall be minimum schedule 40 steel. All HEF piping system couplings, fittings, etc. in a facility shall be of one manufacturer.

9.7.2. The use of “All-Thread” rod to mount an HEF Generator is prohibited. The design shall provide for a suitable mounting platform constructed of steel angles and plate suspended from the overhead with steel components or it shall be bracketed to the walls. Design of support shall as a minimum, comply with seismic criteria as outlined in the UFC 3-310-04, Seismic Design for Buildings.

9.7.3. Piping design shall show consideration (unions or flanged connections) for the removal of pumps, valves and other items for maintenance.

9.7.4. Foam concentrate pipe shall be stainless steel. Pipe gaskets must be compatible with foam concentrate. Flanged connections shall be “Garlock” type or an
approved equivalent type that is compatible with the HEF concentrate used. Threaded stainless steel pipe shall only be used at concentrate tank and proportioner locations as called for by the HEF system manufacturer.

9.7.5. A-E shall require contractor to provide a refill pump for the HEF concentrate system. Horizontal Bladder storage tanks shall be utilized when feasible. Vertical Bladder storage tanks may be permitted, only in existing facilities where there is insufficient space for a Horizontal tank.

9.7.6. On new construction the HEF foam room shall be designed to fully contain a leak of the HEF storage tank, including pressurized discharge. In renovations, provide a minimum containment curb of sufficient height to contain the volume of the HEF tank contents.

9.7.7. Refer to HEF Sequence of Operation as noted in ETL 02-15 and herein for specific guidance:

Table 9-1

<table>
<thead>
<tr>
<th>HEF INPUT/OUTPUT MATRIX</th>
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<tbody>
<tr>
<td>INPUT - ACTIVATION</td>
</tr>
<tr>
<td>SPRINKLER WATER FLOW IN HANGAR AREA</td>
</tr>
<tr>
<td>ONE OVERHEAD HEAT DETECTOR (UNCONFIRMED FIRE)</td>
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<tr>
<td>TWO CROSS-ZONED HEAT DETECTORS (CONFIRMED FIRE)</td>
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<tr>
<td>MANUAL HEF ACTIVATION STATION</td>
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</tbody>
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**NOTES:**
1. THIS CHART IS REPRESENTATIVE OF THE MAJOR FUNCTIONS OF THE HEF SYSTEM AND MAY NOT INCLUDE ALL REQUIRED OPERATIONS.
2. FIRE PUMP SYSTEM WILL START UPON FIRE PROTECTION SYSTEM PRESSURE DROP.
3. SPRINKLER WATER FLOW AND ANY DETECTOR WITHIN THE HANGAR SPACE ARE THE SAME AS TWO HEAT DETECTORS (CONFIRMED FIRE).
10. FIRE SYSTEM APPURTENANCES

10.1. Fire protection design for all facilities shall include the following listed features and items.

10.1.1. Provide Knox (or equivalent type) boxes, located on the exterior of the building at a location to be determined by the BCE and the Base Fire Chief. The box shall be cast brass, recessed style and suitable for housing appropriate keys. Box shall be wired to a tamper switch and routed through the fire alarm panel. Provision of tamper switches for these boxes shall be coordinated with the Base Fire Chief.

10.1.2. Provide fire extinguisher cabinets in accordance with UFC 3-600-01, Fire Protection Engineering for Facilities. All extinguisher cabinets shall be recessed or semi-recessed style with eased corner and glass face. Cabinets shall be specified to be of heavy duty brushed stainless steel construction. Cabinets shall be specified to accommodate the size extinguishers that will be provided by the base fire department. Extinguishers are government furnished (GF) items.

11. SPECIFICATIONS

11.1. Specifications shall require the contractor(s) to provide the following:

11.1.1. The contractor shall provide their own confirming water flow testing where an existing water system is being used in the design.

11.1.2. The installation of the HEF system shall also include a commissioning and start up plan that the contractor will follow, including personnel, equipment, procedures, checklists, required final report data and details of all results that are expected.

11.1.3. Identification and operations identifications that are coordinated with and keyed to the posted operations instructions and the operation & maintenance (O&M) manuals.

11.1.4. O&M manuals shall be completed, submitted and approved by no later than 30 days prior to beneficial occupancy.

11.1.5. Posted instructions for, at a minimum, the following:

11.1.5.1. Comprehensive schematics for Sprinkler – HEF distribution systems.

11.1.5.2. Facility floor plans showing location of all fire equipment and devices with coordinated identification. Show items such as fire walls, fire dampers etc.
11.1.5.3. System diagrams, including isometrics of special equipment and systems (fire alarm riser, fire pumps, HEF system, etc.).

11.1.5.4. Valve charts.

11.1.5.5. Equipment schedule.

11.1.5.6. Wiring diagrams and schematics.

11.1.5.7. Fire/smoke dampers.

11.1.6. Posted Operations Instructions, framed in heavy gauge extruded metal frames, mounted under glass. These posted instructions shall be water/weather proof. Instructions shall be permanently mounted in the reserved clear wall area (show reserved area in the design drawing details) in each fire protection room or mechanical room.

11.1.7. Posted instructions completed with professionally prepared graphics, printed on full size sheets and shall be in color. Instructions shall be prepared for all fire protection systems and shall include all components.

11.1.8. Training for Base personnel on all fire detection and suppression systems. Training shall be specified to be complete with all materials, fees and tuition paid for by the contractor. Employee travel costs shall be paid for by the government.

11.1.9. A professionally edited DVD for training on all HEF and other “special” systems. Editing shall include voice-over editing describing features and action of the depicted system.

12. **POINT OF CONTACT:** The point of contact for this ANGETL is Steve Becker, NGB/A7OC at (701) 857-4378, DSN 344-4378, or email steven.becker@us.af.mil.

![Signature]

MICHAEL E. MCDONALD, P.E., Colonel, USAF
Director of Installations and Mission Support

Attachments:
1. References
2. Current ANGETL Index

Distribution:
Each USPFO
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