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COMPRESSED AIR FOAM

FIRE PROTECTION SYSTEMS IN AIRCRAFT HANGAR AND HELIPORT APPLICATIONS

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AIRCRAFT HANGAR & HELIPORT PROTECTION CONCERNS

The issue of primary concern is the adequate protection against potential fire hazards encountered in aircraft hangars and on rooftop landing facilities/heliports, and the equipment used to suppress potential fires caused in conjunction with these hazards, that meet the intent of fire safety requirements as prescribed in National Fire Protection Association (NFPA) Standards, NFPA 409. ACAF Systems, PSF-Fire Suppression Group, LLC (ACAF Systems,

PFS-FSG) provides a unique and effective combination of delivery equipment and fire suppression agent in one proven package. Due to the nature of the enhanced system design and the compressed air foam (CAF) agent formulation, the fire suppression equipment and design proposed do not directly comply with the prescriptive requirements of NFPA 409 and NFPA 418.

Alternatively, NFPA does not restrict designs to purely singular or a set of prescribed systems of fire suppression. NFPA documents allow for the latitude in design and do recognize

that there are always new technologies and protective arrangements to be considered that may potentially meet fire safety and protection requirements outside the direct scope as prescribed in the standards. To this end, both NFPA 409 (para 1.2.2) and NFPA 418 (para 1.3.1), state "No part of this standard is intended to restrict new technologies or alternative arrangements, provided the level of safety prescribed by the standard is not lowered." Thus, allowing for the introduction of new technologies such as that developed and proposed by ACAF Systems.

NFPA 409 AIRCRAFT HANGAR DESIGN REQUIREMENTS

The current design requirements for low-level low-expansion aqueous film-forming foam (AFFF) systems, as specified in NFPA 409, para 6.2.4.5.1, are as follows "Where AFFF concentrate is used, the minimum application rate of foam solution shall be 0.10 gpm/ft²." This application rate requirement is consistent with the prescriptive parameters set forth in Chapter 5 of NFPA 11 for low expansion foam systems. The application rates are based on low expansion foams combined with delivery equipment that has been utilized in the market for many years without significant technology upgrades.

NFPA 418 HELIPORT DESIGN REQUIREMENTS

The current design requirements for AFFF systems, as specified in NFPA 418, Section 5.7, para 5.7.2, is as follows "The foam discharge rate for fire extinguishing systems shall be 0.10 gpm/ft² for aqueous film-forming foam". Also, NFPA 418 also requires, under Section 5.7.3, to have a design for fixed systems as designed and calculated in conjunction with Chapter 6 of NFPA 409. NFPA 409, para 6.2.4.5.1 specifies the same design density as specified in NFPA 418 para 5.7.2 above. Both standards require a 5-minute application duration for the AFFF. Additionally, this application rate requirement is consistent with the prescriptive parameters set forth in Chapter 5 of NFPA 11 for low expansion foam systems. The application rates, again, are based on low expansion foams combined with delivery equipment that has been utilized in the market for many years without significant technology upgrades.

ALTERNATIVE DESIGN TO NFPA 409 AND NFPA 418 REQUIREMENTS

ACAF Systems utilizes an AFFF compressed air foam fire suppressant in conjunction with its new uniquely engineered delivery equipment. Compressed air foam is a homogenous foam produced by the combination of water, foam concentrate, and air or nitrogen under



pressure. A unique fire fighting foam agent, CAF, extinguishes the fire by establishing a blanket of foam on the flammable liquid surface. The blanket creates separation of oxygen and heat from the burning fuel, extinguishing the fire and preventing re-flash. CAF's ability to reduce heat contributes to the effectiveness of this agent. CAF created with nitrogen provides an even more effective blanket for superior re-flash protection as the incorporation of nitrogen into the CAF mixture enhances the fire suppression capabilities due to its inherent nature as an inert gas. This combined with the unique, FM approved ACAF Systems delivery systems, provides for a total package for effective fire suppression of Class B hydrocarbon liquid fires similar to those encountered in aircraft hangar applications.

ACAF Systems CAF fire suppression systems are pre-engineered special hazard fire suppression systems that deliver AFFF foam through a variety of delivery systems. The delivery system that pertains specifically to the aircraft hangar applications is an automatic oscillating monitor system. CAF, a unique fire suppression material, is created by expanding an AFFF (for hydrocarbon-based liquids) or alcohol resistant-aqueous film-forming foam (AR-AFFF) (for polar solvents) foam water solutions. The expanded material is applied to the hazard area much the same as foam water systems are. CAF, however, has many distinct properties that need to be considered in the design and installation of a system. How the CAF is created and discharged is an impor-

tant aspect of the design; as such, special nozzles are used to distribute the CAF over a hazard area. It extinguishes the fire threat through the following combination of processes:

1. Excludes air from the flammable vapors.
2. Eliminates vapor release from fuel surface.
3. Separates the flames from the fuel surface.
4. Cools the fuel surface and surrounding structural surfaces.

Hazards that CAF systems are permitted to protect include the following:

1. Flammable liquids (flash points below 100°F (38°C) having a vapor pressure not exceeding 40 psi (276 KPa).
2. Combustible liquids (flash point of 100°F (38°C) and above).

ACAF Systems are suitable for Class B hydrocarbon and polar solvents flammable liquids, storage and handling locations where the risk of spill and pool fires exist. Note, polar solvents are liquids that have high dielectric constants, are chemically active, and form coordinate covalent bonds; examples are alcohols and ketones - methanol, propanol, formic acid, ethyl acetate, acetonitrile, etc.

The ACAF Systems self contained (SC) systems have been fully tested and evaluated and have received FM Approvals for the meeting and/or exceeding the requirements of extinguishing and suppressing hydrocarbon and polar solvent fires as prescribed. The SC systems utilize Universal Gold 1%/3% AR AFFF Foam Concentrate in 3% concentration.

When utilized with the unique CAF delivery equipment, the CAF is delivered to the fire at a 10 to 1 expansion ratio. With the receipt of FM Approvals, the equipment meets the requirement set forth in NFPA 409, para 6.2.5.2 "Each low-level foam protection system shall be designed, installed, and maintained in accordance with NFPA 11 or 11A." Under the general requirements for System Components and System Types, Chapter 4, NFPA 11, para 4.1.1 "All components shall be listed for their intended use." As a note, NFPA defines listed as follows "Equipment, materials, or services in a list published by an organization that is acceptable to the authority having jurisdiction and concerned with evaluation of products and services, that maintains periodic inspection of production of listed equipment, materials or periodic evaluation of services, and whose listing states that either the equipment material, or service meets appropriate designated standards or has been tested and found suitable for a specified

purpose." FM is a recognized authority and leader in testing, evaluation, and approval of such products, materials, and services.

Through the FM testing, evaluation, and approval process specified above, the proposed systems received approvals for use to extinguish Class B hydrocarbon and polar solvent fuel fires. Specific to the heliport issue, the systems are approved to extinguish Class B hydrocarbon fuel and polar solvent fires with an application rate of 0.045 gpm/ft², which is significantly less than the application rate of 0.10 gpm/ft² specified in NFPA 409 & NFPA 418. The system designs for both aircraft hangar and heliport CAF fire protection systems will meet the parameters of its FM Approvals with a rate of application of 0.045 gpm/ft². This, according to the FM Approval, is the recommended level of protection that will protect against the incident of the potential hydrocarbon fuel fire in the hangar. The delivery system combined with the CAF formulation has significantly increased

the fire suppression capability of the foam system compared to the history of the equipment used in the past decades. Also of note, that with the achievement of gaining FM Approvals, the systems have also met or exceeded the requirements of UL 162.

AUTHORITY HAVING JURISDICTION (AHJ) REVIEW

Through the information and FM Approvals provided, the AHJ, as stated previously, under NFPA 409, para 1.2.2 and NFPA 418, para 1.3.1, has the option after review and evaluation, to provide approval based on the facts presented, to approve the use of ACAF Systems SC CAF systems to protect the aircraft hangers against Class B hydrocarbon fuel based fires. ACAF Systems will provide copies of the approvals and the conditions of the approvals, proposed design drawings, proposed design specifications & manuals, and generic information about the systems and foam as part of this document, for AHJ review purposes. ■

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From its initial meeting in 2005, the Global Congress on Process Safety has grown into the world's largest gathering of process safety experts. Presented by the Center for Chemical Process Safety (CCPS) and the AIChE Safety Health Division, this annual event now draws attendees from around the globe. Abstracts are now being accepted for the

10th Global Congress on Process Safety, meeting in New Orleans in Spring 2014. Submissions are sought for the Four permanent tracks as well as the fifth special emphasis track (Process Safety Spotlights). Selected papers will contribute to reducing or eliminating process safety incidents by sharing of best practices and pushing the current state of the art.