Technical Committee on Airport Facilities (AIS-AAA)

M E M O R A N D U M

DATE: January 31 , 2019

TO: Principal and Alternate Members

FROM: Brian O'Connor, NFPA Staff Liaison
Office: (617) 984-7257 Email: BOConnor@NFPA.org

SUBJECT: AGENDA – NFPA 409, NFPA 415, and NFPA 423 First Draft Meeting (Fall 2020) March 26 – 28, 2019, Savannah, GA

1. Call to Order – March 26, 8:00am ET
2. Introductions and Attendance
3. Review Agenda
4. NFPA Staff Liaison Presentation
5. Chairman Comments
6. Approval of Previous Meeting Minutes (August 13-15, 2013, New Orleans, LA) (July 14-15, 2014, Baltimore, MD)
7. Generate First Revisions for NFPA 423 (No Public Input received)
8. Act on Public Input and Generate First Revisions for NFPA 415 (6 Public Inputs Received)
9. Act on Public Input and Generate First Revisions for NFPA 409 (50 Public Inputs Received)
10. Other Business
11. Next Meeting
12. Adjourn Meeting

Please submit requests for additional agenda items to the chair at least seven days prior to the meeting, and notify the chair and/or staff liaison as soon as possible if you plan to introduce any large-scale revisions at the meeting.

All NFPA Technical Committee meetings are open to the public. Please contact me for information on attending a meeting as a guest. Read NFPA's Regulations Governing the Development of NFPA Standards (Section 3.3.3.3) for further information.

Additional Meeting Information:
See the Meeting Notice on the Document Information Page (www.nfpa.org/409, www.nfpa.org/415, or www.nfpa.org/423) for meeting location details. If you have any questions, please feel free to contact **Yiu Lee**, *Project Administrator* at 617-984-7683 or by email YLee@nfpa.org.

C. Standards Administration

Address List No Phone

01/29/2019
Brian J. O'Connor

Airport Facilities

AIS-AAA

Matthew J. Daelhousen I 8/2/2010
Chair **AIS-AAA**
FM Global
1151 Boston-Providence Turnpike
PO Box 9102
Norwood, MA 02062-9102
FM Global
Alternate: Ruby Evans

Michael E. Aaron SE 08/03/2016
Principal **AIS-AAA**
Wiss Janney Elstner Associates, Inc.
10 South Lasalle Street, Suite 2600
Chicago, IL 60603
Alternate: Donald G. Goosman

James Brent Abbott E 10/23/2013
Principal **AIS-AAA**
US Department of Defense
Defense Contracts Management Agency
DCMAO-LSSA Contract Safety Aircraft Team
PO Box 1418
Benton, AR 72018
Alternate: Michael W. Vasta

Andrew T. Barrowcliffe I 3/2/2010
Principal **AIS-AAA**
Global Asset Protection Services, LLC
13-380 Providence Avenue
Kelowna, BC V1W 3W4 Canada
Alternate: William J. Sedlak

Gene E. Benzenberg M 1/1/1970
Principal **AIS-AAA**
Alison Control Inc.
35 Daniel Road
Fairfield, NJ 07004

Judy Biddle E 08/17/2015
Principal **AIS-AAA**
US Department of the Air Force
AFCEC Tyndall
139 Barnes Drive, Suite 1
Tyndall AFB, FL 32403-5325
Alternate: Fred K. Walker

James J. Blake E 10/20/2010
Principal **AIS-AAA**
Vancouver Airport Authority
PO Box 23750 Airport Postal Outlet
Richmond, BC V7B 1Y7 Canada

David Brandenburg U 8/9/2011
Principal **AIS-AAA**
Continental Airlines
Corporate Real Estate
4975 Wright Road
Houston, TX 77032

Thomas G. Burk U 1/1/1990
Principal **AIS-AAA**
Federal Express Corporation
Fedex Fire Station
2788 Sprankle Avenue
Memphis, TN 38118
Alternate: Delbert R. Chase, Jr.

David J. Burkhart SE 1/1/1991
Principal **AIS-AAA**
Code Consultants, Inc.
2043 Woodland Parkway, Suite 300
St. Louis, MO 63146-4235
Alternate: Richard M. DiMisa

Craig W. Cook M 08/03/2016
Principal **AIS-AAA**
Johnson Controls
2700 Industrial Parkway South
Marinette, WI 54143-3882
Alternate: John H. Pecot

Patrick Corcoran IM 3/2/2010
Principal **AIS-AAA**
Wolverine Fire Protection Company
8067 North Dort Highway
Mt. Morris, MI 48458

James Devonshire **M** 1/1/1992
Principal **AIS-AAA**
Buckeye Fire Equipment Company
1170 West Corporate Drive, Suite 201
Arlington, TX 76006

Denny Ellison **U** 08/17/2015
Principal **AIS-AAA**
Southwest Airlines Company
2832 Shorecrest Drive
Dal2mx
Dallas, TX 75235-1917
Alternate: Edward A. Jonak

Scott Enides **M** 4/28/2000
Principal **AIS-AAA**
S.R.I. Fire Sprinkler LLC
1060 Central Avenue
Albany, NY 12205
National Fire Sprinkler Association
Alternate: Robert Vincent

Michael E. France **U** 8/5/2009
Principal **AIS-AAA**
National Air Transportation Association
4226 King Street
Alexandria, VA 22302
Alternate: W. Mercer Dye, Jr.

Thomas D. Gambino **SE** 8/5/2009
Principal **AIS-AAA**
Prime Engineering, Inc.
3715 Northside Parkway, N.W
300 Northcreek, Suite 200
Atlanta, GA 30327

Robert Garrett **IM** 04/05/2016
Principal **AIS-AAA**
VSC Fire And Security Inc.
1417 Miller Store Road, Suite C
Virginia Beach, VA 23455
American Fire Sprinkler Association
Alternate: John Grant Campbell

Aaron Johnson **E** 04/05/2016
Principal **AIS-AAA**
Rural/Metro Corporation
Specialty Fire Division @ Sikorsky Aircraft
285 SW Ridgecrest Drive
Port St. Lucie, FL 34984

Elwin G. Joyce, II **E** 1/1/1987
Principal **AIS-AAA**
Eastern Kentucky University
2148 Alexandria Drive
Lexington, KY 40504
International Fire Marshals Association

Jeffrey S. Kidd **M** 08/17/2017
Principal **AIS-AAA**
The Hiller Companies
240 Ballardvale Street
Wilmington, MA 01887
Fire Suppression Systems Association
Alternate: Steve Rice

Kevin Korver **U** 08/17/2017
Principal **AIS-AAA**
The Boeing Company
P.O. Box 3707, MC 17-WE
Seattle, WA 98124
Alternate: Eli Horden

Maurice M. Pilette **SE** 1/1/1993
Principal **AIS-AAA**
Mechanical Designs Ltd.
67 Chouteau Avenue
Framingham, MA 01701-4259
Alternate: Gerard G. Back

Brian M. Pollock **M** 10/28/2014
Principal **AIS-AAA**
Siemens Industry Inc.
Building Technologies Division
Infrastructure & Cities
585 Slawin Court
Mt. Prospect, IL 60056
National Electrical Manufacturers Association
Alternate: Daniel P. Finnegan

Jack Poole **SE** 1/1/1991
Principal **AIS-AAA**
Poole Fire Protection, Inc.
19910 West 161st Street
Olathe, KS 66062-2700
Alternate: Andrew W. Poole

Lee T. Rindfuss **I** 8/5/2009
Principal **AIS-AAA**
Marsh Risk Consulting
99 High Street
Boston, MA 02110
Alternate: Ronald J. Megasko

Robert Saunders **SE** 1/1/1986
Principal **AIS-AAA**
Wasatch Design Consultants
2715 Brinker Avenue
Ogden, UT 84403-0307

VL to Document: 415

Joseph A. Simone **E** 1/15/2004
Principal **AIS-AAA**
US Department of the Navy
Naval Facilities Engineering Command (NAVFAC)
1322 Patterson Avenue SE, Suite 1000
Washington, DC 20374-5065
Alternate: Robert J. Tabet

Martin H. Workman **M** 10/28/2008
Principal **AIS-AAA**
The Viking Corporation
210 North Industrial Park Road
Hastings, MI 49058
Alternate: Robert Coonts

Kevin M. Wypychoski **IM** 3/4/2009
Principal **AIS-AAA**
Precision Mechanical Services, Inc.
PO Box 79
Guilford, CT 06437

Anthony J. Schoenecker **SE** 04/04/2017
Voting Alternate **AIS-AAA**
Burns & McDonnell
8201 Norman Center Drive, Suite 300
Bloomington, MN 55437

Gerard G. Back **SE** 08/17/2017
Alternate **AIS-AAA**
JENSEN HUGHES
3610 Commerce Drive, Suite 817
Baltimore, MD 21227-1652
JENSEN HUGHES
Principal: Maurice M. Pilette

John Grant Campbell **IM** 04/05/2016
Alternate **AIS-AAA**
Fire & Life Safety Amercica
1113 Cavalier Boulevard
Chesapeake, VA 23323
American Fire Sprinkler Association
Principal: Robert Garrett

Delbert R. Chase, Jr. **U** 1/1/1989
Alternate **AIS-AAA**
Federal Express Corporation
2900 Business Park Blvd.
Memphis, TN 38118
Principal: Thomas G. Burk

Robert Coonts **M** 08/17/2018
Alternate **AIS-AAA**
Viking Corporation
21839 E Tallkid
Parker, CO 80138
Principal: Martin H. Workman

Richard M. DiMisa **SE** 8/2/2010
Alternate **AIS-AAA**
Code Consultants, Inc.
2043 Woodland Parkway, Suite 300
St. Louis, MO 63146-4235
Principal: David J. Burkhart

W. Mercer Dye, Jr. U 8/5/2009
Alternate **AIS-AAA**
Dye Aviation Facilities, Inc.
1220 Village Run
Atlanta, GA 30319
National Air Transportation Association
Principal: Michael E. France

Ruby Evans I 12/08/2015
Alternate **AIS-AAA**
FM Global
1151 Boston-Providence Turnpike
PO Box 9102
Norwood, MA 02062-9102
Principal: Matthew J. Daelhousen

Daniel P. Finnegan M 10/28/2014
Alternate **AIS-AAA**
Siemens Industry, Inc.
Building Technologies Division
Fire & Security
2953 Exeter Court
West Dundee, IL 60118-1724
National Electrical Manufacturers Association
Principal: Brian M. Pollock

Donald G. Goosman SE 12/07/2018
Alternate **AIS-AAA**
Wiss Janney Elstner Associates, Inc.
10 South Lasalle Street, Suite 2600
Chicago, IL 60603-1017
Principal: Michael E. Aaron

Eli Horden U 08/17/2017
Alternate **AIS-AAA**
The Boeing Company
PO Box 3707
MC 17-WE
Seattle, WA 98124
Principal: Kevin Korver

Edward A. Jonak U 08/17/2015
Alternate **AIS-AAA**
Southwest Airlines Company
2700 Love Field Drive, DAL-2MT
Dallas, TX 75235-1908
Principal: Denny Ellison

Ronald J. Megasko I 04/04/2017
Alternate **AIS-AAA**
Marsh Risk Consulting
995 Fairview Road
Glenmoore, PA 19343
Principal: Lee T. Rindfuss

John H. Pecot M 04/11/2018
Alternate **AIS-AAA**
Johnson Controls
1125 East Collins Boulevard, Suite 100
Richardson, TX 75081
Principal: Craig W. Cook

Andrew W. Poole SE 10/23/2013
Alternate **AIS-AAA**
Poole Fire Protection, Inc.
19910 West 161st Street
Olathe, KS 66062-2700
Principal: Jack Poole

Steve Rice M 08/17/2017
Alternate **AIS-AAA**
ABCO Fire, LLC
4545 West 160th Street
Cleveland, OH 44135
Fire Suppression Systems Association
Principal: Jeffrey S. Kidd

William J. Sedlak I 10/23/2013
Alternate **AIS-AAA**
Global Asset Protection Services, LLC
190 South LaSalle Street, Suite 3900
Chicago, IL 60067
Principal: Andrew T. Barrowcliffe

Robert J. Tabet E 7/22/1999
Alternate **AIS-AAA**
US Department of the Navy
Naval Facilities Engineering Command, Atlantic
6506 Hampton Boulevard, Code CIFPE
Norfolk, VA 23508-1278
Principal: Joseph A. Simone

Michael W. Vasta E 10/23/2013

Alternate **AIS-AAA**
US Department of Defense
Defense Contracts Management Agency
PO Box 16859, MS P23-50
Philadelphia, PA 19142-0859
Principal: James Brent Abbott

Robert Vincent M 3/4/2009

Alternate **AIS-AAA**
Shambaugh & Son, L.P.
7614 Opportunity Drive
Fort Wayne, IN 46825-3363
National Fire Sprinkler Association
Principal: Scott Enides

Fred K. Walker E 01/01/1987

Alternate **AIS-AAA**
US Department Of The Air Force
Afcec/Cosm
139 Barnes Drive, Suite 1
Panama City, FL 32403-5319
Principal: Judy Biddle

Nathaniel J. Addleman SE 01/01/1985

Member Emeritus **AIS-AAA**
Addleman Engineering PLLC
7602 Oak Fern
Houston, TX 77040-6890

L. M. Krasner SE 1/1/1975

Member Emeritus **AIS-AAA**
11 Penobscot Street
Medfield, MA 02052

Thomas J. Lett SE 1/1/1974

Member Emeritus **AIS-AAA**
Albuquerque Fire & Safety Associates
909 Verde Place SE
Rio Rancho, NM 87124

Brian J. O’Connor 4/20/2017

Staff Liaison **AIS-AAA**
National Fire Protection Association
One Batterymarch Park
Quincy, MA 02169-7471

Meeting Title: 409, 415, 423 First Draft Meeting

Meeting Date: Tuesday, August 13 – Thursday, August 15, 2013
Meeting Location: Four Points by Sheraton French Quarter, New Orleans, LA

Code or Standards: Standard on Aircraft Hangars (409), Standard on Airport Terminal Buildings, Fueling Ramp Drainage, and Loading Walkways (415), Standard for Construction and Protection of Aircraft Engine Test Facilities (423)

Minutes Taken By: Michael Aaron

Attendees:

NFPA Staff

Barry Chase	NFPA	(Staff Liaison)
Andrew Holter	NFPA	

Members of the Technical Committee on Airport Facilities

James R. Doctorman	Boeing Corporation	(Committee Chair)
Michael E. Aaron	The RJA Group	(Committee Secretary)
James J. Blake	Vancouver International Airport Authority, Canada	
J. Robert Boyer	UTC/Edwards Company - NEMA	
Thomas G. Burk	Federal Express Corp.	
David J. Burkhart	Code Consultants Inc.	
Patrick Corcoran	Wolverine Fire Protection Company	
Matthew J. Daelhousen	FM Global	
James Devonshire	Buckeye Fire Equipment Company	
Scott Enides	National Fire Sprinkler Association	
Michael E. France	National Air Transportation Association	
Thomas D. Gambino	Prime Engineering, Inc.	
Elwin G. Joyce, II	International Fire Marshals Association	
Christy J. Marsolo	Tyco Fire Suppression & Building Products	
Jack Poole	Poole Fire Protection, Inc.	
Randy D. Pope	Burns & McDonnell Engineering Company	
Robert W. Rees	American Fire Sprinkler Association	
Joseph L. Scheffey	Hughes Associates, Inc.	
Fred K. Walker	US Department of the Air Force	
Martin H. Workman	The Viking Corporation	
Kevin M. Wypychoski	Precision Mechanical Services, Inc.	

Alternates

Rick J. Jackson (non-voting)	American Fire Sprinkler Association

Non-Members / Guests / Presenters

Tristan Mackintosh	Fireless Flooring

Committee Agenda:

1. **Call to Oder and Introductions**

Introductions were made of those in attendance.

2. **NFPA Staff Liaison Presentation**

Mr. Chase presented an explanation of recently revised NFPA procedures and terminology concerning disposition of public input and committee input. Mr. Doctorman added comments on the agenda.

3. **Revision Schedule**

- First Draft ballots due by January 31, 2014
- NFPA to post First Draft for public comment by March 7, 2014
- Public input closing date May 16, 2014
- Second Draft committee meeting late summer/early fall 2014 (August likely)

4. Appointment of Committee Secretary

Mr. Aaron was appointed as Secretary.

5. Approval of Minutes of Previous Meetings

Minutes of two prior meetings were approved.

6. Action on Public and Committee Input for NFPA 423

No public input was received on NFPA 423. A first draft was generated.

Task group #1 was formed by the Chair to consider the possible use of water mist in support areas. Members: Mr. Boyer (chair) and Mr. Daelhousen.

- The task group provided a report on the last day of the meeting, resulting in multiple Committee Inputs (CI) to seek public comment on the proposal to add water mist systems.

7. Presentation by Mr. Mackintosh

Mr. Mackintosh presented information of the Fireless Flooring system.

8. Presentation by Mr. Scheffey

Mr. Scheffey presented information from research in progress on the subject of egress through jet bridges.

The committee discussed the increase in ARFF response time in the latest revision of NFPA 403. It was decided to send a letter from the chair of this committee to the NFPA 403 technical committee in support of returning to the previous requirement.

9. Action on Public and Committee Input for NFPA 415

Public and committee input was considered, discussed and acted on. A first draft was generated.

10. Action on Public and Committee Input for NFPA 409

Public and committee input was considered, discussed and acted on. A first draft was generated.

The Chair appointed the following task groups:

#2 Redundancy: Mr. Aaron (chair), Mr. Burk, Mr. Rees and Mr. Workman.

- This task group was charged with reviewing the requirements for a redundant fire pump (6.2.10.8.2 and 9.14.13.2), a reserve supply of foam concentrate (6.2.6.3 and 9.14.8.3), and a divided water reservoir (6.2.10.7 and 9.14.12.5) and to determine whether revisions should be considered.
- The task group provided a report on the last day of the meeting, resulting in multiple First Revisions (FR) and Committee Inputs (CI).

#3 Low-Level Systems: Mr. Aaron (chair), Mr. Daelhousen, Mr. Poole and Mr. Workman.

- This task group was charged with considering the various proposals on the subject of permitting low-level foam systems to be “zoned”.
- The task group provided a report on the last day of the meeting, resulting in no revisions to the standard.
- The task group was charged with further action to consider the topic for possible revision at the second draft.

#4 Inside Air for HEF Systems: Mr. Devonshire (chair) and Mr. Poole.

- This task group was charged with considering the various proposals on the subject of permitting inside air to be used for generating foam.
- The task group provided a report on the last day of the meeting, resulting in no revisions to the standard.

#5 Group III Hangars: Mr. Burkhart (chair)

- This task group was charged with reviewing the classification and separation of Group III hangars, specifically with respect to the concepts of hangar clusters, row hangars, and multiple occupancy buildings.
- The task group provided a report on the last day of the meeting, resulting in multiple Committee Inputs (CI) to seek public comments.

#6 Testing Chapter: Mr. Workman (chair), Mr. Blake, Mr. Enides and Mr. Aaron.

- This task group was charged with reviewing and revising the maintenance requirements in Chapter 11. A Committee Input (CI) was created to seek public comments.
- The task group will report at the Second Draft meeting.

11. Other Business

None.

Meeting Adjourned.

Meeting Title: NFPA 409 and NFPA 415 Second Draft Meeting

Meeting Date: Tuesday, July 15– Thursday, July 17, 2014
Meeting Location: Holiday Inn - Inner Harbor, Baltimore, MD

Code or Standards: NFPA 409 *Standard on Aircraft Hangars*; NFPA 415 *Standard on Airport Terminal Buildings, Fueling Ramp Drainage, and Loading Walkways*

Minutes Taken By: Michael Aaron

Attendees:

NFPA Staff

Barry Chase	NFPA	(Staff Liaison)

Members of the Technical Committee on Airport Facilities

James R. Doctorman	Boeing Corporation	(Committee Chair)
Michael E. Aaron	Hughes-RJA	(Committee Secretary)
James Brent Abott	Defense Contracts Management Agency	
Gene E. Benzenberg	Alison Control Inc.	
James J. Blake	Vancouver International Airport Authority, Canada	
David J. Burkhart	Code Consultants Inc.	
Matthew J. Daelhousen	FM Global	
Scott Enides	National Fire Sprinkler Association	
Thomas D. Gambino	Prime Engineering, Inc.	
Elwin G. Joyce, II	International Fire Marshals Association	
Maurice M. Pilette	Mechanical Designs Ltd	
Randy D. Pope	Burns & McDonnell Engineering Company	
Robert W. Rees	American Fire Sprinkler Association	
Joseph A. Simone	US Department of the Navy	
Fred K. Walker	US Department of the Air Force	
Martin H. Workman	The Viking Corporation	
Kevin M. Wypychoski	Precision Mechanical Services, Inc.	

Alternates

Rick J. Jackson	American Fire Sprinkler Association
Lee T. Rindfuss	Marsh Risk Consulting
Joseph L. Scheffey	Hughes-RJA

Non-Voting Members

L. M. Krasner	Member Emeritus

Guests

Herb Mudrow	JBT AeroTech
Josh Swann	Student, University of Maryland

Committee Agenda:

1. **Call to Oder and Introductions**

Introductions were made of those in attendance.

2. **Committee Chair and NFPA Staff Liaison Comments**

Mr. Doctorman and Mr. Chase reviewed NFPA procedures concerning disposition of public comments. Mr. Doctorman reviewed the agenda.

3. Approval of Minutes of the First Draft Meeting

Minutes of the previous meetings were approved.

4. NFPA 415 Second Draft

The committee acted on the Public Comment and developed Second Revisions.

- Mr. Scheffey and Mr. Swann presented the findings of the FPRF research report on the subject of egress through passenger boarding bridges and the possible effects of transparent walls.

5. NFPA 409 Second Draft

The committee acted on the Public Comment and developed Second Revisions.

- Mr. Aaron presented recommendations from the Task Group on Zoning Low-Level Foam Systems.
- Mr. Burkhart presented recommendations from the Task Group on Group III Hangars.
- Mr. Workman presented recommendations from the Task Group on Maintenance and Testing

6. Other Business

The committee discussed the current status of a task group appointed in the previous revision cycle to develop performance criteria for fire suppression systems in aircraft hangars. The task group had made no progress. The committee agreed that the project should be submitted to the Fire Protection Research Foundation for further assistance. Mr. Scheffey was appointed to submit the proposal on behalf of the committee.

The meeting adjourned at 10:00am on Jul 17.

Public Input No. 7-NFPA 415-2018 [Section No. 2.3.3]

2.3.3 UL Publications.

Underwriters Laboratories Inc., 333 Pfingsten Road, Northbrook, IL 60062-2096.

~~ANSI/~~ UL 723,~~Standard for~~ *Test for Surface Burning Characteristics of Building Materials,* ~~2008~~ *2004, revised* 2018 .

Statement of Problem and Substantiation for Public Input

Update the publishing date for the UL standard listed to reflect the most up to date edition. There are many other references to standards promulgated by other standards development organizations where they are considered ANSI approved but do not include ANSI in the reference, so it has been removed. The term “Standard for” is redundant and unnecessary. This change results in the proper short form name of the referenced documents. . These actions are being taken throughout all NFPA references to UL standards.

Submitter Information Verification

Submitter Full Name:	Kelly Nicolello
Organization:	UL LLC
Street Address:	
City:	
State:	
Zip:	
Submittal Date:	Tue Jun 26 16:33:32 EDT 2018
Committee:	AIS-AAA

Public Input No. 8-NFPA 415-2018 [Section No. 6.2.1]

6.2.1 *

Interior finish other than textiles of walls, ceilings, and walkways shall be Class A as defined in 10.2.3.4.1 of NFPA *101* and classified in accordance with ASTM E84, *Standard Test Method for Surface Burning Characteristics of Building Materials*, or ~~ANSI/~~ UL 723, ~~Standard~~ T *est for* ~~Test for~~ *Surface Burning Characteristics of Building Materials*.

Statement of Problem and Substantiation for Public Input

Remove “Standard for” from the title. UL is no longer using that term. Remove ANSI because many years ago, UL preferred the ANSI/UL reference because there was a transition of traditional UL standards towards an ANSI standards development process.

Now, years later, a large majority of UL Standards are ANSI approved and follow the ANSI development and maintenance process. However, sometimes readers are confused because they don't understand the standards are UL standards, not developed by ANSI. There are many other references to standards promulgated by different standards development organizations where they are considered ANSI approved but do not include ANSI in the reference.

Submitter Information Verification

Submitter Full Name: Kelly Nicolello

Organization: UL LLC

Street Address:

City:

State:

Zip:

Submittal Date: Wed Dec 26 14:24:02 EST 2018

Committee: AIS-AAA

Public Input No. 4-NFPA 415-2018 [Section No. 6.2.4]

6.2.4*

During a ramp fire emergency, walkway interiors shall have a positive air pressure delivered from a source that shall remain uncontaminated. The pressurization system to the aircraft loading walkway must adequately restrict the entry of smoke into the walkway from a free-burning jet fuel spill to allow safe egress by passengers from an aircraft.

Additional Proposed Changes

File Name	Description	Approved
NFPA_415_Committee_Submission.pdf	NFPA 415 Submission re Pressurization of Aircraft Loading Walkways	

Statement of Problem and Substantiation for Public Input

Review the perceived inconsistencies between the clauses in Chapter 6 of NFPA 415 in relation to the pressurization of aircraft loading walkways and the requirement to restrict the entry of smoke to allow the safe egress of passengers

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 5-NFPA 415-2018 [New Section after A.6.2.4]	
Public Input No. 6-NFPA 415-2018 [New Section after A.6.2.4]	

Submitter Information Verification

Submitter Full Name: Trevor Dartnell
Organization: Philip Chun
Affiliation: Nil
Street Address:
City:
State:
Zip:

Submittal Date: Wed Jun 20 00:31:31 EDT 2018
Committee: AIS-AAA

Reference: Submission to the National Fire Protection Association Committee regarding NFPA 415 Standard on Airport Terminal Buildings, Fuelling Ramp Drainage, and Loading Walkways

1. Purpose

The purpose of this submission is to request that the National Fire Protection Association Committee review the current requirements of NFPA 415 in relation to the role of aircraft loading walkways in the provision of safe egress from an aircraft in the event of a jet fuel spill fire. In particular, this submission will consider whether there is consistency between the compliance requirements of the standard in relation to the pressurisation of aircraft loading walkways.

2. Background

During my employment as an Airport Building Controller at Sydney Airport, Australia over the past 15 years I have adopted the provisions of NFPA 415 as the primary compliance standard for the design of fuelling ramp drainage and loading walkways. For information I am employed by Philip Chun & Associates Pty Ltd who are contracted to act on behalf of the Federal Government of Australia to issue building approvals at Sydney Airport.

Currently I am working with the lessee of the airport (i.e. Sydney Airport Corporation Limited) to develop standards to meet the requirements of NFPA 415 for the pressurisation of aircraft loading walkways.

3. NFPA 415 Requirements

It is considered that the main clauses of NFPA 415 that are relevant to the issue of safe egress via aircraft loading walkways are as follows:

Clause 1.2.2 – The purpose of this standard is also to specify minimum criteria for fire protection of aircraft loading walkways that can serve as egress routes from aircraft in the event that a fire caused by a flammable liquid spill on the airport ramp exposes the walkway and the aircraft.

Clause 3.3.2 Aircraft Loading Walkway – is defined as an aboveground device through which passengers move between a point in an airport terminal building and an aircraft. Included in this category are walkways essentially fixed and permanently placed, or walkways that are essentially mobile in nature and that fold, telescope, or pivot from a fixed point at the airport terminal building.

Clause 6.1.1 – Each aircraft loading walkway installation shall be designed to provide a safe means of egress from the aircraft for a period of 5 minutes under exposure conditions equivalent to a free-burning jet fuel spill fire.

Explanatory Clause A.6.1.1 – The loading walkway(s) provide the principal means of egress while an aircraft is at the terminal. The normal aircraft escape systems (escape slides) are routinely disabled when the aircraft is at the terminal building; additionally, the doors are often blocked by servicing equipment.

Clause 6.1.2 - Protection of the aircraft loading walkway shall be accompanied by one of the following methods:

(1) Construction design meeting the requirements of Sections 6.1 through 6.4
(2) Fixed fire protection meeting the requirements of Sections 6.1, 6.2 and 6.5

Clause 6.2.4 - During a ramp fire emergency, walkway interiors shall have a positive pressure delivered from a source that shall remain uncontaminated.

Explanatory Clause A.6.2.4 – The source of uncontaminated air is normally from the airport terminal building.

Clause 6.2.5 – Any source of negative air pressure in the aircraft loading walkway shall be automatically shut down in the event of a fire emergency.

Explanatory Clause A.6.2.5 – Aircraft loading walkways can be used for a return air plenum as part of a system that provides ventilation for the aircraft. This system can create a positive or negative pressure in the walkway during normal operation and might use air from make-up. Systems of this type, as well as any exhaust fans on the walkway, are therefore to be automatically shut down in the event of fire emergency outlined in 6.1.1.

Clause 6.2.7 - Where loading walkways are provided, the walkway, including the bumpers, curtains, and canopies, shall be seated according to the manufacturer's instruction and training whenever the walkway is in service.

Explanatory Clause A.6.2.7- Bumpers, curtains, and canopies are essential elements necessary to ensure the fire performance of the walkway's system to provide a safe egress path in the event of a spill fire on the ramp. Many users view the canopies and curtains as weather protection devices and not essential fire safety devices. Because of the physical variations in airframe fuselage shapes, it is not possible to achieve 100 per cent contact of bumpers and canopies against all aircraft fuselages.

4. Design Principals

The Aircraft Loading Walkways – Literature and Information Review prepared by Hughes Associates for the Fire Protection Research Foundation dated 30 May 2014 primarily investigated the issues regarding fire safety in aircraft loading walkways manufactured of glass. The report also identified key fire safety criteria that applied to all aircraft loading walkways. The report stated the following in relation to the aircraft loading walkways and their pressurisation:

- The primary fire safety goal of aircraft walkways is to provide safe egress for passengers and crew members;
- NFPA 415 requires the loading walkway to provide a safe path of egress for five minutes of fire exposure for passengers and crew members;
- Smoke within the loading walkway is another concern for life safety. In the event of a fire emergency, the loading walkway should be designed to prevent smoke infiltration. This could be achieved by maintaining the walkway interior at a positive pressure. In the event that a fire was to penetrate the structure and involve the interior of the walkway, other practices must be put in place to reduce the impact to the passengers trying to reach safety.

5. Discussion

NFPA 415 includes a performance requirement under Clause 6.1.1 that an aircraft loading walkway must provide a safe means of egress from the aircraft for a period of 5 minutes under exposure conditions equivalent to a free-burning jet fuel spill fire. To assist in the provision of safe egress the walkway interiors must have a positive pressure delivered from an uncontaminated source. NFPA 415 does not specify the pressure differential that must be provided in an aircraft loading walkway other than there being a positive pressure.

If an aircraft loading walkway is required to provide a safe means of egress for 5 minutes, then it could be expected that the pressurisation system would either prevent the infiltration of smoke for that period, or alternatively, limit the entry of smoke so that tenable conditions were maintained in the aircraft loading walkway for the 5 minute period to allow evacuation of an aircraft. The main criteria for tenability inside an aircraft loading walkway with a ramp level fuel fire would be smoke layer height, visibility, and carbon monoxide levels. Other tenability criteria such as air temperature, radiant heat from the hot layer, and hydrogen cyanide levels in smoke are unlikely to be relevant for this fire scenario.

Whilst it is appropriate to require a positive pressure differential in the aircraft loading walkway, the question is what level of pressure differential is appropriate. A pressure differential of 20 to 25Pa is regularly used as the fire safety criteria for zone pressurisation and lift pressurisation systems in multi-storey buildings to restrict the spread of smoke throughout the building. Whilst adoption of a minimum pressure differential of 20 or 25Pa between the inside and outside of an aircraft loading walkway would restrict entry of smoke to allow safe egress, satisfying this standard may not be easily achieved due to leakage along the walkway. This issue is discussed in more detail below.

Testing was recently carried out at Sydney Airport on an aircraft loading walkway comprising a fixed walkway with two mobile aircraft loading walkways that was pressurised by three dedicated fans that each supplied $5m^3$/sec into the fixed link. The tests identified that the pressure differential between the inside and outside of the aircraft loading walkway with the pressurisation fans on was 4Pa, whilst airflow from inside the mobile aircraft loading walkway at the point of contact to the aircraft varied between 0.25m/ sec and 0.05m/ sec for the alternate walkways.

As stated previously an aircraft loading walkway may be fixed or mobile, or a combination of both. Based on limited research that I have completed it would seem to indicate that mobile aircraft loading walkways without a fixed link are more common in the United States, whilst a combination of a fixed and mobile aircraft loading walkway is more common in Australia. A fixed aircraft loading walkway has construction that can be readily sealed to restrict the entry of smoke. By contrast, a mobile aircraft loading walkway has gaps to facilitate three dimensional movements to allow connection with different aircraft. The gaps or openings may occur at the telescopic joints in the mobile aircraft loading walkway; or at the points of connection between the mobile aircraft loading walkway and aircraft, terminal building, or fixed part of an aircraft loading walkway. These joints normally allow leakage of air and hinder pressurisation of a mobile aircraft loading walkway. Although the three dimensional movement makes it difficult to seal an aircraft loading walkway, the inclusion of additional requirements in NFPA 415 to require the effective sealing of the joints and the fixed link/ terminal connection points in a mobile aircraft loading walkway would facilitate the positive pressurisation of the walkway. Further advice would be required from manufacturers of mobile aircraft loading walkways to identify appropriate materials that would be adequately flexible to allow for the movement in the walkway; durable to withstand the effects of weather and compression; and resistant to hot smoke temperatures of up to 200^0C. It is considered that there should be compression type seals that are available and suitable for this purpose.

Appendix A to Clause 6.2.7 recognises that the bumpers, curtains, and canopies are essential elements in the fire performance of the walkway system. The standard also states that it is not possible to achieve 100 per cent contact of bumpers and canopies against all aircraft fuselages, and therefore these gaps cannot be fully sealed. These gaps limit the ability to pressurise the aircraft

loading walkway and may therefore allow smoke migration at the point at which evacuating passengers are disembarking the aircraft. It is considered that if all other joints in a fixed or mobile aircraft loading walkway could be effectively sealed, then it should be expected that there would be sufficient leakage of air at the connection between the mobile aircraft loading walkway and aircraft to restrict the entry of smoke into the walkway. It should be recognised that weather conditions, in particular winds, may impact on the pressurisation of an aircraft loading walkway and should be considered during compliance testing.

So that the air supplying the pressurisation system is uncontaminated, the standard recommends that air be drawn from the terminal building. Based on the dimensions of an aircraft loading walkway and noted problems with leakage it is considered that centrifugal type fans are be best suited to create higher pressure airflow. For aircraft loading walkways that comprise both fixed and mobile elements, it may be necessary to provide separate fans at the connection between the terminal and fixed aircraft loading walkway, and between the fixed aircraft loading walkway and mobile aircraft loading walkway to facilitate the pressurisation for the full length of the walkway. It would not be necessary to make this a mandatory requirement, but rather an explanatory clause.

6. Current Application of Standard

Advice from aircraft loading walkway manufacturers in Australia has identified that there are variations in the interpretation regarding the compliance requirements with NFPA 415 for pressurisation of an aircraft loading walkway. The different interpretations include:

1. The terminal has a positive pressure relative to both the outside of the building and the aircraft loading walkway after equipment that may blow contaminated air into the walkway is shut down. As the doors between the terminal and aircraft loading walkway are open during boarding/ disembarking operations, mechanical ventilation from the terminal is supplied into the aircraft loading walkway. It would appear that this interpretation may be the most common measure used for compliance with the standard;
2. Outside air to the terminal is ramped up to 100% capacity in the event of a ramp level fuel fire and air from the terminal is allowed to pressurise the aircraft loading walkway;
3. Supply air fans are installed purely for the purpose of the pressurisation of the loading walkway and provide air from an uncontaminated source. In some cases where there are fixed and mobile elements of the these fans also direct air directly over the opening between the fixed link and aerobridge to provide an increased air supply into the aerobridge to overcome the issue of leakage through the openings in the aerobridge.

Whilst it must be acknowledged that the design team involving architect, fire engineer and mechanical engineer will use different approaches to achieve compliance, it is clear that uncertainty regarding compliance with NFPA 415 is the primary cause of the differences.

Also there are significant differences in the mechanisms that are used to activate the pressurisation system. The different mechanisms that are known to be used include smoke detection within the aircraft loading walkway; flow switch to a sprinkler system installed to the underside of the aircraft loading walkway; flow switch to wall wetting sprinklers protecting the aircraft loading walkway or terminal adjacent to the aircraft loading walkway; activation of a fuel stop device by aircraft re-fuellers; ramp/ apron level break glass alarm; aerobridge console break glass alarm; fixed link break glass alarm; detection of negative pressure within the aircraft loading walkway; smoke detected within any air handling unit or pre-conditioned air unit that supplies air to the loading walkway.

It is considered that detection inside the aircraft loading walkway is not an appropriate mechanism for activation of the pressurisation system as the system should operate before smoke enters the aircraft loading walkway. In fact it is considered that the pressurisation system should shut down if smoke is detected within the aircraft loading walkway after previous activation of the pressurisation system.

As a fuel spill is likely to occur during re-fuelling operations, the activation of a fuel stop device or ramp/ apron level break glass alarm by aircraft re-fuellers or other airport staff is likely to ensure the quickest activation time for the pressurisation system. Activation using the following additional measures is also considered appropriate - flow switch to a sprinkler system installed to the underside of the aircraft loading walkway; flow switch to wall wetting sprinklers protecting the aircraft loading walkway or terminal adjacent to the aircraft loading walkway; aerobridge console break glass alarm; fixed link break glass alarm; smoke detected within any air handling unit or pre-conditioned air unit that supplies air to the loading walkway.

Recommendation

Further to the discussion above it is recommended that NFPA 415 be reviewed and the requirements of Clauses 6.2.4 & 6.2.5 amended. Importantly, there should be consistency between the primary objective to provide a safe means of egress from the aircraft for a period of 5 minutes under exposure conditions equivalent to a free-burning jet fuel spill fire, and the mandatory measures to satisfy this performance requirement. Tests may need to be carried out to determine the appropriate mandatory active and passive design criteria that should be specified in the standard for an aircraft loading walkway to satisfy the performance requirement. The tests would need to accommodate the different configurations of aircraft loading walkways that may be expected based on whether they are fixed or mobile, and how many levels of a terminal they connect with. The standard could then be amended based on the results of the fire tests.

Furthermore, it is considered that NFPA 415 should be amended to include definitive requirements re the following:

1. Confirm whether the aircraft loading walkway pressurisation system should be designed to prevent smoke infiltration for a period of five minutes after detection of fire to allow a safe means of egress from the aircraft by passengers and crew members? If so, clarification should be given regarding the pressure differential that should be provided between the inside and outside of the aircraft loading walkway to restrict the entry of smoke. The standard should also nominate how and where the pressure differential should be measured. This should include test procedures based on the following variables and factors:

    a. aircraft loading arrangement i.e. a mobile aircraft loading walkway only or a combination of both fixed and mobile aircraft loading walkways; the aircraft loading walkways connects a single terminal concourse, or separate Arrivals Level and Departures Levels terminal concourses;

    b. which doors should be opened during any testing;

    c. whether the aerobridge should be fully extended during testing;

    d. whether all aircraft loading walkway connections with the aircraft should be tested for compliance;

    e. status of terminal mechanical system during testing;

f. any allowances for wind or other climatic conditions.

2. Standards for effective sealing of joints in an aircraft loading walkway to limit leakage and enable effective pressurisation of the aircraft loading walkway for a period of 5 minutes;

3. Mechanisms to activate the pressurisation system.

The inclusion of additional deemed-to-satisfy provisions in the standard would not limit the ability of a designer to utilise a performance based solution using fire engineering, except where prohibited by the regulating authority.

The report is submitted for consideration of the committee.

Trevor Dartnell

Trevor.Dartnell@philipchun.com

+61 423 609 082

20 June 2018

Public Input No. 2-NFPA 415-2017 [Section No. 6.4.6.3]

6.4.6.3

The test shall be successful when the following conditions of acceptance are met:

(1) The wall or floor section shall have sustained the applied load during the fire-endurance test without passage of flame for a minimum period of 5 minutes. Flaming shall not appear on the unexposed face.

(2) The maximum allowable surface temperature rise of the cool side of a wall or floor section shall not exceed 250°F (121°C) during a 5-minute exposure as determined by 6.4.4.4.

Statement of Problem and Substantiation for Public Input

This should be a temperature RISE limit so it is consistent with Section 6.4.4.4 and other fire resistance standards that use the same criterion.

Submitter Information Verification

Submitter Full Name: Barry Badders
Organization: Intertek Testing Services
Street Address:
City:
State:
Zip:
Submittal Date: Tue Dec 19 17:31:06 EST 2017
Committee: AIS-AAA

Public Input No. 5-NFPA 415-2018 [New Section after A.6.2.4]

Sealing of Gaps and Joints in Aircraft Loading Walkways

Gaps and openings in an aircraft loading walkway at the joints in the walkway at the points of connection to the terminal must be effectively sealed so as to restrict the entry of smoke from a free-burning jet fuel spill fire.

Additional Proposed Changes

File Name	Description	Approved
NFPA_415_Committee_Submission.pdf	NFPA 415 Review Report	

Statement of Problem and Substantiation for Public Input

An aircraft loading walkway typically has gaps and opening due to the fact that they are a telescopic device. These gaps restrict the ability to positively pressurize an aircraft loading walkway for the full length of the walkway. Depending on the source of the supply air, leakage along the length of the walkway means that pressurisation for the full length of the walkway is difficult to achieve. Mechanical seals or similar are required to ensure that the effective pressurisation for the full length of the walkway can be achieved.

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 4-NFPA 415-2018 [Section No. 6.2.4]	Impacts on performance of the pressurization system to an aircraft loading walkway

Submitter Information Verification

Submitter Full Name: Trevor Dartnell

Organization: Philip Chun

Affiliation: Nil

Street Address:

City:

State:

Zip:

Submittal Date: Wed Jun 20 01:37:54 EDT 2018

Committee: AIS-AAA

Reference: Submission to the National Fire Protection Association Committee regarding NFPA 415 Standard on Airport Terminal Buildings, Fuelling Ramp Drainage, and Loading Walkways

1. Purpose

The purpose of this submission is to request that the National Fire Protection Association Committee review the current requirements of NFPA 415 in relation to the role of aircraft loading walkways in the provision of safe egress from an aircraft in the event of a jet fuel spill fire. In particular, this submission will consider whether there is consistency between the compliance requirements of the standard in relation to the pressurisation of aircraft loading walkways.

2. Background

During my employment as an Airport Building Controller at Sydney Airport, Australia over the past 15 years I have adopted the provisions of NFPA 415 as the primary compliance standard for the design of fuelling ramp drainage and loading walkways. For information I am employed by Philip Chun & Associates Pty Ltd who are contracted to act on behalf of the Federal Government of Australia to issue building approvals at Sydney Airport.

Currently I am working with the lessee of the airport (i.e. Sydney Airport Corporation Limited) to develop standards to meet the requirements of NFPA 415 for the pressurisation of aircraft loading walkways.

3. NFPA 415 Requirements

It is considered that the main clauses of NFPA 415 that are relevant to the issue of safe egress via aircraft loading walkways are as follows:

Clause 1.2.2 – The purpose of this standard is also to specify minimum criteria for fire protection of aircraft loading walkways that can serve as egress routes from aircraft in the event that a fire caused by a flammable liquid spill on the airport ramp exposes the walkway and the aircraft.

Clause 3.3.2 Aircraft Loading Walkway – is defined as an aboveground device through which passengers move between a point in an airport terminal building and an aircraft. Included in this category are walkways essentially fixed and permanently placed, or walkways that are essentially mobile in nature and that fold, telescope, or pivot from a fixed point at the airport terminal building.

Clause 6.1.1 – Each aircraft loading walkway installation shall be designed to provide a safe means of egress from the aircraft for a period of 5 minutes under exposure conditions equivalent to a free-burning jet fuel spill fire.

Explanatory Clause A.6.1.1 – The loading walkway(s) provide the principal means of egress while an aircraft is at the terminal. The normal aircraft escape systems (escape slides) are routinely disabled when the aircraft is at the terminal building; additionally, the doors are often blocked by servicing equipment.

Clause 6.1.2 - Protection of the aircraft loading walkway shall be accompanied by one of the following methods:

(1) Construction design meeting the requirements of Sections 6.1 through 6.4
(2) Fixed fire protection meeting the requirements of Sections 6.1, 6.2 and 6.5

Clause 6.2.4 - During a ramp fire emergency, walkway interiors shall have a positive pressure delivered from a source that shall remain uncontaminated.

Explanatory Clause A.6.2.4 – The source of uncontaminated air is normally from the airport terminal building.

Clause 6.2.5 – Any source of negative air pressure in the aircraft loading walkway shall be automatically shut down in the event of a fire emergency.

Explanatory Clause A.6.2.5 – Aircraft loading walkways can be used for a return air plenum as part of a system that provides ventilation for the aircraft. This system can create a positive or negative pressure in the walkway during normal operation and might use air from make-up. Systems of this type, as well as any exhaust fans on the walkway, are therefore to be automatically shut down in the event of fire emergency outlined in 6.1.1.

Clause 6.2.7 - Where loading walkways are provided, the walkway, including the bumpers, curtains, and canopies, shall be seated according to the manufacturer's instruction and training whenever the walkway is in service.

Explanatory Clause A.6.2.7- Bumpers, curtains, and canopies are essential elements necessary to ensure the fire performance of the walkway's system to provide a safe egress path in the event of a spill fire on the ramp. Many users view the canopies and curtains as weather protection devices and not essential fire safety devices. Because of the physical variations in airframe fuselage shapes, it is not possible to achieve 100 per cent contact of bumpers and canopies against all aircraft fuselages.

4. Design Principals

The Aircraft Loading Walkways – Literature and Information Review prepared by Hughes Associates for the Fire Protection Research Foundation dated 30 May 2014 primarily investigated the issues regarding fire safety in aircraft loading walkways manufactured of glass. The report also identified key fire safety criteria that applied to all aircraft loading walkways. The report stated the following in relation to the aircraft loading walkways and their pressurisation:

- The primary fire safety goal of aircraft walkways is to provide safe egress for passengers and crew members;
- NFPA 415 requires the loading walkway to provide a safe path of egress for five minutes of fire exposure for passengers and crew members;
- Smoke within the loading walkway is another concern for life safety. In the event of a fire emergency, the loading walkway should be designed to prevent smoke infiltration. This could be achieved by maintaining the walkway interior at a positive pressure. In the event that a fire was to penetrate the structure and involve the interior of the walkway, other practices must be put in place to reduce the impact to the passengers trying to reach safety.

5. Discussion

NFPA 415 includes a performance requirement under Clause 6.1.1 that an aircraft loading walkway must provide a safe means of egress from the aircraft for a period of 5 minutes under exposure conditions equivalent to a free-burning jet fuel spill fire. To assist in the provision of safe egress the walkway interiors must have a positive pressure delivered from an uncontaminated source. NFPA 415 does not specify the pressure differential that must be provided in an aircraft loading walkway other than there being a positive pressure.

If an aircraft loading walkway is required to provide a safe means of egress for 5 minutes, then it could be expected that the pressurisation system would either prevent the infiltration of smoke for that period, or alternatively, limit the entry of smoke so that tenable conditions were maintained in the aircraft loading walkway for the 5 minute period to allow evacuation of an aircraft. The main criteria for tenability inside an aircraft loading walkway with a ramp level fuel fire would be smoke layer height, visibility, and carbon monoxide levels. Other tenability criteria such as air temperature, radiant heat from the hot layer, and hydrogen cyanide levels in smoke are unlikely to be relevant for this fire scenario.

Whilst it is appropriate to require a positive pressure differential in the aircraft loading walkway, the question is what level of pressure differential is appropriate. A pressure differential of 20 to 25Pa is regularly used as the fire safety criteria for zone pressurisation and lift pressurisation systems in multi-storey buildings to restrict the spread of smoke throughout the building. Whilst adoption of a minimum pressure differential of 20 or 25Pa between the inside and outside of an aircraft loading walkway would restrict entry of smoke to allow safe egress, satisfying this standard may not be easily achieved due to leakage along the walkway. This issue is discussed in more detail below.

Testing was recently carried out at Sydney Airport on an aircraft loading walkway comprising a fixed walkway with two mobile aircraft loading walkways that was pressurised by three dedicated fans that each supplied $5m^3$/sec into the fixed link. The tests identified that the pressure differential between the inside and outside of the aircraft loading walkway with the pressurisation fans on was 4Pa, whilst airflow from inside the mobile aircraft loading walkway at the point of contact to the aircraft varied between 0.25m/ sec and 0.05m/ sec for the alternate walkways.

As stated previously an aircraft loading walkway may be fixed or mobile, or a combination of both. Based on limited research that I have completed it would seem to indicate that mobile aircraft loading walkways without a fixed link are more common in the United States, whilst a combination of a fixed and mobile aircraft loading walkway is more common in Australia. A fixed aircraft loading walkway has construction that can be readily sealed to restrict the entry of smoke. By contrast, a mobile aircraft loading walkway has gaps to facilitate three dimensional movements to allow connection with different aircraft. The gaps or openings may occur at the telescopic joints in the mobile aircraft loading walkway; or at the points of connection between the mobile aircraft loading walkway and aircraft, terminal building, or fixed part of an aircraft loading walkway. These joints normally allow leakage of air and hinder pressurisation of a mobile aircraft loading walkway. Although the three dimensional movement makes it difficult to seal an aircraft loading walkway, the inclusion of additional requirements in NFPA 415 to require the effective sealing of the joints and the fixed link/ terminal connection points in a mobile aircraft loading walkway would facilitate the positive pressurisation of the walkway. Further advice would be required from manufacturers of mobile aircraft loading walkways to identify appropriate materials that would be adequately flexible to allow for the movement in the walkway; durable to withstand the effects of weather and compression; and resistant to hot smoke temperatures of up to 200^0C. It is considered that there should be compression type seals that are available and suitable for this purpose.

Appendix A to Clause 6.2.7 recognises that the bumpers, curtains, and canopies are essential elements in the fire performance of the walkway system. The standard also states that it is not possible to achieve 100 per cent contact of bumpers and canopies against all aircraft fuselages, and therefore these gaps cannot be fully sealed. These gaps limit the ability to pressurise the aircraft

loading walkway and may therefore allow smoke migration at the point at which evacuating passengers are disembarking the aircraft. It is considered that if all other joints in a fixed or mobile aircraft loading walkway could be effectively sealed, then it should be expected that there would be sufficient leakage of air at the connection between the mobile aircraft loading walkway and aircraft to restrict the entry of smoke into the walkway. It should be recognised that weather conditions, in particular winds, may impact on the pressurisation of an aircraft loading walkway and should be considered during compliance testing.

So that the air supplying the pressurisation system is uncontaminated, the standard recommends that air be drawn from the terminal building. Based on the dimensions of an aircraft loading walkway and noted problems with leakage it is considered that centrifugal type fans are be best suited to create higher pressure airflow. For aircraft loading walkways that comprise both fixed and mobile elements, it may be necessary to provide separate fans at the connection between the terminal and fixed aircraft loading walkway, and between the fixed aircraft loading walkway and mobile aircraft loading walkway to facilitate the pressurisation for the full length of the walkway. It would not be necessary to make this a mandatory requirement, but rather an explanatory clause.

6. Current Application of Standard

Advice from aircraft loading walkway manufacturers in Australia has identified that there are variations in the interpretation regarding the compliance requirements with NFPA 415 for pressurisation of an aircraft loading walkway. The different interpretations include:

1. The terminal has a positive pressure relative to both the outside of the building and the aircraft loading walkway after equipment that may blow contaminated air into the walkway is shut down. As the doors between the terminal and aircraft loading walkway are open during boarding/ disembarking operations, mechanical ventilation from the terminal is supplied into the aircraft loading walkway. It would appear that this interpretation may be the most common measure used for compliance with the standard;
2. Outside air to the terminal is ramped up to 100% capacity in the event of a ramp level fuel fire and air from the terminal is allowed to pressurise the aircraft loading walkway;
3. Supply air fans are installed purely for the purpose of the pressurisation of the loading walkway and provide air from an uncontaminated source. In some cases where there are fixed and mobile elements of the these fans also direct air directly over the opening between the fixed link and aerobridge to provide an increased air supply into the aerobridge to overcome the issue of leakage through the openings in the aerobridge.

Whilst it must be acknowledged that the design team involving architect, fire engineer and mechanical engineer will use different approaches to achieve compliance, it is clear that uncertainty regarding compliance with NFPA 415 is the primary cause of the differences.

Also there are significant differences in the mechanisms that are used to activate the pressurisation system. The different mechanisms that are known to be used include smoke detection within the aircraft loading walkway; flow switch to a sprinkler system installed to the underside of the aircraft loading walkway; flow switch to wall wetting sprinklers protecting the aircraft loading walkway or terminal adjacent to the aircraft loading walkway; activation of a fuel stop device by aircraft re-fuellers; ramp/ apron level break glass alarm; aerobridge console break glass alarm; fixed link break glass alarm; detection of negative pressure within the aircraft loading walkway; smoke detected within any air handling unit or pre-conditioned air unit that supplies air to the loading walkway.

It is considered that detection inside the aircraft loading walkway is not an appropriate mechanism for activation of the pressurisation system as the system should operate before smoke enters the aircraft loading walkway. In fact it is considered that the pressurisation system should shut down if smoke is detected within the aircraft loading walkway after previous activation of the pressurisation system.

As a fuel spill is likely to occur during re-fuelling operations, the activation of a fuel stop device or ramp/ apron level break glass alarm by aircraft re-fuellers or other airport staff is likely to ensure the quickest activation time for the pressurisation system. Activation using the following additional measures is also considered appropriate - flow switch to a sprinkler system installed to the underside of the aircraft loading walkway; flow switch to wall wetting sprinklers protecting the aircraft loading walkway or terminal adjacent to the aircraft loading walkway; aerobridge console break glass alarm; fixed link break glass alarm; smoke detected within any air handling unit or pre-conditioned air unit that supplies air to the loading walkway.

Recommendation

Further to the discussion above it is recommended that NFPA 415 be reviewed and the requirements of Clauses 6.2.4 & 6.2.5 amended. Importantly, there should be consistency between the primary objective to provide a safe means of egress from the aircraft for a period of 5 minutes under exposure conditions equivalent to a free-burning jet fuel spill fire, and the mandatory measures to satisfy this performance requirement. Tests may need to be carried out to determine the appropriate mandatory active and passive design criteria that should be specified in the standard for an aircraft loading walkway to satisfy the performance requirement. The tests would need to accommodate the different configurations of aircraft loading walkways that may be expected based on whether they are fixed or mobile, and how many levels of a terminal they connect with. The standard could then be amended based on the results of the fire tests.

Furthermore, it is considered that NFPA 415 should be amended to include definitive requirements re the following:

1. Confirm whether the aircraft loading walkway pressurisation system should be designed to prevent smoke infiltration for a period of five minutes after detection of fire to allow a safe means of egress from the aircraft by passengers and crew members? If so, clarification should be given regarding the pressure differential that should be provided between the inside and outside of the aircraft loading walkway to restrict the entry of smoke. The standard should also nominate how and where the pressure differential should be measured. This should include test procedures based on the following variables and factors:

    a. aircraft loading arrangement i.e. a mobile aircraft loading walkway only or a combination of both fixed and mobile aircraft loading walkways; the aircraft loading walkways connects a single terminal concourse, or separate Arrivals Level and Departures Levels terminal concourses;

    b. which doors should be opened during any testing;

    c. whether the aerobridge should be fully extended during testing;

    d. whether all aircraft loading walkway connections with the aircraft should be tested for compliance;

    e. status of terminal mechanical system during testing;

f. any allowances for wind or other climatic conditions.

2. Standards for effective sealing of joints in an aircraft loading walkway to limit leakage and enable effective pressurisation of the aircraft loading walkway for a period of 5 minutes;

3. Mechanisms to activate the pressurisation system.

The inclusion of additional deemed-to-satisfy provisions in the standard would not limit the ability of a designer to utilise a performance based solution using fire engineering, except where prohibited by the regulating authority.

The report is submitted for consideration of the committee.

Trevor Dartnell

Trevor.Dartnell@philipchun.com

+61 423 609 082

20 June 2018

Public Input No. 6-NFPA 415-2018 [New Section after A.6.2.4]

Explanatory Clause Mechanisms to Activate an Aircraft Loading Walkway Pressurisation System

The pressurisation system to an aircraft loading walkway should be activated by the following mechanisms, as appropriate - smoke detection within the aircraft loading walkway; flow switch to a sprinkler system installed to the underside of the aircraft loading walkway; flow switch to wall wetting sprinklers protecting the aircraft loading walkway or terminal adjacent to the aircraft loading walkway; activation of a fuel stop device to the hydrant refueling system by aircraft re-fuellers; ramp/ apron level break glass alarm; aerobridge console break glass alarm; fixed link break glass alarm; detection of negative pressure within the aircraft loading walkway; smoke detected within any air handling unit or pre-conditioned air unit that supplies air to the loading walkway.

Additional Proposed Changes

File Name	Description	Approved
NFPA_415_Committee_Submission.pdf	Mechanisms for Activation of Aircraft Loading Walkway Pressurisation Systems	

Statement of Problem and Substantiation for Public Input

NFPA 415 does not clarify how a pressurisation system should be activated. It is considered necessary to provide an explanation as to how it should be activated.

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 4-NFPA 415-2018 [Section No. 6.2.4]	Input 6 is an explanation clause to Clause 6.2.4

Submitter Information Verification

Submitter Full Name: Trevor Dartnell

Organization: Philip Chun

Affiliation: Nil

Street Address:

City:

State:

Zip:

Submittal Date: Wed Jun 20 02:04:35 EDT 2018

Committee: AIS-AAA

Reference: Submission to the National Fire Protection Association Committee regarding NFPA 415 Standard on Airport Terminal Buildings, Fuelling Ramp Drainage, and Loading Walkways

1. Purpose

The purpose of this submission is to request that the National Fire Protection Association Committee review the current requirements of NFPA 415 in relation to the role of aircraft loading walkways in the provision of safe egress from an aircraft in the event of a jet fuel spill fire. In particular, this submission will consider whether there is consistency between the compliance requirements of the standard in relation to the pressurisation of aircraft loading walkways.

2. Background

During my employment as an Airport Building Controller at Sydney Airport, Australia over the past 15 years I have adopted the provisions of NFPA 415 as the primary compliance standard for the design of fuelling ramp drainage and loading walkways. For information I am employed by Philip Chun & Associates Pty Ltd who are contracted to act on behalf of the Federal Government of Australia to issue building approvals at Sydney Airport.

Currently I am working with the lessee of the airport (i.e. Sydney Airport Corporation Limited) to develop standards to meet the requirements of NFPA 415 for the pressurisation of aircraft loading walkways.

3. NFPA 415 Requirements

It is considered that the main clauses of NFPA 415 that are relevant to the issue of safe egress via aircraft loading walkways are as follows:

Clause 1.2.2 – The purpose of this standard is also to specify minimum criteria for fire protection of aircraft loading walkways that can serve as egress routes from aircraft in the event that a fire caused by a flammable liquid spill on the airport ramp exposes the walkway and the aircraft.

Clause 3.3.2 Aircraft Loading Walkway – is defined as an aboveground device through which passengers move between a point in an airport terminal building and an aircraft. Included in this category are walkways essentially fixed and permanently placed, or walkways that are essentially mobile in nature and that fold, telescope, or pivot from a fixed point at the airport terminal building.

Clause 6.1.1 – Each aircraft loading walkway installation shall be designed to provide a safe means of egress from the aircraft for a period of 5 minutes under exposure conditions equivalent to a free-burning jet fuel spill fire.

Explanatory Clause A.6.1.1 – The loading walkway(s) provide the principal means of egress while an aircraft is at the terminal. The normal aircraft escape systems (escape slides) are routinely disabled when the aircraft is at the terminal building; additionally, the doors are often blocked by servicing equipment.

Clause 6.1.2 - Protection of the aircraft loading walkway shall be accompanied by one of the following methods:

(1) Construction design meeting the requirements of Sections 6.1 through 6.4
(2) Fixed fire protection meeting the requirements of Sections 6.1, 6.2 and 6.5

Clause 6.2.4 - During a ramp fire emergency, walkway interiors shall have a positive pressure delivered from a source that shall remain uncontaminated.

Explanatory Clause A.6.2.4 – The source of uncontaminated air is normally from the airport terminal building.

Clause 6.2.5 – Any source of negative air pressure in the aircraft loading walkway shall be automatically shut down in the event of a fire emergency.

Explanatory Clause A.6.2.5 – Aircraft loading walkways can be used for a return air plenum as part of a system that provides ventilation for the aircraft. This system can create a positive or negative pressure in the walkway during normal operation and might use air from make-up. Systems of this type, as well as any exhaust fans on the walkway, are therefore to be automatically shut down in the event of fire emergency outlined in 6.1.1.

Clause 6.2.7 - Where loading walkways are provided, the walkway, including the bumpers, curtains, and canopies, shall be seated according to the manufacturer's instruction and training whenever the walkway is in service.

Explanatory Clause A.6.2.7- Bumpers, curtains, and canopies are essential elements necessary to ensure the fire performance of the walkway's system to provide a safe egress path in the event of a spill fire on the ramp. Many users view the canopies and curtains as weather protection devices and not essential fire safety devices. Because of the physical variations in airframe fuselage shapes, it is not possible to achieve 100 per cent contact of bumpers and canopies against all aircraft fuselages.

4. Design Principals

The Aircraft Loading Walkways – Literature and Information Review prepared by Hughes Associates for the Fire Protection Research Foundation dated 30 May 2014 primarily investigated the issues regarding fire safety in aircraft loading walkways manufactured of glass. The report also identified key fire safety criteria that applied to all aircraft loading walkways. The report stated the following in relation to the aircraft loading walkways and their pressurisation:

- The primary fire safety goal of aircraft walkways is to provide safe egress for passengers and crew members;
- NFPA 415 requires the loading walkway to provide a safe path of egress for five minutes of fire exposure for passengers and crew members;
- Smoke within the loading walkway is another concern for life safety. In the event of a fire emergency, the loading walkway should be designed to prevent smoke infiltration. This could be achieved by maintaining the walkway interior at a positive pressure. In the event that a fire was to penetrate the structure and involve the interior of the walkway, other practices must be put in place to reduce the impact to the passengers trying to reach safety.

5. Discussion

NFPA 415 includes a performance requirement under Clause 6.1.1 that an aircraft loading walkway must provide a safe means of egress from the aircraft for a period of 5 minutes under exposure conditions equivalent to a free-burning jet fuel spill fire. To assist in the provision of safe egress the walkway interiors must have a positive pressure delivered from an uncontaminated source. NFPA 415 does not specify the pressure differential that must be provided in an aircraft loading walkway other than there being a positive pressure.

If an aircraft loading walkway is required to provide a safe means of egress for 5 minutes, then it could be expected that the pressurisation system would either prevent the infiltration of smoke for that period, or alternatively, limit the entry of smoke so that tenable conditions were maintained in the aircraft loading walkway for the 5 minute period to allow evacuation of an aircraft. The main criteria for tenability inside an aircraft loading walkway with a ramp level fuel fire would be smoke layer height, visibility, and carbon monoxide levels. Other tenability criteria such as air temperature, radiant heat from the hot layer, and hydrogen cyanide levels in smoke are unlikely to be relevant for this fire scenario.

Whilst it is appropriate to require a positive pressure differential in the aircraft loading walkway, the question is what level of pressure differential is appropriate. A pressure differential of 20 to 25Pa is regularly used as the fire safety criteria for zone pressurisation and lift pressurisation systems in multi-storey buildings to restrict the spread of smoke throughout the building. Whilst adoption of a minimum pressure differential of 20 or 25Pa between the inside and outside of an aircraft loading walkway would restrict entry of smoke to allow safe egress, satisfying this standard may not be easily achieved due to leakage along the walkway. This issue is discussed in more detail below.

Testing was recently carried out at Sydney Airport on an aircraft loading walkway comprising a fixed walkway with two mobile aircraft loading walkways that was pressurised by three dedicated fans that each supplied $5m^3$/sec into the fixed link. The tests identified that the pressure differential between the inside and outside of the aircraft loading walkway with the pressurisation fans on was 4Pa, whilst airflow from inside the mobile aircraft loading walkway at the point of contact to the aircraft varied between 0.25m/ sec and 0.05m/ sec for the alternate walkways.

As stated previously an aircraft loading walkway may be fixed or mobile, or a combination of both. Based on limited research that I have completed it would seem to indicate that mobile aircraft loading walkways without a fixed link are more common in the United States, whilst a combination of a fixed and mobile aircraft loading walkway is more common in Australia. A fixed aircraft loading walkway has construction that can be readily sealed to restrict the entry of smoke. By contrast, a mobile aircraft loading walkway has gaps to facilitate three dimensional movements to allow connection with different aircraft. The gaps or openings may occur at the telescopic joints in the mobile aircraft loading walkway; or at the points of connection between the mobile aircraft loading walkway and aircraft, terminal building, or fixed part of an aircraft loading walkway. These joints normally allow leakage of air and hinder pressurisation of a mobile aircraft loading walkway. Although the three dimensional movement makes it difficult to seal an aircraft loading walkway, the inclusion of additional requirements in NFPA 415 to require the effective sealing of the joints and the fixed link/ terminal connection points in a mobile aircraft loading walkway would facilitate the positive pressurisation of the walkway. Further advice would be required from manufacturers of mobile aircraft loading walkways to identify appropriate materials that would be adequately flexible to allow for the movement in the walkway; durable to withstand the effects of weather and compression; and resistant to hot smoke temperatures of up to 200^0C. It is considered that there should be compression type seals that are available and suitable for this purpose.

Appendix A to Clause 6.2.7 recognises that the bumpers, curtains, and canopies are essential elements in the fire performance of the walkway system. The standard also states that it is not possible to achieve 100 per cent contact of bumpers and canopies against all aircraft fuselages, and therefore these gaps cannot be fully sealed. These gaps limit the ability to pressurise the aircraft

loading walkway and may therefore allow smoke migration at the point at which evacuating passengers are disembarking the aircraft. It is considered that if all other joints in a fixed or mobile aircraft loading walkway could be effectively sealed, then it should be expected that there would be sufficient leakage of air at the connection between the mobile aircraft loading walkway and aircraft to restrict the entry of smoke into the walkway. It should be recognised that weather conditions, in particular winds, may impact on the pressurisation of an aircraft loading walkway and should be considered during compliance testing.

So that the air supplying the pressurisation system is uncontaminated, the standard recommends that air be drawn from the terminal building. Based on the dimensions of an aircraft loading walkway and noted problems with leakage it is considered that centrifugal type fans are be best suited to create higher pressure airflow. For aircraft loading walkways that comprise both fixed and mobile elements, it may be necessary to provide separate fans at the connection between the terminal and fixed aircraft loading walkway, and between the fixed aircraft loading walkway and mobile aircraft loading walkway to facilitate the pressurisation for the full length of the walkway. It would not be necessary to make this a mandatory requirement, but rather an explanatory clause.

6. Current Application of Standard

Advice from aircraft loading walkway manufacturers in Australia has identified that there are variations in the interpretation regarding the compliance requirements with NFPA 415 for pressurisation of an aircraft loading walkway. The different interpretations include:

1. The terminal has a positive pressure relative to both the outside of the building and the aircraft loading walkway after equipment that may blow contaminated air into the walkway is shut down. As the doors between the terminal and aircraft loading walkway are open during boarding/ disembarking operations, mechanical ventilation from the terminal is supplied into the aircraft loading walkway. It would appear that this interpretation may be the most common measure used for compliance with the standard;
2. Outside air to the terminal is ramped up to 100% capacity in the event of a ramp level fuel fire and air from the terminal is allowed to pressurise the aircraft loading walkway;
3. Supply air fans are installed purely for the purpose of the pressurisation of the loading walkway and provide air from an uncontaminated source. In some cases where there are fixed and mobile elements of the these fans also direct air directly over the opening between the fixed link and aerobridge to provide an increased air supply into the aerobridge to overcome the issue of leakage through the openings in the aerobridge.

Whilst it must be acknowledged that the design team involving architect, fire engineer and mechanical engineer will use different approaches to achieve compliance, it is clear that uncertainty regarding compliance with NFPA 415 is the primary cause of the differences.

Also there are significant differences in the mechanisms that are used to activate the pressurisation system. The different mechanisms that are known to be used include smoke detection within the aircraft loading walkway; flow switch to a sprinkler system installed to the underside of the aircraft loading walkway; flow switch to wall wetting sprinklers protecting the aircraft loading walkway or terminal adjacent to the aircraft loading walkway; activation of a fuel stop device by aircraft re-fuellers; ramp/ apron level break glass alarm; aerobridge console break glass alarm; fixed link break glass alarm; detection of negative pressure within the aircraft loading walkway; smoke detected within any air handling unit or pre-conditioned air unit that supplies air to the loading walkway.

It is considered that detection inside the aircraft loading walkway is not an appropriate mechanism for activation of the pressurisation system as the system should operate before smoke enters the aircraft loading walkway. In fact it is considered that the pressurisation system should shut down if smoke is detected within the aircraft loading walkway after previous activation of the pressurisation system.

As a fuel spill is likely to occur during re-fuelling operations, the activation of a fuel stop device or ramp/ apron level break glass alarm by aircraft re-fuellers or other airport staff is likely to ensure the quickest activation time for the pressurisation system. Activation using the following additional measures is also considered appropriate - flow switch to a sprinkler system installed to the underside of the aircraft loading walkway; flow switch to wall wetting sprinklers protecting the aircraft loading walkway or terminal adjacent to the aircraft loading walkway; aerobridge console break glass alarm; fixed link break glass alarm; smoke detected within any air handling unit or pre-conditioned air unit that supplies air to the loading walkway.

Recommendation

Further to the discussion above it is recommended that NFPA 415 be reviewed and the requirements of Clauses 6.2.4 & 6.2.5 amended. Importantly, there should be consistency between the primary objective to provide a safe means of egress from the aircraft for a period of 5 minutes under exposure conditions equivalent to a free-burning jet fuel spill fire, and the mandatory measures to satisfy this performance requirement. Tests may need to be carried out to determine the appropriate mandatory active and passive design criteria that should be specified in the standard for an aircraft loading walkway to satisfy the performance requirement. The tests would need to accommodate the different configurations of aircraft loading walkways that may be expected based on whether they are fixed or mobile, and how many levels of a terminal they connect with. The standard could then be amended based on the results of the fire tests.

Furthermore, it is considered that NFPA 415 should be amended to include definitive requirements re the following:

1. Confirm whether the aircraft loading walkway pressurisation system should be designed to prevent smoke infiltration for a period of five minutes after detection of fire to allow a safe means of egress from the aircraft by passengers and crew members? If so, clarification should be given regarding the pressure differential that should be provided between the inside and outside of the aircraft loading walkway to restrict the entry of smoke. The standard should also nominate how and where the pressure differential should be measured. This should include test procedures based on the following variables and factors:

    a. aircraft loading arrangement i.e. a mobile aircraft loading walkway only or a combination of both fixed and mobile aircraft loading walkways; the aircraft loading walkways connects a single terminal concourse, or separate Arrivals Level and Departures Levels terminal concourses;

    b. which doors should be opened during any testing;

    c. whether the aerobridge should be fully extended during testing;

    d. whether all aircraft loading walkway connections with the aircraft should be tested for compliance;

    e. status of terminal mechanical system during testing;

f. any allowances for wind or other climatic conditions.

2. Standards for effective sealing of joints in an aircraft loading walkway to limit leakage and enable effective pressurisation of the aircraft loading walkway for a period of 5 minutes;

3. Mechanisms to activate the pressurisation system.

The inclusion of additional deemed-to-satisfy provisions in the standard would not limit the ability of a designer to utilise a performance based solution using fire engineering, except where prohibited by the regulating authority.

The report is submitted for consideration of the committee.

Trevor Dartnell

Trevor.Dartnell@philipchun.com

+61 423 609 082

20 June 2018

Public Input No. 44-NFPA 409-2019 [Global Input]

A committee task group has been created to explore a restructuring of NFPA 409. The structure of NFPA 409 has historically included individual chapters dedicated to individual hangar groups (e.g., Chapter 6 for Group I hangar protection, Chapter 7 for Group II hangar protection, etc.). This has resulted in unnecessary redundancy and inconsistencies throughout the document, and also makes it difficult to use and apply. The task group began work in the fall of 2018 on restructuring the document for improved clarity. The task group will continue this effort in early 2019, with the intent of bringing a specific proposal to the entire committee at the first draft meeting. No technical changes are being made as part of this restructuring.

This public input is intended to simply inform the committee of this plan and get it on the first draft agenda for discussion.

Statement of Problem and Substantiation for Public Input

The restructuring would result in a clarified and more concise document. The specific proposed changes will be available for review at the first draft meeting.

Submitter Information Verification

Submitter Full Name:	Matthew Daelhousen
Organization:	FM Global
Street Address:	
City:	
State:	
Zip:	
Submittal Date:	Wed Jan 02 08:00:01 EST 2019
Committee:	AIS-AAA

Public Input No. 12-NFPA 409-2017 [New Section after 1.1.2]

1.1.3 This standard applies to hangars containing unfueled aircraft and aircraft fueled with either gasoline, aviation gasoline (AVGAS), desiel fuel, jet fuel A, jet fuel B and varients of these fuels. Liquid fuels whose properties vary more that 10% from the listed fuels, gaseous fuels and hypergolic fuels are not covered by this standard and the protection features of this standard would not be considered sufficnet to meet the scope in 1.1.1.

Statement of Problem and Substantiation for Public Input

Current research is examining exotic fuels for future aircraft with properties significantly different from the traditional aviation fuels including gasses like hydrogen. All current suppression systems for aircraft hangars are based on traditional fuels like AVGAS and JET-A (JET-A1, JP4, & JP-8). While it is not possible to state which fuels will be seen in future aircraft, it is important to state the limits around which the current protection features are based.

Submitter Information Verification

Submitter Full Name: Fred Walker
Organization: USAF
Street Address:
City:
State:
Zip:
Submittal Date: Wed Jul 26 23:18:12 EDT 2017
Committee: AIS-AAA

Public Input No. 46-NFPA 409-2019 [New Section after 2.3.2]

FM Publications

Approval Standard for Ignitable Liquid Drainage Floor Assemblies, Class Number 6090, May 2017

Statement of Problem and Substantiation for Public Input

This is a new FM Approval standard and covers liquid drainage floor assemblies which contain and evacuate spills of flammable and combustible liquids, leading to decreased spill pool size and reduced fire size in the event that the liquid is ignited.

For an example of this type of system, please view the video at the following link:
https://jwp.io/s/VcxpTmUb

If unavailable please view on the Safespill Systems website, scroll down to 5th video labeled "3D Kerosene Fire Test Comparison":
https://safespillsystems.com/spill-and-fire-tests/

Approval under this standard requires completion of a survivability test of 20 minutes duration, with a continuous flow of 40 gallons per minute of ignited heptane onto the surface of the flooring system. The system shown in the videos mentioned above has completed that test successfully and is approved under this FM Approval standard. During testing, the fire was controlled sufficiently to prevent opening of any automatic sprinkler heads, which were installed on a 30 foot ceiling at 10 foot spacing. Peak ceiling temperature (at 30 ft) was 126 F.

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 47-NFPA 409-2019 [New Section after 3.3.10]	Related Input provides additional information on the type of system covered by this standard

Submitter Information Verification

Submitter Full Name:	Kyle Giubbini
Organization:	Safespill Systems
Street Address:	
City:	
State:	
Zip:	
Submittal Date:	Thu Jan 03 11:18:01 EST 2019
Committee:	AIS-AAA

Public Input No. 42-NFPA 409-2018 [Section No. 3.3.3]

3.3.3* Aircraft Storage and ~~Servicing Area~~ Service Area .

That part of a hangar normally used for the storage and servicing of one or more aircraft, ~~not including any~~ bounded by exterior walls or 2 hour fire barriers. Any adjacent or contiguous areas or ~~structures, such~~ structures such as shops ~~, storage areas,~~ and offices shall be separated by one hour fire barriers .

Statement of Problem and Substantiation for Public Input

For Group I hangars with low level foam suppression per 6.1.1 (2) or (3): Confusion over the extent of the hangar fire area, 3.3.3, which also has an ambiguous definition, has been observed. If the intent is to include low level foam distribution over the entire aircraft storage and service area per 6.2.5.2, it should be clarified that the area must be bounded by 2 hour fire barrier walls, per 5.2 (or 8.2), or adjacent support areas separated by 1 hour rated walls.

Discharge rate for low level foam systems is over the entire aircraft storage and service area. (6.2.5.3.2 and 6.2.5.4.3)
Water supply capable of supplying all fire suppression systems designed to operate simultaneously (6.2.10) shall be provided.

Otherwise, it can be (and has been) interpreted that the fire area that the water supply must serve is a single hangar bay, even if there is no wall separating the bays. This is further obscured by the identification of zones, without description of how zoning affects system activation, or that there might be more than one zone in a single fire area.

Submitter Information Verification

Submitter Full Name: Liane Ozmun
Organization: Frankfurt Short Bruza
Street Address:
City:
State:
Zip:
Submittal Date: Fri Dec 21 16:23:06 EST 2018
Committee: AIS-AAA

Public Input No. 47-NFPA 409-2019 [New Section after 3.3.10]

Liquid Drainage Floor Assembly

A drainage system which allows liquids to flow into a sub-floor section where liquid is removed and contained before ignition can occur. In cases where the liquid is ignited, the system is designed to minimize the spill area and reduce the overall size of the fire until the flow of liquid is stopped, and/or firefighting measures are initiated.

Statement of Problem and Substantiation for Public Input

For an example of this type of system, please view the video at the following link:
https://jwp.io/s/VcxpTmUb

If unavailable please view on the Safespill Systems website, scroll down to 5th video labeled "3D Kerosene Fire Test Comparison":
https://safespillsystems.com/spill-and-fire-tests/

Liquid drainage floor assemblies provide adequate control of liquid spread and similar benefits to underground or enclosed drainage. In addition, liquid drainage floor assemblies are designed to be installed on top of existing substrate and can be configured to cover design areas of any size. Assemblies can be designed to cover entire hangar floors or just areas where hazards are present. Floor assemblies are available in heights as low as 2 inches and are installed with ramps which allow aircraft to be moved onto and off of the assembly. If existing trench drainage exists, floor assemblies can be designed to drain directly into trench drainage. Installation of floor assemblies in hazard areas between existing trench drainage reduces the amount of fuel involved in a fire and removes spilled liquids without exposing equipment and other materials to burning liquids.

An existing, and rigorously tested, system uses 2 inch high by 6 in wide floor panels, which can be designed to any length, to create a continuous floor assembly. This design allows systems to cover areas as small as landing gear pits and as large as an entire hangar. The system functions by allowing spilled liquid to drain through the top surface of the floor panels and into a sub-floor, acting similar to an enclosed drainage system. Liquid can then be removed to a containment tank on-site or to the existing drainage system.

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 46-NFPA 409-2019 [New Section after 2.3.2]	
Public Input No. 48-NFPA 409-2019 [Section No. A.5.4.2]	
Public Input No. 49-NFPA 409-2019 [Sections 5.11.2.1, 5.11.2.2, 5.11.2.3, 5.11.2.4]	
Public Input No. 50-NFPA 409-2019 [Section No. 5.11.2.6]	
Public Input No. 51-NFPA 409-2019 [Section No. 6.1.1]	
Public Input No. 52-NFPA 409-2019 [Section No. 7.1.1]	
Public Input No. 53-NFPA 409-2019 [Section No. 9.14.1]	
Public Input No. 54-NFPA 409-2019 [New Section after A.8.1.1]	

Submitter Information Verification

Submitter Full Name: Kyle Giubbini

Organization: Safespill Systems

Street Address:

City:

State:

Zip:

Submittal Date: Thu Jan 03 11:37:43 EST 2019

Committee: AIS-AAA

Public Input No. 5-NFPA 409-2016 [Section No. 3.3.15]

3.3.15 * Unfueled Aircraft.

An aircraft whose fuel system has had flammable or combustible liquid removed such that no tank, cell, or piping contains more than one-half of 1 percent of its volumetric capacity.

Proposed Changes Rationale as follows:

The national consensus standard for the protection of aircraft hangars is NFPA 409, *Standard on Aircraft Hangars.* NFPA 409/2016 includes the following definition:

3.3.15* Unfueled Aircraft. An aircraft whose fuel system has had flammable or combustible liquid removed such that no tank, cell, or piping contains more than one-half of 1 percent of its volumetric capacity.

The explanatory material in Annex A only states: ***A.3.3.15 Unfueled Aircraft.*** *It is not the intent to require individual components attached to each tank or cell to be individually drained to 0.5 percent or less of their volumetric capacity. Since the fuel piping does contain a significant quantity of fuel, the committee's intent is for this volume of fuel to be included as part of the tank or cell to which it is attached. This results in the same potential spill size without necessitating the burdensome task of draining the pipe.*

Furthermore, the new edition of **NFPA 409, 2016** did not bring forward the all-inclusive explanation of the with **Expert Commentary** in **NFPA 409/2011 AE** which states: *The intent of the definition of unfueled aircraft is to limit the amount of fuel that could be spilled from a single tank or cell rupture to a maximum of 110 gal (the equivalent to two 55-gal drums) of fuel. This maximum was selected to be in accordance with NFPA 30, which permits up to 120 gal of a Class II combustible liquid to be stored in a single control area protected by a sprinkler system. Basing their calculations on the Boeing 747, the largest aircraft being manufactured at that time, the Technical Committee determined that to achieve this maximum amount of fuel, the 747's fuel system would have to be drained to 0.5 percent of its volumetric capacity. Since spill fires — and not fires within the fuel tanks — are the primary hazard in hangars, the committee also intended that each tank or cell should be drained to limit the amount of fuel that could be spilled from a single rupture. However, the committee did not intend to require individual components attached to each tank or cell to be individually drained to 0.5 percent or less of their volumetric capacity. Since the fuel piping on a 747 does contain a significant quantity of fuel, the committee's intent was for this volume of fuel to be included as part of the tank or cell to which it is attached. This results in the same potential spill size without necessitating the burdensome task of draining the pipe.*

This critical details of the explanatory material has a great impact and influence when developing a risk analysis when planning new hangars or major modification to hanger fire suppression systems. Not all commercial, private, and military aircraft are designed to defuel and drain enough fuel to meet the definition of Unfueled. Many existing and future weapon platforms developed or being developed once defueled has residual fuel left in piping, pumps, cells, etc of only a few gallons i.e., as little as 5 gallons yet does not meet the definition of unfueled and is considered fully fueled and must be in hangars designed for fueled aircraft. The committee acknowledges that 120 gallons of a Class II combustible liquid can be protected by a conventional sprinkler system and is equally acceptable in an aircraft hangar. Disappointingly, the current edition of NFPA 409, does not provide this option for protection of aircraft after being defueled other than the requirements for fully fueled aircrafts even though the aircraft is left with insignificant amount of fuel remaining in piping, pumps, and cells.

The reference in **NFPA 409/2011 AE** to **NFPA 30** states that it *permits up to 120 gal of a Class II combustible liquid to be stored in a single control area protected by a sprinkler system* as part of the rationale for the existing definition. In addition to that, NFPA 30 also permits that quantity can be doubled if the area is protected with a conventional sprinkler system plus that figure can be doubled again if it's contained in approved container. If that is the case, and the aircraft is in a sprinkled building and the fuel cells/tanks are equivalent to an approved cabinet, the amount permitted of Class 1A Flammable liquid is 120 gallons and Class II Combustible liquid is 480 gallons. Additional, there is a very-low-probability that a number of fuel cells, piping, and/or pumps can be punctured in a single accident that would generate a significate potential fuel spill as mentioned in the **NFPA 409 2011 Annotated Edition Handbook** above.

The committee recognizes that when the quantity of fuel on-board the aircraft has reached a defined minimal level, the potential fire resulting from a fuel spill becomes manageable without the need for a supplemental foam fire suppression system or special fire-rated construction. That being said, recommend eliminating the percentage of fuel remaining and instead, provide an acceptable amount of fuel remaining, in gallons, and strictly emphasize the requirement to defuel to eliminate placing an aircraft in a hangar without defueling simply because it does not exceed the allowable maximum.

Recommend paragraph 3.3.15 *Unfueled Aircraft* be rewritten as follows:

~~An aircraft whose fuel system has had flammable or combustible liquid removed to the greatest extent possible without opening fuel tanks/cells or breaking the fuel lines such that no tank, cell, or piping contains more 120 gallons of its volumetric capacity and flammable vapors removed to prevent the accumulation of ignitable vapors to not more than 20 percent of the LFL.~~ **(09/29/2016 See Revision Below)**

OR

Simply remove the requirement for the protection of **UNFUELED** aircraft and refer back to the prior the 1990 edition of protecting aircraft that has been Drained and Purged and defined as: ***Drained and***

Purged Aircraft Fuel Tanks *. Those from which the flammable or combustible liquid has been drained and the flammable or combustible vapor atmosphere or any residue capable of producing flammable or combustible vapors has been removed, so that subsequent airing or ventilation will not result in the reinstatement of a flammable or combustible atmosphere within the tanks unless or until a flammable or combustible liquid is again introduced.*

In the interim, provide an amendment outside the scheduled revision cycle through the issuance of Tentative Interim Amendments (TIAs) or Errata at your earliest convenience that allows hangaring aircraft with insignificant amount of combustible fuel remaining in piping, pumps, and cells other than the requirements for fully fueled aircrafts.

REVISION TO THE ABOVE ADDED 29 Sep 2016 AS FOLLOWS:

Ref: NFPA 409 *Standard on Aircraft Hangars* 2016 Edition, para 3.3.15

I am purposing to add the following sentence to the end of the definition for UNFUELED AIRCRAFT as amended in Italics as follows:

3.3.15* Unfueled Aircraft. An aircraft whose fuel system has had flammable or combustible liquid removed such that no tank, cell, or piping contains more than one-half of 1 percent of its volumetric capacity *or when an aircraft fuel has been removed such that the maximum quantity of fuel remaining that could be spilled onto the hangar floor from any single tank, cell or piping does not exceed 100 gallons of combustible fuels or not to exceed 50 gallons of flammable fuels.*

Rationale : According to the NFPA 409AE/2011, the committee states – *" The intent of the definition of unfueled aircraft is to limit the amount of fuel that could be spilled from a single tank or cell rupture to a maximum of 110 gal (the equivalent to two 55-gal drums) of fuel. This maximum was selected to be in accordance with NFPA 30, which permits up to 120 gal of a Class II combustible liquid to be stored in a single control area protected by a sprinkler system…."* The purpose of the suggested addition to the current definition is to incorporate the 2011AE foundation associated with the *"amount of fuel that could be spilled"* not just the percentage as the basis but include the quantity of fuel in gallons to establish the type of hangar fire protection requirements without increasing the level of risk.

If acceptable, please provide an avenue for an immediate amendment outside the scheduled revision cycle maybe through the issuance of Tentative Interim Amendments (TIAs) or Errata that allows these aircraft to be in hangars protected IAW Chapter 12 so we can start applying the definition promptly?

Your support in this matter is appreciated. Feel free to the amounts of flammables and combustibles for consistency. Please provide feedbacks/status. Thanks for your support. -bk

E N D

Statement of Problem and Substantiation for Public Input

See rationale in proposed changes to para 3.3.15 Unfueled

Submitter Information Verification

Submitter Full Name:	Bill Kapella
Organization:	Lockheed-Martin Aeronautics Company Palmdale, CA
Street Address:	
City:	
State:	
Zip:	
Submittal Date:	Mon Jun 27 16:18:43 EDT 2016
Committee:	AIS-AAA

Public Input No. 2-NFPA 409-2016 [New Section after 5.6.1]

Exception

Additional protection of structural members (columns, beams, trusses, joists) above that established in the IBC for Type I or Type II construction is not required in a facility protected by an approved fire suppression system utilizing low expansion or high expansion foam.

Statement of Problem and Substantiation for Public Input

Utilize Air Force ETL 02-15 more.

Submitter Information Verification

Submitter Full Name: Blake Puckett

Organization: Premier Fire

Street Address:

City:

State:

Zip:

Submittal Date: Fri Jun 24 16:43:44 EDT 2016

Committee: AIS-AAA

Public Input No. 49-NFPA 409-2019 [Sections 5.11.2.1, 5.11.2.2, 5.11.2.3, 5.11.2.4]

Sections 5.11.2.1, 5.11.2.2, 5.11.2.3, 5.11.2.4

5.11.2.1

In aircraft storage and servicing areas of hangars, floor trench drainage or liquid drainage floor assemblies in accordance with 5.11.2.2 through 5.11.2.12 shall be provided.

5.11.2.2*

Floor trench drainage systems or liquid drainage floor assemblies shall be provided to restrict the spread of fuel in order to reduce the fire and explosion hazards from fuel spillage.

5.11.2.3

Trench drainage systems and liquid drainage floor assemblies shall be designed to reduce fire and explosion hazards within the systems to the maximum extent by the use of noncombustible underground piping and by routing trench drainage as directly as possible to a safe outside location. Such systems shall be designed with traps or be provided with ventilation to prevent vapor mixtures from forming within the underground trench drainage system.

5.11.2.4

Trench drainage systems and liquid drainage floor assemblies in aircraft storage or servicing areas shall be designed and constructed so that they have a capacity large enough to prevent buildup of flammable liquids and water over the drain inlet when all fire protection systems and hose streams are discharging at the design rate.

Statement of Problem and Substantiation for Public Input

Liquid drainage floor assemblies provide an alternative method of drainage within aircraft hangars.

For an example of this type of system, please view the video at the following link:
https://jwp.io/s/VcxpTmUb

If unavailable please view on the Safespill Systems website, scroll down to 5th video labeled "3D Kerosene Fire Test Comparison":
https://safespillsystems.com/spill-and-fire-tests/

Liquid drainage floor assemblies provide adequate control of liquid spread and similar benefits to underground or enclosed drainage. In addition, liquid drainage floor assemblies are designed to be installed on top of existing substrate and can be configured to cover design areas of any size. Assemblies can be designed to cover entire hangar floors or just areas where hazards are present. Floor assemblies are available in heights as low as 2 inches and are installed with ramps which allow aircraft to be moved onto and off of the assembly. If existing trench drainage exists, floor assemblies can be designed to drain directly into trench drainage. Installation of floor assemblies in hazard areas between existing trench drainage reduces the amount of fuel involved in a fire and removes spilled liquids without exposing equipment and other materials to burning liquids.

To provide clarification, the system shown in the video uses 2 inch high by 6 in wide floor panels, which can be designed to any length, to create a continuous floor assembly. This design allows systems to cover areas as small as landing gear pits and as large as an entire hangar. The system functions by allowing spilled liquid to drain through the top surface of the floor panels and into a sub-floor, acting similar to an enclosed drainage system. Liquid can then be removed to a containment tank on-site or to the existing drainage system.

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 47-NFPA 409-2019 [New Section after 3.3.10]	Detailed description of liquid drainage floor assembly
Public Input No. 50-NFPA 409-2019 [Section No. 5.11.2.6]	

Submitter Information Verification

Submitter Full Name:	Kyle Giubbini
Organization:	Safespill Systems
Street Address:	
City:	
State:	
Zip:	
Submittal Date:	Thu Jan 03 11:56:41 EST 2019
Committee:	AIS-AAA

Public Input No. 50-NFPA 409-2019 [Section No. 5.11.2.6]

5.11.2.6

Each trench drainage system or liquid drainage floor assembly shall be calculated separately, taking into consideration the maximum rated discharge based on the supply calculation method for the fire protection systems and hose lines.

Statement of Problem and Substantiation for Public Input

Liquid drainage floor assemblies should be included in section 5.11.2 as an alternative or complement to floor trench drainage systems. Supporting arguments provided in related inputs.

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 49-NFPA 409-2019 [Sections 5.11.2.1, 5.11.2.2, 5.11.2.3, 5.11.2.4]	Substantiation for inclusion of liquid drainage floor assemblies as an alternative or in association with floor trench drainage
Public Input No. 47-NFPA 409-2019 [New Section after 3.3.10]	Supporting evidence for the effectiveness of liquid drainage floor assemblies in drainage of flammable and combustible liquids

Submitter Information Verification

Submitter Full Name: Kyle Giubbini
Organization: Safespill Systems
Street Address:
City:
State:
Zip:
Submittal Date: Thu Jan 03 12:03:17 EST 2019
Committee: AIS-AAA

Public Input No. 51-NFPA 409-2019 [Section No. 6.1.1]

6.1.1

The protection of aircraft storage and servicing areas for Group I aircraft hangars shall be in accordance with any one of the following:

(1) A foam-water deluge system, as specified in 6.2.2. In addition, supplementary protection systems as specified in 6.2.3 shall be provided in hangars housing single aircraft having wing areas greater than 279 m^2 (3000 ft^2).

(2) A combination of automatic sprinkler protection in accordance with 6.2.4 and an automatic low-level low-expansion foam system in accordance with 6.2.5.

(3) A combination of automatic sprinkler protection in accordance with 6.2.4 and an automatic low-level high-expansion foam system in accordance with 6.2.5.

(4) A combination of automatic sprinkler protection in accordance with 6.2.4 and a liquid drainage floor assembly which has been approved by the authority having jurisdiction based on full-scale fire testing results.

Statement of Problem and Substantiation for Public Input

For an example of a liquid drainage floor assembly, please view the video at the following link: https://jwp.io/s/VcxpTmUb

If unavailable please view on the Safespill Systems website, scroll down to 5th video labeled "3D Kerosene Fire Test Comparison":
https://safespillsystems.com/spill-and-fire-tests/

Liquid drainage floor assemblies contain and evacuate spilled liquids. They also contain spills and any potential fires to only the area where the spill has occurred. By isolating the hazard and then removing the fuel source from a potential fire, large pool fires are prevented and potential property loss is greatly reduced. With this reduced risk, alternative fire protection methods (water-based automatic sprinklers, reduced densities, or more targeted protection methods) could be used to control and extinguish flammable and combustible liquid fires.

For reference, a required test for FM Approval Standard 6090, Ignitable Liquid Drainage Floor Assemblies, is a 20-minute duration survivability test with a 40 Gallon per minute ignited heptane flow onto the top surface of the liquid drainage floor assembly (over 800 gallons of fuel discharged). The only system which is currently approved under this standard reduced the fire size significantly enough to prevent the opening of any ceiling sprinklers above the design area. Sprinklers were installed on a 30 ft ceiling at 10 foot spacing. Peak ceiling height reached 126 °F.

Before implementing alternative protection methods, adequate testing should be completed to confirm that a worst-case scenario can be adequately controlled or extinguished with the proposed design.

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 47-NFPA 409-2019 [New Section after 3.3.10]	Detailed description of liquid drainage floor assembly
Public Input No. 52-NFPA 409-2019 [Section No. 7.1.1]	
Public Input No. 53-NFPA 409-2019 [Section No. 9.14.1]	

Submitter Information Verification

Submitter Full Name: Kyle Giubbini
Organization: Safespill Systems
Street Address:

City:	
State:	
Zip:	
Submittal Date:	Thu Jan 03 12:15:48 EST 2019
Committee:	AIS-AAA

Public Input No. 6-NFPA 409-2017 [New Section after 6.1.8]

6.1.9

Provide floor drainage in accordance to section 5.11.

Statement of Problem and Substantiation for Public Input

The IBC does not state how floor drainage systems should be sized but requires the Fire Protection Systems to be provided in accordance to NFPA 409. This has led some AHJs and Designers to believe they only need to follow chapter 6 and chapter 7 of NFPA 409 when referenced from the IBC. I believe the intent of NFPA 409 is to have a floor drainage system anytime there is a fire suppression system, but that becomes a gray area when referenced from IBC for Fire Protection. If the intent of NFPA 409 is to have adequate floor drainage system designed to handle the fire suppression flowrate, then by specifically requiring in chapter 6 and chapter 7 the need to follow section 5.11 for floor drainage fixes the issue when NFPA 409 is referenced for the fire protection systems components.

Submitter Information Verification

Submitter Full Name: Carl Thrasher
Organization:
Street Address:
City:
State:
Zip:
Submittal Date: Fri Apr 14 11:15:24 EDT 2017
Committee: AIS-AAA

Public Input No. 4-NFPA 409-2016 [Section No. 6.2.3.4.4]

6.2.3.4.4

The foam generators shall be located at the ceiling or on exterior walls ~~in such a way that only air from outside the aircraft storage and servicing area can be used for foam generation. Roof vents shall be located to avoid recirculation of combustion products into the air inlets of the foam generators.~~ .

Low-level high-expansion foam generators may be designed to use either outside or inside air. Air from inside the hazard can be employed successfully and requires no additional increase in foam discharge rates.

Statement of Problem and Substantiation for Public Input

Inside air should be fine in lieu of roof vents and louvers for hi-ex generators.

Submitter Information Verification

Submitter Full Name: Blake Puckett
Organization: Premier Fire
Street Address:
City:
State:
Zip:
Submittal Date: Fri Jun 24 16:53:57 EDT 2016
Committee: AIS-AAA

Public Input No. 21-NFPA 409-2018 [Section No. 6.2.3.4.5]

6.2.3.4.5 *

Foam generators shall be listed or approved and as defined in NFPA 11. Where blower type generators are used, they shall be powered by reliable ~~water-driven~~ hydraulic or electric driven motors.

Statement of Problem and Substantiation for Public Input

The current text limits the use of aspirating type generators as defined by NFPA 11.

Submitter Information Verification

Submitter Full Name: Martin Workman

Organization: The Viking Corporation

Street Address:

City:

State:

Zip:

Submittal Date: Thu Dec 13 12:07:10 EST 2018

Committee: AIS-AAA

Public Input No. 22-NFPA 409-2018 [Section No. 6.2.3.4.6]

6.2.3.4.6

Electric power reliability for electric blower type foam generators shall be in accordance with electric fire pump requirements of NFPA 20.

Statement of Problem and Substantiation for Public Input

The current text implies all generators are electric. The proposed text defines the requirement for that type of generator, not all generators.

Submitter Information Verification

Submitter Full Name: Martin Workman
Organization: The Viking Corporation
Street Address:
City:
State:
Zip:
Submittal Date: Thu Dec 13 12:19:18 EST 2018
Committee: AIS-AAA

Public Input No. 3-NFPA 409-2016 [Section No. 6.2.4.5 [Excluding any Sub-Sections]]

The design density of water from sprinkler systems shall be a minimum of 6.9 L/min/m^2 (0.~~17 gpm~~ 2 gpm /ft^2) over any 1394 m^2 (~~15~~ 5 ,000 ft^2) area, including the hydraulically most demanding area as defined in NFPA 13.

Statement of Problem and Substantiation for Public Input

Water availability and overkill. These systems are required to have a high expansion or low expansion system with them. No need for 15,000 sqft of design area. See DoD criteria.

Submitter Information Verification

Submitter Full Name: Blake Puckett
Organization: Premier Fire
Street Address:
City:
State:
Zip:
Submittal Date: Fri Jun 24 16:49:44 EDT 2016
Committee: AIS-AAA

Public Input No. 27-NFPA 409-2018 [Section No. 6.2.5.2 [Excluding any Sub-Sections]]

> The low-level high expansion foam system shall be designed to achieve distribution of foam over the entire aircraft storage and service area.

Statement of Problem and Substantiation for Public Input

Low level low expansion systems are actively zoned smaller than the entire hangar area. High expansion foam systems are dependent upon all generators in the area activating.

Submitter Information Verification

Submitter Full Name: Martin Workman

Organization: The Viking Corporation

Street Address:

City:

State:

Zip:

Submittal Date: Thu Dec 13 14:24:21 EST 2018

Committee: AIS-AAA

Public Input No. 28-NFPA 409-2018 [Section No. 6.2.5.2.1]

6.2.5.2.1

The design objective ~~shall~~ for low level high expansion foam systems shall be to achieve coverage of the entire aircraft storage and servicing area to within 1.5 m (5 ft) of the perimeter walls and doors within 3 minutes of system actuation when all foam discharge devices of the system are activated.

Statement of Problem and Substantiation for Public Input

See public input No. 27.

Submitter Information Verification

Submitter Full Name: Martin Workman
Organization: The Viking Corporation
Street Address:
City:
State:
Zip:
Submittal Date: Thu Dec 13 14:37:26 EST 2018
Committee: AIS-AAA

Public Input No. 29-NFPA 409-2018 [New Section after 6.2.5.2.2]

TITLE OF NEW CONTENT 6.2.5.2.2

Type your content here ... For low level low expansion foam systems, design for simultaneous operation of all systems within 100 ft. (30 m) radius horizontally from any point where a fire could start.

Statement of Problem and Substantiation for Public Input

Drainage requirements of Chapter 5 reduce the spread of flammable liquids and reduce the fire surface area

Submitter Information Verification

Submitter Full Name:	Martin Workman
Organization:	The Viking Corporation
Street Address:	
City:	
State:	
Zip:	
Submittal Date:	Thu Dec 13 14:40:38 EST 2018
Committee:	AIS-AAA

Public Input No. 30-NFPA 409-2018 [Section No. 6.2.5.2.2]

6.2.5.2. ~~2~~ 3

Low-level foam systems shall be permitted to be divided into zones that are associated with sprinkler system or fire detection zones.

Statement of Problem and Substantiation for Public Input

renumbering after insertion of new 6.2.5.2.2

Submitter Information Verification

Submitter Full Name: Martin Workman
Organization: The Viking Corporation
Street Address:
City:
State:
Zip:
Submittal Date: Thu Dec 13 15:47:47 EST 2018
Committee: AIS-AAA

Public Input No. 23-NFPA 409-2018 [Section No. 6.2.5.4.6]

6.2.5.4.6 *

Foam generators shall be ~~powered by reliable water-driven or electric~~ listed or approved and as defined in NFPA 11. Where blower type generators are used they shall be powered by reliable hydraulic or electrically driven motors. Electric power reliability for electric blower type foam generators shall be consistent with electric fire pump requirements specified in ~~Chapters 6 and 7 of~~ NFPA 20.

Statement of Problem and Substantiation for Public Input

Change in text allows for all generator types defined in NFPA 11. Deleting the chapter references in NFPA 20 conforms to the style requirement of NFPA.

Submitter Information Verification

Submitter Full Name: Martin Workman

Organization: The Viking Corporation

Street Address:

City:

State:

Zip:

Submittal Date: Thu Dec 13 12:24:26 EST 2018

Committee: AIS-AAA

Public Input No. 36-NFPA 409-2018 [Section No. 6.2.8.1.4]

6.2.8.1.4

Listed detection systems shall be ~~acceptable in lieu of heat detection if approved by~~ <u>accepted by</u> the authority having jurisdiction and installed in accordance with *NFPA 72*.

Statement of Problem and Substantiation for Public Input

OSHA (29CFR 1910) legislation requires Listed detection systems for all applications, regardless of specific initiating devices. The existing text is leading the designer into selection of heat detectors as the first option.

Submitter Information Verification

Submitter Full Name: Jon Miller

Organization: Detector Electronics Corp

Street Address:

City:

State:

Zip:

Submittal Date: Tue Dec 18 21:52:17 EST 2018

Committee: AIS-AAA

Public Input No. 37-NFPA 409-2018 [Section No. 6.2.8.2.1]

6.2.8.2.1

Detectors for actuating the deluge foam-water sprinkler systems shall be Listed flame detectors and/or heat detectors of the rate-of-rise, fixed-temperature, or rate-compensation types for selection and installation in accordance with NFPA 72 .

Statement of Problem and Substantiation for Public Input

The designer should not be limited to selecting only a single heat detector type as the initiating device (see NFPA 409, Section 1.4.1). In addition, the FM Global Property Loss Prevention Data Sheet 7-93: April 2017, Section 2.4.2 permits other Listed initiating devices besides heat detectors as best practices for protection of hangars using high- or low-expansion foam systems.

Submitter Information Verification

Submitter Full Name: Jon Miller
Organization: Detector Electronics Corp
Street Address:
City:
State:
Zip:
Submittal Date: Tue Dec 18 22:05:28 EST 2018
Committee: AIS-AAA

Public Input No. 38-NFPA 409-2018 [Section No. 6.2.8.4]

6.2.8.4 Closed-Head Water Sprinkler Systems.

Where preaction sprinkler systems are provided, detectors for actuating the systems shall be Listed flame detectors and/or heat detectors of the rate-of-rise, fixed-temperature, or rate-compensation ~~type~~ types for selection and installation in accordance with NFPA 72 .

Statement of Problem and Substantiation for Public Input

The designer should not be limited to selecting only a single heat detector type as the initiating device (see NFPA 409, Section 1.4.1). In addition, the FM Global Property Loss Prevention Data Sheet 7-93: April 2017, Section 2.4.2 permits other Listed initiating devices besides heat detectors as best practices for protection of hangars using preaction sprinkler systems.

Submitter Information Verification

Submitter Full Name: Jon Miller
Organization: Detector Electronics Corp
Street Address:
City:
State:
Zip:
Submittal Date: Tue Dec 18 22:14:20 EST 2018
Committee: AIS-AAA

Public Input No. 1-NFPA 409-2016 [Section No. 6.2.9]

~~6.2.9 * - – Hand Hose Systems.~~

~~6.2.9.1 –~~

~~Hand hose systems shall be installed in every hangar to provide for manual fire control.~~

~~6.2.9.2 –~~

~~The hand hose systems shall be arranged to permit application of water or other extinguishing agents on each side and into the interior of the aircraft located in each aircraft storage and servicing area. At least two hose lines shall be designed to be operated simultaneously.~~

~~6.2.9.3 – Foam-Water Hand Hose Systems.~~

~~6.2.9.3.1 –~~

~~Foam-water hand hose systems shall be installed in aircraft storage and servicing areas.~~

~~6.2.9.3.2 –~~

~~The systems shall conform with the applicable portions of NFPA 14 and NFPA 11.~~

~~6.2.9.3.3 –~~

~~These hand hose systems shall be supplied from a connection to the sprinkler system header or from a direct connection to the water source.~~

~~6.2.9.3.4 –~~

~~Each hand hose connection shall be a minimum of 38 mm (1 - 1⁄2 - in.) in size and fitted with a control valve. The hose shall be of a diameter to provide a minimum flow of 227 L/min (60 gpm).~~

~~6.2.9.3.5 –~~

~~The hose shall be installed on an approved rack or reel. Hose shall be fitted with an approved foam-maker nozzle or a combination-type nozzle designed to permit foam application or water spray. Nozzles shall be of the shutoff type or shall have a shutoff valve at the nozzle inlet.~~

~~6.2.9.3.6 –~~

~~Foam–liquid concentrate shall be permitted to be supplied from a central distribution system, separate from or a part of a foam-water sprinkler system, or from stationary foam–liquid concentrate containers fitted with listed proportioning devices.~~

~~6.2.9.3.7 –~~

~~The minimum supply of foam–liquid concentrate shall be large enough to provide operation of at least two hand hose lines for a period of 20 minutes at a foam solution discharge rate of 227 L/min (60 gpm) each.~~

~~6.2.9.4 – Water Hand Hose Systems.~~

~~6.2.9.4.1 –~~

~~Water hand hose and standpipe systems shall be installed in accordance with NFPA 14 in all shop, office, and non-aircraft-storage areas in hangars, except where special hazards that require special protection exist.~~

~~6.2.9.4.2 –~~

~~Hoses shall be fitted with listed adjustable stream pattern nozzles designed to permit straight stream or water spray application.~~

Statement of Problem and Substantiation for Public Input

Hand hose stations are completely out of date and should not be required. No one is going to stand in the middle of a foam dump with a burning aircraft and try to fight the fire from inside the hangar, not even the fire department. Most hangars do not have personnel trained to even use such devices.

Submitter Information Verification

Submitter Full Name: Blake Puckett
Organization: Premier Fire Protection
Street Address:
City:
State:
Zip:
Submittal Date: Fri Jun 24 16:36:47 EDT 2016
Committee: AIS-AAA

Public Input No. 35-NFPA 409-2018 [Section No. 6.2.10.7.3]

6.2.10.7.3

~~No fewer than two fire pumps shall be provided.~~ The number of fire pumps shall be determined by calculated flow demand. As a minumum one additonal pump having the same rating as the primary pumps shall also be installed to provide system functionality when a primary pump is out of service for any reason..

Statement of Problem and Substantiation for Public Input

Hangar system is OOS when pumps/engines go OOS for maintenance and repair. This means aircraft have to be removed from the hangar while this occurs. Also, in the event of a pump failure during an actual event, the backup pump would take over for the failed primary pump.

Submitter Information Verification

Submitter Full Name: Stephen Listerman
Organization: Cincinnati/Northern Kentucky I
Street Address:
City:
State:
Zip:

Submittal Date: Fri Dec 14 13:28:32 EST 2018
Committee: AIS-AAA

Public Input No. 34-NFPA 409-2018 [New Section after 6.4]

TITLE OF NEW CONTENT

A fire alarm system shall be installed to allow audio/visual notification of system activations throughout the entire building. Manual fire alarm pull stations shall also be installed.

Statement of Problem and Substantiation for Public Input

International Building Code states an aircraft hangar is an S-1 construction. There is no requirement for a fire alarm system in the facility. While notification can be seen on the hangar floor when the hangar system activates, there is currently no mandated fire alarm notification system to the rest of the building. This means a hangar activation could occur and people outside of the hangar floor in offices or ancillary maintenance shops may not be aware there is a fire. There is also no manual way to notify the FD other than a system activation, thus the need for manual pull stations.

Additionally, with the high expansion foam option, delayed notification to tenants whose only exit is through the hangar floor could prevent them from seeing exits due to the height of the foam blanket trapping them inside the facility.

Submitter Information Verification

Submitter Full Name: Stephen Listerman
Organization: Cincinnati/Northern Kentucky I
Street Address:
City:
State:
Zip:
Submittal Date: Fri Dec 14 13:19:50 EST 2018
Committee: AIS-AAA

Public Input No. 52-NFPA 409-2019 [Section No. 7.1.1]

7.1.1

The protection of aircraft storage and servicing areas of Group II aircraft hangars shall be in accordance with any one of the following:

(1) The provisions of Chapter 6, unless foam-water deluge systems utilizing air-aspirating discharge devices are installed for the protection of Group II aircraft hangars, in which case the discharge rate specified in 6.2.2.12 of this standard is permitted to be reduced to a minimum of 6.5 L/min/m^2 (0.16 gpm/ft^2) of floor area

(2) A combination of automatic sprinkler protection in accordance with Section 7.2 and an automatic, low-level, low-expansion foam system in accordance with Sections 7.3 and 7.4

(3) A combination of automatic sprinkler protection in accordance with Section 7.2 and an automatic, high-expansion foam system in accordance with Sections 7.3 and 7.5

(4) A closed-head foam-water sprinkler system in accordance with Section 7.6

(5) A combination of automatic sprinkler protection in accordance with 7.2 and an ignitable liquid drainage flooring assembly which has been approved by the authority having jurisdiction based on adequate full-scale fire testing results.

Statement of Problem and Substantiation for Public Input

For an example of a liquid drainage floor assembly, please view the video at the following link: https://jwp.io/s/VcxpTmUb

If unavailable please view on the Safespill Systems website, scroll down to 5th video labeled "3D Kerosene Fire Test Comparison":
https://safespillsystems.com/spill-and-fire-tests/

Liquid drainage floor assemblies contain and evacuate spilled liquids. They also contain spills and any potential fires to only the area where the spill has occurred. By isolating the hazard and then removing the fuel source from a potential fire, large pool fires are prevented and potential property loss is greatly reduced. With this reduced risk, alternative fire protection methods (water-based automatic sprinklers, reduced densities, or more targeted protection methods) could be used to control and extinguish flammable and combustible liquid fires.

For reference, a required test for FM Approval Standard 6090, Ignitable Liquid Drainage Floor Assemblies, is a 20-minute duration survivability test with a 40 Gallon per minute ignited heptane flow onto the top surface of the liquid drainage floor assembly (over 800 gallons of fuel discharged). The only system which is currently approved under this standard reduced the fire size significantly enough to prevent the opening of any ceiling sprinklers above the design area. Sprinklers were installed on a 30 ft ceiling at 10 foot spacing. Peak ceiling height reached 126 °F.

Before implementing alternative protection methods, adequate testing should be completed to confirm that a worst-case scenario can be adequately controlled or extinguished with the proposed design.

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 47-NFPA 409-2019 [New Section after 3.3.10]	Detailed description of liquid drainage floor assemblies
Public Input No. 51-NFPA 409-2019 [Section No. 6.1.1]	Similar revision
Public Input No. 53-NFPA 409-2019 [Section No. 9.14.1]	

Submitter Information Verification

Submitter Full Name: Kyle Giubbini
Organization: Safespill Systems
Street Address:
City:
State:
Zip:
Submittal Date: Thu Jan 03 12:56:11 EST 2019
Committee: AIS-AAA

Public Input No. 7-NFPA 409-2017 [New Section after 7.1.7]

7.1.8
Provide floor drainage in accordance with section 5.11

Statement of Problem and Substantiation for Public Input

The IBC does not state how floor drainage systems should be sized but requires the Fire Protection Systems to be provided in accordance to NFPA 409. This has led some AHJs and Designers to believe they only need to follow chapter 6 and chapter 7 of NFPA 409 when referenced from the IBC. I believe the intent of NFPA 409 is to have a floor drainage system anytime there is a fire suppression system, but that becomes a gray area when referenced from IBC for Fire Protection. If the intent of NFPA 409 is to have adequate floor drainage system designed to handle the fire suppression flowrate, then by specifically requiring in chapter 6 and chapter 7 the need to follow section 5.11 for floor drainage fixes the issue when NFPA 409 is referenced for the fire protection systems components.

Submitter Information Verification

Submitter Full Name: Carl Thrasher
Organization:
Street Address:
City:
State:
Zip:
Submittal Date: Fri Apr 14 11:25:15 EDT 2017
Committee: AIS-AAA

Public Input No. 32-NFPA 409-2018 [Section No. 7.4.2]

7.4.2 *

~~The discharge rate of the system shall be based on the rate of application multiplied by the entire aircraft storage and servicing floor area.~~ For low expansion foam systems, design for simultaneous operation of all systems within 100 ft. (30 m) radius horizontally from any point where a fire could start.

Statement of Problem and Substantiation for Public Input

The design for the low level low expansion foam system in a Group II hangar should be the same as for a Group 1.

Submitter Information Verification

Submitter Full Name: Martin Workman
Organization: The Viking Corporation
Street Address:
City:
State:
Zip:
Submittal Date: Thu Dec 13 16:49:07 EST 2018
Committee: AIS-AAA

Public Input No. 31-NFPA 409-2018 [Section No. 7.5.3]

7.5.3

The discharge rate of the system shall be based on the application rate multiplied by the entire aircraft storage and servicing floor area. The application total discharge rate shall include the sprinkler breakdown factor specified in ~~6.12.8.2.3.2 of~~ NFPA 11.

Statement of Problem and Substantiation for Public Input

Removed specific section reference.

Submitter Information Verification

Submitter Full Name: Martin Workman
Organization: The Viking Corporation
Street Address:
City:
State:
Zip:
Submittal Date: Thu Dec 13 16:28:42 EST 2018
Committee: AIS-AAA

Public Input No. 24-NFPA 409-2018 [Section No. 7.5.5]

7.5.5

Foam generators shall be listed or approved and as defined by NFPA 11. Where blower type generators are used, they shall be powered by reliable water-driven or electric motors. Electric power reliability ~~for both foam~~ for electric blower type foam generators and foam concentrate pumps shall be consistent with electric fire pump requirements specified in ~~Chapters 6 and 7 of~~ NFPA 20.

Statement of Problem and Substantiation for Public Input

The addition of text allows for use of all generator types defined in NFPA 11. The deletion of chapter references for NFPA 20 fits the style format of NFPA.

Submitter Information Verification

Submitter Full Name: Martin Workman
Organization: The Viking Corporation
Street Address:
City:
State:
Zip:
Submittal Date: Thu Dec 13 12:35:45 EST 2018
Committee: AIS-AAA

Public Input No. 16-NFPA 409-2018 [Section No. 7.6.2.1]

7.6.2.1

The design area of the closed-head foam water sprinkler system shall not be required to be increased for ceiling slope.

Statement of Problem and Substantiation for Public Input

The use of the "closed-head water sprinkler system" term might imply that a Section 7.2 closed-head water sprinkler system must also be installed in addition to the Section 7.6 closed-head foam water sprinkler system. Including foam-water in the term should eliminate any possible confusion.

(Reference First Revision 47-NFPA 409-2013)

Submitter Information Verification

Submitter Full Name: Neal Hara
Organization: Battelle-Pacific Northwest National Laboratory
Street Address:
City:
State:
Zip:

Submittal Date: Mon Sep 24 18:33:12 EDT 2018
Committee: AIS-AAA

Public Input No. 17-NFPA 409-2018 [Section No. 7.6.2.2]

7.6.2.2

The design area of the closed-head foam water sprinkler system shall not be required to be increased for preaction systems.

Statement of Problem and Substantiation for Public Input

The use of the "closed-head water sprinkler system" term might imply that a Section 7.2 closed-head water sprinkler system must also be installed in addition to the Section 7.6 closed-head foam water sprinkler system. Including foam-water in the term should eliminate any possible confusion.

(Reference First Revision 47-NFPA 409-2013)

Submitter Information Verification

Submitter Full Name: Neal Hara

Organization: Battelle-Pacific Northwest National Laboratory

Street Address:

City:

State:

Zip:

Submittal Date: Mon Sep 24 18:40:01 EDT 2018

Committee: AIS-AAA

Public Input No. 39-NFPA 409-2018 [Section No. 7.7.1]

7.7.1

Detectors for actuating preaction sprinkler systems shall be Listed flame detectors and/or heat detectors of the rate-of-rise, fixed-temperature, or rate-compensation ~~type~~ types for selection and installation in accordance with NFPA 72 .

Statement of Problem and Substantiation for Public Input

The designer should not be limited to selecting only a single heat detector type as the initiating device (see NFPA 409, Section 1.4.1). In addition, the FM Global Property Loss Prevention Data Sheet 7-93: April 2017, Section 2.4.2 permits other Listed initiating devices besides heat detectors as best practices for protection of hangars using preaction sprinkler systems.

Submitter Information Verification

Submitter Full Name: Jon Miller

Organization: Detector Electronics Corp

Street Address:

City:

State:

Zip:

Submittal Date: Tue Dec 18 22:21:00 EST 2018

Committee: AIS-AAA

Public Input No. 40-NFPA 409-2018 [Section No. 7.7.2]

7.7.2

Detectors for actuating high- or low-expansion foam systems shall be <u>Listed flame detectors and/or heat detectors of the</u> rate-of-rise, fixed-temperature, or rate-compensation ~~type~~ <u>types for selection and installation in accordance with NFPA 72</u> or water flow of a wet pipe sprinkler system.

Statement of Problem and Substantiation for Public Input

The designer should not be limited to selecting only a single heat detector type as the initiating device (see NFPA 409, Section 1.4.1). In addition, the FM Global Property Loss Prevention Data Sheet 7-93: April 2017, Section 2.4.2 permits other Listed initiating devices besides heat detectors as best practices for protection of hangars using high- or low-expansion foam systems.

Submitter Information Verification

Submitter Full Name: Jon Miller

Organization: Detector Electronics Corp

Street Address:

City:

State:

Zip:

Submittal Date: Tue Dec 18 22:26:34 EST 2018

Committee: AIS-AAA

Public Input No. 14-NFPA 409-2018 [New Section after 7.8.8]

TITLE OF NEW CONTENT

Type your content here ...

7.9 Wheeled and Portable Extinguishers

7.9.1 Wheeled and portable extinguishers shall be provided in accordance with NFPA 10.

7.9.2 In aircraft storage and servicing areas, the distribution of such devices shall be in accordance with the extra hazard classification outlined in NFPA 10.

7.9.3 The distribution of extinguishers in other areas of aircraft hangars shall be in accordance with light, ordinary, or extra hazard occupancy based on analysis of each such room or area following the requirements of NFPA 10.

Statement of Problem and Substantiation for Public Input

The same requirements that appear in Chapter 6 for Group I hangars (6.3) and Chapter 9 for Group IV hangars (9.14.14) should be in Chapter 7 for Group II hangars.

Submitter Information Verification

Submitter Full Name:	Jennifer Boyle
Organization:	FEMA
Affiliation:	FEMA
Street Address:	
City:	
State:	
Zip:	
Submittal Date:	Wed May 30 16:15:12 EDT 2018
Committee:	AIS-AAA

Public Input No. 53-NFPA 409-2019 [Section No. 9.14.1]

9.14.1

The protection of aircraft storage and servicing areas for membrane-covered rigid-steel-frame-structure hangars having a hangar fire area greater than 1115 m^2 (12,000 ft^2) and housing fueled aircraft shall be in accordance with any of the following:

(1) A low-expansion foam system as specified in 9.14.7.4

(2) A high-expansion foam system as specified in 9.14.7.5

(3) A combination of automatic sprinkler protection that complies with Section 7.8 (water supply) and an ignitable liquid drainage flooring assembly which has been approved by the authority having jurisdiction based on adequate full-scale fire testing results.

Statement of Problem and Substantiation for Public Input

For an example of a liquid drainage floor assembly, please view the video at the following link:
https://jwp.io/s/VcxpTmUb

If unavailable please view on the Safespill Systems website, scroll down to 5th video labeled "3D Kerosene Fire Test Comparison":
https://safespillsystems.com/spill-and-fire-tests/

Liquid drainage floor assemblies contain and evacuate spilled liquids. They also contain spills and any potential fires to only the area where the spill has occurred. By isolating the hazard and then removing the fuel source from a potential fire, large pool fires are prevented and potential property loss is greatly reduced. With this reduced risk, alternative fire protection methods (water-based automatic sprinklers, reduced densities, or more targeted protection methods) could be used to control and extinguish flammable and combustible liquid fires.

For reference, a required test for FM Approval Standard 6090, Ignitable Liquid Drainage Floor Assemblies, is a 20-minute duration survivability test with a 40 Gallon per minute ignited heptane flow onto the top surface of the liquid drainage floor assembly (over 800 gallons of fuel discharged). The only system which is currently approved under this standard reduced the fire size significantly enough to prevent the opening of any ceiling sprinklers above the design area. Sprinklers were installed on a 30 ft ceiling at 10 foot spacing. Peak ceiling height reached 126 °F.

Before implementing alternative protection methods, adequate testing should be completed to confirm that a worst-case scenario can be adequately controlled or extinguished with the proposed design.

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 47-NFPA 409-2019 [New Section after 3.3.10]	Detailed description of liquid drainage floor assemblies
Public Input No. 51-NFPA 409-2019 [Section No. 6.1.1]	Similar revision
Public Input No. 52-NFPA 409-2019 [Section No. 7.1.1]	Similar revision

Submitter Information Verification

Submitter Full Name: Kyle Giubbini
Organization: Safespill Systems
Street Address:
City:
State:
Zip:

Submittal Date: Thu Jan 03 13:01:17 EST 2019

Committee: AIS-AAA

Public Input No. 33-NFPA 409-2018 [Section No. 9.14.7.1]

9.14.7.1

Hangars protected in accordance with 6.1.1(~~1~~ 2) or 6.1.1(~~2~~ 3) shall be protected with a listed low-level foam protection system.

Statement of Problem and Substantiation for Public Input

6.1.1(1) does not reference low level foam systems. 6.1.1(2) and 6.1.1(3) do reference low level foam systems.

Submitter Information Verification

Submitter Full Name: Martin Workman
Organization: The Viking Corporation
Street Address:
City:
State:
Zip:
Submittal Date: Thu Dec 13 17:08:12 EST 2018
Committee: AIS-AAA

Public Input No. 41-NFPA 409-2018 [Section No. 9.14.7.5.3]

9.14.7.5.3

The discharge rate of the system shall be based on the application rate multiplied by the entire aircraft storage and servicing floor area. ~~The application total discharge rate shall include the sprinkler breakdown factor specified in 6.12.8.2.2 of NFPA 11.~~

Statement of Problem and Substantiation for Public Input

Paragraphs 9.14.1 and 9.14.2. do not require sprinklers when foam systems are provided. Since sprinklers are not required for Group IV hangars with high expansion foam systems, there is no need to apply a breakdown factor.

Submitter Information Verification

Submitter Full Name:	Liane Ozmun
Organization:	Frankfurt Short Bruza
Street Address:	
City:	
State:	
Zip:	
Submittal Date:	Fri Dec 21 11:19:58 EST 2018
Committee:	AIS-AAA

Public Input No. 25-NFPA 409-2018 [Section No. 9.14.7.5.6]

9.14.7.5.6

Foam generators shall be ~~powered by reliable water-driven or~~ listed or approved and as defined in NFPA 11. Where blower type generators are used they shall be powered by reliable hydraulic or electric motors. Electric power reliability for electric blower type foam generators shall be consistent with electric fire pump requirements specified in ~~Chapters 9 and 10 of~~ NFPA 20.

Statement of Problem and Substantiation for Public Input

The new text allows for all types of generators defined in NFPA 11. The deletion of chapter references is in the style format for NFPA.

Submitter Information Verification

Submitter Full Name: Martin Workman
Organization: The Viking Corporation
Street Address:
City:
State:
Zip:
Submittal Date: Thu Dec 13 12:40:48 EST 2018
Committee: AIS-AAA

Public Input No. 18-NFPA 409-2018 [Section No. 11.1.1]

11.1.1

Inspection, testing, and maintenance of fire protection systems in aircraft hangars shall be performed in accordance with NFPA 11, NFPA 25, *NFPA 70*, *NFPA 72*, or NFPA 80 as applicable and as supplemented by Table 11.1.1.

Table 11.1.1 Inspection and Testing of Hangar Fire Protection Systems

	Type and Frequency of Inspections and Tests					
System Components	Weekly	Monthly	Quarterly	Semi-annually	Annually	Every 5 Years
Sprinkler heads	—	—	—	—	V	—
Piping	—	—	—	—	V	D
Pipe hangers	—	—	—	—	V	—
Sprinkler alarm valve	—	V	O [1]	—	—	—
Deluge valve	—	V	—	—	O	D
Pre-action system	—	V	—	—	D	—
Dry pipe systems	—	V	—	—	D	—
Shutoff valves	—	V	—	—	F	—
Fire pumps	F [2]	—	—	—	D	—
Water reservoirs	—	V	—	—	—	—
Hose stations	—	V	—	—	—	D
Strainer filter baskets	—	—	—	—	V	—
Foam concentrate	—	—	—	—	F	—
Concentrate storage tanks	—	V	—	—	—	—
Concentrate pumps	F [2]	—	—	—	O	D
Concentrate control valve (automatic)	—	V	—	—	O	D
Concentrate shutoff valve	—	V	—	—	F	—
Foam proportioning device	—	V	—	—	—	D
Water-powered monitor nozzle	—	V	—	—	D	—
Electric-powered monitor nozzle	—	V	—	—	F	D
Water-powered high-expansion-foam (HEF) generator	—	V	—	—	D	D
Electric-powered high-expansion-foam (HEF) generator	—	V	—	—	F	D
Pneumatic detector	—	—	—	F	O [3]	—
Electric detector	—	—	—	F	O [3]	—
Optical detector	V	—	—	F	O [3]	—
Control panels	—	V	—	F	O	—
Alarm transmission (local and remote)	—	F	—	—	—	—
Tamper switch (supervisory switch valve)	—	—	F	—	—	—
Flow indication switch	—	—	—	—	O	—
Low air pressure supervisory switch	—	—	—	F	O	—
Supervisory alarms	—	—	—	F	—	—
Manual actuation stations	—	—	—	F	—	—
Hangar floor drain system and separators	—	V	—	—	—	D
Fire doors	—	V	—	—	F	—
Gas detectors	—	V	—	F	—	—

System Components	Weekly	Monthly	Quarterly	Semi-annually	Annually	Every 5 Years
	Type and Frequency of Inspections and Tests					
Ventilation system in pits, tunnels, and ducts	—	—	—	F	—	—
Grounding equipment	—	—	—	—	—	F

V: Visual inspection. D: Operational test with actual discharge of foam . O: Operational test with flow, no discharge of foam . F: Functional test, no flow.

[1]For the purposes of this test, the inspector's flow valve is acceptable.

[2]Churn test.

[3]At this time it is necessary to check that the set points are the same as the original.

Statement of Problem and Substantiation for Public Input

Provides clarification on intent of whether discharge should include foam solution or just water.

Submitter Information Verification

Submitter Full Name: Ruby Evans
Organization: FM Global
Street Address:
City:
State:
Zip:
Submittal Date: Tue Dec 11 14:42:38 EST 2018
Committee: AIS-AAA

Public Input No. 19-NFPA 409-2018 [Section No. 11.1.1]

11.1.1

Inspection, testing, and maintenance of fire protection systems in aircraft hangars shall be performed in accordance with NFPA 11, NFPA 25, *NFPA 70*, *NFPA 72*, or NFPA 80 as applicable and as supplemented by Table 11.1.1.

Table 11.1.1 Inspection and Testing of Hangar Fire Protection Systems

	Type and Frequency of Inspections and Tests					
System Components	**Weekly**	**Monthly**	**Quarterly**	**Semi-annually**	**Annually**	**Every 5 Years**
Sprinkler heads	—	—	—	—	V	—
Piping	—	—	—	—	V	D
Pipe hangers	—	—	—	—	V	—
Sprinkler alarm valve	—	V	O[1]	—	—	—
Deluge valve	—	V	—	—	O	D
Pre-action system	—	V	—	—	D	—
Dry pipe systems	—	V	—	—	D	—
Shutoff valves	—	V	—	—	F	—
Fire pumps	F[2]	—	—	—	D	—
Water reservoirs	—	V	—	—	—	—
Hose stations	—	V	—	—	—	D
Strainer filter baskets	—	—	—	—	V	—
Foam concentrate	—	—	—	—	F	—
Concentrate storage tanks	—	V	—	—	—	—
Concentrate pumps	F[2]	—	—	—	O	D
Concentrate control valve (automatic)	—	V	—	—	O	D
Concentrate shutoff valve	—	V	—	—	F	—
Foam proportioning device	—	V	—	—	—	D
Water-powered monitor nozzle	—	V	—	—	O	D
—						
Electric-powered monitor nozzle	—	V	—	—	F	D
Water-powered high-expansion-foam (HEF) generator	—	V	—	—		
~~D~~						
	O				D	
Electric-powered high-expansion-foam (HEF) generator	—	V	—	—	F	D
Pneumatic detector	—	—	—	F	O[3]	—
Electric detector	—	—	—	F	O[3]	—
Optical detector	V	—	—	F	O[3]	—
Control panels	—	V	—	F	O	—
Alarm transmission (local and remote)	—	F	—	—	—	—
Tamper switch (supervisory switch valve)	—	—	F	—	—	—
Flow indication switch	—	—	—	—	O	—
Low air pressure supervisory switch	—	—	—	F	O	—
Supervisory alarms	—	—	—	F	—	—
Manual actuation stations	—	—	—	F	—	—
Hangar floor drain system and separators	—	V	—	—	—	D
Fire doors	—	V	—	—	F	—

Gas detectors	—	V	—	F	—	—
Ventilation system in pits, tunnels, and ducts	—	—	—	F	—	—
Grounding equipment	—	—	—	—	—	F

V: Visual inspection. D: Operational test with actual discharge. O: Operational test with flow, no discharge. F: Functional test, no flow.

[1]For the purposes of this test, the inspector's flow valve is acceptable.

[2]Churn test.

[3]At this time it is necessary to check that the set points are the same as the original.

Statement of Problem and Substantiation for Public Input

Correct typos in the Table. There are two "D"s associated with Electric-powered monitor nozzle. For water-powered, the change proposed is to make it consistent with testing of the other systems in this section which discharge foam.

Submitter Information Verification

Submitter Full Name: Ruby Evans
Organization: FM Global
Street Address:
City:
State:
Zip:
Submittal Date: Tue Dec 11 14:45:36 EST 2018
Committee: AIS-AAA

Public Input No. 20-NFPA 409-2018 [Section No. 11.1.1]

11.1.1

Inspection, testing, and maintenance of fire protection systems in aircraft hangars shall be performed in accordance with NFPA 11, NFPA 25, *NFPA 70*, *NFPA 72*, or NFPA 80 as applicable and as supplemented by Table 11.1.1.

Table 11.1.1 Inspection and Testing of Hangar Fire Protection Systems

	Type and Frequency of Inspections and Tests					
System Components	Weekly	Monthly	Quarterly	Semi-annually	Annually	Every 5 Years
Sprinkler heads	—	—	—	—	V	—
Piping	—	—	—	—	V	D
Pipe hangers	—	—	—	—	V	—
Sprinkler alarm valve	—	V	O [1]	—	—	—
Deluge valve	—	V	—	—	O	D
Pre-action system	—	V	—	—	D	—
Dry pipe systems	—	V	—	—	D	—
Shutoff valves	—	V	—	—	F	—
Fire pumps	F [2]	—	—	—	D	—
Water reservoirs	—	V	—	—	—	—
Hose stations	—	V	—	—	—	D
Strainer filter baskets	—	—	—	—	V	—
Foam concentrate	—	—	—	—	F	—
Concentrate storage tanks	—	V	—	—	—	—
Concentrate pumps	F [2]	—	—	—	O	D
Concentrate control valve (automatic)	—	V	—	—	O	D
Concentrate balancing valve	-	V	-	-	O	D
Concentrate shutoff valve	—	V	—	—	F	—
Foam proportioning device	—	V	—	—	—	D
Water-powered monitor nozzle	—	V	—	—	D	—
Electric-powered monitor nozzle	—	V	—	—	F	D
Water-powered high-expansion-foam (HEF) generator	—	V	—	—	D	D
Electric-powered high-expansion-foam (HEF) generator	—	V	—	—	F	D
Pneumatic detector	—	—	—	F	O [3]	—
Electric detector	—	—	—	F	O [3]	—
Optical detector	V	—	—	F	O [3]	—
Control panels	—	V	—	F	O	—
Alarm transmission (local and remote)	—	F	—	—	—	—
Tamper switch (supervisory switch valve)	—	—	F	—	—	—
Flow indication switch	—	—	—	—	O	—
Low air pressure supervisory switch	—	—	—	F	O	—
Supervisory alarms	—	—	—	F	—	—
Manual actuation stations	—	—	—	F	—	—
Hangar floor drain system and separators	—	V	—	—	—	D

	Type and Frequency of Inspections and Tests					
System Components	Weekly	Monthly	Quarterly	Semi-annually	Annually	Every 5 Years
Fire doors	—	V	—	—	F	—
Gas detectors	—	V	—	F	—	—
Ventilation system in pits, tunnels, and ducts	—	—	—	F	—	—
Grounding equipment	—	—	—	—	—	F

V: Visual inspection. D: Operational test with actual discharge. O: Operational test with flow, no discharge. F: Functional test, no flow.

[1]For the purposes of this test, the inspector's flow valve is acceptable.

[2]Churn test.

[3]At this time it is necessary to check that the set points are the same as the original.

Statement of Problem and Substantiation for Public Input

FM Global is seeing failures related to these valves sticking and not operating properly prior to the 5 year testing frequency. This is impacting proportioning results. Once corrective action was taken to exercise and lubricate the stuck valves, proper proportioning was attained.

Submitter Information Verification

Submitter Full Name: Ruby Evans

Organization: FM Global

Street Address:

City:

State:

Zip:

Submittal Date: Tue Dec 11 14:51:06 EST 2018

Committee: AIS-AAA

Public Input No. 26-NFPA 409-2018 [Section No. 11.1.1]

11.1.1

Inspection, testing, and maintenance of fire protection systems in aircraft hangars shall be performed in accordance with NFPA 11, NFPA 25, *NFPA 70*, *NFPA 72*, or NFPA 80 as applicable and as supplemented by Table 11.1.1.

Table 11.1.1 Inspection and Testing of Hangar Fire Protection Systems

	Type and Frequency of Inspections and Tests					
System Components	**Weekly**	**Monthly**	**Quarterly**	**Semi-annually**	**Annually**	**Every 5 Years**
Sprinkler heads	—	—	—	—	V	—
Piping	—	—	—	—	V	D
Pipe hangers	—	—	—	—	V	—
Sprinkler alarm valve	—	V	O[1]	—	—	—
Deluge valve	—	V	—	—	O	D
Pre-action system	—	V	—	—	D	—
Dry pipe systems	—	V	—	—	D	—
Shutoff valves	—	V	—	—	F	—
Fire pumps	F[2]	—	—	—	D	—
Water reservoirs	—	V	—	—	—	—
Hose stations	—	V	—	—	—	D
Strainer filter baskets	—	—	—	—	V	—
Foam concentrate	—	—	—	—	F	—
Concentrate storage tanks	—	V	—	—	—	—
Concentrate pumps	F[2]	—	—	—	O	D
Concentrate control valve (automatic)	—	V	—	—	O	D
Concentrate shutoff valve	—	V	—	—	F	—
Foam proportioning device	—	V	—	—	—	D
Water-powered monitor nozzle	—	V	—	—	D	—
Electric-powered monitor nozzle	—	V	—	—	F	D
Water-powered high-expansion-foam (HEF) generator	—	V	—	—	D	D
Electric-powered high-expansion-foam (HEF) generator	—	V	—	—	F	D
Aspirating type high-expansion-foam (HEF) generator	—	V	—	—	D	D
Pneumatic detector	—	—	—	F	O[3]	—
Electric detector	—	—	—	F	O[3]	—
Optical detector	V	—	—	F	O[3]	—
Control panels	—	V	—	F	O	—
Alarm transmission (local and remote)	—	F	—	—	—	—
Tamper switch (supervisory switch valve)	—	—	F	—	—	—
Flow indication switch	—	—	—	—	O	—
Low air pressure supervisory switch	—	—	—	F	O	—
Supervisory alarms	—	—	—	F	—	—
Manual actuation stations	—	—	—	F	—	—
Hangar floor drain system and separators	—	V	—	—	—	D

System Components	Weekly	Monthly	Quarterly	Semi-annually	Annually	Every 5 Years
	Type and Frequency of Inspections and Tests					
Fire doors	—	V	—	—	F	—
Gas detectors	—	V	—	F	—	—
Ventilation system in pits, tunnels, and ducts	—	—	—	F	—	—
Grounding equipment	—	—	—	—	—	F

V: Visual inspection. D: Operational test with actual discharge. O: Operational test with flow, no discharge. F: Functional test, no flow.

[1]For the purposes of this test, the inspector's flow valve is acceptable.

[2]Churn test.

[3]At this time it is necessary to check that the set points are the same as the original.

Statement of Problem and Substantiation for Public Input

Addition to chart indicates how aspirating type generators are to be tested and maintained.

Submitter Information Verification

Submitter Full Name: Martin Workman
Organization: The Viking Corporation
Street Address:
City:
State:
Zip:
Submittal Date: Thu Dec 13 12:49:31 EST 2018
Committee: AIS-AAA

Public Input No. 48-NFPA 409-2019 [Section No. A.5.4.2]

A.5.4.2

These special hazards include, but are not limited to, spray painting or doping areas, flammable liquid storage or mixing rooms, and so forth.

Approved liquid drainage floor assemblies may prevent the spread of spilled liquids to adjoining areas, in addition to reducing the hazards associated with an ignitable liquid spill.

Statement of Problem and Substantiation for Public Input

Liquid drainage floor assemblies provide a suitable alternative to the other drainage and containment methods such as curbs and/or drains

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 47-NFPA 409-2019 [New Section after 3.3.10]	Detailed description of liquid drainage floor assembly
Public Input No. 54-NFPA 409-2019 [New Section after A.8.1.1]	

Submitter Information Verification

Submitter Full Name: Kyle Giubbini
Organization: Safespill Systems
Street Address:
City:
State:
Zip:
Submittal Date: Thu Jan 03 11:46:12 EST 2019
Committee: AIS-AAA

Public Input No. 43-NFPA 409-2018 [Section No. A.6.2.8.3.1]

A.6.2.8.3.1

Where separate detection systems are provided for actuation of the supplementary systems, they should be either a radiation (infrared or ultraviolet) or a heat-responsive (continuous strip type or thermistor type) system. When they are initially installed, if there is any doubt as to the stability of these actuating devices because of environmental factors, it is recommended that the devices be utilized to actuate only an alarm rather than trigger the extinguishing systems. As soon as operational experience indicates that the devices are stable, they should be arranged to automatically actuate the extinguishing equipment. Spacing of detection devices should be no greater than the maximum recommended by the manufacturer.

Radiant energy-sensing fire detectors are subject to respond to mutiple radiant energy sources found on current civil and military aircraft. Such soures are routinely operated while aircraft and aircraft systems are serviced and during pre-flight system checks. Ther are documented cases where such aircraft radiant engergy sources have caused inappropriate responses in readiant energy-sensisng detectors and controls from as much as one quarter of a mile from a hangar. The additional evaluation test in Annex (new) are recommended for energy -sensing dectors and controls to be installed in aircraft hangars.

[Proposed new Annex is submitted as separate uploaded document].

Additional Proposed Changes

File Name	Description	Approved
Hangar_Detector_Qualification_change_and_new_annex.docx	Change text and New Annex text	
787_Cropped0002.jpg	Figure 787 emitter locations	

Statement of Problem and Substantiation for Public Input

Optical detectors (radiant energy-sensing) are used in many hangars however many of those e detectors can be affected by multiple different radiant energy sources. Current optical detector approval standards do test for some immunity to inappropriate detector however those test do not reflected the many sources of radiant energy found on both civil and military aircraft operating on most airports today. The attached Boeing 787 figure is a example of the many radiant energy sources found on most current civil aviation aircraft and military often have more radiant emitters and much more powerful systems operating over in broader ranges. Field experience has show both civil and military emitters can affect electronics a significant distances. Aircraft hangar doors are often open exposing optical detectors to direct exposure to aircraft operating on the airfield plus aircraft in maintenance often have to test various emitters during routine maintenance and repair. NFPA 409 does not specifically require optical detectors in hangars, but, in Annex A it specifically recommends the use of radiant energy-sensing detectors when any supplemental detection is provided in hangars. The proposed tests are all taken from standard recognized test methods used to evaluated electronic expected to used in a constantly energy radiated environment.

Submitter Information Verification

Submitter Full Name: Fred Walker
Organization: Department of the Air Force
Street Address:
City:
State:
Zip:

Submittal Date: Mon Dec 31 01:18:58 EST 2018
Committee: AIS-AAA

Public Input No. 10-NFPA 409-2017 [New Section after A.6.4]

TITLE OF NEW CONTENT

A7.1.1 (2) & (3) These options are only considered apprропriate for Group II applications when both the water sprinkler system and the foam/water system are used installed together. In no case is the installation of only one of the systems alone considered appropriate for fueled aircraft in a Group II hangar under this standard.

Statement of Problem and Substantiation for Public Input

The current International Building Code includes text which allows Group II hangars operated by fixed base operators (FBOs) for transit aircraft without maintenance activities to omit the "foam" requirements of NFPA 409. This implies it would be appropriate using 7.1.1 option (2) & (3) it is acceptable to install only the .17 water sprinklers and the hangar would be considered as compliant with NFPA 409. The 409 committee appears to have intended options (2) & (3) to be inclusive such that both the water sprinkler system and the foam system are required to be complliant with NFPA 409. It appears the 409 committee intended that the only acceptable options for 409 compliance includes foam and there is no 409 option for water only protection in a Group II hangar housing fueled aircraft.

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 11-NFPA 409-2017 [New Section after A.6.4]	

Submitter Information Verification

Submitter Full Name: Fred Walker
Organization: Frederick Walker Consultant LL
Street Address:
City:
State:
Zip:

Submittal Date: Fri Jun 30 11:58:04 EDT 2017
Committee: AIS-AAA

Public Input No. 11-NFPA 409-2017 [New Section after A.6.4]

TITLE OF NEW CONTENT

A 7.2 Sprinkler systems complying with section 7.2 are intended to only be used in conjunction with a appropriate foam system as indicated in Section 7.1.1 (2) & (3). Sprinkler system complying with Section 7.2 alone are not considered appropriate protection for Group II hangar housing fueled aircraft.

Statement of Problem and Substantiation for Public Input

Wording in the current IBC would appear to indicate sprinkler only protection complying with 7.2 couold be considered NFPA 409 compliant under certain cases.

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 10-NFPA 409-2017 [New Section after A.6.4]	Same issue

Submitter Information Verification

Submitter Full Name: Fred Walker

Organization: Frederick Walker Consultant LL

Street Address:

City:

State:

Zip:

Submittal Date: Fri Jun 30 12:22:47 EDT 2017

Committee: AIS-AAA

Public Input No. 54-NFPA 409-2019 [New Section after A.8.1.1]

A.8.1.5

A liquid drainage floor assembly with adequate flow capacity to.handle discharges from all fire protection systems in the aircraft storage and servicing area may be used as an alternative to curbing to prevent the spread of spilled liquids to adjacent areas.

Statement of Problem and Substantiation for Public Input

Liquid drainage floor assemblies provide a suitable alternative to the other drainage and containment methods such as curbs and/or drains

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 47-NFPA 409-2019 [New Section after 3.3.10]	Detailed description of liquid drainage floor assemblies
Public Input No. 48-NFPA 409-2019 [Section No. A.5.4.2]	Similar revision

Submitter Information Verification

Submitter Full Name: Kyle Giubbini
Organization: Safespill Systems
Street Address:
City:
State:
Zip:
Submittal Date: Thu Jan 03 13:04:01 EST 2019
Committee: AIS-AAA

Public Input No. 15-NFPA 409-2018 [Section No. C.1.2.3]

C.1.2.3 UL Publications.

Underwriter's Laboratories, Inc., 333 Pfingsten Road, Northbrook, IL 60062-2096.

UL 790,~~Standard~~ _ *Test Methods for Fire Tests of Roof Coverings*, 2004, revised 2018 .

Statement of Problem and Substantiation for Public Input

The term “Standard ” is redundant and unnecessary. This change results in the proper short form name of the referenced documents and the revision date has changed. These actions are being taken throughout all NFPA references to UL standards.

Submitter Information Verification

Submitter Full Name: Kelly Nicolello
Organization: UL LLC
Street Address:
City:
State:
Zip:
Submittal Date: Tue Jun 26 16:29:50 EDT 2018
Committee: AIS-AAA