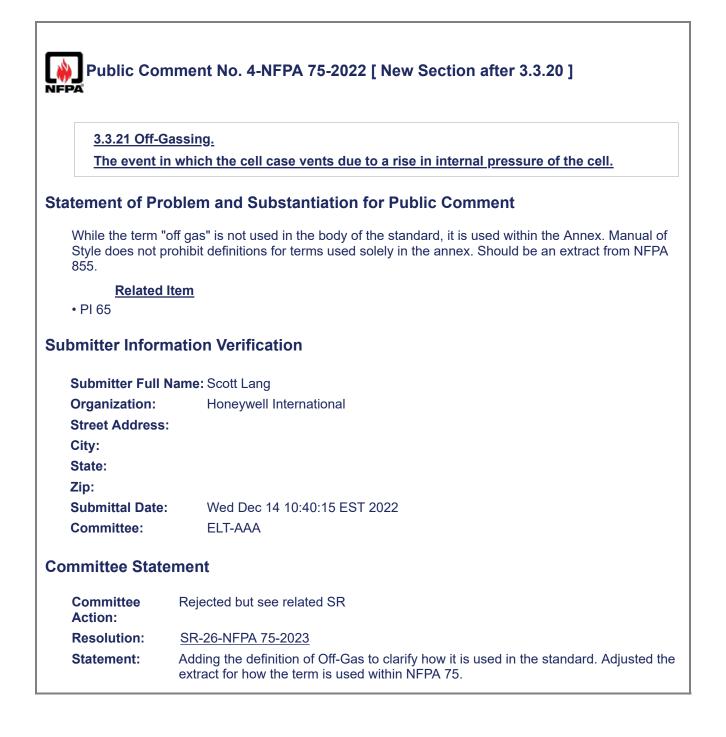


	Immersion Cooling Liquid
	fluid used for the purpose of cooling ITE through direct contact, contained within the n and characterized as a Class IIIB liquid [NFPA 30 4.2.3.2, 2021].
tatement of P	roblem and Substantiation for Public Comment
the marketplac profiles. Fluids unique attribut cooling) or ins design and op Introduction of	bling technology that supports thermal management of ITE is rapidly gaining a foothold in the due to its superior cooling ability and beneficial impact on facility sustainability and systems designed and intended for single phase immersion cooling will have tes, requirements, and failure modes when compared to other cooling systems (e.g. air ulating fluid applications (e.g. transformer fluids). There is a lack of guidance for safe eration of systems and components unique to this area of ITE immersion cooling. a definition for an ITE Immersion Cooling Liquid will address this gap and ease the her guidance for this technology area.
by doing so, e aligned with C	omment extracts the definition for Class IIIB liquids, as set forth in NFPA 30 (2021) and stablishes a broad classification for the liquids based on their closed-cup flash point. It is ommittee Input No. 52-NFPA 75-2022 (11.2), wherein immersion cooling was recognized ystem type with unique considerations for safety.
	Related Item
Committee In	nput No. 52-NFPA 75-2022
ubmitter Info	rmation Verification
Submitter Ful	I Name: Amy Short
Organization:	-
Street Addres	is:
City:	
State:	
Zip:	
Submittal Dat	e: Wed Jan 04 11:22:00 EST 2023
Committee:	ELT-AAA
ommittee Sta	tement
Committee Action:	Rejected but see related SR
Resolution:	SR-13-NFPA 75-2023
Statement:	There is a lack of guidance for safe design and operation of systems and components unique to this area of ITE immersion cooling. Introduction of a definition for an ITE



Cha	apter 5 Performance-Based Design Approach
	Performance-Based Design Approach General .
<u>5.1.</u>	<u>1</u> <u>The requirements of Chapter</u> <u>5</u> <u>shall apply to recognize performance-based practices</u>
	I . 2 <u>The performance-based design approach shall include all of the following nponents:</u>
(1)	Goals and objectives specified in Section 5.2
(2)	Performance criterion specified in 5.3
(3)	Fire risk assessment elements specified in 4.2.3
<u>5.2</u>	Goals and Objectives.
5.7.	2 Performance
The	performance-based design shall meet the following goals and objectives:
(1)	<u>The performance-based approach allows the alternative means to be utilized for the elements of the ITE systems, ITE rooms, and ITE areas as permitted in this standard.</u>
(2)	The risk analysis, design criteria, design brief, system performance, and testing criteria are developed in accordance with this section.
(3)	The design meets the scope and purpose of the standard as detailed in Sections 1.1 at 1.2.
(4)	The performance-based design provides equivalent performance to the prescriptive requirements of this standard.
<u>5.3</u>	
*_(Qualifications.
	performance-based design documents shall be prepared by a licensed design profession experience in fire protection, and acceptable to the AHJ.
5.4	* – Independent Review.
prop	AHJ shall be permitted to require an approved, independent third party to review the posed design brief based on the documented fire risk assessment accepted by the AHJ to ride an evaluation of the design.
5.5	– Final Determination.
	authority having jurisdiction shall make the final determination as to whether the ormance objectives have been met.
5.6	– Maintenance of Design Features.
	design features required for the ITE area to continue to meet the performance goals and actives of this standard shall be maintained for the life of the building.
5.7	– Performance Criteria.

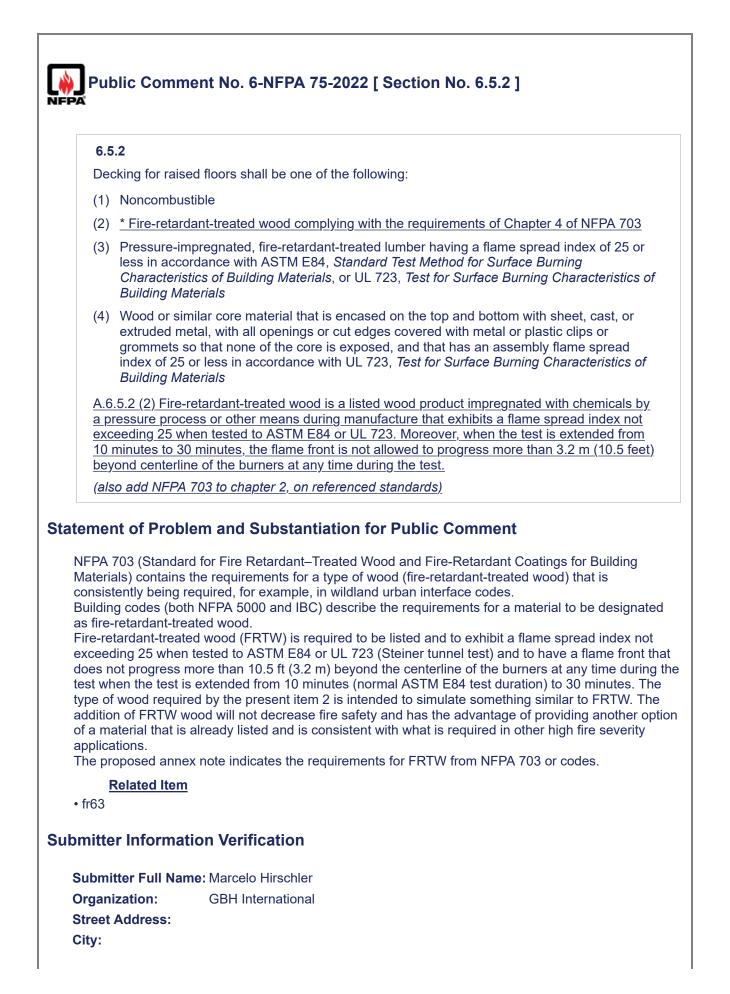
5.7.1 - General.

The performance-based design approach shall include all of the following components:

- (1) Goals and objectives specified in Section 5.2
- (2) Performance criterion specified in 5.7.2
- (3) Fire risk assessment elements specified in 4.2.3

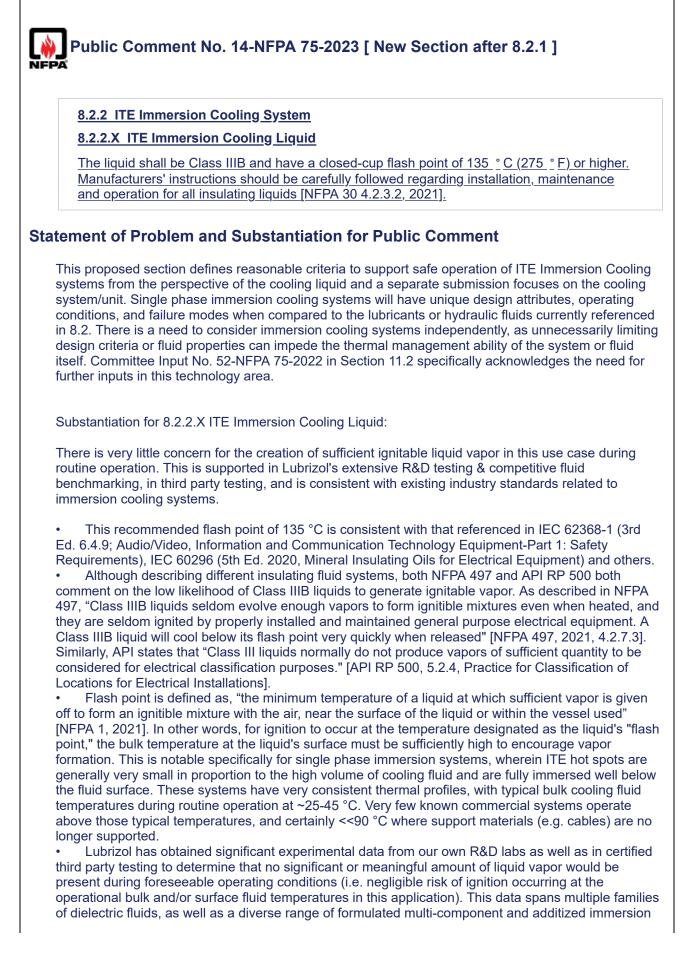
Performance Criterion. ITE systems and ITE areas shall be protected from damage by fire or its associated effects, including smoke, corrosion, heat, and water. <u>5.</u> 7.3 4 Stakeholders. The stakeholders shall be part of the performance-based design approach and include the owner or owner's representative, a licensed design professional experienced in the design of fire and life safety systems for ITE and ITE areas, insurance representatives, the authority having jurisdiction, and representatives of the emergency response entities. <u>5.</u> 7.4 5* Qualifications. The performance-based design documents shall be prepared by a licensed design professional with experience in fire protection, and acceptable to the AHJ. **5.6** * Design Brief. 5.6.1 The design of the ITE area shall include a design brief that is prepared using recognized performance-based design practices. <u>5.</u> 7.4.1 Any **6.2** Any deviation from a prescriptive requirement shall be detailed in the design brief. 5. 7.4.2 Design **6.3** Design specifications and briefs used in the performance-based design shall be clearly stated and shown to be realistic and sustainable. 5. 7 <u>6.4</u> .3_ Specific Specific inspection, testing, or maintenance requirements that are necessary to maintain reliable performance of the fire safety features of the ITE area shall be stated in the design brief. 5.7 * Independent Review. The AHJ shall be permitted to require an approved, independent third party to review the proposed design brief based on the documented fire risk assessment accepted by the AHJ to provide an evaluation of the design. 5.8 Final Determination. The authority having jurisdiction shall make the final determination as to whether the performance objectives have been met.

	<u>5.9 Maintena</u>	nce of Design Features.
		tures required for the ITE area to continue to meet the performance goals and
	objectives of th	is standard shall be maintained for the life of the building.
Stat	ement of Prob	lem and Substantiation for Public Comment
		s address First Revision Affirmative with Comment ballot to improve readability of ly order the requirements within the section.
		Related Item
•	First Revision No	. 54 NFPA 75-2022 [Section No. 5.7]
Sub	mitter Informa	tion Verification
5	Submitter Full Na	me: Randy Willard
C	Organization:	US Central Intelligence Agency
5	Street Address:	
	City:	
	State:	
	Zip:	
	Submittal Date:	Wed Jan 04 19:36:51 EST 2023
(Committee:	ELT-AAA
Con	nmittee Staten	nent
	Committee Action:	Rejected but see related SR
I	Resolution:	<u>SR-10-NFPA 75-2023</u>
\$	Statement:	Revisions improve readability of Chapter 5 and logically order the requirements within the chapter.



Mon Dec 26 14:26:56 EST 2022		
ELT-AAA		
Committee Statement		
: Rejected but held		
This is new material. This will be considered by the TC for the next cycle.		

Public Comm FPA Sections]]	nent No. 9-NFPA 75-2022 [Section No. 8.2 [Excluding any Sub-
<u>or</u> hydraulic pu	the unit is such that oil or equivalent liquid is required for lubrication,- cooling, or urposes, it shall have a closed-cup flash point of 149°C (300°F) or higher, and the be of a sealed construction, incorporating automatic pressure relief devices.
Informational No	ote No. 1: Construction for liquid cooling in equipment is covered by section 8.1.1.
tatement of Prob	lem and Substantiation for Public Comment
UL 62368-1 [UL Si equipment – Part 1	rements for cooling liquids used in information technology equipment is covered in tandard for Safety Audio/video, information and communication technology I: Safety requirements]. Recommend removing "cooling" from section 8.2 text. Add No. 1: Construction for liquid cooling in equipment is covered by section 8.1.1.
	ection can be separated into 2 sections 1 for lubrication and hydraulic fluids (current inus "cooling") and 1 (new) section for cooling liquids where the text would have o section 8.1.1.
If needed, addition	al informative information can be provided in Annex A.
elated Public Co	mments for This Document
Public Comment N CI-52-NFPA 75-2	Related CommentRelationshipNo. 10-NFPA 75-2022 [Section No. 11.2]Related Item2022
ubmitter Informa	tion Verification
Submitter Full Na	me: Will Susiene
Organization:	Intel Corporation
Affiliation:	Information Technology Industry Council
Street Address:	
City: State:	
Zip:	
Submittal Date:	Wed Dec 28 16:26:18 EST 2022
Committee:	ELT-AAA
ommittee Staten	nent
Committee Action:	Rejected but see related SR
Resolution:	<u>SR-15-NFPA 75-2023</u>
Statement:	Removed the term "cooling" as it is covered in the listing standard for ITE equipment.



fluids.

-- As a representative example, a single phase hydrocarbon immersion fluid containing >99% polyalphaolefin-2 (PAO-2) oil has thermophysical characteristics just above the limit proposed herein. It has a measured flash point of 142 °C (ASTM D93) and NO detectable vapor pressure at 25 °C, 50 °C, or even 100 °C (ASTM E1719; <0.0001 psia measured for all three data points; verified at third party test facility). This is significant because sufficient vapor needs to be generated, as measured by vapor pressure, to represent an ignition risk when an ignition source is present. The boiling point of that same fluid was determined by two methods to be 326.3 °C (ASTM D2887; 50% boiling temp) and 316 °C (Thermogravimetric Analysis, TGA) – further confirming that temperatures far exceeding expected operation conditions are needed for significant vapor formation. We would happily provide further explanation or experimental data upon request.

• The "manufacturers' instructions" statement is meant to encourage industry best practices, and is consistent with e.g. NFPA 70B focused on maintenance stating, "Each liquid has definite characteristics, and they should only be mixed after consulting with both manufacturers. Manufacturers' instructions should be carefully followed with all insulating liquids." [NFPA 70B, 2019, 21.2.1.2]

Comment about inclusion of other fluid properties criteria:

• Other criteria to ensure safe operation of ITE single phase immersion cooling technologies are being actively investigated by ourselves as well as others in this area. We seek to ensure appropriate limits for this use case once a sufficient data basis has been established and look forward to providing additional guidance in years to come.

• We have intentionally not referenced autoignition criteria that may be found in other related NFPA or industry guidance documents (e.g. NEC 70 501.130(B), IEC 62368, API RP 2216) because we feel that there is a need for further investigation for this application before appropriate limits are established.

Related Item

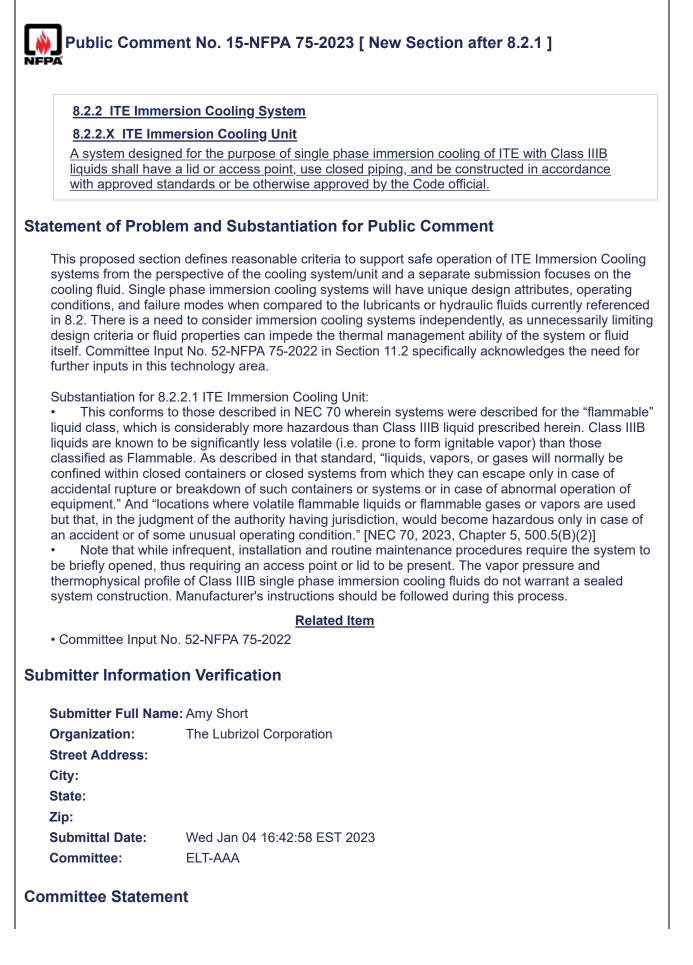
Committee Input No. 52-NFPA 75-2022

Submitter Information Verification

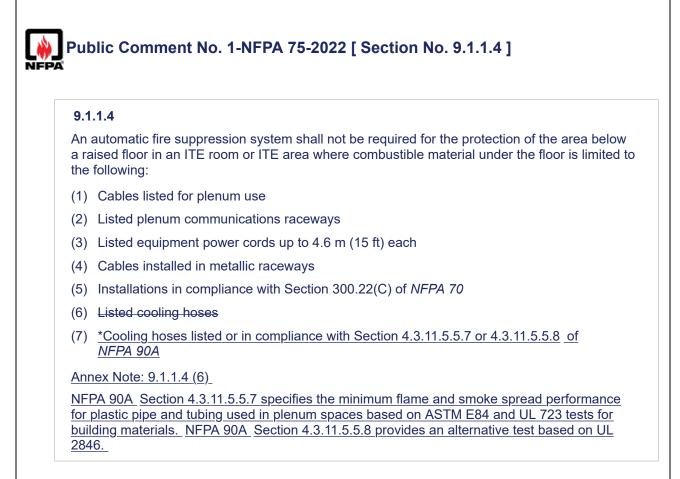
Submitter Full Name: Amy Short	
Organization:	The Lubrizol Corporation
Street Address:	
City:	
State:	
Zip:	
Submittal Date:	Wed Jan 04 12:43:30 EST 2023
Committee:	ELT-AAA

Committee Statement

Committee Action:	Rejected but see related SR
Resolution:	<u>SR-16-NFPA 75-2023</u>
Statement:	Added requirements for ITE Immersion cooling systems because there are systems currently in use and under development that are listed, and are necessary to maintain safety standards.



Committee Action:	Rejected but see related SR
Resolution:	<u>SR-16-NFPA 75-2023</u>
Statement:	Added requirements for ITE Immersion cooling systems because there are systems currently in use and under development that are listed, and are necessary to maintain safety standards.



Statement of Problem and Substantiation for Public Comment

A listing standard for cooling hoses seems lacking. A senior member of the technical committee researched and found a reference to suitable tests and performance in NFPA 90A that are acceptable for pipes and hoses used in plenums. Lacking a listing standard, hoses with a construction compliant to NFPA 90A should be permitted as an option.

From NFPA 90A:

4.3.11.5 Raised Floor Plenum.

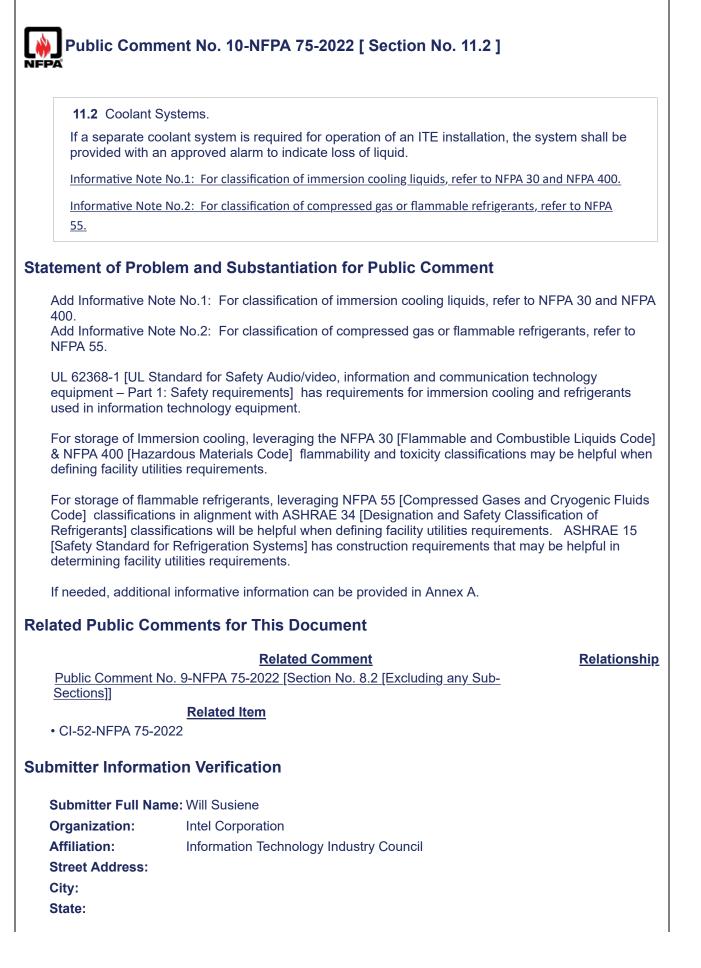
4.3.11.5.5.7 Plastic piping and tubing used in plumbing systems shall be permitted to be used within a raised floor plenum if it exhibits a flame spread index of 25 or less and a smoke developed index of 50 or less when tested in accordance with ASTM E84, Standard Test Method for Surface Burning Characteristics of Building Materials, or UL 723, Test for Surface Burning Characteristics of Building Materials, at full width of the tunnel and with no water or any other liquid in the pipe during the test, unless otherwise permitted by 4.3.11.5.5.8.

4.3.11.5.5.8 Plastic water distribution piping and tubing listed as having a maximum peak optical density of 0.5 or less, an average optical density of 0.15 or less, and a maximum flame spread distance of 1.5 m (5 ft) or less when tested in accordance with UL 2846, Fire Test of Plastic Water Distribution Plumbing Pipe for Visible Flame and Smoke Characteristics, and installed in accordance with its listing, shall be permitted to be used within a raised floor plenum.

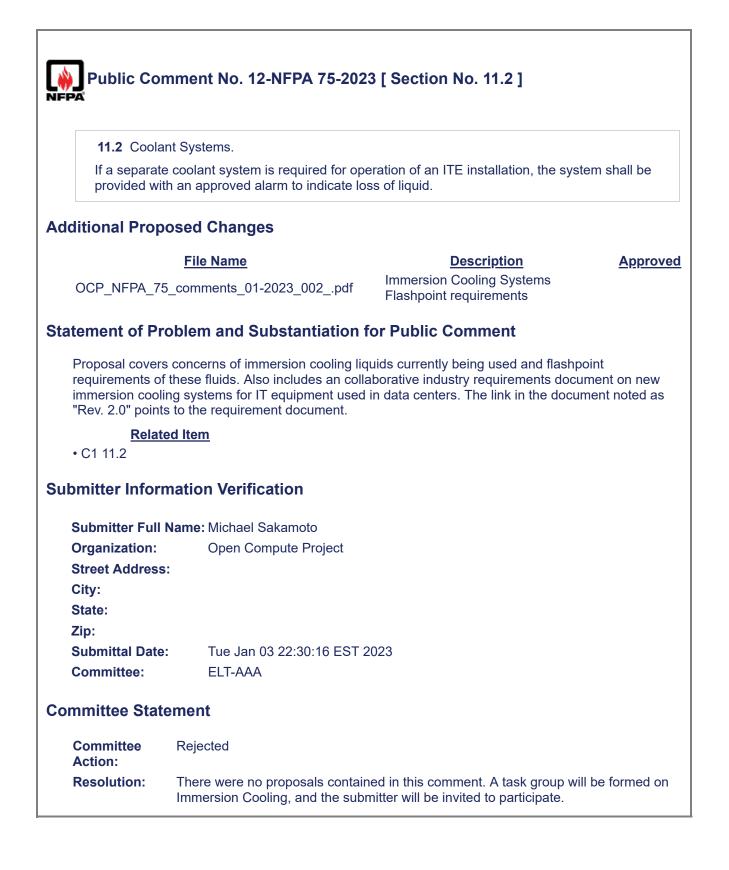
Related Item

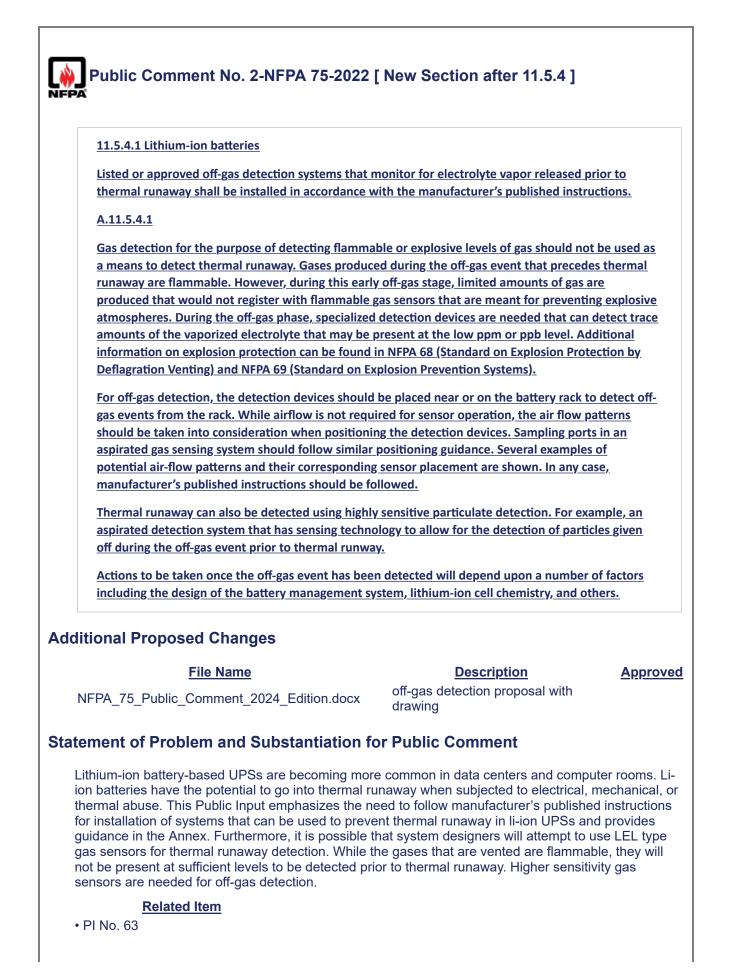
• PI 11

Submitter Information Verification		
Submitter Fu	III Name: Richard Kluge	
Organization	n: Ericsson	
Affiliation:	ATIS	
Street Addre	ss:	
City:		
State:		
Zip:		
Submittal Da	te: Fri Nov 11 15:02:20 EST 2022	
Committee:	ELT-AAA	
Committee Statement		
Committee Action:	Rejected but held	
Resolution:	More research is needed to list the requirements for cooling hoses in raised floors before changing the standard. A task group has been formed to look into this for next cycle.	



Zip:		
Submittal Date:	Wed Dec 28 16:50:31 EST 2022	
Committee:	ELT-AAA	
Committee Statement		
Committee Action: Rejected but see related SR		
Resolution:	<u>SR-20-NFPA 75-2023</u>	
Statement:	Added an annex note to provide additional guidance on coolant systems.	





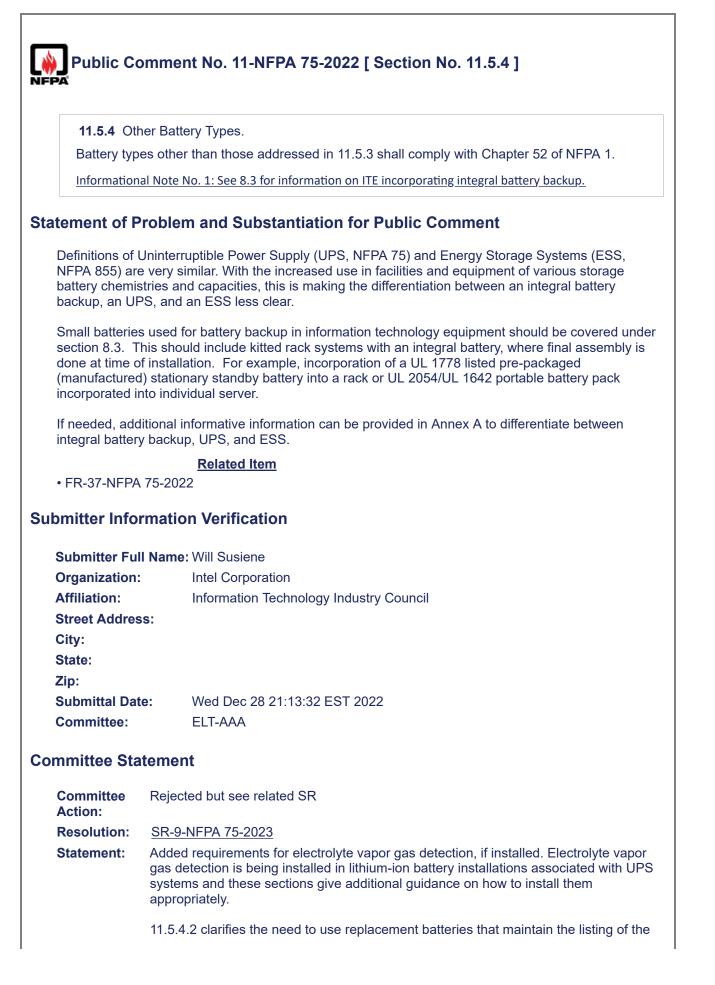
Submitter Information Verification

Submitter Full Name: Scott Lang		
Organization:	Honeywell International	
Street Address:		
City:		
State:		
Zip:		
Submittal Date:	Tue Nov 29 09:08:11 EST 2022	
Committee:	ELT-AAA	

Committee Statement

Committee Action:	Rejected but see related SR
Resolution:	<u>SR-9-NFPA 75-2023</u>
Statement:	Added requirements for electrolyte vapor gas detection, if installed. Electrolyte vapor gas detection is being installed in lithium-ion battery installations associated with UPS systems and these sections give additional guidance on how to install them appropriately.
	11.5.4.2 clarifies the need to use replacement batteries that maintain the listing of the UPS system.

Public Comment No. 3-NFPA 75-2022 [New Section after 11.5.4]		
batteries,	/hen end-of-life lithium-ion batteries in a UPS are replaced with new lithium-ion the user shall confirm that they are compatible and consistent with the on/listing of the UPS regardless of whether the batteries are of the same hemistry.	
statement of P	Problem and Substantiation for Public Comment	
they are fully o	irement aims to prevent problems of li-ion batteries being replaced without assuring that compatible with the batteries being replaced. This goes beyond making sure that the he same general chemistry (e.g., LFP). This is not generally a problem with older battery ike lead acid.	
Re	elated Item	
• Pl No. 67		
Submitter Info	rmation Verification	
Submitter Ful	II Name: Scott Lang	
Organization	Honeywell International	
Street Addres	SS:	
City:		
State:		
Zip: Submittal Dat	te: Tue Nov 29 09:27:59 EST 2022	
Committee:	ELT-AAA	
committee Sta	atement	
Committee Action:	Rejected but see related SR	
Resolution:	<u>SR-9-NFPA 75-2023</u>	
Statement:	Added requirements for electrolyte vapor gas detection, if installed. Electrolyte vapor gas detection is being installed in lithium-ion battery installations associated with UPS systems and these sections give additional guidance on how to install them appropriately.	
	11.5.4.2 clarifies the need to use replacement batteries that maintain the listing of the	



UPS system.

11.6 – Alternati	ve Energy Systems.
11.6.1 * –	
Where provided	l, alternative energy systems shall comply with applicable codes and standards.
11.6.2 –	
If installed in lig 780.	htning-prone areas, the alternative energy installation shall comply with NFPA
atement of Prob	lem and Substantiation for Public Comment
references for Alter ITE Area or ITE Ro	ntirety, to include the related Annex section. No reason for NFPA 75 to make rnative Energy Systems. Highly unlikely such systems would be installed within a bom. NFPA 75 makes no similar references to on-site diesel backup generators, so native Energy Systems? Section as written is outside of NFPA 75 scope.
	Related Item
First Revision No	. 48 - NFPA 75-2022 [New Section after 11.5.5]
bmitter Informa	tion Verification
Cubmitter Full No.	mar Dandy Willard
Submitter Full Nation:	US Central Intelligence Agency
Street Address:	00 Central Intelligence Agency
City:	
State:	
Zip:	
Submittal Date:	Wed Jan 04 20:12:17 EST 2023
Committee:	ELT-AAA
mmittee Statem	ient
Committee Action	a: Accepted
	SR-18-NFPA 75-2023
Resolution:	<u>SR-10-NFFA 75-2025</u>

