



Rådet for vedlikehold  
av brannsløkkemateriell

# “Miljøutfordringer i bransjen – PFAS og nye skumtyper”

– Hva gjelder?

The power behind **your mission**

# Agenda



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- **Introduktion till skumsläck**
  - Vad är skum, vilka olika typer finns det och när används det?
- **PFAS-reglering inom EU inkl. Norge**
  - Vad menas med olika begrepp (PFOS/PFOA/PFAS/C8/C6) och varför är det extra aktuellt just nu, vad gäller för fluorerat skum och vad finns det för framtida alternativ?
- **Guidance/erfarenheter från andra projekt**
  - Hur ska man tänka vid ombyggnad?



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## Hej!

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Viktoria Weding  
*Sales Manager Special Hazards Nordic*



6 år på Tyco/Johnson controls

- Försäljningschef Specialsläck Norden
  - + Ansvarig för kundservice och teknisk support
- Säljare skumsläcksystem Norden



Kemiingenjör Chalmers

15 års internationell erfarenhet från kemiindustrin



Sverige - Stenungsund - Mölndal



+46 704 54 67 88

Viktoria.weding@jci.com



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”Smart buildings”?



# Smart buildings!



# Fire Suppression Products Overview by Segment

## Water



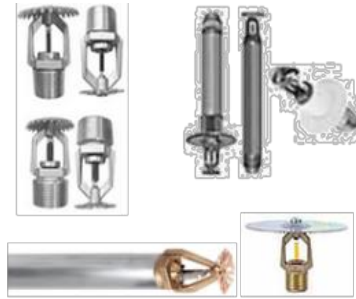
Tyco Fire Sprinkler

### Sprinklers

#### Commercial & Residential



#### Special Application & Storage



### Fire System Components



### Water Mist Systems



## Special Hazards



Ansil SAPHIRE System

### Portables



### Restaurant Systems



### Vehicle Systems



### Foam Systems



### Engineered Systems



## Special Hazards applications



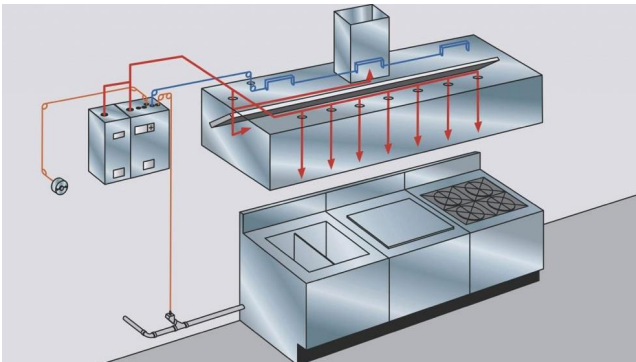
Vehicles (Mining, forestry)



Tire storages



Server rooms



Restaurant kitchens



Helidecks



Tank farms

# Introduktion till skumsläck



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# Erfarenhet av skumsläck?

WHY  
FOAM  
MATTERS?





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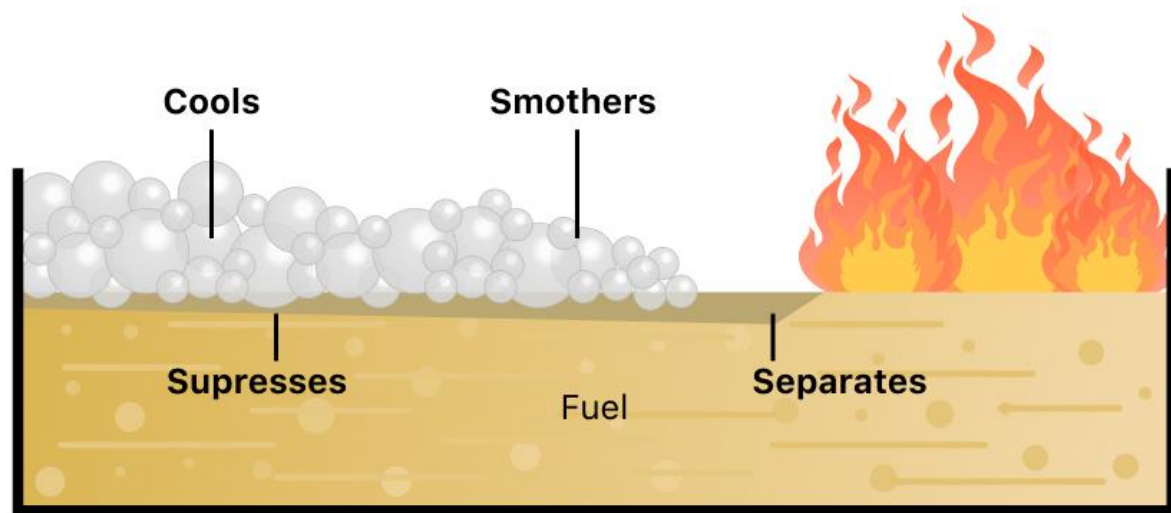
# Varför skum?

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## Hur fungerar skum?



### How AFFF Works



**När ska man  
använda  
skum?**



# Applikationer



## Typiska skumapplikationer

### ▪ Tung och mellanskum

1. B1 dysor/munstycken
2. Sprinkler
3. Tankskydd
4. Invallningsskydd
5. Kanoner
6. Utlastning/inlastning med bil, tåg och båt

### ▪ Lättskum

#### ▪ Hotfoam

1. HIEX



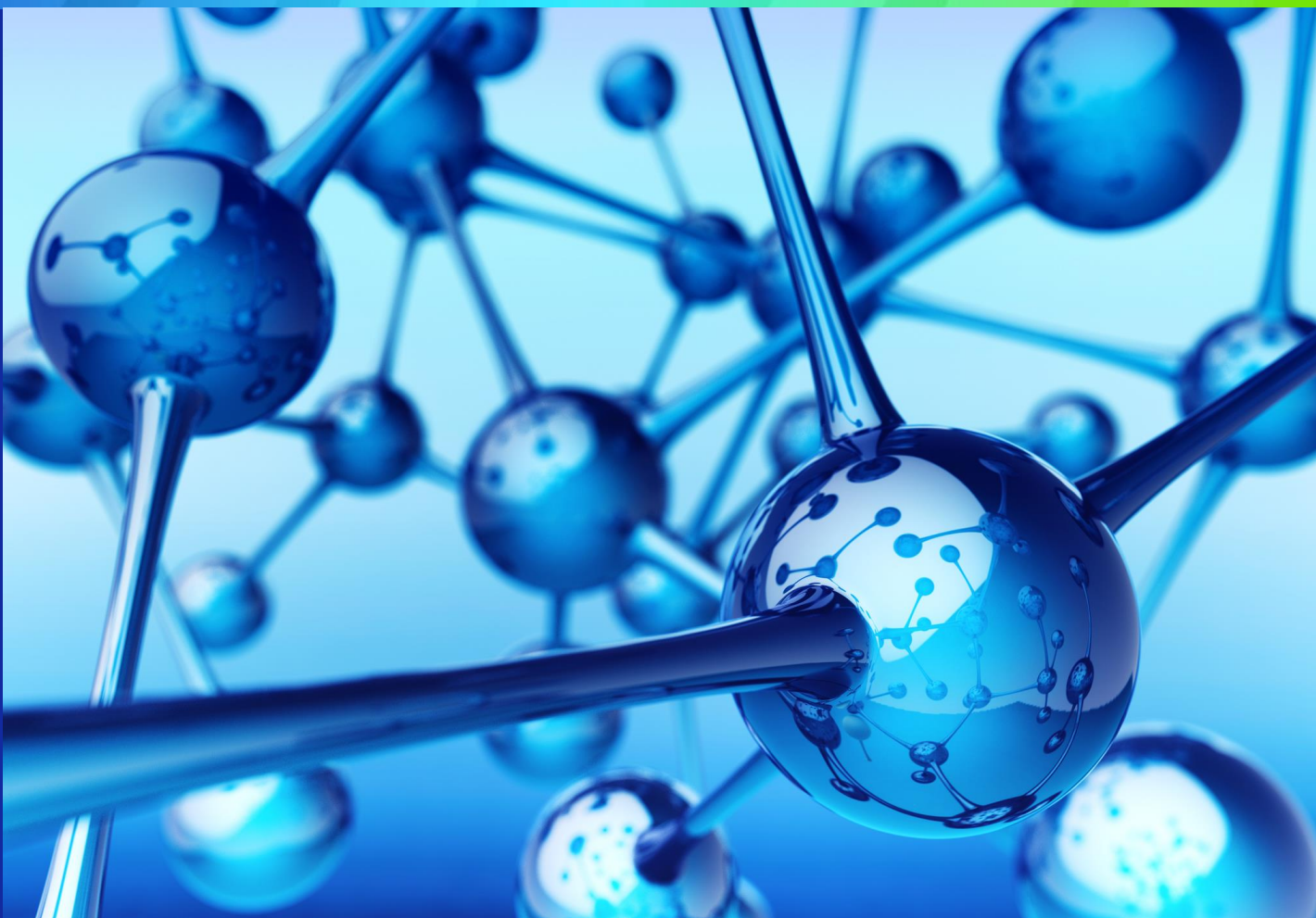


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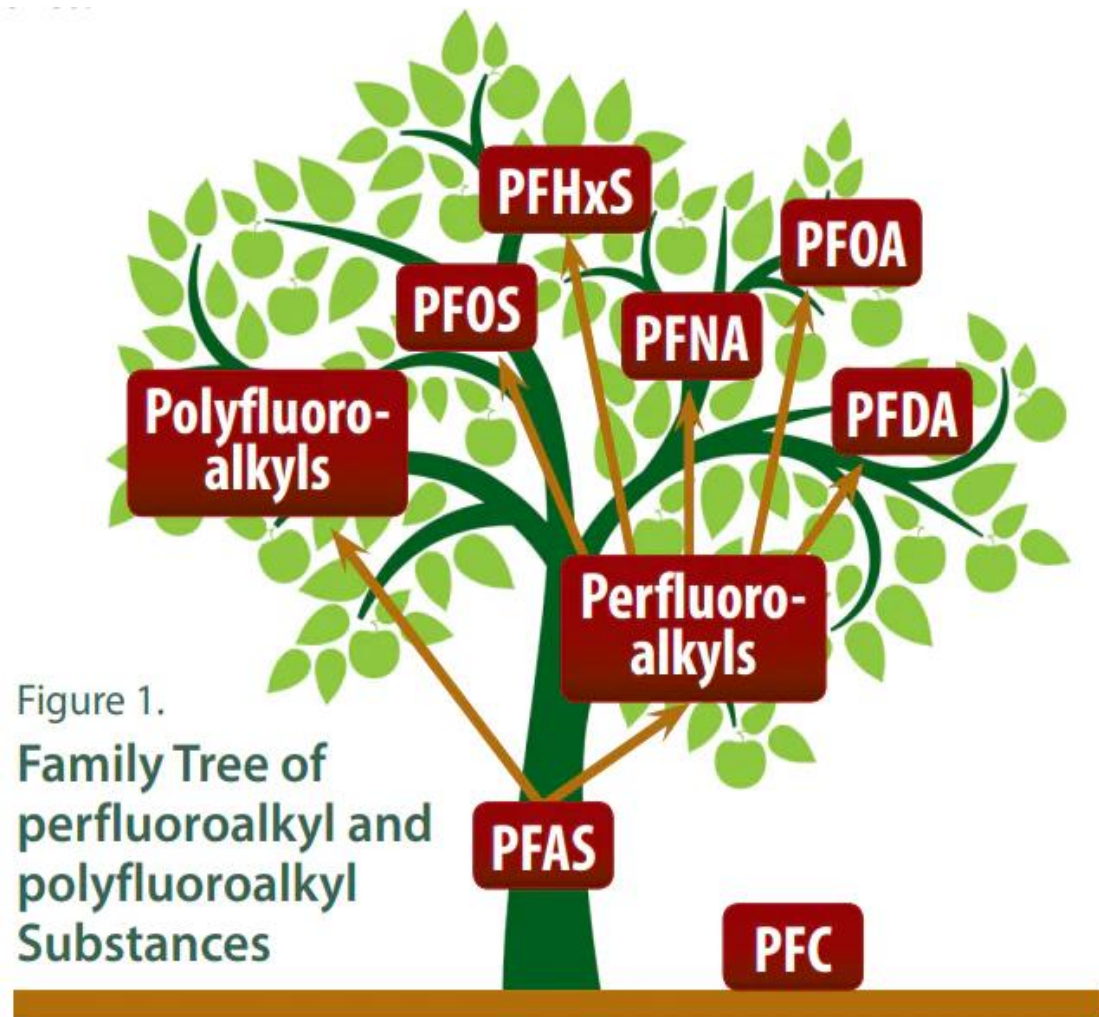
# PFAS

Per- och polyfluoroalkyl

Substanser

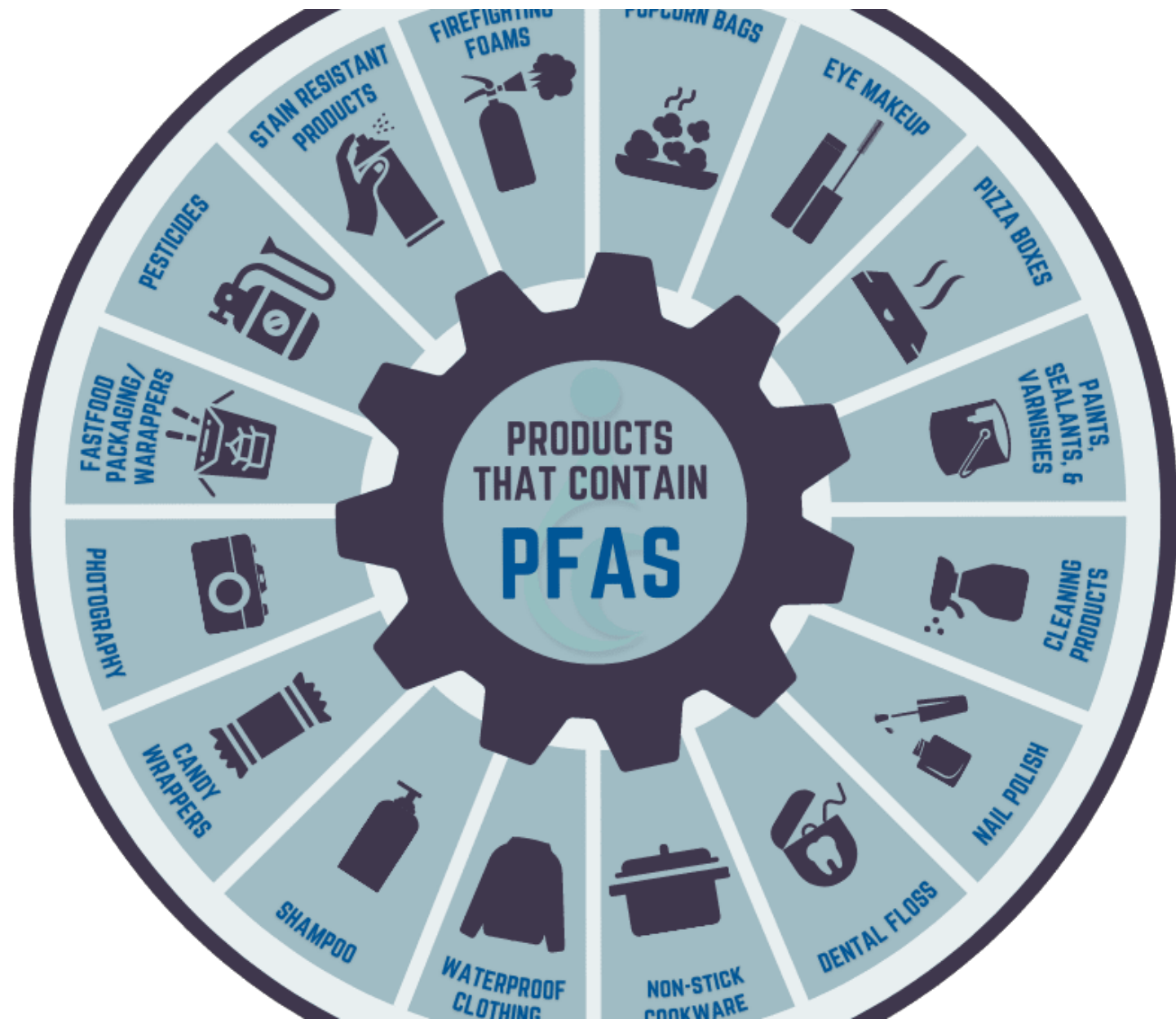


# Tiotusentals...





PFAS finns  
överallt



## PFAS i näringskedjan





## Vad gäller i Norge?

### § 8. Tilsyn.

Kongen bestemmer hvem som skal føre tilsyn med gjennomføringen av denne lov.

Tilsynsmyndigheten skal ha fri adgang til bygning, transportmiddel, lager, innretning, område m.v. hvor produkt som kan medføre virkning som nevnt i [§ 1](#), befinner seg, eller hvor forbrukertjeneste som kan medføre helseskade, tilbys.

Tilsynsmyndigheten kan også foreta nødvendig prøvetaking og kontroll med slike produkter eller utstyr m.v. som benyttes til slike forbrukertjenester.

Med mindre tungtveiende hensyn tilsier noe annet, skal tilsynsmyndigheten utferdige skriftlig rapport om resultatet av kontrollen.

Kongen kan gi forskrifter om internkontroll og internkontrollsystemer for å sikre at krav fastsatt i eller i medhold av denne lov overholdes.

0 Tilføyd ved [lov 27 juli 1990 nr. 52](#), endret ved [lover 11 juni 1993 nr. 68](#), [8 des 2000 nr. 85](#) (ikr. 1 jan 2001 iflg. [res. 8 des 2000 nr. 1234](#)).

### § 8 a. Gebyrer.

Kongen kan gi forskrift om gebyrer for behandling av søknader om tillatelser o.l. etter denne lov eller forskrift fastsatt i medhold av loven, og for kontrolltiltak som gjennomføres for å sikre at loven eller vedtak i medhold av loven blir fulgt. Gebyrene settes slik at de samlet ikke overstiger produktkontrollmyndighetenes kostnader med saksbehandlingen eller kontrollordningen.

Gebyret er tvangsgrunnlag for utlegg.

0 Tilføyd ved [lov 16 mai 1986 nr. 22](#), endret ved [lov 11 juni 1993 nr. 83](#).

## Skumapplikationer vilka påverkas av PFAS regleringen?

- Applikationer som påverkas

1. B1 dysor/munstycken
2. Sprinkler
3. Tankskydd
4. Invallningsskydd
5. Kanoner
6. Ut-/inlastning med bil, tåg och båt

- Applikationer som INTE påverkas

- Hotfoam

  1. HIEX



## Icke-fluorerat skum - att tänka på

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Flera tillverkare slutade att producera fluorerat skum (AFFF) 2023



Tekniska aspekter att ta hänsyn till



Kontamineringsrisker att ta hänsyn till



- ECHA – European Chemical Agency
- Miljødirektoratet
- Kemikalieinspektionen



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## JCI Fluorinated Foam Exit announcement – July 18<sup>th</sup> 2023



CHEMGUARD



SABO  
FOAM

WILLIAMS  
FIRE & HAZARD CONTROL

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## Tyco Fire Protection Products to exit fluorinated firefighting foam (AFFF) market by June 2024

📌 SHARE

MILWAUKEE, July 18, 2023 /PRNewswire/ -- Tyco Fire Protection Products today announced it will discontinue the production and sale of fluorinated firefighting foams by June 2024, including Aqueous Film-Forming Foam (AFFF) and related products, and will transition to non-fluorinated foam alternatives.

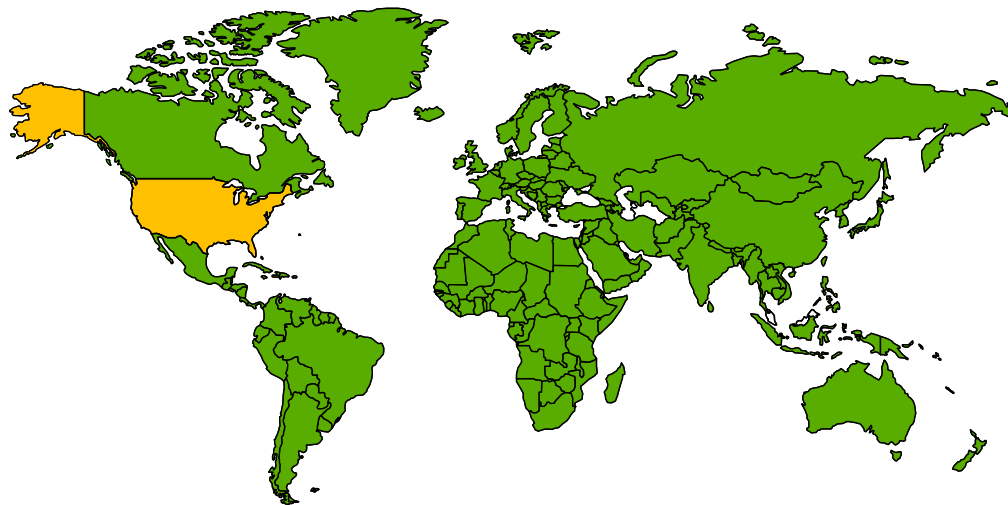
"We have long been a leader in delivering the most innovative, life-saving fire protection solutions in the industry," said Chris Eichmann, vice president and general manager, Global Fire Solutions. "Recent advances have allowed us to create a portfolio of new, non-fluorinated firefighting foam solutions that are effective against a range of fire conditions. Today's announcement reinforces our commitment to move toward more sustainable, effective solutions for our customers and the communities that we protect."



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# Framtidens (*nutidens*) skumssystem

# Globalt fokus på PFAS



- Most active regions around Fluorinated substances regulation work
- Ratifying countries of Stockholm Convention / POP regulation also covering so far PFOS, PFOA, PFHxS...

**KEMI**  
Kemikalieinspektionen

**Miljø-**  
direktoratet



**ECHA**  
EUROPEAN CHEMICALS AGENCY



**EPA**  
NEW ZEALAND



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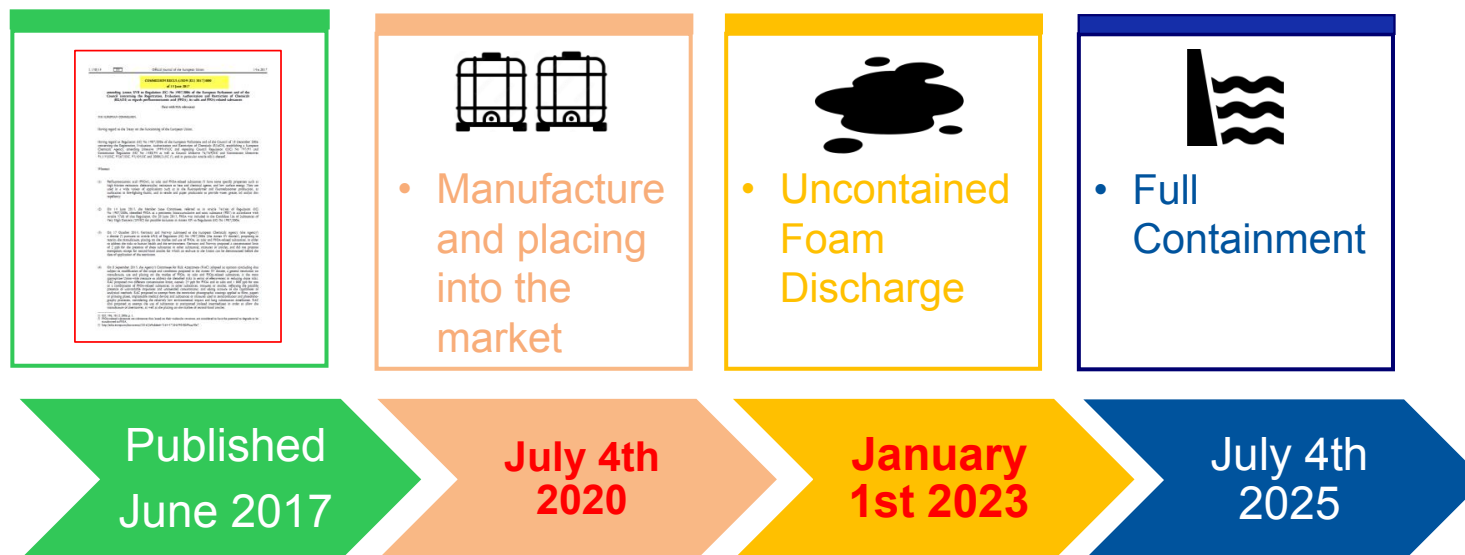
## Reglering av fluorerade substanser – Latest Update



### PFOA Published Directive June 2017

- EU 2017/1000
- EU POP 2019/1021 and also latest amendment (EU) 2020/784

All Long chain [C8] Fluorinated Foams [PFOA < 25 ppb or 25 µg/L limit]



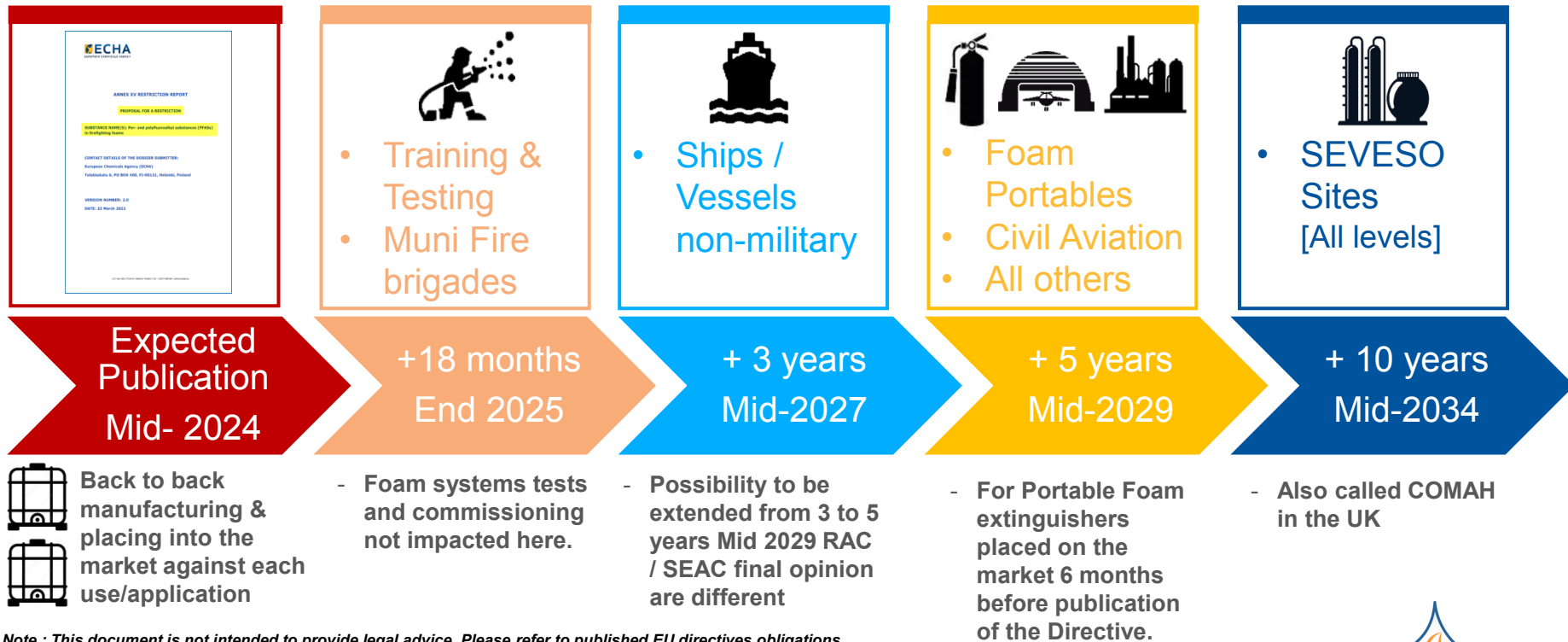
Active  
published  
Directive

Note : This document is not aimed to provide legal advise. Please refer to published EU directives obligations.

# Reglering av fluorerade substanser – ECHA example



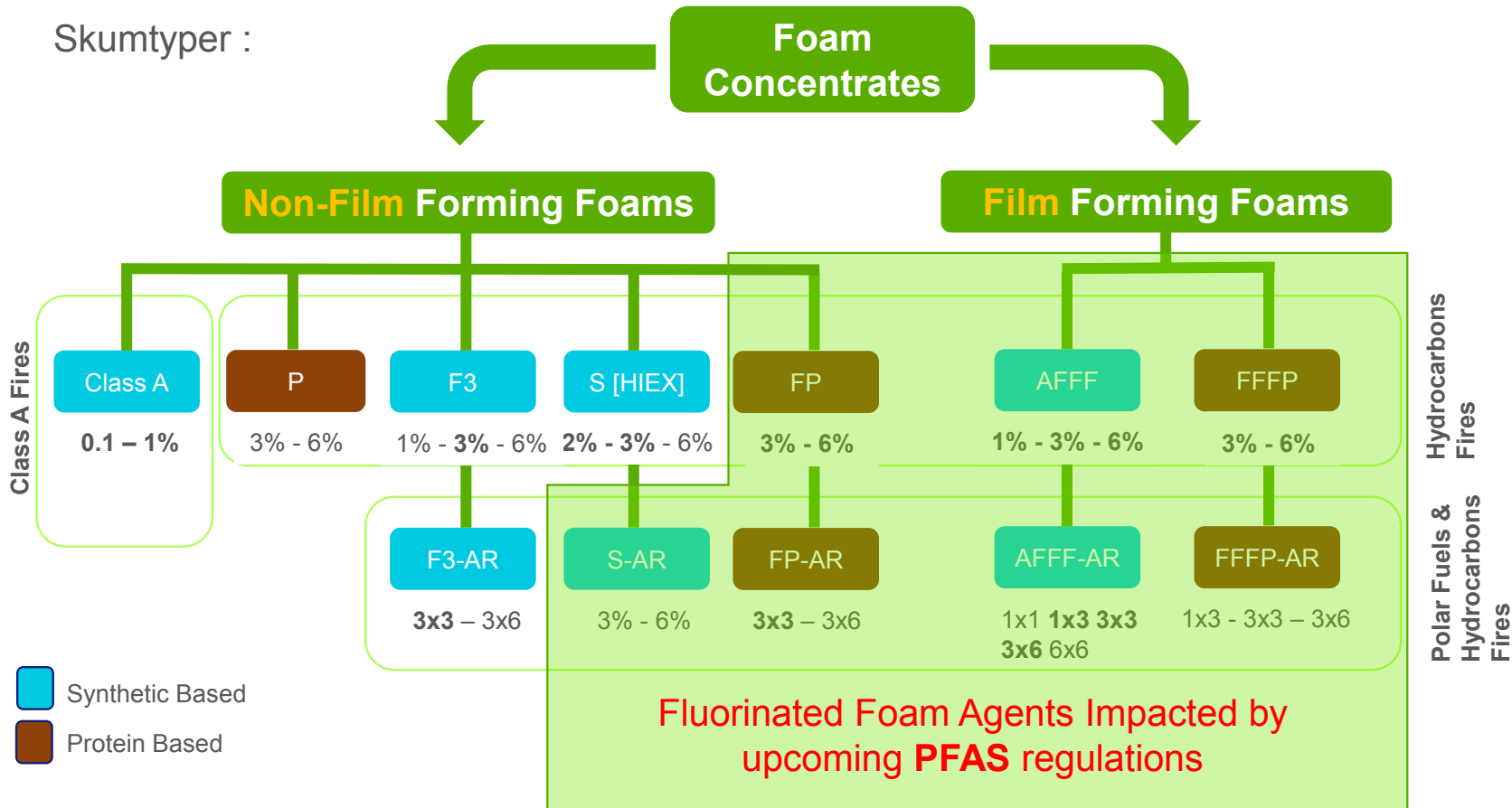
**PFAS** in Fire Fighting Foams **Draft proposal** pending for publication in EU  
All Fluorinated Foams [ **PFAS Limit Proposal < 1 ppm = 1 mg/L** ]



Note : This document is not intended to provide legal advice. Please refer to published EU directives obligations.

# Förekomst av fluorerade substanser i brandskum

Skumtyper :





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# Icke-fluorerat skum

## The Basics ...



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# Glossary – what Non-Fluorinated Foams do or don't do

There is some confusion in the industry about “**Non-Fluorinated Foams**” capabilities



- **F3 = SFFF = NFF** - Different identification within Codes & Standards: **S** category by UL, **SFFF** in NFPA and FM or **F3** in European standard and new NAVSEA MIL-PRF-32725 US Military Specification.

~~Film~~

- **NFFs foams do not form a Film** over Hydrocarbons like AFFFs to block flammable vapors



- Minimum **Foam Expansion** is mandatory for the extinguishing mechanism – Non-Air-Aspirating devices challenges like Monitors or Sprinklers



- Typical **Higher Viscosity** products due to formulations to achieve approaching performance to AFFFs



- NFFs listed **Application rates can be up to 100% or even higher** than AFFFs or AR-AFFFs ones



- NFFs are **not step-in (or drop-in) replacement products** to AR-AFFFs or AFFFs and may require partial or complete systems re-design



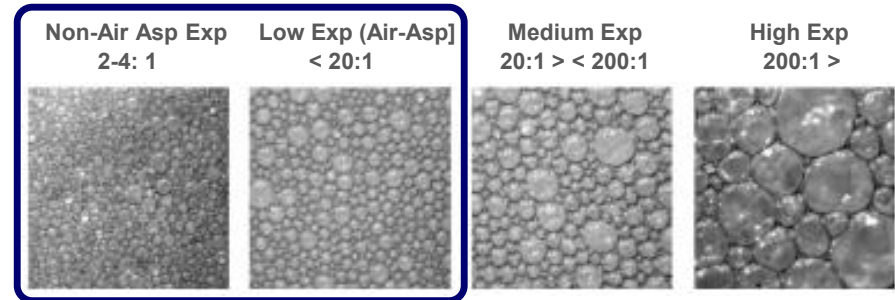
- Most NFFs are **not compatible with Dry Chemical Powders** (purposely omitted in TDs ?)



- Many NFFs are only suitable for Fresh Water use

# E.V.A.

## Expansion ratio



Mobile



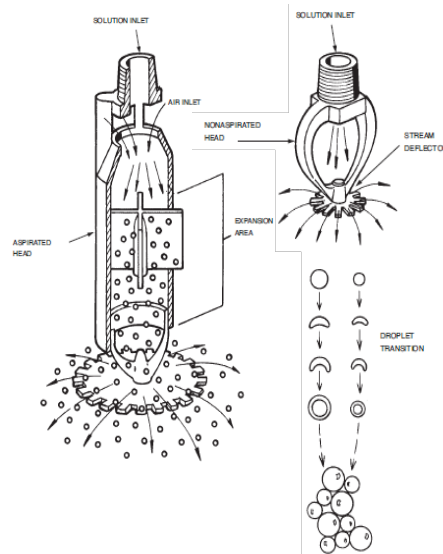
Fixed



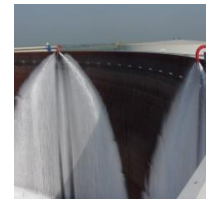
# E.V.A.

## Expansion ratio

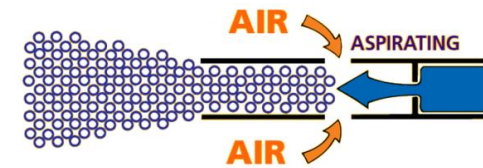
**Air-Aspirating**  
vs  
**Non-Air-Aspirating**



B1 Nozzle Sprinkler

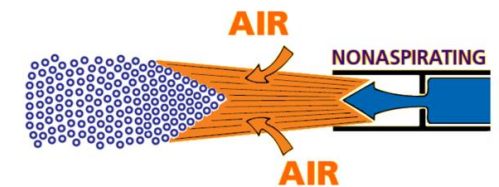


### AIR-ASPIRATING



Typical Expansion :  
**Anything below 20:1**  
[Per NFPA definition]

### NON-AIR-ASPIRATING

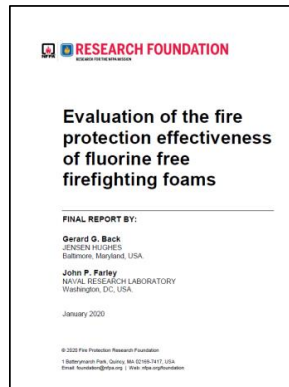


Typical Expansion :  
**Between 2 to 4:1**  
[No official NFPA definition as  
included into Low Expansion  
definition < 20:1]

# E.V.A.

## Expansion ratio

NFFs minimum  
Foams Expansion  
challenges



→ Is Foam Expansion Ratio an important Technical criteria for Non-Fluorinated Foams ?  
Independent Industry extended testing campaign [NFFPA Research Foundation] suggests that an increase of Foam expansion ratio from 7:1 up to 10:1 may be needed for many NFF to perform properly.

→ Is my Hardware able to handle these new NFF agents ?

Awareness of **NFF Agent expansion ratio bracketing** is critical to understand if on-site existing equipment can meet the minimum needed foam expansion ratio to maintain fire performance

... If not, cost to adapt could be really substantial !

### Typical Low Expansion ratios for discharge devices:

Foam Chambers, Foam Pourers	2:1 to 6:1
Monitor nozzles (non-Air Aspirating)	2:1 to 4:1
Sprinklers	2:1 to 4:1
Foam nozzles (Air aspirating)	6:1 to 12:1



# E.V.A.

## Expansion ratio



CEN TC 191 WG3  
EN1568:2018  
ONGOING  
REVISION WORK

Preparing EN1568:2018 revision for 2024

- **Minimum F3 Expansion**
- Minor adjustment on last revision tolerances

WG3 Group research and testing.  
Impact on Foam Expansion for an NFFs.  
Well known product totally failed  
extinguishing when lowering the Foam  
Expansion from 8:1 down to 3:1

Proposed Test method



Foam	Fuel	Proportioning rate [%]	Expansion ratio	Application rate [lpm/m2]	Application type	90% control time	100% extinguishment time
F3-AR	Naphta	3%	8	6	direct	54	58
F3-AR	Naphta	3%	6.5	6	direct	150	180
F3-AR	Naphta	3%	3.1	6	direct	fail	fail

↑ 0.15 gpm/ft<sup>2</sup>



Expansion / Fire performance already in place for  
Decades within UL-162 but not a Public data

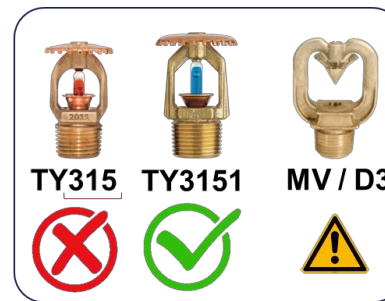
# E.V.A.

## Expansion ratio

Discharge device  
NFF Expansion  
compatibility

### Foam Discharge Devices

 <p>Foam Chambers [Type II devices]</p>	 <p>Dike &amp; Floating Roof Pourers [Type II devices]</p>	 <p>Foam Water Sprinkler [Air Aspirating]</p>
 <p>Sprinklers K 5.6 / 80</p>	 <p>Sprinklers K 8.0 / 115</p>	 <p>Sprinklers K 11.2 / 160</p>
 <p>Monitors Air Aspirating [Type III devices]</p>	 <p>Non-Air Aspirating Monitors and nozzles [Type III devices]</p>	 <p>Foam branchpipe or Nozzles [Type III devices]</p>



**Expansion** requirement  
directly referring to the  
discharge equipment  
**COMPATIBILITY** to be used  
with the selected NFF Foam

# E.V.A.

## Expansion ratio

Another untold impact from higher Expansion requirements for some NFFs products



What industry testing suggests on the Expansion issue of NFF / SFFF Foams:



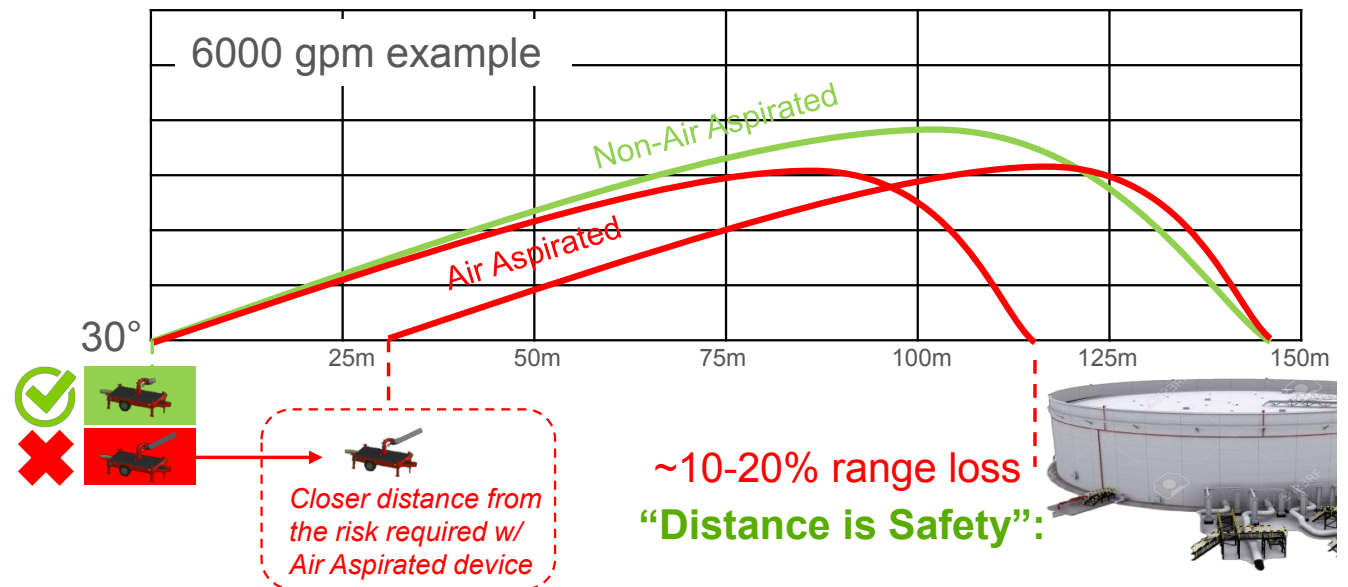
**NFPA 11**

Standard for Low-, Medium-, and High-Expansion Foam

Annex H **informative only**



...Non-Air Aspirated SFFF vs Air Aspirated usable SFFF Impact on Monitor range :

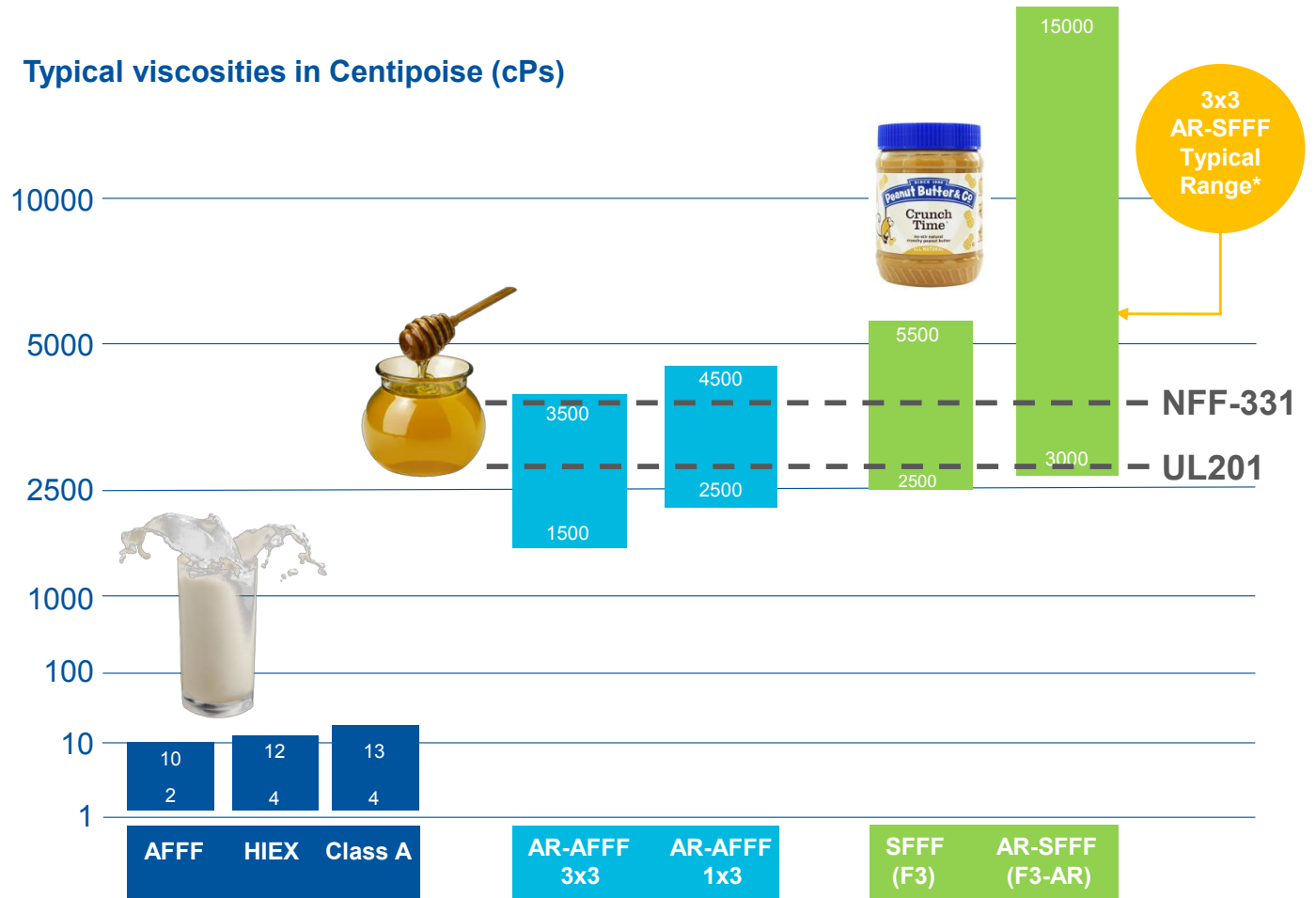


# E.V.A.

## Viscosity

Typical Foam  
Viscosities outlook

Typical viscosities in Centipoise (cPs)

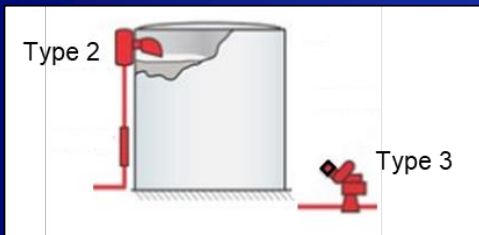


\* Referring to High EN performance 3x3 AR-NFF

# E.V.A.

## UL-162 test rates AFFF vs SFFF

Not tested the same way



**Table 12.1**  
Foam application and duration to burnback ignition for topside outlets

Type III

Application	Foam liquid concentrate	Fuel group	Minimum test application density, gpm/ft <sup>2</sup> (L/min/m <sup>2</sup> ) <sup>a</sup>	Time of foam application, minutes	Duration until burnback ignition, minutes	Minimum design application density, gpm/ft <sup>2</sup> (L/min/m <sup>2</sup> )
Type III, portable discharge outlets	P, FP, FFFP, SFFF ↑	Hydrocarbon	0.06 (2.5) ↑	5	15	0.16 (6.5) <sup>b</sup> ↑
Type III, portable discharge outlets	FFFP, AFFF ↑	Hydrocarbon	0.04 (1.6) →	3	9	0.10 (4.1) <sup>c</sup> →
Type II fixed discharge outlets	P, FP, FFFP, SFFF	Hydrocarbon	0.06 (2.5)	5	15	0.10 (4.1) <sup>d</sup>
Type II, fixed discharge outlets	FFFP, AFFF	Hydrocarbon	0.04 (1.6)	3	9	0.10 (4.1) <sup>c</sup>
Type II, fixed discharge outlets	P, FP, FFFP, AFFF, SFFF	Polar	0.06 (2.5)	5	15	0.10 (4.1) <sup>d</sup>

P – Protein                                  FFFP – Film Forming Fluoroprotein  
 FP – Fluoroprotein                          AFFF – Aqueous Film Forming Foam                          SFFF – Synthetic Fluorine Free Foam

<sup>a</sup> The test application density for hydrocarbons shall be the minimum as specified in the table and for polar solvents may vary as specified by the manufacturer; but, not less than the minimum. For discharge outlets, the test application density is determined by dividing the flow by the area of the test pan.  
<sup>b</sup> The design application density is 0.16 (6.5) or 2-2/3 times the test application density, whichever is greater.  
<sup>c</sup> The design application density is 0.10 (4.1) or 2-1/2 times the test application density, whichever is greater.  
<sup>d</sup> The design application density is 0.10 (4.1) or 1-2/3 times the test application density, whichever is greater.

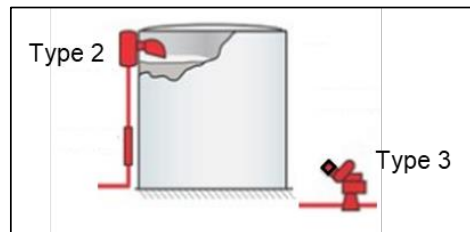
- *UL-162 evaluates NFFs (SFFF) at different tests criteria and design densities than AFFF agents.*
- *SFFFs products are Listed at design application density of 6.5 l/m<sup>2</sup>/min (0.16 gpm/ ft<sup>2</sup>) for Type III when AFFFs are listed at 4.1 l/m<sup>2</sup>/min (0.1 gpm/ ft<sup>2</sup>)*

# E.V.A.

## Application rates

Significant performance differences in Listings achievements

Application Fuels		JCI NFF 3x3 UL201 (EN 1A/1A/1B) lpm/m <sup>2</sup>	Prod. A AR-SFFF 3x3 UL (EN 1A/1A/2A) lpm/m <sup>2</sup>	Prod. B AR-SFFF 3x3 UL (EN 1A/1A/1A) lpm/m <sup>2</sup>	Prod. C AR-SFFF 3x3 UL (EN 1A/1A/1A) lpm/m <sup>2</sup>	Prod. D AR-SFFF 3x3 UL FM lpm/m <sup>2</sup>
Type III	Hydrocarbons (AFFF)	4.1				
	Hydrocarbons (Synthetic)	6.5	6.5	6.5	6.5	6.5
	Premium Gasoline	6.5				
	E15	6.9	9.0			
Type II	Hydrocarbons	4.1		4.1		4.1
	Alcohols	6.9	11.5	8.2	9.4	8.6
	Ethanol	4.1	4.1	4.1	9.4	6.5
	Ketones	6.9		8.2	9.4	8.6
	E85	6.1				



No testing

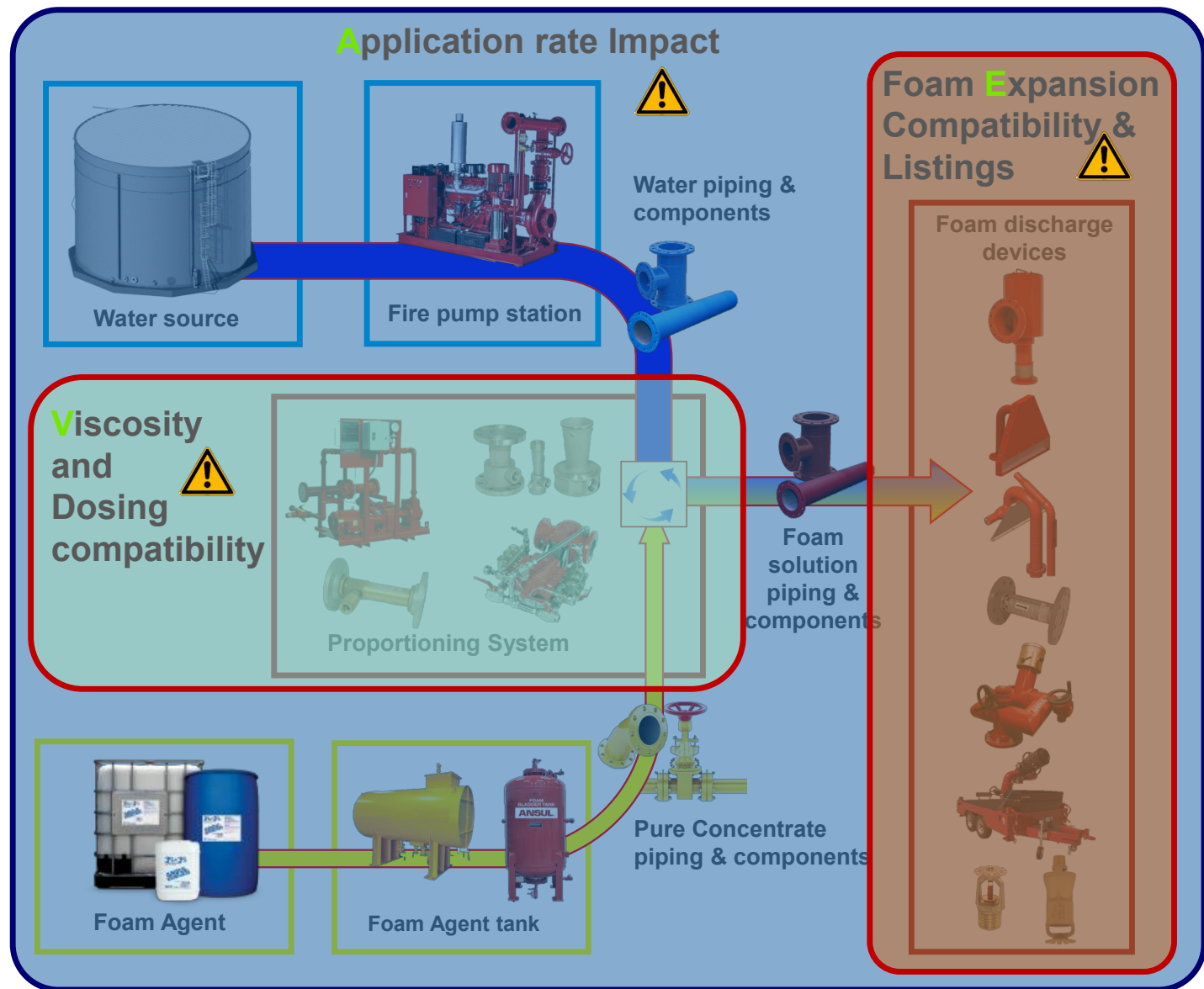
+30%  
 +66%  
 +18%  
 +18%  
 +36%  
 +230%  
 +36%  
 +24%  
 +58%  
 +24%

SFFF product performance - Public data available from [www.UL.com](http://www.UL.com) website

# E.V.A.

Impact on systems

On-Site system audit & Risk Assessment are needed









Rådet for vedlikehold  
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# Non-Fluorinated Foam\*

## Transition Solutions

\* *NFF*

# Testning – HELA systemet måste fungera tillsammans



Mix of **UL Listed**  
& Validation testing

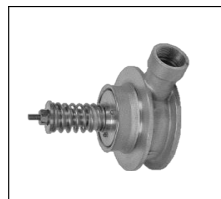
## Foam Dosing Equipment



Bladder Tanks



RFC Proportioners



Wide Range Proportioners



TP MK2 Proportioners



ILBP Pump Proportioners



Wide Range MK3 Pump Proportioners



PP MK2 Pump Proportioners



Foam Pump



PL In-line Inductors



ZF In-line Inductors



Self Inducting Foam Nozzle



FireDos Units Gen 2 & Gen 3

## Foam Discharge Devices



AFC Foam Chambers



FLR Dike & Floating Roof Pourers



OFG Foam Chambers



MRM Medium Expansion



Sprinklers K 5.6 - 8.0 - 11.2



B1 Foam Water Sprinkler



TF Foam Nozzles



MLB Foam pourer



AOM & AFN Monitors



FJM Monitors



[Type 3] Foam branchpipe









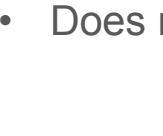


Non-Asp. Foam Nozzle Self Ind.



Rådet for vedlikehold av brannsløkkemateriell

# Utmaningar för branschen

*Alternatives offering to Fluorinated foams as of today is limited on a number of legacy applications*

Market	Foam Standard	Fluorinated vs Non-Fluorinated	Concentration of use							Transition scoring
			1%	3%	6%	1x1	1x3	3x3	3x6	
	IMO 1312	Fluorinated	Green	Green	Green	Green	White	Green	Green	1 / 6
		Non-Fluorinated	Red	Red	Red	Red	White	Green	Red	
	US Coast Guard	Fluorinated	White	White	White	White	White	Green	White	0 / 1
		Non-Fluorinated	White	White	White	White	White	Red	White	
	ICAO B	Fluorinated	Green	Green	Green	Green	White	Green	Green	3-5 / 6
		Non-Fluorinated	Yellow 3	Green	Green	Red	White	Green	Yellow 3	
	ICAO C	Fluorinated	White	White	White	White	White	White	Green	3 / 3
		Non-Fluorinated	White	Yellow 3	Yellow 1	White	White	White	Yellow 1	
	MIL-SPEC	Fluorinated	White	White	White	White	White	Green	White	1 / 1
		Non-Fluorinated	White	White	White	White	White	Yellow 1	White	
	EN1568	Fluorinated	Green	Green	Green	Green	Green	Green	Green	3-6 / 7
		Non-Fluorinated	Yellow 3	Green	Yellow 1	Red	Yellow 3	Green	Green	
	UL-162	Fluorinated	Green	Green	Green	Green	Green	Green	Green	2-4 / 7
		Non-Fluorinated	Red	Green	Yellow 2	Red	Red	Green	Yellow 1	
	UL	Fluorinated	Green	Green	Green	Green	White	Green	Green	2 / 6
		Non-Fluorinated	Red	Yellow 2	Red	Red	White	Yellow 3	Red	
	FM	Fluorinated	Green	Green	Green	Green	White	Green	Green	2 / 6
		Non-Fluorinated	Red	Yellow 2	Red	Red	White	Yellow 1	Red	

- No Newtonian AR-SFFFs (F3-AR)
- Very limited alternatives
- Does not take into account E.V.A. requirements

- No alternative offering
- Limited offering [Qty]
- Over 5-6 products available



Rådet for vedlikehold  
av brannsløkkemateriell

# Foam transition guideline

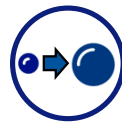


# Foam Transition Guidelines

NFFs transition  
CRITICAL GOALS

## Mission critical :

### Ensure System compatibility with the NFF



**Agent / Foam solution Expansion**  
**Hardware compatibility**



**Agent Viscosity**  
**Dosing system compatibility**



### Maintain system Fire performance



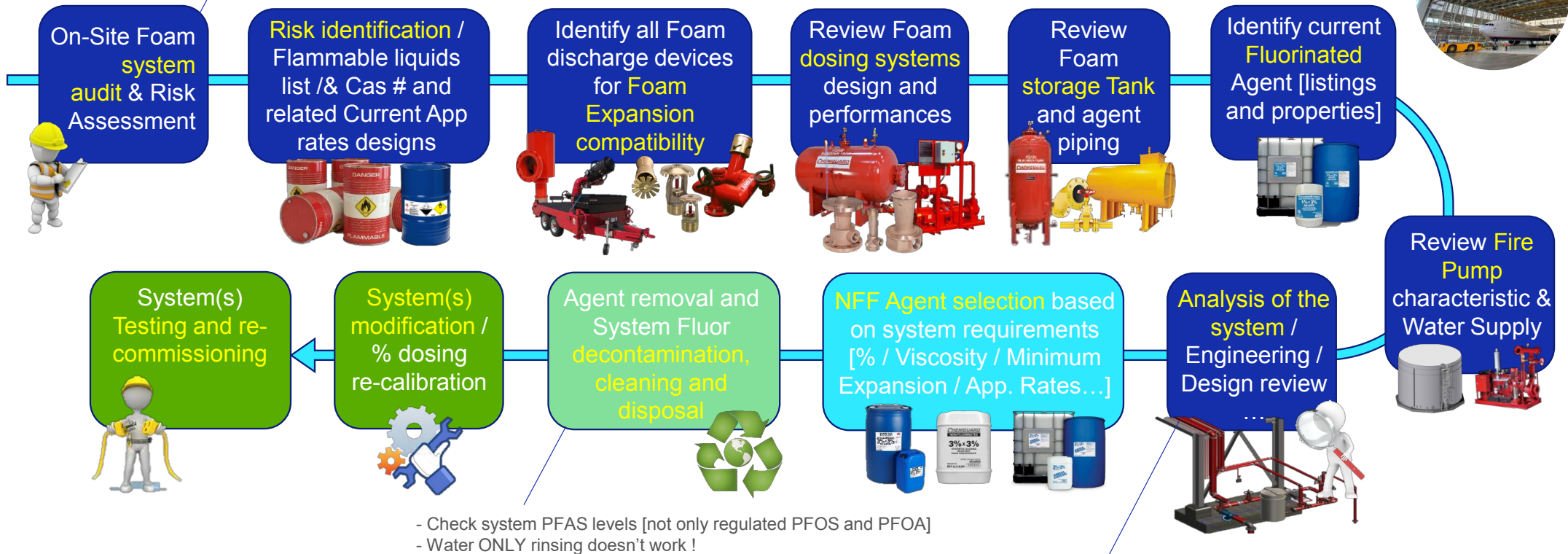
**Agent Application rates**  
**Fuel risks**



# Guideline for systems Transition from AFFFs to SFFFs



Check system PFAS contamination levels



- Check system PFAS levels [not only regulated PFOS and PFOA]
- Water ONLY rinsing doesn't work !

This is our guideline, but End users or local authorities may have different requirements.

Discuss with local Authorities acceptable PFAS trace levels [no regulation on Max PFAS limit yet in place published] Current ECHA proposal is set for 1 ppm [1 mg/Ltr]

# Foam Transition Guidelines

Hur ser det ut nu och vad behövs?

Company name									<input type="checkbox"/> areas to be filled in		
Site location / Address											
Contact Person for the project											
Area /Building name											
Fire system build year											
Risk[s]	Flammable Liquid[s] name[s] or Fire Risk	CAS Number #	Minimum App. Rate Req. NFF-XXX Type II	Minimum App. Rate Req. NFF-XXX Type III	Picture of the protected area / risk				Technical Data Sheet Insert as Objects [if available]		
									SDSs for special products		
	Other relevant information										
Foam System details	Foam system description										
	Design standard [NFA-11 / EN 13565-2 ...]										
	System Area density [L/min/m <sup>2</sup> ]										
	System Pressure										
Water Quality / Type											
Foam Concentrate [current]	Commercial name	Foam Type	%	Manufacturer	Foam Qty	Manufacturing Year	C/B/C? [if known]	Approvals	Foam Agent		
	Other relevant information										
Foam Concentrate Storage details	Tank type	Relevant pictures of the equipment or installation							Foam tank		
	Manufacturer name										
	Capacity [Liter]										
	Type [Horiz / Vert]										
Foam Proportioning System details	Material of Construction										
	Proportioning system type										
	Manufacturer name										
	Model										
	Diameter Ø										
	Concentration setting [%]										
	Flow rate / Flow range [l/min]										
Pressure setting [bar]											
System flow rate/range demand [l/min]											
Other relevant information											
Foam discharge devices / equipment details	Area name	Type of discharge device[s]	Manufacturer name	Model	Sprinkler SIN N°	K Factor	System Calc. Pressure [Bar]	Coverage [m <sup>2</sup> ]	Connection size	Discharge devices	
			Sprinkler								
			Sprinkler								
			Sprinkler								
			Sprinkler								
			Sprinkler								
			Sprinkler								
Relevant pictures of the equipment or installation											
Other relevant information											

**Tusen takk!**

+46 704 54 67 88 cell

[viktorja.weding@jci.com](mailto:viktorja.weding@jci.com)

