



## LIFE WITHOUT AFFF (PFAS)

Per-and polyfluoroalkyl substances (**PFAS**) are the active ingredients in AFFF and AR-AFFF foams and are known to be forever chemicals. Some PFAS compounds have been linked to human health complications.

PFAS compounds are not used to produce class A foams, wetting agents or hi-expansion foams.

Two 1960-90's PFAS compounds, PFOS and PFOA have been linked to cancer and have not been manufactured or permitted in goods produced in the United States since the turn of the 21<sup>st</sup> Century.

National Foam have never used biopersistent PFOS/PFOA compounds in AFFF or fluoroprotein foam formulations. Instead, they use similar non-biopersistent film forming PFAS component. Although non-biopersistent, they can be environmentally persistent and fall into the range of forever chemicals being regulated by many state and local governments. The U.S. Government is likely to make similar prohibitions in military specification and FAA fire foam formulations in the coming year.

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## Fluorine Free Foams Impacts On Fire Department Users

With AFFF's, the heavy lifting, in terms of firefighting is done by water film forming chemicals, fluorosurfactants a.k.a. PFAS. Modern (2015) C6 fluorosurfactants are quite fuel tolerant and is why they allow sub-surface injection or plunging, U.L. Type III application techniques on hydrocarbon fuels both on thin spills and storage tank fires. Not so for foam destructive alcohol or polar solvent fuels. Alcohol resistant AR-AFFF's have always required gentle, U.L. Type II, aerated application techniques on alcohols and gasoline/ethanol blends.



(Hydrocarbon fuels: gasoline, diesel, home fuel oil, crude, heptane, vegetable oils, etc.)

Fluorine free replacements known as F3's or Synthetic Fluorine Free Foams, (SFFF's / AR-SFFF's) must do their work with shaving cream-like lather rather than film forming action on hydrocarbon fuels. They are not as fuel tolerant and may require a more gentle (U.L. Type II), aerated application technique as with alcohol firefighting use with AR-AFFFs. Although Universal F<sup>3</sup> Green and Muni F<sup>3</sup> Green Plus are U.L. Listed on gasoline/ethanol blends using U.L. Type III, plunging techniques.

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## Fluorine Free Foams Impacts On Fire Department Users

Elimination of PFAS have reduced foam solution application rates while in NF's case, improving residence time.

Ignited liquid fuels evaporate water in foam as its applied and must be applied at a rate greater than its consumed. Application rates (density) are measured in gallons per minute (solution) per square foot of fire.

With AFFFs on hydrocarbon fuel fires, U.L. Type III rate is 0.10 gpm sq./ft. for spill fires and 0.16 for fuel in depth. Alcohol application (polar solvent) rates vary with the destructive power of various solvents. F3's or SFFF's hydrocarbon application rate is 0.16 for both spill and storage tank fires and as much as 0.28 for the most foam destructive polar solvents.



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## Fluorine Free Foams Impact On Fire Department Users

Flammable liquids burn quite fast. Gasoline will go at about 1/8" (3 mm) in a minute; diesel not much longer. In eight minutes most of a one-inch spill is consumed, leaving burning class A wreckage to contend with for a much longer time. In the case of a tanker crash, there are eighteen, 300 lb. tires and about 5000 pounds of fiberglass and upholstery left to burn for an hour or so.

Most municipal firefighters see in their mind's eye a raging pooled fire on the road. The fact is, liquid fuels will go where rain goes and isn't likely to stay in one place as is the case when U.L. do their static pan fire tests. U.L. and Mil. Spec. fire tests are on impounded fuel floating on water, Not a likely event for fire department people. Particularly when it comes to U.L. listed Wetting Agents that MUST have impounded fuel to mix with the detergents used in such products. Once soaked into the earth wetting agents are, in my experience, useless.

Fuel is likely to pool in narrow ditches or gouges made by the violence of the moving mass. Very often fuel is soaked into the earth and creates a slower candle-like (catalytic) fire where surface AFFF film forming is useless ... shaving cream lather is the better agent. AFFF's are not at all well suited for such missions and is why Universal Gold is so effective when aerated at safety capping a spill. Gold's best in class residence time (quarter life) is 18 to 23 minutes per application.

The longer the safety cap hold vapor down the better, particularly for those doing crash rescue or recoveries. In this regard pulling PFAS from Universal Gold was beneficial. Universal F<sup>3</sup> Green 3% and to a lesser extent Muni F<sup>3</sup> Green Plus 3% are quite valuable at un-ignited spill events. Residence time for Universal F<sup>3</sup> Green 3% is approaching five hours and for Muni Green Plus it is closer to an hour and a half when aerated +/-10:1 expansion using fresh water. See how to test yours on next page.

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NF Factory Reps Since 1988

Cottrell's 1/4 life "Bottle Shake Test" - Close enough for comparison purposes. 1/6/14

Using water and a lab. graduate, mark a 1000 ml. water bottle at 25, 100, 500 and 750 ml. Using a medication syringe or eyedropper add 3 ml. of foam concentrate, then add water to the 100 ml. line. You have now made a 3% solution. AFFF will disperse instantly. AR-AFFF will not, due to its sirup or gel-like alcohol resistant polymer. It will need to be swirled till 3 ml. of concentrate in the bottom has dissolved.

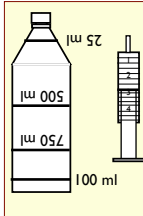
Note: If the eyedropper lifts AR-AFFF foam, so will a foam educator. All National Foam products are UL listed for use with foam educators. NOTE: frothy foam tank samples may test lean.

Once dissolved, shake the bottle vigorously for at least twenty seconds; turn the bottle on its cap and start the clock. Lightly tap the capped end on the table or desk and record the expansion ratio. If the foam sample has filled the bottle, you have achieved a 10:1 expansion ratio. Just about what a low expansion foam nozzle or nozzle attachment will achieve. If it goes to 750 you are at 7.5:1 expansion and so on. Record the expansion ratio, water source and its temperature, as water temperature and its clarity may have an effect on the test result. Salt water may cut drain time by 40 - 50%.

When 25 ml. of liquid has accumulated at the capped end, stop the clock; the foam has reached its quarter life. At this point the foam has lost 25% of its vapor suppression ability, which means it's about time for reapplication. Airport foam (regular AFFF) will go in less than five minutes. Universal Gold should go 19-23 minutes @ 3% depending the water source and how accurately you measured the foam concentrate sample. At 6% it will go 45 to 50 minutes. The longer the better as this quarter life business is what that determines foam replacement cost and how much waste needs to be cleaned up.

Let the sample continue to drain. When it's all drained you will still have foam in the bottle, which was almost useless minutes after you reach quarter life.

Re-shake the bottle for twenty seconds and put a dollop of finished foam on some acetone or denatured alcohol. If it disappears as fast as you apply it, it's not alcohol resistant.



Test your foam and system: Take concentrate sample from your engine's foam tank and the water from its booster tank. Do the 3% bottle shake and record the time.

Run your foam system for twenty seconds, capture a solution sample from a hose coupling and put 100 ml. into another bottle, shake it, and compare the times. If the system sample is faster, it's lean. If it's slower, it's rich. You can be 1% rich, no lean.



Foam Lines Sept. 2012 - edited 1.6.14 ©Cottrell Associates, Inc. combatsupportproducts.com page 3



Longer residence time (¼ life) reduces foam use cost because fewer applications use less concentrate and water. Both have impact on environmental consequences of using fire foam at crash scenes or spills.

The best 1-3 % AR-AFFF has 19-23 minute ¼ life.

Universal F3 Green 3% goes 150-300 minutes.

Reapply foam blanket when detector indicates vapor presence or when fuel odor returns.

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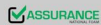


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NF Factory Reps Since 1988

### NF's Fluorine Free, Mil. Spec Replacement

Avio F3 Green KHC 3%  
\$36.66/gal - \$183.30 Pail list  
p/n 2193-3340-0

free freight on \$3500 orders



Avio<sup>3</sup> Green KHC 3%  
Fluorine Free (FF) Foam Concentrate  
NFCS15

Avio Green  
ICAO Level 1C Film-Forming Fluorine Free Foam

Available in 6% Concentration

Replacement Aero-O-Water 3EM ICAO Level 1C Pending FAA and USN Jet Fuel and Aviation Gasoline approval.



Soon to be FAA mandated

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### NF's Range Of Fluorine Free AFFF Replacements

Universal F3 Green 3%-3%  
NFPA 11 / U.L. GFGV

Alcohols, gasoline/ethanol approvals including diesel, home fuel oil, kerosene.

Muni F3 Green Plus 3%  
NFPA 11 / U.L. GFGV

Gasoline/ethanol blends approval include diesel, home fuel oil, kerosene.

Muni F3 Green 3%  
NFPA 11 / U.L. GFGV

No alcohol or ethanol/gasoline approval. Hydrocarbon use only: diesel, home fuel oil, kerosene.

Product page for Universal F3 Green 3%-3% with a yellow callout: 'Consider it a F3, Universal Gold Replacement No 1% 2.5 hr residence time (¼ life)'. Includes GreenScreen Certified logo.

Product page for Muni F3 Green Plus 3% with a yellow callout: 'Consider it a F3, Centurion 3 x 3 Replacement 1.5 hr residence time (¼ life)'. Includes GreenScreen Certified logo.

Product page for Muni F3 Green 3% with a yellow callout: 'A foaming, wetting agent competitor 30 min. residence time (¼ life)'. Includes GreenScreen Certified logo.

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### NF's Range Of Fluorine Free Class A/B Foams And Wetting Agents

KNOCKDOWN Class A/B Foam / Wetting Agent

Responder Class A/B Foam

Product page for KNOCKDOWN Class A/B Foam with a yellow callout: 'Competes in high end class A and B wetting agent market. Is a U.L. Class B Wetting Agent. NFPA 11 - 1.5 - 1.10 U.S.A. Forest Service Approved. AFFF ratings appropriate at 1:1 Dilute. Competes in Wetting Products: F-500, FireAid, FAK500, Airofool, Colobac, M-100, etc. Colobac Out'. Includes U.S. Forest Service logo.

Product page for Responder Class A/B Foam with a yellow callout: 'Competes in low price Class A market. No U.L. or Forest Service Approval. AFFF ratings appropriate at 1:1 Dilute. Although not UL listed it is a capable class B wetting agent'. Includes GreenScreen Certified logo.

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## NFPA 18 A/B Wetting Agent

U.L. 162 GOHR Test Protocol Wetting Agents.  
No Alcohol or Gasoline/Ethanol Approval

- BIO EX SAS (Tempast - Leader)**
- ColdFire (Fire Freeze Int.)**
- Deep Attack (Chemguard)**
- Fire Ade (Fire Service Plus)**
- FireBull Fire Ade (Fire Service Plus)**
- FireCap Plus (Fire Suppression Products)**
- F-500 (Hazard Control Technologies)**
- KNOCKDOWN (National Foam)**
- Micro-Blazeout (Verde Environmental)**
- Novacoal (Baums Castorine)**
- PhosCheck WD881 (Perimeter Solutions)**

- All manner of marketing claims, from use on A, B, D, K fires and alcohols too! The fact remains that Underwriters Laboratory makes no mention of other than A & B fires and specifically, no alcohol.
- When fire goes away so does heat and smoke.
- When water, which is 99.5% of the applied agent evaporates, it refrigerates ... earth science 101. So much for cool or cold in a name...
- A five part dilute of KoolAde will extinguish an ethanol fire if allowed to fully mix in a pan.



## What Is Green Screen Certification



### Standard for Firefighting Foam:

Class B Foam Concentrates and Class A&B Wetting Agents

**GreenScreen Certified™** is an independent, non-profit certification that promotes the use of inherently safer chemicals in products and manufacturing.

**GreenScreen Certified™** firefighting foam products are PFAS-free\* and avoid other regrettable chemicals of high concern to people and planet.

\*PFAS-free is defined as less than 1 part per million (ppm) total organic fluorine as measured by combustion-ion chromatography.



## Restricted Substances

TABLE 2: **GreenScreen Certified Firefighting Foam Restricted Substances List**

CHEMICAL GROUP	CHEMICAL NAME	CASRN	IMPURITY THRESHOLD
Alkylphenols & Alkylphenol Ethoxylates	All chemical compounds meeting the definition of alkylphenol or alkylphenol ethoxylate and containing one or more alkyl chains with a carbon chain length of six carbons or more are restricted in certified products, including but not limited to the list of chemicals in Annex 1.	Various; see Annex I for reference list	0.01% by weight (100 ppm)
Organohalogens	All chemical compounds meeting the definition of organohalogen are restricted in certified products.	Various	0.01% by weight (100 ppm)
Perfluoroalkyl and polyfluoroalkyl Substances (PFASs) <sup>10</sup>	See the OECD list of PFAS substances. <sup>13</sup>	Various	0.0001 % by weight (1 ppm) total organic fluorine <sup>14</sup>
Siloxanes: Cyclic Volatile Methyl Siloxanes	Octamethylcyclotetrasiloxane (D4)	556-67-2	0.01% by weight (100 ppm)
	Decamethylcyclopentasiloxane (D5)	541-02-6	
	Dodecamethylcyclohexasiloxane (D6)	540-97-6	
	Mixtures containing one or more of the above	Various	
Zero Discharge of Hazardous Chemicals Manufacturing Restricted Substances List	ZDHC MRSL V2.0 <sup>15</sup>	Various; see reference	Varies; See reference



# Universal<sup>®F3</sup> Green 3%-3%

Alcohol Resistant Synthetic  
NFC510



- ✔ Superior fluorine free, alcohol resistant synthetic formulation to extinguish both hydrocarbon and polar solvent fires.
- ✔ GreenScreen certified.
- ✔ Formulated without intentionally added (PFAS), (PFOA), fluorosurfactants, fluoropolymers or organohalogens.
- ✔ Lower viscosity than some fluorine free foams to ensure easy induction.
- ✔ Synthetic Fluorine Free Foam (SFFF) and Fluorine Free Foam (F3)
- ✔ 3% induction on both hydrocarbon and polar solvent risks.
- ✔ Specifically designed for high hazard facilities and chemical manufacturing facilities.
- ✔ 100% Biodegradable.



Universal<sup>®F3</sup> Green 3%-3% is a superior quality 3% synthetic fluorine free (FF) foam concentrate, designed for extinguishing and securing all types of flammable liquid fires and Class A incidents. Universal<sup>®F3</sup> Green 3%-3% has been designed specifically for general emergency responders who are faced with a variety of risks in a range of situations.

Universal<sup>®F3</sup> Green 3%-3% is a patented combination of surfactants and other ingredients to produce a vapor sealing blanket of foam that rapidly spreads over the surface of the fuel to provide rapid control and extinguishment.

- Unique patented formulation only available from National Foam.
- Fluorine free – can be used where traditional fluorinated products cannot be used.

### Standards and Approvals

- ✔ Underwriters Laboratories, Inc.
- ✔ Underwriters Laboratories of Canada.
- ✔ LASTFIRE - Good/Good/ Good in both fresh and seawater.
- ✔ Meets EN1568 Parts 3 and 4 on all fuels and all water types.
- ✔ NFPA 11
- ✔ NFPA 16

### Applications

Universal<sup>®F3</sup> Green 3%-3% is used in high risk situations where hydrocarbons (such as oils, gasoline, diesel fuel, and aviation kerosene) are stored, processed, or transported and/or polar solvents (such as alcohols, ketones, esters, and ethers) are stored, processed, or transported.

Universal<sup>®F3</sup> Green 3%-3% provides a vapor suppressing foam blanket on unignited hydrocarbon spills.

Universal<sup>®F3</sup> Green 3%-3% can also be used as a wetting agent in combating fires in Class A materials such as wood, paper, and tires.

### Typical Physical Properties

Appearance.....	Pale Yellow Color
Specific Gravity at 68°F(20°C).....	1.02-1.04
pH @ 68°F(20°C) .....	7.0-8.0
Viscosity@ 68°F(20°C) .....	1,700 cP*
Expansion Ratio .....	5 - 11**
25% Drainage Time .....	90 - 300 minutes**
Freezing Point.....	21°F(-6°C)
Lowest Use Temperature .....	35°F(2°C)
Max Continuous Storage Temperature.....	120°F(49°C)

\*Brookfield #4 Spindle @ 60 rpm. Viscosity measured under different shear conditions will vary because of pseudoplastic rheology of this non-Newtonian product.

\*\*Expansion ratio and 25% drainage time are typical values and are affected by accuracy of the foam proportioning device, the type of foam-making device, operating parameters, water quality and type, and atmospheric conditions.

# Universal<sup>®F3</sup> Green 3%-3%

## Alcohol Resistant Synthetic

### Equipment

Universal<sup>®F3</sup> Green 3%-3% is intended for use at 3% (3 parts concentrate to 97 parts of water) on hydrocarbons and polar solvents. Universal<sup>®F3</sup> Green 3%-3% is readily proportioned using conventional foam proportioning equipment such as portable and fixed (in-line) foam venturi proportioners, handline nozzles with pick-up tubes, balanced pressure variable flow proportioners, balanced pressure bladder tank proportioners, and around-the-pump proportioners.

Universal<sup>®F3</sup> Green 3%-3% should be used with air aspirating discharge devices. Devices include low expansion nozzles, monitors and fixed foam discharge devices.

### Compatibility

Universal<sup>®F3</sup> Green 3%-3% is suitable for use in combination with:

- Soft or hard, fresh, brackish or sea water.
- Expanded protein-based or synthetic foams for application to a fire in sequence or simultaneously.

### Environmental

Universal<sup>®F3</sup> Green 3%-3% contains no intentionally added PFAS and has been certified "PFAS free" by GreenScreen. Universal<sup>®F3</sup> Green 3%-3% is 100%

biodegradable, however, as with any substance, care should be taken to prevent discharge from entering groundwater, surface water, or storm drains. Disposal of Universal<sup>®F3</sup> Green 3%-3% should be made in accordance with federal, state, and local regulations.

### Storage

Universal<sup>®F3</sup> Green 3%-3% is ideally stored in its original shipping container or in tanks or other containers which have been designed for such foam storage. Recommended construction materials are stainless steel (Type 304L or 316), high density cross-linked polyethylene, or reinforced fiberglass polyester (isophthalic polyester resin) with a vinyl ester resin internal layer coating (50 -100 mils).

Universal<sup>®F3</sup> Green 3%-3% is freeze/thaw stable.

Foam concentrates are subject to evaporation which accelerates when the product is exposed to air. Storage tanks should be sealed and fitted with a pressure vacuum vent to prevent free exchange of air. The recommended storage environment is within the temperature range of 35°F to 120°F (2°C to 49°C). Shade balls (hollow plastic spheres), floated on top of atmospheric tanks, can be used to slow evaporation.

### Shelf Life, Inspection, and Testing

The shelf life of any foam concentrate is maximized by proper storage conditions and maintenance. Factors affecting shelf life are wide temperature changes, extreme high or low temperatures, evaporation, dilution, and contamination by foreign materials. National Foam firefighting foam concentrates have been tested and have not shown significant loss of performance even after 10 years or more, provided annual testing and proper storage recommendations are followed. Refer to National Foam technical bulletin NFTB240 for recommendations on foam concentrate storage and preservation.

Annual testing of all firefighting foam is recommended by the National Fire Protection Association (NFPA). National Foam provides a Technical Service Program to conduct such tests. Refer to National Foam product data sheet NFC960 for further details on Technical Service program.

### Ordering Information

Container	Shipping Weight	Shipping Dimensions	Part Number
5-Gallon Pails (19 liters)	44.1 lb. (20.0 kg)	1.13 cu. ft. <sup>3</sup> (0.032 cu. m)	2190-3340-0
55-Gallon Drums (208 liters)	492 lb. (223.0 kg)	11.1 cu. ft. <sup>3</sup> (0.314 cu. m)	2190-3481-0
275-Gallon IBC Reusable Tote Tank (1041 liters)	2494 lb. (1131.0 kg)	48.2 cu. ft. <sup>3</sup> (1.365 cu. m)	2190-3725-0
330-Gallon IBC Reusable Tote Tank (1249 liters)	2990 lb. (1356.3 kg)	55.8 cu. ft. <sup>3</sup> (1.580 cu. m)	2190-3733-0

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### National Foam

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National Foam operates a continuous programme of product development. The right is therefore reserved to modify any specification without prior notice and National Foam should be contacted to ensure that the current issues of all technical data sheets are used.

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 03/21 NFC510 (Rev K)



# Muni<sup>F3</sup> Green Plus 3%

3% Synthetic Fluorine Free Foam

Alcohol Resistant Synthetic

NFC511



- ✔ Superior 3% synthetic fluorine free foam formulated to extinguish hydrocarbon fires including E15 gasolines.
- ✔ Specifically designed for the Municipal firefighter.
- ✔ UL/ULC Listed.
- ✔ Green Screen Certified.
- ✔ Formulated without intentionally added (PFAS), (PFOA), (PFOS), fluorosurfactants, fluoropolymers or organohalogens.
- ✔ Low viscosity to ensure easy induction.
- ✔ 100% Biodegradable.
- ✔ Formulated avoiding regrettable chemical substitutes such as chlorines, and siloxanes.
- ✔ Can be used on structural fires, Class A and B fires.



Muni<sup>F3</sup> Green Plus 3% is a superior quality synthetic fluorine free foam concentrate, designed for municipal firefighters on Class A and B hydrocarbon fires. The UL/ULC listing for Muni<sup>F3</sup> Green Plus covers various blends of gasoline from unblended (i.e. sport racing) through, E5, E10 and up to E15 (i.e. 15% ethanol/gasoline blend). Muni<sup>F3</sup> Green Plus is GreenScreen certified, assuring that no regrettable chemical substitutes have been used in the formulation.

Muni<sup>F3</sup> Green Plus 3% is a patented formulation producing a vapor sealing blanket of foam that rapidly spreads over the surface of the fuel to provide rapid control and extinguishment.

- Unique patented formulation only available from National Foam.
- Fluorine free – can be used where traditional fluorinated products cannot be used.

### Standards and Approvals

- ✔ Underwriters Laboratories, Inc.
- ✔ Underwriters Laboratories of Canada.
- ✔ NFPA 11

### Applications

Muni<sup>F3</sup> Green Plus 3% is used in municipal fire risk situations where hydrocarbon

fuels (such as oils, gasoline, diesel fuel, and aviation kerosene) are stored or transported and can be used on oxygenated gasoline blends containing up to 15% ethanol. For fuel in depth fires, refer to our UniversalF3 Green 3% X 3% fluorine free foam concentrate data sheet (NFC510).

Muni<sup>F3</sup> Green Plus 3% can also be used as a wetting agent in combating structural fires and fires in Class A materials such as wood, paper, and tires.

Muni<sup>F3</sup> Green Plus 3% provides a vapor suppressing foam blanket on unignited hydrocarbon spills, exhibiting long drainage times.

### Typical Physical Properties

Appearance.....	Pale Yellow Color
Specific Gravity at 68°F(20°C).....	1.03
pH @ 68°F(20°C).....	7.5
Viscosity@ 68°F(20°C).....	<2,000 cP*
Expansion Ratio.....	5:1**
25% Drainage Time.....	>90 minutes**
Lowest Use Temperature.....	35°F(2°C)
Max Continuous Storage Temperature.....	120°F(49°C)

\*Brookfield #4 Spindle @ 60 rpm. Viscosity measured under different shear conditions will vary because of pseudoplastic rheology of this non-Newtonian product.

\*\*Expansion ratio and 25% drainage time are typical values and are affected by accuracy of the foam proportioning device, the type of foam-making device, operating parameters, water quality and type, and atmospheric conditions.

# Muni<sup>F3</sup> Green Plus 3%

## Alcohol Resistant Synthetic

### Equipment

Muni<sup>F3</sup> Green Plus 3% is intended for use at 3% (3 parts concentrate to 97 parts of water) on hydrocarbons and polar solvents. Muni<sup>F3</sup> Green Plus 3% is readily proportioned using conventional foam proportioning equipment such as portable and fixed (in-line) foam venturi proportioners, handline nozzles with pick-up tubes, around-the-pump proportioners, and on-board A/B proportioners.

Muni<sup>F3</sup> Green Plus 3% should be used with air aspirating discharge devices. Devices include low expansion nozzles, monitors and fixed foam discharge devices.

### Compatibility

Muni<sup>F3</sup> Green Plus 3% is suitable for use in combination with soft or hard, fresh or brackish water.

Muni<sup>F3</sup> Green Plus 3% should not be mixed with any other type of foam concentrate in long or short term storage. Such mixing could lead to chemical changes in the product and a possible reduction in or loss of its firefighting capability. Most expanded foams are compatible for side-by-side application during an incident.

### Environmental

Muni<sup>F3</sup> Green Plus 3% has no intentionally added PFAS. Muni<sup>F3</sup> Green Plus 3% is 100% biodegradable and is manufactured without any intentionally added fluorinated surfactants, fluorinated polymers, organo-halogens or siloxanes.

Muni<sup>F3</sup> Green Plus 3% is biodegradable, however, as with any substance, care should be taken to prevent discharge from entering groundwater, surface water, or storm drains. Disposal of Muni<sup>F3</sup> Green Plus 3% should be made in accordance with federal, state, and local regulations.

### Storage

Muni<sup>F3</sup> Green Plus 3% is ideally stored in its original shipping container or in tanks or other containers which have been designed for such foam storage. Recommended construction materials are stainless steel (Type 304L or 316), high density cross-linked polyethylene, or reinforced fiberglass polyester (isophthalic polyester resin) with a vinyl ester resin internal layer coating (50 -100 mils).

Foam concentrates are subject to evaporation which accelerates when the product is exposed to air. Storage tanks should be sealed and fitted with

a pressure vacuum vent to prevent free exchange of air. The recommended storage environment is within the temperature range of 35°F to 120°F (2°C to 49°C). Shade balls (hollow plastic spheres), floated on top of atmospheric tanks, can be used to slow evaporation.

### Shelf Life, Inspection, and Testing

The shelf life of any foam concentrate is maximized by proper storage conditions and maintenance. Factors affecting shelf life are wide temperature changes, extreme high or low temperatures, evaporation, dilution, and contamination by foreign materials. National Foam firefighting foam concentrates have been tested and have not shown significant loss of performance even after 10 years or more, provided annual testing and proper storage recommendations are followed. Refer to National Foam technical bulletin NFTB240 for recommendations on foam concentrate storage and preservation.

Annual testing of all firefighting foam is recommended by the National Fire Protection Association (NFPA). National Foam provides a Technical Service Program to conduct such tests. Refer to National Foam product data sheet NFC960 for further details on Technical Service program.

### Ordering Information

Container	Shipping Weight	Shipping Dimensions	Part Number
5-Gallon Pails (19 liters)	44.1 lb. (20.0 kg)	1.13 cu. ft. <sup>3</sup> (0.032 cu. m)	2198-3340-0
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275-Gallon IBC Reusable Tote Tank (1041 liters)	2494 lb. (1131.0 kg)	48.2 cu. ft. <sup>3</sup> (1.365 cu. m)	2198-3725-0
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### National Foam

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 02/21 NFC511 (Rev A)



# Muni<sup>F3</sup> Green 3%

## Synthetic Fluorine Free Foam

Synthetic  
NFC512



- ✔ Superior 3% synthetic fluorine free foam formulated to extinguish hydrocarbon fires.
- ✔ Specifically designed for the Municipal firefighter.
- ✔ UL/ULC Listed.
- ✔ Formulated without intentionally added (PFAS), (PFOA), fluorosurfactants, fluoropolymers or organohalogens.
- ✔ Low viscosity to ensure easy induction.
- ✔ 100% Biodegradable. GreenScreen Cert.
- ✔ Formulated avoiding regrettable chemical substitutes such as chlorines, and siloxanes.
- ✔ Can be used on structural fires, Class A and B fires.
- ✔ Can be used as a wetting agent at 0.5% - 1.0%.



Muni<sup>F3</sup> Green 3% is a superior quality synthetic fluorine free foam concentrate, designed for municipal firefighters on Class A and B hydrocarbon fires.

Muni<sup>F3</sup> Green 3% is formulated to produce a vapor sealing blanket of foam that rapidly spreads over the surface of the fuel to provide rapid control and extinguishment.

- Unique patented formulation only available from National Foam.
- Fluorine free – can be used where traditional fluorinated products cannot be used.

### Standards and Approvals

- ✔ Underwriters Laboratories, Inc.
- ✔ Underwriters Laboratories of Canada.
- ✔ NFPA 11

### Applications

Muni<sup>F3</sup> Green 3% is used in municipal fire risk situations where hydrocarbon fuels (such as oils, gasoline, diesel fuel, and aviation kerosene) are stored or transported.

Muni<sup>F3</sup> Green 3% can also be used as a wetting agent in combating structural fires and fires in Class A materials such as wood, paper, and tires at a concentration of 0.5%-1.0%.

Muni<sup>F3</sup> Green 3% provides a vapor

suppressing foam blanket on unignited hydrocarbon spills, exhibiting long drainage times.

### Typical Physical Properties

Appearance.....	Off White
Specific Gravity at 68°F(20°C).....	1.01
pH @ 68°F(20°C).....	7.5
Viscosity@ 68°F(20°C).....	<1200 cP*
Expansion Ratio.....	5:1**
25% Drainage Time.....	>30 minutes**
Lowest Use Temperature.....	35°F(2°C)
Max Continuous Storage Temperature.....	120°F(49°C)

*\*Brookfield #4 Spindle @ 60 rpm. Viscosity measured under different shear conditions will vary because of pseudoplastic rheology of this non-Newtonian product.*

*\*\*Expansion ratio and 25% drainage time are typical values and are affected by accuracy of the foam proportioning device, the type of foam-making device, operating parameters, water quality and type, and atmospheric conditions.*

### Equipment

Muni<sup>F3</sup> Green 3% is intended for use at 3% (3 parts concentrate to 97 parts of water) on hydrocarbons. Muni<sup>F3</sup> Green 3% is readily proportioned using conventional foam proportioning equipment such as portable and fixed (in-line) foam venturi proportioners, handline nozzles with pick-up tubes, around-the-pump proportioners, and on-board A/B proportioners.

Muni<sup>F3</sup> Green 3% should be used with air aspirating discharge devices. Devices include low expansion nozzles, monitors and fixed foam discharge devices.



# Muni<sup>F3</sup> Green 3%

## Synthetic Fluorine Free Foam

### Compatibility

Muni<sup>F3</sup> Green 3% is suitable for use in combination with:

- Potable or fresh water
- Expanded protein based or synthetic foams for application to a fire in sequence or simultaneously

Muni<sup>F3</sup> Green 3% should not be mixed with any other type of foam concentrate in long or short term storage. Such mixing could lead to chemical changes in the product and a possible reduction in or loss of its firefighting capability. Most expanded foams are compatible for side-by-side application during an incident.

### Environmental

Muni<sup>F3</sup> Green 3% has no intentionally added PFAS. Muni<sup>F3</sup> Green 3% is 100% biodegradable and is manufactured without any intentionally added fluorinated surfactants, fluorinated polymers, organo-halogens or siloxanes. Muni<sup>F3</sup> Green 3% is biodegradable, however, as with any substance, care should be taken to prevent discharge

from entering groundwater, surface water, or storm drains. Disposal of Muni<sup>F3</sup> Green 3% should be made in accordance with federal, state, and local regulations.

### Storage

Muni<sup>F3</sup> Green 3% is ideally stored in its original shipping container or in tanks or other containers which have been designed for such foam storage. Recommended construction materials are stainless steel (Type 304L or 316), high density cross-linked polyethylene, or reinforced fiberglass polyester (isophthalic polyester resin) with a vinyl ester resin internal layer coating (50 -100 mils).

Foam concentrates are subject to evaporation which accelerates when the product is exposed to air. Storage tanks should be sealed and fitted with a pressure vacuum vent to prevent free exchange of air. The recommended storage environment is within the temperature range of 35°F to 120°F (2°C to 49°C). Shade balls (hollow plastic spheres), floated on top of atmospheric tanks, can be used to slow evaporation.

### Shelf Life, Inspection, and Testing

The shelf life of any foam concentrate is maximized by proper storage conditions and maintenance. Factors affecting shelf life are wide temperature changes, extreme high or low temperatures, evaporation, dilution, and contamination by foreign materials. National Foam firefighting foam concentrates have been tested and have not shown significant loss of performance even after 10 years or more, provided annual testing and proper storage recommendations are followed. Refer to National Foam technical bulletin NFTB240 for recommendations on foam concentrate storage and preservation.

Annual testing of all firefighting foam is recommended by the National Fire Protection Association (NFPA). National Foam provides a Technical Service Program to conduct such tests. Refer to National Foam product data sheet NFC960 for further details on Technical Service program.

### Ordering Information

Container	Shipping Weight	Shipping Dimensions	Part Number
5-Gallon Pails (19 liters)	44.1 lb. (20.0 kg)	1.13 cu. ft. <sup>3</sup> (0.032 cu. m)	2199-3340-0
55-Gallon Drums (208 liters)	492 lb. (223.0 kg)	11.1 cu. ft. <sup>3</sup> (0.314 cu. m)	2199-3481-0
275-Gallon IBC Reusable Tote Tank (1041 liters)	2494 lb. (1131.0 kg)	48.2 cu. ft. <sup>3</sup> (1.365 cu. m)	2199-3725-0
330-Gallon IBC Reusable Tote Tank (1249 liters)	2990 lb. (1356.3 kg)	55.8 cu. ft. <sup>3</sup> (1.580 cu. m)	2199-3733-0

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### National Foam

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 02/21 NFC512 (Rev A)



# KNOCKDOWN<sup>®</sup>

Class "A" Foam Concentrate

NFC700



- ✔ Environmentally acceptable foam concentrate
- ✔ 0.1 - 1.0 Proportioning
- ✔ UL listed as a Wetting Agent at 0.3% for Class A and Class B.
- ✔ Can be used with fresh, brackish and sea water.
- ✔ Exhibits good foamability, even in cold water.
- ✔ Contains NO alcohols for higher flash point and compatibility with Class A/B Systems.
- ✔ No intentionally added PFAS, PFOA or PFOS.
- ✔ USDA approved for use in aircraft, water scoopers, fixed bucket helicopters and ground engines



Source: US Forest Service

Knockdown foam concentrate works in two ways. First, Knockdown improves the penetrating capability of water. It reduces the surface tension of plain water which allows it to penetrate surfaces where water might normally run off, to reach deep-seated fires. This helps reduce the amount of water required to extinguish the fire and also provides quicker Knockdown. Secondly, Knockdown increases the heat absorbing capabilities of water. Foaming ingredients give water the ability to adhere to vertical surfaces which allows the water longer contact with the fuel. The longer the water is in contact with the fuel, the more heat it is able to absorb. A coating of Class A foam may also be used for exposure protection to prevent fuels from igniting by raising their moisture content and providing a tough protective barrier to an oncoming flame front.

### Typical Physical Properties

Appearance.....	Pale Green Liquid
Specific Gravity at 77°F(25°C).....	1.05
pH.....	9.0
Min Usable	
Concentrate Temp.....	20°F(-7°C)
Max Usable	
Concentrate Temp.....	120°F(49°C)
Freezing Point.....	6°F(-14°C)
Viscosity @ 70°F (21°C).....	20 cST
Viscosity @ 20°F (-7°C).....	32 cST
Surface Tension	
@ 0.1% Conc.....	25.7 Dynes/cm
Surface Tension	
@ 0.5% Conc.....	24.1 Dynes/cm
Flash Point: Pensky Martens:	
Closed Cup Method.....	>205°F

### Standards and Approvals

- Meets USDA 5100-307A
- Underwriters Laboratories, Inc.
- NFPA 18
- NFPA 298
- NFPA 1145 (Structure Attack)
- NFPA 1150

### Storage and Handling

Knockdown should be stored in its original shipping container or in tanks or other containers which have been designed for such foam storage. Recommended construction materials are stainless steel (Type 304L or 316), high density cross-linked polyethylene, or reinforced fiberglass polyester (isophthalic polyester resin) with a vinyl ester resin internal layer coating (50 -100 mils). Refer to National Foam Technical Bulletin NFTB100 for further information.

Foam concentrates are subject to evaporation which accelerates when the product is exposed to air. Storage tanks should be sealed and fitted with a pressure vacuum vent to prevent free exchange of air. The recommended storage temperature range for Knockdown concentrate is 20°F (-7°C) to 120°F (49°C).

Knockdown foam concentrate is freeze/thaw stable. Should the product freeze during shipment or storage, no performance loss is expected upon thawing. Samples of Knockdown, premixed with potable municipal water supplies, have been shown to be stable

# KNOCKDOWN®

## Class "A" Foam Concentrate

### Mining

Whether your mine fire emergency is above ground or underground, Knockdown allows you to take control. Knockdown's characteristics of fast wetting, cooling and penetrating allow excellent fire suppressing capabilities when applied through bore holes for deep seated underground mine fires. These same characteristics make it the agent of choice for stubborn surface mine fires as well.

The use of Knockdown as a compressed air foam in these types of applications can be most beneficial by actually flooding the mine area with a tough, durable blanket of foam. Knockdown allows more water to penetrate the deep seated fires thus creating steam, which reduces temperatures and assists in the extinguishment of the fire.

### Industrial

Knockdown's specialized formulation is well suited in the industrial arena of fire fighting. The rapid control, fast wetting, and superior penetrating capabilities of Knockdown allow it to be very effective through fixed sprinkler systems as well as hose stream applications. National Foam manufactures a complete line of foam proportioning equipment and systems that are compatible with Knockdown for this application. Existing sprinkler systems can easily be converted to Class A systems. This is especially beneficial in paper manufacturing, lumber and saw mills, as well as power generating stations having coal bunkers. Anywhere you find a Class A fuel hazard, you'll find Knockdown as the fire suppressant agent of choice.

### Tire Fires

Tire fires are an extreme threat to the environment and can be one of the most difficult fires to control and extinguish. Knockdown has a proven track record for the extinguishment of these types of fires. Typically, thousands of gallons of water and often heavy earth moving equipment are required to extinguish a tire fire. The use of Knockdown will greatly reduce the amount of water and equipment required. The alternating application of Knockdown through aspirated and non-aspirated nozzles offer a penetrating and smothering blanket, allowing more water to get into the deep seated fire. This equates to less water, equipment, manpower and dollars spent to control and extinguish these tough fires. Not only is Knockdown environmentally friendly, it is your best weapon for rapid fire attack on these environmentally destructive tire fires.

### Hydrocarbon Spill Control

Knockdown is also formulated for extinguishing and emulsifying hydrocarbon spills at a 0.3% application rate. Special care should be used when using Knockdown on Class B fire spill situations. The utilization of air-aspirating nozzles, over non-aspirating nozzles, may offer more effective control of these situations. Knockdown should be used on hydrocarbon spills ONLY. Class A foam should never be used on polar solvent or water miscible fuels.

### Wetting Agents vs. Foam

Foam and wetting agents are not the same, as evidenced by development of separate NFPA standards within the same technical committee.

NFPA-11, Standard for Low Expansion Foam defines foam as a stable aggregation of small bubbles of lower density than oil or water that exhibits a tenacity for covering horizontal surfaces. It flows freely over a burning liquid surface and forms a tough air excluding, continuous blanket that seals volatile combustible vapors from access to air. The basic mechanism foam utilizes for extinguishment is to separate the fuel from oxygen eliminating one leg of the fire tetrahedron, thus interrupting the combustion process. In situations where a fire has been extinguished or ignition has not occurred, foam also serves to provide a visual confirmation that the surface of the fuel has been covered.

NFPA-18, Standard on Wetting Agents defines Wetting Agents as chemical compounds which, when added to water in proper quantities, materially reduce its surface tension, increase its penetrating and spreading abilities, and may also provide emulsification and foaming characteristics. Wetting agents generally contain a surfactant or emulsifying ingredient which enables them to mix (emulsify) with hydrocarbon fuels similar to oil and water in salad dressing. This is sometimes referred to as "encapsulating" or "locking up" the fuel.

Many fire service professionals are not aware there is a difference between foam, and wetting agents or emulsifiers. Understanding the above performance parameters and limitations of each will help the user determine the applicability of each agent for the intended use. Knockdown, along with being an excellent class "A" extinguishing agent, can also be used as an emulsifier on hydrocarbon fuel spills. However, Class B Wetting Agent listings do not extend to polar solvents or water miscible fuels.

# KNOCKDOWN®

## Class “A” Foam Concentrate

and not suffer any significant loss of expansion or drainage properties after 30 days. Actual results may vary based on the water supply.

It is recommended that Knockdown not be mixed with any other type of foam concentrate in long term storage. Such mixing could lead to chemical changes in the product and a possible reduction in or loss of its firefighting capability. Most expanded foams are compatible for side-by-side application during an incident.

### Shelf Life, Inspection, and Testing

The shelf life of any foam concentrate is maximized by proper storage conditions and maintenance. Factors affecting shelf life are wide temperature changes, extreme high or low temperatures, evaporation, dilution, and contamination by foreign materials. National Foam firefighting foam concentrates have been tested and have not shown significant loss of performance even after 10 years or more, provided annual testing and proper storage recommendations are followed. Refer to National Foam technical bulletin NFTB240 for recommendations on foam concentrate storage and preservation. Annual testing of all fire fighting foam is recommended by the National Fire Protection Association (NFPA). National Foam provides a Technical Service Program to conduct such tests. Refer to National Foam product data sheet NFC960 for further details on Technical Service Program.

### Environmental and Toxicological Information

Knockdown is biodegradable. However, as with any substance, care should be taken to prevent discharge from entering ground water, surface water, or storm

drains. With advance notice, Knockdown foam concentrate or foam solution may be treated by local biological sewage treatment systems. Since facilities vary widely by location, advance notice should be given, and disposal should be made in accordance with federal, state, and local regulations.

The biological oxygen demand (BOD) and chemical oxygen demand (COD) of Knockdown are as follows:

#### BOD<sub>5</sub>

Concentrate.....	389,000 mg/kg
0.5% Sol.....	2,140 mg/kg
1% Sol.....	4,220 mg/kg

#### COD

Concentrate.....	782,000 mg/kg
0.5% Sol.....	3,900 mg/kg
1% Sol.....	7,960 mg/kg

Tests for acute oral toxicity have proved negative. Knockdown concentrate is a primary skin irritant. Repeated skin contact will remove oils from the skin and cause dryness. Knockdown is classified as a primary eye irritant, and contact with the eyes should be avoided. Users are advised to wear protective eyewear. If the foam concentrate enters the eyes, flush them well with water and seek immediate medical attention. For further details see the Knockdown Safety Data Sheet NMS700.

### Structural Firefighting

Knockdown is a superior firefighting formulation for structural fire attack in the Municipal fire service. This formulation can be up to five times more effective than plain water on Class A materials. Knockdown isolates the fuel by excluding oxygen, adhering to Class A materials, and penetrating faster than plain water,

which means less water damage and less water required. Knockdown can be used as a premix, batch mixed, educted, or injected into the water stream. Knockdown can also be used for exposure protection. When applying it for this type of application, it is advisable to use air-aspirated nozzles and/or CAFS. Opposing structures can be protected by a durable, insulating blanket of foam deflecting radiant heat. Knockdown significantly out performs plain water during the overhaul phase of structural firefighting. Acting as a time release capsule, it slowly releases its water, while adhering to walls, ceilings and other surfaces.

### Forestry

Using Knockdown, the firefighter takes the offensive approach to attack the fire, minimizing the fire effects in the wildland/urban interface. The unique properties of Knockdown provide an excellent foam blanket, which can be created using back packs and all handlines. This ground application is particularly useful in building a fire line, and for direct attack, prescribed burning, and mop-up operations.

Knockdown is especially beneficial for any type of air attack, including helicopters and fixed wing aircraft. It is well suited to provide accurate and dependable proportioning through all types of onboard injection systems. Knockdown foam solution dropped from aircraft or helicopters will assist in controlling fire spread and greatly reduce the amount of time required and water used to successfully attack the fire. Knockdown's unique foaming capabilities create an excellent fire break by pretreating Class A materials to increase the moisture content of the fuel, thus inhibiting ignition.

# KNOCKDOWN®

## Class "A" Foam Concentrate

### Typical Proportioning Settings

UL Listed Wetting.....	0.3%
Class B, Hydrocarbon Spill Emulsification.....	0.3%
Structural Fire, Attack and Overhaul.....	0.5%- 0.7%
Exposure Protection, Aspirated.....	0.7%-1.0%
Compressed Air Application.....	0.1-0.5%
Air Attack: Water Bombers and Helicopters.....	0.3%-0.6%

### Suggested Structural Fire Application Rates

Fully Involved, Well Vented.....	0.33 gpm/sq. ft.
Half Involvement.....	0.17 gpm/sq. ft.
Quarter Involvement.....	0.09 gpm/sq. ft.
Overhaul.....	5-10 gpm/sq. ft.

Knockdown can also be used as a training foam for non-fire scenarios. Diluting 1 part Knockdown with 4 parts water provides a cost effective foam for training simulation. The diluted foam can then be proportioned at 1%, 3% or 6% to provide foam expansion similar to AFFF foam concentrates.

### Ordering Information

Container	Shipping Weight	Shipping Dimensions	Part Number
5-Gallon Pails (19 liters)	46 lb. (20.9 kg)	1.13 cu. ft. <sup>3</sup> (0.032 cu. m)	2170-2340-6
55-Gallon Drums (208 liters)	506 lb. (229.5 kg)	11.51 cu. ft. <sup>3</sup> (0.326 cu. m)	2170-2481-6
275-Gallon IBC Reusable Tote Tank (1041 liters)	2541 lb. (1152.6 kg)	51.11 cu. ft. <sup>3</sup> (1.1061 cu. m)	2170-2725-6
330-Gallon IBC Reusable Tote Tank (1249 liters)	3043 lb. (1380.3 kg)	55.8 cu. ft. <sup>3</sup> (1.580 cu. m)	2170-2033-6
Bulk	8.80 lb./gal. (1.055 kg/l)		2170-2001-6

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# Responder®

Class "A" Foam Concentrate

NFC600



- ✔ Premix is stable for more than 30 days (using potable water)
- ✔ Compatible with class A/B systems and compressed air foam systems
- ✔ Can be used with fresh, brackish and sea water, plus exhibits good formability, even in cold water
- ✔ Contains NO alcohols
- ✔ Designed for Municipal fire fighters battling wildland fires
- ✔ Can also be used as a wetting agents
- ✔ Can be used as a training foam at 1%, 3% and 6% foam concentrate
- ✔ No intentionally added PFAS, PFOA or PFOS

Responder foam concentrate works in two ways. First, Responder improves the penetrating capability of water. It reduces the surface tension of plain water which allows it to penetrate surfaces where water might normally run off, to reach deep-seated fires. This helps reduce the amount of water required to extinguish the fire and also provides quicker knockdown. Secondly, Responder increases the heat absorbing capabilities of water. Foaming ingredients give water the ability to adhere to vertical surfaces which allows the water longer contact with the fuel. The longer the water is in contact with the fuel, the more heat it is able to absorb. A coating of Class A foam may also be used for exposure protection to prevent fuels from igniting by raising their moisture content and providing a tough protective barrier to an oncoming flame front.

### Applications

- Structural Fire Fighting
- Forestry
- Mining
- Industrial
- Tire Fires
- Hydrocarbon Spill Control

### Typical Physical Properties

Appearance..... Colorless Liquid  
 Specific Gravity at 77°F(25°C)..... 1.04  
 pH..... 8.2  
 Viscosity @ 77°F (25°C) ..... 5 cST  
 Viscosity @ 35°F (2°C) ..... 10 cST  
 Min Usable Temperature..... 35°F(2°C)  
 Max Usable Temperature..... 120°F(49°C)  
 Freezing Point..... 12°F (49°C)  
 Flash Point:  
 TAG Closed Cup Method ..... >200°F

Responder can also be used as a training foam for non-fire scenarios proportioned at 1%, 3% or 6% to provide foam expansion similar to AFFF foam concentrates.

### Storage and Handling

Responder should be stored in its original shipping container or in tanks or other containers which have been designed for such foam storage. Recommended construction materials are stainless steel (Type 304L or 316), high density cross-linked polyethylene, or reinforced fiberglass polyester (isophthalic polyester resin) with a vinyl ester resin internal layer coating (50 -100 mils).

Foam concentrates are subject to evaporation which accelerates when the product is exposed to air. Storage tanks should be sealed and fitted with a pressure vacuum vent to prevent free

# Responder<sup>®</sup>

## Class "A" Foam Concentrate

exchange of air. The recommended storage temperature range for Responder concentrate is 35°F (2°C) to 120°F (49°C).

Refer to National Foam product data sheet NFC950 for further information.

Responder is freeze/thaw stable. Should the product freeze during shipment or storage, no performance loss is expected upon thawing.

Samples of Responder, premixed with potable municipal water supplies, have been shown to be stable and not suffer any significant loss of expansion or drainage properties after 30 days. Actual results may vary based on the water supply.

It is recommended that Responder not be mixed with any other type of foam concentrate in long term storage. Such mixing could lead to chemical changes in the product and a possible reduction in or loss of its firefighting capability. Most expanded foams are compatible for side-by-side application during an incident.

### Shelf Life, Inspection, and Testing

The shelf life of any foam concentrate is maximized by proper storage conditions and maintenance. Factors affecting shelf life are wide temperature changes, extreme high or low temperatures, evaporation, dilution, and contamination by foreign materials. National Foam firefighting foam concentrates have been tested and have not shown significant loss of performance even after 10 years or more, provided annual testing and proper storage recommendations are followed. Refer to National Foam technical bulletin NFTB240 for recommendations on foam concentrate storage and preservation.

Annual testing of all firefighting foams is recommended by the National Fire Protection Association (NFPA). National Foam provides a Technical Service Program to conduct such tests. Refer to National Foam product data sheet NFC960 for further details on Technical Service Program, or contact your National Foam representative.

### Environmental and Toxicological Information

Responder is biodegradable. However, as with any substance, care should be taken to prevent discharge from entering ground water, surface water, or storm drains. With advance notice, RESPONDER may be treated by local biological sewage treatment systems. Since facilities vary widely by location, disposal should be made in accordance with federal, state and local regulations.

Responder has not been tested for acute oral toxicity, primary skin and primary eye irritation. Repeated skin contact will remove oils from the skin and cause dryness. Responder is classified as a primary eye irritant, and contact with the eyes should be avoided. Users are advised to wear protective eyewear. If the foam concentrate enters the eyes, flush them well with water and seek immediate medical attention. For further details see the Responder Safety Data Sheet NMS600.

### Ordering Information

Container	Shipping Weight	Shipping Dimensions	Part Number
5-Gallon Pails (19 liters)	46 lb. (20.9 kg)	1.13 cu. ft. <sup>3</sup> (0.032 cu. m)	2170-0340-6
55-Gallon Drums (208 liters)	499 lb. (226.3 kg)	11.1 cu. ft. <sup>3</sup> (0.314 cu. m)	2170-0481-6
275-Gallon IBC Reusable Tote Tank (1041 liters)	2519 lb. (1142.6 kg)	48.2 cu. ft. <sup>3</sup> (1.365 cu. m)	2170-0725-6
330-Gallon IBC Reusable Tote Tank (1249 liters)	3016 lb. (1368.1 kg)	55.8 cu. ft. <sup>3</sup> (1.580 cu. m)	2170-0033-6
Bulk	8.67 lb./gal. (1.04 kg/l)		2130-0001-6

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# Avio<sup>F3</sup> Green KHC 3%

Fluorine Free (FF) Foam Concentrate  
NFC515

- ✔ World's first film-forming fluorine free foam on aviation fuels (Jet A and Jet A-1).
- ✔ Avio<sup>F3</sup> Green KHC 3% is a superior quality synthetic fluorine free (FF) foam concentrate, designed for extinguishing and securing flammable aviation fuel spills and fires (Jet A and Jet A1).
- ✔ 100% Biodegradable.
- ✔ Avio<sup>F3</sup> Green KHC 3% is formulated without using PFAS, PFOA, Fluorosurfactants, Fluoropolymers or Organohalogens.
- ✔ Fast knockdown and extinguishment exceeding the requirements of ICAO Level C.
- ✔ Third party certified to meet the requirements of ICAO Level C.
- ✔ Passes Boeing D6-17487, Rev T Corrosion series as foam concentrate and 3% solution.
- ✔ Specifically designed for crash truck usage.
- ✔ Uses up to 40% less foam concentrate than ICAO Level "B" foam concentrates.



# Avio Green

ICAO Level "C" Film-Forming Fluorine Free Foam

**Avio<sup>F3</sup> Green KHC 3% is a patent pending combination of surfactants and other ingredients and produces a vapor sealing blanket of foam that rapidly spreads over the surface of the fuel to provide rapid control and extinguishment.**

- Unique patent pending formulation only available from National Foam.
- Film-forming to assist with fast knockdown and excellent burnback.
- Newtonian flow characteristics.
- Low viscosity for easy proportioning.
- Fluorine free - can be used where traditional fluorinated products cannot be used.

### Standards and Approvals

- ✔ Certified to meet the requirements of ICAO Level C (MPA Dresden GmbH)
- ✔ NFPA 403
- ✔ NFPA 412
- ✔ NFPA 414

### Applications

Avio<sup>F3</sup> Green KHC 3% is used at 3% concentration in high risk situations where hydrocarbon fuels such as Jet-A, Jet-A1 and aviation kerosene are processed, stored or transported. It is not suitable for use on polar solvents or water miscible fuels such as alcohols, ketones, esters and ethers.

Avio<sup>F3</sup> Green KHC 3% is designed to be used on Aviation Rescue Fire Fighting vehicles (ARFF), Rapid Intervention

Vehicles (RIV) and airport crash trucks where fast extinguishment is essential for saving life. Avio<sup>F3</sup> Green KHC 3% provides a vapor suppressing foam blanket on Jet-A and Jet-A1 spills.

Avio<sup>F3</sup> Green KHC 3% is an excellent alternative to standard Aqueous Film Forming Foam concentrates and is in compliance with the FAA Reauthorization Act of 2018 (Section 332), providing aircraft manufacturers and airports a fluorine-free alternative that meets the requirements of NFPA 403, Standard for Aircraft Rescue and Fire-Fighting Services at Airports. Avio<sup>F3</sup> Green KHC 3% also meets the 8 conditions of Canadian Aviation Regulation (CARs) Section 303.08 exemptions to allow all Canadian airport operators to use performance specifications of the International Civil Aviation Organization (ICAO) International Standards and Recommended Practices, Annex 14 instead of the performance specifications set out in paragraph 323.08(1)(a) of Standard 323 – Aircraft Fire Fighting at Airports and Aerodromes (CAN/ULC-S560 or of CAN/ULC-S563).

### Typical Physical Properties

Appearance.....	Clear Mobile Liquid
Specific Gravity at 68°F(20°C).....	0.99-1.01
Viscosity @ 68°F(20°C).....	60-100 cSt
Freezing Point.....	27°F(-3°C)
Lowest Use Temperature.....	35°F(2°C)
Max Continuous Storage Temperature.....	120°F(49°C)



# Avio<sup>F3</sup> Green KHC 3%

## Fluorine Free (FF) Foam Concentrate

### Approvals and Listings

Avio<sup>F3</sup> Green KHC 3% meets and exceeds the requirements of ICAO Level C and is third-party certified to this performance level.

### Equipment

Avio<sup>F3</sup> Green KHC 3% is intended for use at 3% (3 parts concentrate to 97 parts water). Avio<sup>F3</sup> Green KHC 3% is readily proportioned using conventional foam proportioning equipment.

Avio<sup>F3</sup> Green KHC 3% should be used with aspirated devices. Where a fire or shallow spill is involved with fire, National Foam always recommends the use of aspirated foam where a stable foam blanket is essential.

### Compatibility

Avio<sup>F3</sup> Green KHC 3% is suitable for use in combination with:

- Potable and fresh water.
- Expanded protein-based or synthetic foams for application to a fire in sequence or simultaneously.
- Dry powder extinguishing agents either separately or as twin agent systems.

As required by NFPA 11, Avio<sup>F3</sup> Green KHC 3% should not be mixed with other foam concentrates. Such mixing could lead to chemical changes in the product

and a possible reduction in or loss of fire fighting capability.

### Environmental

Avio<sup>F3</sup> Green KHC 3% contains no intentionally added fluorosurfactants, fluoropolymers, organohalogens or PFAS.

Avio<sup>F3</sup> Green KHC 3% is 100% biodegradable, however, care should be taken to prevent discharge from entering groundwater, surface water, or storm drains. Disposal of Avio<sup>F3</sup> Green KHC 3% foam concentrate or foam solution should be made in accordance with federal, state, and local regulations.

### Storage

Avio<sup>F3</sup> Green KHC 3% is ideally stored in its original shipping container or in tanks or other containers which have been designed for such foam storage. Recommended construction materials are stainless steel (Type 304L or 316), high density cross-linked polyethylene, or reinforced fiberglass polyester (isophthalic polyester resin) with a vinyl ester resin internal layer coating (50 -100 mils). Refer to NFTB100 for further information.

Foam concentrates are subject to evaporation which accelerates when the product is exposed to air. Storage tanks should be kept full, sealed and fitted with a pressure vacuum vent to prevent free exchange of air. The recommended

storage environment is within the temperature range of 35°F to 120°F (2°C to 49°C).

### Shelf Life, Inspection, and Testing

The shelf life of any foam concentrate is maximized by proper storage conditions and maintenance. Factors affecting shelf life are wide temperature changes, extreme high or low temperatures, evaporation, dilution, and contamination by foreign materials. National Foam firefighting foam concentrates have been tested and have not shown significant loss of performance even after 10 years or more, provided annual testing and proper storage recommendations are followed. Refer to National Foam technical bulletin NFTB240 for recommendations on foam concentrate storage and preservation.

Annual testing of all firefighting foam is recommended by the National Fire Protection Association (NFPA). National Foam provides a Technical Service Program to conduct such tests. Refer to National Foam product data sheet NFC960 for further details on Technical Service program.



### Ordering Information

Container	Shipping Weight	Shipping Dimensions	Part Number
5-Gallon Pails (19 liters)	44.1 lb. (20.0 kg)	1.13 cu. ft. <sup>3</sup> (0.032 cu. m)	2193-3340-0
55-Gallon Drums (208 liters)	480.6 lb. (218.0 kg)	11.1 cu. ft. <sup>3</sup> (0.314 cu. m)	2193-3481-0
275-Gallon IBC Reusable Tote Tank (1041 liters)	2428.5 lb. (1102.0 kg)	48.2 cu. ft. <sup>3</sup> (1.365 cu. m)	2193-3725-0

### National Foam

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National Foam operates a continuous programme of product development. The right is therefore reserved to modify any specification without prior notice and National Foam should be contacted to ensure that the current issues of all technical data sheets are used.

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