Perimeter SOLUTIONS

Transitioning from PFAS Fluorinated Foam to SOLBERG® Fluorine-free Firefighting Foam
Perimeter Solutions - General Guidance

JANUARY 2025

PURPOSE STATEMENT

Transitioning from PFAS-based fluorinated firefighting foam to a Fluorine-free Foam, such as Perimeter Solutions' SOLBERG® range of Synthetic Fluorine-Free Foam (SFFF) Concentrates, requires careful planning, system preparation, and testing. Below is an overview of the potential areas to cover with Perimeter Solutions' engagement in a transition plan.

1. DETERMINE WHAT TYPE OF FIREFIGHTING FOAM YOU HAVE ON SITE

Start by identifying whether your existing Class B foam concentrate contains per- and polyfluoroalkyl substances (PFAS) – See PFAS containing foams list below for a PFAS foam guide and general identification. Knowing the composition and classification of your current firefighting foam is essential for compliance with new regulations and planning for its replacement. The current industrial best practice recommended for identifying PFAS levels is through Total Oxidisable Precursor Assay (TOP-A) and Total Organic Fluorine (TOF)[1]; other options are available globally. The PFAS screening test will help with budgeting for the transition, as it will assist with determining whether you can continue to use your existing foam (if compliant with Environmental regulations at the site). Additionally, PFAS screening will help identify decontamination and cleaning needs for the fire system equipment, foam storage and piping early in the process, as well as determine whether new system components may be required. (See step 6.)

PFAS-containing foams:

- Aqueous film-forming foam (AFFF)
- Alcohol-resistant aqueous film-forming foam (AR-AFFF)
- Film-forming fluoroprotein foam (FFFP)
- Alcohol-resistant film-forming fluoroprotein foam (AR-FFFP)
- Fluoroprotein foam (FP)
- Alcohol-resistant fluoroprotein foam (AR-FP)

2. IF YOU HAVE A PFAS-CONTAINING FOAM CONCENTRATE, REVIEW THE LAWS AND REGULATIONS IN YOUR REGION, COUNTRY, OR INDUSTRY

Regulations governing the use, type, and transition from PFAS-containing foams vary by region, country, and industry. Consult state and local authorities to ensure compliance.

- Identify the PFAS regulations driving the transition (e.g., local bans on PFAS, PFAS limits to meet environmental compliance).
- Identify if local regulations exempt specific industries and identify the time frame specific to your industry to transition to SFFF.

3. IF YOU ARE REQUIRED TO CHANGE YOUR FOAM CONCENTRATE, DETERMINE THE BEST WAY TO DISPOSE OF WHAT YOU CURRENTLY HAVE – FOAM AND EQUIPMENT

Proper disposal of legacy PFAS foam is critical and cleaning the equipment can be costly. This will be determined by the level of cleaning set by the end-user and/or the regulator guideline. After cleaning, the flush water/cleaning material may contain environmentally harmful residue, which requires proper disposal in addition to the PFAS foam. There are several options for disposal being provided globally by 3rd parties external to Perimeter Solutions.

For guidance purposes only, the most common are as follows. (These need to be checked and approved by Authority Holding Jurisdiction and/or Local and National EPA regulations):

The United Nations Environment Program (UNEP) suggests the following methods for the destruction or irreversible transformation of perfluorooctane sulfonate (PFOS), that could be applicable to PFAS foam waste.

- Cement kiln (co-incineration)
- Gas phase chemical reduction (GPCR)
- Hazardous waste incineration
- Supercritical water oxidation (SCWO)

Guidance released in 2024 by the United States Environmental Protection Agency (EPA) discusses three technologies for disposal of PFAS. All three of these technologies are currently being used to dispose of PFAS foams in the United States.

- Incineration
- Underground injection (deep-well injection)
- Landfill (after solidification)

In Queensland, Australia, PFAS foams have to be destroyed by high-temperature incineration at about 1,100 degrees Celsius with a residence time of 2 seconds. Cement kilns have been used in Australia to destroy PFAS foams for many years.

Below is a list of companies that provide services for PFAS remediation.

Company	Website
Arcadis	**https://www.arcadis.com/**
CDM Smith	**https://www.cdmsmith.com/en/**
Clean Harbors	**https://www.cleanharbors.com/**
Clean Management	**https://cleanmanagement.com/**
Mid-Way Environmental	**https://mid-wayenvironmental.com/**
Revive Environmental	**https://revive-environmental.com/**
Siron	**https://drydelugetesting.com/**
SPSI	**http://www.callspsi.com/about.htm**
Republic Services	**https://www.republicservices.com/environmental-solutions**
Veolia	**https://www.veolia.com/en**
Xylem & Evoqua	**https://www.xylem.com/en-us/**

**These companies are not endorsed by Perimeter Solutions. The above is not a complete list of companies that provide services for PFAS remediation.*

4. REEVALUATE THE HAZARDS YOUR LOCATION/SITE HAS TODAY (OR PLAN TO HAVE IN THE FUTURE)

Before selecting a new foam concentrate, conduct a comprehensive hazard analysis – Perimeter Solutions can assist with this. General areas to consider are the types of fuels (hydrocarbon or polar solvent fuels), fire risks, and suppression systems in use at your facility, as these may have changed from the original design installation. This step ensures that the new foam will provide the necessary fire protection for your current specific application.

5. SELECT AN APPROPRIATE FOAM CONCENTRATE BASED ON YOUR UPDATED HAZARD ANALYSIS

Choose an SFFF solution that meets the fire suppression requirements identified in your updated hazard analysis. Perimeter Solutions offers a broad range of Underwriters Laboratories (UL)-listed and Factory Mutual (FM)-approved products, as well as LASTFIRE, IMO, ICAO, Mil-Spec and EN1568-certified SFFF foam concentrates. This includes SOLBERG® VERSAGARD™ and SOLBERG® RE-HEALING™ foams, designed to match or exceed the performance requirements for various applications.

Your local Perimeter Solutions representative will be able to assist in selection. Alternatively, the following can be used as preliminary guidance before consultation with Perimeter Solutions - **https://www.perimeter-solutions.com/en/product-catalog/**

Some additional questions/guidance that will help determine the correct Perimeter Solutions Fluorine-free SFFF foam concentrate offering can be found in the *"Perimeter Solutions - Foam Application Rate Questionnaire"*[2]. Now, is the opportunity for the site to set the minimum fire performance required. These may be governed by the following approvals selected by the end-user/site:

- UNDERWRITERS LABORATORIES (UL)
- FACTORY MUTUAL (FM)
- EUROPEAN NORMS (EN-Standards)
- GOVERNMENTS & MILITARIES (Mil-Spec)
- ICAO (International Civil Aviation Organization)
- IMO (International Maritime Organization)
- LASTFIRE (Large Atmospheric Storage Tanks)

6. PERFORM A FIRE SYSTEM / FOAM EQUIPMENT ASSESSMENT

Before starting the transition to SFFF, verify the fire system is correctly operating, including confirming the proportioning system functionality. After verifying the fire system is operating as originally designed, identify foam concentrates, storage tanks, proportioning systems, and discharge devices in your system. Verify the compatibility of current hardware with the Perimeter Solutions – SOLBERG synthetic fluorine-free firefighting foam (SFFF and AR-SFFF) range. Transitioning to SFFF may require adjustments to existing equipment. Check compatibility with pumps, proportioning systems, and discharge devices. Depending on the foam selected, modifications may be required, or maybe minimal. Perimeter Solutions can assist with this and has a range of SOLBERG system hardware, bladder tanks and discharge devices listed and approved to multiple global approvals, including UL and FM, with SOLBERG SFFF foam concentrates. Additionally, 3rd parties also hold UL and FM approvals with SOLBERG foams. Perimeter Solutions has also worked with fire engineers globally to confirm existing hardware and discharge devices that may be compatible with SOLBERG SFFF concentrates, depending on the approvals required. Note: If fluorinated foam was stored in a bladder tank, it is recommended to replace the bladder bag with a new bladder (rather than try to clean – due to residual PFAS contamination) and to dispose of the old bladder bag as PFAS-contaminated waste.

Having completed the above assessment with Perimeter Solutions assistance, the following steps can further assist in planning and carrying out a potential transition from PFAS foams to Perimeter Solutions innovative SOLBERG synthetic fluorine-free firefighting foam concentrates. Engaging early with Perimeter Solutions in this process is critical and will help with guidance on planning a smoother transition. The below is guidance only, as each site and system may need to be reviewed on a case-by-case basis.

SUMMARY OF KEY STEPS TO REVIEW BEFORE, DURING AND AFTER THE TRANSITION FROM PFAS FOAM TO SFFF AFTER CONFIRMING LOCAL PFAS REGULATIONS:

Summary of Key Considerations for Foam Transition - General Step Actions:

- **Understand Regulations -** Identify compliance needs for PFAS-free foam.
- **System Assessment -** Evaluate the current foam system and equipment.
- **Foam Disposal -** Safely remove and dispose of PFAS foam.
- **System Cleaning -** Flush and clean to remove PFAS residues.
- **Transition to New Foam -** Fill, calibrate, and test the system with SOLBERG foam.
- **Personnel Training -** Train staff on any operational differences and safe use.
- **Documentation Updates -** Update manuals, SDS, and system records.

SYSTEM CONDITION INSPECTION:

- Check for corrosion, scaling, or damage in tanks, pipelines, and proportioning equipment.
- Ensure that seals, gaskets, and pump components are in good condition and compatible with the new foam – Refer to *Perimeter Solutions - Technical Bulletin 1028 - Construction Material Compatibility*[3].

Evaluate Existing Proportioning Systems:

- Confirm the current foam system (balanced pressure, bladder tank, in-line eductor, etc.) can operate with the viscosity and proportioning requirements of the replacement foam selected.

Test Compatibility

- Confirm existing water supplies (e.g., seawater, freshwater) are compatible with the foam. Consult with Perimeter Solutions to ensure water type and system suitability.

PLAN FOAM DISPOSAL

Dispose of Existing PFAS Foam:

- Arrange for the collection and safe disposal of PFAS foam through a licensed hazardous waste disposal contractor.
- Follow regulatory guidelines (e.g., EPA or local hazardous waste laws).

Flush and Cleaning of Fire System:

- Prepare a flushing plan to remove PFAS residue from tanks, pipelines, and proportioning systems.
- Use cleaning agents approved for PFAS decontamination or consult with a 3rd party experienced in system cleanout.
- Collect all rinse water/cleaning agents and treat it as hazardous waste (or as required by environmental regulations).
- Send final wash water sample be tested for PFAS to ensure the limit of detection is below environmental regulations prior to introduction of new foam. Record and engage with Local EPA/

Authority Having Jurisdiction (AHJ) to confirm acceptance prior to filling the fire system with SOLBERG SFFF foam.

TRANSITION TO SOLBERG FLUORINE-FREE FOAM (AFTER FULL PFAS CLEANOUT AND CONFIRMED BY REGULATOR/ AHJ THAT AN ACCEPTABLE LEVEL OF PFAS DECONTAMINATION HAS BEEN ACHIEVED)

- Re-inspect the fire system to ensure no components have been impacted during the cleanout process. Before starting the transition to SFFF, verify the fire system is correctly operating, including confirming the proportioning system functionality

Fill System with SOLBERG Foam:

- Add SOLBERG fluorine-free foam concentrate to foam storage tanks.
- Label storage tanks and equipment to indicate the SOLBERG foam being used – Product Name and usage % as a minimum.

Check and Confirm Proportioning Equipment:

- Calibrate proportioning systems for the SOLBERG foam's required mixing ratio (e.g., 1%, 3%, or 6%).

Perform System Testing:
Conduct a full system operational test with the SOLBERG foam to verify system

- Ensure corrected proportioning % of the foam concentrate is achieved.
- Foam quality meets with design/performance parameters (expansion ratio, drain time).
- Perform discharge tests on representative nozzles or monitors to confirm compatibility and effectiveness. Alternative non-discharge and surrogates are now potentially available – refer to NFPA 11 Annex D for future guidance on all these tests.
- Adjust system parameters as necessary based on test results.

TRAIN PERSONNEL

- Provide training for firefighters and operators on the use of SOLBERG fluorine-free foam.
- Educate personnel about any operational differences, such as foam application techniques, foam behavior, and storage requirements.

UPDATE DOCUMENTATION

- Revise operational manuals, maintenance schedules, and foam system documentation to reflect the use of SOLBERG fluorine-free foam.
- Keep records of system testing, foam disposal, and calibration.
- Update safety data sheets (SDS) and ensure they are accessible to personnel.

MONITOR AND MAINTAIN THE SYSTEM

- Conduct regular inspections and maintenance to ensure the system remains in optimal condition.
- Periodically test (in line with local standards) the SOLBERG foam to confirm its performance and compliance with applicable standards.
- Monitor for environmental regulations or changes that could affect foam system requirements.

COMMUNICATE TRANSITION OUTCOMES

- Inform stakeholders, including regulators, insurers, and clients, about the successful transition to SOLBERG fluorine-free foam.

By incorporating the above guidance into a PFAS transition program, facilities can start to build a strong plan to transition from PFAS-based foams to Perimeter Solutions — SOLBERG Fluorine-Free Foam while managing and maintaining fire safety and environmental standards.

For further information or assistance on transitioning to Perimeter Solutions — SOLBERG Fluorine-free Foam please reach out to your local Perimeter Solutions representative.

REFERENCES:

1. **https://www.alsglobal.com/-/media/ALSGlobal/News/News-Articles/Enviromail-Canada/PDFs/EnviroMail_27_Total-Organofluorine-Assay-for-Estimates-of-Total-PFAS**
2. Perimeter Solutions - Foam Application Rate Questionnaire.
3. Perimeter Solutions - Technical Bulletin 1028 - Construction Material Compatibility.
4. Industry Best Practice for PFAS Foams refer to Fire Fighting Foam Coalition (FFFC) - **https://www.fffc.org/**