# PRODUCT GUIDE

# 4FLITE PG

## SAE AMS 1428
## TYPE IV ANTI-ICING FLUID

ASGlobal 4Flite PG
Product Guide
Version 3.0, April 2025

## Document Version Updates

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### Updates

- Page 5, Paragraph 1 – Grammatical change, no significance
- Page 6, Paragraph 2 – Grammatical change, no significance
- Page 8 – Link to AMIL Qualified fluids page updated
- Page 9 – Grammatical change, no significance
- Page 11, Paragraph 4 – Grammatical change, no significance
- Page 16, Paragraph 6 – Grammatical change, no significance
- Page 18, Paragraph 3 – Grammatical change, no significance
- Page 20, Paragraph 1 – Grammatical change, no significance
- Page 22 – Address information updated

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## ASGlobal

ASGlobal is a worldwide organization with offices located in Canada, the United States, the European Union, Central Asia and with partners and team members all over the globe. We are a small but trusted name in aviation specialty chemicals with a strong focus on aircraft and airport winterization products. Whether in support of our airline, airport or aviation ground service company customers, we take great pride in our unique world-class customer service approach as the foundation of the growth of our global customer base.

Our team of experts has over five decades of experience in the aviation industry, challenging the status quo to ensure that our partners receive optimal solutions and the most cost-effective products possible.

## Clean Aircraft Concept

The Clean Aircraft Concept was established by global aviation regulators to ensure that the takeoff of aircraft is prohibited when snow, ice, slush or frost is adhering to wings, tails, control surfaces, propellers, engine intakes and other critical surfaces of the aircraft. To this end, global regulations, industry standards and robust procedures for all aspects of ground de/anti-icing operations have been developed by the global industry to ensure that aircraft are de/anti-iced on the ground prior to departure. The most common approaches for deicing and anti-icing aircraft in winter operations are glycol-based fluids, such as our Sky-Go EG and Sky-Go PG Type I fluids and our 4Flite EG and 4Flite PG Type IV fluids.

## What We Offer

ASGlobal is uniquely positioned as a producer and distributor of aircraft de/anti-icing fluids, runway deicing fluids and aircraft lavatory fluids. Our aircraft de/anti-icing fluids are available in either Ethylene Glycol (EG) or Propylene Glycol (PG) formulation, depending on the geographical location of the customer.

Our fluids allow for the safe and efficient departure of customer aircraft in challenging and unpredictable winter operating conditions, when used in collaboration with a comprehensive ground de/anti-icing program.

## Product Guide

This Product Guide contains details and general guidance for the handling, storage and operational use of 4Flite PG Type IV anti-icing fluid.

This 4Flite PG Product Guide (Version 3.0) is dated April 2025 and shall remain current until a revision is issued. It is the responsibility of the user of 4Flite PG to verify the ASGlobal website and to ensure that the most recent version of the Product Guide is always employed. All previous versions of the Product Guide shall be removed from circulation and destroyed.

Customers using 4Flite PG shall always ensure that this Product Guide is made available to all personnel handling and employing 4Flite PG, and that all applicable information from this Product Guide is included within employee training programs and operational procedures, as required.

## Safety Data Sheet

An associated Safety Data Sheet (SDS) has been provided along with this Product Guide. It is strongly recommended that users of 4Flite PG consult, read and understand the safety precautions provided within the SDS and comply with such measures while receiving, handling and/or using 4Flite PG fluid.

## Product Disclaimers

ASGlobal does not guarantee, explicitly or implicitly, the properties of the 4Flite PG product or the suitability of the 4Flite PG product for a particular de/anti-icing operation or application. The user of 4Flite PG is therefore solely responsible for determining the suitability of the 4Flite PG fluid for the intended application. The user of 4Flite PG is solely responsible for assuming all risk and liability in connection with the use of the 4Flite PG product.

4Flite PG fluid is not a stand-alone anti-icing approach and must always be employed as part of a comprehensive aircraft ground de/anti-icing program developed based on industry standards such as SAE AS 6285 and specific procedures from the airlines and airframe manufacturers.

Only suitably trained and qualified personnel should be allowed to receive, handle, test and apply 4Flite PG fluids. All relevant product information from this guide, such as product properties, lowest operational use temperatures, handling considerations and fluid performance data shall be included within the user's internal personnel training programs.

The details contained within this Product Guide were based on information believed to be reliable at the time of publication and are intended to provide general guidance on the 4Flite PG product and its usage. All references within this document to third-party information such as SAE standards and global regulatory guidance were correct at the time of publication of this Product Guide.

## Introducing 4Flite PG

4Flite PG is a thickened Type IV aircraft anti-icing fluid that has been fully qualified in accordance with SAE Aerospace Material Specification (AMS) 1428/1.

4Flite PG Type IV anti-icing fluid is a Propylene-Glycol based fluid containing water, corrosion inhibitors, surfactants, polymers, green dye and other additives.

4Flite PG fluid is intended to be used as part of a robust and comprehensive aircraft ground de/anti-icing program that is compliant with industry standards, local regulations and customer airline de/anti-icing programs.

4Flite PG fluid is designed to be applied unheated to aircraft surfaces as the second step of a two-step de/anti-icing procedure to provide a protective coating to treated aircraft surfaces against the reformation of ice, snow and frost following the successful deicing of the aircraft with heated ASGlobal Type I fluids. The protection times provided by the 4Flite PG Type IV fluid in various winter weather conditions are called Holdover Times and are documented in a fluid-specific performance chart for 4Flite PG that has been published by Transport Canada and the Federal Aviation Administration.

4Flite PG has been fully qualified in its Neat or 100/00 formulation only, which signifies that the fluid, as supplied by ASGlobal, is not intended to be further diluted by the end user.

## 4Flite PG Qualification

4Flite PG Type IV fluid has undergone extensive testing as per the requirements in SAE AMS 1428/1, including physical property testing, material compatibility testing, environmental performance testing, aerodynamic elimination testing and anti-icing performance testing. 4Flite PG is a fully qualified fluid that has met or exceeded all requirements identified within SAE AMS 1428/1.

All work to qualify 4Flite PG to the requirements of SAE AMS 1428/1 was performed by accredited independent laboratories. A copy of the full Fluid Qualification Report for 4Flite PG can be obtained directly from ASGlobal upon request.

4Flite PG Type IV is included on the lists of Qualified Type IV Fluids published by the Anti-Icing Materials International Laboratory (AMIL), Transport Canada and the Federal Aviation Administration. These lists can be found electronically at the links below.

AMIL

https://lima.uqac.ca/services/?lang=en

Transport Canada Transports Canada

https://tc.canada.ca/en/aviation/general-operating-flight-rules/holdover-time-hot-guidelines-icing-anti-icing-aircraft#toc-1

Federal Aviation Administration

https://www.faa.gov/other_visit/aviation_industry/airline_operators/airline_safety/deicing/

## Delivery Options

4Flite PG Type IV anti-icing fluid is available in the following delivery options:

### For Canada and Europe:

- ~19,000 Liters per tanker truckload
- ~22,000 Liters per ISO tank
- Totes ~1,000 Liters each
- Drums ~208 Liters each

### For the United States:

- ~5,000 Gallons per tanker truckload
- ~6,000 Gallons per ISO tank
- Totes ~265 Gallons each
- Drums ~55 Gallons each

## 4Flite PG Fluid Data Summary

A summary of physical, operational and performance data for 4Flite PG has been provided in the table below.

| | Data | 4Flite PG |
|---|---|---|
| 1 | Qualification | Conforms to SAE AMS 1428/1 |
| 2 | Composition | 50% by Weight Propylene Glycol |
| 3 | Colour | Green |
| 4 | Appearance | Free of Suspended Matter |
| 5 | Freezing Point | -38ºC (-36.4ºF) |
| 6 | Refractive Index @ 20ºC | 1.3901 – 1.3931 |
| 7 | pH | 6.5 - 7.5 |
| 8 | Viscosity (Production Range) | 26,100 – 36,500 mPa.s* |
| 9 | Lowest On-Wing Viscosity | 26,100 mPa.s* |
| 10 | LOUT | -26ºC (-15ºF) |
| * | Viscosity Method: Spindle LV2-disc (with guard leg), 600 mL low form (Griffin) beaker, fluid volume 425 mL, 20ºC, 0.3 rpm, 10.0 minutes. | |

## Fluid Acceptance

Users of 4Flite PG fluid shall ensure that a robust and consistent procedure for fluid acceptance is employed and that only duly trained personnel perform fluid acceptance duties.

Prior to accepting fluids, the receiver shall ensure that all shipping documents and product labels clearly identify the 4Flite PG fluid and that a Certificate of Analysis for the fluid has been provided. All seals and caps on the shipping vessels shall be intact as required.

The user shall always verify that the 4Flite PG fluid received complies with the provided Certificate of Analysis and that specific data related to the received shipment be recorded and retained, as per SAE standards and customer de/anti-icing programs. Fluid samples should also be collected and retained.

If any pertinent information is not provided or if any test results are out of range, the user should not accept the fluid shipment and should contact ASGlobal immediately.

## Freezing Point Testing of 4Flite PG

The freezing point of an anti-icing fluid is the temperature at which the fluid will freeze on aircraft surfaces. The freezing point of 4Flite PG Neat (100/00) is -38ºC (-36.4ºF).

4Flite PG fluid used in winter operations shall be tested by the user daily (or as required in approved ground de/anti-icing programs) to ensure that the freezing point of the fluid is appropriate for each spray application and that the Lowest Operational Use Temperature (LOUT) has not been exceeded.

Hand-held refractometers should be employed by the user to measure the refractive index of 4Flite PG fluid and to determine if the fluid is within the acceptable refraction range.

The user shall always ensure that all refractometers used in operations are suitable for the intended use, that refractometers are properly calibrated and maintained, and that all functional tests (such as zeroing the refractometer) are performed daily or as per manufacturer and/or customer de/anti-icing program requirements. For details on suitable refractometers for 4Flite PG, the user should contact ASGlobal.

## Acceptable Refractive Index Range

4Flite PG fluid, as delivered in its Neat (100/00) form, has an acceptable refractive index range of 1.3901 – 1.3931.

## Lowest Operational Use Temperature of 4Flite PG

SAE AS 6285 defines a Type IV fluid's LOUT as the higher (warmer) temperature of:

- The lowest temperature at which the fluid meets the aerodynamic acceptance test (determined in accordance with SAE AS 5900) for a given type of aircraft rotation speed (high-speed or low-speed); and
- The freezing point of the fluid plus the required freezing point buffer of 7ºC (13ºF).

4Flite PG has undergone extensive aerodynamic acceptance as part of the qualification process for SAE AMS 1428/1. For high-speed ramp aircraft (greater than 100 knots of rotation speed), the aerodynamic acceptance temperature of 4Flite PG Neat (100/00) was determined to be -26ºC (-15ºF).

As 4Flite PG's aerodynamic acceptance temperature of -26ºC (-15ºF) is warmer than the freezing point plus the buffer (-31ºC or -23.8ºF), the **LOUT of 4Flite PG is -26ºC (-15ºF)**.

## Viscosity

ASGlobal's 4Flite PG is a thickened fluid with a high viscosity that has been formulated to provide a protective layer to treated aircraft surfaces against the reformation of frost, snow and ice. The fluid is designed to remain at high viscosity on treated aircraft and to absorb winter precipitation until the shear force of the take-off roll is exerted upon the fluid and it eliminates to provide aerodynamically clean surfaces. The viscosity of the fluid therefore plays a vital role in the overall performance of the fluid and the end user must ensure the integrity of the viscosity of 4Flite PG fluid through periodic measurements to validate the overall quality of the 4Flite PG fluid used in operations. This includes performing pre-season and other periodic viscosity verifications of 4Flite PG fluids stored in tanks and vehicles, as per SAE AS 6285 requirements and customer de/anti-icing programs.

## Recommended Viscosity Measurement Method

As the viscosity of 4Flite PG is dependent on temperature and the force applied to the fluid, it is imperative that a consistent method of viscosity measurement such as that included in SAE AS 9968 be employed for measuring the viscosity of 4Flite PG fluids.

ASGlobal recommends that the following viscosity method be employed for measuring and reporting the viscosities of 4Flite PG fluid:

- Brookfield LVT Viscometer, DV-II or equivalent;
- Spindle LV2-disc (with guard leg);
- 425 mL of fluid placed in a 600 mL low form (Griffin) beaker;
- Test temperature = 20ºC;
- Viscometer is started at a speed of 0.3rpm;
- The viscosity measurement is recorded at precisely 10 minutes; and
- The viscosity is reported in millipascal-seconds (or mPa.s).

## Production Range Viscosity

The Production Range Viscosity for 4Flite PG 100/00 is 26,100 to 36,500 mPa.s when measured using ASGlobal's recommended viscosity measurement method. The end user shall always ensure that fluid received is within the acceptable range.

## Lowest On-Wing Viscosity

The Lowest On-Wing Viscosity (LOWV) of 4Flite PG 100/00 is the viscosity of the fluid that was sent for endurance time tests (as per SAE ARP 5485) to determine the holdover time performance of 4Flite PG in various winter operating conditions. The LOWV is therefore the lowest viscosity of 4Flite PG for which the holdover times published by Transport Canada and the Federal Aviation Administration will continue to apply.

The documented LOWV of 4Flite PG, which is included in the holdover time guidance information from Transport Canada and the Federal Aviation Administration, is 26,100 mPa.s.

To ensure that deicing vehicles don't shear 4Flite PG below the LOWV, the end user is required to perform spray tests on a pre-determined basis, as per the requirements in SAE AS 6285 and the various air carrier de/anti-icing programs. 4Flite PG fluid samples from shear tests shall be collected using an acceptable procedure and then tested for viscosity using ASGlobal's recommended viscosity measurement method to ensure that the LOWV is respected. Collected fluid samples can also be properly labeled and sent directly to ASGlobal for viscosity verification.

Shear tests shall be performed at least once annually prior to the start of the deicing season for each deicing vehicle in use. Air carrier customers and other end users may have more stringent requirements for shear tests, and the end user of 4Flite PG shall always ensure that these requirements are respected. This includes the need to potentially complete shear tests during the season in addition to prior to the season, as well as every time a vehicle spray system is repaired or replaced or whenever a new vehicle is introduced.

## Product Dilution

4Flite PG is intended to be employed in a Neat or 100/00 form and shall never be further diluted by the user once received. The fluid has been formulated to be applied unheated and as received as the second step of a two-step de/anti-icing operation.

The holdover time performance of 4Flite PG fluid has not been determined in 75/25 or 50/50 dilutions, and therefore no holdover times for dilutions of the 4Flite PG fluid have been published in the 4Flite PG brand-specific table by the regulators.

## Applying 4Flite PG

The responsibility for ensuring that de/anti-icing operations with 4Flite PG comply with airframe manufacturer requirements, customer de/anti-icing programs, regulatory requirements, environmental considerations and SAE standards resides solely with the user of the product. As such, the fluid application information contained within this Product Guide shall be considered as additional information only.

The user shall also ensure that only properly trained personnel apply 4Flite PG fluids in accordance with applicable customer de/anti-icing programs.

## Two-Step De/Anti-Icing Operations

A two-step process is typically employed when aircraft surfaces are contaminated and active precipitation is falling or is expected to begin prior to the departure of the aircraft. In this case, deicing would be completed with a heated ASGlobal Type I fluid in the first step, but then would be immediately followed up with an anti-icing application of 4Flite PG as a second step. The flight crew operating the aircraft is responsible for selecting the desired de/anti-icing process (one-step or two-step) and the desired fluid types.

In the first step of a two-step de/anti-icing operation, the user shall ensure that sufficient amounts of heated Type I fluid are employed at a suitable concentration. All aircraft surfaces shall be properly cleaned in the first step and inspected by the user as per SAE standards, regulations and customer de/anti-icing programs to ensure that no contamination remains on treated surfaces.

In the second step of two-step operations, the user shall apply an adequate amount of 4Flite PG fluid to aircraft surfaces within three minutes of the Type I spray to provide a uniform fluid coverage.

Each airframe manufacturer identifies the surfaces that can be treated with deicing and anti-icing fluids. Spray diagrams for common aircraft types are included in SAE AS 6286 and customer de/anti-icing programs. The user of 4Flite PG shall always comply with the guidance and restrictions provided in the aircraft spray diagrams and should be aware of all no-spray zones. In the event that the user of 4Flite PG is unfamiliar with the airframe being deiced or has questions about where 4Flite PG can be applied to such aircraft, the user should discuss the de/anti-icing operation with the flight crew or consult the air carrier de/anti-icing program or SAE AS 6286.

4Flite PG fluids should always be applied to aircraft surfaces from a close yet safe distance, as per minimum distances for the deicing vehicle, bucket and nozzle included in applicable ground de/anti-icing programs. For best results and to prevent unnecessary shearing of the fluid, 4Flite PG should be applied using low flow rates and a fan nozzle setting.

## One-Step Anti-Icing with Unheated 4Flite PG

One-step anti-icing with unheated 4Flite PG fluid can be performed in certain conditions, such as to provide a preventative coating to aircraft surfaces when frost conditions or periods of snow or freezing precipitation are forecasted during the overnight hours. In such cases, it is permissible to apply unheated 4Flite PG fluid to clean and dry aircraft surfaces to assist in protecting the aircraft against adhering contamination and to help minimize the time required to deice the aircraft the following morning. This type of preventative anti-icing may assist in ensuring an on-time departure of the aircraft.

Unheated 4Flite PG fluid can also be applied to clean aircraft surfaces when the aircraft is positioned in a hangar, prior to being pulled out into active or forecasted winter operating conditions.

When using 4Flite PG unheated as a one-step anti-icing fluid, the end user shall always ensure that customer airline de/anti-icing programs are respected.

## One-Step De/Anti-Icing with Heated 4Flite PG

One-step de/anti-icing with thickened anti-icing fluids is a permissible practice that is still employed in certain global markets. In such cases, the anti-icing fluid is heated and applied to remove contamination from aircraft critical surfaces.

The repeated use of heated thickened anti-icing fluids for de/anti-icing has been the subject of focused research in recent years. This practice results in residues in aerodynamically quiet areas of the aircraft that can rehydrate in periods of high humidity. These rehydrated residues can freeze, resulting potentially in jammed flight controls if the frozen residues are located in highly sensitive areas.

For these reasons, ASGlobal strongly recommends the use of heated Type I fluids for deicing followed by an unheated application of 4Flite PG as an anti-icing fluid, should an anti-icing application be required.

## Applying 4Flite PG with Forced Air

It is a common practice at many airports around the world and with certain types of vehicles to apply Type I fluids with onboard forced air systems that allow the Type I fluid to be injected into, or applied on top of, a forced air stream.

4Flite PG is a thickened anti-icing fluid that is sensitive to shearing. Shearing of the fluid because of the forced application could result in a reduction in the overall viscosity of the 4Flite PG fluid, which could greatly impact its overall performance as the impacts of the forced air system on the holdover time of 4Flite PG are unknown. As such, it is recommended that end users wanting to employ 4Flite PG with forced air should contact ASGlobal for guidance.

## Fluid Failure

An aircraft anti-icing fluid has lost its effectiveness, and as such is considered to have failed, when it is no longer able to absorb, melt and shed contamination. Fluid failure can typically be determined by performing a visual or tactile check of treated aircraft surfaces. Some visual clues that a fluid has lost (or is in the process of losing) its effectiveness are a loss of fluid dye or a lack of uniformity in fluid dye across a treated surface, loss of gloss, snow or ice accumulation within the fluid layer, surface freezing, buildup of ice crystals in or on the fluid surface or the presence of slush.

When the user of 4Flite PG has determined that the fluid has lost or is in the process of losing its effectiveness, the flight crew shall be notified immediately and another complete deicing and anti-icing (if required) of the aircraft must be completed before it should be permitted to attempt to take off. A pre-takeoff check of the aircraft, or even a pre-takeoff contamination check, may be the only ways to determine that aircraft are free of any contamination.

Fluid failure recognition is an important part of user responsibilities and therefore all user personnel should be trained and qualified to conduct visual and tactile inspections and recognize the onset of fluid failure.

## Holdover Time

The holdover time of an aircraft anti-icing fluid is defined as the estimated time that an anti-icing fluid is effective in preventing frost, ice, slush or snow from forming and adhering to treated surfaces.

Holdover time is calculated as beginning with the start of the final application of the anti-icing fluid and expiring when the fluid is no longer effective. Holdover times are published in winter guidance updates published annually by Transport Canada and the Federal Aviation Administration. The end user must always ensure that the most recent version of the holdover time tables are employed at all times.

When using 4Flite PG as an anti-icing fluid in accordance with the regulator Type IV holdover time tables, the 4Flite PG fluid must be applied unheated to clean aircraft surfaces and applied in a minimum quantity of one liter per square meter on required aircraft surfaces, or in a minimum volume specified in SAE AS 6286 or the various air carrier de/anti-icing programs. The desired thickness of the 4Flite PG fluid on treated aircraft surfaces is 1 to 3 mm.

As part of the communication of the Anti-Icing Code to the flight crew, users are required to designate the fluid used and provide the flight crew with a start of holdover time application. When reporting the use of 4Flite PG in the Anti-Icing Code, users shall identify the fluid as “ASGlobal 4Flite PG Type IV, 100%”.

## Storage and Handling of 4Flite PG

The user should ensure that 4Flite PG is stored and handled correctly to maintain satisfactory fluid performance and to ensure that all sources of potential degradation are minimized.

## Product Safety

The user shall always consult the SDS before handling 4Flite PG and ensure that the fluid is employed safely and in an environmentally responsible manner consistent with all applicable local procedures and regulations. It is the responsibility of the user of 4Flite PG to know, understand and adhere to all local procedures, regulations and restrictions on the use of glycol-based fluids in operations.

The user is responsible for ensuring that all employees, contractors and customers are supplied with pertinent information related to the safe use of the 4Flite PG product and that all employees tasked with handling and applying the fluids are properly trained to undertake these functions.

All fluids shall be stored responsibly as outlined in this Product Guide.

Areas where de/anti-icing operations occur can become contaminated with glycol-based fluids due to overspray or dripping and become slippery. The user should employ great caution when operating equipment in these areas and all personnel, flight crews or even passengers should exercise great caution if required to walk in areas exposed to these products. To prevent the spread of glycol-based fluids to other uncontaminated areas, personnel exposed to fluids on the ground should wipe their feet before entering aircraft, vehicles or buildings.

All runoff from de/anti-icing operations should be contained, collected and disposed of in accordance with federal, provincial/state, and local regulations and guidelines. As the requirements governing the collection and disposal of waste fluids from de/anti-icing operations can vary greatly from one location to the next, it is the sole responsibility of the user of 4Flite PG to understand and adhere to all applicable regulations and requirements.

To ensure responsible environmental management of glycol-based fluids used in aircraft ground de/anti-icing operations, users should maintain a Glycol Management Plan (GMP) for each station undertaking de/anti-icing activities and should include this plan within local operating procedures. The GMP would identify local roles and responsibilities related to de/anti-icing, acceptable areas for deicing operations, details on fluids employed, storage and handling procedures, methods to contain and dispose of effluent, glycol reporting procedures, emergency response plans in the events of spills or accidents and inventory control procedures, amongst other elements.

## Storage Tanks

Bulk deliveries of 4Flite PG fluid should only be stored in structurally intact and well-maintained storage tanks. These storage tanks can be made from stainless steel, light colored opaque high-density polyethylene, or epoxy lined steel tanks with an inspection. If the user intends to store 4Flite PG fluid in a tank made from material other than those identified above, the user should contact ASGlobal in advance of loading the fluid in such tanks.

All fluid tanks used to store de/anti-icing fluids should be inspected at least annually to ensure that no corrosion or contamination is present on the inside of the tanks. All records of tank inspections should be kept on file by the user for auditing purposes.

When 4FIlite PG is supplied to the user in totes and/or drums, it is preferable for the totes and drums to be stored inside a dry building with all fill and drain ports protected against damage. Totes and drums should be kept away from direct heat sources and shielded from sunlight and fluorescent lights, as these are a source of ultraviolet light, which may degrade fluid performance and quality. Totes and drums can also be covered to prevent exposure to ultraviolet light.

When stored in a proper manner, 4Flite PG is not corrosive and will not damage materials commonly used for storage tanks, pumps, fittings and transfer lines. 4Flite PG fluid is compatible with most elastomers used in gaskets, hoses and seals.

The user should avoid using dissimilar metals in contact with each other as galvanic action may occur, which may degrade 4Flite PG fluid in some cases and result in the possible formation of gels and light residues.

## Piping and Hoses

All piping and hoses used to supply 4Flite PG should be dedicated solely for use with this product and should be clearly labelled and color-coded as applicable.  A minimum pipe or hose diameter of 8 centimeters (3 inches) is recommended.

Fixed piping can be made from various metals used in storage tank construction, so long as incompatibility issues are considered to prevent degradation of the fluid. All piping used for 4Flite PG should be well maintained by the user and the surfaces should be smooth with no sharp bends.

Flexible hoses used for 4Flite PG should be those approved for use with either petroleum-based products or chemical solvents. Hose fittings should be capped when not in use and stored off the ground to keep them free from contaminants.

## Pumps

Thickened anti-icing fluids are exposed to shear forces when they are pumped or sprayed through a nozzle, and therefore the end user shall always ensure that proper pumps are used in operations. 4Flite PG fluid is a shear-stable fluid that can be transferred with various commercially available low-shear pump types such as diaphragm pumps and progressive cavity pumps, without affecting the fluid's quality or performance.

## Storage Stability

If the user adheres to strict guidelines for the proper storage of 4Flite PG fluid, the shelf life of 4Flite PG will exceed one year under normal ambient conditions.

Periodic testing of 4Flite PG fluid is required to ensure that the fluid quality is within specifications and the fluid is still acceptable for use. At a minimum, 4Flite PG fluid in user storage tanks shall be tested for quality prior to the onset of each deicing season. This testing shall include, at a minimum, conformance to specifications for product identification and labeling, color, suspended matter, viscosity, refractive index and pH. The user may also specify more frequent intervals for such quality tests, as required in internal de/anti-icing programs and/or as per customer requirements.

All 4Flite PG fluid not meeting specifications during periodic tests shall be quarantined and samples should be sent to ASGlobal for laboratory verification.

## Storage Heating of 4Flite PG

All 4Flite PG fluids should ideally be stored unheated and all unnecessary heating of the fluid shall always be avoided to prevent repetitive heating and cooling cycles on the fluid which may result in thermal degradation, decreases in viscosity and potential increases in refraction measurements.

To ensure that 4Flite PG fluids are safe to use, the user shall ensure that fluid refraction is verified daily during the winter season as part of a robust and ongoing fluid quality program.

## Incompatible Mixtures

4Flite PG should not be mixed with any other deicing or anti-icing fluid.

## Using 4Flite PG with New Equipment

When 4Flite PG is slated for use in a new deicing vehicle, the user shall ensure that the vehicle is thoroughly cleaned prior to the introduction of the fluid. Anti-icing solutions placed in the vehicle for transport should thoroughly flushed and the fluid tanks and piping rinsed with water prior to loading 4Flite PG into the fluid tanks.

## Fluid Changeover Procedures

If the user is undertaking a fluid changeover from another fluid to 4Flite PG, the user should communicate with ASGlobal in advance of the fluid changeover, to ensure that all precautions are taken to manage the fluid changeover process and maintain product integrity.

## Fluid Transfers

If transferring 4Flite PG fluids for any reason (ex: placing water in vehicle tanks for personnel training or for maintenance on deicing vehicle tanks), all vessels receiving a 4Flite PG transfer shall be thoroughly cleaned and flushed prior to the 4Flite PG fluid being loaded on the vessel. If the receiving tank already contains 4Flite PG, the user should ensure that fluid is tested as required prior to transferring fluid from the tank to the receiving vessel. If the tank fluid was contaminated, the action of transferring the contaminated fluid to the receiving vessel would contaminate the fluid in this vessel. To minimize the risk of product contamination, the user should verify the labels on both the source and receiving vessels prior to the transfer of fluid.

## Product Labels

All storage tanks and deicing vehicles housing 4Flite PG fluids shall be properly labeled to indicate the type of fluid in use. The user shall communicate with ASGlobal to obtain such product labels and shall ensure that they are properly affixed to tanks and vehicles.

## Precautions

- 4Flite PG Neat (100/00) is designed to be employed as supplied and should not be further diluted by the user once received.
- 4Flite PG should never be applied to aircraft surfaces if the measured refractive index is outside of the acceptable refraction index range (1.3901 to 1.3931).
- 4Flite PG fluid should be applied unheated to clean aircraft surfaces as a second-step anti-icing fluid.
- 4Flite PG fluid should never be applied heated to aircraft surfaces.
- The user shall ensure that all personnel tasked with handling, testing and using 4Flite PG are properly trained and qualified.
- The user shall ensure that the LOUT of 4Flite PG is always respected and that the fluid is never applied to aircraft at temperatures below -26ºC (-15ºF).
- 4Flite PG fluid should not be applied on aircraft no-spray areas. The user should ensure that all personnel have access to no-spray diagrams for common aircraft types and that the spray restrictions related to these aircraft types are trained to personnel.
- 4Flite PG should not be used as antifreeze for vehicles or aircraft lavatories.
- Areas sprayed with 4Flite PG fluid may become slippery. The user should exercise great caution when walking or working in areas where the fluid has accumulated.
- 4Flite PG should not be used to de/anti-ice:
    - Helicopters or Runways;
    - Apron or ramp areas;
    - Pavement;
    - Sidewalks; or
    - Deicing vehicles or ground support equipment.

## Contact Information

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