DE/ANTI-ICING MANUAL

SKYUP MT Limited

Tel: +356 79242432 E-mail: contact@skymalta.aero

Registered address: Ewropa Business Centre, Level 3 - 701, Dun Karm Street, Birkirkara, BKR 9034, Malta

Operating address: Third Floor of Merlin House, Mountbatten Street, Hamrun, HMR 1574 Malta

Issue 2, Revision 1
Revision Date: 29.01.2025

DOCUMENT №: SEU-GRH-003

Approval Page

Issue: 2	Date: 17.09.2024	Revision: 1	Date: 29.01.2025

	Name/Responsibility	Signature	Date
Prepared by:	Viktor Zakrevskyi Director Ground Operations	DocuSigned by: 5D5AA07060CD4C2...	03.02.2025
Internally approved by:	Oleksandr Zabolotnyi Director Safety	Signed by: Oleksandr Zabolotnyi 4F438B324CAB433...	03.02.2025
	Anatolii Nechai Director Compliance	Signed by: 641323E2E2E9434...	03.02.2025

LIST OF EFFECTIVE PAGES

Page	Rev.	Rev. date
Title page		
1	1	29.01.2025
Disclaimer		
1	0	17.09.2024
Approval Page		
AP-1	1	29.01.2025
List of Effective Pages		
LEP-1	1	29.01.2025
LEP-2	0	17.09.2024
Record of Revisions		
RR-1	1	29.01.2025
Revision Highlights		
RH-1	1	29.01.2025
Distribution List		
DL-1	0	17.09.2024
Table of Contents		
TOC-1	1	29.01.2025
TOC-2	1	29.01.2025
Chapter 1		
1-1	0	17.09.2024
1-2	1	29.01.2025
Chapter 2		
2-1	1	29.01.2025
Chapter 3		
3-1	1	29.01.2025
3-2	1	29.01.2025
3-3	1	29.01.2025
3-4	1	29.01.2025
3-5	0	17.09.2024
3-6	1	29.01.2025
3-7	0	17.09.2024
3-8	0	17.09.2024
3-9	0	17.09.2024
3-10	0	17.09.2024
3-11	0	17.09.2024
3-12	0	17.09.2024
3-13	0	17.09.2024
3-14	1	29.01.2025
3-15	0	17.09.2024
3-16	0	17.09.2024
3-17	0	17.09.2024
3-18	0	17.09.2024
3-19	0	17.09.2024
3-20	0	17.09.2024
3-21	0	17.09.2024
3-22	0	17.09.2024
3-23	0	17.09.2024
3-24	0	17.09.2024
3-25	0	17.09.2024
3-26	0	17.09.2024
3-27	0	17.09.2024
3-28	0	17.09.2024
3-29	0	17.09.2024
3-30	0	17.09.2024
3-31	0	17.09.2024
3-32	1	29.01.2025

Page	Rev.	Rev. date
3-33	0	17.09.2024
3-34	0	17.09.2024
3-35	0	17.09.2024
3-36	0	17.09.2024
Chapter 4		
4-1	1	29.01.2025
4-2	0	17.09.2024
4-3	0	17.09.2024
4-4	0	17.09.2024
4-5	0	17.09.2024
4-6	0	17.09.2024
4-7	1	29.01.2025
Chapter 5		
5-1	0	17.09.2024
5-2	0	17.09.2024
5-3	0	17.09.2024
Annex 1		
A.1-1	0	17.09.2024
A.1-2	0	17.09.2024
A.1-3	0	17.09.2024
A.1-4	0	17.09.2024
A.1-5	0	17.09.2024
A.1-6	0	17.09.2024
A.1-7	0	17.09.2024
A.1-8	0	17.09.2024
A.1-9	0	17.09.2024
A.1-10	0	17.09.2024
A.1-11	0	17.09.2024
A.1-12	0	17.09.2024
A.1-13	0	17.09.2024
A.1-14	0	17.09.2024
A.1-15	0	17.09.2024
A.1-16	0	17.09.2024
A.1-17	0	17.09.2024
A.1-18	0	17.09.2024
A.1-19	0	17.09.2024
A.1-20	0	17.09.2024
A.1-21	0	17.09.2024
A.1-22	0	17.09.2024
A.1-23	0	17.09.2024
A.1-24	0	17.09.2024
A.1-25	0	17.09.2024
A.1-26	0	17.09.2024
A.1-27	0	17.09.2024
A.1-28	0	17.09.2024
A.1-29	0	17.09.2024
A.1-30	0	17.09.2024
A.1-31	0	17.09.2024
A.1-32	0	17.09.2024
A.1-33	0	17.09.2024
A.1-34	0	17.09.2024
A.1-35	0	17.09.2024
A.1-36	0	17.09.2024
A.1-37	0	17.09.2024
A.1-38	0	17.09.2024

A.1-39	0	17.09.2024
A.1-40	0	17.09.2024
A.1-41	0	17.09.2024
A.1-42	0	17.09.2024
A.1-43	0	17.09.2024
A.1-44	0	17.09.2024
A.1-45	0	17.09.2024
A.1-46	0	17.09.2024
A.1-47	0	17.09.2024
A.1-48	0	17.09.2024
A.1-49	0	17.09.2024
A.1-50	0	17.09.2024
A.1-51	0	17.09.2024
A.1-52	0	17.09.2024
A.1-53	0	17.09.2024
A.1-54	0	17.09.2024
A.1-55	0	17.09.2024
A.1-56	0	17.09.2024
A.1-57	0	17.09.2024
A.1-58	0	17.09.2024
A.1-59	0	17.09.2024
A.1-60	0	17.09.2024
A.1-61	0	17.09.2024
A.1-62	0	17.09.2024
A.1-63	0	17.09.2024
A.1-64	0	17.09.2024
A.1-65	0	17.09.2024
A.1-66	0	17.09.2024
A.1-67	0	17.09.2024
A.1-68	0	17.09.2024
A.1-69	0	17.09.2024
A.1-70	0	17.09.2024
A.1-71	0	17.09.2024
A.1-72	0	17.09.2024
A.1-73	0	17.09.2024

RECORD OF REVISIONS

The Effective Date is determined by Director Ground Operations after internal approvals in accordance with CMM Ch.4.

The Effective Date shall be stated in Centrik database as “Valid From” during the document distribution process.

Issue №	Issue date	Revision №	Revision date	Effective date
1	24.02.2023	0	24.02.2023	14.04.2023
		1	26.12.2023	31.12.2023
		2	29.01.2024	09.02.2024
2	17.09.2024	0	17.09.2024	11.10.2024
		1	29.01.2025	03.02.2025

REVISION HIGHLIGHTS

Issue No. 2, Revision No.1, Dated 29.01.2025.

The revision of the Manual includes changes to processes and procedures as specified below.

Item No.	Page No.	Change
Chapter 1		
1.2	1-2	Note was added
Chapter 2		
2.1	2-1	SAE reference was revised
2.2	2-1	Subsection title has been updated without changing its context
Chapter 3		
3.1	3-1	Definition of Clean Aircraft Concept was revised – “propellers” were excluded from the list of critical aircraft surfaces that must be de/anti-iced in the event of frozen or freezing contamination, as they are not available on all types of SKYUP MT aircraft
3.3.1	3-2, 3-3, 3-4	Commander definition has been updated Deicing Provider definition was changed to External De/Anti-icing Service Provider or De/Anti-icing Service Provider with no change in the content of the definition Pilot-in-Command, Ground Service Provider definitions have been added
3.4.1	3-6	SKYUP MT responsibility was clarified
3.4.3	3-6	New subsection “Director Ground Operations” was added
3.8.3	3-14	Reference to Section 6 was removed
3.12	3-32	Information about hand signal use was clarified
Chapter 4		
4.1	4-1	Provisions for SKYUP MT Compliance Monitoring Program was clarified
4.4.3.1	4-7	Requirements for monthly operational checks was removed
4.4.3.2	4-7	Information about communication means of reporting and information to be reported was clarified
Different chapters		Minor editorial corrections were made without highlighting
Different chapters		In order to enhance clarity across the Manual the following term Deicing Provider was changed to External De/Anti-icing Service Provider or De/Anti-icing Service Provider (both terms can be used throughout the manual)

DISTRIBUTION LIST

The Director Ground Operations is responsible for the relevance of the master copy of the document.

The master copy is the one posted on Centrik in electronic format.

Link to Centrik: https://skyup.centrik.net/

No.	Holder	Location	Format
1	Director Ground Operations	Centrik	Master Digital
-	SKYUP MT	Centrik	Electronic (PDF)
-	SKYUP MT Aircraft	EFB	Electronic (PDF)
-	Parties	Centrik	Electronic (PDF)

TABLE OF CONTENTS

1. GENERAL

1.1. APPLICABILITY

The procedures described in this MANUAL are applicable to:

(1) SKYUP MT Limited

Legal address:

Ewropa Business Centre, Level 3 – 701,

Dun Karm Street, Birkirkara BKR 9034, Malta

Tel: +356 79242432

E-mail: contact@skymalta.aero

(2) External De/Anti-icing Service Providers that perform de/anti-icing functions for the SKYUP MT as a core set of De/Anti-icing procedures in the conduct of De/Anti-icing functions. While all relevant factors have been taken into consideration and these procedures constitute best practice.

1.2. APPROVED DE/ANTI-ICING SERVICE PROVIDERS LIST

№	Company name	Airport	Type of service	Comments
1.	Wisag Ground Service	BER	De/Anti-icing and Post-deicing check	
2.	NICE Airport Service	FRA	De/Anti-icing and Post-deicing check	
3.	SIA HAVAS LATVIA	RIX	De/Anti-icing and Post-deicing check	
4.	Baltic Ground Services	VNO	De/Anti-icing and Post-deicing check	
5.	AS Tallinn Airport GH	TLL	De/Anti-icing and Post-deicing check	
6.	Airport Handling SRL	RMO	De/Anti-icing and Post-deicing check	
7.	Airport Rzeszow-Jasionka	RZE	De/Anti-icing and Post-deicing check	
8.	Menzies Aviation	OTP, IAS, CLJ, TSR, SBZ	De/Anti-icing and Post-deicing check	
9.	LS Airport Services S.A	WAW, GDN, KTW	De/Anti-icing and Post-deicing check	

№	Company name	Airport	Type of service	Comments
10.	WELCOME Airport Services	POZ	De/Anti-icing and Post-deicing check	
11.	WRO-LOT Airline Services Ltd	WRO	De/Anti-icing and Post-deicing check	
12.	UAB Litcargus	KUN	De/Anti-icing and Post-deicing check	
13.	R.A. Aeroportul Oradea	OMR	De/Anti-icing and Post-deicing check	

Note: If a new station opens after the SKYUP MT De/Anti-icing Manual release, a new De/Anti-icing Service Provider will be added to the list above in the next SKYUP MT De/Anti-icing Manual revision.

2. INTRODUCTION

2.1. REFERENCES

- The Manual of Aircraft Ground Deicing/Anti-icing Operations (Doc 9640) Third Edition, 2018.
- SAE Publications:
  - AS6285E, Aircraft Ground Deicing/Anti-Icing Processes;
  - AS6286D Aircraft Ground DeIcing/Anti-icing Training and Qualification Program;
  - AS6332A Aircraft Ground Deicing/Anti-icing Quality Management.
- FAA HOLDOVER TIME GUIDELINES, Winter 2024-2025, ORIGINAL ISSUE: AUGUST 6, 2024.

2.2. RESPONSIBILITY AND AMENDMENT

This Manual is developed and published by SKYUP MT Director Ground Operations before each winter season and is available in Centrik (http://skyup.centrik.net/). Any copy in addition to that published will be forwarded to all users under the responsibility of Director Ground Operations.

Before new issue of this Manual a meeting will be held to inform Flight Operations Directorate about major change in the procedure established in this document.

In case of significant revision of above source documents, the affected Part of this Manual will be amended accordingly and will be forwarded in electronic format to Director Ground Operations. In January, all referenced documentation will be checked for major change.

A complete revision of this Manual that supersedes the previous one is issued at least every year, parts effected by revision will be marked by means of vertical line at the very left of the page.

3. AIRCRAFT DE/ANTI-ICING PROCEDURES

3.1. SCOPE

This section of the document establishes the minimum requirements for ground-based aircraft deicing/anti-icing methods with fluids and procedures to facilitate the safe operation of transport aircraft during icing conditions. This does not specify requirements for particular aircraft types.

Frost, ice or snow deposits, which can seriously affect the aerodynamic performance and/or controllability of an aircraft, are effectively removed by the application of the procedures specified in this document.

CLEAN AIRCRAFT CONCEPT - no person shall attempt to dispatch or commence take-off of an aircraft when frozen or freezing contamination is present on or adhering to the wings, engine inlets, control surfaces or other critical surfaces that might adversely affect the performance or controllability of the aircraft.

The SKYUP MT policy is that the CLEAN AIRCRAFT CONCEPT shall be achieved through the following:

- Standardized methods of fluid application;
- Compliance with specific aircraft limitations;
- A clean aircraft through proper treatment of applicable surfaces.

3.2. AIRCRAFT SPECIFIC INFORMATION

The references to Aircraft Specific Information (ref. DAIM 3.8.7 and 3.9). This Manual will not be updated if a new revision of GOM is issued before the new scheduled edition of this Manual.

3.3. DEFINITIONS AND ABBREVIATIONS

3.3.1. Definitions

For the purposes of this document, the following definitions apply.

ACTIVE FROST: Active frost is a condition when frost is forming. Active frost occurs when aircraft surface temperature is at or below 0 °C (32 °F) when the humidity of the air is at or below the frost point.

ANTI-ICING: Procedure by which fluid is applied to provide protection against the formation of frost or ice or the accumulation of snow or slush on treated surfaces of an aircraft for a limited period of time (Holdover Time).

ANTI-ICING CODE: This code is given to the flight crew/Pilot in Command that deicing/anti-icing has been carried out and the details of the anti-icing treatment that was applied.

ANTI-ICING FLUID:

(a) Mixture of water and Type I fluid;

(b) Premix Type I fluid;

(c) Type II fluid or Type IV fluid;

(d) Mixture of water and Type II fluid or Type IV fluid.

Note: Fluids in (a) and (b) shall be heated to ensure a temperature of 60 °C (140 °F) minimum at the nozzle.

SAE Type II and IV fluids for anti-icing are normally applied unheated on clean aircraft surfaces but may be applied heated.

SAE Type III fluids are not applicable for SKYUP MT fleet.

BUFFER (FREEZE POINT BUFFER): The difference between the freezing point of the fluid and the outside air temperature (OAT).

CHECK: The examination of an aircraft item against a relevant standard by a trained and qualified person.

COLD-SOAK EFFECT: The wings of an aircraft are said to be “cold-soaked” when they contain very cold fuel as a result of having just landed after a flight at high altitude or from having been refueled with very cold fuel.

Whenever precipitation falls on a cold-soaked aircraft on the ground, clear icing may occur. Even in ambient temperatures between -2 and +15 °C (28 and 59 °F), ice or frost can form in the presence of visible moisture or high humidity if the aircraft structure remains at 0 °C (32 °F) or below.

Clear ice is very difficult to detect visually and may break loose during or after take-off. The following factors contribute to cold-soaking: temperature and quantity of fuel in fuel cells, type and location of fuel cells, length of time at high altitude flights, temperature of uplifted fuel, and time since refueling.

COLD SOAKING: Ice can form even when the outside air temperature (OAT) is well above 0 °C (32 °F). An aircraft equipped with wing fuel tanks may have fuel that is at a sufficiently low temperature such that it lowers the wing skin temperature to below the freezing point of water. If an aircraft has been at a high altitude, where cold temperature prevails, for a period of time, the aircrafts’ major structural components such as the wing, tail, and fuselage will assume the lower temperature, which will often be below the freezing point. This phenomenon is known as cold soaking. While on the ground, the cold soaked aircraft will cause ice to form when liquid water, either as condensation from the atmosphere or as rain, comes in contact with cold soaked surfaces.

COLD SOAKED CLEAR ICE: This is the formation of ice, normally in the area of the wing fuel tanks, caused by the cold soak effect. Clear ice is very difficult to be detected visually and may break loose during or after take-off and poses a hazard particularly to aircraft with rear fuselage mounted engines.

COLD SOAKED FUEL FROST: This is the formation of frost, normally in the area of the wing fuel tanks, caused by the cold soak effect.

COLD SOAKED WING ICE/FROST: Water, visible moisture, or humidity forming ice or frost on the wing surface, when the temperature of the aircraft wing surface is at or below 0 °C (32 °F).

COMMANDER – The pilot designated by the operator responsible for the operation and safety of the aircraft during flight time. He may delegate the conduct of the flight to another suitable qualified pilot. (See Pilot-in-Command).

CONTAMINATION: Contamination is defined as all forms of frozen or semi-frozen deposits on an aircraft, such as frost, snow, slush, or ice.

CONTAMINATION CHECK: A check of aircraft surfaces and components for contamination to establish the need for deicing.

DEICING: Procedure by which frost, snow, slush, or ice is removed from an aircraft in order to provide clean surfaces and components.

DEICING/ANTI-ICING: Combination of or referring to both of the procedures for 'deicing' and 'anti-icing'. It may be performed in one or two steps.

DEICING FLUID:

(a) Heated water;

(b) Heated mixture of water and Type I fluid;

(c) Heated premix Type I fluid;

(d) Heated Type II, Type III, or Type IV fluid;

(e) Heated mixture of water and Type II, Type III, or Type IV fluid.

Note: The effect of unheated deicing fluid is minimal.

External De/Anti-icing Service Provider also De/Anti-icing Service Provider - The company responsible for the aircraft deicing/anti-icing operations on an airfield (both terms can be used throughout the manual).

FREEZING DRIZZLE: Fairly uniform precipitation composed exclusively of fine drops [diameter less than 0.5 mm (0.02 inch)] very close together which freeze upon impact with the ground or other exposed objects.

FREEZING FOG: A suspension of numerous very small water droplets which freeze upon impact with the ground or other exposed objects; generally, reduces the horizontal visibility at the earth's surface to less than 1 km (5/8 mile).

FROST/HOAR FROST: Frost is the tiny solid deposition of water vapor from saturated air which occurs when the temperature of a surface is below 0 °C (32 °F). Frost occurs typically with clear skies at temperatures below freezing the point.

FREEZING RAIN (LIGHT): Precipitation of liquid water particles which freezes upon impact with the ground or other exposed objects, either in the form of drops of more than 0.5 mm (0.02 inch) or smaller drops which, in contrast to drizzle, are widely separated. Measured intensity of liquid water particles is up to 2.5 mm/hour (0.10 inch/hour) or 25 grams/dm2/hour with a maximum of 0.25 mm (0.01 inch) in 6 minutes.

FREEZING RAIN (MODERATE AND HEAVY): Precipitation of liquid water particles which freezes upon impact with the ground or other exposed objects, either in the form of drops of more than 0.5 mm (0.02 inch) or smaller drops which, in contrast to drizzle, are widely separated. Measured intensity of liquid water particles is more than 2.5 mm/hour (0.10 inch/hour) or 25 grams/dm2/hour.

Ground Service Provider - A company/organization appointed by SKYUP MT to perform ground handling functions includes de/anti-icing procedures.

HAIL: Precipitation of small balls or pieces of ice with a diameter ranging from 5 to 50 mm (0.2 to >2.0 inches) falling either separately or agglomerated.

HOLDOVER TIME: Estimated time for which an anti-icing fluid will prevent the formation of frost or ice and the accumulation of snow on the treated surfaces of an aircraft.

ICE PELLETS: Precipitation of transparent (grains of ice), or translucent (small hail) pellets of ice, which are spherical or irregular, and have a diameter of 5 mm (0.2 inch) or less. Ice pellets usually bounce when hitting hard ground.

LOCAL FROST: The limited formation of frost in localized wing areas cooled by cold fuel or large masses of cold metal in the wing structure; this type of frost does not cover the entire wing.

LOWEST OPERATIONAL USE TEMPERATURE (LOUT): The higher (warmer) of:

- The lowest temperature at which the fluid meets the aerodynamic acceptance test (according to AS5900) for a given type (high speed or low speed) of aircraft, or,
- The freezing point of the fluid plus the buffer of 10 °C (18 °F) for Type I fluid and 7 °C (13 °F) for Type II, III, or IV fluids.

For applicable values, refer to the fluid manufacturer's documentation.

NEGATIVE BUFFER: A negative buffer exists when the freezing point of a deicing fluid is above the OAT (see Tables 1 or 2 for "first step" application limits).

Pilot-in-Command – means the pilot designated as being in command and charged with the safe conduct of the flight (See Commander).

PROXIMITY SENSOR: A proximity sensor is a safety feature on some models of deicing equipment, that upon activation disengages relevant systems, preventing equipment movement and damage from occurring due to physical contact between equipment components (e.g., spray nozzle, forced air nozzle, operator basket, etc.,) and aircraft surfaces. As a safety mechanism, the proximity sensor is designed to prevent damage from occurring to aircraft surfaces, normally while the equipment chassis is in a stationary position (not maneuvering). Where equipped, the type of sensor used may vary by design, and may activate either by physical contact (e.g., a proximity switch with contact mechanism), or by non-physical activation (e.g., infrared, radar, etc.).

REFRACTIVE INDEX: Refractive index is the comparative speed of light in different transparent media. The difference in this speed leads to refraction (bending of the light) which can be used to measure the composition of the media. In the case of water and glycol mixture, this refraction can be used to accurately determine the percentage of glycol in the water.

QUALIFIED STAFF: Trained staff who have passed theoretical and practical training tests and have been certified for performing this type of job, see AS6286 training and qualification program.

REFRACTOMETER: An optical instrument designed to measure the refractive index of water-soluble fluids.

RESIDUE/GEL: A buildup of dried out thickened fluids typically found in aerodynamically quiet areas of the aircraft.

RIME ICE: Small, frozen, spherical water droplets, opaque/milky and granular in appearance, which look like frost in a freezer; typically rime ice has low adhesion to the surface and its surrounding rime ice particles.

SLUSH: Slush is snow or ice that has been combined with water.

SNOW: Snow is a precipitation of ice crystals, most of which are branched, star-shaped or mixed with unbranched crystals. At temperatures, higher than -5 °C (23 °F), the crystals are generally agglomerated into snowflakes.

SNOW GRAINS: Precipitation of very small white and opaque particles of ice that are fairly flat or elongated with a diameter of less than 1 mm (0.04 inch); when snow grains hit hard ground, they do not bounce or shatter.

Note: For holdover time purposes, treat snow grains as snow.

SNOW PELLETS: Precipitation of white, opaque particles of ice; the particles are round or sometimes conical; their diameters range from approximately 2 to 5 mm (0.08 to 0.2 inch); they are brittle and easily crushed; they do bounce and may break upon contact with hard ground.

Note: For holdover time purposes, treat snow pellets as snow.

STORAGE TANK: A vessel for holding fluid that can be fixed, or mobile; includes rolling tanks (ISO tanks), totes, trailers, or drums.

TACTILE CHECK: A tactile check requires a person to touch specific aircraft surfaces. Tactile checks, under certain circumstances, may be the only way of confirming the critical surfaces of an aircraft are not contaminated. For some aircraft, tactile checks are mandatory as part of the deicing/anti-icing check process to ensure the critical surfaces are free of frozen contaminants.

3.3.2. Abbreviations

ATC	Air Traffic Control
ACARS	Aircraft Communications Addressing and Reporting System
APU	Auxiliary Power Unit
CDF	Central Deicing Facility
DDF	Designated Deicing Facility
DIS	De/Anti-icing Supervisor
º C	Degrees Celsius
C of C	Certificate of Conformance
º F	Degrees Fahrenheit
EMB	Electronic Message Board
ERP	Emergency Response Plan
FAA	Federal Aviation Administration

FP	Freezing Point
GOM	Ground Operations Manual
H	Hours
HOT	Holdover Time
LOUT	Lowest Operational Use Temperature
Min	Minutes
OAT	Outside Air Temperature
SDS	Safety Data Sheet

3.4. ROLES AND RESPONSIBILITIES

3.4.1. SKYUP MT

SKYUP MT shall have responsibility for:

- Aircraft De/Anti-icing Manual
- The Pilot-in-Command training
- Management Responsibilities

3.4.2. Pilot-in-Command

The Pilot-in-Command has the ultimate responsibility for the aircraft shall not commence take-off unless the external surfaces are clear of any deposit which might adversely affect performance and/or controllability.

3.4.3. Director Ground Operations

Director Ground Operation shall have the responsibility for:

- Ensuring the safety and security of De/Anti-icing operations.
- Ensuring that De/Anti-icing Service Providers comply to SKYUP MT De/Anti-icing Manual requirements, requirements of relevant regulations, SKYUP MT policies and standards.
- Ensuring that sufficient trained personnel, adequate facilities and adequate equipment are available at the airports where the program may be applied.
- Ensuring that contracted De/Anti-icing Service Providers are adequately trained.
- Identify aircraft-specific procedures.

3.4.4. De/Anti-Icing Service Provider

De/Anti-icing Service Provider shall have the responsibility for:

- The safety and operability of the Designated Deicing Facilities.
- Aircraft Ground Deicing/Anti-Icing Procedures.

A De/Anti-icing Service Provider shall have aircraft deicing/anti-icing procedures, including a quality control program. These procedures, which ensure compliance with

the relevant regulations, shall cover all aspects of the aircraft ground deicing/anti-icing process including (but not limited to) instructions, tasks, responsibilities, authorizations and infra-structure for the deicing/anti-icing process as follows:

- Use of suitable deicing/anti-icing treatment method according to this Manual and Aerospace Standards.
- Remote deicing/anti-icing instructions (when applicable).
- Sufficient number of trained and qualified deicing/anti-icing personnel.
- Qualified Staff to co-ordinate and supervise the deicing/anti-icing treatments.
- Use of suitable deicing/anti-icing equipment meeting specification ARP1971 and/or ISO 11077.
- Special handling procedures for Type II and IV deicing/anti-icing fluids to maintain quality.
- Post treatment check (when applicable).
- Protocol for communications with cockpit crew for both gate and remote locations (when applicable).
- Reporting the anti-icing code to the cockpit crew (when applicable).
- Documentation of all deicing/anti-icing treatments.
- Personnel safety arrangements.
- Provisions for tools and clothing for deicing/anti-icing personnel.
- Environmental arrangements.
- A quality control program.
- Personnel carrying out the deicing/anti-icing operations are responsible for ensuring that the task is performed in accordance with the requirements detailed in the latest edition of this Manual.

3.4.5. Airports

Airports shall have the responsibility for:

- Following local environmental regulations.
- The logistics of bringing fluid onto a field.
- The operability of the Dedicated Deicing Facilities.
- Message Boards.
- Weather Support.
- Health and Safety.

3.4.6. Regulatory Authority

Regulator Authority has the responsibility for:

- Regulatory and guidance material, plus the advocacy of the clean aircraft concept.

- The policies and standards that support the operability of the clean aircraft concept.

3.4.7. Air Traffic Control

Air traffic Control has the responsibility for:

- The flow of aircraft through the regional system.

The person responsible for final release/dispatch of the aircraft is responsible for ensuring that the aircraft has been deiced/anti-iced in accordance with the requirements detailed in the latest edition of this Manual.

3.5. STAFF TRAINING AND QUALIFICATION

Only trained and qualified personnel shall perform aircraft ground deicing/anti-icing procedures. A deicing training program shall be maintained and executed by the organization that performs the deicing. The training program shall address all elements of the training material, levels of qualifications, verification of success, functions, duties, responsibilities, quality control, and regular overview of instructing. The training program shall refer to current industry standards and regulations. All training records shall be kept as per the regulatory or De/Anti-icing Service Provider`s recordkeeping policy. The training program shall be reviewed at least annually to ensure that it covers all current aspects of deicing/anti-icing operations.

Companies providing deicing/anti-icing services should have both a Qualification Programme and a Quality Assurance Programme to monitor and maintain an acceptable level of competence.

3.5.1. Training Requirements

3.5.1.1. Theoretical Training

Training shall be a combination of theoretical (suitable and sufficient information and instruction relating to the topic being trained) and practical skills training to verify the trainees' understanding of, and ability to complete, the task being trained. Changes to methods and processes shall be communicated to relevant personnel, and additional information and training shall be delivered as appropriate. Training success shall be proven by an examination/assessment which shall cover all training subjects laid down in DAIM 3.5.2.

The theoretical examination shall be in accordance with SAE requirements. The pass mark shall be 75% and only persons passing this examination can be qualified.

Even though score of 75% will approve the theoretical part, the student will be directly informed about wrong answers with the corrected ones, in order to secure the safe de/anti-icing operations.

3.5.1.2. Practical Training

The practical evaluation and demonstration of skills for normal equipment and operational methods is expected.

The practical training and demonstration of knowledge or skills where new equipment or operational methods are utilized is required.

Both initial and annual recurrent training shall be conducted to ensure that all personnel obtain and retain a thorough knowledge of aircraft ground deicing/anti-icing policies and procedures, including new procedures and lessons learned.

For personnel performing the actual deicing/anti-icing treatment on aircraft for the first time, practical training with the deicing/anti-icing equipment and an aircraft shall be included.

An aircraft is required to familiarize new trainees with the relevant typical aircraft surfaces/components and identification of no spray areas.

Prior to receiving final qualification, personnel performing deicing/anti-icing operations (driving and/or spraying) shall demonstrate competence in removing frozen contamination under operational conditions, to a qualified trainer or supervisor. Details of this assessment shall be recorded.

3.5.2. Training Subjects

Training subjects shall include but are not limited to the following (when applicable):

- Common standard, regulation and recommendation including local rule and restriction.
- Hazard of snow, ice and frost.
- Basic characteristics of aircraft deicing/anti-icing fluids, including causes and consequences of fluid degradation, fluid remaining on surfaces, and dried and/or rehydrated residues. Types, purpose, characteristics, and effectiveness of deicing and anti-icing fluids as applicable. Deicing/anti-icing fluids handling/performance implications.
- General techniques for removing deposits of frost, snow, slush, or ice from aircraft surfaces and for anti-icing.
- Safe operation of equipment and de/anti-icing operations including aircraft critical area
- Deicing/anti-icing procedures in general and specific measures to be performed on different aircraft types.
- Types of checks required.
- Safe operation of equipment and de/anti-icing operations including aircraft critical area.
- Emergency procedures.
- Fluid application and limitations of holdover timetables.
- Deicing/anti-icing codes, communication and coordination.
- Special provisions and procedures for contract deicing/anti-icing (if applicable).
- Environmental considerations, e.g., where to deice, spill reporting, hazardous waste control.
- New procedures and development, lessons learned from previous winters.
- Conditions which can lead to the formation of ice on the aircraft.

Note: For more detailed information about training subjects refer to the SAE International®, AS6286 document "Aircraft Ground Deicing/Anti-Icing Training and Qualification Program".

3.5.3. Levels of Qualification

The qualification level shall be clearly defined. Each qualified person shall be fully aware of their approved functions. A person may hold several approvals depending on the job function.

Levels and groups of qualifications may be divided into the following groups:

1) DI-L10 Deicing Vehicle Driver;
2) DI-L20 Deicing Operator;
3) DI-L30 Deicing Supervisor;
4) DI-L30B Pre/Post Deicing Inspector;
5) DI-L40 Deicing Instructor;
6) DI-L50 Deicing Coordinator;
7) DI-L60 Fluid Quality Inspector (Laboratory staff);
8) DI-L70 Head of Deicing Training
9) DI-L80 Flight Crew (winter operations);
10) DI-L80B Cabin Crew (icing awareness).

3.5.4. Records

Records of the personnel training and qualifications shall be maintained for proof of qualification. All training records shall be kept as per the regulatory or De/Anti-icing Service Provider’s recordkeeping policy but at least one year.

3.6. FLUID HANDLING AND STORAGE

Deicing/anti-icing fluid is a chemical product with an environmental impact. During fluid handling avoid any unnecessary spillage, comply with local environmental and health laws and the manufacturer’s safety data sheet (SDS). Different products shall not be mixed without additional qualification testing.

Only fluids manufactured in accordance with SAE specifications shall be used in De/Anti-icing of SKYUP MT aircraft.

Fluids used in de-icing and anti-icing operations shall be stored, handled and applied in accordance with criteria listed in this Manual, fluid manufacturer and aircraft manufacturer (Boeing).

CAUTION: Slippery conditions may exist on the ground or equipment following the deicing/anti-icing procedure.

3.6.1. Storage

Tanks shall be dedicated to the storage of the deicing and/or anti-icing fluid to avoid contamination with other fluids. Storage tanks shall be constructed of materials compatible with the deicing/anti-icing fluid, as specified by the fluid manufacturer. Care should be taken to avoid using dissimilar metals in contact with each other, as galvanic corrosion may form and degrade thickened fluids.

Tanks shall be conspicuously labelled to avoid contamination. As a minimum, the following information must be identified:

- Type of fluid SAE I, II, or IV.
- Fluid Product Name.
- Fluid Concentration or mixture.
- e.g., SAE TYPE I Fluid Manufacturer, Product Name, Concentrate Aircraft Deicing Fluid.
- e.g., SAE TYPE I Fluid Manufacturer, Product Name, Dilute Aircraft Deicing Fluid.
- e.g., SAE Type IV Fluid Manufacture, Product Name, “undiluted”, 75/25 or 50/50.

The condition of the tanks shall be examined annually for corrosion, contamination, and/or leaks. If corrosion or contamination is evident, tanks shall be repaired or replaced. Corrosion in tanks most often occurs in the vapor space of partially empty tanks by evaporation and subsequent condensation of water from the deicing fluid.

To reduce corrosion, keep tanks containing aircraft deicing fluid full during summer or periods of low use.

Note 1: If the quality of the fluids is checked in accordance with DAIM 4.3, the tank inspection interval may be longer than one year.

Note 2: Although deicing/anti-icing fluids are generally noncorrosive, their vapor can be corrosive.

Storage temperature limits for the fluid shall comply with the manufacturer’s requirements.

3.6.2. Handling

The performance characteristics of SAE Type II and IV de-icing/anti-icing fluids may be degraded by excessive mechanical shearing or chemical contamination. Therefore, only compatible pumps, control valves, piping, hoses, and application devices (nozzles) shall be used.

The design of fluid transfer systems shall be in accordance with the fluid manufacturers’ recommendations. Fluid transfer systems shall be dedicated to the specific fluid being handled to prevent inadvertently mixing fluids of different types or manufacturers. All fill ports and discharge points shall be clearly labelled to prevent inadvertent product mixing. All fill ports must be protected to prevent foreign contamination.

3.6.3. Heating

Deicing/anti-icing fluids shall be heated according to the fluid manufacturer’s guidelines, and the heated fluids shall be checked periodically.

- For Type I fluids, water loss may cause undesirable aerodynamic effects.
- For Type II and IV fluids thermal exposure and/or water loss may cause degradation making them not usable.

CAUTION: Avoid unnecessary heating of fluid in vehicle tanks. Prolonged or repeated heating of fluids (directly or indirectly) may result in loss of water or oxidation which can lead to the performance degradation of the fluid and may cause viscosity degradation in Type II and IV fluids leading to shorter holdover times. Any of the following situations or a combination of them can accelerate the fluid performance degradation:

- low fluid usage (turnover);
- trucks being in standby mode with heating system on for extended periods of time;
- high temperatures in the fluid tanks;
- high temperatures in water tanks which are in direct contact with the fluid tanks (no insulation between tanks).

The integrity of the fluid following heating shall be checked periodically. Factors like heating rate, time, and temperature cycling should be considered in determining the frequency of fluid inspections. Refer to the fluid manufacturers' recommendations.

3.6.4. Application

Check with the fluid manufacturer's recommendations for filling and fluid transitions to prevent fluid contamination and degradation. Requirements for suitable equipment are described in SAE International® ARP1971, "Aircraft Deicing Vehicle - Self-Propelled". Application equipment shall be clean before being initially filled with deicing/anti-icing fluid to prevent fluid contamination.

3.7. CONTAMINATION CHECK

The decision that deicing/anti-icing is required may be determined when one or more of the following circumstances is applicable:

- An aircraft is parked overnight and subjected to ice or snow conditions.
- When ice has accumulated in flight (inflight ice).
- During taxi to the gate in icing and/or snow conditions.
- Following an inspection or check by the flight crew at a gate.
- As indicated by a check by a qualified deicing/anti-icing person.
- Active frozen or freezing falling precipitation is occurring.
- When cold soaked fuel has created ice or frost on critical surfaces or components.
- When aircraft has been deiced/anti-iced some time prior to flight crew arrival.

3.7.1. Contamination Check to Establish the Need for Deicing

A Contamination Check shall include all areas mentioned in ref. DAIM 3.9.1 - 3.9.8 and any other surfaces and components of the aircraft as indicated by the aircraft manufacturer and shall be performed from points offering sufficient visibility of these parts (e.g., from the deicing/anti-icing vehicle, a ladder or any other suitable means of access as necessary). Any contamination found on the surfaces or components of the aircraft that are critical to safe conduct of the flight shall be removed by a deicing

treatment; this shall be followed by anti-icing treatment when required. If anti-icing is also required, this treatment may be performed as a one-step or two-step deicing/anti-icing of the relevant surfaces.

Where an aircraft has been deiced and/or anti-iced some time prior to the arrival of the flight crew, an additional 'Contamination Check' shall be carried out prior to departure, to establish whether further treatment is required. Requests for deicing/anti-icing shall specify the parts of the aircraft requiring treatment.

3.7.2. Tactile Check

The need for a tactile check shall be determined by the aircraft manufacturer.

Where an aircraft has been deiced and/or anti-iced some time prior to the arrival of the Flight Crew, an additional Contamination Check shall be carried out prior to departure, to establish whether further treatment is required.

Requests for deicing/anti-icing shall specify the parts of the aircraft requiring treatment.

3.8. PROCEDURE

These procedures specify the methods for deicing and anti-icing of aircraft on the ground to provide safe take-off. When aircraft surfaces are contaminated by frozen moisture, they shall be deiced prior to dispatch with fluids, mechanical methods, alternative technologies, or combinations thereof. When freezing precipitation exists and the precipitation is adhering to the surfaces at the time of dispatch, aircraft surfaces shall be deiced/anti-iced with fluids. If both deicing and anti-icing are required, the procedure may be performed in one or two steps The selection of a one- or two-step process depends on weather conditions, available equipment, available methods (generally the use of deicing and anti-icing fluids), and the holdover time needed.

CAUTION: Slippery conditions can exist on the ground or equipment following the deicing/anti-icing procedure.

Note: Where holdover time is critical, a two-step procedure using undiluted Type II, or IV fluid for the second step should always be considered.

3.8.1. Pre-Deicing Process to be Done Prior to Deicing/Anti-Icing

A pre-deicing process prior to the main deicing process, to remove large amount of frozen contamination (e.g., snow, slush, or ice), in order to reduce the quantity of glycol-based deicing fluid that is needed. This pre-deicing process may be performed with various means (e.g., infrared technology, brooms, forced air, fluid injected into forced air, heat, heated water, heated fluids with negative buffer). If the pre- step process is used, make sure that the subsequent deicing process removes all frozen contamination including the contamination that may have formed on surfaces and/or in cavities due to the pre-step process.

3.8.2. Infrared Deicing

This sub-section establishes the procedures for the removal of frozen precipitation by using infrared deicing technology. Specific information on facility requirements, as well as their inclusion in aircraft ground deicing programs.

(a) General requirements: Frost, snow, slush, or ice shall be removed from aircraft surfaces prior to dispatch from the facility or prior to anti-icing.

(b) Deicing: Deicing using infrared energy is accomplished through heat that breaks the bond of adhering frozen contamination. The application of infrared energy may be continued to melt and evaporate frozen contaminants. Wet surfaces require an application of heated deicing fluids to preclude refreezing after removal of infrared energy source. When required, for operations other than frost or leading-edge ice removal and when OAT is at or below 0 °C (32 °F), an additional treatment with hot deicing fluid shall be performed within the facility to prevent re-freezing of water which may remain in hidden areas.

CAUTION: If the aircraft requires re-deicing and de/anti-icing fluids had been applied before flight, conventional de/anti-icing with fluids shall be performed.

(c) Inspection: The aircraft shall be inspected in accordance with the requirements of DAIM 3.9.

(d) Anti-icing: If anti-icing is required, it shall be accomplished. If anti-icing is performed inside the facility, infrared power levels must be adjusted as required during the anti-icing process to prevent the re-accumulation of frozen contamination due to the effect of snow blowing through the facility and to maintain fluid integrity for the time the aircraft is in the facility. Dehydration of the fluid can negatively impact the fluid performance.

3.8.3. Deicing by Fluids

Frost, snow, slush, or ice may be removed from aircraft surfaces by the use of deicing fluids. It is the responsibility of the De/Anti-icing Service Provider to ensure that all frozen deposits (with the possible exception of frost which may be allowed) are removed from the specified surfaces during the deicing process.

3.8.3.1. Removal of Contaminants

For maximum effect, fluids shall be applied close to the surface to minimize heat loss. Fluid temperature and pressure should not exceed aircraft maintenance manual requirements.

The heat in the fluid effectively melts any frost, as well as light deposits of snow, slush, and ice. Heavier accumulations require the heat to break the bond between the frozen deposits and the structure; the hydraulic force of the fluid spray is then used to flush off the contamination. The deicing fluid will prevent re-freezing for a period of time depending on aircraft skin and OAT, the fluid used, the mixture strength, and the weather.

3.8.3.2. Removal of Frost and Light Ice

A general procedure consisting of a nozzle setting that gives a solid cone (fan) spray should be used. This ensures the largest droplet pattern available, thus retaining the maximum heat in the fluid. Providing the hot fluid is applied close to the aircraft skin, a minimal amount of fluid will be required to melt the deposit.

3.8.3.3. Removal of Snow

A nozzle setting sufficient to flush off deposits and minimize foam production is recommended.

Foam could be confused as snow. The method adopted will depend on the equipment available and the depth and type of snow, i.e., light and dry or wet and heavy. In general, the heavier the deposits of snow or ice, the heavier the fluid flow that will be required to remove it effectively and efficiently from the aircraft surfaces. For light deposits of both wet and dry snow, similar procedures as for frost removal may be adopted.

Wet snow is more difficult to remove than dry snow and unless deposits are relatively light, the selection of a high fluid flow will be found to be more effective. Under certain conditions it will be possible to use the heat, combined with the hydraulic force of the fluid spray, to melt and subsequently flush off frozen deposits. However, where snow has bonded to the aircraft skin, the procedures detailed in ref. DAIM 3.8 should be utilized. Heavy accumulation of snow will always be difficult to remove from aircraft surfaces and vast quantities of fluid will invariably be consumed in the attempt. Under these conditions, serious consideration should be given to removing the majority of the snow using a pre-step process before attempting a normal deicing process.

3.8.3.4. Removal of Ice

Heated fluid shall be used to break the ice bond. The high thermal conductivity of metal skin is utilized when a stream of hot fluid is directed at close range onto one spot, until the surface is just exposed. This will then transmit the heat laterally in all directions raising the temperature above the freeze point and thereby breaking the adhesion of the frozen mass with the aircraft surface.

Non-metallic surfaces (e.g., composites) have a lower heat transfer than metallic surfaces.

Deicing may take longer, and more fluid may be needed. By repeating this procedure, a number of times, the adhesion of a large area of frozen snow or glazed ice can be broken. The deposits can then be flushed off with either a low or high flow, depending on the amount of the deposit.

3.8.3.5. General Deicing Fluid Application Strategy

For effective removal of snow and ice the following techniques should be adopted. Aircraft may require unique procedures to accommodate design differences, aircraft manufacturer's instructions should be consulted. Ice, snow, or frost dilutes the fluid. Apply enough hot deicing fluid to ensure that re-freezing does not occur, and all contaminated fluid is driven off. The application of deicing fluid must be done in a pattern that ensures all contaminants on the aircraft are removed. The preferred method is to spray the aircraft from top to bottom.

3.8.3.6. Wings, Horizontal Stabilizers, and Elevators

The direction of the spray shall be from the leading edge to the trailing edge. Start at the top (wing tip) and work down to the base (to fuselage).

3.8.3.7. Lower Wing Surface (under side of wing) Deicing Procedures

Treatments must be symmetrical and may include flaps and lower surfaces. Spray the affected areas with a heated fluid/water mixture suitable for a one-step procedure as required, (see caution below), and then spray the same areas under the other wing. Both wings must be treated identically (same areas, same amount and type of fluid,

same mixture strength), even if the frozen contamination is only present under one wing. Holdover times do not apply to underwing treatments.

It is the responsibility of the De/Anti-icing Service Provider to ensure that the treatment is performed symmetrically and that on completion all frozen deposits (with the possible exception of frost, which may be allowed), have been removed. When it is confirmed that the treated areas are clean, the following statement shall be given to the flight crew: “Underwing deicing only, holdover times do not apply”.

CAUTION: Underwing frost and ice are usually caused by very cold fuel in the wing tanks. Use a fluid/water mixture with a higher concentration of glycol than is usually required by the OAT to prevent re-freezing.

3.8.3.8. Removal of Local Area Contamination

When no precipitation is falling or expected, and when there is no active frost a “local area” deicing may be carried out under the below mentioned or similar conditions. In some cases, a full or complete deicing is not necessary. When the presence of frost and/or ice is limited to localized areas on the surfaces of the aircraft and no holdover time is applicable, only the contaminated areas will require treatment.

This type of contamination will generally be found on the wing and/or stabilizer leading edges or in patches on the wing and/or stabilizer upper surfaces. Spray the affected area(s) with a heated fluid/water mixture suitable for a one-step procedure. Both sides of the wing and/or stabilizer upper surfaces shall receive the same amount and type of fluid at the same concentration; the same area in the same location on each wing/stabilizer shall be sprayed including when conditions would not indicate the need for treatment of both wings/stabilizers.

It is the responsibility of the De/Anti-icing Service Provider to ensure that the treatment is performed symmetrically and that on completion all frozen deposits have been removed. After this check has confirmed that the areas are clean the following statement shall be given to the flight crew:

“Local area deicing only. Holdover times do not apply”.

3.8.3.9. Vertical Surfaces

Start at the top and work down to the base of any vertical surfaces.

3.8.3.10. Fuselage

Spray the fluid along the top centreline and then towards the outboard of the fuselage. Ensure that it is clear of ice, snow, and slush in accordance with the aircraft manufacturers’ manuals.

Hoarfrost is allowed on the fuselage of Boeing 737-800.

3.8.3.11. Nose/Radom Area and Flight Deck Windows

Type I fluid/water mixture or manual methods of removal (such as squeegees or brushes) are recommended.

When thickened fluids are used, avoid spraying near the flight deck windows, as fluid can cause a severe loss of visibility. Any thickened fluid remaining on the nose areas where it could blow back onto the windscreens should be removed prior to departure, using a diluted Type I fluid, squeegees or equivalent. If flight deck windows are contaminated with thickened fluids use water or an approved windshield cleaner (use

of a low windscreen washing fluid is recommended when OAT is at or below 0 °C (32 °F)).

CAUTION: Prior to cleaning of the flight deck windows ensure that the window heating system is switched off.

3.8.3.12. Landing Gear and Wheel Bays

Do not spray deicing fluid directly onto wheels and brakes. Remove all ice and snow from the landing gear, paying particular attention to uplocks, downlocks, sensors, door mechanisms, and steering systems.

Note: It may be possible to mechanically remove accumulations such as blown snow, however, where deposits have bonded to surfaces, they can be removed by the application of hot air.

3.8.3.13. Engines

Deposits of snow should be mechanically removed from engines prior to departure. Any frozen deposits that may have bonded to either the lower surface of the intake or the fan blades including the rear side may be removed by hot air or other means recommended by the engine manufacturer. If use of deicing fluid is permitted, do not spray directly into the engine core.

3.8.4. Anti-Icing by Fluids

Frost, snow, slush, or ice will, for a period of time, be prevented from adhering to or accumulating on aircraft surfaces by the application of anti-icing fluids. This section provides procedures for the use of anti-icing fluids.

(a) Required Usage: Anti-icing fluid shall be applied to the aircraft surfaces when freezing rain, snow, or other freezing precipitation may adhere to the aircraft at the time of dispatch.

(b) Optional Usage: Anti-icing fluid may be applied to clean aircraft surfaces at the time of arrival (preferably before unloading begins) on short turnarounds during freezing precipitation, and on overnight aircraft. This will minimize ice accumulation prior to departure and often makes subsequent deicing easier.

CAUTION: This practice has the potential to build up dried residues. An appropriate inspection and cleaning program shall be established.

In anticipation of weather conditions that require deicing, anti-icing fluid may be applied to clean aircraft surfaces prior to aircraft being exposed to the freezing precipitation. This will minimize the possibility of snow and ice bonding or reduce the accumulation of frozen precipitation on aircraft surfaces and facilitate subsequent deicing.

Clean aircraft concept shall be achieved through proper treatment of applicable sufaces.

CAUTION: Acetate- or format-based fluids when used for aircraft deicing may significantly shorten the Holdover Times of Type II and IV fluids when used thereafter and may also cause corrosion of aircraft materials.

Prior to flight, the aircraft must be deiced, unless the integrity of the fluid can be ensured. Deice in accordance with ref. DAIM 3.8.7, whenever possible, to reduce the potential for dried residue build up.

Note 1: Dehydration water evaporation of Type II and IV fluid can negatively impact the fluid performance.

For effective anti-icing, an even layer of sufficient thickness of fluid is required over the prescribed aircraft surfaces which are free of frozen deposits. For maximum anti-icing protection, undiluted SAE Type II or IV fluid should be used. The high fluid flow pressure and flow rates normally associated with deicing are not required. When possible, pump speeds and nozzle spray patterns should be adjusted accordingly.

Note 2: SAE Type I fluids provide limited holdover effectiveness when used for anti-icing purposes.

3.8.4.1. Anti-Icing Fluid Application Strategy

(a) Anti-icing fluids must be applied so that it can completely cover the surfaces and form a uniform coating. Enough anti-icing has been applied when it can be visually confirmed that the anti-icing fluid is just beginning to run off the leading and trailing edges of the surfaces.

(b) The anti-icing fluid application process should be continuous and carried out as near to the departure time as possible to maximize the available holdover time.

(c) While anti-icing fluid thickness will vary in time over the profile of the wing surface, it should be distributed uniformly. To control the uniformity of application, all horizontal aircraft surfaces should be visually checked during the application of the anti-icing fluid.

Thickened fluids Type II, and IV compliant with SAE AMS 1428 are typically used to provide aircraft with anti-icing protection under precipitation conditions on ground. To assure that those fluids provide the holdover time-protection published in FAA HOLDOVER TIME GUIDELINES, it is important that they are applied in accordance with the current instructions of SAE AS6285, being the correct amount indicated by the fluid just beginning to run off the leading and trailing edges in the case of a wing. Note that the correct amount of fluid is influenced by additional factors, such as the specific type of fluid and the prevailing environmental conditions.

(d) Spray from the leading edge to the trailing edge on wings, horizontal and vertical stabilizers. The following surfaces shall be treated as specified by the aircraft manufacturer’s documentation:

- Wing upper surfaces including leading edges and upper control surfaces.
- Wing tip devices.
- Both sides of vertical stabilizer and rudder to receive anti-ice protection when freezing.
- Precipitation conditions exist.
- Horizontal stabilizer upper surfaces including leading edges and elevator upper surfaces.
- When necessary fuselage upper surfaces dependent upon the amount and type of freezing.
- Precipitation.

CAUTION: Anti-icing fluids may not flow evenly over wing leading edges, horizontal and vertical stabilizers. These surfaces should be checked to ensure that they are properly coated with fluid.

It is the responsibility of the De/Anti-icing Service Provider to ensure that the surfaces mentioned above are free of frost, snow, slush, or ice prior to the start of the anti-icing treatment and that on completion of the treatment these surfaces are fully covered with an adequate layer of anti-icing fluid.

3.8.4.2. Local Frost Prevention in Cold Soaked Wing Areas

Wing surface temperatures can be considerably below OAT due to contact with cold fuel and/or close proximity to large masses of cold soaked metal in the wing structure. In these areas frost can build up on wing surfaces and may result in the entire wing needing to be deiced and anti-iced prior to the subsequent departure. This section provides standards for the prevention of local frost formation in cold soaked wing tank areas during transit stops to make deicing and anti-icing of the entire wing unnecessary under such circumstances. This procedure does not, however, supersede standard deicing and anti-icing procedures in accordance with DAIM, and it shall be applied in coordination with these subsections. This procedure also does not relieve the user from any requirements for treatment and checks in accordance with aircraft manufacturer manuals.

Note: this section is also applicable to other surfaces of the aircraft (e.g., stabilizers).

(a) Procedure

Using suitable spray equipment, apply a proper coating of undiluted SAE Type II or IV fluid to the wings in the limited cold soaked areas where the formation of frost may be expected due to contact of the wing with cold fuel or masses of cold metal.

Note: A proper coating completely covers the treated area with visible fluid.

(b) Limits/Precautions for Local Frost Prevention

- Procedure Limitation: This local frost prevention procedure is not a substitute for standard deicing and anti-icing procedures in accordance with DAIM 3.8.6.2, clear ice checks or any other aircraft manufacturer requirement, nor a substitute for the requirement that aircraft surfaces shall be clear of frost, snow, slush or ice accumulations.
- Training: This procedure shall only be carried out by trained and qualified personnel (reference AS 6286).

(c) Application limits

This local frost prevention procedure shall be applied to clean wings immediately following arrival of the aircraft. Application is acceptable at the latest when frost just starts to form, but in this case the fluid shall be applied at a minimum temperature of 50 °C (122 °F). If precipitation occurred between application of the fluid and dispatch of the aircraft and/or if precipitation is expected before take-off, a two-step deicing/anti-icing procedure shall be performed (refer to DAIM 3.8.6.2).

(d) Symmetrical treatment requirement

Wings shall receive the same and symmetrical treatment; the same area in the same location on each wing shall be sprayed including when conditions would not indicate the need for treatment of both wings.

CAUTION: Aerodynamic problems could result if this requirement is not met.

(e) Holdover time

A holdover time shall not be assigned to local frost prevention since this treatment does not cover the entire aircraft or wing surface respectively.

(f) Final check - local frost prevention

A tactile (by touch) check of treated areas and a visual check of untreated areas of both wings shall be performed immediately before the aircraft leaves the parking position. These checks are conducted to ensure that both wings are clean and free of frost. The applied anti-icing fluid shall remain in a liquid state and shall show no indication of failure (e.g., colour change to white, a loss of gloss, or the presence of ice crystals in the fluid film).

(g) Flight crew information - local frost prevention

The following information shall be provided to the flight crew: “Local frost prevention was accomplished; no holdover times applies.”

3.8.4.3. Holdover Time

Holdover time is obtained by anti-icing fluids remaining on the aircraft surfaces. With a one-step deicing/anti-icing process the holdover time begins at the start of the treatment and with a two-step deicing/anti-icing process at the start of the second step (anti-icing) Holdover time will have effectively run out when frozen deposits start to form/accumulate on treated aircraft surfaces.

Due to their properties, Type I fluids form a thin liquid wetting film, which provides limited holdover time, especially in conditions of freezing precipitation. With this type of fluid, no additional holdover time would be provided by increasing the concentration of the fluid in the fluid/water mixture. Type II, III, and IV fluids contain a pseudo plastic thickening agent, which enables the fluid to form a thicker liquid wetting film on external aircraft surfaces. This film provides a longer holdover time especially in conditions of freezing precipitation. With this type of fluid, additional holdover time will be provided by increasing the concentration of the fluid/water mixture, with a maximum holdover time available typically from undiluted fluid.

Holdover time guidelines give an indication as to the time frame of protection that could reasonably be expected under conditions of precipitation. However, due to the many variables that can influence holdover time, these times should not be considered as minima or maxima as the actual time of protection may be extended or reduced, depending upon the particular conditions existing at the time. Holdover time guidelines are established and published by the FAA and TC. The responsibility for the application of this data remains with the user.

CAUTION: Heavy precipitation rates or high moisture content, high wind velocity, or jet blast may reduce holdover time below the lowest time stated in the range. Holdover time may also be reduced when aircraft skin temperature is lower than OAT.

Therefore, the indicated times should be used only in conjunction with a pre-take-off check.

CAUTION: Surface coatings are currently available that may be identified as ice phobic or hydrophobic, enhance the appearance of aircraft external surfaces and/or lead to fuel savings. Since these coatings may affect the fluid wetting capability and the resulting fluid thickness of deicing/anti-icing fluids they have the potential to affect holdover time and aerodynamics. For more information, see AIR6232 and consult the aircraft manufacturers.

3.8.5. Limits

3.8.5.1. Fluid Related Limits

Temperature Limits (see appropriate tables in DAIM, Annex 1): When performing two-step deicing/anti-icing, the freeze point (FP) of the fluid used for the first step shall be at or below the OAT.

SAE Type I Fluids: The FP of the SAE Type I fluid mixture used for either one-step deicing/anti-icing or as a second step in the two-step operation shall be at least 10 °C (18 °F) below the OAT. In no case shall this temperature be lower than the LOUT.

CAUTION: All Type I fluids supplied as concentrates for dilution with water prior to use shall not be used undiluted. For exceptions refer to fluid manufacturer's documentation.

CAUTION: All Type I fluids have a maximum concentration mix related to the aerodynamic acceptability. Refer to fluid manufacturer’s documentation.

SAE Type II, and IV Fluids: The freeze point of SAE Type II and IV fluids used for either one-step deicing/anti-icing or as the second step in a two-step treatment shall be at least 7 °C (13 °F) below OAT and not lower than the aerodynamic acceptability lower limit of the fluid.

Note: These fluids shall not be used below -25 °C (-13 °F) in active frost conditions.

Frost, snow, slush, or ice dilutes the fluid. Apply enough hot deicing fluid to ensure that refreezing does not occur, and all contaminated fluid is driven off.

3.8.5.2. Application Limits

Under no circumstances shall an aircraft that has been anti- iced receive a further coating of anti-icing fluid directly on top of the contaminated film. If an additional treatment is required before flight, a complete deicing/ anti-icing shall be performed.

Ensure that any remaining fluid from any previous treatment is flushed off. Anti-icing only is not permitted.

CAUTION: The application of Type II and IV fluid, especially when used in a one-step process or in the first step of a two-step process, may cause fluid to collect in aerodynamically quiet areas, cavities, and gaps which can dry out and leave dried residues. Dried residues may rehydrate and freeze following a period of high humidity and/or rain conditions. This may cause flight control problems. These dried residues may require removal.

The application of hot water or heated Type I fluid in the first step of a two-step process will minimize the formation of residues. Dried residues may rehydrate and freeze under certain temperature, high humidity and/or rain conditions and may block

or impede critical flight control systems. If a Type II or IV fluid is used in a one-step process or in the first step of a two-step process, then an appropriate inspection and cleaning program shall be established. Whenever suitable, deice and anti-ice with only Type I to help avoid these residue issues.

Flight control problems associated with frozen or unfrozen residues have been observed to be particularly prevalent when thickened fluids are used to remove frost during a period of dry weather followed by hydration of the dried residues by water from rain, condensation, cleaning, or wet snow in flight.

Note 1: In order to detect dried residues, it may help to spray a water mist onto the affected surfaces. This causes the dried residues to rehydrate and swell into a gel.

Note 2: If removal of contamination is required on the lower side of the wings and the horizontal stabilizer and elevator, deicing/anti-icing fluid shall be applied sparingly to minimise fluid flow into drain holes. Whenever possible, use Type I only. Consult the aircraft manufacturer's documentation.

3.8.6. Procedure Precautions

3.8.6.1. One-Step Deicing/Anti-Icing

This is performed using heated deicing/anti-icing fluids. The correct fluid concentration is chosen with regard to desired holdover time, dictated by OAT and weather conditions. The fluid used to deice the aircraft remains on the aircraft surfaces to provide limited anti-ice capability.

CAUTION: Wing skin temperature may differ and, in some cases, may be lower than OAT. A mix with higher glycol concentration can be used under the latter condition to ensure a sufficient buffer.

CAUTION: The application of Type II, or IV fluid, especially when used in a one-step process, may cause fluid to collect in aerodynamically quiet areas, cavities and gaps which can dry out and leave dried residues. Dried residues may rehydrate and freeze following a period of high humidity and/or rain conditions. This may impede flight control systems. These dried residues may require removal. Consult the aircraft manufacturer with regard to inspection methods and frequency, related maintenance requirements and aircraft washing recommendations.

Note 1: If a Type II, or IV fluid is used in a one-step process, then an appropriate inspection and cleaning program shall be established. Whenever suitable, deice and anti-ice with only Type I.

Note 2: To detect dried residues, it may help to spray a water mist onto the affected surfaces. This causes the dried residues to rehydrate and swell into a gel.

Note 3: If removal of contamination is required on the lower side of the wings and the horizontal stabilizer and elevator, deicing/anti- icing fluid shall be applied sparingly to minimise fluid flow into drain holes. Whenever possible, use Type I only. Consult the aircraft manufacturer's documentation.

Note 4: Detection and removal of dried residues shall be accomplished by Part 145 personnel.

3.8.6.2. Two-Step Deicing/Anti-Icing when the First Step Is Performed with Deicing Fluid

The correct fluid(s) shall be chosen regarding OAT. The second step is performed with anti-icing fluid to protect the surfaces. This fluid and its concentration are chosen regarding desired holdover time, which is dictated by OAT and weather conditions. The second step to be applied before first step fluid freezes, typically within 3 minutes. (This time may be higher than 3 minutes in some conditions, but potentially lower in heavy precipitation, colder temperatures, or for critical surfaces constructed of composite materials. If necessary, the second step shall be applied area by area.) When treating composite surfaces, freezing may happen quickly. It is the responsibility of the De/Anti-icing Service Provider to ensure that all frozen deposits have been removed from the treated surfaces, before applying the second step fluid.

Use a second step spraying technique to cover completely the first step fluid with a sufficient amount of second step fluid. For guidance on the amount of fluid refer to the document AS6286. Where re-freezing occurs following the initial treatment, both the first and second step must be repeated.

CAUTION: Wing skin temperature may differ and, in some cases, may be lower than OAT. A mix with higher glycol concentration can be used under these conditions to ensure a sufficient buffer.

CAUTION: The application of Type II, or IV fluid, especially when used in a one-step process or in the first step of a two-step process, may cause fluid to collect in aerodynamically quiet areas, cavities, and gaps, which can dry out and leave dried residues. Dried residues may rehydrate and freeze following a period of high humidity and/or rain conditions. This may impede flight control systems. These dried residues may require removal. The use of hot water or heated mixture of Type I fluid/water for the first step of a two-step deicing/anti-icing process will minimize the formation of dried residues. Whenever possible, deice and anti-ice with only Type I to help avoid these residue issues.

Note 1: If a Type II, or IV fluid is used in the first step of a two- step process, then an appropriate inspection and cleaning program shall be established. Whenever suitable, deice and anti-ice with only Type I.

Note 2: To detect dried residues, it may help to spray a water mist onto the affected surfaces.

This causes the dried residues to rehydrate and swell into a gel.

Note 3: Anti-icing of the lower side of the wings and/or horizontal stabilizer and elevator is normally not foreseen. However, if these surfaces must be deiced, the freezing point of deicing fluid must be low enough to prevent refreezing.

(a) With regard to holdover time provided by the applied fluid, the objective is that it is equal to or greater than the estimated time from the start of anti-icing to the start of take-off based on existing weather conditions.

(b) Aircraft shall be treated symmetrically, that is, left hand and right-hand side shall receive the same and complete treatment, even when only one side of the aircraft needs treatment. Anti-icing treatments shall always cover the entire wing, the entire vertical stabilizer/rudder and horizontal stabilizer/elevator on both sides of the aircraft.

WARNING: This is a regulatory requirement. The aircraft is considered UNSAFE if this requirement is not met.

(c) During anti-icing and deicing, the moveable surfaces shall be in a position as specified by the aircraft manufacturer.

(d) Engines shall remain running at idle or can be shut down during deicing/anti-icing operations. Air conditioning and/or APU bleed air shall be selected OFF, or as recommended by the airframe and engine manufacturer. Avoid spraying deicing/anti-icing fluid directly into the engine inlet core.

(e) Do not spray deicing/anti-icing fluids directly onto wiring harnesses and electrical components (receptacles, junction boxes, etc.) brakes, wheels, exhausts, or thrust reversers (See DAIM 3.8.7 Fluid application diagram).

(f) Deicing/anti-icing fluid spray shall not be directed into the orifices of pitot tubes (heads), static ports/vents, or directly onto air stream direction detectors probes/angle of attack airflow sensors. This includes all openings.

(g) All reasonable precautions shall be taken to minimize fluid entry into engines, APU, other intakes/outlets, and control surface cavities. Refer to manufacturer documentation. Deicing/anti-icing fluid spray shall not be directed into engine core or directly onto engine probes/sensors.

(h) Do not direct fluid spray onto the flight deck or cabin windows as this can cause crazing of the acrylic or penetration of the window seals. Fluid spray may be directed above these surfaces and allowed to flow over.

(i) SAE Type II, or IV fluids are used, all traces of the fluid on flight deck windows shall be removed prior to departure, with particular attention being paid to windows fitted with wipers. Any forward area from which fluid may blow back onto windscreens during taxi or subsequent take-off shall be free of fluid prior to departure. Failure to do so may result in obscured visibility.

Note: Deicing/anti-icing fluid can be removed by rinsing with an approved cleaner and a soft cloth or flushing with Type I fluid.

(j) Landing gear and wheel bays shall be kept free from the build-up of slush, ice, or accumulations of blown snow.

(k) When removing ice, snow, or slush from aircraft surfaces care shall be taken to prevent it entering and accumulating in auxiliary intakes and control surface balance bays, gaps, or hinge areas.

(l) Contamination builds up on and within aircraft lift devices and other critical surfaces can form in flight or when on the ground. During icing conditions, when flaps and slats are retracted, contamination may not be visible. Conditions where this can occur may include but are not limited to the accumulation of impact ice in flight; the splash up of slush onto the underwing and flaps during ground maneuvering; and flap track contamination where snow and/or other contaminants may blow and compact within these openings. As the possibility exists that this could remain undetected, it is important that when these conditions are present or suspected, these areas be inspected, and any frozen deposits removed prior to departure.

(m) Under the conditions of freezing fog, or other freezing precipitation conditions, it is necessary for the front and rear side on the fan blades to be checked for ice build-up prior to start-up. Any deposits discovered are to be removed by directing air from a low flow hot air source, such as a cabin heater, onto the affected areas or other means recommended by the SKYUP MT based on information from the aircraft and engine manufacturers.

(n) After frequent applications of deicing/anti-icing fluids it is advisable to inspect aerodynamically quiet areas and cavities for dried residues of thickened deicing/anti-icing fluid. For these inspections, it may be necessary to open access panels. Consult airframe manufacturers for inspection and cleaning details and procedures.

(o) A deicing/anti-icing treatment should be continuous and as short as possible. If a treatment is interrupted (for example a truck running out of fluid), the cockpit crew shall be immediately informed stating:

- The reason for the interruption.
- Actions to be taken (in consultation with the cockpit crew).
- Expected time of delay.

Before continuing the treatment:

- Inform the cockpit crew.
- Establish in consultation with the cockpit crew, the further treatment to be carried out, including any surfaces requiring re-treatment in relation to holdover time. Carry out the treatment as agreed.

3.8.6.3. Clear Ice Precautions

(a) Clear ice can form on aircraft surfaces below a layer of snow or slush. It is therefore important that surfaces are closely examined following each deicing operation, in order to ensure that all deposits have been removed. Significant deposits of clear ice can form in the vicinity of the fuel tanks, on wing upper surfaces as well as underwing. Aircraft are most vulnerable with regard to this type of build-up when one or more of the following conditions exist:

(b) Wing temperatures remain well below 0 °C (32 °F) during the turnaround/transit.

(c) Ambient humidity is high and/or precipitation occurs while the aircraft is on the ground.

(d) When frost or ice is present on lower surface of either wing.

(e) Ambient temperatures between -2 °C (28 °F) and +15 °C (59 °F) are experienced, although clear ice may form at other temperatures if the other three conditions listed above exist.

Clear ice formation is extremely difficult to detect. Therefore, when the above conditions prevail, or when there is otherwise any doubt that clear ice may have formed, a close examination shall be made visually and/or physically prior to departure, in order to ensure that surfaces are free of clear ice. If clear ice is believed to be present, deicing is required.

Note: Low wing temperatures associated with this type of build-up normally occur when large quantities of cold fuel remain in wing tanks during the turnaround/transit and any subsequent refuelling is insufficient to cause a significant increase in fuel temperature.

3.8.6.4. Proximity Sensor Activation Reporting Procedures

An operational procedure shall be in place in circumstances where a proximity sensor on the deicing equipment is activated and/or comes into contact with an aircraft surface. For equipment types furnished with a proximity sensor requiring physical contact in order to activate, in the event of sensor contact, the pilot in command shall be informed immediately, and be provided with specific information pertaining to the location on the aircraft where contact was made. The equipment involved shall remain in position until investigation can occur to inspect the affected area for damage.

A third party shall visually inspect the affected area for any signs of visual damage. If no visible damage is observed, the de/anti-icing process may continue at the discretion of the pilot in command. If damage is suspected or detected, the Pilot - in Command shall be notified and the de/anti-icing process shall cease. Further inspection of the affected area should be performed by an individual deemed qualified under the SKYUP MT program to determine the aircraft's airworthiness.

Note: By design, this type of proximity sensor normally will not cause damage to an aircraft surface if contact is made to a fixed aircraft surface, while the equipment chassis is stationary. In certain circumstances however, damage may occur outside of the sensors design limitations. This includes but is not limited to:

- Contact with an aircraft surface while the equipment chassis is maneuvering.
- Contact with an aircraft surface while the aircraft is maneuvering.
- Contact with a moving/rotating aircraft surface (i.e. engine fan blade, etc.) and/or
- Contact is made or suspected to have been made between a component of the deicing vehicle and aircraft.

In these circumstances, the procedures mentioned above this note shall apply.

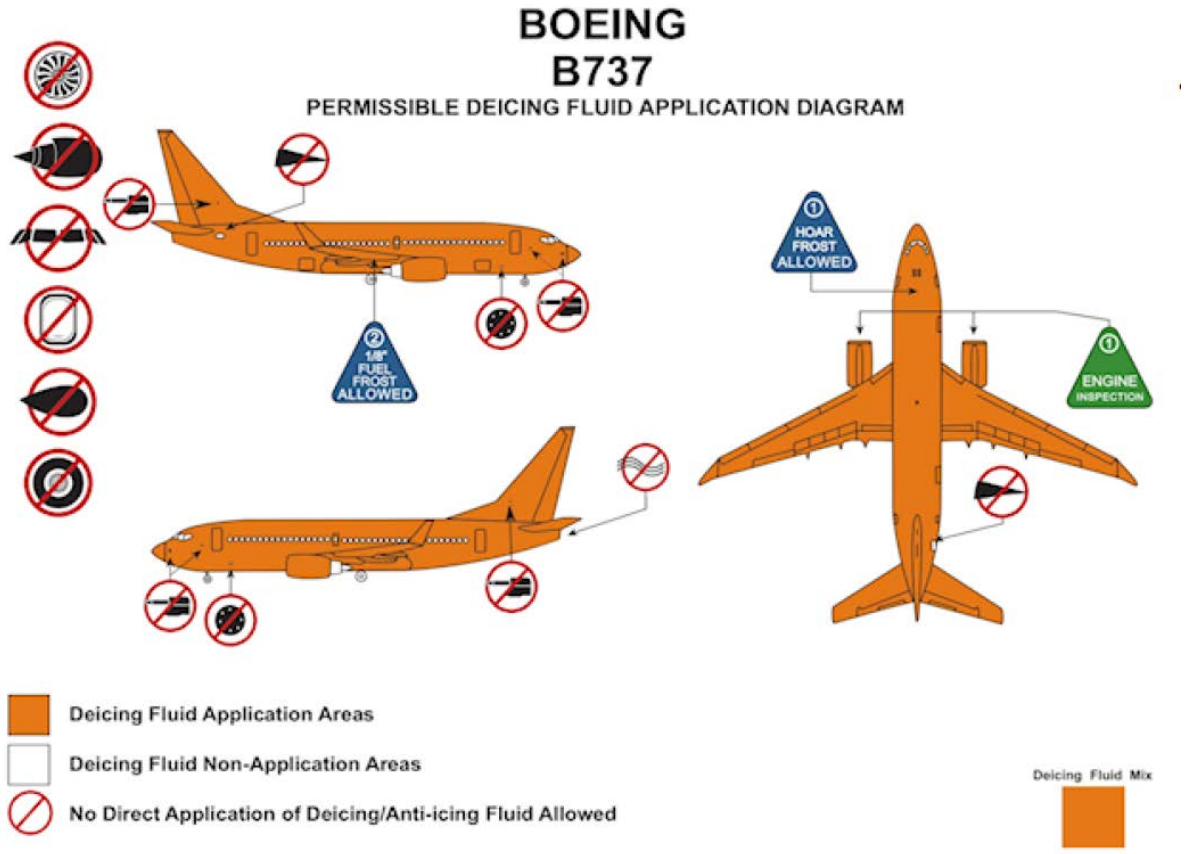
Should a proximity sensor be activated, all pertinent and relevant details shall be documented, including (at a minimum):

- Date.
- Time.
- Vehicle operator name(s).
- Vehicle identification (e.g., number).
- Flight number.
- Aircraft registration and/or SKYUP MT fleet identification (e.g., fin/tail/ship number, etc.).
- Deicing location (e.g., bay or gate number).

- Location on the aircraft where the contact was made, including specifics (e.g., side, aircraft part, etc.).
- proximity sensor location on the vehicle and point where the contact was made (e.g., nozzle, left side of sensor, etc.).
- Name and job title of the third-party individual that performed inspection.
- Third party company name (not required if third party is from the de/anti-icing company).
- Result of the third-party inspection (e.g., no visual damage detected or damage suspected/present).

Ground crew involved in the de/anti-icing operations shall be trained on the operation of the proximity sensor (including equipment reactivation) and procedures in the event of contact. In addition, for those personnel deemed qualified to perform the third-party inspection, they shall also be trained on visual inspection requirements and procedures. Flight crew should be trained on the purpose and functionality of a proximity sensor, and the specific SKYUP MT procedures and requirements in the event of contact.

3.8.7. Fluid Application Diagram



BOEING
B737
PERMISSIBLE ANTI-ICING FLUID APPLICATION DIAGRAM

Legend

Do not spray into engine openings.

Do not spray into engine exhaust.

Do not apply Type II, Type IV to radome.

Do not spray directly at flight deck windows/windscreen.

Do not spray directly at main deck cabin windows or doors.

Do not spray directly at or into pitot tubes, TAT probes, angle of attack vanes or other data sensing devices/probes/tubes.

Do not spray directly at static ports.

Do not spray directly at or into aircraft intake or exhaust vents, ram air inlet, scoops, drains, outlets or pressurized outflow valves.

Do not spray directly at aircraft wheels, brakes, oleo struts, mechanisms and switches.

Do not spray into APU inlet

Do not spray into APU exhaust

Thin hoarfrost is acceptable on the upper surface of the fuselage proved all vents and ports are clear. Thin hoarfrost is thin enough to distinguish paint lines, markings or lettering.

3.9. GENERAL AIRCRAFT REQUIREMENTS AFTER DEICING/ANTI-ICING

Following the deicing/anti-icing procedures and prior to take-off, the critical aircraft surfaces shall be clean of all frost, ice, slush, and snow accumulations in accordance with the following requirements.

3.9.1. Wings, Tail and Control Surfaces

Wings, tail and control surfaces shall be free of ice, snow, slush, and frost except that a coating of frost may be present on wing lower surfaces in areas cold soaked by fuel between forward and aft spars in accordance with the aircraft manufacturer's published manuals.

Note: Frost or any other contamination is not acceptable on the lower side of the horizontal stabiliser and elevator, unless specified otherwise in the AFM or other aircraft manufacturer's documentation.

3.9.2. Pitot Heads and Static Ports

Pitot heads and static ports shall be clear of ice, frost, snow and fluid.

3.9.3. Engines

Engine inlets (including the leading edge), exhaust, cooling intakes, control system probes and ports shall be clear of ice and snow. Engine fan blades shall be clear of ice, frost and snow, and shall be free to rotate.

3.9.4. Air Conditioning Inlets and Exits

Air conditioning inlets and exits shall be clear of ice, frost and snow. Outflow valves shall be clear and unobstructed.

3.9.5. Landing Gear and Landing Gear Doors

Landing gear and landing gear doors shall be unobstructed and clear of ice, frost and snow.

3.9.6. Fuel Tank Vents

Fuel tank vents shall be clear of ice, frost and snow.

3.9.7. Fuselage

Fuselage shall be clear of i snow, slash or ice. Frost may be present in accordance with the aircraft manufacturer's manuals.

3.9.8. Flight Deck Windows and Nose or Radome Area

Any significant deposits of frost, snow, slush, or ice on the windscreens or on areas forward of the windscreens shall be removed prior to departure. Heated flight deck windows will not normally require deicing. Any forward area from which fluid may flow back onto windscreens during taxi or subsequent take-off shall be free of fluid prior to departure.

If SAE Type II or IV fluid has been used, all traces of the fluid on flight deck windows shall be removed prior to departure, with particular attention paid to windows fitted with wipers.

Thickened-fluid (SAE Type II or IV) can be removed by using a diluted Type I mixture, water (where it has been determined that refreezing will not occur), a manual method

(ensuring that windscreen heat is turned off), or another cleaner as approved by the aircraft manufacturer.

Note: During falling precipitation, heated windows may cause liquid runoff to freeze near sensors, requiring deicing.

3.9.9. Dried Fluid Residues when the Aircraft has not been Flown after Anti-Icing

Dried thickened-fluid (SAE Type II or IV) residue could occur when surfaces have been treated but the aircraft has not subsequently been flown and not been subject to precipitation. The fluid may then have dried on the surfaces. In such situations, the aircraft must be checked for dried residues from deicing/anti-icing fluids and cleaned as necessary.

3.9.10. Special Maintenance Considerations

Proper account should be taken of the possible side-effects of fluid use. Such effects may include, but are not necessarily limited to, dried and/or rehydrated residues, corrosion and the removal of lubricants.

3.9.11. Flight Control Check

A functional flight control check using an external observer may be required after deicing/anti-icing depending upon aircraft type (see relevant manuals). This is particularly important in the case of an aircraft that has been subjected to an extreme ice or snow covering.

3.9.12. Post Deicing/Anti-Icing Check

An aircraft shall not be dispatched after a deicing/anti-icing operations until the aircraft has received the following visual check by a trained and Qualified Staff. This check shall cover wings, horizontal stabilizer (both lower and upper surfaces), vertical stabilizer and fuselage.

This check shall also include any other parts of the aircraft on which a deicing/anti-icing treatment was performed according to the requirements identified during the contamination check.

The check shall be performed from points offering sufficient visibility of all prescribed surfaces (e.g. from the deicer itself or another equipment suitable for gaining access). Any contamination found shall be removed by further deicing/anti-icing treatment and the check repeated. Before take-off the commander must ensure that he has received confirmation that this Post Deicing/ Anti-icing Check has been accomplished.

Note: Clear ice check is required for ALL AIRCRAFT.

Post deicing check may be performed by Ground Service Provider, third party's maintenance contracted personnel or by External De/Anti-icing Service Provider personnel. These personnel must be qualified and trained as established in this manual. SKYUP MT will verify periodically training standard and procedure (syllabus, examinations list of trained and qualified personnel).

Where the De/Anti-icing Service Provider is carrying out the deicing/anti-icing process and also the Post Deicing/ Anti-icing Check, it may either be performed as a separate check or incorporated into the deicing operation as defined below. The De/Anti-icing Service Provider shall specify the actual method adopted, where necessary by SKYUP MT, in his winter procedures.

(a) As the deicing/anti-icing operations progresses the De/Anti-icing Service Provider will closely monitor the surfaces receiving treatment, in order to ensure that all forms of frost, ice, slush or snow (with the possible exception of frost, which may be allowed) are removed and that, on completion of the treatment, these surfaces are fully covered with an adequate layer of anti-icing fluid.

(b) Once the operation has been completed, the De/Anti-icing Service Provider will carry out a close visual check of the surface where treatment commenced, in order to ensure it has remained free of contamination (this procedure not required under 'frost only' conditions).

(c) Where the request for deicing/anti-icing did not specify the fuselage, it shall also receive a visual check at this time, in order to confirm that it has remained free of contamination.

(d) Any evidence of contamination that is outside the defined limits shall be reported to the Commander immediately.

3.10. PRE-TAKE-OFF CHECK

The Commander shall continually monitor the weather conditions after the performed deicing/anti-icing treatment. Prior to take-off he shall assess whether the applied holdover time is still appropriate and/or if untreated surfaces may have become contaminated. This Check is normally performed from inside the flight deck.

3.11. PRE-TAKE-OFF CONTAMINATION CHECK

A check of the critical surfaces for contamination. This check shall be performed when the condition of the critical surfaces of the aircraft cannot be effectively assessed by a pre-take-off check or when the applied holdover time has been exceeded. This check is normally performed from outside the aircraft.

The alternate means of compliance to a pre-take-off contamination check is a complete deicing/ anti icing re-treatment of the aircraft.

3.12. COMMUNICATION PROCEDURES

The person communicating with the flight crew shall have a basic knowledge of the English language in order to communicate properly. For local flights involving local flight and ground crews, local language may be used by them.

Communication between the Commander and the deicing crew will usually be achieved using a combination of printed forms and verbal communication. For treatments carried out after aircraft doors are closed, use of flight interphone (headset) or VHF radio will usually be required. Electronic message boards may also be used in 'off stand' situations. Use of hand signals is not recommended except for the final 'all clear' signal and during deicing/anti-icing operations with engines running. For deicing/anti-icing operations with engines running see also ref. DAIM 5.1.

If any significant damage on the airplane is identified during the walk-around/contamination check and/or damage identified or caused during the de/anti-icing process, it must immediately be reported to the flight crew for further investigation and decision for aircraft airworthiness.

3.12.1. Communication Prior to Starting Deicing/Anti-Icing Treatment

(a) Before deicing/anti-icing, the Commander shall be requested to confirm the treatment required (areas to be deiced, anti-icing requirements, special deicing procedures). De/Anti-icing Request Form SEU-GRH-FORM-026 (ref. GOM, Annex A and/ or http://skyup.centrik.net/) shall be filled out. Alternate, Provider's Request Form might be used after SKYUP MT (gh.mt@skymalta.aero) approval.

(b) Before fluid application starts, the Commander shall be requested to configure the aircraft for deicing/ anti-icing (surfaces, controls and systems, as per aircraft type requirements). The deicing crew shall wait for confirmation that this has been completed before commencing the treatment.

(c) For treatments carried out without the flight crew present, a suitably qualified individual shall be nominated to confirm the treatment required and to confirm correct configuration of the aircraft.

3.12.2. Post Deicing/Anti-Icing Communication

An aircraft shall not be dispatched for departure after a deicing/anti-icing operations until the Commander has been notified of the type of deicing/anti-icing operations performed (Anti-icing Code). The Anti-icing Code shall be provided by a qualified person at the completion of the treatment, indicating that the checked surfaces are free of ice, frost, snow, and slush, and in addition includes the necessary information to allow the Commander to estimate the holdover time to be expected under the prevailing weather conditions. When a treatment is interrupted for a significant period of time (e.g. truck runs out of fluid) the flight crew shall be informed stating the reason, the action to be taken and the estimated time delay. When continuing the treatment, the previously treated surfaces must be fully deiced and anti-iced again, when the holdover time of the treatment from before the interruption is not sufficient.

The flight crew shall receive all necessary information relevant to fluid(s) applied to the aircraft surfaces.

3.12.3. Anti-Icing Code

The following information shall be recorded and be communicated to the Commander by referring to the last step of the procedure and in the sequence provided below:

Note: This information shall not be communicated in circumstances where anti-icing holdover times do not apply, e.g., local frost prevention in cold-soaked wing areas, symmetrical local area deicing, or deicing of specific surfaces only (such as leading edges for removal of impact ice), etc. In these circumstances, upon completion of the treatment, the flight crew shall be provided with the deicing fluid type applied (e.g., "Type I"); a statement that holdover time does not apply (e.g., "no holdover time applies"); and confirmation that the post-deicing check has been completed (e.g., "post deicing check completed").

(a) the fluid type (i.e. Type I, II, IV).

(b) the fluid name (manufacturer and brand/trade name) of the Type II or IV anti-icing fluid, if applicable.

Note: no requirement for Type I fluid.

(c) the concentration of fluid (dilution) within the neat fluid/water mixture, expressed as a percentage by volume for Type II or IV (i.e., 100% (“neat”) = 100% fluid, 75% = 75% fluid and 25% water, 50% = 50% fluid and 50% water).

Note: no requirement for Type I fluid.

(d) the local time (hours/minutes) at the beginning of the final deicing/anti-icing step;

- for a one-step deicing/anti-icing: at the start of the treatment; or
- for a two-step deicing/anti-icing: at the start of the second step (anti-icing).

(e) the date in the following format: day, month, year (DDMMMYY (e.g., 28JAN21 = January 28, 2021));

Note: This element is required for record keeping and is optional for flight crew notification.

(f) the statement "Post deicing/anti-icing check completed".

Note 1: For specific aircraft types, additional requirements exist, e.g., tactile checks for clear ice on wing surfaces. Additional confirmation for these checks may be required.

EXAMPLE
A deicing/anti-icing procedure whose last step is the use of a mixture of 75% of a type II fluid and 25% water, commencing at 13:35 local time on 20 February 2016, is reported and recorded as follows: “TYPE II/75 13:35 (20th FEB 2016) (“complete name of anti-icing fluid”) "Post deicing/anti-icing check completed”.

Note 2: An alternative means of visual communication of the anti-icing code to the flight crew can be used (e.g., written on paper, EMBs, ACARS, etc.).

3.12.4. Post Deicing/Anti-Icing Check and Transmission of the Anti-Icing Code to the Commander

The company (De/Anti-icing Service Provider) carrying out Post deicing/anti-icing check are listed in DAIM (ref. DAIM 1.2.) APPROVED DE/ANTI-ICING SUPPLIERS LIST. If two different companies are involved in the deicing/anti-icing treatment and post deicing/anti-icing check, it must be ensured that the Anti-Icing Code is not given before the post deicing/anti-icing check is completed.

The De/Anti-icing Service Provider carrying out the deicing/anti-icing treatment shall be responsible for the treatment and pass all information about the treatment in a written format to the De/Anti-icing Service Provider carrying out the post deicing/anti-icing check.

After post de/anti-icing check completed crew shall receive confirmation of a clean aircraft. Transmission of elements (a), (b), (c), (d), (e) and (f) of DAIM (ref. DAIM 3.12.3) to the Commander confirms that a post deicing/anti-icing check was completed, and the aircraft is clean.

This transmission may be performed according to one of the following methods:

- By direct entry on aircraft or via headset by personnel performing the post deicing/ anti-icing check.

- Via headset by the same personnel who's performed the de/anti-icing treatment after positive confirmation (either written or verbal according to the local agreed procedures) from the personnel performing the post deicing/anti-icing check if performed by different personnel/companies.
- Via radio through a remote position by personnel belonging to the De/Anti-icing Service Provider performing the deicing/anti-icing after confirmation directly by the personnel performing the post deicing/ anti-icing check, or by the personnel performing the deicing/anti-icing (who has in turn received such confirmation by the personnel performing the deicing/anti-icing check).

3.12.5. All Clear Signal

The flight crew shall receive a confirmation from the ground crew that all deicing/anti-icing operations are complete, and that all personnel and equipment are clear before reconfiguring or moving the aircraft.

3.13. HOLDOVER TIME

Holdover time is obtained by anti-icing fluids remaining on the aircraft surfaces. With a one-step deicing/anti-icing process the holdover time begins at the start of the treatment and with a two-step deicing/anti-icing process at the start of the second step (anti-icing) Holdover time will have effectively run out when frozen deposits start to form/accumulate on treated aircraft surfaces. Due to their properties, Type I fluids form a thin liquid wetting film, which provides limited holdover time, especially in conditions of freezing precipitation. With this type of fluid, no additional holdover time would be provided by increasing the concentration of the fluid in the fluid/water mixture. Type II, and IV fluids contain a pseudo plastic thickening agent, which enables the fluid to form a thicker liquid wetting film on external aircraft surfaces. This film provides a longer holdover time especially in conditions of freezing precipitation. With this type of fluid, additional holdover time will be provided by increasing the concentration of the fluid/water mixture, with a maximum holdover time available typically from undiluted fluid.

Holdover time guidelines reported in the Annex 1 of this Manual, give an indication as to the time frame of protection that could reasonably be expected under conditions of precipitation. However, due to the many variables that can influence holdover time, these times should not be considered as minima or maxima as the actual time of protection may be extended or reduced, depending upon the particular conditions existing at the time. Holdover time guidelines are established and published by the FAA and TC. The responsibility for the application of this data remains with the user.

CAUTION: Heavy precipitation rates or high moisture content, high wind velocity, or jet blast may reduce holdover time below the lowest time stated in the range. Holdover time may also be reduced when aircraft skin temperature is lower than OAT. Therefore, the indicated times should be used only in conjunction with a pre-take-off check.

CAUTION: Surface coatings are currently available that may be identified as ice phobic or hydrophobic, enhance the appearance of aircraft external surfaces and/or lead to fuel savings. Since these coatings may affect the fluid wetting capability and the resulting fluid thickness of deicing/anti-icing fluids they have the potential to affect

holdover time and aerodynamics. For more information, see AIR6232 and consult the aircraft manufacturers.

Note 1: For use of holdover time guidelines consult fluid manufacturer's technical literature for minimum viscosity limits of fluids as applied to aircraft surfaces.

Note 2: A degraded Type II or Type IV fluid may be used, provided the holdover time guidelines for Type I fluids are used.

A Type II or Type IV fluid is degraded if the viscosity is below the minimum limit as provided by the fluid manufacturer. The Type II fluid holdover time guideline may be used with degraded Type IV fluids only after substantiation by holdover time testing.

Note 3: Holdover time guidelines for individual fluid products "brand name" published in FAA or TC guidelines for winter operations are provided in Annex 1 of this Manual particularly for the application of the 'light' and 'very light snow' columns.

4. OVERSIGHT

4.1. SKYUP MT COMPLIANCE MONITORING PROGRAM

All companies providing deicing/anti-icing services are subject to SKYUP MT Compliance Monitoring Program.

SKYUP MT has processes to monitor External De/Anti-icing Service Providers that conduct operational de/anti-icing functions to ensure requirements that affect the safety of de/anti-icing operations are being fulfilled (ref. SKYUP MT CMM, 3.4).

The purpose is to ensure that deicing/anti-icing of aircraft on the ground is accomplished in accordance with all applicable regulations, requirements, industry standards, operational procedures and this manual. Full information about SKYUP MT Compliance Monitoring Program, refer to Compliance Monitoring Manual (SEU-CMS-001, Chapter 2).

4.1.1. De/Anti-Icing Service Provider Quality Assurance

De/Anti-icing Service Provider shall have own quality control program which covers all aspects of aircraft ground deicing/anti-icing and shall include, but is not limited to, the following checks:

- Procedures and instructions up to date.
- Responsibilities and tasks clearly defined and up to date.
- Communication procedures/protocols up to date.
- All personnel trained and qualified.
- The quality of deicing/anti-icing fluid from all storage tanks, all equipment tanks and all spray nozzles are within limits.
- Correct and safe functioning of deicing/anti-icing spray equipment.
- Correct and safe functioning of (remote/centralised) deicing/anti -icing facility if applicable.
- Reporting methods and reports up to date.

Note 1: Prior to the start of each winter, perform all above listed checks in accordance with pre-season de/anti-icing checklist SEU-GRH-FORM-020 (ref. GOM, Annex A and/or http://skyup.centrik.net/).

Note 2: During each winter season perform quality control checks on deicing/anti-icing fluids from all spray nozzles at operational settings on a regular basis and file test results till the start of the next winter period.

4.2. FLUID SAMPLING PROCEDURE FOR TYPE II ANDTYPE IV FLUIDS

To ensure that the necessary safety margins are maintained between the start of the deicing/anti-icing operations and take-off, the fluid used to both deice and anti-ice aircraft surfaces, must be in an “ex-fluid manufacturers” condition and at the correct concentration. Due to the possible effect of vehicle/equipment heating and/or delivery system components on fluid condition, it is necessary for the sampling method to simulate typical aircraft application. This section therefore describes the approved methods for collecting samples of Type II and IV fluids, sprayed from

operational aircraft deicing/anti-icing vehicles/equipment, prior to the necessary quality control checks being carried out.

(a) Method using a purpose-built stand:

Spray the fluid onto a purpose-built stand, consisting of a suitable plate (for application) and an associated fluid collection system. In the absence of such a stand, a suitable apparatus can be used. The distance between the spray nozzle and the surface shall be approximately 1 to 3 m and the fluid shall be sprayed perpendicular to the surface. By following this simple procedure, a representative nozzle sample can be obtained. If there are any questions about the deicing fluid, contact and consult the fluid manufacturer. If there are any questions about the deicing vehicle or unit, pump, pump pressure, etc., consult the ground service equipment shop or the vehicle manufacturer.

- Select the required flow rate/spray pattern for the fluid to be sampled simulating routine operations.
- Spray the fluid to purge the lines and check the concentration of a sample, taken from the gun/nozzle after purging.
- Should the refractive index indicate that the lines have not been adequately purged, repeat the previous step until the concentration is correct for the fluid to be sampled (on certain vehicles it may be necessary to spray more than 50 litres of fluid, before the lines are completely purged).
- Direct the fluid onto the sampling surface and spray an adequate amount of fluid to allow for a 1 litre sample to be taken.

(b) Trash can method: items required:

- Large garbage cans, buckets, or 208 litres (55 gallon) drums.
- Large trash can liners.
- Sample bottle that is clean and dry.

Procedure for nozzle sample:

- Set trash cans out and put 2 liners in each trash can.
- Weigh the trash can down with sand or blocks.
- Stand about +1 to 3 meters or 4 to 10 feet away from the cans.
- Open the nozzle and spray into 1 of the trash cans so that the lines are purged of any old fluid.
- When the line has been purged, move the nozzle to the next trash can, keeping the nozzle open.
- Do not close the nozzle and restart as that will shear the fluid.
- Spray 2 to 3 gallons (8 to 12 litres) into the second trash can.
- Pull the liner out and put a small hole in bottom of bag to fill the sample bottle.

(c) Sample Identification

Attach a label to each sample bottle providing the following data:

- Manufacturers' brand name and full name and Type of the fluid (e.g., Kilfrost ABC-3/Type II).
- Identification of deicing/anti-icing equipment (e.g., Elephant Beta DT04, Fixed Rig R001, etc.).
- Detail where the sample was taken from (e.g., nozzle, storage tank, or equipment tank).
- Mixture strength (e.g., 100/0, 75/25, etc.).
- Station (e.g., BAK, etc.).
- Date sample was taken.

4.3. CHECKING PROCEDURE FOR AIRCRAFT DEICING/ANTI-ICING FLUIDS

To ensure the necessary safety margins are maintained in the deicing/anti-icing operations, the fluid used to both deice and anti- ice aircraft surfaces, must meet specification and be at the correct concentration. Factors like pumping, storing, heating, and spraying may cause degradation/contamination of deicing/anti-icing fluids. To assure the correct quality of these fluids, follow fluid manufacturer’s recommendations and perform the following checks. Results of all testing shall be recorded.

4.3.1. Fluid Delivery/Acceptance Check

(a) Check of documentation on each delivery

Check that the fluid delivered corresponds to the fluid ordered. Make sure the brand name and concentration of the product specified in the delivery documents corresponds to the delivered fluid. Each container/tank truck shall be checked. Make sure that the brand name and the concentration of the delivered fluid corresponds to the brand name and the concentration of the storage or equipment tanks.

Verify each delivery (container/tank truck) has an associated fluid certificate of conformity (C of C). The C of C, at a minimum shall include test results conforming to the three (four for thickened fluids) items listed directly below. Additionally, the fluid manufacturer shall give assurances on the condition of each container and/or bulk loaded delivery tanker trailer. This should be through cleaning certification documentation or previous load documentation. In the absence of these items (C of C and container/ trailer status) the receiving organization shall perform the following checks.

(b) Fluid sample checks

Before the first use of the delivered fluid for filling a storage tank or equipment tank, take a sample from the container/tank truck (each separate compartment if applicable) and perform the following checks:

- Visual examination for colour and foreign body contamination.
- Concentration by a Refractive Index check.
- pH (*).

- Viscosity check for thickened (Type II and IV) fluids.

* - Perform this check if it is suitable to detect degradation of the fluid used.

All results shall be within the limits set by the applicable fluid manufacturer.

4.3.2. Fluid Pre-Season and Within-Season Checks

4.3.2.1. Type I Fluid Checks Shall be Performed:

- At the start of the deicing season.
- For each vehicle, at least one within-season nozzle sample check should be done.
- On any vehicle or storage tank when fluid contamination or degradation is suspected.

Fluid samples shall be taken from all deicing/anti-icing fluid spray nozzles of all deicing/anti-icing spraying equipment in the most common concentrations used for deicing/anti-icing and from all storage tanks in use. For vehicles without a mixing system, the sample may be taken directly from the vehicle pre-mix tank after ensuring that the fluid is at a uniform mixture. Perform the following checks on the fluid samples:

- Visual examination.
- Refractive Index.
- pH (*).

* Perform this check if it is suitable to detect degradation of the fluid used.

4.3.2.2. Type II and Type IV Fluids Checks Shall be Performed:

- At the start of the deicing season and at mid-season.
- For each vehicle, at least twice within-season nozzle sample check of all concentrations available should be done.
- On any vehicle or storage tank when fluid contamination or degradation is suspected.
- After equipment maintenance on the fluid pump and spray system that has the potential to affect the quality of the fluid (e.g., pumps, nozzles, etc.).

Fluid samples shall be taken from all deicing/anti- icing fluid spray nozzles of all deicing/anti-icing spraying equipment for all of the concentrations used for anti-icing and from all storage tanks in use. Perform the following checks:

- Visual examination.
- Refractive Index.
- pH (*).
- Laboratory viscosity.

* Perform this check if it is suitable to detect degradation of the fluid used.

4.3.2.3. Fluid Sample Check Requirements

- Results of the visual, refractive index, and pH checks shall be within the limits set by the applicable fluid manufacturer.
- Results of viscosity checks on samples from spray nozzles shall be within the limits set for use of the applicable holdover timetable and for aerodynamic acceptance (Lowest On-Wing Viscosity and Highest On-Wing Viscosity).
- Results of viscosity checks on samples from storage tanks shall be within the limits needed to ensure fluid viscosity will meet applicable holdover timetable requirements considering any expected degradation during the use of fluid application equipment and to ensure aerodynamic acceptance (Lowest On-Wing Viscosity and Highest On-Wing Viscosity).

4.3.3. Daily Concentration Checks

Fluids or fluid/water mixture samples shall be taken from the deicing/anti-icing equipment nozzles on a daily basis when the equipment is in use. Perform a refractive index check on the samples taken. The sample shall be protected against precipitation. Combustion heaters and trucks shall not be operated in confined or poorly ventilated areas to prevent asphyxiation. Requirements for suitable equipment are described in ARP1971.

Note 1: Equipment without a mixing system: samples may be taken from the mix tank instead of the nozzle. Ensure the fluid is at a uniform mix.

Note 2: Equipment with proportional mixing systems: operational setting for the flow and pressure shall be used. Allow the selected fluid concentration to stabilize before taking a sample.

Note 3: Equipment with automated fluid mixture monitoring system: the interval for refractive index checks has to be determined by the De/Anti-icing Service Provider in accordance with the system design.

4.3.3.1. Type I Fluid from Nozzles

- Maximum permitted concentration shall not be exceeded.
- For use in a 1-step method and in the 2nd step of a 2-step method, the concentration shall be such that the of the fluid is at least 10 °C (18 °F) below the OAT.
- For use in the 1st step of a two-step method, the concentration shall be such that the freezing point of the fluid is at the OAT or below.

4.3.3.2. Type 1 Fluid in Tanks

The concentration shall be within the ‘in-service’ limits published by the manufacturer for fluid at the applicable concentration.

4.3.3.3. Type II and IV Fluid

- For fluids from nozzles and in tanks, the concentration shall be within the ‘in-service’ limits published by the manufacturer for fluid at the applicable concentration.

- For Type II, and IV fluid/water mixtures (50/50 or 75/25) a tolerance range of 0 to +7% from the setting may apply, depending on the product.

4.3.4. Check on Directly or Indirectly Heated Type II or IV Fluids

SAE Type II and IV deicing/anti-icing fluids, if heated (directly or indirectly), shall be heated in a manner to preclude fluid degradation in storage or application. The integrity of the fluid following heating shall be checked periodically. Factors like heating rate and heating time cycles should be considered in determining the frequency of fluid inspections. Refer to the fluid manufacturers' recommendations.

4.3.5. Fluid Check Methods

The following checks may be performed by any equivalent method:

(a) Visual Contamination Check

- Put fluid from the sample into a clean glass bottle.
- Check for any kind of contamination (e.g. rust particles, debris, rubber or discoloration, etc.).

(b) Refractive Index Check

- Perform a functionality test on the Refractometer.
- Put a fluid drop taken from the sample or from the nozzle onto the test screen of the refractometer and close the cover plate.
- Read the value on internal scale and use the correction factor given by the manufacturer of the fluid in case the temperature of the Refractometer is not 20 ºC (68 °F).
- Compare the value with the refractive index limits to determine concentration.
- Clean the Refractometer and return it into the protective cover.

(c) pH Value Check

This check may be performed either with pH indicator paper (litmus paper) or with a calibrated or functionally tested pH meter. Read the value and compare with the limits for the fluid.

Note: In the laboratory this pH check shall be performed with a calibrated or functionally tested pH meter.

(d) Field viscosity check

This check may be performed using the fluid manufacturers recommended method, like a falling ball or the Stoneybrook device. Read the value and compare with the limits for the fluid.

(e) Laboratory viscosity test

- Perform the viscosity test using AS9968.
- Compare the viscosity values with the applicable limits.

4.4. DE/ANTI-ICING MONITORING

4.4.1. General

The main idea of the de/anti-icing process monitoring is to ensure the highest level of flight safety during cold weather operations.

4.4.2. Pre-Season Survey

At the beginning of winter season, De/Anti-icing Service Provider shall perform pre-season checks according to SKYUP MT DE/ANTI-ICING MANUAL.

The purpose of PRE-SEASON DE/ANTI-ICING CHECKLIST (Ref. GOM, Annex A, SEU-GRH-FORM-020) to ensure the availability and use of adequate facilities and equipment for aircraft de-/anti-icing operations at applicable locations.

Completed PRE-SEASON DE/ANTI-ICING CHECKLIST (Ref. GOM, Annex A, SEU-GRH-FORM-020) shall be sent to gh.mt@skymalta.aero

All printable/fillable forms are saved in PRINTABLE FORMS folder on the SKYUP MT website http://skyup.centrik.net/

4.4.3. During Winter Season

4.4.3.1. Operational Checks

Operational check should be done at randomly selected flight where DE/ANTI-ICING procedure take place.

Completed OPERATIONAL DE/ANTI-ICING CHECK SEU-GRH-FORM-028 (http://skyup.centrik.net/) shall be attached to the relevant Station file and scan copy shall be sent to gh.mt@skymalta.aero

4.4.3.2. On-line Reporting

De/Anti-icing Service Provider has to complete PayUp report (https://payup.skyup.aero/) and provide following information:

- Date.
- Flight number.
- Registration number.
- OAT (if applicable).
- One-step or Two-step procedure (if applicable).
- Mixture used for each step (if applicable).
- Total amount of fluid (to be indicated separately for each step).
- Total amount of water.

Alternatively, such information may be send to ground.dep@skyup.aero

5. OFF-GATE DEICING/ANTI-ICING PROCEDURE

5.1. COMMUNICATION

During deicing/anti-icing, a two-way communication between the flight crew and the De/Anti-icing Service Provider`s operational personnel must be established prior to the deicing/anti-icing treatment. This may be done either by interphone or by VHF radio. Alternate means of communication may be the use of EMBs. In the event of conflict, verbal communication shall take precedence.

During treatment, all necessary information must be transmitted to the flight crew, including the beginning of treatment, treatment of the sections requiring deactivation of aircraft systems, the Anti-Icing Code, etc., (using standardized deicing/anti-icing phraseology). Communication contact with the flight crew may be concluded after transmission of the Anti-Icing Code and readiness for taxi-out has been announced.

During deicing/anti-icing operations with engines running, both verbal and visual communications shall be utilized, and positive control maintained during the deicing/anti-icing operations in accordance with ARP5660.

When off-gate deicing/anti-icing area is entered by taxiing, a sufficient taxi and stopping guidance must be arranged, or marshaller assistance must be given. In case radio contact must be established before entering the deicing/anti-icing area, the signs with clearly marked operation frequency must be visible from the cockpit before entering this area.

5.2. GENERAL INSTRUCTIONS

The De/Anti-icing Service Provider and/or airport authority must ensure that all necessary information regarding operation of the off-gate/CDF/DDF site is published and available to flight crews. This information shall be included within the De/Anti-icing Service Provider`s and/or airport authority’s local procedures documentation and be made available to SKYUP MT and flight crews (e.g., it can be included as part of flight release documentation, etc.). This information should also be published in applicable state aeronautical navigation documents/publications. This information shall include, at a minimum:

- The location of and standard taxi routing to, within, and from the deicing/anti-icing site.
- The means by which to coordinate the deicing/anti-icing operations.
- The means by which to communicate before, during, and after the deicing/anti-icing operations.
- The means by which taxi-and-stop guidance is provided to the flight crew (e.g., VHF, EMB’s, etc.) and
- Any unique requirements or procedural differences affecting the flight crew and/or flight crew/ground crew interface.

5.3. RESPONSIBILITIES

The responsibility to conduct a Contamination Check before dispatch rests with trained and qualified personnel. The results of the Contamination Check must be provided to the flight crew via verbal or visual (written or electronic) means.

Subsequently, the flight crew is responsible for acquiring the proper treatment. After treatment, the treated surfaces and components must be checked by a trained and qualified staff (ref. DAIM 3.5.) and the Anti-Icing Code must be given to the flight crew (ref. DAIM 3.12.3).

Subsequently, the flight crew is responsible for the airworthiness of the aircraft.

5.4. EMERGENCY PROCEDURE

Whether conducting deicing/anti-icing operations at a remote location or at a centralized deicing/anti-icing facility, local procedures shall be established to ensure that both aircraft and ground emergencies are handled safely, expeditiously, and are coordinated with the local emergency plan.

5.5. SCRIPTS AND PHRASEOLOGY

Following standard communication terminology is recommended during off-gate deicing/anti-icing procedures:

- (DIS = deicing/anti-icing supervisor).
- (COMMANDER = Pilot-in-Command).

DIS: “Set parking-brake, confirm the airplane is ready for treatment, inform on any special requests.”

After the airplane is configured for treatment:

COMMANDER: “Parking brake is set, you may begin treatment and observe… (any special requests like: ice under wing/flaps, clear-ice on top of wing, snow on fuselage, ice on landing gear, anti-ice with Type IV fluid, etc.)”

DIS: “The treatment will begin now… (special request given, like “ice under wing”, etc.) I will call you back when ready”.

Only after all equipment is cleared from the airplane and all checks are completed:

DIS: “Deicing/anti-icing completed, Deicing/anti-icing check completed, Anti-icing Code is: … (plus any additional info needed). I am disconnecting. Standby for clear signal at right/left and/or contact ground/tower for taxi clearance.”

COMMANDER: “Deicing/anti-icing completed; Anti-icing code is …”

Guidelines for establishing clear concise standardized communication and phraseology between aircraft flight and ground crews during aircraft deicing operations is contained in ARP6257. It is very important that both parties communicate fully about contact requirements, aircraft configuration, de/anti-icing treatment needed, and post deicing reporting requirements.

For equipment types furnished with a proximity sensor requiring physical contact to activate, and, in the event of sensor contact, the Pilot in Command shall be informed using the following phraseology:

Ground Crew to Flight Crew:

“A safety proximity sensor (identify location on the deicing equipment) has been activated on the (specify specific location on the aircraft). (Name third party title that performed inspection) has performed a visual inspection on the affected area. Provide

results of the third-party inspection (e.g., there is no visual damage detected or damage is suspected or present). Advise your intentions.

ACTIVE FROST HOLDOVER TIME (HOT) GUIDELINES
WINTER 2024-2025

The HOT Guidelines are provided for information and guidance purposes. The HOT Guidelines on their own do not change, create, amend or permit deviations from regulatory requirements.

The HOT Guidelines may use mandatory terms such as “must”, “shall” and “is/are required” so as to convey the intent of meeting regulatory requirements and SAE Standards, where applicable. The term “should” is to be understood, unless an alternative method of achieving safety is implemented that would meet or exceed the intent of the recommendation.

CAUTIONS

- The responsibility for the application of these data remains with the user.
- Fluids used during ground de/anti-icing do not provide in-flight icing protection.
- This table is for departure planning only and should be used in conjunction with pretakeoff check procedures

TABLE 1: ACTIVE FROST HOLDOVER TIMES FOR SAE TYPE I, TYPE II, TYPE III, AND TYPE IV FLUIDS[1]

Outside Air Temperature[2,3,4]	Type I Aluminium	Type I Composite
-1 °C and above (30 °F and above)	0:45	0:35
below -1 to -3 °C (below 30 to 27 °F)		
below -3 to -10 °C (below 27 to 14 °F)		
below -10 to -14 °C (below 14 to 7 °F)		
below -14 to -21 °C (below 7 to -6 °F)		
below -21 to -25 °C (below -6 to -13 °F)		
below -25 °C to LOUT (below -13 °F to LOUT)		

Outside Air Temperature[3,4]	Concentration Fluid/Water By % Volume	Type II	Type III[5]	Type IV
-1 °C and above (30 °F and above)	100/0	8:00	2:00	12:00
	75/25	5:00	1:00	5:00
	50/50	2:00	0:30	3:00
below -1 to -3 °C (below 30 to 27 °F)	100/0	8:00	2:00	12:00
	75/25	5:00	1:00	5:00
	50/50	1:30	0:30	3:00
below -3 to -10 °C (below 27 to 14 °F)	100/0	8:00	2:00	10:00
	75/25	4:00	1:00	5:00
below -10 to -14 °C (below 14 to 7 °F)	100/0	6:00	2:00	6:00
	75/25	1:00	1:00	1:00
below -14 to -21 °C (below 7 to -6 °F)	100/0	3:00	2:00	6:00
below -21 to -25 °C (below -6 to -13 °F)	100/0	2:00	2:00	4:00
below -25 °C (below -13 °F)	100/0	No Holdover Time Guidelines Exist		

NOTES

1 To use the HOTs in this table, ensure that the fluid and dilution being used is listed in the List of Qualified Fluids Tested for Anti-Icing Performance and Aerodynamic Acceptance table (Table 49 - Table 52). Any restrictions on the use of the fluid have to be identified and applied.
2 Type I Fluid / Water Mixture must be selected so that the freezing point of the mixture is at least 10 °C (18 °F) below outside air temperature.
3 Ensure that the lowest operational use temperature (LOUT) is respected.
4 Changes in outside air temperature (OAT) over the course of longer frost events can be significant; the appropriate holdover time to use is the one provided for the coldest OAT that has occurred in the time between the de/anti-icing fluid application and take-off.
5 To use the Type III fluid frost holdover times, the fluid brand being used must be known. AllClear AeroClear MAX must be applied unheated.

CAUTIONS

- The cautions that apply to the holdover times in the table above can be found on page A.1-1.

HOT GUIDELINES FOR SAE TYPE I FLUIDS
WINTER 2024-2025

The HOT Guidelines are provided for information and guidance purposes. The HOT Guidelines on their own do not change, create, amend or permit deviations from regulatory requirements.

The HOT Guidelines may use mandatory terms such as “must”, “shall” and “is/are required” so as to convey the intent of meeting regulatory requirements and SAE Standards, where applicable. The term “should” is to be understood, unless an alternative method of achieving safety is implemented that would meet or exceed the intent of the recommendation.

CAUTIONS

- The responsibility for the application of these data remains with the user.
- The time of protection will be shortened in heavy weather conditions. Heavy precipitation rates or high moisture content, high wind velocity, or jet blast may reduce holdover time below the lowest time stated in the range. Holdover time may be reduced when aircraft skin temperature is lower than outside air temperature.
- Fluids used during ground de/anti-icing do not provide in-flight icing protection.
- This table is for departure planning only and should be used in conjunction with pretakeoff check procedures

TABLE 2: HOLDOVER TIMES FOR SAE TYPE I FLUID ON CRITICAL AIRCRAFT SURFACES COMPOSED PREDOMINANTLY OF ALUMINUM

Outside Air Temperature[1,2]	Freezing Fog, Freezing Mist[3], or Ice Crystals[4]	Snow mixed with Freezing Fog[5]	Very Light Snow, Snow Grains or Snow Pellets[6,7,8]	Light Snow, Snow Grains or Snow Pellets[6,7,8]	Moderate Snow, Snow Grains or Snow Pellets[6,8]	Freezing Drizzle[9]	Light Freezing Rain	Rain on Cold-Soaked Wing[10]	Other[11]
-3 °C and above (27 °F and above)	0:11 - 0:17	0:05 - 0:08	0:18 - 0:22	0:11 - 0:18	0:06 - 0:11	0:09 - 0:13	0:02 - 0:05	0:02 - 0:05	
below -3 to -6 °C (below 27 to 21 °F)	0:08 - 0:13	0:04 - 0:06	0:14 - 0:17	0:08 - 0:14	0:05 - 0:08	0:05 - 0:09	0:02 - 0:05	CAUTION: No holdover time guidelines exist	
below -6 to -10 °C (below 21 to 14 °F)	0:06 - 0:10	0:03 - 0:05	0:11 - 0:13	0:06 - 0:11	0:04 - 0:06	0:04 - 0:07	0:02 - 0:05		
below -10 °C (below 14 °F)	0:05 - 0:09	0:02 - 0:03	0:07 - 0:08	0:04 - 0:07	0:02 - 0:04				

NOTES

1 Type I fluid / water mixture must be selected so that the freezing point of the mixture is at least 10 °C (18 °F) below outside air temperature.
2 Ensure that the lowest operational use temperature (LOUT) is respected.
3 Freezing mist is best confirmed by observation. It is never reported by METAR however it can occur when mist is present at 0 °C (32 °F) and below.
4 Use freezing fog holdover times in conditions of ice crystals mixed with freezing fog or mist.
5 These holdover times are for use in -SNFZFG and SNFZFG. The Snowfall Intensities as a Function of Prevailing Visibility table (Table 48) is required to confirm the precipitation intensity is no greater than “moderate”. No holdover times exist if the reported visibility correlates to a “heavy” precipitation intensity.
6 To determine snowfall intensity, the Snowfall Intensities as a Function of Prevailing Visibility table (Table 48) is required.
7 Use light freezing rain holdover times in conditions of very light or light snow mixed with light rain or drizzle. The Snowfall Intensities as a Function of Prevailing Visibility table (Table 48) is required to confirm the precipitation intensity is no greater than “light”. No holdover times exist if the reported visibility correlates to a “moderate” or “heavy” precipitation intensity.
8 Use snow holdover times in conditions of very light, light, or moderate snow mixed with ice crystals.
9 Includes light, moderate and heavy freezing drizzle. Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
10 No holdover time guidelines exist for this condition for 0 °C (32 °F) and below.
11 Heavy snow, ice pellets, moderate and heavy freezing rain, small hail and hail.

CAUTIONS

- The cautions that apply to the holdover times in the table above can be found on page A.1-3.

TABLE 3: HOLDOVER TIMES FOR SAE TYPE I FLUID ON CRITICAL AIRCRAFT SURFACES COMPOSED PREDOMINANTLY OF COMPOSITES

NOT APPLICABLE

HOT GUIDELINES FOR SAE TYPE II FLUIDS
WINTER 2024-2025

The HOT Guidelines are provided for information and guidance purposes. The HOT Guidelines on their own do not change, create, amend or permit deviations from regulatory requirements.

The HOT Guidelines may use mandatory terms such as “must”, “shall” and “is/are required” so as to convey the intent of meeting regulatory requirements and SAE Standards, where applicable. The term “should” is to be understood, unless an alternative method of achieving safety is implemented that would meet or exceed the intent of the recommendation.

CAUTIONS

- The responsibility for the application of these data remains with the user.
- The time of protection will be shortened in heavy weather conditions. Heavy precipitation rates or high moisture content, high wind velocity, or jet blast may reduce holdover time below the lowest time stated in the range. Holdover time may be reduced when aircraft skin temperature is lower than outside air temperature.
- Fluids used during ground de/anti-icing do not provide in-flight icing protection.
- This table is for departure planning only and should be used in conjunction with pretakeoff check procedures.
- Whenever frost or ice occurs on the lower surface of the wing in the area of the fuel tank, indicating a cold-soaked wing, the 50/50 dilutions of Type II or IV shall not be used for the anti-icing step because fluid freezing may occur.

TABLE 4: GENERIC HOLDOVER TIMES FOR SAE TYPE II FLUIDS[1]

Outside Air Temperature[2]	Fluid Concentration Fluid/Water By % Volume	Freezing Fog, Freezing Mist[3], or Ice Crystals[4]	Snow mixed with Freezing Fog[5]	Snow, Snow Grains or Snow Pellets[6,7,8]	Freezing Drizzle[9]	Light Freezing Rain	Rain on Cold-Soaked Wing[10]	Other[11]
-3 °C and above (27 °F and above)	100/0	0:55 - 1:50	0:20 - 0:40	0:30 - 0:55	0:35 - 1:05	0:25 - 0:35	0:07 - 0:45	
	75/25	0:40 - 1:10	0:15 - 0:25	0:15 - 0:30	0:25 - 0:40	0:15 - 0:25	0:04 - 0:25	
	50/50	0:15 - 0:30	0:05 - 0:10	0:07 - 0:15	0:09 - 0:15	0:06 - 0:09	CAUTION: No holdover time guidelines exist	
below -3 to -8 °C (below 27 to 18 °F)	100/0	0:30 - 0:45	0:15 - 0:30	0:20 - 0:40	0:20 - 0:45	0:15 - 0:20		
	75/25	0:25 - 0:55	0:09 - 0:15	0:10 - 0:25	0:15 - 0:30	0:08 - 0:15		
below -8 to -14 °C (below 18 to 7 °F)	100/0	0:30 - 0:45	0:10 - 0:25	0:15 - 0:30	0:20 - 0:45[12]	0:15 - 0:20[12]		
	75/25	0:25 - 0:55	0:07 - 0:15	0:09 - 0:20	0:15 - 0:30[12]	0:08 - 0:15[12]		
below -14 to -18 °C (below 7 to 0 °F)	100/0	0:15 - 0:20	0:01 - 0:05	0:02 - 0:07				
below -18 to -25 °C (below 0 to -13 °F)	100/0	0:15 - 0:20	0:00 - 0:02	0:01 - 0:03				
below -25 °C to LOUT[13] (below -13 °F to LOUT)	100/0	0:15 - 0:20	0:00 - 0:00	0:00 - 0:01				

NOTES

1 To use the HOTs in this table, ensure that the fluid and dilution being used is listed in the Type II Fluids Tested for Anti-Icing Performance and Aerodynamic Acceptance table (Table 52). Any restrictions on the use of the fluid have to be identified and applied.
2 Ensure that the lowest operational use temperature (LOUT) is respected. Consider use of Type I fluid when Type II fluid cannot be used.
3 Freezing mist is best confirmed by observation. It is never reported by METAR however it can occur when mist is present at 0 °C (32 °F) and below.
4 Use freezing fog holdover times in conditions of ice crystals mixed with freezing fog or mist.
5 These holdover times are for use in -SNFZFG and SNFZFG. The Snowfall Intensities as a Function of Prevailing Visibility table (Table 48) is required to confirm the precipitation intensity is no greater than “moderate”. No holdover times exist if the reported visibility correlates to a “heavy” precipitation intensity.
6 To determine snowfall intensity, the Snowfall Intensities as a Function of Prevailing Visibility table (Table 48) is required.
7 Use light freezing rain holdover times in conditions of very light or light snow mixed with light rain or drizzle. The Snowfall Intensities as a Function of Prevailing Visibility table (Table48) is required to confirm the precipitation intensity is no greater than “light”. No holdover times exist if the reported visibility correlates to a “moderate” or “heavy” precipitation intensity.
8 Use snow holdover times in conditions of very light, light, or moderate snow mixed with ice crystals.
9 Includes light, moderate and heavy freezing drizzle. Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
10 No holdover time guidelines exist for this condition for 0 °C (32 °F) and below.
11 Heavy snow, ice pellets, moderate and heavy freezing rain, small hail and hail.
12 No holdover time guidelines exist for this condition below -10 °C (14 °F).
13 If the LOUT is unknown, no holdover time guidelines exist below -25 °C (-13 °F).

CAUTIONS

- The cautions that apply to the holdover times in the table above can be found on page A.1-6.

TABLE 5: TYPE II HOLDOVER TIMES FOR ABAX ECOWING AD-2

Outside Air Temperature[1]	Fluid Concentration Fluid/Water By % Volume	Freezing Fog, Freezing Mist[2], or Ice Crystals[3]	Snow mixed with Freezing Fog[4]	Very Light Snow, Snow Grains or Snow Pellets[5,6,7]	Light Snow, Snow Grains or Snow Pellets[5,6,7]	Moderate Snow, Snow Grains or Snow Pellets[5,7]	Freezing Drizzle[8]	Light Freezing Rain	Rain on Cold-Soaked Wing[9]	Other[10]
-3 °C and above (27 °F and above)	100/0	1:20 - 3:00	0:30 - 0:55	2:25 - 2:55	1:15 - 2:25	0:40 - 1:15	0:40 - 1:40	0:30 - 0:45	0:09 - 1:25	
	75/25	1:15 - 1:25	0:20 - 0:40	1:45 - 2:10	0:55 - 1:45	0:25 - 0:55	0:35 - 1:05	0:20 - 0:30	0:04 - 0:50	
	50/50	0:15 - 0:30	0:05 - 0:10	0:35 - 0:40	0:15 - 0:35	0:07 - 0:15	0:09 - 0:15	0:06 - 0:09	CAUTION: No holdover time guidelines exist	
below -3 to -8 °C (below 27 to 18 °F)	100/0	0:45 - 2:30	0:25 - 0:45	2:00 - 2:25	1:00 - 2:00	0:30 - 1:00	0:25 - 1:10	0:20 - 0:30		
	75/25	0:35 - 1:55	0:20 - 0:35	1:40 - 2:05	0:50 - 1:40	0:25 - 0:50	0:15 - 0:55	0:20 - 0:35		
below -8 to -14 °C (below 18 to 7 °F)	100/0	0:45 - 2:30	0:20 - 0:40	1:45 - 2:05	0:55 - 1:45	0:30 - 0:55	0:25 - 1:10[11]	0:20 - 0:30[11]		
	75/25	0:35 - 1:55	0:20 - 0:35	1:35 - 2:00	0:50 - 1:35	0:25 - 0:50	0:15 - 0:55[11]	0:20 - 0:35[11]		
below -14 to -18 °C (below 7 to 0 °F)	100/0	0:15 - 0:40	0:01 - 0:05	0:20 - 0:30	0:07 - 0:20	0:02 - 0:07				
below -18 to -25 °C (below 0 to -13 °F)	100/0	0:15 - 0:40	0:00 - 0:02	0:09 - 0:15	0:03 - 0:09	0:01 - 0:03				
below -25 to -27 °C (below -13 to -17 °F)	100/0	0:15 - 0:40	0:00 - 0:00	0:05 - 0:07	0:01 - 0:05	0:00 - 0:01				

NOTES

1 Ensure that the lowest operational use temperature (LOUT) is respected. Consider use of Type I fluid when Type II fluid cannot be used.
2 Freezing mist is best confirmed by observation. It is never reported by METAR however it can occur when mist is present at 0 °C (32 °F) and below.
3 Use freezing fog holdover times in conditions of ice crystals mixed with freezing fog or mist.
4 These holdover times are for use in -SNFZFG and SNFZFG. The Snowfall Intensities as a Function of Prevailing Visibility table (Table 48) is req
5 To determine snowfall intensity, the Snowfall Intensities as a Function of Prevailing Visibility table (Table 48) is required.
6 Use light freezing rain holdover times in conditions of very light or light snow mixed with light rain or drizzle. The Snowfall Intensities as a Function of Prevailing Visibility table (Table 48) is required to confirm the precipitation intensity is no greater than “light”. No holdover times exist if the reported visibility correlates to a “moderate” or “heavy” precipitation intensity.
7 Use snow holdover times in conditions of very light, light, or moderate snow mixed with ice crystals.
8 Includes light, moderate and heavy freezing drizzle. Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
9 No holdover time guidelines exist for this condition for 0 °C (32 °F) and below.
10 Heavy snow, ice pellets, moderate and heavy freezing rain, small hail and hail.
11 No holdover time guidelines exist for this condition below -10 °C (14 °F).

CAUTIONS

- The cautions that apply to the holdover times in the table above can be found on page A.1-6.

TABLE 6: TYPE II HOLDOVER TIMES FOR AVIATION XI'AN HIGH-TECH CLEANWING II

Outside Air Temperature[1]	Fluid Concentration Fluid/Water By % Volume	Freezing Fog, Freezing Mist[2], or Ice Crystals[3]	Snow mixed with Freezing Fog[4]	Very Light Snow, Snow Grains or Snow Pellets[5,6,7]	Light Snow, Snow Grains or Snow Pellets[5,6,7]	Moderate Snow, Snow Grains or Snow Pellets[5,7]	Freezing Drizzle[8]	Light Freezing Rain	Rain on Cold-Soaked Wing[9]	Other[10]
-3 °C and above (27 °F and above)	100/0	0:55 - 1:50	0:20 - 0:40	1:35 - 1:55	0:55 - 1:35	0:30 - 0:55	0:35 - 1:05	0:25 - 0:35	0:10 - 0:55	
	75/25	0:50 - 1:20	0:20 - 0:35	1:20 - 1:40	0:45 - 1:20	0:25 - 0:45	0:35 - 1:00	0:20 - 0:30	0:07 - 0:50	
	50/50	0:35 - 1:00	0:10 - 0:20	0:50 - 1:05	0:25 - 0:50	0:15 - 0:25	0:20 - 0:40	0:10 - 0:20	CAUTION: No holdover time guidelines exist	
below -3 to -8 °C (below 27 to 18 °F)	100/0	0:45 - 1:50	0:15 - 0:30	1:20 - 1:35	0:40 - 1:20	0:25 - 0:40	0:30 - 0:55	0:20 - 0:25		
	75/25	0:40 - 1:45	0:20 - 0:35	1:20 - 1:35	0:45 - 1:20	0:25 - 0:45	0:35 - 0:40	0:20 - 0:25		
below -8 to -14 °C (below 18 to 7 °F)	100/0	0:45 - 1:50	0:15 - 0:25	1:05 - 1:20	0:35 - 1:05	0:20 - 0:35	0:30 - 0:55[11]	0:20 - 0:25[11]		
	75/25	0:40 - 1:45	0:20 - 0:35	1:20 - 1:35	0:45 - 1:20	0:25 - 0:45	0:35 - 0:40[11]	0:20 - 0:25[11]		
below -14 to -18 °C (below 7 to 0 °F)	100/0	0:20 - 0:50	0:09 - 0:20	0:45 - 1:00	0:25 - 0:45	0:15 - 0:25				
below -18 to -25 °C (below 0 to -13 °F)	100/0	0:20 - 0:50	0:05 - 0:10	0:30 - 0:35	0:15 - 0:30	0:07 - 0:15				

NOTES

1 Ensure that the lowest operational use temperature (LOUT) is respected. Consider use of Type I fluid when Type II fluid cannot be used.
2 Freezing mist is best confirmed by observation. It is never reported by METAR however it can occur when mist is present at 0 °C (32 °F) and below.
3 Use freezing fog holdover times in conditions of ice crystals mixed with freezing fog or mist.
4 These holdover times are for use in -SNFZFG and SNFZFG. The Snowfall Intensities as a Function of Prevailing Visibility table (Table 48) is required to confirm the precipitation intensity is no greater than "moderate". No holdover times exist if the reported visibility correlates to a "heavy" precipitation intensity.
5 To determine snowfall intensity, the Snowfall Intensities as a Function of Prevailing Visibility table (Table 48) is required.
6 Use light freezing rain holdover times in conditions of very light or light snow mixed with light rain or drizzle. The Snowfall Intensities as a Function of Prevailing Visibility table (Table 48) is required to confirm the precipitation intensity is no greater than "light". No holdover times exist if the reported visibility correlates to a "moderate" or "heavy" precipitation intensity.
7 Use snow holdover times in conditions of very light, light, or moderate snow mixed with ice crystals.
8 Includes light, moderate and heavy freezing drizzle. Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
9 No holdover time guidelines exist for this condition for 0 °C (32 °F) and below.
10 Heavy snow, ice pellets, moderate and heavy freezing rain, small hail and hail.
11 No holdover time guidelines exist for this condition below -10 °C (14 °F).

CAUTIONS

- The cautions that apply to the holdover times in the table above can be found on page A.1-6.

TABLE 7: TYPE II HOLDOVER TIMES FOR CLARIANT SAFEWING MP II FLIGHT

Outside Air Temperature[1]	Fluid Concentration Fluid/Water By % Volume	Freezing Fog, Freezing Mist[2], or Ice Crystals[3]	Snow mixed with Freezing Fog[4]	Very Light Snow, Snow Grains or Snow Pellets[5,6,7]	Light Snow, Snow Grains or Snow Pellets[5,6,7]	Moderate Snow, Snow Grains or Snow Pellets[5,7]	Freezing Drizzle[8]	Light Freezing Rain	Rain on Cold-Soaked Wing[9]	Other[10]
-3 °C and above (27 °F and above)	100/0	3:30 - 4:00	0:45 - 1:10	2:35 - 3:00	1:35 - 2:35	1:00 - 1:35	1:20 - 2:00	0:45 - 1:25	0:10 - 1:30	
	75/25	1:50 - 2:45	0:30 - 1:00	2:35 - 3:00	1:20 - 2:35	0:40 - 1:20	1:10 - 1:30	0:30 - 0:55	0:06 - 0:50	
	50/50	0:55 - 1:45	0:09 - 0:20	0:45 - 0:55	0:25 - 0:45	0:10 - 0:25	0:20 - 0:30	0:10 - 0:15	CAUTION: No holdover time guidelines exist	
below -3 to -8 °C (below 27 to 18 °F)	100/0	0:55 - 1:45	0:35 - 1:00	2:05 - 2:30	1:15 - 2:05	0:45 - 1:15	0:35 - 1:30	0:25 - 0:45		
	75/25	0:25 - 1:05	0:20 - 0:40	1:45 - 2:10	0:55 - 1:45	0:30 - 0:55	0:25 - 1:10	0:20 - 0:35		
below -8 to -14 °C (below 18 to 7 °F)	100/0	0:55 - 1:45	0:30 - 0:50	1:50 - 2:10	1:05 - 1:50	0:40 - 1:05	0:35 - 1:30[11]	0:25 - 0:45[11]		
	75/25	0:25 - 1:05	0:15 - 0:30	1:20 - 1:40	0:40 - 1:20	0:20 - 0:40	0:25 - 1:10[11]	0:20 - 0:35[11]		
below -14 to -18 °C (below 7 to 0 °F)	100/0	0:30 - 0:50	0:06 - 0:20	1:10 - 1:40	0:25 - 1:10	0:08 - 0:25				
below -18 to -25 °C (below 0 to -13 °F)	100/0	0:30 - 0:50	0:02 - 0:07	0:30 - 0:40	0:10 - 0:30	0:03 - 0:10				
below -25 to -29 °C (below -13 to -20 °F)	100/0	0:30 - 0:50	0:01 - 0:05	0:20 - 0:30	0:07 - 0:20	0:02 - 0:07				

NOTES

1 Ensure that the lowest operational use temperature (LOUT) is respected. Consider use of Type I fluid when Type II fluid cannot be used.
2 Freezing mist is best confirmed by observation. It is never reported by METAR however it can occur when mist is present at 0 °C (32 °F) and below.
3 Use freezing fog holdover times in conditions of ice crystals mixed with freezing fog or mist.
4 These holdover times are for use in -SNFZFG and SNFZFG. The Snowfall Intensities as a Function of Prevailing Visibility table (Table 48) is required to confirm the precipitation intensity is no greater than “moderate”. No holdover times exist if the reported visibility correlates to a “heavy” precipitation intensity.
5 To determine snowfall intensity, the Snowfall Intensities as a Function of Prevailing Visibility table (Table 48) is required.
6 Use light freezing rain holdover times in conditions of very light or light snow mixed with light rain or drizzle. The Snowfall Intensities as a Function of Prevailing Visibility table (Table 48) is required to confirm the precipitation intensity is no greater than “light”. No holdover times exist if the reported visibility correlates to a “moderate” or “heavy” precipitation intensity.
7 Use snow holdover times in conditions of very light, light, or moderate snow mixed with ice crystals.
8 Includes light, moderate and heavy freezing drizzle. Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
9 No holdover time guidelines exist for this condition for 0 °C (32 °F) and below.
10 Heavy snow, ice pellets, moderate and heavy freezing rain, small hail and hail.
11 No holdover time guidelines exist for this condition below -10 °C (14 °F).

CAUTIONS

- The cautions that apply to the holdover times in the table above can be found on page A.1-6.

TABLE 8: TYPE II HOLDOVER TIMES FOR CRYOTECH POLAR GUARD® II

Outside Air Temperature[1]	Fluid Concentration Fluid/Water By % Volume	Freezing Fog, Freezing Mist[2], or Ice Crystals[3]	Snow mixed with Freezing Fog[4]	Very Light Snow, Snow Grains or Snow Pellets[5,6,7]	Light Snow, Snow Grains or Snow Pellets[5,6,7]	Moderate Snow, Snow Grains or Snow Pellets[5,7]	Freezing Drizzle[8]	Light Freezing Rain	Rain on Cold-Soaked Wing[9]	Other[10]
-3 °C and above (27 °F and above)	100/0	2:50 - 4:00	0:50 - 1:25	3:00 - 3:00	1:55 - 3:00	1:05 - 1:55	1:35 - 2:00	1:15 - 1:30	0:15 - 2:00	
	75/25	2:30 - 4:00	0:30 - 1:05	3:00 - 3:00	1:25 - 3:00	0:40 - 1:25	1:40 - 2:00	0:40 - 1:10	0:09 - 1:40	
	50/50	0:50 - 1:25	0:07 - 0:20	1:10 - 1:35	0:25 - 1:10	0:10 - 0:25	0:20 - 0:45	0:09 - 0:20	CAUTION: No holdover time guidelines exist	
below -3 to -8 °C (below 27 to 18 °F)	100/0	0:55 - 2:30	0:35 - 1:05	2:25 - 2:50	1:25 - 2:25	0:50 - 1:25	0:35 - 1:35	0:35 - 0:45		
	75/25	0:40 - 1:30	0:25 - 0:50	2:20 - 3:00	1:05 - 2:20	0:30 - 1:05	0:25 - 1:05	0:35 - 0:45		
below -8 to -14 °C (below 18 to 7 °F)	100/0	0:55 - 2:30	0:30 - 0:50	2:00 - 2:20	1:10 - 2:00	0:40 - 1:10	0:35 - 1:35[11]	0:35 - 0:45[11]		
	75/25	0:40 - 1:30	0:20 - 0:45	2:00 - 2:30	0:55 - 2:00	0:25 - 0:55	0:25 - 1:05[11]	0:35 - 0:45[11]		
below -14 to -18 °C (below 7 to 0 °F)	100/0	0:25 - 0:50	0:08 - 0:25	1:35 - 2:15	0:35 - 1:35	0:10 - 0:35				
below -18 to -25 °C (below 0 to -13 °F)	100/0	0:25 - 0:50	0:03 - 0:10	0:40 - 0:55	0:15 - 0:40	0:04 - 0:15				
below -25 to -30.5 °C (below -13 to -23 °F)	100/0	0:25 - 0:50	0:02 - 0:05	0:25 - 0:30	0:07 - 0:25	0:02 - 0:07				

NOTES

1 Ensure that the lowest operational use temperature (LOUT) is respected. Consider use of Type I fluid when Type II fluid cannot be used.
2 Freezing mist is best confirmed by observation. It is never reported by METAR however it can occur when mist is present at 0 °C (32 °F) and below.
3 Use freezing fog holdover times in conditions of ice crystals mixed with freezing fog or mist.
4 These holdover times are for use in -SNFZFG and SNFZFG. The Snowfall Intensities as a Function of Prevailing Visibility table (Table 48) is required to confirm the precipitation intensity is no greater than “moderate”. No holdover times exist if the reported visibility correlates to a “heavy” precipitation intensity.
5 To determine snowfall intensity, the Snowfall Intensities as a Function of Prevailing Visibility table (Table 48) is required.
6 Use light freezing rain holdover times in conditions of very light or light snow mixed with light rain or drizzle. The Snowfall Intensities as a Function of Prevailing Visibility table (Table 48) is required to confirm the precipitation intensity is no greater than “light”. No holdover times exist if the reported visibility correlates to a “moderate” or “heavy” precipitation intensity.
7 Use snow holdover times in conditions of very light, light, or moderate snow mixed with ice crystals.
8 Includes light, moderate and heavy freezing drizzle. Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
9 No holdover time guidelines exist for this condition for 0 °C (32 °F) and below.
10 Heavy snow, ice pellets, moderate and heavy freezing rain, small hail and hail.
11 No holdover time guidelines exist for this condition below -10 °C (14 °F).

CAUTIONS

- The cautions that apply to the holdover times in the table above can be found on page A.1-6.

TABLE 9: TYPE II HOLDOVER TIMES FOR KILFROST ABC-K PLUS

Outside Air Temperature[1]	Fluid Concentration Fluid/Water By % Volume	Freezing Fog, Freezing Mist[2], or Ice Crystals[3]	Snow mixed with Freezing Fog[4]	Snow, Snow Grains or Snow Pellets[5,6,7]	Freezing Drizzle[8]	Light Freezing Rain	Rain on Cold-Soaked Wing[9]	Other[10]
-3 °C and above (27 °F and above)	100/0	2:15 - 3:45	0:45 - 1:15	1:00 - 1:40	1:50 - 2:00	1:00 - 1:25	0:20 - 2:00	
	75/25	1:40 - 2:30	0:25 - 0:50	0:35 - 1:10	1:25 - 2:00	0:50 - 1:10	0:15 - 2:00	
	50/50	0:35 - 1:05	0:05 - 0:10	0:07 - 0:15	0:20 - 0:30	0:10 - 0:15	CAUTION: No holdover time guidelines exist	
below -3 to -8 °C (below 27 to 18 °F)	100/0	0:30 - 1:05	0:40 - 1:10	0:55 - 1:30	0:25 - 1:00	0:15 - 0:35		
	75/25	0:25 - 1:25	0:25 - 0:50	0:35 - 1:05	0:20 - 0:55	0:09 - 0:30		
below -8 to -14 °C (below 18 to 7 °F)	100/0	0:30 - 1:05	0:40 - 1:05	0:50 - 1:25	0:25 - 1:00[11]	0:15 - 0:35[11]		
	75/25	0:25 - 1:25	0:25 - 0:50	0:35 - 1:05	0:20 - 0:55[11]	0:09 - 0:30[11]		
below -14 to -18 °C (below 7 to 0 °F)	100/0	0:30 - 0:55	0:01 - 0:05	0:02 - 0:07				
below -18 to -25 °C (below 0 to -13 °F)	100/0	0:30 - 0:55	0:00 - 0:02	0:01 - 0:03				
below -25 to -29 °C (below -13 to -20 °F)	100/0	0:30 - 0:55	0:00 - 0:00	0:00 - 0:01				

NOTES

1 Ensure that the lowest operational use temperature (LOUT) is respected. Consider use of Type I fluid when Type II fluid cannot be used.
2 Freezing mist is best confirmed by observation. It is never reported by METAR however it can occur when mist is present at 0 °C (32 °F) and below.
3 Use freezing fog holdover times in conditions of ice crystals mixed with freezing fog or mist.
4 These holdover times are for use in -SNFZFG and SNFZFG. The Snowfall Intensities as a Function of Prevailing Visibility table (Table 48) is required to confirm the precipitation intensity is no greater than “moderate”. No holdover times exist if the reported visibility correlates to a “heavy” precipitation intensity.
5 To determine snowfall intensity, the Snowfall Intensities as a Function of Prevailing Visibility table (Table 48) is required.
6 Use light freezing rain holdover times in conditions of very light or light snow mixed with light rain or drizzle. The Snowfall Intensities as a Function of Prevailing Visibility table (Table 48) is required to confirm the precipitation intensity is no greater than “light”. No holdover times exist if the reported visibility correlates to a “moderate” or “heavy” precipitation intensity.
7 Use snow holdover times in conditions of very light, light, or moderate snow mixed with ice crystals.
8 Includes light, moderate and heavy freezing drizzle. Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
9 No holdover time guidelines exist for this condition for 0 °C (32 °F) and below.
10 Heavy snow, ice pellets, moderate and heavy freezing rain, small hail and hail.
11 No holdover time guidelines exist for this condition below -10 °C (14 °F).

CAUTIONS

- The cautions that apply to the holdover times in the table above can be found on page A.1-6.

TABLE 10: TYPE II HOLDOVER TIMES FOR KILFROST ICE CLEAR II

Outside Air Temperature[1]	Fluid Concentration Fluid/Water By % Volume	Freezing Fog, Freezing Mist[2], or Ice Crystals[3]	Snow mixed with Freezing Fog[4]	Very Light Snow, Snow Grains or Snow Pellets[5,6,7]	Light Snow, Snow Grains or Snow Pellets[5,6,7]	Moderate Snow, Snow Grains or Snow Pellets[5,7]	Freezing Drizzle[8]	Light Freezing Rain	Rain on Cold-Soaked Wing[9]	Other[10]
-3 °C and above (27 °F and above)	100/0	1:25 - 2:25	0:30 - 1:00	2:25 - 2:55	1:20 - 2:25	0:40 - 1:20	1:00 - 1:35	0:40 - 1:05	0:15 - 2:00	
	75/25	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
	50/50	N/A	N/A	N/A	N/A	N/A	N/A	N/A	CAUTION: No holdover time guidelines exist	
below -3 to -8 °C (below 27 to 18 °F)	100/0	1:05 - 2:35	0:30 - 0:50	2:10 - 2:35	1:10 - 2:10	0:40 - 1:10	0:30 - 1:15	0:35 - 0:55		
	75/25	N/A	N/A	N/A	N/A	N/A	N/A	N/A		
below -8 to -14 °C (below 18 to 7 °F)	100/0	1:05 - 2:35	0:25 - 0:50	2:00 - 2:25	1:05 - 2:00	0:35 - 1:05	0:30 - 1:15[11]	0:35 - 0:55[11]		
	75/25	N/A	N/A	N/A	N/A	N/A	N/A	N/A		
below -14 to -18 °C (below 7 to 0 °F)	100/0	0:35 - 0:45	0:10 - 0:20	0:55 - 1:05	0:30 - 0:55	0:15 - 0:30				
below -18 to -25 °C (below 0 to -13 °F)	100/0	0:35 - 0:45	0:06 - 0:10	0:30 - 0:35	0:15 - 0:30	0:08 - 0:15				
below -25 to -28 °C (below -13 to -18 °F)	100/0	0:35 - 0:45	0:05 - 0:09	0:25 - 0:30	0:10 - 0:25	0:06 - 0:10				

NOTES

1 Ensure that the lowest operational use temperature (LOUT) is respected. Consider use of Type I fluid when Type II fluid cannot be used.
2 Freezing mist is best confirmed by observation. It is never reported by METAR however it can occur when mist is present at 0 °C (32 °F) and below.
3 Use freezing fog holdover times in conditions of ice crystals mixed with freezing fog or mist.
4 These holdover times are for use in -SNFZFG and SNFZFG. The Snowfall Intensities as a Function of Prevailing Visibility table (Table 48) is required to confirm the precipitation intensity is no greater than “moderate”. No holdover times exist if the reported visibility correlates to a “heavy” precipitation intensity.
5 To determine snowfall intensity, the Snowfall Intensities as a Function of Prevailing Visibility table (Table 48) is required.
6 Use light freezing rain holdover times in conditions of very light or light snow mixed with light rain or drizzle. The Snowfall Intensities as a Function of Prevailing Visibility table (Table 48) is required to confirm the precipitation intensity is no greater than “light”. No holdover times exist if the reported visibility correlates to a “moderate” or “heavy” precipitation intensity.
7 Use snow holdover times in conditions of very light, light, or moderate snow mixed with ice crystals.
8 Includes light, moderate and heavy freezing drizzle. Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
9 No holdover time guidelines exist for this condition for 0 °C (32 °F) and below.
10 Heavy snow, ice pellets, moderate and heavy freezing rain, small hail and hail.
11 No holdover time guidelines exist for this condition below -10 °C (14 °F).

CAUTIONS

- The cautions that apply to the holdover times in the table above can be found on page A.1-6.

TABLE 11: TYPE II HOLDOVER TIMES FOR MKS DEVO CHEMICALS COREICEPHOB TYPE II

Outside Air Temperature[1]	Fluid Concentration Fluid/Water By % Volume	Freezing Fog, Freezing Mist[2], or Ice Crystals[3]	Snow mixed with Freezing Fog[4]	Very Light Snow, Snow Grains or Snow Pellets[5,6,7]	Light Snow, Snow Grains or Snow Pellets[5,6,7]	Moderate Snow, Snow Grains or Snow Pellets[5,7]	Freezing Drizzle[8]	Light Freezing Rain	Rain on Cold-Soaked Wing[9]	Other[10]
-3 °C and above (27 °F and above)	100/0	1:55 - 2:45	0:30 - 1:00	2:35 - 3:00	1:25 - 2:35	0:40 - 1:25	1:10 - 2:00	0:45 - 1:00	0:15 - 1:35	
	75/25	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
	50/50	1:05 - 1:45	0:15 - 0:35	1:35 - 1:55	0:45 - 1:35	0:25 - 0:45	0:50 - 1:15	0:25 - 0:30	CAUTION: No holdover time guidelines exist	
below -3 to -8 °C (below 27 to 18 °F)	100/0	0:45 - 1:25	0:25 - 0:45	1:50 - 2:15	1:00 - 1:50	0:30 - 1:00	0:30 - 1:10	0:25 - 0:35		
	75/25	N/A	N/A	N/A	N/A	N/A	N/A	N/A		
below -8 to -14 °C (below 18 to 7 °F)	100/0	0:45 - 1:25	0:20 - 0:35	1:30 - 1:50	0:50 - 1:30	0:25 - 0:50	0:30 - 1:10[11]	0:25 - 0:35[11]		
	75/25	N/A	N/A	N/A	N/A	N/A	N/A	N/A		
below -14 to -18 °C (below 7 to 0 °F)	100/0	0:15 - 0:25	0:01 - 0:05	0:20 - 0:30	0:07 - 0:20	0:02 - 0:07				
below -18 to -25 °C (below 0 to -13 °F)	100/0	0:15 - 0:25	0:00 - 0:02	0:09 - 0:15	0:03 - 0:09	0:01 - 0:03				
below -25 to -27 °C (below -13 to -17 °F)	100/0	0:15 - 0:25	0:00 - 0:00	0:05 - 0:07	0:01 - 0:05	0:00 - 0:01				

NOTES

1 Ensure that the lowest operational use temperature (LOUT) is respected. Consider use of Type I fluid when Type II fluid cannot be used.
2 Freezing mist is best confirmed by observation. It is never reported by METAR however it can occur when mist is present at 0 °C (32 °F) and below.
3 Use freezing fog holdover times in conditions of ice crystals mixed with freezing fog or mist.
4 These holdover times are for use in -SNFZFG and SNFZFG below 0°C. The Snowfall Intensities as a Function of Prevailing Visibility table (Table 48) is required to confirm that the precipitation intensity is no greater than “moderate”. No holdover times exist if the reported visibility correlates to a “heavy” precipitation intensity.
5 To determine snowfall intensity, the Snowfall Intensities as a Function of Prevailing Visibility table (Table 48) is required.
6 Use light freezing rain holdover times in conditions of very light or light snow mixed with light rain or drizzle. The Snowfall Intensities as a Function of Prevailing Visibility table (Table 48) is required to confirm that the precipitation intensity is no greater than “light”. No holdover times exist if the reported visibility correlates to a “moderate” or “heavy” precipitation intensity.
7 Use snow holdover times in conditions of very light, light, or moderate snow mixed with ice crystals.
8 Includes light, moderate and heavy freezing drizzle. Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
9 No holdover time guidelines exist for this condition for 0°C (32°F) and below.
10 Heavy snow, ice pellets, moderate and heavy freezing rain, small hail and hail.
11 No holdover time guidelines exist for this condition below -10°C (14°F).

CAUTIONS

- The cautions that apply to the holdover times in the table above can be found on page A.1-6.

TABLE 12: TYPE II HOLDOVER TIMES FOR NEWAVE AEROCHEMICAL FCY-2

Outside Air Temperature[1]	Fluid Concentration Fluid/Water By % Volume	Freezing Fog, Freezing Mist[2], or Ice Crystals[3]	Snow mixed with Freezing Fog[4]	Snow, Snow Grains or Snow Pellets[5,6,7]	Freezing Drizzle[8]	Light Freezing Rain	Rain on Cold-Soaked Wing[9]	Other[10]
-3 °C and above (27 °F and above)	100/0	1:15 - 2:25	0:25 - 0:40	0:30 - 0:55	0:35 - 1:05	0:25 - 0:35	0:08 - 0:45	
	75/25	0:50 - 1:30	0:15 - 0:30	0:20 - 0:40	0:25 - 0:45	0:15 - 0:25	0:05 - 0:25	
	50/50	0:25 - 0:35	0:09 - 0:20	0:15 - 0:25	0:10 - 0:20	0:07 - 0:10	CAUTION: No holdover time guidelines exist	
below -3 to -8 °C (below 27 to 18 °F)	100/0	0:45 - 1:30	0:15 - 0:30	0:20 - 0:40	0:20 - 0:45	0:15 - 0:20		
	75/25	0:30 - 1:05	0:10 - 0:20	0:15 - 0:25	0:15 - 0:30	0:08 - 0:15		
below -8 to -14 °C (below 18 to 7 °F)	100/0	0:45 - 1:30	0:10 - 0:25	0:15 - 0:30	0:20 - 0:45[11]	0:15 - 0:20[11]		
	75/25	0:30 - 1:05	0:08 - 0:15	0:10 - 0:20	0:15 - 0:30[11]	0:08 - 0:15[11]		
below -14 to -18 °C (below 7 to 0 °F)	100/0	0:25 - 0:35	0:01 - 0:05	0:02 - 0:07				
below -18 to -25 °C[12] (below 0 to -13 °F)	100/0	0:25 - 0:35	0:00 - 0:02	0:01 - 0:03				
below -25 to -28 °C (below -13 to -18 °F)	100/0	0:25 - 0:35	0:00 - 0:00	0:00 - 0:01				

NOTES

1 Ensure that the lowest operational use temperature (LOUT) is respected. Consider use of Type I fluid when Type II fluid cannot be used.
2 Freezing mist is best confirmed by observation. It is never reported by METAR however it can occur when mist is present at 0 °C (32 °F) and below.
3 Use freezing fog holdover times in conditions of ice crystals mixed with freezing fog or mist.
4 These holdover times are for use in -SNFZFG and SNFZFG. The Snowfall Intensities as a Function of Prevailing Visibility table (Table 48) is required to confirm the precipitation intensity is no greater than “moderate”. No holdover times exist if the reported visibility correlates to a “heavy” precipitation intensity.
5 To determine snowfall intensity, the Snowfall Intensities as a Function of Prevailing Visibility table (Table 48) is required.
6 Use light freezing rain holdover times in conditions of very light or light snow mixed with light rain or drizzle. The Snowfall Intensities as a Function of Prevailing Visibility table (Table 48) is required to confirm the precipitation intensity is no greater than “light”. No holdover times exist if the reported visibility correlates to a “moderate” or “heavy” precipitation intensity.
7 Use snow holdover times in conditions of very light, light, or moderate snow mixed with ice crystals.
8 Includes light, moderate and heavy freezing drizzle. Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
9 No holdover time guidelines exist for this condition for 0 °C (32 °F) and below.
10 Heavy snow, ice pellets, moderate and heavy freezing rain, small hail and hail.
11 No holdover time guidelines exist for this condition below -10 °C (14 °F).

CAUTIONS

- The cautions that apply to the holdover times in the table above can be found on page A.1-6.

TABLE 13: TYPE II HOLDOVER TIMES FOR ROMCHIM ADD-PROTECT NG TYPE II

Outside Air Temperature[1]	Fluid Concentration Fluid/Water By % Volume	Freezing Fog, Freezing Mist[2], or Ice Crystals[3]	Snow mixed with Freezing Fog[4]	Very Light Snow, Snow Grains or Snow Pellets[5,6,7]	Light Snow, Snow Grains or Snow Pellets[5,6,7]	Moderate Snow, Snow Grains or Snow Pellets[5,7]	Freezing Drizzle[8]	Light Freezing Rain	Rain on Cold-Soaked Wing[9]	Other[10]
-3 °C and above (27 °F and above)	100/0	1:10 - 2:25	0:25 - 0:55	2:35 - 3:00	1:10 - 2:35	0:35 - 1:10	0:50 - 1:20	0:35 - 0:50	0:07 - 1:10	
	75/25	1:00 - 1:50	0:20 - 0:40	1:55 - 2:25	0:55 - 1:55	0:25 - 0:55	0:40 - 1:15	0:25 - 0:40	0:07 - 0:55	
	50/50	0:25 - 0:55	0:10 - 0:20	0:55 - 1:05	0:30 - 0:55	0:15 - 0:30	0:20 - 0:35	0:10 - 0:20	CAUTION: No holdover time guidelines exist	
below -3 to -8 °C (below 27 to 18 °F)	100/0	0:55 - 1:35	0:20 - 0:40	1:50 - 2:20	0:50 - 1:50	0:25 - 0:50	0:35 - 1:10	0:25 - 0:35		
	75/25	0:55 - 1:25	0:15 - 0:30	1:25 - 1:45	0:40 - 1:25	0:20 - 0:40	0:25 - 1:05	0:20 - 0:30		
below -8 to -14 °C (below 18 to 7 °F)	100/0	0:55 - 1:35	0:15 - 0:30	1:25 - 1:50	0:40 - 1:25	0:20 - 0:40	0:35 - 1:10[11]	0:25 - 0:35[11]		
	75/25	0:55 - 1:25	0:10 - 0:25	1:05 - 1:25	0:30 - 1:05	0:15 - 0:30	0:25 - 1:05[11]	0:20 - 0:30[11]		
below -14 to -18 °C (below 7 to 0 °F)	100/0	0:15 - 0:20	0:01 - 0:05	0:20 - 0:30	0:07 - 0:20	0:02 - 0:07				
below -18 to -25 °C (below 0 to -13 °F)	100/0	0:15 - 0:20	0:00 - 0:02	0:09 - 0:15	0:03 - 0:09	0:01 - 0:03				
below -25 to -28 °C (below -13 to -18 °F)	100/0	0:15 - 0:20	0:00 - 0:00	0:05 - 0:07	0:01 - 0:05	0:00 - 0:01				

NOTES

1 Ensure that the lowest operational use temperature (LOUT) is respected. Consider use of Type I fluid when Type II fluid cannot be used.
2 Freezing mist is best confirmed by observation. It is never reported by METAR however it can occur when mist is present at 0 °C (32 °F) and below.
3 Use freezing fog holdover times in conditions of ice crystals mixed with freezing fog or mist.
4 These holdover times are for use in -SNFZFG and SNFZFG. The Snowfall Intensities as a Function of Prevailing Visibility table (Table 48) is required to confirm the precipitation intensity is no greater than “moderate”. No holdover times exist if the reported visibility correlates to a “heavy” precipitation intensity.
5 To determine snowfall intensity, the Snowfall Intensities as a Function of Prevailing Visibility table (Table 48) is required.
6 Use light freezing rain holdover times in conditions of very light or light snow mixed with light rain or drizzle. The Snowfall Intensities as a Function of Prevailing Visibility table (Table 48) is required to confirm the precipitation intensity is no greater than “light”. No holdover times exist if the reported visibility correlates to a “moderate” or “heavy” precipitation intensity.
7 Use snow holdover times in conditions of very light, light, or moderate snow mixed with ice crystals.
8 Includes light, moderate and heavy freezing drizzle. Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
9 No holdover time guidelines exist for this condition for 0 °C (32 °F) and below.
10 Heavy snow, ice pellets, moderate and heavy freezing rain, small hail and hail.
11 No holdover time guidelines exist for this condition below -10 °C (14 °F).

CAUTIONS

- The cautions that apply to the holdover times in the table above can be found on page A.1-6.

TABLE 14: TYPE II HOLDOVER TIMES FOR ROMCHIM ADD-PROTECT TYPE II

Outside Air Temperature[1]	Fluid Concentration Fluid/Water By % Volume	Freezing Fog, Freezing Mist[2], or Ice Crystals[3]	Snow mixed with Freezing Fog[4]	Very Light Snow, Snow Grains or Snow Pellets[5,6,7]	Light Snow, Snow Grains or Snow Pellets[5,6,7]	Moderate Snow, Snow Grains or Snow Pellets[5,7]	Freezing Drizzle[8]	Light Freezing Rain	Rain on Cold-Soaked Wing[9]	Other[10]
-3 °C and above (27 °F and above)	100/0	1:40 - 3:30	0:20 - 0:45	1:55 - 2:25	1:00 - 1:55	0:30 - 1:00	0:40 - 1:35	0:25 - 0:45	0:09 - 0:50	
	75/25	0:40 - 1:10	0:15 - 0:25	1:00 - 1:10	0:30 - 1:00	0:15 - 0:30	0:25 - 0:40	0:15 - 0:25	0:05 - 0:25	
	50/50	0:20 - 0:35	0:07 - 0:15	0:30 - 0:35	0:15 - 0:30	0:09 - 0:15	0:10 - 0:30	0:08 - 0:10	CAUTION: No holdover time guidelines exist	
below -3 to -8 °C (below 27 to 18 °F)	100/0	0:30 - 0:45	0:15 - 0:30	1:20 - 1:40	0:40 - 1:20	0:20 - 0:40	0:25 - 0:50	0:20 - 0:30		
	75/25	0:30 - 0:55	0:09 - 0:15	0:40 - 0:50	0:25 - 0:40	0:10 - 0:25	0:20 - 0:30	0:15 - 0:20		
below -8 to -14 °C (below 18 to 7 °F)	100/0	0:30 - 0:45	0:15 - 0:25	1:05 - 1:20	0:35 - 1:05	0:15 - 0:35	0:25 - 0:50[11]	0:20 - 0:30[11]		
	75/25	0:30 - 0:55	0:07 - 0:15	0:35 - 0:40	0:20 - 0:35	0:09 - 0:20	0:20 - 0:30[11]	0:15 - 0:20[11]		
below -14 to -18 °C (below 7 to 0 °F)	100/0	0:15 - 0:25	0:01 - 0:05	0:20 - 0:30	0:07 - 0:20	0:02 - 0:07				
below -18 to -25 °C (below 0 to -13 °F)	100/0	0:15 - 0:25	0:00 - 0:02	0:09 - 0:15	0:03 - 0:09	0:01 - 0:03				
below -25 to -28 °C (below -13 to -18 °F)	100/0	0:15 - 0:25	0:00 - 0:00	0:05 - 0:07	0:01 - 0:05	0:00 - 0:01				

NOTES

1 Ensure that the lowest operational use temperature (LOUT) is respected. Consider use of Type I fluid when Type II fluid cannot be used.
2 Freezing mist is best confirmed by observation. It is never reported by METAR however it can occur when mist is present at 0 °C (32 °F) and below.
3 Use freezing fog holdover times in conditions of ice crystals mixed with freezing fog or mist.
4 These holdover times are for use in -SNFZFG and SNFZFG. The Snowfall Intensities as a Function of Prevailing Visibility table (Table 48) is required to confirm the precipitation intensity is no greater than “moderate”. No holdover times exist if the reported visibility correlates to a “heavy” precipitation intensity.
5 To determine snowfall intensity, the Snowfall Intensities as a Function of Prevailing Visibility table (Table 48) is required.
6 Use light freezing rain holdover times in conditions of very light or light snow mixed with light rain or drizzle. The Snowfall Intensities as a Function of Prevailing Visibility table (Table 48) is required to confirm the precipitation intensity is no greater than “light”. No holdover times exist if the reported visibility correlates to a “moderate” or “heavy” precipitation intensity.
7 Use snow holdover times in conditions of very light, light, or moderate snow mixed with ice crystals.
8 Includes light, moderate and heavy freezing drizzle. Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
9 No holdover time guidelines exist for this condition for 0 °C (32 °F) and below.
10 Heavy snow, ice pellets, moderate and heavy freezing rain, small hail and hail.
11 No holdover time guidelines exist for this condition below -10 °C (14 °F).

CAUTIONS

The cautions that apply to the holdover times in the table above can be found on page A.1-6.

HOT GUIDELINES FOR SAE TYPE III FLUIDS
WINTER 2024-2025

NOT APPLICABLE

TABLE 15: TYPE III HOLDOVER TIMES FOR ALLCLEAR AEROCLEAR MAX APPLIED UNHEATED ON LOW SPEED AIRCRAFT[1]

NOT APPLICABLE

TABLE 16: TYPE III HOLDOVER TIMES FOR ALLCLEAR AEROCLEAR MAX APPLIED UNHEATED ON MIDDLE SPEED AIRCRAFT[1]

NOT APPLICABLE

TABLE 17: TYPE III HOLDOVER TIMES FOR ALLCLEAR AEROCLEAR MAX APPLIED UNHEATED ON HIGH SPEED AIRCRAFT[1]

NOT APPLICABLE

HOT GUIDELINES FOR SAE TYPE IV FLUIDS
WINTER 2024-2025

The HOT Guidelines are provided for information and guidance purposes. The HOT Guidelines on their own do not change, create, amend, or permit deviations from regulatory requirements.

The HOT Guidelines may use mandatory terms such as “must”, “shall” and “is/are required” so as to convey the intent of meeting regulatory requirements and SAE Standards, where applicable. The term “should” is to be understood, unless an alternative method of achieving safety is implemented that would meet or exceed the intent of the recommendation.

CAUTIONS

- The responsibility for the application of these data remains with the user.
- The time of protection will be shortened in heavy weather conditions. Heavy precipitation rates or high moisture content, high wind velocity jet blast, or blowing snow may reduce holdover time below the lowest time stated in the range. Holdover time may be reduced when aircraft skin temperature is lower than outside air temperature.
- Fluids used during ground de/anti-icing do not provide in-flight icing protection.
- This table is for departure planning only and should be used in conjunction with pretakeoff check procedures.
- Whenever frost or ice occurs on the lower surface of the wing in the area of the fuel tank, indicating a cold-soaked wing, the 50/50 dilutions of Type II or IV shall not be used for the anti-icing step because fluid freezing may occur.

TABLE 18: GENERIC HOLDOVER TIMES FOR SAE TYPE IV FLUIDS[1]

Outside Air Temperature[2]	Fluid Concentration Fluid/Water By % Volume	Freezing Fog, Freezing Mist[3], or Ice Crystals[4]	Snow mixed with Freezing Fog[5]	Very Light Snow, Snow Grains or Snow Pellets[6,7,8]	Light Snow, Snow Grains or Snow Pellets[6,7,8]	Moderate Snow, Snow Grains or Snow Pellets[6,8]	Freezing Drizzle[9]	Light Freezing Rain	Rain on Cold-Soaked Wing[10]	Other[11]
-3 °C and above (27 °F and above)	100/0	1:15 - 2:15	0:25 - 0:45	1:55 - 2:20	1:00 - 1:55	0:30 - 1:00	0:40 - 1:10	0:20 - 0:35	0:08 - 1:05	
	75/25	1:25 - 2:40	0:30 - 0:55	2:05 - 2:25	1:15 - 2:05	0:40 - 1:15	1:00 - 1:20	0:30 - 0:50	0:09 - 1:20	
	50/50	0:30 - 0:55	0:07 - 0:20	1:00 - 1:10	0:25 - 1:00	0:10 - 0:25	0:15 - 0:40	0:09 - 0:20	CAUTION: No holdover time guidelines exist	
below -3 to -8 °C (below 27 to 18 °F)	100/0	0:15 - 0:35	0:20 - 0:40	1:45 - 2:05	0:55 - 1:45	0:25 - 0:55	0:25 - 1:10	0:20 - 0:25		
	75/25	0:40 - 1:20	0:25 - 0:50	1:50 - 2:10	1:05 - 1:50	0:30 - 1:05	0:20 - 1:05	0:15 - 0:25		
below -8 to -14 °C (below 18 to 7 °F)	100/0	0:15 - 0:35	0:15 - 0:35	1:30 - 1:50	0:45 - 1:30	0:20 - 0:45	0:25 - 1:10[12]	0:20 - 0:25[12]		
	75/25	0:40 - 1:20	0:20 - 0:45	1:45 - 2:00	0:55 - 1:45	0:25 - 0:55	0:20 - 1:05[12]	0:15 - 0:25[12]		
below -14 to -18 °C (below 7 to 0 °F)	100/0	0:15 - 0:30	0:01 - 0:06	0:30 - 0:45	0:09 - 0:30	0:02 - 0:09				
below -18 to -25 °C (below 0 to -13 °F)	100/0	0:15 - 0:30	0:00 - 0:02	0:10 - 0:20	0:03 - 0:10	0:01 - 0:03				
below -25 °C to LOUT[13] (below -13 °F to LOUT)	100/0	0:15 - 0:30	0:00 - 0:01	0:07 - 0:10	0:02 - 0:07	0:00 - 0:02				

NOTES

1 To use the HOTs in this table, ensure that the fluid and dilution being used is listed in the Type IV Fluids Tested for Anti-Icing Performance and Aerodynamic Acceptance table (Table 52). Any restrictions on the use of the fluid have to be identified and applied.
2 Ensure that the lowest operational use temperature (LOUT) is respected. Consider use of Type I fluid when Type IV fluid cannot be used.
3 Freezing mist is best confirmed by observation. It is never reported by METAR however it can occur when mist is present at 0 °C (32 °F) and below.
4 Use freezing fog holdover times in conditions of ice crystals mixed with freezing fog or mist.
5 These holdover times are for use in -SNFZFG and SNFZFG. The Snowfall Intensities as a Function of Prevailing Visibility table (Table 48) is required to confirm the precipitation intensity is no greater than “moderate”. No holdover times exist if the reported visibility correlates to a “heavy” precipitation intensity.
6 To determine snowfall intensity, the Snowfall Intensities as a Function of Prevailing Visibility table (Table 48) is required.
7 Use light freezing rain holdover times in conditions of very light or light snow mixed with light rain or drizzle. The Snowfall Intensities as a Function of Prevailing Visibility table (Table 48) is required to confirm the precipitation intensity is no greater than “light”. No holdover times exist if the reported visibility correlates to a “moderate” or “heavy” precipitation intensity.
8 Use snow holdover times in conditions of very light, light, or moderate snow mixed with ice crystals.
9 Includes light, moderate and heavy freezing drizzle. Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
10 No holdover time guidelines exist for this condition for 0 °C (32 °F) and below.
11 Heavy snow, ice pellets, moderate and heavy freezing rain, small hail and hail (Table 46 provides allowance times for Type IV EG fluids and Table 47 provides allowance times for Type IV PG fluids in ice pellets and small hail. If the glycol type is unknown, the allowance times for SAE Type IV PG fluids should be used).
12 No holdover time guidelines exist for this condition below -10 °C (14 °F).
13 If the LOUT is unknown, no holdover time guidelines exist below -25.5 °C (-14 °F).

CAUTIONS

- The cautions that apply to the holdover times in the table above can be found on page A.1-22.

TABLE 19: TYPE IV HOLDOVER TIMES FOR ABAX ECOWING AD-49

Outside Air Temperature[1]	Fluid Concentration Fluid/Water By % Volume	Freezing Fog, Freezing Mist[2], or Ice Crystals[3]	Snow mixed with Freezing Fog[4]	Very Light Snow, Snow Grains or Snow Pellets[5,6,7]	Light Snow, Snow Grains or Snow Pellets[5,6,7]	Moderate Snow, Snow Grains or Snow Pellets[5,7]	Freezing Drizzle[8]	Light Freezing Rain	Rain on Cold-Soaked Wing[9]	Other[10]
-3 °C and above (27 °F and above)	100/0	3:20 - 4:00	0:45 - 1:25	3:00 - 3:00	1:55 - 3:00	1:00 - 1:55	1:25 - 2:00	1:00 - 1:25	0:10 - 1:55	
	75/25	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
	50/50	N/A	N/A	N/A	N/A	N/A	N/A	N/A		
below -3 to -8 °C (below 27 to 18 °F)	100/0	0:20 - 1:35	0:35 - 1:05	2:55 - 3:00	1:30 - 2:55	0:45 - 1:30	0:25 - 1:25	0:20 - 0:25		
	75/25	N/A	N/A	N/A	N/A	N/A	N/A	N/A		
below -8 to -14 °C (below 18 to 7 °F)	100/0	0:20 - 1:35	0:30 - 0:55	2:25 - 3:00	1:15 - 2:25	0:40 - 1:15	0:25 - 1:25[11]	0:20 - 0:25[11]		
	75/25	N/A	N/A	N/A	N/A	N/A	N/A	N/A		
below -14 to -18 °C (below 7 to 0 °F)	100/0	0:25 - 0:40	0:01 - 0:06	0:30 - 0:45	0:09 - 0:30	0:02 - 0:09				
below -18 to -25 °C (below 0 to -13 °F)	100/0	0:25 - 0:40	0:00 - 0:02	0:10 - 0:20	0:03 - 0:10	0:01 - 0:03				
below -25 to -26 °C (below -13 to -15 °F)	100/0	0:25 - 0:40	0:00 - 0:01	0:07 - 0:10	0:02 - 0:07	0:00 - 0:02				

CAUTION: No holdover time guidelines exist

NOTES

1 Ensure that the lowest operational use temperature (LOUT) is respected. Consider use of Type I fluid when Type IV fluid cannot be used.
2 Freezing mist is best confirmed by observation. It is never reported by METAR however it can occur when mist is present at 0 °C (32 °F) and below.
3 Use freezing fog holdover times in conditions of ice crystals mixed with freezing fog or mist.
4 These holdover times are for use in -SNFZFG and SNFZFG. The Snowfall Intensities as a Function of Prevailing Visibility table (Table 48) is required to confirm the precipitation intensity is no greater than “moderate”. No holdover times exist if the reported visibility correlates to a “heavy” precipitation intensity.
5 To determine snowfall intensity, the Snowfall Intensities as a Function of Prevailing Visibility table (Table 48) is required.
6 Use light freezing rain holdover times in conditions of very light or light snow mixed with light rain or drizzle. The Snowfall Intensities as a Function of Prevailing Visibility table (Table 48) is required to confirm the precipitation intensity is no greater than “light”. No holdover times exist if the reported visibility correlates to a “moderate” or “heavy” precipitation intensity.
7 Use snow holdover times in conditions of very light, light, or moderate snow mixed with ice crystals.
8 Includes light, moderate and heavy freezing drizzle. Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
9 No holdover time guidelines exist for this condition for 0 °C (32 °F) and below.
10 Heavy snow, ice pellets, moderate and heavy freezing rain, small hail and hail (Table 47 provides allowance times for Type IV PG fluids in ice pellets and small hail).
11 No holdover time guidelines exist for this condition below -10 °C (14 °F).

CAUTIONS

- The cautions that apply to the holdover times in the table above can be found on page A.1-22.

TABLE 20: TYPE IV HOLDOVER TIMES FOR ALAB INTERNATIONAL PROFLIGHT EG4

Outside Air Temperature[1]	Fluid Concentration Fluid/Water By % Volume	Freezing Fog, Freezing Mist[2], or Ice Crystals[3]	Snow mixed with Freezing Fog[4]	Very Light Snow, Snow Grains or Snow Pellets[5,6,7]	Light Snow, Snow Grains or Snow Pellets[5,6,7]	Moderate Snow, Snow Grains or Snow Pellets[5,7]	Freezing Drizzle[8]	Light Freezing Rain	Rain on Cold-Soaked Wing[9]	Other[10]
-3 °C and above (27 °F and above)	100/0	3:05 - 4:00	0:45 - 1:25	3:00 - 3:00	1:50 - 3:00	1:00 - 1:50	1:25 - 2:00	0:40 - 1:00	0:10 - 2:00	
	75/25	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
	50/50	N/A	N/A	N/A	N/A	N/A	N/A	N/A	CAUTION: No holdover time guidelines exist	
below -3 to -8 °C (below 27 to 18 °F)	100/0	2:30 - 3:55	0:45 - 1:25	3:00 - 3:00	1:50 - 3:00	1:00 - 1:50	1:05 - 2:00	0:50 - 1:35		
	75/25	N/A	N/A	N/A	N/A	N/A	N/A	N/A		
below -8 to -14 °C (below 18 to 7 °F)	100/0	2:30 - 3:55	0:45 - 1:25	3:00 - 3:00	1:50 - 3:00	1:00 - 1:50	1:05 - 2:00[11]	0:50 - 1:35[11]		
	75/25	N/A	N/A	N/A	N/A	N/A	N/A	N/A		
below -14 to -18 °C (below 7 to 0 °F)	100/0	0:35 - 1:35	0:07 - 0:20	0:50 - 1:05	0:25 - 0:50	0:10 - 0:25				
below -18 to -25 °C (below 0 to -13 °F)	100/0	0:35 - 1:35	0:03 - 0:10	0:40 - 0:55	0:15 - 0:40	0:05 - 0:15				
below -25 to -26°C (below -13 to -15°F)	100/0	0:35 - 1:35	0:01 - 0:06	0:25 - 0:35	0:08 - 0:25	0:02 - 0:08				

NOTES

1 Ensure that the lowest operational use temperature (LOUT) is respected. Consider use of Type I fluid when Type IV fluid cannot be used.
2 Freezing mist is best confirmed by observation. It is never reported by METAR however it can occur when mist is present at 0 °C (32 °F) and below.
3 Use freezing fog holdover times in conditions of ice crystals mixed with freezing fog or mist.
4 These holdover times are for use in -SNFZFG and SNFZFG. The Snowfall Intensities as a Function of Prevailing Visibility table (Table 48) is required to confirm the precipitation intensity is no greater than “moderate”. No holdover times exist if the reported visibility correlates to a “heavy” precipitation intensity.
5 To determine snowfall intensity, the Snowfall Intensities as a Function of Prevailing Visibility table (Table 48) is required.
6 Use light freezing rain holdover times in conditions of very light or light snow mixed with light rain or drizzle. The Snowfall Intensities as a Function of Prevailing Visibility table (Table 48) is required to confirm the precipitation intensity is no greater than “light”. No holdover times exist if the reported visibility correlates to a “moderate” or “heavy” precipitation intensity.
7 Use snow holdover times in conditions of very light, light, or moderate snow mixed with ice crystals.
8 Includes light, moderate and heavy freezing drizzle. Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
9 No holdover time guidelines exist for this condition for 0 °C (32 °F) and below.
10 Heavy snow, ice pellets, moderate and heavy freezing rain, small hail and hail (Table 46 provides allowance times for Type IV EG fluids in ice pellets and small hail).
11 No holdover time guidelines exist for this condition below -10 °C (14 °F).

CAUTIONS

- The cautions that apply to the holdover times in the table above can be found on page A.1-22.

TABLE 21: TYPE IV HOLDOVER TIMES FOR ALAB INTERNATIONAL PROFLIGHT PG4

Outside Air Temperature[1]	Fluid Concentration Fluid/Water By % Volume	Freezing Fog, Freezing Mist[2], or Ice Crystals[3]	Snow mixed with Freezing Fog[4]	Very Light Snow, Snow Grains or Snow Pellets[5,6,7]	Light Snow, Snow Grains or Snow Pellets[5,6,7]	Moderate Snow, Snow Grains or Snow Pellets[5,7]	Freezing Drizzle[8]	Light Freezing Rain	Rain on Cold-Soaked Wing[9]	Other[10]
-3 °C and above (27 °F and above)	100/0	1:25 - 2:15	0:30 - 1:00	2:40 - 3:00	1:20 - 2:40	0:40 - 1:20	1:05 - 1:25	0:40 - 0:50	0:15 - 1:20	
	75/25	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
	50/50	N/A	N/A	N/A	N/A	N/A	N/A	N/A	CAUTION: No holdover time guidelines exist	
below -3 to -8 °C (below 27 to 18 °F)	100/0	1:05 - 2:20	0:25 - 0:50	2:20 - 2:55	1:10 - 2:20	0:35 - 1:10	0:45 - 1:10	0:35 - 0:45		
	75/25	N/A	N/A	N/A	N/A	N/A	N/A	N/A		
below -8 to -14 °C (below 18 to 7 °F)	100/0	1:05 - 2:20	0:20 - 0:45	2:05 - 2:35	1:00 - 2:05	0:30 - 1:00	0:45 - 1:10[11]	0:35 - 0:45[11]		
	75/25	N/A	N/A	N/A	N/A	N/A	N/A	N/A		
below -14 to -18 °C (below 7 to 0 °F)	100/0	0:35 - 0:50	0:01 - 0:06	0:30 - 0:45	0:09 - 0:30	0:02 - 0:09				
below -18 to -25 °C (below 0 to -13 °F)	100/0	0:35 - 0:50	0:00 - 0:02	0:10 - 0:20	0:03 - 0:10	0:01 - 0:03				
below -25 to -29°C (below -13 to -20°F)	100/0	0:35 - 0:50	0:00 - 0:01	0:07 - 0:10	0:02 - 0:07	0:00 - 0:02				

NOTES

1 Ensure that the lowest operational use temperature (LOUT) is respected. Consider use of Type I fluid when Type IV fluid cannot be used.
2 Freezing mist is best confirmed by observation. It is never reported by METAR however it can occur when mist is present at 0 °C (32 °F) and below.
3 Use freezing fog holdover times in conditions of ice crystals mixed with freezing fog or mist.
4 To determine snowfall intensity, the Snowfall Intensities as a Function of Prevailing Visibility table (Table 48) is required.
5 Use light freezing rain holdover times in conditions of very light or light snow mixed with light rain or drizzle. The Snowfall Intensities as a Function of Prevailing Visibility table (Table 48) is required to confirm the precipitation intensity is no greater than “light”. No holdover times exist if the reported visibility correlates to a “moderate” or “heavy” precipitation intensity.
6 Use snow holdover times in conditions of very light, light, or moderate snow mixed with ice crystals.
7 Includes light, moderate and heavy freezing drizzle. Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
8 No holdover time guidelines exist for this condition for 0 °C (32 °F) and below.
9 Heavy snow, ice pellets, moderate and heavy freezing rain, small hail and hail (Table 49 provides allowance times for Type IV PG fluids in ice pellets and small hail).
10 No holdover time guidelines exist for this condition below -10 °C (14 °F).

CAUTIONS

- The cautions that apply to the holdover times in the table above can be found on page A.1-22.

TABLE 22: TYPE IV HOLDOVER TIMES FOR ALLCLEAR CLEARWING EG

Outside Air Temperature[1]	Fluid Concentration Fluid/Water By % Volume	Freezing Fog, Freezing Mist[2], or Ice Crystals[3]	Snow mixed with Freezing Fog[4]	Very Light Snow, Snow Grains or Snow Pellets[5,6,7]	Light Snow, Snow Grains or Snow Pellets[5,6,7]	Moderate Snow, Snow Grains or Snow Pellets[5,7]	Freezing Drizzle[8]	Light Freezing Rain	Rain on Cold-Soaked Wing[9]	Other[10]
-3 °C and above (27 °F and above)	100/0	1:50 - 3:15	0:30 - 1:00	2:40 - 3:00	1:20 - 2:40	0:40 - 1:20	1:10 - 1:35	0:30 - 1:00	0:10 - 1:30	
	75/25	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
	50/50	N/A	N/A	N/A	N/A	N/A	N/A	N/A		
below -3 to -8 °C (below 27 to 18 °F)	100/0	1:35 - 3:45	0:25 - 0:55	2:25 - 3:00	1:10 - 2:25	0:35 - 1:10	1:05 - 1:30	0:30 - 1:00		
	75/25	N/A	N/A	N/A	N/A	N/A	N/A	N/A		
below -8 to -14 °C (below 18 to 7 °F)	100/0	1:35 - 3:45	0:25 - 0:50	2:15 - 2:45	1:05 - 2:15	0:30 - 1:05	1:05 - 1:30[11]	0:30 - 1:00[11]		
	75/25	N/A	N/A	N/A	N/A	N/A	N/A	N/A		
below -14 to -18 °C (below 7 to 0 °F)	100/0	0:55 - 2:00	0:15 - 0:35	1:35 - 2:05	0:45 - 1:35	0:20 - 0:45				
below -18 to -25 °C (below 0 to -13 °F)	100/0	0:55 - 2:00	0:09 - 0:20	0:55 - 1:10	0:25 - 0:55	0:15 - 0:25				
below -25 to -29 °C (below -13 to -20 °F)	100/0	0:55 - 2:00	0:07 - 0:15	0:45 - 0:55	0:20 - 0:45	0:10 - 0:20				

CAUTION: No holdover time guidelines exist

NOTES

1 Ensure that the lowest operational use temperature (LOUT) is respected. Consider use of Type I fluid when Type IV fluid cannot be used.
2 Freezing mist is best confirmed by observation. It is never reported by METAR however it can occur when mist is present at 0 °C (32 °F) and below.
3 Use freezing fog holdover times in conditions of ice crystals mixed with freezing fog or mist.
4 These holdover times are for use in -SNFZFG and SNFZFG. The Snowfall Intensities as a Function of Prevailing Visibility table (Table 48) is required to confirm the precipitation intensity is no greater than “moderate”. No holdover times exist if the reported visibility correlates to a “heavy” precipitation intensity.
5 To determine snowfall intensity, the Snowfall Intensities as a Function of Prevailing Visibility table (Table 48) is required.
6 Use light freezing rain holdover times in conditions of very light or light snow mixed with light rain or drizzle. The Snowfall Intensities as a Function of Prevailing Visibility table (Table 48) is required to confirm the precipitation intensity is no greater than “light”. No holdover times exist if the reported visibility correlates to a “moderate” or “heavy” precipitation intensity.
7 Use snow holdover times in conditions of very light, light, or moderate snow mixed with ice crystals.
8 Includes light, moderate and heavy freezing drizzle. Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
9 No holdover time guidelines exist for this condition for 0 °C (32 °F) and below.
10 Heavy snow, ice pellets, moderate and heavy freezing rain, small hail and hail (Table 46 provides allowance times for Type IV EG fluids in ice pellets and small hail).
11 No holdover time guidelines exist for this condition below -10 °C (14 °F).

CAUTIONS

- The cautions that apply to the holdover times in the table above can be found on page A.1-22.

TABLE 23: TYPE IV HOLDOVER TIMES FOR ASGLOBAL 4FLITE EG

Outside Air Temperature[1]	Fluid Concentration Fluid/Water By % Volume	Freezing Fog, Freezing Mist[2], or Ice Crystals[3]	Snow mixed with Freezing Fog[4]	Very Light Snow, Snow Grains or Snow Pellets[5,6,7]	Light Snow, Snow Grains or Snow Pellets[5,6,7]	Moderate Snow, Snow Grains or Snow Pellets[5,7]	Freezing Drizzle[8]	Light Freezing Rain	Rain on Cold-Soaked Wing[9]	Other[10]
-3 °C and above (27 °F and above)	100/0	1:35 - 3:15	0:25 - 0:45	2:05 - 2:35	1:00 - 2:05	0:30 - 1:00	0:40 - 1:10	0:20 - 0:35	0:08 - 1:05	
	75/25	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
	50/50	N/A	N/A	N/A	N/A	N/A	N/A	N/A	CAUTION: No holdover time guidelines exist	
below -3 to -8 °C (below 27 to 18 °F)	100/0	1:25 - 2:45	0:20 - 0:40	1:50 - 2:15	0:55 - 1:50	0:25 - 0:55	0:40 - 1:10	0:20 - 0:35		
	75/25	N/A	N/A	N/A	N/A	N/A	N/A	N/A		
below -8 to -14 °C (below 18 to 7 °F)	100/0	1:25 - 2:45	0:20 - 0:35	1:35 - 2:00	0:50 - 1:35	0:25 - 0:50	0:40 - 1:10[11]	0:20 - 0:35[11]		
	75/25	N/A	N/A	N/A	N/A	N/A	N/A	N/A		
below -14 to -18 °C (below 7 to 0 °F)	100/0	0:50 - 1:25	0:15 - 0:35	1:35 - 2:00	0:45 - 1:35	0:20 - 0:45				
below -18 to -25 °C (below 0 to -13 °F)	100/0	0:50 - 1:25	0:15 - 0:30	1:20 - 1:40	0:35 - 1:20	0:20 - 0:35				
below -25 to -30 °C (below -13 to -22 °F)	100/0	0:30 - 1:05	0:09 - 0:20	0:55 - 1:05	0:25 - 0:55	0:10 - 0:25				

NOTES

1 Ensure that the lowest operational use temperature (LOUT) is respected. Consider use of Type I fluid when Type IV fluid cannot be used.
2 Freezing mist is best confirmed by observation. It is never reported by METAR however it can occur when mist is present at 0 °C (32 °F) and below.
3 Use freezing fog holdover times in conditions of ice crystals mixed with freezing fog or mist.
4 These holdover times are for use in -SNFZFG and SNFZFG. The Snowfall Intensities as a Function of Prevailing Visibility table (Table 48) is required to confirm the precipitation intensity is no greater than “moderate”. No holdover times exist if the reported visibility correlates to a “heavy” precipitation intensity.
5 To determine snowfall intensity, the Snowfall Intensities as a Function of Prevailing Visibility table (Table 48) is required.
6 Use light freezing rain holdover times in conditions of very light or light snow mixed with light rain or drizzle. The Snowfall Intensities as a Function of Prevailing Visibility table (Table 48) is required to confirm the precipitation intensity is no greater than “light”. No holdover times exist if the reported visibility correlates to a “moderate” or “heavy” precipitation intensity.
7 Use snow holdover times in conditions of very light, light, or moderate snow mixed with ice crystals.
8 Includes light, moderate and heavy freezing drizzle. Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
9 No holdover time guidelines exist for this condition for 0 °C (32 °F) and below.
10 Heavy snow, ice pellets, moderate and heavy freezing rain, small hail and hail.
11 No holdover time guidelines exist for this condition below -10 °C (14 °F).

CAUTIONS

- The cautions that apply to the holdover times in the table above can be found on page A.1-22.

TABLE 24: TYPE IV HOLDOVER TIMES FOR ASGLOBAL 4FLITE PG

Outside Air Temperature[1]	Fluid Concentration Fluid/Water By % Volume	Freezing Fog, Freezing Mist[2], or Ice Crystals[3]	Snow mixed with Freezing Fog[4]	Very Light Snow, Snow Grains or Snow Pellets[5,6,7]	Light Snow, Snow Grains or Snow Pellets[5,6,7]	Moderate Snow, Snow Grains or Snow Pellets[5,7]	Freezing Drizzle[8]	Light Freezing Rain	Rain on Cold-Soaked Wing[9]	Other[10]
-3 °C and above (27 °F and above)	100/0	1:50 - 3:15	0:40 - 1:10	2:50 - 3:00	1:35 - 2:50	0:50 - 1:35	1:10 - 1:35	0:45 - 1:05	0:15 - 1:20	
	75/25	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
	50/50	N/A	N/A	N/A	N/A	N/A	N/A	N/A	CAUTION: No holdover time guidelines exist	
below -3 to -8 °C (below 27 to 18 °F)	100/0	1:05 - 1:55	0:30 - 0:50	2:05 - 2:30	1:10 - 2:05	0:35 - 1:10	0:55 - 1:10	0:35 - 0:55		
	75/25	N/A	N/A	N/A	N/A	N/A	N/A	N/A		
below -8 to -14 °C (below 18 to 7 °F)	100/0	1:05 - 1:55	0:20 - 0:40	1:40 - 2:00	0:55 - 1:40	0:30 - 0:55	0:55 - 1:10[11]	0:35 - 0:55[11]		
	75/25	N/A	N/A	N/A	N/A	N/A	N/A	N/A		
below -14 to -18 °C (below 7 to 0 °F)	100/0	0:30 - 0:45	0:15 - 0:25	1:05 - 1:20	0:35 - 1:05	0:15 - 0:35				
below -18 to -25 °C (below 0 to -13 °F)	100/0	0:30 - 0:45	0:07 - 0:15	0:35 - 0:45	0:20 - 0:35	0:09 - 0:20				
below -25 to -26 °C (below -13 to -15 °F)	100/0	0:30 - 0:45	0:06 - 0:15	0:35 - 0:45	0:20 - 0:35	0:08 - 0:20				

NOTES

1 Ensure that the lowest operational use temperature (LOUT) is respected. Consider use of Type I fluid when Type IV fluid cannot be used.
2 Freezing mist is best confirmed by observation. It is never reported by METAR however it can occur when mist is present at 0 °C (32 °F) and below.
3 Use freezing fog holdover times in conditions of ice crystals mixed with freezing fog or mist.
4 These holdover times are for use in -SNFZFG and SNFZFG. The Snowfall Intensities as a Function of Prevailing Visibility table (Table 48) is required to confirm the precipitation intensity is no greater than “moderate”. No holdover times exist if the reported visibility correlates to a “heavy” precipitation intensity.
5 To determine snowfall intensity, the Snowfall Intensities as a Function of Prevailing Visibility table (Table 48) is required.
6 Use light freezing rain holdover times in conditions of very light or light snow mixed with light rain or drizzle. The Snowfall Intensities as a Function of Prevailing Visibility table (Table 48) is required to confirm the precipitation intensity is no greater than “light”. No holdover times exist if the reported visibility correlates to a “moderate” or “heavy” precipitation intensity.
7 Use snow holdover times in conditions of very light, light, or moderate snow mixed with ice crystals.
8 Includes light, moderate and heavy freezing drizzle. Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
9 No holdover time guidelines exist for this condition for 0 °C (32 °F) and below.
10 Heavy snow, ice pellets, moderate and heavy freezing rain, small hail and hail (Table 47 provides allowance times for Type IV PG fluids in ice pellets and small hail).
11 No holdover time guidelines exist for this condition below -10 °C (14 °F).

CAUTIONS

- The cautions that apply to the holdover times in the table above can be found on page A.1-22.

TABLE 25: TYPE IV HOLDOVER TIMES FOR AVIAFLUID AVIAFLIGHT EG

Outside Air Temperature[1]	Fluid Concentration Fluid/Water By % Volume	Freezing Fog, Freezing Mist[2], or Ice Crystals[3]	Snow mixed with Freezing Fog[4]	Very Light Snow, Snow Grains or Snow Pellets[5,6,7]	Light Snow, Snow Grains or Snow Pellets[5,6,7]	Moderate Snow, Snow Grains or Snow Pellets[5,7]	Freezing Drizzle[8]	Light Freezing Rain	Rain on Cold-Soaked Wing[9]	Other[10]
-3 °C and above (27 °F and above)	100/0	1:30 - 3:05	0:30 - 0:50	1:55 - 2:20	1:10 - 1:55	0:40 - 1:10	1:05 - 2:00	0:30 - 0:50	0:10 - 2:00	
	75/25	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
	50/50	N/A	N/A	N/A	N/A	N/A	N/A	N/A	CAUTION: No holdover time guidelines exist	
below -3 to -8 °C (below 27 to 18 °F)	100/0	1:20 - 3:00	0:25 - 0:45	1:45 - 2:05	1:00 - 1:45	0:35 - 1:00	0:55 - 1:30	0:35 - 0:50		
	75/25	N/A	N/A	N/A	N/A	N/A	N/A	N/A		
below -8 to -14 °C (below 18 to 7 °F)	100/0	1:20 - 3:00	0:25 - 0:40	1:35 - 1:55	0:55 - 1:35	0:30 - 0:55	0:55 - 1:30[11]	0:35 - 0:50[11]		
	75/25	N/A	N/A	N/A	N/A	N/A	N/A	N/A		
below -14 to -18 °C (below 7 to 0 °F)	100/0	0:35 - 1:45	0:20 - 0:40	1:40 - 2:00	0:50 - 1:40	0:25 - 0:50				
below -18 to -25 °C (below 0 to -13 °F)	100/0	0:35 - 1:45	0:15 - 0:30	1:20 - 1:35	0:40 - 1:20	0:20 - 0:40				
below -25 to -31 °C (below -13 to -24 °F)	100/0	0:35 - 1:05	0:07 - 0:15	0:35 - 0:45	0:20 - 0:35	0:09 - 0:20				

NOTES

1 Ensure that the lowest operational use temperature (LOUT) is respected. Consider use of Type I fluid when Type IV fluid cannot be used.
2 Freezing mist is best confirmed by observation. It is never reported by METAR however it can occur when mist is present at 0 °C (32 °F) and below.
3 Use freezing fog holdover times in conditions of ice crystals mixed with freezing fog or mist.
4 These holdover times are for use in -SNFZFG and SNFZFG. The Snowfall Intensities as a Function of Prevailing Visibility table (Table 48) is required to confirm the precipitation intensity is no greater than “moderate”. No holdover times exist if the reported visibility correlates to a “heavy” precipitation intensity.
5 To determine snowfall intensity, the Snowfall Intensities as a Function of Prevailing Visibility table (Table 48) is required.
6 Use light freezing rain holdover times in conditions of very light or light snow mixed with light rain or drizzle. The Snowfall Intensities as a Function of Prevailing Visibility table (Table 48) is required to confirm the precipitation intensity is no greater than “light”. No holdover times exist if the reported visibility correlates to a “moderate” or “heavy” precipitation intensity.
7 Use snow holdover times in conditions of very light, light, or moderate snow mixed with ice crystals.
8 Includes light, moderate and heavy freezing drizzle. Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
9 No holdover time guidelines exist for this condition for 0 °C (32 °F) and below.
10 Heavy snow, ice pellets, moderate and heavy freezing rain, small hail and hail (Table 46 provides allowance times for Type IV EG fluids in ice pellets and small hail).
11 No holdover time guidelines exist for this condition below -10 °C (14 °F).

CAUTIONS

- The cautions that apply to the holdover times in the table above can be found on page A.1-22.

TABLE 26: TYPE IV HOLDOVER TIMES FOR AVIAFLUID AVIAFLIGHT PG

Outside Air Temperature[1]	Fluid Concentration Fluid/Water By % Volume	Freezing Fog, Freezing Mist[2], or Ice Crystals[3]	Snow mixed with Freezing Fog[4]	Very Light Snow, Snow Grains or Snow Pellets[5,6,7]	Light Snow, Snow Grains or Snow Pellets[5,6,7]	Moderate Snow, Snow Grains or Snow Pellets[5,7]	Freezing Drizzle[8]	Light Freezing Rain	Rain on Cold-Soaked Wing[9]	Other[10]
-3 °C and above (27 °F and above)	100/0	2:15 - 4:00	0:40 - 1:15	3:00 - 3:00	1:40 - 3:00	0:55 - 1:40	2:00 - 2:00	1:10 - 1:55	0:20 - 2:00	
	75/25	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
	50/50	N/A	N/A	N/A	N/A	N/A	N/A	N/A	CAUTION: No holdover time guidelines exist	
below -3 to -8 °C (below 27 to 18 °F)	100/0	1:05 - 2:10	0:25 - 0:50	2:00 - 2:25	1:05 - 2:00	0:35 - 1:05	0:35 - 1:55	0:45 - 1:05		
	75/25	N/A	N/A	N/A	N/A	N/A	N/A	N/A		
below -8 to -14 °C (below 18 to 7 °F)	100/0	1:05 - 2:10	0:20 - 0:35	1:30 - 1:50	0:50 - 1:30	0:25 - 0:50	0:35 - 1:55[11]	0:45 - 1:05[11]		
	75/25	N/A	N/A	N/A	N/A	N/A	N/A	N/A		
below -14 to -18 °C (below 7 to 0 °F)	100/0	0:20 - 0:35	0:10 - 0:20	0:50 - 1:00	0:25 - 0:50	0:15 - 0:25				
below -18 to -25 °C (below 0 to -13 °F)	100/0	0:20 - 0:35	0:05 - 0:09	0:25 - 0:30	0:15 - 0:25	0:06 - 0:15				
below -25 to -25.5 °C (below -13 to -14 °F)	100/0	0:20 - 0:35	0:05 - 0:09	0:25 - 0:30	0:10 - 0:25	0:06 - 0:10				

NOTES

1 Ensure that the lowest operational use temperature (LOUT) is respected. Consider use of Type I fluid when Type IV fluid cannot be used.
2 Freezing mist is best confirmed by observation. It is never reported by METAR however it can occur when mist is present at 0 °C (32 °F) and below.
3 Use freezing fog holdover times in conditions of ice crystals mixed with freezing fog or mist.
4 These holdover times are for use in -SNFZFG and SNFZFG. The Snowfall Intensities as a Function of Prevailing Visibility table (Table 48) is required to confirm the precipitation intensity is no greater than “moderate”. No holdover times exist if the reported visibility correlates to a “heavy” precipitation intensity.
5 To determine snowfall intensity, the Snowfall Intensities as a Function of Prevailing Visibility table (Table 48) is required.
6 Use light freezing rain holdover times in conditions of very light or light snow mixed with light rain or drizzle. The Snowfall Intensities as a Function of Prevailing Visibility table (Table 48) is required to confirm the precipitation intensity is no greater than “light”. No holdover times exist if the reported visibility correlates to a “moderate” or “heavy” precipitation intensity.
7 Use snow holdover times in conditions of very light, light, or moderate snow mixed with ice crystals.
8 Includes light, moderate and heavy freezing drizzle. Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
9 No holdover time guidelines exist for this condition for 0 °C (32 °F) and below.
10 Heavy snow, ice pellets, moderate and heavy freezing rain, small hail and hail (Table 47 provides allowance times for Type IV PG fluids in ice pellets and small hail).
11 No holdover time guidelines exist for this condition below -10 °C (14 °F).

CAUTIONS

- The cautions that apply to the holdover times in the table above can be found on page A.1-22.

TABLE 27: TYPE IV HOLDOVER TIMES FOR CHEMCO CHEMR EG IV

Outside Air Temperature[1]	Fluid Concentration Fluid/Water By % Volume	Freezing Fog, Freezing Mist[2], or Ice Crystals[3]	Snow mixed with Freezing Fog[4]	Very Light Snow, Snow Grains or Snow Pellets[5,6,7]	Light Snow, Snow Grains or Snow Pellets[5,6,7]	Moderate Snow, Snow Grains or Snow Pellets[5,7]	Freezing Drizzle[8]	Light Freezing Rain	Rain on Cold-Soaked Wing[9]	Other[10]
-3 °C and above (27 °F and above)	100/0	2:05 - 3:35	0:25 - 1:00	3:00 - 3:00	1:15 - 3:00	0:35 - 1:15	0:45 - 1:40	0:25 - 0:40	0:09 - 1:45	
	75/25	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
	50/50	N/A	N/A	N/A	N/A	N/A	N/A	N/A		
below -3 to -8 °C (below 27 to 18 °F)	100/0	1:25 - 3:40	0:25 - 1:00	3:00 - 3:00	1:15 - 3:00	0:35 - 1:15	1:00 - 1:35	0:35 - 0:50		
	75/25	N/A	N/A	N/A	N/A	N/A	N/A	N/A		
below -8 to -14 °C (below 18 to 7 °F)	100/0	1:25 - 3:40	0:25 - 1:00	3:00 - 3:00	1:15 - 3:00	0:35 - 1:15	1:00 - 1:35[11]	0:35 - 0:50[11]		
	75/25	N/A	N/A	N/A	N/A	N/A	N/A	N/A		
below -14 to -18 °C (below 7 to 0 °F)	100/0	0:40 - 1:25	0:15 - 0:30	1:25 - 1:45	0:40 - 1:25	0:20 - 0:40				
below -18 to -25 °C (below 0 to -13 °F)	100/0	0:40 - 1:25	0:15 - 0:30	1:25 - 1:45	0:40 - 1:25	0:20 - 0:40				
below -25 to -27 °C (below -13 to -17 °F)	100/0	0:40 - 1:25	0:15 - 0:30	1:25 - 1:45	0:40 - 1:25	0:20 - 0:40				

CAUTION: No holdover time guidelines exist

NOTES

1 Ensure that the lowest operational use temperature (LOUT) is respected. Consider use of Type I fluid when Type IV fluid cannot be used.
2 Freezing mist is best confirmed by observation. It is never reported by METAR however it can occur when mist is present at 0 °C (32 °F) and below.
3 Use freezing fog holdover times in conditions of ice crystals mixed with freezing fog or mist.
4 These holdover times are for use in -SNFZFG and SNFZFG. The Snowfall Intensities as a Function of Prevailing Visibility table (Table 48) is required to confirm the precipitation intensity is no greater than “moderate”. No holdover times exist if the reported visibility correlates to a “heavy” precipitation intensity.
5 To determine snowfall intensity, the Snowfall Intensities as a Function of Prevailing Visibility table (Table 48) is required.
6 Use light freezing rain holdover times in conditions of very light or light snow mixed with light rain or drizzle. The Snowfall Intensities as a Function of Prevailing Visibility table (Table 48) is required to confirm the precipitation intensity is no greater than “light”. No holdover times exist if the reported visibility correlates to a “moderate” or “heavy” precipitation intensity.
7 Use snow holdover times in conditions of very light, light, or moderate snow mixed with ice crystals.
8 Includes light, moderate and heavy freezing drizzle. Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
9 No holdover time guidelines exist for this condition for 0 °C (32 °F) and below.
10 Heavy snow, ice pellets, moderate and heavy freezing rain, small hail and hail (Table 46 provides allowance times for Type IV EG fluids in ice pellets and small hail).
11 No holdover time guidelines exist for this condition below -10 °C (14 °F).

CAUTIONS

- The cautions that apply to the holdover times in the table above can be found on page A.1-22.

TABLE 28: TYPE IV HOLDOVER TIMES FOR CHEMCO CHEMR NORDIK IV

Outside Air Temperature[1]	Fluid Concentration Fluid/Water By % Volume	Freezing Fog, Freezing Mist[2], or Ice Crystals[3]	Snow mixed with Freezing Fog[4]	Very Light Snow, Snow Grains or Snow Pellets[5,6,7]	Light Snow, Snow Grains or Snow Pellets[5,6,7]	Moderate Snow, Snow Grains or Snow Pellets[5,7]	Freezing Drizzle[8]	Light Freezing Rain	Rain on Cold-Soaked Wing[9]	Other[10]
-3 °C and above (27 °F and above)	100/0	2:15 - 4:00	0:40 - 1:20	3:00 - 3:00	1:45 - 3:00	0:55 - 1:45	1:20 - 2:00	0:55 - 1:20	0:25 - 2:00	
	75/25	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
	50/50	N/A	N/A	N/A	N/A	N/A	N/A	N/A	CAUTION: No holdover time guidelines exist	
below -3 to -8 °C (below 27 to 18 °F)	100/0	1:50 - 4:00	0:40 - 1:20	3:00 - 3:00	1:45 - 3:00	0:55 - 1:45	1:15 - 2:00	0:45 - 1:20		
	75/25	N/A	N/A	N/A	N/A	N/A	N/A	N/A		
below -8 to -14 °C (below 18 to 7 °F)	100/0	1:50 - 4:00	0:40 - 1:20	3:00 - 3:00	1:45 - 3:00	0:55 - 1:45	1:15 - 2:00[11]	0:45 - 1:20[11]		
	75/25	N/A	N/A	N/A	N/A	N/A	N/A	N/A		
below -14 to -18 °C (below 7 to 0 °F)	100/0	0:40 - 1:30	0:35 - 1:10	3:00 - 3:00	1:35 - 3:00	0:50 - 1:35				
below -18 to -25 °C (below 0 to -13 °F)	100/0	0:40 - 1:30	0:25 - 0:50	2:10 - 2:40	1:05 - 2:10	0:35 - 1:05				
below -25 to -29 °C (below -13 to -20 °F)	100/0	0:40 - 1:30	0:20 - 0:40	1:50 - 2:15	0:55 - 1:50	0:30 - 0:55				

NOTES

1 Ensure that the lowest operational use temperature (LOUT) is respected. Consider use of Type I fluid when Type IV fluid cannot be used.
2 Freezing mist is best confirmed by observation. It is never reported by METAR however it can occur when mist is present at 0 °C (32 °F) and below.
3 Use freezing fog holdover times in conditions of ice crystals mixed with freezing fog or mist.
4 These holdover times are for use in -SNFZFG and SNFZFG. The Snowfall Intensities as a Function of Prevailing Visibility table (Table 48) is required to confirm the precipitation intensity is no greater than “moderate”. No holdover times exist if the reported visibility correlates to a “heavy” precipitation intensity.
5 To determine snowfall intensity, the Snowfall Intensities as a Function of Prevailing Visibility table (Table 48) is required.
6 Use light freezing rain holdover times in conditions of very light or light snow mixed with light rain or drizzle. The Snowfall Intensities as a Function of Prevailing Visibility table (Table 48) is required to confirm the precipitation intensity is no greater than “light”. No holdover times exist if the reported visibility correlates to a “moderate” or “heavy” precipitation intensity.
7 Use snow holdover times in conditions of very light, light, or moderate snow mixed with ice crystals.
8 Includes light, moderate and heavy freezing drizzle. Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
9 No holdover time guidelines exist for this condition for 0 °C (32 °F) and below.
10 Heavy snow, ice pellets, moderate and heavy freezing rain, small hail and hail (Table 46 provides allowance times for Type IV EG fluids in ice pellets and small hail).
11 No holdover time guidelines exist for this condition below -10 °C (14 °F).

CAUTIONS

- The cautions that apply to the holdover times in the table above can be found on page A.1-22.

TABLE 29: TYPE IV HOLDOVER TIMES FOR CHONGQING JOBA CHEMICAL CO., LTD FW-IV

Outside Air Temperature[1]	Fluid Concentration Fluid/Water By % Volume	Freezing Fog, Freezing Mist[2], or Ice Crystals[3]	Snow mixed with Freezing Fog[4]	Very Light Snow, Snow Grains or Snow Pellets[5,6,7]	Light Snow, Snow Grains or Snow Pellets[5,6,7]	Moderate Snow, Snow Grains or Snow Pellets[5,7]	Freezing Drizzle[8]	Light Freezing Rain	Rain on Cold-Soaked Wing[9]	Other[10]
-3 °C and above (27 °F and above)	100/0	3:15 - 4:00	0:35 - 1:15	3:00 - 3:00	1:40 - 3:00	0:50 - 1:40	1:30 - 2:00	0:45 - 1:05	0:15 - 2:00	
	75/25	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
	50/50	N/A	N/A	N/A	N/A	N/A	N/A	N/A	CAUTION: No holdover time guidelines exist	
below -3 to -8 °C (below 27 to 18 °F)	100/0	2:30 - 4:00	0:30 - 1:00	2:45 - 3:00	1:25 - 2:45	0:40 - 1:25	0:50 - 2:00	0:35 - 1:10		
	75/25	N/A	N/A	N/A	N/A	N/A	N/A	N/A		
below -8 to -14 °C (below 18 to 7 °F)	100/0	2:30 - 4:00	0:30 - 0:55	2:25 - 3:00	1:15 - 2:25	0:35 - 1:15	0:50 - 2:00[11]	0:35 - 1:10[11]		
	75/25	N/A	N/A	N/A	N/A	N/A	N/A	N/A		
below -14 to -18 °C (below 7 to 0 °F)	100/0	0:35 - 1:40	0:20 - 0:40	2:00 - 2:35	0:55 - 2:00	0:25 - 0:55				
below -18 to -25 °C (below 0 to -13 °F)	100/0	0:35 - 1:40	0:15 - 0:30	1:20 - 1:45	0:35 - 1:20	0:15 - 0:35				
below -25 to -29°C (below -13 to -20°F)	100/0	0:35 - 1:40	0:10 - 0:25	1:10 - 1:30	0:30 - 1:10	0:15 - 0:30				

NOTES

1 Ensure that the lowest operational use temperature (LOUT) is respected. Consider use of Type I fluid when Type IV fluid cannot be used.
2 Freezing mist is best confirmed by observation. It is never reported by METAR however it can occur when mist is present at 0 °C (32 °F) and below.
3 Use freezing fog holdover times in conditions of ice crystals mixed with freezing fog or mist.
4 These holdover times are for use in -SNFZFG and SNFZFG. The Snowfall Intensities as a Function of Prevailing Visibility table (Table 48) is required to confirm the precipitation intensity is no greater than “moderate”. No holdover times exist if the reported visibility correlates to a “heavy” precipitation intensity.
5 To determine snowfall intensity, the Snowfall Intensities as a Function of Prevailing Visibility table (Table 48) is required.
6 Use light freezing rain holdover times in conditions of very light or light snow mixed with light rain or drizzle. The Snowfall Intensities as a Function of Prevailing Visibility table (Table 48) is required to confirm the precipitation intensity is no greater than “light”. No holdover times exist if the reported visibility correlates to a “moderate” or “heavy” precipitation intensity.
7 Use snow holdover times in conditions of very light, light, or moderate snow mixed with ice crystals.
8 Includes light, moderate and heavy freezing drizzle. Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
9 No holdover time guidelines exist for this condition for 0 °C (32 °F) and below.
10 Heavy snow, ice pellets, moderate and heavy freezing rain, small hail and hail (Table 46 provides allowance times for Type IV EG fluids in ice pellets and small hail).
11 No holdover time guidelines exist for this condition below -10 °C (14 °F).

CAUTIONS

- The cautions that apply to the holdover times in the table above can be found on page A.1-22.

TABLE 30: TYPE IV HOLDOVER TIMES FOR CLARIANT SAFEWING MP IV LAUNCH

Outside Air Temperature[1]	Fluid Concentration Fluid/Water By % Volume	Freezing Fog, Freezing Mist[2], or Ice Crystals[3]	Snow mixed with Freezing Fog[4]	Very Light Snow, Snow Grains or Snow Pellets[5,6,7]	Light Snow, Snow Grains or Snow Pellets[5,6,7]	Moderate Snow, Snow Grains or Snow Pellets[5,7]	Freezing Drizzle[8]	Light Freezing Rain	Rain on Cold-Soaked Wing[9]	Other[10]
-3 °C and above (27 °F and above)	100/0	4:00 - 4:00	0:50 - 1:20	2:50 - 3:00	1:45 - 2:50	1:05 - 1:45	1:30 - 2:00	1:00 - 1:40	0:15 - 1:40	
	75/25	3:40 - 4:00	0:45 - 1:20	3:00 - 3:00	1:45 - 3:00	1:00 - 1:45	1:40 - 2:00	0:45 - 1:15	0:10 - 1:45	
	50/50	1:25 - 2:45	0:20 - 0:35	1:25 - 1:40	0:45 - 1:25	0:25 - 0:45	0:30 - 0:50	0:20 - 0:25	CAUTION: No holdover time guidelines exist	
below -3 to -8 °C (below 27 to 18 °F)	100/0	1:00 - 1:55	0:40 - 1:05	2:25 - 2:50	1:30 - 2:25	0:55 - 1:30	0:35 - 1:40	0:25 - 0:45		
	75/25	0:40 - 1:20	0:40 - 1:10	2:40 - 3:00	1:30 - 2:40	0:50 - 1:30	0:25 - 1:10	0:25 - 0:45		
below -8 to -14 °C (below 18 to 7 °F)	100/0	1:00 - 1:55	0:35 - 1:00	2:10 - 2:30	1:20 - 2:10	0:50 - 1:20	0:35 - 1:40[11]	0:25 - 0:45[11]		
	75/25	0:40 - 1:20	0:35 - 1:00	2:25 - 2:55	1:25 - 2:25	0:45 - 1:25	0:25 - 1:10[11]	0:25 - 0:45[11]		
below -14 to -18 °C (below 7 to 0 °F)	100/0	0:30 - 0:50	0:05 - 0:15	1:15 - 1:45	0:20 - 1:15	0:06 - 0:20				
below -18 to -25 °C (below 0 to -13 °F)	100/0	0:30 - 0:50	0:02 - 0:06	0:30 - 0:45	0:09 - 0:30	0:02 - 0:09				
below -25 to -28.5 °C (below -13 to -19 °F)	100/0	0:30 - 0:50	0:01 - 0:04	0:20 - 0:30	0:06 - 0:20	0:01 - 0:06				

NOTES

1 Ensure that the lowest operational use temperature (LOUT) is respected. Consider use of Type I fluid when Type IV fluid cannot be used.
2 Freezing mist is best confirmed by observation. It is never reported by METAR however it can occur when mist is present at 0 °C (32 °F) and below.
3 Use freezing fog holdover times in conditions of ice crystals mixed with freezing fog or mist.
4 These holdover times are for use in -SNFZFG and SNFZFG. The Snowfall Intensities as a Function of Prevailing Visibility table (Table 48) is required to confirm the precipitation intensity is no greater than “moderate”. No holdover times exist if the reported visibility correlates to a “heavy” precipitation intensity.
5 To determine snowfall intensity, the Snowfall Intensities as a Function of Prevailing Visibility table (Table 48) is required.
6 Use light freezing rain holdover times in conditions of very light or light snow mixed with light rain or drizzle. The Snowfall Intensities as a Function of Prevailing Visibility table (Table 48) is required to confirm the precipitation intensity is no greater than “light”. No holdover times exist if the reported visibility correlates to a “moderate” or “heavy” precipitation intensity.
7 Use snow holdover times in conditions of very light, light, or moderate snow mixed with ice crystals.
8 Includes light, moderate and heavy freezing drizzle. Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
9 No holdover time guidelines exist for this condition for 0 °C (32 °F) and below.
10 Heavy snow, ice pellets, moderate and heavy freezing rain, small hail and hail (Table 47 provides allowance times for Type IV PG fluids in ice pellets and small hail).
11 No holdover time guidelines exist for this condition below -10 °C (14 °F).

CAUTIONS

- The cautions that apply to the holdover times in the table above can be found on page A.1-22.

TABLE 31: TYPE IV HOLDOVER TIMES FOR CLARIANT SAFEWING MP IV LAUNCH PLUS

Outside Air Temperature[1]	Fluid Concentration Fluid/Water By % Volume	Freezing Fog, Freezing Mist[2], or Ice Crystals[3]	Snow mixed with Freezing Fog[4]	Very Light Snow, Snow Grains or Snow Pellets[5,6,7]	Light Snow, Snow Grains or Snow Pellets[5,6,7]	Moderate Snow, Snow Grains or Snow Pellets[5,7]	Freezing Drizzle[8]	Light Freezing Rain	Rain on Cold-Soaked Wing[9]	Other[10]
-3 °C and above (27 °F and above)	100/0	3:55 - 4:00	0:40 - 1:35	3:00 - 3:00	2:05 - 3:00	0:55 - 2:05	2:00 - 2:00	1:00 - 2:00	0:20 - 2:00	
	75/25	3:55 - 4:00	0:35 - 1:25	3:00 - 3:00	1:55 - 3:00	0:50 - 1:55	2:00 - 2:00	1:20 - 1:25	0:20 - 1:50	
	50/50	1:15 - 1:50	0:15 - 0:35	1:35 - 2:00	0:45 - 1:35	0:20 - 0:45	0:25 - 1:00	0:15 - 0:20	CAUTION: No holdover time guidelines exist	
below -3 to -8 °C (below 27 to 18 °F)	100/0	0:55 - 2:15	0:35 - 1:15	3:00 - 3:00	1:40 - 3:00	0:45 - 1:40	0:25 - 1:35	0:25 - 0:40		
	75/25	0:40 - 2:00	0:30 - 1:05	3:00 - 3:00	1:30 - 3:00	0:35 - 1:30	0:20 - 1:05	0:20 - 0:30		
below -8 to -14 °C (below 18 to 7 °F)	100/0	0:55 - 2:15	0:30 - 1:05	3:00 - 3:00	1:25 - 3:00	0:40 - 1:25	0:25 - 1:35[11]	0:25 - 0:40[11]		
	75/25	0:40 - 2:00	0:25 - 0:55	2:55 - 3:00	1:15 - 2:55	0:30 - 1:15	0:20 - 1:05[11]	0:20 - 0:30[11]		
below -14 to -18 °C (below 7 to 0 °F)	100/0	0:25 - 0:50	0:05 - 0:20	1:15 - 1:50	0:25 - 1:15	0:07 - 0:25				
below -18 to -25 °C (below 0 to -13 °F)	100/0	0:25 - 0:50	0:02 - 0:07	0:30 - 0:45	0:09 - 0:30	0:03 - 0:09				
below -25 to -29 °C (below -13 to -20 °F)	100/0	0:25 - 0:50	0:01 - 0:04	0:20 - 0:30	0:06 - 0:20	0:02 - 0:06				

NOTES

1 Ensure that the lowest operational use temperature (LOUT) is respected. Consider use of Type I fluid when Type IV fluid cannot be used.
2 Freezing mist is best confirmed by observation. It is never reported by METAR however it can occur when mist is present at 0 °C (32 °F) and below.
3 Use freezing fog holdover times in conditions of ice crystals mixed with freezing fog or mist.
4 These holdover times are for use in -SNFZFG and SNFZFG. The Snowfall Intensities as a Function of Prevailing Visibility table (Table 48) is required to confirm the precipitation intensity is no greater than “moderate”. No holdover times exist if the reported visibility correlates to a “heavy” precipitation intensity.
5 To determine snowfall intensity, the Snowfall Intensities as a Function of Prevailing Visibility table (Table 48) is required.
6 Use light freezing rain holdover times in conditions of very light or light snow mixed with light rain or drizzle. The Snowfall Intensities as a Function of Prevailing Visibility table (Table 48) is required to confirm the precipitation intensity is no greater than “light”. No holdover times exist if the reported visibility correlates to a “moderate” or “heavy” precipitation intensity.
7 Use snow holdover times in conditions of very light, light, or moderate snow mixed with ice crystals.
8 Includes light, moderate and heavy freezing drizzle. Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
9 No holdover time guidelines exist for this condition for 0 °C (32 °F) and below.
10 Heavy snow, ice pellets, moderate and heavy freezing rain, small hail and hail (Table 47 provides allowance times for Type IV PG fluids in ice pellets and small hail).
11 No holdover time guidelines exist for this condition below -10 °C (14 °F).

CAUTIONS

- The cautions that apply to the holdover times in the table above can be found on page A.1-22.

TABLE 32: TYPE IV HOLDOVER TIMES FOR CRYOTECH POLAR GUARD® ADVANCE

Outside Air Temperature[1]	Fluid Concentration Fluid/Water By % Volume	Freezing Fog, Freezing Mist[2], or Ice Crystals[3]	Snow mixed with Freezing Fog[4]	Very Light Snow, Snow Grains or Snow Pellets[5,6,7]	Light Snow, Snow Grains or Snow Pellets[5,6,7]	Moderate Snow, Snow Grains or Snow Pellets[5,7]	Freezing Drizzle[8]	Light Freezing Rain	Rain on Cold-Soaked Wing[9]	Other[10]
-3 °C and above (27 °F and above)	100/0	2:50 - 4:00	0:50 - 1:25	3:00 - 3:00	1:55 - 3:00	1:05 - 1:55	1:35 - 2:00	1:15 - 1:30	0:15 - 2:00	
	75/25	2:30 - 4:00	0:30 - 1:05	3:00 - 3:00	1:25 - 3:00	0:40 - 1:25	1:40 - 2:00	0:40 - 1:10	0:09 - 1:40	
	50/50	0:50 - 1:25	0:07 - 0:20	1:10 - 1:35	0:25 - 1:10	0:10 - 0:25	0:20 - 0:45	0:09 - 0:20	CAUTION: No holdover time guidelines exist	
below -3 to -8 °C (below 27 to 18 °F)	100/0	0:55 - 2:30	0:35 - 1:05	2:25 - 2:50	1:25 - 2:25	0:50 - 1:25	0:35 - 1:35	0:35 - 0:45		
	75/25	0:40 - 1:30	0:25 - 0:50	2:20 - 3:00	1:05 - 2:20	0:30 - 1:05	0:25 - 1:05	0:35 - 0:45		
below -8 to -14 °C (below 18 to 7 °F)	100/0	0:55 - 2:30	0:30 - 0:50	2:00 - 2:20	1:10 - 2:00	0:40 - 1:10	0:35 - 1:35[11]	0:35 - 0:45[11]		
	75/25	0:40 - 1:30	0:20 - 0:45	2:00 - 2:30	0:55 - 2:00	0:25 - 0:55	0:25 - 1:05[11]	0:35 - 0:45[11]		
below -14 to -18 °C (below 7 to 0 °F)	100/0	0:25 - 0:50	0:08 - 0:25	1:35 - 2:15	0:35 - 1:35	0:10 - 0:35				
below -18 to -25 °C (below 0 to -13 °F)	100/0	0:25 - 0:50	0:03 - 0:10	0:40 - 0:55	0:15 - 0:40	0:04 - 0:15				
below -25 to -30.5 °C (below -13 to -23 °F)	100/0	0:25 - 0:50	0:02 - 0:05	0:25 - 0:30	0:07 - 0:25	0:02 - 0:07				

NOTES

1 Ensure that the lowest operational use temperature (LOUT) is respected. Consider use of Type I fluid when Type IV fluid cannot be used.
2 Freezing mist is best confirmed by observation. It is never reported by METAR however it can occur when mist is present at 0 °C (32 °F) and below.
3 Use freezing fog holdover times in conditions of ice crystals mixed with freezing fog or mist.
4 These holdover times are for use in -SNFZFG and SNFZFG. The Snowfall Intensities as a Function of Prevailing Visibility table (Table 48) is required to confirm the precipitation intensity is no greater than “moderate”. No holdover times exist if the reported visibility correlates to a “heavy” precipitation intensity.
5 To determine snowfall intensity, the Snowfall Intensities as a Function of Prevailing Visibility table (Table 48) is required.
6 Use light freezing rain holdover times in conditions of very light or light snow mixed with light rain or drizzle. The Snowfall Intensities as a Function of Prevailing Visibility table (Table 48) is required to confirm the precipitation intensity is no greater than “light”. No holdover times exist if the reported visibility correlates to a “moderate” or “heavy” precipitation intensity.
7 Use snow holdover times in conditions of very light, light, or moderate snow mixed with ice crystals.
8 Includes light, moderate and heavy freezing drizzle. Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
9 No holdover time guidelines exist for this condition for 0 °C (32 °F) and below.
10 Heavy snow, ice pellets, moderate and heavy freezing rain, small hail and hail (Table 47 provides allowance times for Type IV PG fluids in ice pellets and small hail).
11 No holdover time guidelines exist for this condition below -10 °C (14 °F).

CAUTIONS

- The cautions that apply to the holdover times in the table above can be found on page A.1-22.

TABLE 33: TYPE IV HOLDOVER TIMES FOR CRYOTECH POLAR GUARD® XTEND

Outside Air Temperature[1]	Fluid Concentration Fluid/Water By % Volume	Freezing Fog, Freezing Mist[2], or Ice Crystals[3]	Snow mixed with Freezing Fog[4]	Very Light Snow, Snow Grains or Snow Pellets[5,6,7]	Light Snow, Snow Grains or Snow Pellets[5,6,7]	Moderate Snow, Snow Grains or Snow Pellets[5,7]	Freezing Drizzle[8]	Light Freezing Rain	Rain on Cold-Soaked Wing[9]	Other[10]
-3 °C and above (27 °F and above)	100/0	2:30 - 4:00	0:50 - 1:30	3:00 - 3:00	2:00 - 3:00	1:05 - 2:00	2:00 - 2:00	1:00 - 1:50	0:20 - 1:45	
	75/25	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
	50/50	N/A	N/A	N/A	N/A	N/A	N/A	N/A	CAUTION: No holdover time guidelines exist	
below -3 to -8 °C (below 27 to 18 °F)	100/0	1:00 - 1:50	0:40 - 1:10	2:50 - 3:00	1:35 - 2:50	0:50 - 1:35	0:35 - 1:40	0:50 - 0:55		
	75/25	N/A	N/A	N/A	N/A	N/A	N/A	N/A		
below -8 to -14 °C (below 18 to 7 °F)	100/0	1:00 - 1:50	0:35 - 1:00	2:25 - 2:55	1:20 - 2:25	0:45 - 1:20	0:35 - 1:40[11]	0:50 - 0:55[11]		
	75/25	N/A	N/A	N/A	N/A	N/A	N/A	N/A		
below -14 to -18 °C (below 7 to 0 °F)	100/0	0:25 - 0:40	0:15 - 0:30	1:20 - 1:40	0:40 - 1:20	0:20 - 0:40				
below -18 to -25 °C (below 0 to -13 °F)	100/0	0:25 - 0:40	0:05 - 0:10	0:30 - 0:40	0:15 - 0:30	0:06 - 0:15				
below -25 to -29 °C (below -13 to -20 °F)	100/0	0:25 - 0:40	0:03 - 0:06	0:20 - 0:25	0:09 - 0:20	0:04 - 0:09				

NOTES

1 Ensure that the lowest operational use temperature (LOUT) is respected. Consider use of Type I fluid when Type IV fluid cannot be used.
2 Freezing mist is best confirmed by observation. It is never reported by METAR however it can occur when mist is present at 0 °C (32 °F) and below.
3 Use freezing fog holdover times in conditions of ice crystals mixed with freezing fog or mist.
4 These holdover times are for use in -SNFZFG and SNFZFG. The Snowfall Intensities as a Function of Prevailing Visibility table (Table 48) is required to confirm the precipitation intensity is no greater than “moderate”. No holdover times exist if the reported visibility correlates to a “heavy” precipitation intensity.
5 To determine snowfall intensity, the Snowfall Intensities as a Function of Prevailing Visibility table (Table 48) is required.
6 Use light freezing rain holdover times in conditions of very light or light snow mixed with light rain or drizzle. The Snowfall Intensities as a Function of Prevailing Visibility table (Table 48) is required to confirm the precipitation intensity is no greater than “light”. No holdover times exist if the reported visibility correlates to a “moderate” or “heavy” precipitation intensity.
7 Use snow holdover times in conditions of very light, light, or moderate snow mixed with ice crystals.
8 Includes light, moderate and heavy freezing drizzle. Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
9 No holdover time guidelines exist for this condition for 0 °C (32 °F) and below.
10 Heavy snow, ice pellets, moderate and heavy freezing rain, small hail and hail (Table 47 provides allowance times for Type IV PG fluids in ice pellets and small hail).
11 No holdover time guidelines exist for this condition below -10 °C (14 °F).

CAUTIONS

- The cautions that apply to the holdover times in the table above can be found on page A.1-22.

TABLE 34: TYPE IV HOLDOVER TIMES FOR DOW INC. UCAR ENDURANCE™ EG106

Outside Air Temperature[1]	Fluid Concentration Fluid/Water By % Volume	Freezing Fog, Freezing Mist[2], or Ice Crystals[3]	Snow mixed with Freezing Fog[4]	Very Light Snow, Snow Grains or Snow Pellets[5,6,7]	Light Snow, Snow Grains or Snow Pellets[5,6,7]	Moderate Snow, Snow Grains or Snow Pellets[5,7]	Freezing Drizzle[8]	Light Freezing Rain	Rain on Cold-Soaked Wing[9]	Other[10]
-3 °C and above (27 °F and above)	100/0	2:05 - 3:10	0:30 - 1:00	2:45 - 3:00	1:20 - 2:45	0:40 - 1:20	1:10 - 2:00	0:50 - 1:15	0:20 - 2:00	
	75/25	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
	50/50	N/A	N/A	N/A	N/A	N/A	N/A	N/A	CAUTION: No holdover time guidelines exist	
below -3 to -8 °C (below 27 to 18 °F)	100/0	1:50 - 3:20	0:25 - 0:50	2:25 - 3:00	1:10 - 2:25	0:35 - 1:10	0:55 - 1:50	0:45 - 1:10		
	75/25	N/A	N/A	N/A	N/A	N/A	N/A	N/A		
below -8 to -14 °C (below 18 to 7 °F)	100/0	1:50 - 3:20	0:25 - 0:45	2:10 - 2:45	1:05 - 2:10	0:30 - 1:05	0:55 - 1:50[11]	0:45 - 1:10[11]		
	75/25	N/A	N/A	N/A	N/A	N/A	N/A	N/A		
below -14 to -18 °C (below 7 to 0 °F)	100/0	0:30 - 1:05	0:15 - 0:35	1:45 - 2:15	0:50 - 1:45	0:25 - 0:50				
below -18 to -25 °C (below 0 to -13 °F)	100/0	0:30 - 1:05	0:15 - 0:30	1:30 - 1:55	0:40 - 1:30	0:20 - 0:40				
below -25 to -29 °C (below -13 to -20 °F)	100/0	0:30 - 1:05	0:15 - 0:30	1:20 - 1:45	0:40 - 1:20	0:20 - 0:40				

NOTES

1 Ensure that the lowest operational use temperature (LOUT) is respected. Consider use of Type I fluid when Type IV fluid cannot be used.
2 Freezing mist is best confirmed by observation. It is never reported by METAR however it can occur when mist is present at 0 °C (32 °F) and below.
3 Use freezing fog holdover times in conditions of ice crystals mixed with freezing fog or mist.
4 These holdover times are for use in -SNFZFG and SNFZFG. The Snowfall Intensities as a Function of Prevailing Visibility table (Table 48) is required to confirm the precipitation intensity is no greater than “moderate”. No holdover times exist if the reported visibility correlates to a “heavy” precipitation intensity.
5 To determine snowfall intensity, the Snowfall Intensities as a Function of Prevailing Visibility table (Table 48) is required.
6 Use light freezing rain holdover times in conditions of very light or light snow mixed with light rain or drizzle. The Snowfall Intensities as a Function of Prevailing Visibility table (Table 48) is required to confirm the precipitation intensity is no greater than “light”. No holdover times exist if the reported visibility correlates to a “moderate” or “heavy” precipitation intensity.
7 Use snow holdover times in conditions of very light, light, or moderate snow mixed with ice crystals.
8 Includes light, moderate and heavy freezing drizzle. Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
9 No holdover time guidelines exist for this condition for 0 °C (32 °F) and below.
10 Heavy snow, ice pellets, moderate and heavy freezing rain, small hail and hail (Table 46 provides allowance times for Type IV EG fluids in ice pellets and small hail).
11 No holdover time guidelines exist for this condition below -10 °C (14 °F).

CAUTIONS

- The cautions that apply to the holdover times in the table above can be found on page A.1-22.

TABLE 35: TYPE IV HOLDOVER TIMES FOR DOW INC. UCAR™ FLIGHTGUARD™ AD-49

Outside Air Temperature[1]	Fluid Concentration Fluid/Water By % Volume	Freezing Fog, Freezing Mist[2], or Ice Crystals[3]	Snow mixed with Freezing Fog[4]	Very Light Snow, Snow Grains or Snow Pellets[5,6,7]	Light Snow, Snow Grains or Snow Pellets[5,6,7]	Moderate Snow, Snow Grains or Snow Pellets[5,7]	Freezing Drizzle[8]	Light Freezing Rain	Rain on Cold-Soaked Wing[9]	Other[10]
-3 °C and above (27 °F and above)	100/0	3:20 - 4:00	0:45 - 1:25	3:00 - 3:00	1:55 - 3:00	1:00 - 1:55	1:25 - 2:00	1:00 - 1:25	0:10 - 1:55	
	75/25	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
	50/50	N/A	N/A	N/A	N/A	N/A	N/A	N/A	CAUTION: No holdover time guidelines exist	
below -3 to -8 °C (below 27 to 18 °F)	100/0	0:20 - 1:35	0:35 - 1:05	2:55 - 3:00	1:30 - 2:55	0:45 - 1:30	0:25 - 1:25	0:20 - 0:25		
	75/25	N/A	N/A	N/A	N/A	N/A	N/A	N/A		
below -8 to -14 °C (below 18 to 7 °F)	100/0	0:20 - 1:35	0:30 - 0:55	2:25 - 3:00	1:15 - 2:25	0:40 - 1:15	0:25 - 1:25[11]	0:20 - 0:25[11]		
	75/25	N/A	N/A	N/A	N/A	N/A	N/A	N/A		
below -14 to -18 °C (below 7 to 0 °F)	100/0	0:25 - 0:40	0:01 - 0:06	0:30 - 0:45	0:09 - 0:30	0:02 - 0:09				
below -18 to -25 °C (below 0 to -13 °F)	100/0	0:25 - 0:40	0:00 - 0:02	0:10 - 0:20	0:03 - 0:10	0:01 - 0:03				
below -25 to -26 °C (below -13 to -15 °F)	100/0	0:25 - 0:40	0:00 - 0:01	0:07 - 0:10	0:02 - 0:07	0:00 - 0:02				

NOTES

1 Ensure that the lowest operational use temperature (LOUT) is respected. Consider use of Type I fluid when Type IV fluid cannot be used.
2 Freezing mist is best confirmed by observation. It is never reported by METAR however it can occur when mist is present at 0 °C (32 °F) and below.
3 Use freezing fog holdover times in conditions of ice crystals mixed with freezing fog or mist.
4 These holdover times are for use in -SNFZFG and SNFZFG. The Snowfall Intensities as a Function of Prevailing Visibility table (Table 48) is required to confirm the precipitation intensity is no greater than “moderate”. No holdover times exist if the reported visibility correlates to a “heavy” precipitation intensity.
5 To determine snowfall intensity, the Snowfall Intensities as a Function of Prevailing Visibility table (Table 48) is required.
6 Use light freezing rain holdover times in conditions of very light or light snow mixed with light rain or drizzle. The Snowfall Intensities as a Function of Prevailing Visibility table (Table 48) is required to confirm the precipitation intensity is no greater than “light”. No holdover times exist if the reported visibility correlates to a “moderate” or “heavy” precipitation intensity.
7 Use snow holdover times in conditions of very light, light, or moderate snow mixed with ice crystals.
8 Includes light, moderate and heavy freezing drizzle. Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
9 No holdover time guidelines exist for this condition for 0 °C (32 °F) and below.
10 Heavy snow, ice pellets, moderate and heavy freezing rain, small hail and hail (Table 47 provides allowance times for Type IV PG fluids in ice pellets and small hail).
11 No holdover time guidelines exist for this condition below -10 °C (14 °F).

CAUTIONS

- The cautions that apply to the holdover times in the table above can be found on page A.1-22.

TABLE 36: TYPE IV HOLDOVER TIMES FOR INLAND TECHNOLOGIES ECO-SHIELD®

Outside Air Temperature[1]	Fluid Concentration Fluid/Water By % Volume	Freezing Fog, Freezing Mist[2], or Ice Crystals[3]	Snow mixed with Freezing Fog[4]	Very Light Snow, Snow Grains or Snow Pellets[5,6,7]	Light Snow, Snow Grains or Snow Pellets[5,6,7]	Moderate Snow, Snow Grains or Snow Pellets[5,7]	Freezing Drizzle[8]	Light Freezing Rain	Rain on Cold-Soaked Wing[9]	Other[10]
-3 °C and above (27 °F and above)	100/0	1:15 - 2:40	0:35 - 1:00	2:25 - 2:50	1:20 - 2:25	0:45 - 1:20	0:40 - 1:30	0:35 - 0:40	0:15 - 1:35	
	75/25	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
	50/50	N/A	N/A	N/A	N/A	N/A	N/A	N/A	CAUTION: No holdover time guidelines exist	
below -3 to -8 °C (below 27 to 18 °F)	100/0	1:10 - 2:35	0:30 - 0:55	2:05 - 2:30	1:10 - 2:05	0:40 - 1:10	0:50 - 1:25	0:30 - 0:40		
	75/25	N/A	N/A	N/A	N/A	N/A	N/A	N/A		
below -8 to -14 °C (below 18 to 7 °F)	100/0	1:10 - 2:35	0:25 - 0:50	1:55 - 2:15	1:05 - 1:55	0:35 - 1:05	0:50 - 1:25[11]	0:30 - 0:40[11]		
	75/25	N/A	N/A	N/A	N/A	N/A	N/A	N/A		
below -14 to -18 °C (below 7 to 0 °F)	100/0	0:30 - 1:00	0:01 - 0:06	0:30 - 0:45	0:09 - 0:30	0:02 - 0:09				
below -18 to -25 °C (below 0 to -13 °F)	100/0	0:30 - 1:00	0:00 - 0:02	0:10 - 0:20	0:03 - 0:10	0:01 - 0:03				
below -25 to -25.5 °C (below -13 to -14 °F)	100/0	0:30 - 1:00	0:00 - 0:01	0:07 - 0:10	0:02 - 0:07	0:00 - 0:02				

NOTES

1 Ensure that the lowest operational use temperature (LOUT) is respected. Consider use of Type I fluid when Type IV fluid cannot be used.
2 Freezing mist is best confirmed by observation. It is never reported by METAR however it can occur when mist is present at 0 °C (32 °F) and below.
3 Use freezing fog holdover times in conditions of ice crystals mixed with freezing fog or mist.
4 These holdover times are for use in -SNFZFG and SNFZFG. The Snowfall Intensities as a Function of Prevailing Visibility table (Table 48) is required to confirm the precipitation intensity is no greater than “moderate”. No holdover times exist if the reported visibility correlates to a “heavy” precipitation intensity.
5 To determine snowfall intensity, the Snowfall Intensities as a Function of Prevailing Visibility table (Table 48) is required.
6 Use light freezing rain holdover times in conditions of very light or light snow mixed with light rain or drizzle. The Snowfall Intensities as a Function of Prevailing Visibility table (Table 48) is required to confirm the precipitation intensity is no greater than “light”. No holdover times exist if the reported visibility correlates to a “moderate” or “heavy” precipitation intensity.
7 Use snow holdover times in conditions of very light, light, or moderate snow mixed with ice crystals.
8 Includes light, moderate and heavy freezing drizzle. Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
9 No holdover time guidelines exist for this condition for 0 °C (32 °F) and below.
10 Heavy snow, ice pellets, moderate and heavy freezing rain, small hail and hail (Table 47 provides allowance times for Type IV PG fluids in ice pellets and small hail).
11 No holdover time guidelines exist for this condition below -10 °C (14 °F).

CAUTIONS

- The cautions that apply to the holdover times in the table above can be found on page A.1-22.

TABLE 37: TYPE IV HOLDOVER TIMES FOR JSC RCP NORDIX DEFROST ECO 4

Outside Air Temperature[1]	Fluid Concentration Fluid/Water By % Volume	Freezing Fog, Freezing Mist[2], or Ice Crystals[3]	Snow mixed with Freezing Fog[4]	Very Light Snow, Snow Grains or Snow Pellets[5,6,7]	Light Snow, Snow Grains or Snow Pellets[5,6,7]	Moderate Snow, Snow Grains or Snow Pellets[5,7]	Freezing Drizzle[8]	Light Freezing Rain	Rain on Cold-Soaked Wing[9]	Other[10]
-3 °C and above (27 °F and above)	100/0	1:30 - 2:40	0:30 - 0:55	2:30 - 3:00	1:15 - 2:30	0:35 - 1:15	1:05 - 1:30	0:40 - 1:05	0:15 - 1:10	
	75/25	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
	50/50	N/A	N/A	N/A	N/A	N/A	N/A	N/A	CAUTION: No holdover time guidelines exist	
below -3 to -8 °C (below 27 to 18 °F)	100/0	0:55 - 2:35	0:25 - 0:50	2:15 - 2:45	1:05 - 2:15	0:35 - 1:05	0:50 - 1:20	0:35 - 0:50		
	75/25	N/A	N/A	N/A	N/A	N/A	N/A	N/A		
below -8 to -14 °C (below 18 to 7 °F)	100/0	0:55 - 2:35	0:25 - 0:45	2:05 - 2:35	1:00 - 2:05	0:30 - 1:00	0:50 - 1:20[11]	0:35 - 0:50[11]		
	75/25	N/A	N/A	N/A	N/A	N/A	N/A	N/A		
below -14 to -18 °C (below 7 to 0 °F)	100/0	0:30 - 0:50	0:01 - 0:06	0:30 - 0:45	0:09 - 0:30	0:02 - 0:09				
below -18 to -25 °C (below 0 to -13 °F)	100/0	0:30 - 0:50	0:00 - 0:02	0:10 - 0:20	0:03 - 0:10	0:01 - 0:03				
below -25 to -25.5 °C (below -13 to -14 °F)	100/0	0:30 - 0:50	0:00 - 0:01	0:07 - 0:10	0:02 - 0:07	0:00 - 0:02				

NOTES

1 Ensure that the lowest operational use temperature (LOUT) is respected. Consider use of Type I fluid when Type IV fluid cannot be used.
2 Freezing mist is best confirmed by observation. It is never reported by METAR however it can occur when mist is present at 0 °C (32 °F) and below.
3 Use freezing fog holdover times in conditions of ice crystals mixed with freezing fog or mist.
4 These holdover times are for use in -SNFZFG and SNFZFG. The Snowfall Intensities as a Function of Prevailing Visibility table (Table 48) is required to confirm the precipitation intensity is no greater than “moderate”. No holdover times exist if the reported visibility correlates to a “heavy” precipitation intensity.
5 To determine snowfall intensity, the Snowfall Intensities as a Function of Prevailing Visibility table (Table 48) is required.
6 Use light freezing rain holdover times in conditions of very light or light snow mixed with light rain or drizzle. The Snowfall Intensities as a Function of Prevailing Visibility table (Table 48) is required to confirm the precipitation intensity is no greater than “light”. No holdover times exist if the reported visibility correlates to a “moderate” or “heavy” precipitation intensity.
7 Use snow holdover times in conditions of very light, light, or moderate snow mixed with ice crystals.
8 Includes light, moderate and heavy freezing drizzle. Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
9 No holdover time guidelines exist for this condition for 0 °C (32 °F) and below.
10 Heavy snow, ice pellets, moderate and heavy freezing rain, small hail and hail (Table 47 provides allowance times for Type IV PG fluids in ice pellets and small hail).
11 No holdover time guidelines exist for this condition below -10 °C (14 °F).

CAUTIONS

- The cautions that apply to the holdover times in the table above can be found on page A.1-22.

TABLE 38: TYPE IV HOLDOVER TIMES FOR JSC RCP NORDIX DEFROST NORTH 4

Outside Air Temperature[1]	Fluid Concentration Fluid/Water By % Volume	Freezing Fog, Freezing Mist[2], or Ice Crystals[3]	Snow mixed with Freezing Fog[4]	Very Light Snow, Snow Grains or Snow Pellets[5,6,7]	Light Snow, Snow Grains or Snow Pellets[5,6,7]	Moderate Snow, Snow Grains or Snow Pellets[5,7]	Freezing Drizzle[8]	Light Freezing Rain	Rain on Cold-Soaked Wing[9]	Other[10]
-3 °C and above (27 °F and above)	100/0	2:10 - 4:00	0:30 - 1:00	2:55 - 3:00	1:25 - 2:55	0:40 - 1:25	1:05 - 2:00	0:30 - 0:50	0:09 - 1:55	
	75/25	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
	50/50	N/A	N/A	N/A	N/A	N/A	N/A	N/A	CAUTION: No holdover time guidelines exist	
below -3 to -8 °C (below 27 to 18 °F)	100/0	2:40 - 4:00	0:30 - 1:00	2:55 - 3:00	1:25 - 2:55	0:40 - 1:25	1:05 - 2:00	0:40 - 1:00		
	75/25	N/A	N/A	N/A	N/A	N/A	N/A	N/A		
below -8 to -14 °C (below 18 to 7 °F)	100/0	2:40 - 4:00	0:30 - 1:00	2:55 - 3:00	1:25 - 2:55	0:40 - 1:25	1:05 - 2:00[11]	0:40 - 1:00[11]		
	75/25	N/A	N/A	N/A	N/A	N/A	N/A	N/A		
below -14 to -18 °C (below 7 to 0 °F)	100/0	0:45 - 1:55	0:07 - 0:20	0:50 - 1:05	0:25 - 0:50	0:10 - 0:25				
below -18 to -25 °C (below 0 to -13 °F)	100/0	0:45 - 1:55	0:03 - 0:10	0:40 - 0:55	0:15 - 0:40	0:05 - 0:15				
below -25 to -26 °C (below -13 to -15 °F)	100/0	0:45 - 1:55	0:01 - 0:06	0:25 - 0:35	0:08 - 0:25	0:02 - 0:08				

NOTES

1 Ensure that the lowest operational use temperature (LOUT) is respected. Consider use of Type I fluid when Type IV fluid cannot be used.
2 Freezing mist is best confirmed by observation. It is never reported by METAR however it can occur when mist is present at 0 °C (32 °F) and below.
3 Use freezing fog holdover times in conditions of ice crystals mixed with freezing fog or mist.
4 These holdover times are for use in -SNFZFG and SNFZFG. The Snowfall Intensities as a Function of Prevailing Visibility table (Table 48) is required to confirm the precipitation intensity is no greater than “moderate”. No holdover times exist if the reported visibility correlates to a “heavy” precipitation intensity.
5 To determine snowfall intensity, the Snowfall Intensities as a Function of Prevailing Visibility table (Table 48) is required.
6 Use light freezing rain holdover times in conditions of very light or light snow mixed with light rain or drizzle. The Snowfall Intensities as a Function of Prevailing Visibility table (Table 48) is required to confirm the precipitation intensity is no greater than “light”. No holdover times exist if the reported visibility correlates to a “moderate” or “heavy” precipitation intensity.
7 Use snow holdover times in conditions of very light, light, or moderate snow mixed with ice crystals.
8 Includes light, moderate and heavy freezing drizzle. Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
9 No holdover time guidelines exist for this condition for 0 °C (32 °F) and below.
10 Heavy snow, ice pellets, moderate and heavy freezing rain, small hail and hail (Table 46 provides allowance times for Type IV EG fluids in ice pellets and small hail).
11 No holdover time guidelines exist for this condition below -10 °C (14 °F).

CAUTIONS

- The cautions that apply to the holdover times in the table above can be found on page A.1-22.

TABLE 39: TYPE IV HOLDOVER TIMES FOR KILFROST ABC-S PLUS

Outside Air Temperature[1]	Fluid Concentration Fluid/Water By % Volume	Freezing Fog, Freezing Mist[2], or Ice Crystals[3]	Snow mixed with Freezing Fog[4]	Very Light Snow, Snow Grains or Snow Pellets[5,6,7]	Light Snow, Snow Grains or Snow Pellets[5,6,7]	Moderate Snow, Snow Grains or Snow Pellets[5,7]	Freezing Drizzle[8]	Light Freezing Rain	Rain on Cold-Soaked Wing[9]	Other[10]
-3 °C and above (27 °F and above)	100/0	2:10 - 4:00	0:55 - 1:35	3:00 - 3:00	2:05 - 3:00	1:15 - 2:05	1:50 - 2:00	1:05 - 2:00	0:25 - 2:00	
	75/25	1:25 - 2:40	0:30 - 0:55	2:05 - 2:25	1:15 - 2:05	0:45 - 1:15	1:00 - 1:20	0:30 - 0:50	0:10 - 1:20	
	50/50	0:30 - 0:55	0:15 - 0:25	1:00 - 1:10	0:30 - 1:00	0:15 - 0:30	0:15 - 0:40	0:15 - 0:20	CAUTION: No holdover time guidelines exist	
below -3 to -8 °C (below 27 to 18 °F)	100/0	0:55 - 3:30	0:50 - 1:25	3:00 - 3:00	1:50 - 3:00	1:05 - 1:50	0:25 - 1:35	0:20 - 0:30		
	75/25	0:45 - 1:50	0:30 - 0:50	1:50 - 2:10	1:05 - 1:50	0:40 - 1:05	0:20 - 1:10	0:15 - 0:25		
below -8 to -14 °C (below 18 to 7 °F)	100/0	0:55 - 3:30	0:45 - 1:15	2:55 - 3:00	1:45 - 2:55	1:00 - 1:45	0:25 - 1:35[11]	0:20 - 0:30[11]		
	75/25	0:45 - 1:50	0:25 - 0:45	1:45 - 2:00	1:00 - 1:45	0:35 - 1:00	0:20 - 1:10[11]	0:15 - 0:25[11]		
below -14 to -18 °C (below 7 to 0 °F)	100/0	0:40 - 1:00	0:01 - 0:06	0:30 - 0:45	0:09 - 0:30	0:02 - 0:09				
below -18 to -25 °C (below 0 to -13 °F)	100/0	0:40 - 1:00	0:00 - 0:02	0:10 - 0:20	0:03 - 0:10	0:01 - 0:03				
below -25 to -28 °C (below -13 to -18 °F)	100/0	0:40 - 1:00	0:00 - 0:01	0:07 - 0:10	0:02 - 0:07	0:00 - 0:02				

NOTES

1 Ensure that the lowest operational use temperature (LOUT) is respected. Consider use of Type I fluid when Type IV fluid cannot be used.
2 Freezing mist is best confirmed by observation. It is never reported by METAR however it can occur when mist is present at 0 °C (32 °F) and below.
3 Use freezing fog holdover times in conditions of ice crystals mixed with freezing fog or mist.
4 These holdover times are for use in -SNFZFG and SNFZFG. The Snowfall Intensities as a Function of Prevailing Visibility table (Table 48) is required to confirm the precipitation intensity is no greater than “moderate”. No holdover times exist if the reported visibility correlates to a “heavy” precipitation intensity.
5 To determine snowfall intensity, the Snowfall Intensities as a Function of Prevailing Visibility table (Table 48) is required.
6 Use light freezing rain holdover times in conditions of very light or light snow mixed with light rain or drizzle. The Snowfall Intensities as a Function of Prevailing Visibility table (Table 48) is required to confirm the precipitation intensity is no greater than “light”. No holdover times exist if the reported visibility correlates to a “moderate” or “heavy” precipitation intensity.
7 Use snow holdover times in conditions of very light, light, or moderate snow mixed with ice crystals.
8 Includes light, moderate and heavy freezing drizzle. Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
9 No holdover time guidelines exist for this condition for 0 °C (32 °F) and below.
10 Heavy snow, ice pellets, moderate and heavy freezing rain, small hail and hail (Table 47 provides allowance times for Type IV PG fluids in ice pellets and small hail).
11 No holdover time guidelines exist for this condition below -10 °C (14 °F).

CAUTIONS

- The cautions that apply to the holdover times in the table above can be found on page A.1-22.

TABLE 40: TYPE IV HOLDOVER TIMES FOR MKS DEVO CHEMICALS COREICEPHOB TYPE IV PG

Outside Air Temperature[1]	Fluid Concentration Fluid/Water By % Volume	Freezing Fog, Freezing Mist[2], or Ice Crystals[3]	Snow mixed with Freezing Fog[4]	Very Light Snow, Snow Grains or Snow Pellets[5,6,7]	Light Snow, Snow Grains or Snow Pellets[5,6,7]	Moderate Snow, Snow Grains or Snow Pellets[5,7]	Freezing Drizzle[8]	Light Freezing Rain	Rain on Cold-Soaked Wing[9]	Other[10]
-3 °C and above (27 °F and above)	100/0	2:20 - 3:50	0:35 - 1:15	3:00 - 3:00	1:40 - 3:00	0:45 - 1:40	1:25 - 2:00	0:50 - 1:20	0:10 - 1:40	
	75/25	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
	50/50	N/A	N/A	N/A	N/A	N/A	N/A	N/A	CAUTION: No holdover time guidelines exist	
below -3 to -8 °C (below 27 to 18 °F)	100/0	0:15 - 0:35	0:25 - 0:55	2:35 - 3:00	1:10 - 2:35	0:35 - 1:10	0:40 - 1:30	0:20 - 0:35		
	75/25	N/A	N/A	N/A	N/A	N/A	N/A	N/A		
below -8 to -14 °C (below 18 to 7 °F)	100/0	0:15 - 0:35	0:20 - 0:45	2:05 - 2:40	0:55 - 2:05	0:25 - 0:55	0:40 - 1:30[11]	0:20 - 0:35[11]		
	75/25	N/A	N/A	N/A	N/A	N/A	N/A	N/A		
below -14 to -18 °C (below 7 to 0 °F)	100/0	0:15 - 0:30	0:01 - 0:06	0:30 - 0:45	0:09 - 0:30	0:02 - 0:09				
below -18 to -25 °C (below 0 to -13 °F)	100/0	0:15 - 0:30	0:00 - 0:02	0:10 - 0:20	0:03 - 0:10	0:01 - 0:03				
below -25 to -29 °C (below -13 to -20 °F)	100/0	0:15 - 0:30	0:00 - 0:01	0:07 - 0:10	0:02 - 0:07	0:00 - 0:02				

NOTES

1 Ensure that the lowest operational use temperature (LOUT) is respected. Consider use of Type I fluid when Type IV fluid cannot be used.
2 Freezing mist is best confirmed by observation. It is never reported by METAR however it can occur when mist is present at 0 °C (32 °F) and below.
3 Use freezing fog holdover times in conditions of ice crystals mixed with freezing fog or mist.
4 These holdover times are for use in -SNFZFG and SNFZFG. The Snowfall Intensities as a Function of Prevailing Visibility table (Table 48) is required to confirm the precipitation intensity is no greater than “moderate”. No holdover times exist if the reported visibility correlates to a “heavy” precipitation intensity.
5 To determine snowfall intensity, the Snowfall Intensities as a Function of Prevailing Visibility table (Table 48) is required.
6 Use light freezing rain holdover times in conditions of very light or light snow mixed with light rain or drizzle. The Snowfall Intensities as a Function of Prevailing Visibility table (Table 48) is required to confirm the precipitation intensity is no greater than “light”. No holdover times exist if the reported visibility correlates to a “moderate” or “heavy” precipitation intensity.
7 Use snow holdover times in conditions of very light, light, or moderate snow mixed with ice crystals.
8 Includes light, moderate and heavy freezing drizzle. Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
9 No holdover time guidelines exist for this condition for 0 °C (32 °F) and below.
10 Heavy snow, ice pellets, moderate and heavy freezing rain, small hail and hail (Table 47 provides allowance times for Type IV PG fluids in ice pellets and small hail).
11 No holdover time guidelines exist for this condition below -10 °C (14 °F).

CAUTIONS

- The cautions that apply to the holdover times in the table above can be found on page A.1-22.

TABLE 41: TYPE IV HOLDOVER TIMES FOR NEWAVE AEROCHEMICAL FCY 9311

Outside Air Temperature[1]	Fluid Concentration Fluid/Water By % Volume	Freezing Fog, Freezing Mist[2], or Ice Crystals[3]	Snow mixed with Freezing Fog[4]	Very Light Snow, Snow Grains or Snow Pellets[5,6,7]	Light Snow, Snow Grains or Snow Pellets[5,6,7]	Moderate Snow, Snow Grains or Snow Pellets[5,7]	Freezing Drizzle[8]	Light Freezing Rain	Rain on Cold-Soaked Wing[9]	Other[10]
-3 °C and above (27 °F and above)	100/0	1:55 - 4:00	0:25 - 0:55	2:20 - 2:55	1:10 - 2:20	0:35 - 1:10	1:10 - 2:00	0:40 - 1:05	0:15 - 1:25	
	75/25	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
	50/50	N/A	N/A	N/A	N/A	N/A	N/A	N/A	CAUTION: No holdover time guidelines exist	
below -3 to -8 °C (below 27 to 18 °F)	100/0	0:35 - 2:05	0:20 - 0:40	1:50 - 2:20	0:55 - 1:50	0:30 - 0:55	0:35 - 1:20	0:20 - 0:35		
	75/25	N/A	N/A	N/A	N/A	N/A	N/A	N/A		
below -8 to -14 °C (below 18 to 7 °F)	100/0	0:35 - 2:05	0:20 - 0:35	1:35 - 2:00	0:50 - 1:35	0:25 - 0:50	0:35 - 1:20[11]	0:20 - 0:35[11]		
	75/25	N/A	N/A	N/A	N/A	N/A	N/A	N/A		
below -14 to -18 °C (below 7 to 0 °F)	100/0	0:30 - 0:55	0:10 - 0:20	1:00 - 1:15	0:30 - 1:00	0:15 - 0:30				
below -18 to -25 °C (below 0 to -13 °F)	100/0	0:30 - 0:55	0:05 - 0:10	0:35 - 0:40	0:15 - 0:35	0:07 - 0:15				
below -25 to -29.5 °C (below -13 to -21 °F)	100/0	0:30 - 0:55	0:05 - 0:10	0:30 - 0:40	0:15 - 0:30	0:06 - 0:15				

NOTES

1 Ensure that the lowest operational use temperature (LOUT) is respected. Consider use of Type I fluid when Type IV fluid cannot be used.
2 Freezing mist is best confirmed by observation. It is never reported by METAR however it can occur when mist is present at 0 °C (32 °F) and below.
3 Use freezing fog holdover times in conditions of ice crystals mixed with freezing fog or mist.
4 These holdover times are for use in -SNFZFG and SNFZFG. The Snowfall Intensities as a Function of Prevailing Visibility table (Table 48) is required to confirm the precipitation intensity is no greater than “moderate”. No holdover times exist if the reported visibility correlates to a “heavy” precipitation intensity.
5 To determine snowfall intensity, the Snowfall Intensities as a Function of Prevailing Visibility table (Table 48) is required.
6 Use light freezing rain holdover times in conditions of very light or light snow mixed with light rain or drizzle. The Snowfall Intensities as a Function of Prevailing Visibility table (Table 48) is required to confirm the precipitation intensity is no greater than “light”. No holdover times exist if the reported visibility correlates to a “moderate” or “heavy” precipitation intensity.
7 Use snow holdover times in conditions of very light, light, or moderate snow mixed with ice crystals.
8 Includes light, moderate and heavy freezing drizzle. Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
9 No holdover time guidelines exist for this condition for 0 °C (32 °F) and below.
10 Heavy snow, ice pellets, moderate and heavy freezing rain, small hail and hail (Table 47 provides allowance times for Type IV PG fluids in ice pellets and small hail).
11 No holdover time guidelines exist for this condition below -10 °C (14 °F).

CAUTIONS

- The cautions that apply to the holdover times in the table above can be found on page A.1-22.

TABLE 42: TYPE IV HOLDOVER TIMES FOR NEWAVE AEROCHEMICAL FCY-EGIV

Outside Air Temperature[1]	Fluid Concentration Fluid/Water By % Volume	Freezing Fog, Freezing Mist[2], or Ice Crystals[3]	Snow mixed with Freezing Fog[4]	Very Light Snow, Snow Grains or Snow Pellets[5,6,7]	Light Snow, Snow Grains or Snow Pellets[5,6,7]	Moderate Snow, Snow Grains or Snow Pellets[5,7]	Freezing Drizzle[8]	Light Freezing Rain	Rain on Cold-Soaked Wing[9]	Other[10]
-3 °C and above (27 °F and above)	100/0	2:35 - 4:00	0:25 - 0:55	2:35 - 3:00	1:10 - 2:35	0:35 - 1:10	1:20 - 2:00	0:40 - 1:05	0:15 - 2:00	
	75/25	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
	50/50	N/A	N/A	N/A	N/A	N/A	N/A	N/A	CAUTION: No holdover time guidelines exist	
below -3 to -8 °C (below 27 to 18 °F)	100/0	1:25 - 3:25	0:20 - 0:45	2:10 - 2:45	1:00 - 2:10	0:25 - 1:00	0:50 - 2:00	0:45 - 1:05		
	75/25	N/A	N/A	N/A	N/A	N/A	N/A	N/A		
below -8 to -14 °C (below 18 to 7 °F)	100/0	1:25 - 3:25	0:20 - 0:40	1:55 - 2:25	0:50 - 1:55	0:25 - 0:50	0:50 - 2:00[11]	0:45 - 1:05[11]		
	75/25	N/A	N/A	N/A	N/A	N/A	N/A	N/A		
below -14 to -18 °C (below 7 to 0 °F)	100/0	0:35 - 1:55	0:15 - 0:30	1:35 - 2:05	0:40 - 1:35	0:15 - 0:40				
below -18 to -25 °C (below 0 to -13 °F)	100/0	0:35 - 1:55	0:09 - 0:20	1:10 - 1:35	0:30 - 1:10	0:15 - 0:30				
below -25 to -29 °C (below -13 to -20 °F)	100/0	0:35 - 1:55	0:08 - 0:20	1:00 - 1:20	0:25 - 1:00	0:10 - 0:25				

NOTES

1 Ensure that the lowest operational use temperature (LOUT) is respected. Consider use of Type I fluid when Type IV fluid cannot be used.
2 Freezing mist is best confirmed by observation. It is never reported by METAR however it can occur when mist is present at 0 °C (32 °F) and below.
3 Use freezing fog holdover times in conditions of ice crystals mixed with freezing fog or mist.
4 These holdover times are for use in -SNFZFG and SNFZFG. The Snowfall Intensities as a Function of Prevailing Visibility table (Table 48) is required to confirm the precipitation intensity is no greater than “moderate”. No holdover times exist if the reported visibility correlates to a “heavy” precipitation intensity.
5 To determine snowfall intensity, the Snowfall Intensities as a Function of Prevailing Visibility table (Table 48) is required.
6 Use light freezing rain holdover times in conditions of very light or light snow mixed with light rain or drizzle. The Snowfall Intensities as a Function of Prevailing Visibility table (Table 48) is required to confirm the precipitation intensity is no greater than “light”. No holdover times exist if the reported visibility correlates to a “moderate” or “heavy” precipitation intensity.
7 Use snow holdover times in conditions of very light, light, or moderate snow mixed with ice crystals.
8 Includes light, moderate and heavy freezing drizzle. Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
9 No holdover time guidelines exist for this condition for 0 °C (32 °F) and below.
10 Heavy snow, ice pellets, moderate and heavy freezing rain, small hail and hail (Table 46 provides allowance times for Type IV EG fluids in ice pellets and small hail).
11 No holdover time guidelines exist for this condition below -10 °C (14 °F).

CAUTIONS

- The cautions that apply to the holdover times in the table above can be found on page A.1-22.

TABLE 43: TYPE IV HOLDOVER TIMES FOR SHAANXI CLEANWAY CLEANSURFACE IV

Outside Air Temperature[1]	Fluid Concentration Fluid/Water By % Volume	Freezing Fog, Freezing Mist[2], or Ice Crystals[3]	Snow mixed with Freezing Fog[4]	Very Light Snow, Snow Grains or Snow Pellets[5,6,7]	Light Snow, Snow Grains or Snow Pellets[5,6,7]	Moderate Snow, Snow Grains or Snow Pellets[5,7]	Freezing Drizzle[8]	Light Freezing Rain	Rain on Cold-Soaked Wing[9]	Other[10]
-3 °C and above (27 °F and above)	100/0	2:30 - 4:00	0:30 - 1:15	3:00 - 3:00	1:40 - 3:00	0:40 - 1:40	1:20 - 2:00	0:40 - 1:10	0:15 - 1:50	
	75/25	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
	50/50	N/A	N/A	N/A	N/A	N/A	N/A	N/A	CAUTION: No holdover time guidelines exist	
below -3 to -8 °C (below 27 to 18 °F)	100/0	0:55 - 2:05	0:20 - 0:45	2:25 - 3:00	1:00 - 2:25	0:25 - 1:00	0:30 - 1:30	0:25 - 0:35		
	75/25	N/A	N/A	N/A	N/A	N/A	N/A	N/A		
below -8 to -14 °C (below 18 to 7 °F)	100/0	0:55 - 2:05	0:15 - 0:35	1:45 - 2:15	0:45 - 1:45	0:20 - 0:45	0:30 - 1:30[11]	0:25 - 0:35[11]		
	75/25	N/A	N/A	N/A	N/A	N/A	N/A	N/A		
below -14 to -18 °C (below 7 to 0 °F)	100/0	0:25 - 0:35	0:10 - 0:20	1:05 - 1:20	0:30 - 1:05	0:15 - 0:30				
below -18 to -25 °C (below 0 to -13 °F)	100/0	0:25 - 0:35	0:05 - 0:10	0:35 - 0:45	0:15 - 0:35	0:07 - 0:15				
below -25 to -30 °C (below -13 to -22 °F)	100/0	0:20 - 0:30	0:04 - 0:09	0:30 - 0:35	0:15 - 0:30	0:06 - 0:15				

NOTES

1 Ensure that the lowest operational use temperature (LOUT) is respected. Consider use of Type I fluid when Type IV fluid cannot be used.
2 Freezing mist is best confirmed by observation. It is never reported by METAR however it can occur when mist is present at 0 °C (32 °F) and below.
3 Use freezing fog holdover times in conditions of ice crystals mixed with freezing fog or mist.
4 These holdover times are for use in -SNFZFG and SNFZFG. The Snowfall Intensities as a Function of Prevailing Visibility table (Table 48) is required to confirm that the precipitation intensity is no greater than “moderate”. No holdover times exist if the reported visibility correlates to a “heavy” precipitation intensity.
5 To determine snowfall intensity, the Snowfall Intensities as a Function of Prevailing Visibility table (Table 48) is required.
6 Use light freezing rain holdover times in conditions of very light or light snow mixed with light rain or drizzle. The Snowfall Intensities as a Function of Prevailing Visibility table (Table 48) is required to confirm that the precipitation intensity is no greater than “light”. No holdover times exist if the reported visibility correlates to a “moderate” or “heavy” precipitation intensity.
7 Use snow holdover times in conditions of very light, light, or moderate snow mixed with ice crystals.
8 Includes light, moderate and heavy freezing drizzle. Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
9 No holdover time guidelines exist for this condition for 0 °C (32 °F) and below.
10 Heavy snow, ice pellets, moderate and heavy freezing rain, small hail and hail (Table 47 provides allowance times for Type IV PG fluids in ice pellets and small hail).
11 No holdover time guidelines exist for this condition below -10 °C (14 °F).

CAUTIONS

- The cautions that apply to the holdover times in the table above can be found on page A.1-22

ALLOWANCE TIMES TABLES FOR WINTER 2024-2025

The HOT Guidelines are provided for information and guidance purposes. The HOT Guidelines on their own do not change, create, amend or permit deviations from regulatory requirements.

The HOT Guidelines may use mandatory terms such as “must”, “shall” and “is/are required” so as to convey the intent of meeting regulatory requirements and SAE Standards, where applicable. The term “should” is to be understood, unless an alternative method of achieving safety is implemented that would meet or exceed the intent of the recommendation.

CAUTIONS

- The responsibility for the application of these data remains with the user.
- Fluids used during ground de/anti-icing do not provide in-flight icing protection.
- This table is for departure planning only and should be used in conjunction with pretakeoff check procedures.
- Allowance time cannot be extended by an inspection of the aircraft critical surfaces.

TABLE 44: LIST OF FLUIDS VALIDATED FOR USE WITH ALLOWANCE TIMES[1]

Manufacturer	Fluid Name	Applicable Allowance Times (ATs)
Type III Fluids		
AllClear Systems LLC	AeroClear MAX	ATs for Type III Fluids
Type IV EG Fluids		
ALAB International	PROFLIGHT EG4	ATs for Type IV EG Fluids[3]
AllClear Systems LLC	ClearWing EG	ATs for Type IV EG Fluids
ASGlobal	4Flite EG	Fluid has not been validated[2]
AVIAFLUID International Ltd	AVIAFlight EG	ATs for Type IV EG Fluids
CHEMCO Inc.	ChemR EG IV	ATs for Type IV EG Fluids
CHEMCO Inc.	ChemR Nordik IV	ATs for Type IV EG Fluids
CHONGQING JOBA CHEMICAL CO,.LTD	FW-IV	ATs for Type IV EG Fluids[3]
Dow Inc	UCAR ENDURANCE™ EG106 ADF/AAF	ATs for Type IV EG Fluids
JSC RCP Nordix	Defrost NORTH 4	ATs for Type IV EG Fluids
Newave Aerochemical Co. Ltd.	FCY-EGIV	ATs for Type IV EG Fluids
Type IV PG Fluids		
ABAX Industries	ECOWING AD-49	ATs for Type IV PG Fluids
ALAB International	PROFLIGHT PG4	ATs for Type IV PG Fluids[3]
ASGlobal	4Flite PG	ATs for Type IV PG Fluids
AVIAFLUID International Ltd	AVIAFlight PG	ATs for Type IV PG Fluids
Clariant Produkte (Deutschland) GmbH	Safewing MP IV LAUNCH	ATs for Type IV PG Fluids
Clariant Produkte (Deutschland) GmbH	Safewing MP IV LAUNCH PLUS	ATs for Type IV PG Fluids
Cryotech Deicing Technology	Polar Guard® Advance	ATs for Type IV PG Fluids
Cryotech Deicing Technology	Polar Guard® Xtend	ATs for Type IV PG Fluids
Dow Chemical Company	UCAR™ FLIGHTGUARD™ AD-49	ATs for Type IV PG Fluids
Inland Technologies Inc.	ECO-SHIELD®	ATs for Type IV PG Fluids
JSC RCP Nordix	Defrost ECO 4	ATs for Type IV PG Fluids
Kilfrost Limited	ABC-S Plus	ATs for Type IV PG Fluids
MKS DevO Chemicals	COREICEPHOB TYPE-IV PG	ATs for Type IV PG Fluids[3]
Newave Aerochemical Co. Ltd.	FCY 9311	ATs for Type IV PG Fluids
Shaanxi Cleanway Aviation Chemical Co., Ltd.	Cleansurface IV	ATs for Type IV PG Fluids[3]

NOTES
1. Allowance times are for use with undiluted (100/0) Type III, Type IV EG, and Type IV PG fluids only. No allowance times exist for Type II fluids.
2. No allowance times exist for this fluid at the time of publication as the allowance times have not yet been validated.
3. Fluid is new to market and in the process of commercialization. The applicable allowance times can be used for a limited grace period of two testing opportunities that is made available to the manufacturer. The fluid must be validated within this time frame to continue the use of the allowance times.

TABLE 45: ALLOWANCE TIMES FOR SAE TYPE III FLUIDS

NOT APPLICABLE

TABLE 46: ALLOWANCE TIMES FOR SAE TYPE IV ETHYLENE GLYCOL (EG) FLUIDS[1,2]

Precipitation Types or Combinations and Applicable METAR Codes[5]	Outside Air Temperature				
	Above 0 °C[3] (32 °F and above)	0 to -5 °C[3] (32 to 23 °F)	Below -5 to -10 °C[3] (Below 23 to 14 °F)	Below -10 to -16 °C[3] (Below 14 to 3 °F)	Below -16 to -22 °C[3,4] (Below 3 to -8 °F)
Light Ice Pellets -PL, -GS	70 minutes	70 minutes	70 minutes	50 minutes	30 minutes
Light Ice Pellets Mixed with Light Snow -PLSN, -SNPL, -GSSN, -SNGS	50 minutes	50 minutes	30 minutes	25 minutes	
Light Ice Pellets Mixed with Light or Moderate Freezing Drizzle -PLFZDZ, -FZDZPL, FZDZPL, -GSFZDZ, -FZDZGS, FZDZGS		40 minutes	30 minutes		
Light Ice Pellets Mixed with Light or Moderate Drizzle -PLDZ, -DZPL, DZPL, -GSDZ, -DZGS, DZGS	40 minutes				
Light Ice Pellets Mixed with Light Freezing Rain -PLFZRA, -FZRAPL, -GSFZRA, -FZRAGS		40 minutes	30 minutes		
Light Ice Pellets Mixed with Light Rain -PLRA, -RAPL, -GSRA, -RAGS	40 minutes				
Light Ice Pellets Mixed with Light Rain and Light Snow -PLRASN, -PLSNRA, -RAPLSN, -RASNPL, -SNPLRA, -SNRAPL, -GSRASN, -GSSNRA, -RAGSSN, -RASNGS, -SNGSRA, -SNRAGS	20 minutes				
Light Ice Pellets Mixed with Light Freezing Rain and Light Snow -PLFZRASN, -PLSNFZRA, -FZRAPLSN, -FZRASNPL, -SNPLFZRA, -SNFZRAPL, -GSFZRASN, -GSSNFZRA, -FZRAGSSN, -FZRASNGS, -SNGSFZRA, -SNFZRAGS		20 minutes			
Moderate Ice Pellets (or Small Hail) PL, GS	35 minutes	35 minutes	35 minutes	15 minutes	10 minutes
Moderate Ice Pellets (or Small Hail) Mixed with Moderate Snow PLSN, SNPL, GSSN, SNGS	25 minutes	15 minutes	10 minutes		
Moderate Ice Pellets (or Small Hail) Mixed with Moderate Freezing Drizzle PLFZDZ, GSFZDZ		20 minutes	10 minutes		
Moderate Ice Pellets (or Small Hail) Mixed with Moderate Drizzle PLDZ, GSDZ	20 minutes				
Moderate Ice Pellets (or Small Hail) Mixed with Moderate Rain PLRA, GSRA, RAPL, RAGS	15 minutes				

Caution: No allowance times currently exist

Caution: No allowance times currently exist

NOTES

- The notes that apply to the allowance times in the table above can be found on page A.1-53.

CAUTIONS

- The cautions that apply to the allowance times in the table above can be found on page A.1-49.

TABLE 46 (CONT'D): ALLOWANCE TIMES FOR SAE TYPE IV ETHYLENE GLYCOL (EG) FLUIDS[1,2]

NOTES

1 These allowance times are for use with undiluted (100/0) EG based fluids. If the glycol type is unknown, the allowance times for SAE Type IV PG fluids should be used. To use the allowance times in this table, ensure the fluid being used is listed in the List of Fluids Validated for the Use of Allowance Times Table (Table 44).
2 Takeoff is allowed up to 90 minutes after start of fluid application if the precipitation stops at or before the allowance time expires and does not restart. Takeoff is not permitted if the OAT decreases during the 90 minutes in conditions of light ice pellets mixed with either: light or moderate freezing drizzle, light or moderate drizzle, light freezing rain, light rain, light rain and light snow, or light freezing rain and light snow.
3 No allowance times exist for EG based fluids when used on aircraft with rotation speeds less than 100 knots.
4 Ensure that the lowest operational use temperature (LOUT) is respected.
5 In the US, small hail is reported as GR with the remark "GR LESS THAN ¼". Outside of the US small hail is reported as GS. If the METAR does not report an intensity for small hail, use the "moderate ice pellets or small hail" allowance times. If the METAR reports an intensity with small hail, the ice pellet condition with the equivalent intensity can be used. This also applies in mixed conditions.

TABLE 47: ALLOWANCE TIMES FOR SAE TYPE IV PROPYLENE GLYCOL (PG) FLUIDS[1,2]

Precipitation Types or Combinations and Applicable METAR Codes[6]	Outside Air Temperature				
	Above 0 °C[3] (32 °F and above)	0 to -5 °C[3] (32 to 23 °F)	Below -5 to -10 °C[3] (Below 23 to 14 °F)	Below -10 to -16 °C[4] (Below 14 to 3 °F)	Below -16 to -22 °C[4,5] (Below 3 to -8 °F)
Light Ice Pellets -PL, -GS	50 minutes	50 minutes	30 minutes	30 minutes	20 minutes
Light Ice Pellets Mixed with Light Snow -PLSN, -SNPL, -GSSN, -SNGS	40 minutes	40 minutes	15 minutes	15 minutes	
Light Ice Pellets Mixed with Light or Moderate Freezing Drizzle -PLFZDZ, -FZDZPL, FZDZPL, -GSFZDZ -FZDZGS, FZDZGS		25 minutes	10 minutes		
Light Ice Pellets Mixed with Light or Moderate Drizzle -PLDZ, -DZPL, DZPL, -GSDZ, -DZGS, DZGS	25 minutes				
Light Ice Pellets Mixed with Light Freezing Rain -PLFZRA, -FZRAPL, -GSFZRA, -FZRAGS		25 minutes	10 minutes	Caution: No allowance times currently exist	
Light Ice Pellets Mixed with Light Rain -PLRA, -RAPL, -GSRA, -RAGS	25 minutes				
Light Ice Pellets Mixed with Light Rain and Light Snow -PLRASN, -PLSNRA, -RAPLSN, -RASNPL, -SNPLRA, -SNRAPL, -GSRASN, -GSSNRA, -RAGSSN, -RASNGS, -SNGSRA, -SNRAGS	20 minutes				
Light Ice Pellets Mixed with Light Freezing Rain and Light Snow -PLFZRASN, -PLSNFZRA, -FZRAPLSN, -FZRASNPL, -SNPLFZRA, -SNFZRAPL, -GSFZRASN, -GSSNFZRA, -FZRAGSSN, -FZRASNGS, -SNGSFZRA, -SNFZRAGS		20 minutes			
Moderate Ice Pellets (or Small Hail) PL, GS	15 minutes	15 minutes	10 minutes	10 minutes	
Moderate Ice Pellets (or Small Hail) Mixed with Moderate Snow PLSN, SNPL, GSSN, SNGS	15 minutes	5 minutes	5 minutes		
Moderate Ice Pellets (or Small Hail) Mixed with Moderate Freezing Drizzle PLFZDZ, GSFZDZ		10 minutes	7 minutes		
Moderate Ice Pellets (or Small Hail) Mixed with Moderate Drizzle PLDZ, GSDZ	10 minutes	Caution: No allowance times currently exist			
Moderate Ice Pellets (or Small Hail) Mixed with Moderate Rain PLRA, GSRA, RAPL, RAGS	10 minutes				

NOTES

- The notes that apply to the allowance times in the table above can be found on page A.1-53.

CAUTIONS

- The cautions that apply to the allowance times in the table above can be found on page A.1-49.

TABLE 47 (CONT'D): ALLOWANCE TIMES FOR SAE TYPE IV PROPYLENE GLYCOL (PG) FLUIDS[1,2]

NOTES

1 These allowance times are for use with undiluted (100/0) PG based fluids applied on aircraft with rotation speeds of 100 knots or greater. If the glycol type is unknown, the allowance times for SAE Type IV PG fluids should be used. To use the allowance times in this table, ensure the fluid being used is listed in the List of Fluids Validated for the Use of Allowance Times Table (Table 44).
2 Takeoff is allowed up to 90 minutes after start of fluid application if the precipitation stops at or before the allowance time expires and does not restart. Takeoff is not permitted if the OAT decreases during the 90 minutes in conditions of light ice pellets mixed with either: light or moderate freezing drizzle, light or moderate drizzle, light freezing rain, light rain, light rain and light snow, or light freezing rain and light snow.
3 No allowance times exist for PG based fluids when used on aircraft with rotation speeds less than 100 knots.
4 No allowance times exist for PG based fluids when used on aircraft with rotation speeds less than 115 knots.
5 Ensure that the lowest operational use temperature (LOUT) is respected.
6 In the US, small hail is reported as GR with the remark "GR LESS THAN ¼". Outside of the US, small hail is reported as GS. If the METAR does not report an intensity for small hail, use the "moderate ice pellets or small hail" allowance times. If the METAR reports an intensity with small hail, the ice pellet condition with the equivalent intensity can be used. This also applies in mixed conditions.

SUPPLEMENTAL GUIDANCE FOR WINTER 2024-2025

The HOT Guidelines are provided for information and guidance purposes. The HOT Guidelines on their own do not change, create, amend or permit deviations from regulatory requirements.

The HOT Guidelines may use mandatory terms such as “must”, “shall” and “is/are required” so as to convey the intent of meeting regulatory requirements and SAE Standards, where applicable. The term “should” is to be understood, unless an alternative method of achieving safety is implemented that would meet or exceed the intent of the recommendation.

TABLE 48: SNOWFALL INTENSITIES AS A FUNCTION OF PREVAILING VISIBILITY

Visibility		Day		Night	
Statute Miles	Meters	-1°C and below 30 °F and below	Above -1°C Above 30 °F	-1°C and Below 30 °F and below	Above -1°C Above 30 °F
≤1/4 (≤3/8)	≤400 (≤600)	Heavy	Heavy	Heavy	Heavy
1/2 (>3/8 to ≤5/8)	800 (>600 to ≤1000)	Moderate	Heavy	Heavy	Heavy
3/4 (>5/8 to ≤7/8)	1200 (>1000 to ≤1400)	Moderate	Moderate	Moderate	Heavy
1 (>7/8 to ≤1 1/8)	1600 (>1400 to ≤1800)	Light	Light	Moderate	Moderate
1 ¼ (>1 1/8 to ≤1 3/8)	2000 (>1800 to ≤2200)	Light	Light	Moderate	Moderate
1 ½ (>1 3/8 to ≤1 5/8)	2400 (>2200 to ≤2600)	Light	Light	Moderate	Moderate
1 ¾ (>1 5/8 to ≤1 7/8)	2800 (>2600 to ≤3000)	Very Light	Light	Light	Light
2 (>1 7/8 to ≤2 ¼)	3200 (>3000 to ≤3600)	Very Light	Very Light	Light	Light
2 ½ (>2 ¼ to ≤2 ¾)	4000 (>3600 to ≤4400)	Very Light	Very Light	Very Light	Very Light
3 (>2 ¾ to ≤3 ¼)	4800 (>4400 to ≤5200)	Very Light	Very Light	Very Light	Very Light
≥3 ½ (>3 ¼)	≥5600 (>5200)	Very Light	Very Light	Very Light	Very Light

NOTES

- The METAR/SPECI reported visibility or flight crew observed visibility will be used with this visibility table to establish snowfall intensity for Type I, II, III and IV holdover time guidelines, during snow, snow grain, or snow pellet precipitation conditions. This visibility table will also be used when snow, snow grains, or snow pellets are accompanied by blowing or drifting snow, or when snow is mixed with ice crystals or freezing fog in the METAR/SPECI.
- The use of Runway Visual Range (RVR) is not permitted for determining visibility used with the holdover tables.
- Some METARs contain tower visibility as well as surface visibility. Whenever surface visibility is available from an official source, such as a METAR, in either the main body of the METAR or in the Remarks ("RMK") section, the preferred action is to use the surface visibility value.
- If the visibility is being reduced by snow along with form(s) of obscuration such as fog, haze, smoke, etc., use of the table above may overestimate the actual snowfall intensity. However, use of the snowfall intensity being reported by the weather observer or automated surface observing system (ASOS), from the FMH-1 Table, may underestimate the actual snowfall intensity as it does not directly correlate to the snowfall intensities used when determining holdover times. Use of the visibility table in all snow conditions with or without obscurations is recommended.

Example for how to read and use the table: *CYVO 160200Z 15011G17KT 1SM -SN DRSN OVC009 M06/M08 A2948*

In the above METAR the snowfall intensity is reported as light. However, based upon the "Snowfall Intensities as a Function of Prevailing Visibility" table, with a visibility of 1 statute mile, at night and a temperature of -6°C, the snowfall intensity is classified as moderate. The snowfall intensity of moderate - not the METAR reported intensity of light - will be used to determine which holdover time guideline value is appropriate for the fluid in use.

TABLE 49:
TYPE I FLUIDS TESTED FOR ANTI-ICING PERFORMANCE AND AERODYNAMIC ACCEPTANCE

(see cautions and notes on pages A.1-69 and A.1-70)

Fluid Name	Type of Glycol[1]	Expiry[2] (y-m-d)	Lowest Operational Use Temperature[3]					
			Dilution[4,5] (fluid/water)	low speed aerodynamic test[6]		middle speed aerodynamic test[6]		high speed aerodynamic test[6]	
				°C	°F	°C	°F	°C	°F
ABAX Industries									
DE-950	PG	26-06-01	71/29	-26	-15	Not tested[11]		-31	-24
ADDCON EUROPE GmbH[10]									
IceFree I.80	*PG*	*21-03-14[9]*	*70/30*	*-26*	*-15*	*Not tested[11]*		*-32*	*-26*
Aéro Mag 2000									
DeiceX PG ADF Concentrate (Multiple Location)	PG	Y-M-D[12]	65/35	-25	-13	Not tested[11]		-31.5	-25
ALAB Industries[10]									
WDF 1	*EG*	*22-03-02[9]*	*70/30*	*-40*	*-40*	*Not tested[11]*		*-45*	*-49*
ALAB International									
PROFLIGHT EG1	EG	25-06-01	70/30	-43.5	-46	Not tested[11]		-44	-47
AllClear Systems LLC									
Lift-Off E-188	EG	26-06-01	70/30	-40	-40	Not tested[11]		-41.5	-43
Lift-Off P-88	PG	26-06-01	70/30	-24.5	-12	Not tested[11]		-29.5	-21
Arcton Ltd.[10]									
Arctica DG ready-to-use	*DEG*	*22-03-26[9]*	*as supplied*	*-26*	*-15*	*Not tested[11]*		*-26*	*-15*
ASGlobal									
Sky-Go EG	EG	26-09-23	70/30	*-31[14]*	*-24[14]*	Not tested[11]		-44	-47
Sky-Go PG	PG	26-07-27	70/30	*-21.5[14]*	*-7[14]*	Not tested[11]		-30.5	-23
Sky-Go PG 80	PG	27-08-07	70/30	*-25[14]*	*-13[14]*	Not tested[11]		-31.5	-25
AVIAFLUID International Ltd									
AVIAFLO EG	*EG*	*21-06-19[9]*	*70/30*	*-40.5*	*-41*	*Not tested[11]*		*-44*	*-47*
AVIAFLO PG	*PG*	*22-02-10[9]*	*70/30*	*Not tested[11]*		*Not tested[11]*		*-30*	*-22*
Aviation Xi'an High-Tech Physical Chemical Co. Ltd.									
Cleanwing I	PG	27-06-08	75/25	Not tested[11]		Not tested[11]		-39.5	-39
Cleanwing E	*EG*	*22-07-09[13]*	*75/25*	*-37*	*-35*	*Not tested[11]*		*-37*	*-35*
Cleanwing S-92	*EG*	*22-06-03[13]*	*75/25*	*-35*	*-31*	*Not tested[11]*		*-40*	*-40*
KHF-1	PG	27-06-08	75/25	Not tested[11]		Not tested[11]		-38.5	-37

TABLE 49 (CONT'D):
TYPE I FLUIDS TESTED FOR ANTI-ICING PERFORMANCE AND AERODYNAMIC ACCEPTANCE

(see cautions and notes on pages A.1-69 and A.1-70)

Fluid Name	Type of Glycol[1]	Expiry[2] (y-m-d)	Lowest Operational Use Temperature[3]					
			Dilution[4,5] (fluid/water)	low speed aerodynamic test[6]		middle speed aerodynamic test[6]		high speed aerodynamic test[6]	
				°C	°F	°C	°F	°C	°F
Beijing Wangye Aviation Chemical Product Co Ltd.[10]									
KLA-1A	*EG*	*22-05-22[9]*	*60/40*	*Not tested[11]*		*Not tested[11]*		*-32*	*-26*
Beijing Yadilite Aviation Advanced Materials Corporation[10]									
YD-101 Type I	*PG*	*21-03-07[9]*	*60/40*	*Not tested[11]*		*Not tested[11]*		*-30*	*-22*
YD-101A Type I	EG	25-02-26	70/30	Not tested[11]		Not tested[11]		-38	-36
CHEMCO Inc.									
CHEMR EG I	EG	28-06-01	70/30	-37	-35	Not tested[11]		-43	-45
CHEMR REG I	EG	26-06-01	75/25	-36.5	-34	Not tested[11]		-43.5	-46
Chongqing Joba Chemical Co., Ltd									
FW-I	EG	25-11-07	75/25	-43	-45	Not tested[11]		-46	-51
Clariant Produkte (Deutschland) GmbH									
Octaflo EF Concentrate	*PG*	*22-03-28[9]*	*65/35*	*-25*	*-13*	*Not tested[11]*		*-33*	*-27*
Safewing MP I 1938 ECO (80)	*PG*	*24-06-23[9]*	*71/29*	*-25*	*-13*	*Not tested[11]*		*-32.5*	*-27*
Safewing MP I ECO PLUS (80)	PG	27-06-01	71/29	-25	-13	Not tested[11]		-33	-27
Safewing MP I LFD 80	PG	25-04-15	71/29	-26	-15	Not tested[11]		-33	-27
Safewing MP I LFD 80 Pre-Mix 55%	PG	27-06-01	as supplied	Not tested[11]		Not tested[11]		-17	1
Safewing MP I LFD 88	PG	27-06-01	65/35	-26	-15	Not tested[11]		-33	-27
Safewing MP I LFD PLUS 88	PG	26-06-01	65/35	-25	-13	Not tested[11]		-34	-29
Cryotech Deicing Technology									
Polar Plus® LT	PG	28-06-01	63/37	-27	-17	Not tested[11]		-33	-27
Polar Plus® LT (80)	PG	28-06-01	70/30	-27	-17	Not tested[11]		-33	-27
Dow Inc.									
UCAR™ ADF Concentrate	EG	27-06-01	75/25	-36	-33	Not tested[11]		-45	-49
UCAR™ ADF XL54[15]	EG	27-06-01	as supplied	-33	-27	Not tested[11]		-33	-27
UCAR™ PG ADF Concentrate	PG	27-06-01	65/35	-25	-13	Not tested[11]		-32	-26
UCAR™ PG ADF Dilute 55/45[16]	PG	27-06-01	as supplied	-24	-11	Not tested[11]		-25	-13

TABLE 49 (CONT'D):
TYPE I FLUIDS TESTED FOR ANTI-ICING PERFORMANCE AND AERODYNAMIC ACCEPTANCE

(see cautions and notes on pages A.1-69 and A.1-70)

Fluid Name	Type of Glycol[1]	Expiry[2] (y-m-d)	Lowest Operational Use Temperature[3]					
			Dilution[4,5] (fluid/water)	low speed aerodynamic test[6]		middle speed aerodynamic test[6]		high speed aerodynamic test[6]	
				°C	°F	°C	°F	°C	°F
Heilongjiang Hangjie Aero-chemical Technology Co. Ltd.[10]									
HJF-1	*EG*	*21-06-14[9]*	*65/35*	*Not tested[11]*		*Not tested[11]*		*-42*	*-44*
HOC Industries									
SafeTemp® ES Plus	*PG*	*24-06-30[13]*	*65/35*	*-25.5*	*-14*	*Not tested[11]*		*-29*	*-20*
Inland Technologies Inc.									
DuraGly-E Type I ADF Concentrate	*EG*	*23-02-08[13]*	*60/40*	*-33*	*-27*	*Not tested[11]*		*-33*	*-27*
Inland ADF Concentrate (Multiple Location)	EG	Y-M-D[17]	75/25	-36	-33	Not tested[11]		-42.5	-45
SafeTemp® ES Plus (Multiple Location)	*PG*	*Y-M-D[18]*	*65/35*	*-25.5*	*-14*	*Not tested[11]*		*-31*	*-24*
JSC RCP Nordix									
DEFROST EG 88.1	EG	25-04-13	70/30	-40.5	-41	Not tested[11]		-44.5	-48
DEFROST PG 1	*PG*	*23-11-21[9]*	*70/30*	*-24.5*	*-12*	*Not tested[11]*		*-31.5*	*-25*
Kilfrost Limited									
Kilfrost DF Plus	PG	27-06-01	69/31	-25.5	-14	Not tested[11]		-32	-26
Kilfrost DF Plus (80)	*PG*	*24-07-14[9]*	*69/31*	*-26*	*-15*	*Not tested[11]*		*-31.5*	*-25*
Kilfrost DF Plus (88)	*PG*	*23-06-05[9]*	*63/37*	*-25.5*	*-14*	*Not tested[11]*		*-32*	*-26*
Kilfrost Ice Clear I	PG	27-06-01	70/30	-26	-15	Not tested[11]		-33	-27
LNT Solutions[10]									
LNT E188	EG	25-08-13	70/30	-30.5	-23	Not tested[11]		-41	-42
LNT P180	PG	26-11-10	69/31	-26	-15	Not tested[11]		-32	-26
MKS DevO Chemicals									
COREICEPHOB TYPE I	PG	26-06-01	71/29	Not tested[11]		Not tested[11]		-32.5	-27
Newave Aerochemical Co. Ltd.									
FCY-1A	EG	27-06-01	75/25	*-40[14]*	*-40[14]*	Not tested[11]		-40	-40
FCY-1Bio+	EG	25-06-22	75/25	-40.5	-41	Not tested[11]		-40.5	-41
FCY-1Bio+ (R)	EG	25-12-01	75/25	Not tested[11]		Not tested[11]		-46	-51

TABLE 49 (CONT'D):
TYPE I FLUIDS TESTED FOR ANTI-ICING PERFORMANCE AND AERODYNAMIC ACCEPTANCE
(see cautions and notes on pages A.1-69 and A.1-70)

Fluid Name	Type of Glycol[1]	Expiry[2] (y-m-d)	Lowest Operational Use Temperature[3]					
			Dilution[4,5] (fluid/water)	low speed aerodynamic test[6]		middle speed aerodynamic test[6]		high speed aerodynamic test[6]
				°C	°F	°C	°F	°C	°F
ROMCHIM PROTECT SRL									
ADD-PROTECT NG Type I	EG	26-06-01	60/40	-22	-8	Not tested[11]		-22	-8
ADD-PROTECT Type I	PG	27-06-01	70/30	-25.5	-14	Not tested[11]		-31	-24
Shaanxi Cleanway Aviation Chemical Co., Ltd									
Cleansurface I	EG	25-06-07	75/25	Not tested[11]		Not tested[11]		-40.5	-41
Cleansurface I-BIO	*EG*	*22-05-02[9]*	*75/25*	*Not tested[11]*		*Not tested[11]*		*-37*	*-35*
Topan LLP[10]									
TOPAN TYPE I	*EG*	*24-07-13[9]*	*75/25*	*-35.5*	*-32*	*Not tested[11]*		*-42*	*-44*
Xinjiang Zhongtian Liyang Aviation Newmaterial Technology Co., Ltd.[10]									
Clearice-I	*EG*	*23-10-24[9]*	*60/40*	*Not tested[11]*		*Not tested[11]*		*-30*	*-22*
Clearice-IB	*EG*	*24-08-04[9]*	*75/25*	*Not tested[11]*		*Not tested[11]*		*-43.5*	*-46*

TABLE 50:
TYPE II FLUIDS TESTED FOR ANTI-ICING PERFORMANCE AND AERODYNAMIC ACCEPTANCE

(see cautions and notes on pages A.1-69 and A.1-70)

Fluid Name	Type of Glycol[1]	Expiry[2] (y-m-d)	Dilution (fluid/water)	Lowest Operational Use Temperature[3]				AS 9968 Viscosity[7] (mPa.s)			
				middle speed aerodynamic test[6]		high speed aerodynamic test[6]		Lowest On-Wing Viscosity[8]		Highest On-Wing Viscosity[8]	
				°C	°F	°C	°F	Manufacturer Method	Alternate Method	Manufacturer Method	Alternate Method
ABAX Industries											
ECOWING AD-2	PG	25-06-01	100/0	Not tested[11]		-27	-17	5 750 (a)	Not Available[19]	17 200 (a)	14 000 (h)
			75/25	Not tested[11]		-15	5	12 000 (c)	Not Available[19]	30 200 (c)	32 000 (h)
			50/50[9]	*Not tested[11]*		*-3*	27	*7 500 (a)*	*Not Available[19]*	*26 900 (c)*	*36 800 (h)*
Aviation Xi'an High-Tech Physical Chemical Co. Ltd.											
Cleanwing II	PG	25-07-06	100/0	Not tested[11]		-25	-13	4 650 (e)	4 500 (a)	13 500 (a)	11 100 (i)
			75/25	Not tested[11]		-15	5	9 450 (e)	10 000 (a)	14 600 (i)	Not Available[19]
			50/50	Not tested[11]		-4.5	24	10 150 (e)	10 200 (a)	12 900 (i)	Not Available[19]
Clariant Produkte (Deutschland) GmbH											
Safewing MP II FLIGHT	PG	26-06-01	*100/0*	Not tested[11]		-29	-20	3 340 (a)	Not Available[19]	20 500 (q)	20 500 (c)
			75/25	Not tested[11]		-14	7	12 900 (c)	Not Available[19]	47 800 (q)	47 800 (c)
			50/50	Not tested[11]		-3.5	26	11 500 (a)	Not Available[19]	63 000 (q)	63 000 (c)
Cryotech Deicing Technology											
Polar Guard® II	PG	25-06-01	100/0	Not tested[11]		-30.5	-23	4 400 (f)	4 050 (a)	17 000 (f)	16 200 (a)
			75/25	Not tested[11]		-14	7	11 600 (f)	9 750 (a)	38 000 (c)	Not Available[19]
			50/50	Not tested[11]		-3.5	26	80 (a)	Not Available[19]	48 000 (c)	Not Available[19]
Kilfrost Limited											
ABC-K Plus	PG	25-06-01	100/0	Not tested[11]		-29	-20	2 850 (e)	2 640 (a)	13 400 (a)	Not Available[19]
			75/25	Not tested[11]		-14.5	6	12 650 (e)	12 650 (c)	29 000 (c)	Not Available[19]
			50/50	Not tested[11]		-3.5	26	4 200 (e)	5 260 (a)	15 000 (a)	Not Available[19]
Ice Clear II	PG	26-06-01	100/0	Not tested[11]		-28	-18	4 100 (a)	18 000 (m)	26 000 (c)	Not Available[19]
			75/25	Dilution Not Applicable				Dilution Not Applicable			
			50/50	Dilution Not Applicable				Dilution Not Applicable			
MKS DevO Chemicals											
COREICEPHOB Type II	PG	26-06-01	100/0	Not tested[11]		-27	-17	34 400 (i)	Not Available[19]	50 200 (i)	Not Available[19]
			75/25	Dilution Not Applicable				Dilution Not Applicable			
			50/50	Not tested[11]		-3.5	26	20 700 (i)	Not Available[19]	30 700 (i)	Not Available[19]

TABLE 50 (CONT'D):
TYPE II FLUIDS TESTED FOR ANTI-ICING PERFORMANCE AND AERODYNAMIC ACCEPTANCE
(see cautions and notes on pages A.1-69 and A.1-70)

Fluid Name	Type of Glycol[1]	Expiry[2] (y-m-d)	Dilution (fluid/water)	Lowest Operational Use Temperature[3]				AS 9968 Viscosity[7] (mPa.s)			
				middle speed aerodynamic test[6]		high speed aerodynamic test[6]		Lowest On-Wing Viscosity[8]		Highest On-Wing Viscosity[8]	
				°C	°F	°C	°F	Manufacturer Method	Alternate Method	Manufacturer Method	Alternate Method
Newave Aerochemical Co. Ltd.											
FCY-2	PG	25-07-13	100/0	Not tested[11]		-28	-18	7 000 (e)	8 920 (a)	24 800 (c)	Not Available[19]
			75/25	Not tested[11]		-14.5	6	18 550 (e)	18 550 (c)	31 300 (i)	Not Available[19]
			50/50	Not tested[11]		-4.5	24	6 750 (e)	7 030 (a)	15 200 (i)	Not Available[19]
ROMCHIM PROTECT SRL											
ADD-PROTECT NG Type II	PG	25-06-01	100/0	Not tested[11]		-28	-18	5 200 (a)	Not Available[19]	12 400 (a)	Not Available[19]
			75/25	Not tested[11]		-14.5	6	8 250 (a)	Not Available[19]	43 800 (i)	Not Available[19]
			50/50	Not tested[11]		-3	27	5 850 (a)	Not Available[19]	38 900 (i)	Not Available[19]
ADD-PROTECT Type II	PG	25-06-01	100/0	Not tested[11]		-28	-18	4 000 (a)	Not Available[19]	18 250 (a)	12 900 (i)
			75/25	Not tested[11]		-14	7	7 700 (a)	Not Available[19]	23 300 (c)	23 200 (i)
			50/50	Not tested[11]		-3	27	14 500 (a)	Not Available[19]	31 400 (c)	22 600 (i)

TABLE 44:
TYPE III FLUIDS TESTED FOR ANTI-ICING PERFORMANCE AND AERODYNAMIC ACCEPTANCE

NOT APPLICABLE

TABLE 45:
TYPE IV FLUIDS TESTED FOR ANTI-ICING PERFORMANCE AND AERODYNAMIC ACCEPTANCE

(see cautions and notes on pages A.1-69 and A.1-70)

Fluid Name	Type of Glycol[1]	Expiry[2] (y-m-d)	Dilution (fluid/water)	Lowest Operational Use Temperature[3]				AS 9968 Viscosity[7] (mPa.s)			
				middle speed aerodynamic test[6]		high speed aerodynamic test[6]		Lowest On-Wing Viscosity[8]		Highest On-Wing Viscosity[8]	
				°C	°F	°C	°F	Manufacturer Method	Alternate Method	Manufacturer Method	Alternate Method
ABAX Industries											
ECOWING AD-49	PG	26-06-01	100/0	Not tested[11]		-26	-15	12 150 (h)	11 000 (a)	22 400 (h)	25 900 (c)
			75/25	Dilution Not Applicable				Dilution Not Applicable			
			50/50	Dilution Not Applicable				Dilution Not Applicable			
ALAB International											
PROFLIGHT EG4	EG	25-06-01	100/0	Not tested[11]		-26	-15	1 840 (a)	Not Available[19]	6 180 (a)	Not Available[19]
			75/25	Dilution Not Applicable				Dilution Not Applicable			
			50/50	Dilution Not Applicable				Dilution Not Applicable			
PROFLIGHT PG4	PG	26-06-01	100/0	Not tested[11]		-29	-20	10 600 (a)	Not Available[19]	17 800 (h)	Not Available[19]
			75/25	Dilution Not Applicable				Dilution Not Applicable			
			50/50	Dilution Not Applicable				Dilution Not Applicable			
AllClear Systems LLC											
ClearWing EG	EG	25-06-01	100/0	Not tested[11]		-29	-20	35 500 (n)	13 350 (a)	51 800 (k)	Not Available[19]
			75/25	Dilution Not Applicable				Dilution Not Applicable			
			50/50	Dilution Not Applicable				Dilution Not Applicable			
ASGlobal											
4Flite EG	*EG*	*24-07-15[13]*	*100/0*	*Not tested[11]*		*-30*	*-22*	*6 600 (a)*	*Not Available[19]*	*17 300 (a)*	*Not Available[19]*
			75/25	*Dilution Not Applicable*				*Dilution Not Applicable*			
			50/50	*Dilution Not Applicable*				*Dilution Not Applicable*			
4Flite PG	PG	25-08-04	100/0	Not tested[11]		-26	-15	26 100 (c)	Not Available[19]	36 500 (c)	Not Available[19]
			75/25	Dilution Not Applicable				Dilution Not Applicable			
			50/50	Dilution Not Applicable				Dilution Not Applicable			
AVIAFLUID International Ltd											
AVIAFlight EG	*EG*	*22-04-28[9]*	*100/0*	*Not tested[11]*		*-31*	*-24*	*5 600 (a)*	*Not Available[19]*	*12 800 (a)*	*11 200 (i)*
			75/25	*Dilution Not Applicable*				*Dilution Not Applicable*			
			50/50	*Dilution Not Applicable*				*Dilution Not Applicable*			
AVIAFlight PG	*PG*	*23-07-01[9]*	*100/0*	*Not tested[11]*		*-25.5*	*-14*	*28 600 (c)*	*Not Available[19]*	*35 900 (c)*	*22 200 (i)*
			75/25	*Dilution Not Applicable*				*Dilution Not Applicable*			
			50/50	*Dilution Not Applicable*				*Dilution Not Applicable*			

TABLE 52 (CONT'D):
TYPE IV FLUIDS TESTED FOR ANTI-ICING PERFORMANCE AND AERODYNAMIC ACCEPTANCE

(see cautions and notes on pages A.1-69 and A.1-70)

Fluid Name	Type of Glycol[1]	Expiry[2] (y-m-d)	Dilution (fluid/water)	Lowest Operational Use Temperature[3]				AS 9968 Viscosity[7] (mPa.s)			
				middle speed aerodynamic test[6]		high speed aerodynamic test[6]		Lowest On-Wing Viscosity[8]		Highest On-Wing Viscosity[8]	
				°C	°F	°C	°F	Manufacturer Method	Alternate Method	Manufacturer Method	Alternate Method
CHEMCO Inc.											
ChemR EG IV	*EG*	*23-04-07[9]*	*100/0*	*Not tested[11]*		*-27*	*-17*	*46 400 (m)*	*19 450 (c)*	*67 000 (m)*	*Not Available[19]*
			75/25	*Dilution Not Applicable*				*Dilution Not Applicable*			
			50/50	*Dilution Not Applicable*				*Dilution Not Applicable*			
ChemR Nordik IV	EG	25-06-01	100/0	Not tested[11]		-29	-20	60 800 (n)	43 100 (c)	87 100 (n)	Not Available[19]
			75/25	Dilution Not Applicable				Dilution Not Applicable			
			50/50	Dilution Not Applicable				Dilution Not Applicable			
Chongqing Joba Chemical Co.,Ltd											
FW-IV	EG	25-11-01	100/0	Not tested[11]		-29	-20	32 600 (j)	Not Available[19]	66 200 (j)	Not Available[19]
			75/25	Dilution Not Applicable				Dilution Not Applicable			
			50/50	Dilution Not Applicable				Dilution Not Applicable			
Clariant Produkte (Deutschland) GmbH											
Safewing MP IV LAUNCH	PG	26-06-01	100/0	Not tested[11]		-28.5	-19	7 550 (a)	Not Available[19]	20 500 (q)	20 500 (c)
			75/25	Not tested[11]		-14	7	18 000 (a)	Not Available[19]	47 800 (q)	47 800 (c)
			50/50	Not tested[11]		-3.5	26	17 800 (a)	Not Available[19]	63 000 (q)	63 000 (c)
Safewing MP IV LAUNCH PLUS	PG	25-06-01	100/0	Not tested[11]		-29	-20	8 700 (p)	8 450 (a)	21 000 (q)	21 000 (c)
			75/25	Not tested[11]		-14	7	18 800 (q)	17 200 (c)	51 600 (q)	51 600 (c)
			50/50	Not tested[11]		-3.5	26	9 700 (p)	12 150 (a)	65 700 (q)	65 700 (c)
Cryotech Deicing Technology											
Polar Guard® Advance	PG	25-06-01	100/0	Not tested[11]		-30.5	-23	4 400 (f)	4 050 (a)	17 000 (f)	16 200 (a)
			75/25	Not tested[11]		-14	7	11 600 (f)	9 750 (a)	38 000 (c)	Not Available[19]
			50/50	Not tested[11]		-3.5	26	80 (a)	Not Available[19]	48 000 (c)	Not Available[19]
Polar Guard® Xtend	PG	25-06-01	100/0	Not tested[11]		-29	-20	6 000 (f)	6 350 (a)	23 500 (f)	23 200 (c)
			75/25	Dilution Not Applicable				Dilution Not Applicable			
			50/50	Dilution Not Applicable				Dilution Not Applicable			

TABLE 52 (CONT'D):
TYPE IV FLUIDS TESTED FOR ANTI-ICING PERFORMANCE AND AERODYNAMIC ACCEPTANCE

(see cautions and notes on pages A.1-69 and A.1-70)

Fluid Name	Type of Glycol[1]	Expiry[2] (y-m-d)	Dilution (fluid/water)	Lowest Operational Use Temperature[3]				AS9968 Viscosity[7] (mPa.s)			
				middle speed aerodynamic test[6]		high speed aerodynamic test[6]		Lowest On-Wing Viscosity[8]		Highest On-Wing Viscosity[8]	
				°C	°F	°C	°F	Manufacturer Method	Alternate Method	Manufacturer Method	Alternate Method
Dow Inc.											
UCAR ENDURANCE™ EG106 ADF/AAF	EG	25-06-01	100/0	Not tested[11]		-29	-20	24 850 (j)	2 230 (a)	47 800 (j)	5 900 (a)
			75/25	Dilution Not Applicable				Dilution Not Applicable			
			50/50	Dilution Not Applicable				Dilution Not Applicable			
UCAR™ FLIGHTGUARD™ AD-49	PG	25-06-08	100/0	Not tested[11]		-26	-15	12 150 (h)	11 000 (a)	22 400 (h)	25 900 (c)
			75/25	Dilution Not Applicable				Dilution Not Applicable			
			50/50	Dilution Not Applicable				Dilution Not Applicable			
Inland Technologies Inc.											
ECO-SHIELD®	PG	24-10-28	100/0	Not tested[11]		-25.5	-14	11 050 (a)	Not Available[19]	25 800 (i)	34 500 (c)
			75/25	Dilution Not Applicable				Dilution Not Applicable			
			50/50	Dilution Not Applicable				Dilution Not Applicable			
JSC RCP Nordix											
Defrost ECO 4	*PG*	*23-08-12[9]*	*100/0*	*Not tested[11]*		*-25.5*	*-14*	*9 800 (h)*	*12 350 (a)*	*14 800 (i)*	*17 340 (a)*
			75/25	*Dilution Not Applicable*				*Dilution Not Applicable*			
			50/50	*Dilution Not Applicable*				*Dilution Not Applicable*			
Defrost NORTH 4	*EG*	*23-06-01[9]*	*100/0*	*Not tested[11]*		*-26*	*-15*	*2 500 (a)*	*Not Available[19]*	*5 350 (a)*	*Not Available[19]*
			75/25	*Dilution Not Applicable*				*Dilution Not Applicable*			
			50/50	*Dilution Not Applicable*				*Dilution Not Applicable*			
Kilfrost Limited											
ABC-S Plus	PG	25-06-15	100/0	Not tested[11]		-28	-18	17 900 (e)	17 900 (c)	43 800 (c)	Not Available[19]
			75/25	Not tested[11]		-14.5	6	18 300 (e)	18 300 (c)	58 000 (c)	Not Available[19]
			50/50	Not tested[11]		-3.5	26	7 500 (e)	7 500 (a)	27 000 (c)	Not Available[19]
MKS DevO Chemicals											
COREICEPHOB TYPE-IV PG	PG	26-06-01	100/0	Not tested[11]		-29	-20	50 200 (i)	Not Available[19]	60 900 (i)	Not Available[19]
			75/25	Dilution Not Applicable				Dilution Not Applicable			
			50/50	Dilution Not Applicable				Dilution Not Applicable			

TABLE 52 (CONT'D):
TYPE IV FLUIDS TESTED FOR ANTI-ICING PERFORMANCE AND AERODYNAMIC ACCEPTANCE
(see cautions and notes on pages A.1-69 and A.1-70)

Fluid Name	Type of Glycol[1]	Expiry[2] (y-m-d)	Dilution (fluid/water)	Lowest Operational Use Temperature[3]				AS9968 Viscosity[7] (mPa.s)			
				middle speed aerodynamic test[6]		high speed aerodynamic test[6]		Lowest On-Wing Viscosity[8]		Highest On-Wing Viscosity[8]	
				°C	°F	°C	°F	Manufacturer Method	Alternate Method	Manufacturer Method	Alternate Method
Newave Aerochemical Co. Ltd.											
FCY 9311	PG	26-06-01	100/0	Not tested[11]		-29.5	-21	14 100 (c)	Not Available[19]	27 600 (c)	25 700 (i)
			75/25	Dilution Not Applicable				Dilution Not Applicable			
			50/50	Dilution Not Applicable				Dilution Not Applicable			
FCY-EGIV	EG	26-06-01	100/0	Not tested[11]		-29	-20	24 800 (g)	6 300 (a)	43 700 (k)	78 000 (c)
			75/25	Dilution Not Applicable				Dilution Not Applicable			
			50/50	Dilution Not Applicable				Dilution Not Applicable			
Shaanxi Cleanway Aviation Chemical Co., Ltd											
Cleansurface IV	PG	25-11-28	100/0	Not tested[11]		-30	-22	16 750 (a)	Not Available[19]	29 700 (d)	Not Available[19]
			75/25	Dilution Not Applicable				Dilution Not Applicable			
			50/50	Dilution Not Applicable				Dilution Not Applicable			

CAUTIONS AND NOTES FOR TABLES 49, 50, 51, 52

CAUTIONS

These tables list fluids that have been tested with respect to endurance time performance (Holdover Times), anti-icing performance (Water Spray Endurance Testing/High Humidity Endurance Testing) and aerodynamic acceptance (Type I: SAE ARP6207 §3.4.1, AMS1424 §3.5.2 and §3.5.3; Type II/ III/ IV: SAE ARP5718 §FOREWARD, AMS1428 §3.2.4 and §3.2.5) only. These tests were conducted by APS Aviation Inc. (www.apsaviation.ca) and Anti-icing Materials International Laboratory (AMIL) (www.uqac.ca/amil). The end user is responsible for contacting the fluid manufacturer to confirm all other SAE AMS1424/1428 technical requirement tests, such as fluid stability, toxicity, materials compatibility, etc. have been conducted. These technical requirement tests are typically conducted by Scientific Material International (SMI) (www.smiinc.com) and AMIL, or any acceptable source.
LOUT data provided in these tables is based strictly on the manufacturer's data; the end user is responsible for verifying the validity of this data.
Type I fluids supplied in concentrated form must not be used in that form and must be diluted.

NOTES

1 PG = conventional glycol (propylene glycol); EG = conventional glycol (ethylene glycol); DEG = conventional glycol (diethylene glycol); NCG = non-conventional glycol (organic non-ionic diols and triols, e.g. 1,3-propanediol, glycerine) and mixtures of non-conventional glycol and conventional glycol; NG = non-glycol (e.g. organic salts) and mixtures of non-glycol and glycol.
2 Expiry date is the earlier expiry date of the Aerodynamic Test(s) or Water Spray Endurance Test. Fluids that are tested after the issuance of this list will appear in a later update.
3 The values in this table were determined using test results from pre-production fluid samples when available. In some cases, the fluid manufacturer requested the publication of a more conservative value than the pre-production test value. The lowest operational use temperature (LOUT) for a given fluid is the higher (warmer) of:
a) The lowest temperature at which the fluid meets the aerodynamic acceptance test for a given aircraft type; or
b) The actual freezing point of the fluid plus its freezing point buffer (Type I = 10 °C/18 °F; Type II/III/IV = 7 °C/13 °F).
Note: LOUTs are rounded to the nearest half degree Celsius and the values in degrees Fahrenheit are calculated to the nearest whole degree.
4 The LOUT for Type I fluids that are intended to be diluted is derived from a dilution that provides the lowest operational use temperature. For other Type I dilutions, determine the freezing point of the fluid and add a 10 °C freezing point buffer, as a dilution will usually yield a higher and more restrictive operational use temperature. Consult the fluid manufacturer or fluid documentation for further clarification and guidance on establishing the appropriate operational use temperature of a diluted fluid.
5 Type I concentrate fluids have also been tested at 50/50 (glycol/water) dilution.
6 If uncertain whether the aircraft to be treated conforms to the low speed, the middle speed, or the high speed aerodynamic test, consult the aircraft manufacturer. The aerodynamic test is defined in SAE AS5900 (latest version).
7 The Alternate viscosity method should only be used for field verification and auditing purposes; when in doubt as to which method is appropriate, use the manufacturer method. Viscosity measurement methods are indicated as letters (in parentheses) beside each viscosity value. Details of each measurement method are shown in the table on the following page. The exact measurement method (spindle, container, fluid volume, temperature, speed, duration) must be used to compare the viscosity of a sample to a viscosity given in this table.
8 The lowest on-wing viscosity (LOWV), and highest on-wing viscosity (HOWV) values in this table are those of the fluids provided by the manufacturers for holdover time testing, and initial qualification aerodynamic testing. For the holdover times and lowest operation use temperature to be valid, the viscosity of the fluid on the wing shall not be lower than the LOWV value in this table and higher than the HOWV value in this table. The user should periodically ensure that the viscosity of a fluid sample taken from the wing surface complies with these limits.
9 Aerodynamic Performance and Anti-Icing Performance test data has expired; fluids listed in italics will be removed from this listing four years after expiry.
10 Manufacturer has not provided fluid information as required in SAE ARP5718B; fluid may be removed from this listing in subsequent revisions.
11 Manufacturer has indicated fluid was not tested.
12 Dow UCAR™ PG ADF Concentrate, sold under the product name DeiceX PG ADF Concentrate, qualified from 2023-06-15.
13 Currently in the test/re-test process. Contact the fluid manufacturer for latest information (see Appendix C for latest available contact information).
14 Fluid was not retested for low-speed aerodynamics. This data will be removed four years after the expiry of the last low speed test.
15 For UCAR™ ADF XL54, refer to primary site qualification of UCAR™ ADF Concentrate.
16 For UCAR™ PG ADF Dilute 55/45, refer to primary site qualification of UCAR™ PG ADF Concentrate.
17 Dow UCAR™ ADF Concentrate, sold under the product name Inland ADF Concentrate, qualified from 2015-09-04.
18 Refer to preproduction qualification of SafeTemp® ES Plus submitted by HOC Industries, qualified from 2017-11-20
19 Manufacturer has not provided an alternate method for measuring viscosity. Please use the Manufacturer Method.

TABLE 53:
VISCOSITY MEASUREMENT METHODS FOR TYPE II, III, AND IV FLUIDS TESTED FOR ANTI-ICING PERFORMANCE AND AERODYNAMIC ACCEPTANCE

Method	Brookfield Spindle*	Container	Fluid Volume	Temp.**	Speed	Duration
a	LV1 (with guard leg)	600 mL low form (Griffin) beaker	575 mL***	20 °C	0.3 rpm	10.0 minutes
b	LV1 (with guard leg)	600 mL low form (Griffin) beaker	575 mL***	20 °C	0.3 rpm	33.3 minutes
c	LV2-disc (with guard leg)	600 mL low form (Griffin) beaker	425 mL***	20 °C	0.3 rpm	10.0 minutes
d	LV2-disc (with guard leg)	600 mL low form (Griffin) beaker	575 mL***	20 °C	0.3 rpm	10.0 minutes
e	LV2-disc (with guard leg)	150 mL tall form (Berzelius) beaker	135 mL***	20 °C	0.3 rpm	10.0 minutes
f	SC4-34/13R	small sample adapter	10 mL	20 °C	0.3 rpm	10.0 minutes
g	SC4-34/13R	small sample adapter	10 mL	0 °C	0.3 rpm	30.0 minutes
h	SC4-31/13R	small sample adapter	10 mL	20 °C	0.3 rpm	10.0 minutes
i	SC4-31/13R	small sample adapter	10 mL	20 °C	0.3 rpm	30.0 minutes
j	SC4-31/13R	small sample adapter	10 mL	0 °C	0.3 rpm	10.0 minutes
k	SC4-31/13R	small sample adapter	10 mL	0 °C	0.3 rpm	30.0 minutes
l	SC4-31/13R	small sample adapter	9 mL	20 °C	0.3 rpm	15.0 minutes
m	SC4-31/13R	small sample adapter	9 mL	0 °C	0.3 rpm	10.0 minutes
n	SC4-31/13R	small sample adapter	9 mL	0 °C	0.3 rpm	30.0 minutes
o	SC4-31/13R	small sample adapter	9 mL	0 °C	0.3 rpm	65.0 minutes
p	LV1	big sample adapter	55 mL	20 °C	0.3 rpm	10.0 minutes
q	LV2-disc	big sample adapter	60 mL	20 °C	0.3 rpm	10.0 minutes

* Spindle must be attached to a Brookfield viscometer model equipped with an LV spring.

** Sample temperature will affect readings; ensure sufficient time is allowed for sample to reach thermal equilibrium before starting test. Use of a cooling bath strongly recommended.

*** If necessary, adjust fluid volume to ensure fluid is level with notch on the spindle shaft.

TABLE 54: GUIDELINES FOR THE APPLICATION OF SAE TYPE I FLUID

Outside Air Temperature (OAT)[1]	One-Step Procedure De/Anti-icing[2]	Two-Step Procedure	
		First Step: Deicing	Second Step: Anti-icing[3]
0 °C (32 °F) and above	Fluid/water mixture heated to at least 60°C (140°F) at the nozzle with a freezing point of at least 10°C (18°F) below OAT	Heated water or a heated fluid/water mixture	Fluid/water mixture heated to at least 60°C (140°F) at the nozzle with a freezing point of at least 10°C (18°F) below OAT
Below 0 °C (32 °F) to LOUT		Heated fluid/water mixture with a freezing point at OAT or below	

NOTES

1 Fluids must not be used at temperatures below their lowest operational use temperature (LOUT).
2 When anti-icing using the one-step procedure, a minimum quantity of 1 litre/m^2 (~2 gal./100 sq. ft.) of Type I fluid mixture heated to at least 60°C (140°F) is required after all frozen contamination is removed. This is achieved using a continuous process. This application is necessary to heat the surfaces, as heat contributes significantly to the Type I fluid holdover times.

3 To be applied before first-step fluid freezes, typically within 3 minutes. This time may be higher than 3 minutes in some conditions, but potentially lower in heavy precipitation, colder temperatures, or for critical surfaces constructed of composite materials. If necessary, the second step shall be applied area by area (sectionally).

CAUTIONS

- This table is applicable for the use of Type I holdover time guidelines in all conditions, including active frost. If holdover times are not required, a temperature of 60 °C (140 °F) at the nozzle is desirable.
- If holdover times are required, the temperature of water or fluid/water mixtures shall be at least 60 °C (140 °F) at the nozzle. Upper temperature limit shall not exceed fluid and aircraft manufacturers' recommendations.
- To use Type I Holdover Times Guidelines in all conditions including active frost, an additional minimum of 1 liter/m^2 (~2 gal./100 sq. ft.) of heated Type I fluid mixture must be applied to the surfaces after all frozen contamination is removed. This application is necessary to heat the surfaces, as heat contributes significantly to the Type I fluid holdover times. The required protection can be provided using a 1-step method by applying more fluid than is strictly needed to just remove all of the frozen contamination (the same additional amount stated above is required).
- The lowest operational use temperature (LOUT) for a given Type I fluid is the higher (warmer) of:
  a) The lowest temperature at which the fluid meets the aerodynamic acceptance test for a given aircraft type; or
  b) The actual freezing point of the fluid plus a freezing point buffer of 10 °C (18 °F).
- Wing skin temperatures may be colder or warmer than the OAT. Causes can include: radiation cooling, cold-soaked wing, or hangar storage. Consult the appropriate guidance (HOT Tables and FAA Ground Deicing General Information Document, Winter 2024-2025") for the contaminant in question.
- When conducting aircraft deicing using a Type I fluid and not using the 10 °C/18 °F buffer, procedures must be developed and approved to ensure refreezing does not occur prior to take-off.

TABLE 46: GUIDELINES FOR THE APPLICATION OF SAE TYPE II AND IV FLUID

(FLUID CONCENTRATIONS IN % VOLUME)

Outside Air Temperature (OAT)[1]	One-Step Procedure De/Anti-icing	Two-Step Procedure	
		First Step: Deicing	Second Step: Anti-icing[2]
0 °C (32 °F) and above	100/0, 75/25 or 50/50 Heated[3] Type II or IV fluid/water mixture	Heated water or a heated Type I, II, III, or IV fluid/water mixture	100/0, 75/25 or 50/50 Heated or unheated Type II or IV fluid/water mixture
Below 0 °C (32 °F) to -3 °C (27 °F)	100/0, 75/25 or 50/50 Heated[3] Type II or IV fluid/water mixture	Heated Type I, II, III, or IV fluid/water mixture with a freezing point at OAT or below	100/0, 75/25 or 50/50 Heated or unheated Type II or IV fluid/water mixture
Below -3 °C (27 °F) to -14 °C (7 °F)	100/0 or 75/25 Heated[3] Type II or IV fluid/water mixture	Heated Type I, II, III, or IV fluid/water mixture with a freezing point at OAT or below	100/0 or 75/25 Heated or unheated Type II or IV fluid/water mixture
Below -14 °C (7 °F) to LOUT	100/0 Heated[3] Type II or IV fluid	Heated Type I, II, III, or IV fluid/water mixture with a freezing point at OAT or below	100/0 Heated or unheated Type II or IV fluid

NOTES

1 Fluids used for the anti-icing procedure must not be used at temperatures below their lowest operational use temperature (LOUT). First step fluids must not be used below their freezing points. Consideration should be given to the use of Type I/III fluid when Type II/IV fluid cannot be used due to LOUT limitations (see Tables 55 and 57). The LOUT for a given Type II/IV fluid is the higher (warmer) of:

a) The lowest temperature at which the fluid meets the aerodynamic acceptance test for a given aircraft type; or
b) The actual freezing point of the fluid plus its freezing point buffer of 7 °C (13 °F).

Although some LOUTs are lower than the temperatures stated in the HOT table, holdover times do not apply when anti-icing below the lowest temperature stated in the band.

2 To be applied before first step fluid freezes, typically within 3 minutes. Time may be longer than 3 minutes in some conditions, but potentially shorter in heavy precipitation, colder temperatures, or for critical surfaces constructed of composite materials. If necessary, the second step shall be applied area by area (sectionally).

3 Clean aircraft may be anti-iced with unheated fluid.

CAUTIONS

- For heated fluids, a fluid temperature not less than 60 °C (140 °F) at the nozzle is desirable.
- Upper temperature limit shall not exceed fluid and aircraft manufacturers' recommendations.
- Wing skin temperatures may be colder or warmer than the OAT. Causes can include: radiation cooling, cold-soaked wing, or hangar storage. Consult the appropriate guidance (HOT Tables and FAA Ground Deicing General Information Document, Winter 2024-2025") for the contaminant in question.
- Whenever frost or ice occurs on the lower surface of the wing in the area of the fuel tank, indicating a cold-soaked wing, the 50/50 dilutions of Type II or IV shall not be used for the anti-icing step because fluid freezing may occur.
- An insufficient amount of anti-icing fluid may cause a substantial loss of holdover time. This is particularly true when using a Type I fluid mixture for the first step in a two-step procedure.
- When conducting aircraft deicing using a Type I fluid and not using the 10 °C/18 °F buffer, procedures must be developed and approved to ensure refreezing does not occur prior to take-off.

TABLE 47: GUIDELINES FOR THE APPLICATION OF UNHEATED SAE TYPE III FLUID

NOT APPLICABLE