

Transport Canada Holdover Time (HOT) Guidelines Winter 2009-2010

Original Issue, July 2009

This document should be used in conjunction with *Guidelines for Aircraft Ground-Icing Operations* (TP 14052E, second edition, April 2005).

The two documents complement each other and should be used together for a thorough understanding of the subject matter.

CHANGE CONTROL RECORDS

This page indicates any changes made to individual pages within the document. Changed pages have the appropriate revision date in the footer. Sidebars are shown to assist in identifying where the changes have been made on these pages.

It is the responsibility of the end user to periodically check the following website for updates on Holdover Time Guidelines:

<http://www.tc.gc.ca/CivilAviation/commerce/HoldoverTime/menu.htm>.

<i>REVISION</i>	<i>DATE</i>	<i>DESCRIPTION OF CHANGES</i>	<i>AFFECTED PAGES</i>	<i>AUTHOR</i>

OBSOLETE

SUMMARY OF CHANGES FROM PREVIOUS YEAR

The principal changes from the previous year are briefly indicated herein.

Type I Fluid

- The Type I holdover time guideline values are unchanged; however, the Type I active frost holdover times have been moved to the new active frost holdover time table (see below).

Type II Fluid

- A fluid-specific table has been created for one new Type II fluid, Aviation Shaanxi Hi-Tech Cleanwing II. The addition of this fluid did not impact the generic holdover times.
- Aviation Xi'an Hi-Tech KHF-II has been removed from the Type II guidelines due to ongoing concerns with fluid viscosity. The manufacturer had indicated intentions to requalify the fluid at a higher viscosity; however, the related aerodynamic test results were not provided to Transport Canada. The removal of this fluid did not impact the Type II generic holdover times.
- Kilfrost ABC-II Plus has been removed from the Type II guidelines as per the protocol for removing obsolete data. Removal of this fluid resulted in three increases to the Type II generic holdover times: two in freezing fog and one in freezing drizzle.
- All Type IV fluids also qualify as Type II fluids and therefore the Type II generic holdover times are the lowest holdover times of all Type II and Type IV fluids. A reduction has been made to one Type II generic freezing fog value as a result of a Type IV fluid having a shorter holdover time than any Type II fluid.
- The Type II active frost holdover times have been moved from the Type II holdover time tables to the new active frost holdover time table (see below).
- The *below -25°C* row has been removed from all Type II holdover time tables. In its place, the *below -14 to -25°C* row has been modified to *below -14 to -25°C or LOUT*. Unless the user verifies a lowest operational use temperature (LOUT) below -25°C, the holdover times apply down to -25°C only.

Type III Fluid

- The Type III holdover time guideline values are unchanged; however, the Type III active frost holdover times have been moved to the new active frost holdover time table (see below).

Type IV Fluid

- Fluid-specific tables have been created for two new Type IV fluids: ABAX Ecowing AD-49 and Kilfrost ABC-4^{sustain}. Kilfrost ABC-4^{sustain} is currently in the qualification process. The addition of ABAX Ecowing AD-49 did not impact the generic holdover times; the addition of Kilfrost ABC-4^{sustain} caused one reduction to the generic holdover times, in freezing fog.
- The Type IV active frost holdover times have been moved from the Type IV holdover time tables to the new active frost holdover time table (see below).
- The *below -25°C* row has been removed from all Type IV holdover time tables. In its place, the *below -14 to -25°C* row has been modified to *below -14 to -25°C or LOUT*. Unless the user verifies a lowest operational use temperature (LOUT) below -25°C, the holdover times apply down to -25°C only.

Holdover Times in Active Frost Conditions

- The active frost holdover times have been moved from the generic and fluid-specific tables to a new active frost holdover time table. Type I and Type III active frost holdover times remain the same; reductions have been made to some Type II and Type IV values as a result of several years of research indicating lower values are required.

Holdover Times in Light Snow Mixed with Light Rain

- Recent tests have shown that light freezing rain holdover times can be used in conditions of light snow mixed with light rain. A note to this effect has been added to all Type I, Type II, Type III and Type IV holdover time tables.

Operations during Ice Pellet Conditions

- Further research has been conducted this year to expand and modify the guidance material for operations during ice pellet conditions. Specifically, changes have been made to include guidance for operations in light ice pellets mixed with moderate rain and to expand the guidance for operations in light ice pellets mixed with light or moderate snow.

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CHANGES TO *Guidelines for Aircraft Ground-Icing Operations* (TP 14052E, second ed., April 2005)

The following changes will be incorporated into TP 14052E at its next revision. They are recorded here in advance due to the longer life cycle time associated with the updating and publication of TP 14052E and are for immediate use.

Replace Sub-Paragraph 10.11, “Applying Anti-Icing Fluid in a Hangar”, with the following:

There are operational conditions when Air Operators may choose to anti-ice their aircraft while the aircraft remains in a heated hangar. This is one way to reduce the consumption of deicing fluid and to minimize the environmental impact of deicing.

The period of time after Type IV fluid application and the air temperature in the hangar both have an effect on the ability of the fluid to protect the aircraft when it is pulled out of the hangar and into freezing/frozen precipitation. The HOT for a fluid is based largely upon the fluid’s thickness on the surface. The fluid thickness varies with time and temperature. Therefore, the holdover time clock must be started at the time of first application of anti-icing fluid onto a clean wing. It may not be started when the aircraft is first exposed to frozen precipitation.

Replace Sub-Paragraph 10.12.1 (5th paragraph), “Brooms”, with the following:

Using the wing broom to remove contamination does not always mean that the wing surface is clean and safe for flight. Every time a broom is used to remove contamination, a tactile inspection must be performed.

Replace Sub-Paragraph 10.13.3, “Hot Water”, with the following:

Hot water may be used to remove large amounts of contamination (such as ice) from an aircraft, provided that the Outside Air Temperature is -3°C and above as per the application procedures for SAE Type I and SAE Type II, III and IV fluids described in tables 6 & 7 of the Transport Canada HOT Guidelines document.

Delete Sub-Paragraph 10.13.3.1 Item g) only.

Replace entire contents of 10.13.5 to 10.13.5.4 with the following:

10.13.5 Ground Ice Detection Systems (GIDS)

The development of ground ice detection sensors has been stimulated by the difficulty in determining whether an aircraft is free of frozen contaminants prior to takeoff. Humans have a limited ability to accurately evaluate the condition of an aircraft’s critical surface during ground icing operations. Impediments to ensuring the aircraft is free of frozen contaminants include poor lighting conditions, visibility restrictions due to blowing snow, and the difficulty in determining whether clear ice is present.

For the purposes of this document, these sensors are referred to as Remote on Ground Ice Detection Systems (ROGIDS). A Minimum Operational Performance Specification (MOPS) for these systems is identified in SAE document AS 5681.

Air Operators and/or service providers seeking authorization to incorporate ROGIDS into their operations should consult Transport Canada Advisory Circular AC 602-001, “Operational Use of Remote on Ground Ice Detection Systems (ROGIDS) for Post De-Icing Applications”. This document is available at the following website:

<http://www.tc.gc.ca/CivilAviation/IMSdoc/ACs/600/602-001.htm>

Add the following sentence immediately before the example of Sub-Paragraph 11.1.4.1.a “Estimating the Precipitation Rate”:

This estimate applies to all fluid Types I, II, III, and IV.

Replace Sub-Paragraph 11.1.5, “Elapsed time is less than the lowest time in the HOT cell”, with the following:

Transport Canada has previously considered that, under an approved ground icing program, if the lowest time in a cell has NOT been exceeded for conditions covered by the Guidelines, there is no requirement to inspect the aircraft’s critical surfaces prior to commencing a takeoff.

This position was based on evidence gained during fluids testing. The HOT values are conservative for the lowest number in the cell, if:

- a) The conditions present are NOT in excess of those conditions represented by the table (e.g. for snow, it would be a moderate snow condition); and
- b) The impact of other factors (e.g. jet blast) has been considered and deemed not to affect the HOT.

If there is doubt surrounding the conditions associated with using the lowest time as decision-making criteria, an inspection prior to takeoff would be prudent. This inspection should be conducted in accordance with the procedures described in the Air Operator’s Approved Ground Icing Program.

Replace Paragraph 11.1.8 with the following:

The HOT Guidelines do not include guidelines for all meteorological conditions.

Holdover time guidelines have not been assessed for the following conditions: a) Snow Pellets; b) Hail; c) Moderate and Heavy Freezing Rain; and d) Heavy Snow.

Notes: Operators need to assess whether operations can be safely conducted under these conditions.

Additionally, holdover time guidelines have not been assessed for ice pellets, since a formal protocol for ice pellet testing has not yet been developed and included in standard SAE testing methodologies and no visual failure criteria have yet been identified for ice pellet conditions. Instead, an allowance time based upon research has been developed for operations during ice pellet conditions.

Add Paragraph 11.1.12: Type I HOT Guidelines for Aircraft with Critical Surfaces Constructed Using Composite Materials

Preliminary research has shown that for aircraft with large portions of critical surfaces constructed using composite materials, Type I fluid holdover times could be shorter by up to 30% as compared to the current holdover times. Further testing is expected to develop Type I holdover times specific for aircraft with critical surfaces constructed using composite materials.

Replace Paragraph 12.1.2 with the following:

Holdover time guidelines have not been assessed for ice pellets, since a formal protocol for ice pellet testing has not yet been developed and included in standard SAE testing methodologies and no visual failure criteria have been identified for ice pellet conditions.

However, comprehensive ice pellet research was conducted jointly by the research teams of the FAA and Transport Canada. This research consisted of extensive climatic chamber, wind tunnel, and live aircraft testing with ice pellets (light and moderate) and light ice pellets mixed with other forms of precipitation. Results of this research provide the basis for allowance times for operations in light and moderate ice pellets, as well as allowance times for operations in light ice pellets mixed with other forms of precipitation.

HOLDOVER TIME (HOT) GUIDELINES FOR WINTER 2009-2010

Table 0	Active Frost Holdover Guidelines
Table 1	SAE Type I Fluid Holdover Guidelines
Table 2-Generic	SAE Type II Fluid Holdover Guidelines
Table 2-A-E26	ABAX Type II Fluid Holdover Guidelines Ecowing 26
Table 2-AS-Cleanwing II	Aviation Shaanxi Hi-Tech Type II Fluid Holdover Guidelines Cleanwing II
Table 2-C-2025	Clariant Type II Fluid Holdover Guidelines Safewing MP II 2025 ECO
Table 2-C-Flight	Clariant Type II Fluid Holdover Guidelines Safewing MP II Flight
Table 2-K-ABC-2000	Kilfrost Type II Fluid Holdover Guidelines ABC-2000
Table 2-K-ABC-K+	Kilfrost Type II Fluid Holdover Guidelines ABC-K PLUS
Table 2-N-FCY-2	Newave Aerochemical Type II Fluid Holdover Guidelines FCY-2
Table 2-O-EM-II	Octagon Type II Fluid Holdover Guidelines E Max II
Table 3	SAE Type III Fluid Holdover Guidelines
Table 4-Generic	SAE Type IV Fluid Holdover Guidelines
Table 4-A-AD-480	ABAX Type IV Fluid Holdover Guidelines AD-480
Table 4-A-Ecowing AD-49	ABAX Type IV Fluid Holdover Guidelines Ecowing AD-49
Table 4-C-2001	Clariant Type IV Fluid Holdover Guidelines Safewing MP IV 2001
Table 4-C-2012	Clariant Type IV Fluid Holdover Guidelines Safewing MP IV 2012 Protect
Table 4-C-Launch	Clariant Type IV Fluid Holdover Guidelines Safewing MP IV Launch
Table 4-D-ULTRA+	Dow Chemical Type IV Fluid Holdover Guidelines UCAR™ ADF/AAF ULTRA+
Table 4-D-E106	Dow Chemical Type IV Fluid Holdover Guidelines UCAR™ Endurance EG106
Table 4-D-AD-480	Dow Chemical Type IV Fluid Holdover Guidelines UCAR™ FlightGuard AD-480
Table 4-K-ABC-4 ^{sustain}	Kilfrost Type IV Fluid Holdover Guidelines ABC-4 ^{sustain}
Table 4-K-ABC-S	Kilfrost Type IV Fluid Holdover Guidelines ABC-S
Table 4-K-ABC-S PLUS	Kilfrost Type IV Fluid Holdover Guidelines ABC-S PLUS
Table 4-L-ARCTIC Shield	Lyondell Type IV Fluid Holdover Guidelines ARCTIC Shield™
Table 4-O-MF	Octagon Type IV Fluid Holdover Guidelines Max-Flight
Table 4-O-MF-04	Octagon Type IV Fluid Holdover Guidelines Max-Flight 04
Table 4-O-MFLO	Octagon Type IV Fluid Holdover Guidelines MaxFlo
Table 5	Currently Qualified Fluids
Table 6	SAE Type I Deicing Fluid Application Procedures
Table 7	SAE Type II, Type III and Type IV Anti-Icing Fluid Application Procedures
Table 8	Visibility in Snow vs. Snowfall Intensity Chart
Table 9	Lowest On-Wing Viscosity Values for Anti-Icing Fluids
Table 10	Ice Pellet Allowance Times

TABLE 0

ACTIVE FROST HOLDOVER GUIDELINES FOR WINTER 2009-2010

THE RESPONSIBILITY FOR THE APPLICATION OF THESE DATA REMAINS WITH THE USER

Outside Air Temperature		Concentration Neat Fluid/Water (Volume %/Volume %)	Approximate Holdover Times (hours:minutes)			
			Active Frost			
Degrees Celsius	Degrees Fahrenheit		Type I ^{1,2}	Type II	Type III	Type IV
above -1	above 30	100/0	0:45	8:00	2:00	12:00
		75/25		5:00	1:00	5:00
		50/50		3:00	0:30	3:00
below -1 to -3	below 30 to 27	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	below 27 to 14	100/0		8:00	2:00	10:00
		75/25		5:00	1:00	5:00
below -10 to -14	below 14 to 7	100/0		6:00	2:00	6:00
		75/25		1:00	1:00	1:00
below -14 to -21	below 7 to -6	100/0	6:00	2:00	6:00	
		below -21 to -25	below -6 to -13	100/0	2:00	2:00

NOTES

- 1 Type I Fluid / Water Mixture is selected so that the freezing point of the mixture is at least 10°C (18°F) below outside air temperature.
- 2 May be used below -25°C (-13°F) provided the lowest operational use temperature (LOUT) of the fluid is respected.

CAUTIONS

- Fluids used during ground deicing/anti-icing do not provide in-flight icing protection.

TABLE 1

SAE TYPE I³ FLUID HOLDOVER GUIDELINES FOR WINTER 2009-2010

THE RESPONSIBILITY FOR THE APPLICATION OF THESE DATA REMAINS WITH THE USER

Outside Air Temperature ⁵		Approximate Holdover Times Under Various Weather Conditions (minutes)							
Degrees Celsius	Degrees Fahrenheit	Freezing Fog	Snow or Snow Grains ¹			Freezing Drizzle ⁴	Light Freezing Rain	Rain on Cold Soaked Wing	Other ²
			Very Light ⁶	Light ⁶	Moderate				
-3 and above	27 and above	11 – 17	18	11 – 18	6 – 11	9 – 13	4 – 6	2 – 5	CAUTION: No holdover time guidelines exist
below -3 to -6	below 27 to 21	8 – 13	14	8 – 14	5 – 8	5 – 9	4 – 6		
below -6 to -10	below 21 to 14	6 – 10	11	6 – 11	4 – 6	4 – 7	2 – 5		
Below -10	below 14	5 – 9	7	4 – 7	2 – 4				

NOTES

- 1 To use these times, the fluid must be heated to a minimum temperature providing 60°C (140°F) at the nozzle and an average rate of at least 1 litre/m² (2 gal./100 sq. ft.) must be applied to deiced surfaces, OTHERWISE TIMES WILL BE SHORTER.
- 2 Heavy snow, snow pellets, ice pellets, moderate and heavy freezing rain, and hail.
- 3 Type I Fluid / Water Mixture is selected so that the freezing point of the mixture is at least 10°C (18°F) below outside air temperature.
- 4 Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
- 5 Ensure that the lowest operational use temperature (LOUT) is respected.
- 6 Use light freezing rain holdover times in conditions of light snow mixed with light rain.

CAUTIONS

- The only acceptable decision-making criterion, for takeoff without a pre-takeoff contamination inspection, is the shorter time within the applicable holdover time table cell.
- 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.
- Holdover time may be reduced when aircraft skin temperature is lower than outside air temperature.
- Fluids used during ground deicing/anti-icing do not provide in-flight icing protection.

TABLE 2-Generic

SAE TYPE II FLUID HOLDOVER GUIDELINES FOR WINTER 2009-2010¹

THE RESPONSIBILITY FOR THE APPLICATION OF THESE DATA REMAINS WITH THE USER

Outside Air Temperature		Type II Fluid Concentration Neat Fluid/Water (Volume %/Volume %)	Approximate Holdover Times Under Various Weather Conditions (hours:minutes)					
Degrees Celsius	Degrees Fahrenheit		Freezing Fog	Snow or Snow Grains ⁶	Freezing Drizzle ⁴	Light Freezing Rain	Rain on Cold Soaked Wing	Other ²
-3 and above	27 and above	100/0	0:35 – 1:30	0:20 – 0:45	0:30 – 0:55	0:15 – 0:30	0:05 – 0:40	CAUTION: No holdover time guidelines exist
		75/25	0:25 – 1:00	0:15 – 0:30	0:20 – 0:45	0:10 – 0:25	0:05 – 0:25	
		50/50	0:15 – 0:30	0:05 – 0:15	0:05 – 0:15	0:05 – 0:10		
below -3 to -14	below 27 to 7	100/0	0:20 – 1:05	0:15 – 0:30	0:20 – 0:45 ³	0:10 – 0:20 ³		
		75/25	0:25 – 0:50	0:10 – 0:20	0:15 – 0:30 ³	0:05 – 0:15 ³		
below -14 to -25 or LOU ⁵	below 7 to -13 or LOU ⁵	100/0	0:15 – 0:35 ⁵	0:15 – 0:30 ⁵				

NOTES

- 1 Based on the lowest holdover times of the fluids listed in Table 5-2 and Table 5-4.
- 2 Heavy snow, snow pellets, ice pellets, moderate and heavy freezing rain, and hail.
- 3 These holdover times only apply to outside air temperatures to -10°C (14°F) under freezing drizzle and light freezing rain.
- 4 Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
- 5 Ensure that the lowest operational use temperature (LOU) is respected. Consider use of Type I when Type II fluid cannot be used.
- 6 Use light freezing rain holdover times in conditions of light snow mixed with light rain.

CAUTIONS

- The only acceptable decision-making criterion, for takeoff without a pre-takeoff contamination inspection, is the shorter time within the applicable holdover time table cell.
- 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.
- Holdover time may be reduced when aircraft skin temperature is lower than outside air temperature.
- Fluids used during ground deicing/anti-icing do not provide in-flight icing protection.

TABLE 2-A-E26

ABAX TYPE II FLUID HOLDOVER GUIDELINES FOR WINTER 2009-2010¹
ECOWING 26

THE RESPONSIBILITY FOR THE APPLICATION OF THESE DATA REMAINS WITH THE USER

Outside Air Temperature		Type II Fluid Concentration Neat Fluid/Water (Volume %/Volume %)	Approximate Holdover Times Under Various Weather Conditions (hours:minutes)					
Degrees Celsius	Degrees Fahrenheit		Freezing Fog	Snow or Snow Grains ⁶	Freezing Drizzle ⁴	Light Freezing Rain	Rain on Cold Soaked Wing	Other ²
-3 and above	27 and above	100/0	1:25 – 2:35	0:40 – 1:00	0:50 – 1:35	0:40 – 0:50	0:20 – 1:25	CAUTION: No holdover time guidelines exist
		75/25	1:05 – 1:55	0:25 – 0:45	0:45 – 1:05	0:25 – 0:35	0:10 – 1:00	
		50/50	0:30 – 0:45	0:10 – 0:20	0:15 – 0:25	0:05 – 0:10		
below -3 to -14	below 27 to 7	100/0	0:45 – 2:15	0:35 – 0:55	0:30 – 1:10 ³	0:15 – 0:35 ³		
		75/25	0:35 – 1:15	0:25 – 0:40	0:20 – 0:50 ³	0:15 – 0:25 ³		
below -14 to -25 or LOU ⁵	below 7 to -13 or LOU ⁵	100/0	0:25 – 0:45 ⁵	0:15 – 0:30 ⁵				

NOTES

- 1 These holdover times are derived from tests of this fluid having a viscosity as listed in Table 9.
- 2 Heavy snow, snow pellets, ice pellets, moderate and heavy freezing rain, and hail.
- 3 These holdover times only apply to outside air temperatures to -10°C (14°F) under freezing drizzle and light freezing rain.
- 4 Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
- 5 Ensure that the lowest operational use temperature (LOU) is respected. Consider use of Type I when Type II fluid cannot be used.
- 6 Use light freezing rain holdover times in conditions of light snow mixed with light rain.

CAUTIONS

- The only acceptable decision-making criterion, for takeoff without a pre-takeoff contamination inspection, is the shorter time within the applicable holdover time table cell.
- 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.
- Holdover time may be reduced when aircraft skin temperature is lower than outside air temperature.
- Fluids used during ground deicing/anti-icing do not provide in-flight icing protection.

TABLE 2-AS-CLEANWING II

AVIATION SHAANXI HI-TECH TYPE II FLUID HOLDOVER GUIDELINES FOR WINTER 2009-2010¹
CLEANWING II

THE RESPONSIBILITY FOR THE APPLICATION OF THESE DATA REMAINS WITH THE USER

Outside Air Temperature		Type II Fluid Concentration Neat Fluid/Water (Volume %/Volume %)	Approximate Holdover Times Under Various Weather Conditions (hours:minutes)					
Degrees Celsius	Degrees Fahrenheit		Freezing Fog	Snow or Snow Grains ⁶	Freezing Drizzle ⁴	Light Freezing Rain	Rain on Cold Soaked Wing	Other ²
-3 and above	27 and above	100/0	0:55 – 1:50	0:30 – 0:55	0:35 – 1:05	0:25 – 0:35	0:10 – 0:55	CAUTION: No holdover time guidelines exist
		75/25	0:50 – 1:20	0:25 – 0:45	0:35 – 1:00	0:20 – 0:30	0:05 – 0:50	
		50/50	0:35 – 1:00	0:15 – 0:30	0:20 – 0:40	0:10 – 0:20		
below -3 to -14	below 27 to 7	100/0	0:45 – 1:50	0:30 – 0:55	0:30 – 0:55 ³	0:20 – 0:25 ³		
		75/25	0:40 – 1:45	0:25 – 0:45	0:35 – 0:40 ³	0:20 – 0:25 ³		
below -14 to -25 or LOU ⁵	below 7 to -13 or LOU ⁵	100/0	0:20 – 0:50 ⁵	0:15 – 0:30 ⁵				

NOTES

- 1 These holdover times are derived from tests of this fluid having a viscosity as listed in Table 9.
- 2 Heavy snow, snow pellets, ice pellets, moderate and heavy freezing rain, and hail.
- 3 These holdover times only apply to outside air temperatures to -10°C (14°F) under freezing drizzle and light freezing rain.
- 4 Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
- 5 Ensure that the lowest operational use temperature (LOU) is respected. Consider use of Type I when Type II fluid cannot be used.
- 6 Use light freezing rain holdover times in conditions of light snow mixed with light rain.

CAUTIONS

- The only acceptable decision-making criterion, for takeoff without a pre-takeoff contamination inspection, is the shorter time within the applicable holdover time table cell.
- 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.
- Holdover time may be reduced when aircraft skin temperature is lower than outside air temperature.
- Fluids used during ground deicing/anti-icing do not provide in-flight icing protection.

TABLE 2-C-2025

CLARIANT TYPE II FLUID HOLDOVER GUIDELINES FOR WINTER 2009-2010¹
SAFWING MP II 2025 ECO

THE RESPONSIBILITY FOR THE APPLICATION OF THESE DATA REMAINS WITH THE USER

Outside Air Temperature		Type II Fluid Concentration Neat Fluid/Water (Volume %/Volume %)	Approximate Holdover Times Under Various Weather Conditions (hours:minutes)					
Degrees Celsius	Degrees Fahrenheit		Freezing Fog	Snow or Snow Grains ⁶	Freezing Drizzle ⁴	Light Freezing Rain	Rain on Cold Soaked Wing	Other ²
-3 and above	27 and above	100/0	1:30 – 2:05	0:40 – 1:10	0:40 – 1:00	0:25 – 0:35	0:10 – 1:15	CAUTION: No holdover time guidelines exist
		75/25	0:55 – 1:45	0:25 – 0:45	0:25 – 0:45	0:20 – 0:25	0:05 – 0:50	
		50/50	0:20 – 0:35	0:05 – 0:15	0:10 – 0:15	0:05 – 0:10		
below -3 to -14	below 27 to 7	100/0	0:45 – 1:50	0:35 – 1:00	0:35 – 1:05 ³	0:20 – 0:35 ³		
		75/25	0:40 – 1:20	0:25 – 0:45	0:30 – 0:40 ³	0:15 – 0:25 ³		
below -14 to -25 or LOU ⁵	below 7 to -13 or LOU ⁵	100/0	0:25 – 0:45 ⁵	0:15 – 0:30 ⁵				

NOTES

- 1 These holdover times are derived from tests of this fluid having a viscosity as listed in Table 9.
- 2 Heavy snow, snow pellets, ice pellets, moderate and heavy freezing rain, and hail.
- 3 These holdover times only apply to outside air temperatures to -10°C (14°F) under freezing drizzle and light freezing rain.
- 4 Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
- 5 Ensure that the lowest operational use temperature (LOU) is respected. Consider use of Type I when Type II fluid cannot be used.
- 6 Use light freezing rain holdover times in conditions of light snow mixed with light rain.

CAUTIONS

- The only acceptable decision-making criterion, for takeoff without a pre-takeoff contamination inspection, is the shorter time within the applicable holdover time table cell.
- 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.
- Holdover time may be reduced when aircraft skin temperature is lower than outside air temperature.
- Fluids used during ground deicing/anti-icing do not provide in-flight icing protection.

TABLE 2-C-Flight

CLARIANT TYPE II FLUID HOLDOVER GUIDELINES FOR WINTER 2009-2010¹
SAFWING MP II FLIGHT

THE RESPONSIBILITY FOR THE APPLICATION OF THESE DATA REMAINS WITH THE USER

Outside Air Temperature		Type II Fluid Concentration Neat Fluid/Water (Volume %/Volume %)	Approximate Holdover Times Under Various Weather Conditions (hours:minutes)					
Degrees Celsius	Degrees Fahrenheit		Freezing Fog	Snow or Snow Grains ⁶	Freezing Drizzle ⁴	Light Freezing Rain	Rain on Cold Soaked Wing	Other ²
-3 and above	27 and above	100/0	3:30 – 4:00	1:00 – 1:35	1:20 – 2:00	0:45 – 1:25	0:10 – 1:30	CAUTION: No holdover time guidelines exist
		75/25	2:30 – 4:00	0:40 – 1:20	1:15 – 2:00	0:30 – 0:55	0:05 – 1:20	
		50/50	0:55 – 1:45	0:10 – 0:25	0:20 – 0:30	0:10 – 0:15		
below -3 to -14	below 27 to 7	100/0	0:55 – 1:45	0:40 – 1:05	0:35 – 1:30 ³	0:25 – 0:45 ³		
		75/25	0:40 – 1:10	0:20 – 0:40	0:25 – 1:10 ³	0:30 – 0:40 ³		
below -14 to -25 or LOU ⁵	below 7 to -13 or LOU ⁵	100/0	0:30 – 0:50 ⁵	0:15 – 0:30 ⁵				

NOTES

- 1 These holdover times are derived from tests of this fluid having a viscosity as listed in Table 9.
- 2 Heavy snow, snow pellets, ice pellets, moderate and heavy freezing rain, and hail.
- 3 These holdover times only apply to outside air temperatures to -10°C (14°F) under freezing drizzle and light freezing rain.
- 4 Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
- 5 Ensure that the lowest operational use temperature (LOU) is respected. Consider use of Type I when Type II fluid cannot be used.
- 6 Use light freezing rain holdover times in conditions of light snow mixed with light rain.

CAUTIONS

- The only acceptable decision-making criterion, for takeoff without a pre-takeoff contamination inspection, is the shorter time within the applicable holdover time table cell.
- 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.
- Holdover time may be reduced when aircraft skin temperature is lower than outside air temperature.
- Fluids used during ground deicing/anti-icing do not provide in-flight icing protection.

TABLE 2-K-ABC-2000

KILFROST TYPE II FLUID HOLDOVER GUIDELINES FOR WINTER 2009-2010¹
ABC-2000

THE RESPONSIBILITY FOR THE APPLICATION OF THESE DATA REMAINS WITH THE USER

Outside Air Temperature		Type II Fluid Concentration Neat Fluid/Water (Volume %/Volume %)	Approximate Holdover Times Under Various Weather Conditions (hours:minutes)					
Degrees Celsius	Degrees Fahrenheit		Freezing Fog	Snow or Snow Grains ⁶	Freezing Drizzle ⁴	Light Freezing Rain	Rain on Cold Soaked Wing	Other ²
-3 and above	27 and above	100/0	1:30 – 3:05	0:30 – 1:00	0:55 – 1:35	0:40 – 0:50	0:15 – 1:10	CAUTION: No holdover time guidelines exist
		75/25	1:40 – 3:30	0:30 – 1:05	0:45 – 1:15	0:40 – 0:50	0:15 – 1:40	
		50/50	1:00 – 2:10	0:15 – 0:30	0:15 – 0:25	0:05 – 0:15		
below -3 to -14	below 27 to 7	100/0	0:35 – 1:25	0:25 – 0:45	0:25 – 0:50 ³	0:10 – 0:30 ³		
		75/25	0:35 – 1:15	0:25 – 0:50	0:25 – 0:55 ³	0:15 – 0:30 ³		
below -14 to -25 or LOU ⁵	below 7 to -13 or LOU ⁵	100/0	0:20 – 0:45 ⁵	0:15 – 0:30 ⁵				

NOTES

- 1 These holdover times are derived from tests of this fluid having a viscosity as listed in Table 9.
- 2 Heavy snow, snow pellets, ice pellets, moderate and heavy freezing rain, and hail.
- 3 These holdover times only apply to outside air temperatures to -10°C (14°F) under freezing drizzle and light freezing rain.
- 4 Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
- 5 Ensure that the lowest operational use temperature (LOU) is respected. Consider use of Type I when Type II fluid cannot be used.
- 6 Use light freezing rain holdover times in conditions of light snow mixed with light rain.

CAUTIONS

- The only acceptable decision-making criterion, for takeoff without a pre-takeoff contamination inspection, is the shorter time within the applicable holdover time table cell.
- 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.
- Holdover time may be reduced when aircraft skin temperature is lower than outside air temperature.
- Fluids used during ground deicing/anti-icing do not provide in-flight icing protection.

TABLE 2-K-ABC-K+

**KILFROST TYPE II FLUID HOLDOVER GUIDELINES FOR WINTER 2009-2010¹
ABC-K PLUS**

THE RESPONSIBILITY FOR THE APPLICATION OF THESE DATA REMAINS WITH THE USER

Outside Air Temperature		Type II Fluid Concentration Neat Fluid/Water (Volume %/Volume %)	Approximate Holdover Times Under Various Weather Conditions (hours:minutes)					
Degrees Celsius	Degrees Fahrenheit		Freezing Fog	Snow or Snow Grains ⁶	Freezing Drizzle ⁴	Light Freezing Rain	Rain on Cold Soaked Wing	Other ²
-3 and above	27 and above	100/0	2:15 – 3:45	1:00 – 1:40	1:50 – 2:00	1:00 – 1:25	0:20 – 2:00	CAUTION: No holdover time guidelines exist
		75/25	1:40 – 2:30	0:35 – 1:10	1:25 – 2:00	0:50 – 1:10	0:15 – 2:00	
		50/50	0:35 – 1:05	0:05 – 0:15	0:20 – 0:30	0:10 – 0:15		
below -3 to -14	below 27 to 7	100/0	0:30 – 1:05	0:50 – 1:25	0:25 – 1:00 ³	0:15 – 0:35 ³		
		75/25	0:25 – 1:25	0:35 – 1:05	0:20 – 0:55 ³	0:05 – 0:30 ³		
below -14 to -25 or LOU ⁵	below 7 to -13 or LOU ⁵	100/0	0:30 – 0:55 ⁵	0:15 – 0:30 ⁵				

NOTES

- 1 These holdover times are derived from tests of this fluid having a viscosity as listed in Table 9.
- 2 Heavy snow, snow pellets, ice pellets, moderate and heavy freezing rain, and hail.
- 3 These holdover times only apply to outside air temperatures to -10°C (14°F) under freezing drizzle and light freezing rain.
- 4 Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
- 5 Ensure that the lowest operational use temperature (LOU) is respected. Consider use of Type I when Type II fluid cannot be used.
- 6 Use light freezing rain holdover times in conditions of light snow mixed with light rain.

CAUTIONS

- The only acceptable decision-making criterion, for takeoff without a pre-takeoff contamination inspection, is the shorter time within the applicable holdover time table cell.
- 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.
- Holdover time may be reduced when aircraft skin temperature is lower than outside air temperature.
- Fluids used during ground deicing/anti-icing do not provide in-flight icing protection.

TABLE 2-N-FCY-2

NEWAVE AEROCHEMICAL TYPE II FLUID HOLDOVER GUIDELINES FOR WINTER 2009-2010¹
FCY-2

THE RESPONSIBILITY FOR THE APPLICATION OF THESE DATA REMAINS WITH THE USER

Outside Air Temperature		Type II Fluid Concentration Neat Fluid/Water (Volume %/Volume %)	Approximate Holdover Times Under Various Weather Conditions (hours:minutes)					
Degrees Celsius	Degrees Fahrenheit		Freezing Fog	Snow or Snow Grains ⁶	Freezing Drizzle ⁴	Light Freezing Rain	Rain on Cold Soaked Wing	Other ²
-3 and above	27 and above	100/0	1:15 – 2:25	0:30 – 0:55	0:35 – 1:05	0:25 – 0:35	0:05 – 0:45	CAUTION: No holdover time guidelines exist
		75/25	0:50 – 1:30	0:20 – 0:40	0:25 – 0:45	0:15 – 0:25	0:05 – 0:25	
		50/50	0:25 – 0:35	0:15 – 0:25	0:10 – 0:20	0:05 – 0:10		
below -3 to -14	below 27 to 7	100/0	0:45 – 1:30	0:15 – 0:30	0:20 – 0:45 ³	0:15 – 0:20 ³		
		75/25	0:30 – 1:05	0:10 – 0:20	0:15 – 0:30 ³	0:05 – 0:15 ³		
below -14 to -25 or LOU ⁵	below 7 to -13 or LOU ⁵	100/0	0:25 – 0:35 ⁵	0:15 – 0:30 ⁵				

NOTES

- 1 These holdover times are derived from tests of this fluid having a viscosity as listed in Table 9.
- 2 Heavy snow, snow pellets, ice pellets, moderate and heavy freezing rain, and hail.
- 3 These holdover times only apply to outside air temperatures to -10°C (14°F) under freezing drizzle and light freezing rain.
- 4 Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
- 5 Ensure that the lowest operational use temperature (LOU) is respected. Consider use of Type I when Type II fluid cannot be used.
- 6 Use light freezing rain holdover times in conditions of light snow mixed with light rain.

CAUTIONS

- The only acceptable decision-making criterion, for takeoff without a pre-takeoff contamination inspection, is the shorter time within the applicable holdover time table cell.
- 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.
- Holdover time may be reduced when aircraft skin temperature is lower than outside air temperature.
- Fluids used during ground deicing/anti-icing do not provide in-flight icing protection.

TABLE 2-O-EM-II

OCTAGON TYPE II FLUID HOLDOVER GUIDELINES FOR WINTER 2009-2010¹
E MAX II

THE RESPONSIBILITY FOR THE APPLICATION OF THESE DATA REMAINS WITH THE USER

Outside Air Temperature		Type II Fluid Concentration Neat Fluid/Water (Volume %/Volume %)	Approximate Holdover Times Under Various Weather Conditions (hours:minutes)					
Degrees Celsius	Degrees Fahrenheit		Freezing Fog	Snow or Snow Grains ⁶	Freezing Drizzle ⁴	Light Freezing Rain	Rain on Cold Soaked Wing	Other ²
-3 and above	27 and above	100/0	2:05 – 3:45	0:40 – 1:20	0:45 – 1:35	0:30 – 0:40	0:15 – 1:30	CAUTION: No holdover time guidelines exist
		75/25	1:25 – 2:50	0:25 – 0:55	0:40 – 1:10	0:20 – 0:30	0:10 – 1:05	
		50/50	0:30 – 0:55	0:10 – 0:25	0:15 – 0:30	0:10 – 0:15		
below -3 to -14	below 27 to 7	100/0	0:50 – 1:45	0:35 – 1:10	0:35 – 1:00 ³	0:20 – 0:30 ³		
		75/25	0:30 – 1:20	0:25 – 0:50	0:35 – 1:05 ³	0:15 – 0:30 ³		
below -14 to -25 or LOU ⁵	below 7 to -13 or LOU ⁵	100/0	0:20 – 0:35 ⁵	0:15 – 0:30 ⁵				

NOTES

- 1 These holdover times are derived from tests of this fluid having a viscosity as listed in Table 9.
- 2 Heavy snow, snow pellets, ice pellets, moderate and heavy freezing rain, and hail.
- 3 These holdover times only apply to outside air temperatures to -10°C (14°F) under freezing drizzle and light freezing rain.
- 4 Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
- 5 Ensure that the lowest operational use temperature (LOU) is respected. Consider use of Type I when Type II fluid cannot be used.
- 6 Use light freezing rain holdover times in conditions of light snow mixed with light rain.

CAUTIONS

- The only acceptable decision-making criterion, for takeoff without a pre-takeoff contamination inspection, is the shorter time within the applicable holdover time table cell.
- 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.
- Holdover time may be reduced when aircraft skin temperature is lower than outside air temperature.
- Fluids used during ground deicing/anti-icing do not provide in-flight icing protection.

TABLE 3

SAE TYPE III FLUID HOLDOVER GUIDELINES FOR WINTER 2009-2010

THE RESPONSIBILITY FOR THE APPLICATION OF THESE DATA REMAINS WITH THE USER

Outside Air Temperature ³		Type III Fluid Concentration Neat Fluid/Water (Volume %/Volume %)	Approximate Holdover Times Under Various Weather Conditions (minutes)							
Degrees Celsius	Degrees Fahrenheit		Freezing Fog	Snow or Snow Grains			Freezing Drizzle ¹	Light Freezing Rain	Rain on Cold Soaked Wing	Other ²
				Very Light ⁴	Light ⁴	Moderate				
-3 and above	27 and above	100/0	20 – 40	35	20 – 35	10 – 20	10 – 20	8 – 10	6 – 20	CAUTION: No holdover time guidelines exist
		75/25	15 – 30	25	15 – 25	8 – 15	8 – 15	6 – 10	2 – 10	
		50/50	10 – 20	15	8 – 15	4 – 8	5 – 9	4 – 6		
below -3 to -10	below 27 to 14	100/0	20 – 40	30	15 – 30	9 – 15	10 – 20	8 – 10		
		75/25	15 – 30	25	10 – 25	7 – 10	9 – 12	6 – 9		
below -10	below 14	100/0	20 – 40	30	15 – 30	8 – 15				

NOTES

- 1 Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
- 2 Heavy snow, snow pellets, ice pellets, moderate and heavy freezing rain, and hail.
- 3 Ensure that the lowest operational use temperature (LOUT) is respected. Consider use of Type I when Type III fluid cannot be used.
- 4 Use light freezing rain holdover times in conditions of light snow mixed with light rain.

CAUTIONS

- The only acceptable decision-making criterion, for takeoff without a pre-takeoff contamination inspection, is the shorter time within the applicable holdover time table cell.
- High wind velocity or jet blast may reduce holdover time.
- Holdover time may be reduced when aircraft skin temperature is lower than outside air temperature.
- Fluids used during ground deicing/anti-icing do not provide in-flight icing protection.

TABLE 4-Generic

SAE TYPE IV FLUID HOLDOVER GUIDELINES FOR WINTER 2009-2010¹

THE RESPONSIBILITY FOR THE APPLICATION OF THESE DATA REMAINS WITH THE USER

Outside Air Temperature		Type IV Fluid Concentration Neat Fluid/Water (Volume %/Volume %)	Approximate Holdover Times Under Various Weather Conditions (hours:minutes)					
Degrees Celsius	Degrees Fahrenheit		Freezing Fog	Snow or Snow Grains ⁶	Freezing Drizzle ⁴	Light Freezing Rain	Rain on Cold Soaked Wing	Other ²
-3 and above	27 and above	100/0	1:15 – 2:30	0:35 – 1:15	0:40 – 1:10	0:25 – 0:40	0:10 – 1:05	CAUTION: No holdover time guidelines exist
		75/25	1:00 – 1:45	0:20 – 0:55	0:35 – 0:50	0:15 – 0:30	0:05 – 0:40	
		50/50	0:15 – 0:35	0:05 – 0:15	0:10 – 0:20	0:05 – 0:10		
below -3 to -14	below 27 to 7	100/0	0:20 – 1:20	0:20 – 0:40	0:20 – 0:45 ³	0:10 – 0:25 ³	CAUTION: No holdover time guidelines exist	
		75/25	0:25 – 0:50	0:15 – 0:35	0:15 – 0:30 ³	0:10 – 0:20 ³		
below -14 to -25 or LOUT ⁵	below 7 to -13 or LOUT ⁵	100/0	0:15 – 0:40 ⁵	0:15 – 0:30 ⁵				

NOTES

- 1 Based on the lowest holdover times of the fluids listed in Table 5-4.
- 2 Heavy snow, snow pellets, ice pellets, moderate and heavy freezing rain, and hail.
- 3 These holdover times only apply to outside air temperatures to -10°C (14°F) under freezing drizzle and light freezing rain.
- 4 Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
- 5 Ensure that the lowest operational use temperature (LOUT) is respected. Consider use of Type I when Type IV fluid cannot be used.
- 6 Use light freezing rain holdover times in conditions of light snow mixed with light rain.

CAUTIONS

- The only acceptable decision-making criterion, for takeoff without a pre-takeoff contamination inspection, is the shorter time within the applicable holdover time table cell.
- 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.
- Holdover time may be reduced when aircraft skin temperature is lower than outside air temperature.
- Fluids used during ground deicing/anti-icing do not provide in-flight icing protection.

TABLE 4-A-AD-480

**ABAX TYPE IV FLUID HOLDOVER GUIDELINES FOR WINTER 2009-2010¹
AD-480**

THE RESPONSIBILITY FOR THE APPLICATION OF THESE DATA REMAINS WITH THE USER

Outside Air Temperature		Type IV Fluid Concentration Neat Fluid/Water (Volume %/Volume %)	Approximate Holdover Times Under Various Weather Conditions (hours:minutes)					
Degrees Celsius	Degrees Fahrenheit		Freezing Fog	Snow or Snow Grains ⁶	Freezing Drizzle ⁴	Light Freezing Rain	Rain on Cold Soaked Wing	Other ²
-3 and above	27 and above	100/0	2:00 – 3:30	0:40 – 1:20	0:50 – 1:30	0:35 – 0:55	0:15 – 1:35	CAUTION: No holdover time guidelines exist
		75/25	1:30 – 2:45	0:30 – 1:05	0:50 – 1:15	0:30 – 0:45	0:10 – 1:15	
		50/50	0:30 – 0:45	0:10 – 0:20	0:15 – 0:25	0:05 – 0:15		
below -3 to -14	below 27 to 7	100/0	0:20 – 1:20	0:30 – 0:55	0:25 – 1:20 ³	0:15 – 0:30 ³		
		75/25	0:25 – 0:50	0:20 – 0:45	0:25 – 1:05 ³	0:15 – 0:30 ³		
below -14 to -25 or LOU ⁵	below -7 to -13 or LOU ⁵	100/0	0:15 – 0:40 ⁵	0:15 – 0:30 ⁵				

NOTES

- 1 These holdover times are derived from tests of this fluid having a viscosity as listed in Table 9.
- 2 Heavy snow, snow pellets, ice pellets, moderate and heavy freezing rain, and hail.
- 3 These holdover times only apply to outside air temperatures to -10°C (14°F) under freezing drizzle and light freezing rain.
- 4 Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
- 5 Ensure that the lowest operational use temperature (LOU) is respected. Consider use of Type I when Type IV fluid cannot be used.
- 6 Use light freezing rain holdover times in conditions of light snow mixed with light rain.

CAUTIONS

- The only acceptable decision-making criterion, for takeoff without a pre-takeoff contamination inspection, is the shorter time within the applicable holdover time table cell.
- 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.
- Holdover time may be reduced when aircraft skin temperature is lower than outside air temperature.
- Fluids used during ground deicing/anti-icing do not provide in-flight icing protection.

TABLE 4-A-Ecowing AD-49

ABAX TYPE IV FLUID HOLDOVER GUIDELINES FOR WINTER 2009-2010¹
ECOWING AD-49

THE RESPONSIBILITY FOR THE APPLICATION OF THESE DATA REMAINS WITH THE USER

Outside Air Temperature		Type IV Fluid Concentration Neat Fluid/Water (Volume %/Volume %)	Approximate Holdover Times Under Various Weather Conditions (hours:minutes)					
Degrees Celsius	Degrees Fahrenheit		Freezing Fog	Snow or Snow Grains ⁶	Freezing Drizzle ⁴	Light Freezing Rain	Rain on Cold Soaked Wing	Other ²
-3 and above	27 and above	100/0	3:20 – 4:00	1:10 – 1:50	1:25 – 2:00	1:00 – 1:25	0:10 – 1:55	CAUTION: No holdover time guidelines exist
		75/25	2:25 – 4:00	1:20 – 1:40	1:55 – 2:00	0:50 – 1:30	0:10 – 1:40	
		50/50	0:25 – 0:50	0:15 – 0:25	0:15 – 0:30	0:10 – 0:15		
below -3 to -14	below 27 to 7	100/0	0:20 – 1:35	1:10 – 1:50	0:25 – 1:25 ³	0:20 – 0:25 ³		
		75/25	0:30 – 1:10	1:20 – 1:40	0:15 – 1:05 ³	0:15 – 0:25 ³		
below -14 to -25 or LOU ⁵	below -7 to -13 or LOU ⁵	100/0	0:25 – 0:40 ⁵	0:15 – 0:30 ⁵				

NOTES

- 1 These holdover times are derived from tests of this fluid having a viscosity as listed in Table 9.
- 2 Heavy snow, snow pellets, ice pellets, moderate and heavy freezing rain, and hail.
- 3 These holdover times only apply to outside air temperatures to -10°C (14°F) under freezing drizzle and light freezing rain.
- 4 Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
- 5 Ensure that the lowest operational use temperature (LOU) is respected. Consider use of Type I when Type IV cannot be used.
- 6 Use light freezing rain holdover times in conditions of light snow mixed with light rain.

CAUTIONS

- The only acceptable decision-making criterion, for takeoff without a pre-takeoff contamination inspection, is the shorter time within the applicable holdover time table cell.
- 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.
- Holdover time may be reduced when aircraft skin temperature is lower than outside air temperature.
- Fluids used during ground deicing/anti-icing do not provide in-flight icing protection.

TABLE 4-C-2001

CLARIANT TYPE IV FLUID HOLDOVER GUIDELINES FOR WINTER 2009-2010¹
SAFWING MP IV 2001

THE RESPONSIBILITY FOR THE APPLICATION OF THESE DATA REMAINS WITH THE USER

Outside Air Temperature		Type IV Fluid Concentration Neat Fluid/Water (Volume %/Volume %)	Approximate Holdover Times Under Various Weather Conditions (hours:minutes)						
Degrees Celsius	Degrees Fahrenheit		Freezing Fog	Snow or Snow Grains ⁶	Freezing Drizzle ⁴	Light Freezing Rain	Rain on Cold Soaked Wing	Other ²	
-3 and above	27 and above	100/0	1:20 – 3:20	1:00 – 1:55	0:55 – 1:55	0:40 – 1:00	0:15 – 2:00		
		75/25	1:20 – 2:00	0:35 – 1:00	0:35 – 1:10	0:25 – 0:35			0:10 – 1:25
		50/50	0:15 – 0:40	0:10 – 0:20	0:10 – 0:20	0:05 – 0:15			
below -3 to -14	below 27 to 7	100/0	0:45 – 1:35	0:30 – 0:50	0:55 – 1:35 ³	0:30 – 0:45 ³			
		75/25	0:30 – 1:00	0:20 – 0:35	0:40 – 1:10 ³	0:20 – 0:30 ³			
below -14 to -25 or LOU ⁵	below 7 to -13 or LOU ⁵	100/0	0:20 – 0:45 ⁵	0:15 – 0:30 ⁵					

CAUTION:
No holdover time guidelines exist

NOTES

- 1 These holdover times are derived from tests of this fluid having a viscosity as listed in Table 9.
- 2 Heavy snow, snow pellets, ice pellets, moderate and heavy freezing rain, and hail.
- 3 These holdover times only apply to outside air temperatures to -10°C (14°F) under freezing drizzle and light freezing rain.
- 4 Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
- 5 Ensure that the lowest operational use temperature (LOU) is respected. Consider use of Type I when Type IV fluid cannot be used.
- 6 Use light freezing rain holdover times in conditions of light snow mixed with light rain.

CAUTIONS

- The only acceptable decision-making criterion, for takeoff without a pre-takeoff contamination inspection, is the shorter time within the applicable holdover time table cell.
- 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.
- Holdover time may be reduced when aircraft skin temperature is lower than outside air temperature.
- Fluids used during ground deicing/anti-icing do not provide in-flight icing protection.

TABLE 4-C-2012

CLARIANT TYPE IV FLUID HOLDOVER GUIDELINES FOR WINTER 2009-2010¹
SAFEWING MP IV 2012 PROTECT

THE RESPONSIBILITY FOR THE APPLICATION OF THESE DATA REMAINS WITH THE USER

Outside Air Temperature		Type IV Fluid Concentration Neat Fluid/Water (Volume %/Volume %)	Approximate Holdover Times Under Various Weather Conditions (hours:minutes)					
Degrees Celsius	Degrees Fahrenheit		Freezing Fog	Snow or Snow Grains ⁶	Freezing Drizzle ⁴	Light Freezing Rain	Rain on Cold Soaked Wing	Other ²
-3 and above	27 and above	100/0	1:15 – 2:30	0:40 – 1:15	0:40 – 1:10	0:25 – 0:45	0:10 – 1:05	CAUTION: No holdover time guidelines exist
		75/25	1:10 – 2:05	0:25 – 0:55	0:35 – 0:50	0:15 – 0:30	0:05 – 0:40	
		50/50	0:25 – 0:45	0:15 – 0:25	0:15 – 0:20	0:05 – 0:10		
below -3 to -14	below 27 to 7	100/0	0:45 – 1:45	0:20 – 0:40	0:25 – 0:45 ³	0:15 – 0:25 ³		
		75/25	0:25 – 1:05	0:20 – 0:40	0:15 – 0:30 ³	0:10 – 0:20 ³		
below -14 to -25 or LOUT ⁵	below 7 to -13 or LOUT ⁵	100/0	0:20 – 0:45 ⁵	0:15 – 0:30 ⁵				

NOTES

- 1 These holdover times are derived from tests of this fluid having a viscosity as listed in Table 9.
- 2 Heavy snow, snow pellets, ice pellets, moderate and heavy freezing rain, and hail.
- 3 These holdover times only apply to outside air temperatures to -10°C (14°F) under freezing drizzle and light freezing rain.
- 4 Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
- 5 Ensure that the lowest operational use temperature (LOUT) is respected. Consider use of Type I when Type IV fluid cannot be used.
- 6 Use light freezing rain holdover times in conditions of light snow mixed with light rain.

CAUTIONS

- The only acceptable decision-making criterion, for takeoff without a pre-takeoff contamination inspection, is the shorter time within the applicable holdover time table cell.
- 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.
- Holdover time may be reduced when aircraft skin temperature is lower than outside air temperature.
- Fluids used during ground deicing/anti-icing do not provide in-flight icing protection.

TABLE 4-C-Launch

CLARIANT TYPE IV FLUID HOLDOVER GUIDELINES FOR WINTER 2009-2010¹
SAFWING MP IV LAUNCH

THE RESPONSIBILITY FOR THE APPLICATION OF THESE DATA REMAINS WITH THE USER

Outside Air Temperature		Type IV Fluid Concentration Neat Fluid/Water (Volume %/Volume %)	Approximate Holdover Times Under Various Weather Conditions (hours:minutes)					
Degrees Celsius	Degrees Fahrenheit		Freezing Fog	Snow or Snow Grains ⁶	Freezing Drizzle ⁴	Light Freezing Rain	Rain on Cold Soaked Wing	Other ²
-3 and above	27 and above	100/0	4:00 – 4:00	1:05 – 1:45	1:30 – 2:00	1:00 – 1:40	0:15 – 1:40	CAUTION: No holdover time guidelines exist
		75/25	3:40 – 4:00	1:00 – 1:45	1:40 – 2:00	0:45 – 1:15	0:10 – 1:45	
		50/50	1:25 – 2:45	0:25 – 0:45	0:30 – 0:50	0:20 – 0:25		
below -3 to -14	below 27 to 7	100/0	1:00 – 1:55	0:50 – 1:20	0:35 – 1:40 ³	0:25 – 0:45 ³		
		75/25	0:40 – 1:20	0:45 – 1:25	0:25 – 1:10 ³	0:25 – 0:45 ³		
below -14 to -25 or LOUT ⁵	below 7 to -13 or LOUT ⁵	100/0	0:30 – 0:50 ⁵	0:15 – 0:30 ⁵				

NOTES

- 1 These holdover times are derived from tests of this fluid having a viscosity as listed in Table 9.
- 2 Heavy snow, snow pellets, ice pellets, moderate and heavy freezing rain, and hail.
- 3 These holdover times only apply to outside air temperatures to -10°C (14°F) under freezing drizzle and light freezing rain.
- 4 Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
- 5 Ensure that the lowest operational use temperature (LOUT) is respected. Consider use of Type I when Type IV fluid cannot be used.
- 6 Use light freezing rain holdover times in conditions of light snow mixed with light rain.

CAUTIONS

- The only acceptable decision-making criterion, for takeoff without a pre-takeoff contamination inspection, is the shorter time within the applicable holdover time table cell.
- 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.
- Holdover time may be reduced when aircraft skin temperature is lower than outside air temperature.
- Fluids used during ground deicing/anti-icing do not provide in-flight icing protection.

TABLE 4-D-ULTRA+

DOW CHEMICAL TYPE IV FLUID HOLDOVER GUIDELINES FOR WINTER 2009-2010¹
UCAR™ ADF/AAF ULTRA+

THE RESPONSIBILITY FOR THE APPLICATION OF THESE DATA REMAINS WITH THE USER

Outside Air Temperature		Type IV Fluid Concentration Neat Fluid/Water (Volume %/Volume %)	Approximate Holdover Times Under Various Weather Conditions (hours:minutes)					
Degrees Celsius	Degrees Fahrenheit		Freezing Fog	Snow or Snow Grains ⁶	Freezing Drizzle ⁴	Light Freezing Rain	Rain on Cold Soaked Wing	Other ²
-3 and above	27 and above	100/0	1:35 – 3:35	0:35 – 1:15	0:45 – 1:35	0:25 – 0:40	CAUTION: No holdover time guidelines exist	
		75/25						
		50/50						
below -3 to -14	below 27 to 7	100/0	1:25 – 3:00	0:25 – 0:55	0:45 – 1:25 ³	0:30 – 0:45 ³		
		75/25						
below -14 to -24	below 7 to -11	100/0	0:40 – 2:10 ⁵	0:20 – 0:45 ⁵				

NOTES

- 1 These holdover times are derived from tests of this fluid having a viscosity as listed in Table 9.
- 2 Heavy snow, snow pellets, ice pellets, moderate and heavy freezing rain, and hail.
- 3 These holdover times only apply to outside air temperatures to -10°C (14°F) under freezing drizzle and light freezing rain.
- 4 Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
- 5 Ensure that the lowest operational use temperature (LOUT) is respected. Consider use of Type I when Type IV fluid cannot be used.
- 6 Use light freezing rain holdover times in conditions of light snow mixed with light rain.

CAUTIONS

- The only acceptable decision-making criterion, for takeoff without a pre-takeoff contamination inspection, is the shorter time within the applicable holdover time table cell.
- 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.
- Holdover time may be reduced when aircraft skin temperature is lower than outside air temperature.
- Fluids used during ground deicing/anti-icing do not provide in-flight icing protection.

TABLE 4-D-E106

DOW CHEMICAL TYPE IV FLUID HOLDOVER GUIDELINES FOR WINTER 2009-2010¹
UCAR™ ENDURANCE EG106

THE RESPONSIBILITY FOR THE APPLICATION OF THESE DATA REMAINS WITH THE USER

Outside Air Temperature		Type IV Fluid Concentration Neat Fluid/Water (Volume %/Volume %)	Approximate Holdover Times Under Various Weather Conditions (hours:minutes)					Other ²
Degrees Celsius	Degrees Fahrenheit		Freezing Fog	Snow or Snow Grains ⁶	Freezing Drizzle ⁴	Light Freezing Rain	Rain on Cold Soaked Wing	
-3 and above	27 and above	100/0	2:05 – 3:10	0:40 – 1:20	1:10 – 2:00	0:50 – 1:15	CAUTION: No holdover time guidelines exist	
		75/25						
		50/50						
below -3 to -14	below 27 to 7	100/0	1:50 – 3:20	0:30 – 1:05	0:55 – 1:50 ³	0:45 – 1:10 ³		
		75/25						
below -14 to -25 or LOU ⁵	below 7 to -13 or LOU ⁵	100/0	0:30 – 1:05 ⁵	0:15 – 0:30 ⁵				

NOTES

- 1 These holdover times are derived from tests of this fluid having a viscosity as listed in Table 9.
- 2 Heavy snow, snow pellets, ice pellets, moderate and heavy freezing rain, and hail.
- 3 These holdover times only apply to outside air temperatures to -10°C (14°F) under freezing drizzle and light freezing rain.
- 4 Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
- 5 Ensure that the lowest operational use temperature (LOU) is respected. Consider use of Type I when Type IV fluid cannot be used.
- 6 Use light freezing rain holdover times in conditions of light snow mixed with light rain.

CAUTIONS

- The only acceptable decision-making criterion, for takeoff without a pre-takeoff contamination inspection, is the shorter time within the applicable holdover time table cell.
- 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.
- Holdover time may be reduced when aircraft skin temperature is lower than outside air temperature.
- Fluids used during ground deicing/anti-icing do not provide in-flight icing protection.

TABLE 4-D-AD-480

DOW CHEMICAL TYPE IV FLUID HOLDOVER GUIDELINES FOR WINTER 2009-2010¹
UCAR™ FLIGHTGUARD AD-480

THE RESPONSIBILITY FOR THE APPLICATION OF THESE DATA REMAINS WITH THE USER

Outside Air Temperature		Type IV Fluid Concentration Neat Fluid/Water (Volume %/Volume %)	Approximate Holdover Times Under Various Weather Conditions (hours:minutes)					
Degrees Celsius	Degrees Fahrenheit		Freezing Fog	Snow or Snow Grains ⁶	Freezing Drizzle ⁴	Light Freezing Rain	Rain on Cold Soaked Wing	Other ²
-3 and above	27 and above	100/0	2:00 – 3:30	0:40 – 1:20	0:50 – 1:30	0:35 – 0:55	0:15 – 1:35	CAUTION: No holdover time guidelines exist
		75/25	1:30 – 2:45	0:30 – 1:05	0:50 – 1:15	0:30 – 0:45	0:10 – 1:15	
		50/50	0:30 – 0:45	0:10 – 0:20	0:15 – 0:25	0:05 – 0:15		
below -3 to -14	below 27 to 7	100/0	0:20 – 1:20	0:30 – 0:55	0:25 – 1:20 ³	0:15 – 0:30 ³		
		75/25	0:25 – 0:50	0:20 – 0:45	0:25 – 1:05 ³	0:15 – 0:30 ³		
below -14 to -25 or LOU ⁵	below 7 to -13 or LOU ⁵	100/0	0:15 – 0:40 ⁵	0:15 – 0:30 ⁵				

NOTES

- 1 These holdover times are derived from tests of this fluid having a viscosity as listed in Table 9.
- 2 Heavy snow, snow pellets, ice pellets, moderate and heavy freezing rain, and hail.
- 3 These holdover times only apply to outside air temperatures to -10°C (14°F) under freezing drizzle and light freezing rain.
- 4 Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
- 5 Ensure that the lowest operational use temperature (LOU) is respected. Consider use of Type I when Type IV fluid cannot be used.
- 6 Use light freezing rain holdover times in conditions of light snow mixed with light rain.

CAUTIONS

- The only acceptable decision-making criterion, for takeoff without a pre-takeoff contamination inspection, is the shorter time within the applicable holdover time table cell.
- 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.
- Holdover time may be reduced when aircraft skin temperature is lower than outside air temperature.
- Fluids used during ground deicing/anti-icing do not provide in-flight icing protection.

TABLE 4-K-ABC-4^{sustain}

KILFROST TYPE IV FLUID HOLDOVER GUIDELINES FOR WINTER 2009-2010¹
ABC-4^{sustain}

THE RESPONSIBILITY FOR THE APPLICATION OF THESE DATA REMAINS WITH THE USER

Outside Air Temperature		Type IV Fluid Concentration Neat Fluid/Water (Volume %/Volume %)	Approximate Holdover Times Under Various Weather Conditions (hours:minutes)					
Degrees Celsius	Degrees Fahrenheit		Freezing Fog	Snow or Snow Grains ⁶	Freezing Drizzle ⁴	Light Freezing Rain	Rain on Cold Soaked Wing	Other ²
-3 and above	27 and above	100/0	1:45 – 3:55	1:00 – 1:45	1:35 – 2:00	1:05 – 1:30	0:20 – 2:00	CAUTION: No holdover time guidelines exist
		75/25	1:00 – 1:50	0:30 – 0:55	0:40 – 1:05	0:25 – 0:40	0:10 – 1:20	
		50/50	0:20 – 0:35	0:05 – 0:15	0:10 – 0:20	0:05 – 0:10		
below -3 to -14	below 27 to 7	100/0	0:55 – 2:55	1:00 – 1:45	0:35 – 1:50 ³	1:05 – 1:25 ³		
		75/25	0:35 – 2:10	0:30 – 0:55	0:25 – 1:20 ³	0:15 – 0:40 ³		
below -14 to -25 or LOU ⁵	below 7 to -13 or LOU ⁵	100/0	0:40 – 1:00 ⁵	0:15 – 0:30 ⁵				

NOTES

- 1 These holdover times are derived from tests of this fluid having a viscosity as listed in Table 9.
- 2 Heavy snow, snow pellets, ice pellets, moderate and heavy freezing rain, and hail.
- 3 These holdover times only apply to outside air temperatures to -10°C (14°F) under freezing drizzle and light freezing rain.
- 4 Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
- 5 Ensure that the lowest operational use temperature (LOU) is respected. Consider use of Type I when Type IV cannot be used.
- 6 Use light freezing rain holdover times in conditions of light snow mixed with light rain.

CAUTIONS

- The only acceptable decision-making criterion, for takeoff without a pre-takeoff contamination inspection, is the shorter time within the applicable holdover time table cell.
- 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.
- Holdover time may be reduced when aircraft skin temperature is lower than outside air temperature.
- Fluids used during ground deicing/anti-icing do not provide in-flight icing protection.

TABLE 4-K-ABC-S

KILFROST TYPE IV FLUID HOLDOVER GUIDELINES FOR WINTER 2009-2010¹
ABC-S

THE RESPONSIBILITY FOR THE APPLICATION OF THESE DATA REMAINS WITH THE USER

Outside Air Temperature		Type IV Fluid Concentration Neat Fluid/Water (Volume %/Volume %)	Approximate Holdover Times Under Various Weather Conditions (hours:minutes)					
Degrees Celsius	Degrees Fahrenheit		Freezing Fog	Snow or Snow Grains ⁶	Freezing Drizzle ⁴	Light Freezing Rain	Rain on Cold Soaked Wing	Other ²
-3 and above	27 and above	100/0	2:35 – 4:00	1:00 – 1:40	1:20 – 1:50	1:00 – 1:25	0:20 – 1:15	CAUTION: No holdover time guidelines exist
		75/25	1:05 – 1:45	0:30 – 0:55	0:45 – 1:10	0:35 – 0:50	0:10 – 0:50	
		50/50	0:20 – 0:35	0:05 – 0:15	0:15 – 0:20	0:05 – 0:10		
below -3 to -14	below 27 to 7	100/0	0:45 – 2:05	0:45 – 1:20	0:20 – 1:00 ³	0:10 – 0:30 ³		
		75/25	0:25 – 1:00	0:25 – 0:50	0:20 – 1:10 ³	0:10 – 0:35 ³		
below -14 to -25 or LOU ⁵	below 7 to -13 or LOU ⁵	100/0	0:20 – 0:40 ⁵	0:15 – 0:30 ⁵				

NOTES

- 1 These holdover times are derived from tests of this fluid having a viscosity as listed in Table 9.
- 2 Heavy snow, snow pellets, ice pellets, moderate and heavy freezing rain, and hail.
- 3 These holdover times only apply to outside air temperatures to -10°C (14°F) under freezing drizzle and light freezing rain.
- 4 Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
- 5 Ensure that the lowest operational use temperature (LOU) is respected. Consider use of Type I when Type IV fluid cannot be used.
- 6 Use light freezing rain holdover times in conditions of light snow mixed with light rain.

CAUTIONS

- The only acceptable decision-making criterion, for takeoff without a pre-takeoff contamination inspection, is the shorter time within the applicable holdover time table cell.
- 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.
- Holdover time may be reduced when aircraft skin temperature is lower than outside air temperature.
- Fluids used during ground deicing/anti-icing do not provide in-flight icing protection.

TABLE 4-K-ABC-S PLUS

**KILFROST TYPE IV FLUID HOLDOVER GUIDELINES FOR WINTER 2009-2010¹
ABC-S PLUS**

THE RESPONSIBILITY FOR THE APPLICATION OF THESE DATA REMAINS WITH THE USER

Outside Air Temperature		Type IV Fluid Concentration Neat Fluid/Water (Volume %/Volume %)	Approximate Holdover Times Under Various Weather Conditions (hours:minutes)					
Degrees Celsius	Degrees Fahrenheit		Freezing Fog	Snow or Snow Grains ⁶	Freezing Drizzle ⁴	Light Freezing Rain	Rain on Cold Soaked Wing	Other ²
-3 and above	27 and above	100/0	2:10 – 4:00	1:15 – 2:00	1:50 – 2:00	1:05 – 2:00	0:25 – 2:00	CAUTION: No holdover time guidelines exist
		75/25	1:25 – 2:40	0:45 – 1:15	1:00 – 1:20	0:30 – 0:50	0:10 – 1:20	
		50/50	0:30 – 0:55	0:15 – 0:30	0:15 – 0:40	0:15 – 0:20		
below -3 to -14	below 27 to 7	100/0	0:55 – 3:30	1:00 – 1:45	0:25 – 1:35 ³	0:20 – 0:30 ³		
		75/25	0:45 – 1:50	0:35 – 1:00	0:20 – 1:10 ³	0:15 – 0:25 ³		
below -14 to -25 or LOU ⁵	below 7 to -13 or LOU ⁵	100/0	0:40 – 1:00 ⁵	0:15 – 0:30 ⁵				

NOTES

- 1 These holdover times are derived from tests of this fluid having a viscosity as listed in Table 9.
- 2 Heavy snow, snow pellets, ice pellets, moderate and heavy freezing rain, and hail.
- 3 These holdover times only apply to outside air temperatures to -10°C (14°F) under freezing drizzle and light freezing rain.
- 4 Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
- 5 Ensure that the lowest operational use temperature (LOU) is respected. Consider use of Type I when Type IV fluid cannot be used.
- 6 Use light freezing rain holdover times in conditions of light snow mixed with light rain.

CAUTIONS

- The only acceptable decision-making criterion, for takeoff without a pre-takeoff contamination inspection, is the shorter time within the applicable holdover time table cell.
- 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.
- Holdover time may be reduced when aircraft skin temperature is lower than outside air temperature.
- Fluids used during ground deicing/anti-icing do not provide in-flight icing protection.

TABLE 4-L-ARCTIC Shield

LYONDELL TYPE IV FLUID HOLDOVER GUIDELINES FOR WINTER 2009-2010¹
ARCTIC SHIELD™

THE RESPONSIBILITY FOR THE APPLICATION OF THESE DATA REMAINS WITH THE USER

Outside Air Temperature		Type IV Fluid Concentration Neat Fluid/Water (Volume %/Volume %)	Approximate Holdover Times Under Various Weather Conditions (hours:minutes)					
Degrees Celsius	Degrees Fahrenheit		Freezing Fog	Snow or Snow Grains ⁶	Freezing Drizzle ⁴	Light Freezing Rain	Rain on Cold Soaked Wing	Other ²
-3 and above	27 and above	100/0	1:55 – 3:10	0:50 – 1:25	0:55 – 1:40	0:45 – 1:05	0:15 – 1:25	CAUTION: No holdover time guidelines exist
		75/25	1:20 – 2:15	0:40 – 1:05	0:55 – 1:25	0:30 – 0:45	0:05 – 1:20	
		50/50	0:35 – 0:45	0:20 – 0:35	0:20 – 0:30	0:10 – 0:15		
below -3 to -14	below 27 to 7	100/0	1:00 – 2:25	0:45 – 1:15	0:25 – 1:30 ³	0:25 – 0:30 ³		
		75/25	0:50 – 1:45	0:35 – 0:55	0:30 – 1:15 ³	0:25 – 0:30 ³		
below -14 to -25 or LOU ⁵	below 7 to -13 or LOU ⁵	100/0	0:25 – 0:45 ⁵	0:15 – 0:30 ⁵				

NOTES

- 1 These holdover times are derived from tests of this fluid having a viscosity as listed in Table 9.
- 2 Heavy snow, snow pellets, ice pellets, moderate and heavy freezing rain, and hail.
- 3 These holdover times only apply to outside air temperatures to -10°C (14°F) under freezing drizzle and light freezing rain.
- 4 Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
- 5 Ensure that the lowest operational use temperature (LOU) is respected. Consider use of Type I when Type IV fluid cannot be used.
- 6 Use light freezing rain holdover times in conditions of light snow mixed with light rain.

CAUTIONS

- The only acceptable decision-making criterion, for takeoff without a pre-takeoff contamination inspection, is the shorter time within the applicable holdover time table cell.
- 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.
- Holdover time may be reduced when aircraft skin temperature is lower than outside air temperature.
- Fluids used during ground deicing/anti-icing do not provide in-flight icing protection.

TABLE 4-O-MF

OCTAGON TYPE IV FLUID HOLDOVER GUIDELINES FOR WINTER 2009-2010¹
MAX-FLIGHT

THE RESPONSIBILITY FOR THE APPLICATION OF THESE DATA REMAINS WITH THE USER

Outside Air Temperature		Type IV Fluid Concentration Neat Fluid/Water (Volume %/Volume %)	Approximate Holdover Times Under Various Weather Conditions (hours:minutes)					
Degrees Celsius	Degrees Fahrenheit		Freezing Fog	Snow or Snow Grains ⁶	Freezing Drizzle ⁴	Light Freezing Rain	Rain on Cold Soaked Wing	Other ²
-3 and above	27 and above	100/0	2:40 – 4:00	0:50 – 1:35	0:55 – 2:00	0:35 – 1:00	0:15 – 1:15	CAUTION: No holdover time guidelines exist
		75/25	2:05 – 3:15	0:45 – 1:45	1:15 – 2:00	0:35 – 1:10	0:10 – 0:40	
		50/50	0:55 – 1:45	0:25 – 1:15	0:35 – 1:00	0:15 – 0:30		
below -3 to -14	below 27 to 7	100/0	0:50 – 2:30	0:25 – 0:50	0:25 – 1:10 ³	0:20 – 0:40 ³		
		75/25	0:30 – 1:05	0:20 – 0:50	0:20 – 1:00 ³	0:15 – 0:30 ³		
below -14 to -25 or LOU ⁵	below 7 to -13 or LOU ⁵	100/0	0:20 – 0:45 ⁵	0:15 – 0:30 ⁵				

NOTES

- 1 These holdover times are derived from tests of this fluid having a viscosity as listed in Table 9.
- 2 Heavy snow, snow pellets, ice pellets, moderate and heavy freezing rain, and hail.
- 3 These holdover times only apply to outside air temperatures to -10°C (14°F) under freezing drizzle and light freezing rain.
- 4 Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
- 5 Ensure that the lowest operational use temperature (LOU) is respected. Consider use of Type I when Type IV fluid cannot be used.
- 6 Use light freezing rain holdover times in conditions of light snow mixed with light rain.

CAUTIONS

- The only acceptable decision-making criterion, for takeoff without a pre-takeoff contamination inspection, is the shorter time within the applicable holdover time table cell.
- 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.
- Holdover time may be reduced when aircraft skin temperature is lower than outside air temperature.
- Fluids used during ground deicing/anti-icing do not provide in-flight icing protection.

TABLE 4-O-MF-04

OCTAGON TYPE IV FLUID HOLDOVER GUIDELINES FOR WINTER 2009-2010¹
MAX-FLIGHT 04

THE RESPONSIBILITY FOR THE APPLICATION OF THESE DATA REMAINS WITH THE USER

Outside Air Temperature		Type IV Fluid Concentration Neat Fluid/Water (Volume %/Volume %)	Approximate Holdover Times Under Various Weather Conditions (hours:minutes)					
Degrees Celsius	Degrees Fahrenheit		Freezing Fog	Snow or Snow Grains ⁶	Freezing Drizzle ⁴	Light Freezing Rain	Rain on Cold Soaked Wing	Other ²
-3 and above	27 and above	100/0	2:40 – 4:00	1:25 – 2:00	2:00 – 2:00	1:10 – 1:30	0:20 – 2:00	CAUTION: No holdover time guidelines exist
		75/25	2:05 – 3:15	1:05 – 2:00	1:50 – 2:00	1:00 – 1:20	0:20 – 2:00	
		50/50	0:55 – 1:45	0:25 – 1:15	0:35 – 1:10	0:25 – 0:35		
below -3 to -14	below 27 to 7	100/0	0:50 – 2:30	0:35 – 1:10	0:25 – 1:30 ³	0:20 – 0:40 ³		
		75/25	0:30 – 1:05	0:40 – 1:20	0:20 – 1:00 ³	0:15 – 0:30 ³		
below -14 to -25 or LOU ⁵	below 7 to -13 or LOU ⁵	100/0	0:20 – 0:45 ⁵	0:15 – 0:30 ⁵				

NOTES

- 1 These holdover times are derived from tests of this fluid having a viscosity as listed in Table 9.
- 2 Heavy snow, snow pellets, ice pellets, moderate and heavy freezing rain, and hail.
- 3 These holdover times only apply to outside air temperatures to -10°C (14°F) under freezing drizzle and light freezing rain.
- 4 Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
- 5 Ensure that the lowest operational use temperature (LOU) is respected. Consider use of Type I when Type IV fluid cannot be used.
- 6 Use light freezing rain holdover times in conditions of light snow mixed with light rain.

CAUTIONS

- The only acceptable decision-making criterion, for takeoff without a pre-takeoff contamination inspection, is the shorter time within the applicable holdover time table cell.
- 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.
- Holdover time may be reduced when aircraft skin temperature is lower than outside air temperature.
- Fluids used during ground deicing/anti-icing do not provide in-flight icing protection.

TABLE 4-O-MFLO

OCTAGON TYPE IV FLUID HOLDOVER GUIDELINES FOR WINTER 2009-2010¹
MAXFLO

THE RESPONSIBILITY FOR THE APPLICATION OF THESE DATA REMAINS WITH THE USER

Outside Air Temperature		Type IV Fluid Concentration Neat Fluid/Water (Volume %/Volume %)	Approximate Holdover Times Under Various Weather Conditions (hours:minutes)					
Degrees Celsius	Degrees Fahrenheit		Freezing Fog	Snow or Snow Grains ⁶	Freezing Drizzle ⁴	Light Freezing Rain	Rain on Cold Soaked Wing	Other ²
-3 and above	27 and above	100/0	2:20 – 3:35	0:40 – 1:30	1:20 – 2:00	0:30 – 1:00	0:10 – 2:00	CAUTION: No holdover time guidelines exist
		75/25	1:25 – 2:00	0:20 – 0:55	0:40 – 1:05	0:20 – 0:35	0:05 – 1:15	
		50/50	0:20 – 0:40	0:05 – 0:15	0:10 – 0:20	0:05 – 0:10		
below -3 to -14	below 27 to 7	100/0	1:10 – 2:20	0:25 – 1:00	0:35 – 1:45 ³	0:30 – 0:50 ³		
		75/25	0:40 – 1:25	0:15 – 0:40	0:35 – 1:15 ³	0:15 – 0:30 ³		
below -14 to -25 or LOU ⁵	below 7 to -13 or LOU ⁵	100/0	0:30 – 1:00 ⁵	0:15 – 0:30 ⁵				

NOTES

- 1 These holdover times are derived from tests of this fluid having a viscosity as listed in Table 9.
- 2 Heavy snow, snow pellets, ice pellets, moderate and heavy freezing rain, and hail.
- 3 These holdover times only apply to outside air temperatures to -10°C (14°F) under freezing drizzle and light freezing rain.
- 4 Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
- 5 Ensure that the lowest operational use temperature (LOU) is respected. Consider use of Type I when Type IV fluid cannot be used.
- 6 Use light freezing rain holdover times in conditions of light snow mixed with light rain.

CAUTIONS

- The only acceptable decision-making criterion, for takeoff without a pre-takeoff contamination inspection, is the shorter time within the applicable holdover time table cell.
- 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.
- Holdover time may be reduced when aircraft skin temperature is lower than outside air temperature.
- Fluids used during ground deicing/anti-icing do not provide in-flight icing protection.

TABLE 5
CURRENTLY QUALIFIED FLUIDS (2009-2010)

Table 5-1: Qualified Type I Anti-icing Fluids^{(1) (2)}

#	COMPANY NAME	FLUID NAME	EXPIRY (Y-M-D)
1-1	ABAX Industries	ABAX DE-950	12-06-25
1-2	ABAX Industries	ABAX DE-950 Colorless	12-06-26
1-3	Arcton Ltd.	Arctica DG ready-to-use	13-04-08
1-4	Aviation Xi'an Hi-Tech Physical Co. Ltd.	KHF-1	11-09-20
1-5	<i>Battelle Memorial Institute</i>	<i>D³: Degradable by Design™ ADF1006A</i>	<i>08-01-13⁽³⁾</i>
1-6	Beijing Wangye Aviation Chemical Product Co.	KLA-1	11-09-20
1-7	<i>Beijing Wangye Aviation Chemical Product Co.</i>	<i>YJF-1</i>	<i>09-02-23⁽³⁾</i>
1-8	<i>Clariant Produkte (Deutschland) GmbH</i>	<i>Clariant Safewing MP I 1938 TF</i>	<i>08-08-21⁽³⁾</i>
1-9	<i>Clariant Produkte (Deutschland) GmbH</i>	<i>Clariant Safewing MP I 1938 TF PreMix 60% i.e. ready-to-use (multiple location)</i>	<i>07-09-14⁽³⁾</i>
1-10	Clariant Produkte (Deutschland) GmbH	Clariant Safewing MP I 1938 ECO (80)	12-06-10
1-11	Clariant Produkte (Deutschland) GmbH	Clariant Safewing MP I 1938 ECO (80) PreMix 55% i.e. ready-to-use	13-05-20
1-12	Clariant Produkte (Deutschland) GmbH	Clariant Safewing MP I 1938 ECO	12-06-10
1-13	Clariant Produkte (Deutschland) GmbH	Clariant Safewing EG I 1996	12-06-10
1-14	Clariant Produkte (Deutschland) GmbH	Clariant Safewing EG I 1996 (88)	11-07-06
1-15	Clariant Produkte (Deutschland) GmbH	Safewing MPI ECO PLUS (80)	11-03-20
1-16	<i>Chemical Specialists Development Inc.</i>	<i>Prist Wing De-Icer</i>	<i>08-05-17⁽³⁾</i>
1-17	Dow Chemical Company	Dow UCAR™ Aircraft Deicing Fluid Concentrate	11-09-10
1-18	Dow Chemical Company	Dow UCAR™ ADF XL54	13-01-21
1-19	Dow Chemical Company	Dow UCAR™ PG Aircraft Deicing Fluid	12-02-05
1-20	Dow Chemical Company	Dow UCAR™ PG ADF Dilute 55/45	12-02-05
1-21	<i>HOC Industries</i>	<i>SafeTemp I ES</i>	<i>07-10-27⁽³⁾</i>
1-22	HOC Industries	SafeTemp ES Plus	11-10-04
1-23	<i>Inland Technologies Inc.</i>	<i>Inland Duragly-P ready to use</i>	<i>05-09-11⁽³⁾</i>
1-24	<i>Inland Technologies Inc.</i>	<i>Inland Duragly-E ready to use</i>	<i>05-10-20⁽³⁾</i>
1-25	Kilfrost Limited	Kilfrost DF Plus	11-09-27
1-26	Kilfrost Limited	Kilfrost DF Plus (80)	12-07-21
1-27	Kilfrost Limited	Kilfrost DF Plus (88)	11-09-27
1-28	Kilfrost Limited	Kilfrost DFsustain™	13-02-10
1-29	<i>Lyondell Chemical Company</i>	<i>ARCOPlus</i>	<i>08-02-14⁽³⁾</i>
1-30	<i>Lyondell Chemical Company</i>	<i>ARCTIC Plus™</i>	<i>08-04-10⁽³⁾</i>
1-31	Newave Aerochemical Co. Ltd.	FCY-1A	11-08-21
1-32	Octagon Process Inc.	EcoFlo	13-07-06
1-33	Octagon Process Inc.	Octaflo EF	11-07-11
1-34	Octagon Process Inc.	Octaflo EG	13-06-10
1-35	<i>Viterbo S.A.</i>	<i>Jarkleer SAE Type I</i>	<i>07-01-20⁽³⁾</i>

⁽¹⁾ Qualified solely with respect to anti-icing performance and aerodynamic acceptance by the Anti-icing Materials International Laboratory, Université du Québec à Chicoutimi. Web site: <http://www.ugac.ca/amil/index.htm>. The expiry date was determined based upon the earliest qualification date of the High Speed Aerodynamic Test or Water Spray Endurance Test.

For other specification requirements for Type I fluids, see SAE AMS 1424 (latest version). Fluids that successfully qualify after the issuance of this list will appear in a later update.

⁽²⁾ Concentrate fluids have also been qualified at 50/50 (glycol/water) dilution.

⁽³⁾ Fluids listed in italics have expired and will be removed from this listing four years after expiry.

⁽⁴⁾ Currently in qualification/re-qualification process.

TABLE 5 (cont.)
CURRENTLY QUALIFIED FLUIDS (2009-2010)

Table 5-2: Qualified ⁽¹⁾ Type II Anti-icing Fluids			
#	COMPANY NAME	FLUID NAME	EXPIRY (Y-M-D)
2-1	ABAX Industries	Ecowing 26	09-08-21 ⁽³⁾
2-2	Aviation Shaanxi Hi-Tech Physical Chemical Co. Ltd.	Cleanwing II	11-02-19
2-3	Clariant Produkte (Deutschland) GmbH	Safewing MP II 1951	11-05-20
2-4	<i>Clariant Produkte (Deutschland) GmbH</i>	<i>Safewing MP II 2025 ECO</i>	08-06-28 ⁽²⁾
2-5	Clariant Produkte (Deutschland) GmbH	Safewing MP II FLIGHT	10-06-16
2-6	Kilfrost Limited	ABC-3	10-06-11
2-7	Kilfrost Limited	ABC-2000	10-07-21
2-8	Kilfrost Limited	ABC-K PLUS	10-07-10
2-9	Newave Aerochemical Co. Ltd.	FCY-2	11-05-27
2-10	Octagon Process Inc.	E Max II	08-10-31 ⁽²⁾

Table 5-3: Qualified ⁽¹⁾ Type III Anti-icing Fluids			
#	COMPANY NAME	FLUID NAME	EXPIRY (Y-M-D)
3-1	Clariant Produkte (Deutschland) GmbH	Clariant Safewing MP III 2031 ECO	09-05-08 ⁽³⁾
	CAUTION: The lowest operational use temperature (LOUT) is -16.5°C (2°F) for aircraft with rotation speeds less than 100 knots or -29°C (-20°F) for aircraft with higher rotation speeds.		11-06-08 ⁽⁴⁾

Table 5-4: Qualified ⁽¹⁾ Type IV Anti-icing Fluids			
#	COMPANY NAME	FLUID NAME	EXPIRY (Y-M-D)
4-1	ABAX Industries	AD-480	09-07-30 ⁽³⁾
4-2	ABAX Industries	Ecowing AD-49	10-12-12
4-3	<i>Clariant Produkte (Deutschland) GmbH</i>	<i>Safewing MP IV 2001</i>	08-06-26 ⁽²⁾
4-4	<i>Clariant Produkte (Deutschland) GmbH</i>	<i>Safewing MP IV 2012 Protect</i>	07-07-12 ⁽²⁾
4-5	Clariant Produkte (Deutschland) GmbH	Safewing MP IV LAUNCH	10-06-18
4-6	<i>Dow Chemical Company</i>	<i>UCAR™ ADF/AAF ULTRA+</i>	08-08-21 ⁽²⁾
4-7	Dow Chemical Company	UCAR™ Endurance EG106 De/Anti-Icing Fluid	09-09-04 ⁽³⁾
4-8	Dow Chemical Company	UCAR™ FlightGuard AD-480	10-04-30
4-9	<i>Ely Chemical Company</i>	<i>Octagon Max-Flight</i>	06-07-06 ⁽²⁾
4-10	Kilfrost Limited	ABC-4 ^{sustain}	Y-M-D ⁽³⁾
4-11	Kilfrost Limited	ABC-S	11-07-06
4-12	Kilfrost Limited	ABC-S PLUS	11-06-01
4-13	Lyondell Chemical Company	ARCTIC Shield™	10-05-21
4-14	<i>Octagon Process Inc.</i>	<i>Max-Flight</i>	06-07-06 ⁽²⁾
4-15	Octagon Process Inc.	Max-Flight 04	10-04-29
4-16	Octagon Process Inc.	MaxFlo	07-03-24 ⁽³⁾

⁽¹⁾ Qualified solely with respect to anti-icing performance and aerodynamic acceptance by the Anti-icing Materials International Laboratory, Université du Québec à Chicoutimi. Web site: <http://www.ugac.ca/amil/index.htm>. The expiry date was determined based upon the earliest qualification date of the High Speed Aerodynamic Test or Water Spray Endurance Test, unless otherwise noted.

For other specification requirements for Type II, III or IV fluids, see SAE AMS 1428 (latest version). Fluids that successfully qualify after the issuance of this list will appear in a later update.

⁽²⁾ Fluids listed in italics have expired and will be removed from this listing four years after expiry.

⁽³⁾ Currently in qualification/re-qualification process.

⁽⁴⁾ Expiry date based upon the Low Speed Aerodynamic Test.

TABLE 6

SAE TYPE I DEICING FLUID APPLICATION PROCEDURES

Guidelines for the application of SAE Type I fluid mixtures at minimum concentrations for the prevailing outside air temperature (OAT)

Outside Air Temperature (OAT) ¹	One-Step Procedure Deicing/Anti-icing	Two-Step Procedure	
		First Step: Deicing	Second Step: Anti-icing ²
-3°C (27°F) and above	Heated mix of fluid and water with a freezing point of at least 10°C (18°F) below OAT	Heated water or a heated mix of fluid and water	Heated mix of fluid and water with a freezing point of at least 10°C (18°F) below OAT
Below -3°C (27°F)		Freezing point of heated fluid mixture shall not be more than 3°C (5°F) above OAT	

1 Fluids must not be used at temperatures below their lowest operational use temperature (LOUT).

2 To be applied before first step fluid freezes, typically within 3 minutes.

NOTES

- 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 time guidelines in snow conditions, at least 1 litre/m² (~ 2 gal./100 sq. ft.) must be applied to the deiced surfaces.
- This table is applicable for the use of Type I Holdover Time Guidelines. If holdover times are not required, a temperature of 60°C (140°F) at the nozzle is desirable.
- The lowest operational use temperature (LOUT) for a given fluid is the higher 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 10°C (18°F).

CAUTION

- **Wing skin temperatures may differ and in some cases may be lower than outside air temperatures; a stronger mix (more glycol) may be needed under these conditions.**

TABLE 7

SAE TYPE II, TYPE III and TYPE IV ANTI-ICING FLUID APPLICATION PROCEDURES

Guidelines for the application of SAE Type II, III and IV fluid mixtures (minimum concentrations in % by volume) as a function of outside air temperature (OAT)

Outside Air Temperature (OAT) ¹	One-Step Procedure Deicing/Anti-icing	Two-Step Procedure	
		First Step: Deicing	Second Step: Anti-icing ²
-3°C (27°F) and above	50/50 Heated ³ Type II/III/IV	Heated water or a heated mix of Type I, II, III or IV with water	50/50 Type II/III/IV
-14°C (7°F) and above	75/25 Heated ³ Type II/III/IV	Heated suitable mix of Type I, Type II/III/IV and water with FP not more than 3°C (5°F) above actual OAT	75/25 Type II/III/IV
-25°C (-13°F) and above	100/0 Heated ³ Type II/III/IV	Heated suitable mix of Type I, Type II/III/IV and water with FP not more than 3°C (5°F) above actual OAT	100/0 Type II/III/IV
Below -25°C (-13°F)	Type II/III/IV fluid may be used below -25°C (-13°F) provided that the OAT is at or above the LOUT. Consider the use of Type I when Type II/III/IV fluid cannot be used (see Table 6).		

- 1 Fluids must not be used at temperatures below their lowest operational use temperature (LOUT).
- 2 To be applied before first step fluid freezes, typically within 3 minutes.
- 3 Clean aircraft may be anti-iced with unheated fluid.

NOTES

- For heated fluids, a fluid temperature not less than 60°C (140°F) at the nozzle is desirable. When the first step is performed using a fluid/water mix with a freezing point above OAT, the temperature at the nozzle shall be at least 60°C and at least 1 litre/m² (2 gal./100 sq. ft.) shall be applied to the surfaces to be de-iced.
- Upper temperature limit shall not exceed fluid and aircraft manufacturers' recommendations.
- The lowest operational use temperature (LOUT) for a given fluid is the higher 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).

CAUTIONS

- Wing skin temperatures may differ and in some cases may be lower than outside air temperatures; a stronger mix (more glycol) may be needed under these conditions.
- 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, III 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.

TABLE 8
VISIBILITY IN SNOW VS. SNOWFALL INTENSITY CHART¹

Lighting	Temperature Range		Visibility in Snow (Statute Miles)			
	°C	°F	Heavy	Moderate	Light	Very Light
Darkness	-1 and above	30 and above	≤1	>1 to 2½	>2½ to 4	>4
	Below -1	Below 30	≤¾	>¾ to 1½	>1½ to 3	>3
Daylight	-1 and above	30 and above	≤½	>½ to 1½	>1½ to 3	>3
	Below -1	Below 30	≤¾	>¾ to 7/8	>7/8 to 2	>2

1 Based on: *Relationship between Visibility and Snowfall Intensity* (TP 14151E), Transportation Development Centre, Transport Canada, November 2003; and *Theoretical Considerations in the Estimation of Snowfall Rate Using Visibility* (TP 12893E), Transportation Development Centre, Transport Canada, November 1998.

HOW TO READ AND USE THE TABLE

This visibility table applies to all fluid Types I, II, III, and IV.

Assume that the daytime visibility in snowfall is 1 statute mile and the temperature is -7°C. Based on these conditions, the snowfall intensity is light. This snowfall intensity is used to determine which holdover time guideline value is appropriate for the fluid in use.

TABLE 9
LOWEST ON-WING VISCOSITY VALUES FOR ANTI-ICING FLUIDS
(See Table 9 endnotes)

Table 9-1: Type II Anti-Icing Fluids			
FLUID NAME	FLUID DILUTION	LOWEST ON-WING VISCOSITY ^a (mPa.s)	
		MANUFACTURER METHOD	AIR 9968 REVISION A METHOD
ABAX Ecowing 26	100/0	4 900 ^e	4 600 ^g
	75/25	2 200 ^g	2 200 ^g
	50/50	50 ^g	50 ^g
Aviation Shaanxi Hi-Tech Cleanwing II	100/0	4 650 ^c	4 500 ^g
	75/25	9 450 ^c	10 000 ^g
	50/50	10 150 ^c	10 200 ^g
Clariant Safewing MP II 2025 ECO	100/0	5 500 ^b	5 750 ^g
	75/25	10 000 ^b	10 000 ^g
	50/50	3 000 ^b	3 250 ^g
Clariant Safewing MP II Flight	100/0	3 340 ^g	3 340 ^g
	75/25	17 500 ^g	17 500 ^g
	50/50	11 500 ^g	11 500 ^g
Clariant Safewing MP II 1951	100/0	2 500 ^b	2 750 ^g
	75/25	2 900 ^b	3 000 ^g
	50/50	50 ^b	50 ^g
Kilfrost ABC-3	100/0	2 500 ^c	2 500 ^j
	75/25	2 000 ^c	2 000 ^j
	50/50	400 ^c	400 ^j
Kilfrost ABC-2000	100/0	2 350 ^c	2 350 ^g
	75/25	3 000 ^c	3 000 ^j
	50/50	1 000 ^c	1 000 ^j
Kilfrost ABC-K Plus	100/0	2 850 ^c	2 640 ^g
	75/25	12 650 ^c	12 650 ^c
	50/50	4 200 ^c	5 260 ^g
Newave Aerochemical FCY-2	100/0	7 000 ^c	8 920 ^g
	75/25	18 550 ^c	18 550 ^c
	50/50	6 750 ^c	7 030 ^g
Octagon E Max II	100/0	13 520 ^d	13 520 ^g
	75/25	11 400 ^g	11 400 ^g
	50/50	2 820 ^g	2 820 ^g

Table 9-2: Type III Anti-Icing Fluids			
FLUID NAME	FLUID DILUTION	LOWEST ON-WING VISCOSITY ^a (mPa.s)	
		MANUFACTURER METHOD	AIR 9968 REVISION A METHOD
Clariant Safewing MP III 2031 ECO	100/0	30 ^h	Not Applicable
	75/25	55 ^h	Not Applicable
	50/50	10 ^h	Not Applicable

TABLE 9 (cont.)
LOWEST ON-WING VISCOSITY VALUES FOR ANTI-ICING FLUIDS
(See Table 9 endnotes)

Table 9-3: Type IV Anti-Icing Fluids			
FLUID NAME	FLUID DILUTION	LOWEST ON-WING VISCOSITY ^a	
		(mPa.s)	
		MANUFACTURER METHOD	AIR 9968 REVISION A METHOD
ABAX AD-480	100/0	15 200 ^e	12 800 ^c
	75/25	16 000 ^e	12 400 ^c
	50/50	4 000 ^e	3 800 ^g
ABAX Ecowing AD-49	100/0	12 150 ^k	11 000 ^g
	75/25	30 700 ^k	32 350 ^l
	50/50	19 450 ^k	21 150 ^l
Clariant Safewing MP IV 2001	100/0	18 000 ^b	18 000 ^c
	75/25	8 000 ^b	11 500 ^g
	50/50	1 200 ^b	1 750 ^g
Clariant Safewing MP IV 2012 Protect	100/0	7 800 ^b	7 250 ^g
	75/25	17 800 ^b	17 700 ^c
	50/50	4 500 ^b	4 250 ^g
Clariant Safewing MP IV Launch	100/0	7 550 ^g	7 550 ^g
	75/25	18 000 ^g	18 000 ^g
	50/50	17 800 ^g	17 800 ^g
Dow UCAR™ ADF/AAF ULTRA+	100/0	36 000 ^f	28 000 ^c
	75/25	Dilution Not Applicable	Dilution Not Applicable
	50/50	Dilution Not Applicable	Dilution Not Applicable
Dow UCAR™ Endurance EG106	100/0	24 850 ^f	2 230 ^g
	75/25	Dilution Not Applicable	Dilution Not Applicable
	50/50	Dilution Not Applicable	Dilution Not Applicable
Dow UCAR™ FlightGuard AD-480	100/0	15 200 ^e	12 800 ^c
	75/25	16 000 ^e	12 400 ^c
	50/50	4 000 ^e	3 800 ^g
Kilfrost ABC-4 ^{sustain}	100/0	18 400 ^c	18 400 ^c
	75/25	15 400 ^c	15 400 ^c
	50/50	4 700 ^c	5 050 ^g
Kilfrost ABC-S	100/0	17 000 ^c	17 000 ^c
	75/25	12 000 ^c	12 000 ^c
	50/50	2 000 ^c	2 000 ^j
Kilfrost ABC-S PLUS	100/0	17 900 ^c	17 900 ^c
	75/25	18 300 ^c	18 300 ^c
	50/50	7 500 ^c	7 500 ^j
Lyondell ARCTIC Shield™	100/0	23 150 ⁱ	28 000 ^c
	75/25	21 700 ⁱ	22 100 ^c
	50/50	6 400 ⁱ	7 640 ^g
See next page for additional Type IV fluids			

TABLE 9 (cont.)
LOWEST ON-WING VISCOSITY VALUES FOR ANTI-ICING FLUIDS
(See Table 9 endnotes)

Table 9-3: Type IV Anti-Icing Fluids (cont.)			
FLUID NAME	FLUID DILUTION	LOWEST ON-WING VISCOSITY ^a	
		(mPa.s)	
		MANUFACTURER METHOD	AIR 9968 REVISION A METHOD
Octagon Max-Flight	100/0	5 540 ^d	5 540 ^g
	75/25	15 000 ^g	15 000 ^g
	50/50	5 200 ^g	5 200 ^g
Octagon Max-Flight 04	100/0	5 540 ^d	5 540 ^g
	75/25	15 000 ^g	15 000 ^g
	50/50	5 200 ^g	5 200 ^g
Octagon MaxFlo	100/0	8 670 ^g	8 670 ^g
	75/25	8 200 ^g	8 200 ^g
	50/50	2 200 ^g	2 200 ^g

NOTES

- a The Aerospace Information Report (AIR) 9968 Revision A (December 2004) 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.
- b Brookfield Spindle SC4-34/13R, small sample adapter, 10 mL of fluid, at 20°C, 0.3 rpm, for 15 minutes 0 seconds.
- c Brookfield Spindle LV2-disc with guard leg, 150 mL of fluid, at 20°C, 0.3 rpm, for 10 minutes 0 seconds.
- d Brookfield Spindle LV1 with guard leg, 500 mL of fluid, at 20°C, 0.3 rpm, for 33 minutes 20 seconds.
- e Brookfield Spindle SC4-34/13R, small sample adapter, 10 mL of fluid, at 20°C, 0.3 rpm, for 30 minutes 0 seconds.
- f Brookfield Spindle SC4-31/13R, small sample adapter, 10 mL of fluid, at 0°C, 0.3 rpm, for 10 minutes 0 seconds.
- g Brookfield Spindle LV1 with guard leg, 500 mL of fluid, at 20°C, 0.3 rpm, for 10 minutes 0 seconds.
- h Brookfield Spindle LV0, UL-Adapter, 16 mL of fluid, at 20°C, 0.3 rpm, for 10 minutes 0 seconds.
- i Brookfield Spindle SC4-31/13R, small sample adapter, 9 mL of fluid, at 20°C, 0.3 rpm, for 33 minutes 0 seconds.
- j Brookfield Spindle LV1 with guard leg, 150 mL of fluid, at 20°C, 0.3 rpm, for 10 minutes 0 seconds.
- k Brookfield Spindle SC4-31/13R, small sample adapter, 10 mL of fluid, at 20°C, 0.3 rpm, for 10 minutes 0 seconds.
- l Brookfield Spindle LV-2 disc with guard leg, 500 mL of fluid, at 20°C, 0.3 rpm, for 10 minutes 0 seconds.

SIGNIFICANCE OF THIS TABLE

The viscosity values of the fluids in this table are those of the fluids provided by the manufacturers for holdover time testing. For the holdover time guidelines to be valid, the viscosity of the fluid on the wing shall not be lower than that listed in this table. The user should periodically ensure that the viscosity value of a fluid sample taken from the wing is not lower than that listed.

ICE PELLET ALLOWANCE TIMES FOR WINTER 2009-2010

Comprehensive ice pellet research was conducted jointly by the research teams of the FAA and Transport Canada. This research consisted of extensive climatic chamber, wind tunnel, and live aircraft testing with ice pellets (light or moderate) and light ice pellets mixed with other forms of precipitation.

Results of this research provide the basis for allowance times for operations in ice pellets (light or moderate) and operations in light ice pellets mixed with other forms of precipitation.

Additionally, Type IV anti-icing fluid with ice pellets embedded was evaluated for its aging qualities over periods of time beyond the allowance times, when the active precipitation time was limited to the allowance times.

Operational Guidelines

- 1) Tests have shown that ice pellets generally remain in a frozen state embedded in Type IV anti-icing fluid, and are not dissolved by the fluid in the same manner as other forms of precipitation. Using current guidelines for determining anti-icing fluid failure, the presence of a contaminant not dissolved by the fluid (remaining embedded) is an indication that the fluid has failed. These embedded ice pellets are generally not readily detectable by the human eye during pre-takeoff contamination inspection procedures.
- 2) The research data have also shown that after proper deicing and anti-icing, the accumulation of light ice pellets, moderate ice pellets, and light ice pellets mixed with other forms of precipitation in Type IV fluid will not prevent the fluid from flowing off the aerodynamic surfaces during takeoff.
- 3) The allowance times were developed based on this aerodynamic testing and are contained in Table 10.
- 4) The ice pellet allowances are contingent on the operator's approved ground icing program being updated to incorporate the ice pellet information contained herein, including the following conditions and restrictions that must be satisfied:
 - a) The aircraft critical surfaces must be properly deiced before the application of Type IV anti-icing fluid;
 - b) The allowance time is valid only if the aircraft is anti-iced with undiluted Type IV fluid;
 - c) These allowance times are from the start of the Type IV anti-icing fluid application;
 - d) The allowance time is limited to aircraft with a rotation speed of 100 knots or greater;
 - e) If the takeoff is not accomplished within the applicable allowance time in Table 10, the aircraft must be completely deiced, and if precipitation is still present, anti-iced again prior to a subsequent takeoff;
 - f) The allowance time cannot be extended by an inspection of the aircraft critical surfaces from either inside or outside the aircraft;

- g) If the temperature decreases below the temperature on which the allowance time was based, where the new lower temperature has an associated allowance time for the precipitation condition and the present time is within the new allowance time, then that new time must be used as the allowance time limit;
- h) If ice pellet precipitation becomes heavier than moderate or if the light ice pellets mixed with other forms of allowable precipitation exceeds the listed intensities or temperature range, the allowance time cannot be used;
- i) If the precipitation condition stops at or before the time limits of the applicable allowance time in Table 10 and does not restart, the aircraft may take off up to 90 minutes after the start of the application of the Type IV anti-icing fluid. However, under conditions of light ice pellets mixed with light freezing rain, the OAT must not decrease during the 90-minute period.

5) Examples:

- a) Type IV anti-icing fluid is applied with a start of application time of 10:00, OAT is 0°C, light ice pellets fall until 10:20 and stop and do not restart. The allowance time stops at 10:50; however, provided that no precipitation restarts after the allowance time of 10:50; the aircraft may take off without any further action up to 11:30.
- b) Type IV anti-icing fluid is applied with a start of application time of 10:00, OAT is 0°C, light ice pellets mixed with freezing drizzle falls until 10:10, stops and restarts at 10:15, and stops at 10:20. The allowance time stops at 10:25; however, provided no precipitation restarts after the end of the allowance time at 10:25, the aircraft may take off without any further action up to 11:30.
- c) Type IV anti-icing fluid is applied with a start of application time of 10:00, OAT is 0°C, light ice pellets mixed with light freezing rain falls until 10:10, stops and restarts at 10:15, and stops at 10:20. The allowance time stops at 10:25; however, provided that the OAT remains constant or increases and that no precipitation restarts after the end of the allowance time at 10:25, the aircraft may take off without any further action up to 11:30.
- d) On the other hand, if Type IV anti-icing fluid is applied with a start of application time of 10:00, OAT is 0°C, light ice pellets mixed with freezing drizzle falls until 10:10, stops and restarts at 10:30, with the allowance time stopping at 10:25, the aircraft may not take off, no matter how short the time or type of precipitation after 10:25, without being deiced and anti-iced if precipitation is present.

TABLE 10
ICE PELLET ALLOWANCE TIMES FOR WINTER 2009-2010

	OAT -5°C and above	OAT less than -5°C to -10°C	OAT less than -10°C
Light Ice Pellets	50 minutes	30 minutes	30 minutes
Moderate Ice Pellets	25 minutes	10 minutes	10 minutes
Light Ice Pellets Mixed with Light or Moderate Freezing Drizzle	25 minutes	10 minutes	Caution: No allowance times currently exist
Light Ice Pellets Mixed with Light Freezing Rain	25 minutes	10 minutes	
Light Ice Pellets Mixed with Light Rain	25 minutes		
Light Ice Pellets Mixed with Moderate Rain	25 minutes		
Light Ice Pellets Mixed with Light Snow	25 minutes	15 minutes	
Light Ice Pellets Mixed with Moderate Snow	10 minutes		

OBSOLETE