

AEROSPACE STANDARD

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REV. F

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Aircraft Ground Deicing/Anti-Icing Processes

RATIONALE

This document has been revised to provide updated industry standards. The following are the changes included in Revision F:

Section	Title	Description
2.1.6	Aircraft Manufacturer Manuals	Additional information
2.2.1	Abbreviations	Added new terminology
2.2.2.2	Definitions	Added and updated definitions
3.3	Deicing Service Provider	Additional guidance
4.2	Quality Control Program	Additional guidance
4.3	Fluid Quality Control	Updated guidance
4.3.1	Fluid Delivery Methods	Updated guidance
4.3.2	Fluid Preseason and Within-Season Checks	Updated guidance
4.3.4	Fluid Test Methods	Updated guidance
4.3.6	Nonconformities or Discrepancies	New section
5.1	Aircraft Ground Deicing/Anti-icing Methods	Updated guidance
5.3	Infrared Deicing	Removed
5.3.2	General Deicing Fluid Application Strategy	Updated guidance
5.3.3	Removal of Local Aera Contamination	Updated guidance
5.4	Anti-Icing by Fluids	Updated guidance
5.4.1	Anti-Icing Procedures	Updated guidance
5.4.2	Anti-Icing Fluid Application Strategy	Updated guidance
5.4.3	Holdover Time	Updated guidance
5.4.4	Allowance Times	New section
5.4.5	Local Frost Prevention in Cold-Soaked	Updated guidance
5.5.1	Fluid-Related Limits	Updated guidance
5.5.3	Aircraft-Related Limits	Updated guidance
5.6	Procedure Precautions	Added guidance
5.6.2	Two-Step Process When the First Step	Additional guidance
5.6.7	Spray Precautions and Sensitive Areas	Additional guidance
5.6.12	Treatment Interruption	Additional guidance
6.1	Contamination Check	Additional guidance
10.5	Nonconformities and Discrepancies	New section

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FOREWORD

AS6285 provides industry standards for methods and procedures used to perform proper aircraft ground deicing/anti-icing, whether using AMS1424/1428 qualified fluid - Type I, II, III, IV - or non-fluid methods.

AS6285 is the foundational document of the tripartite *Global Aircraft Deicing Standards*, which include AS6286 and AS6332. These three documents form a synthesis, individually contributing nuanced content toward the collective whole.

Exposure to ground weather conditions conducive to ice formation can cause frost, snow, slush, or ice accumulation on aircraft surfaces and components. These contaminants can adversely affect aircraft performance, stability, control, and mechanical devices (such as control surfaces, sensors, flaps, and landing gear). Consequently, the presence of frozen deposits unaccounted for during aircraft certification can compromise aerodynamic performance.

A number of authoritative regulatory entities converge in direct contribution toward development of these global standards, providing regulations and guidance governing aircraft operations in ground icing conditions. These include the International Civil Aviation Organization (ICAO), the Federal Aviation Administration (FAA), the European Union Aviation Safety Agency (EASA), and Transport Canada (TC). These regulations prohibit aircraft dispatch or takeoff when frozen contaminants are present on critical surfaces or components - a critical surface or component is one that could adversely affect the mechanical or aerodynamic function of an aircraft - and this prohibition is addressed by the *clean aircraft concept*, which *mandates* removal of frozen deposits adhering to aircraft surfaces or critical safe flight components prior to takeoff and *functions* as the guiding principle toward which all efforts of this document strive. In the event of differences or discrepancies between this standard and domestic end-user regulations, the latter shall prevail.

This document recognizes the fact that unique icing situations or aircraft types and models may require special procedures and is thereby not to be understood as a replacement for the rational judgment of an aircraft operator. Responsibility for accurate and thorough aircraft deicing/anti-icing procedures is held by the aircraft operator, and the pilot-in-command has the ultimate authority for determining that an aircraft is clean and airworthy.

1. SCOPE

1.1 Field of Application

This SAE Aerospace Standard (AS) establishes the minimum requirements for ground-based aircraft deicing/anti-icing methods and procedures to ensure the safe operation of aircraft during icing conditions on the ground. This document does not specify the requirements for particular aircraft models.

NOTE: Refer to particular aircraft operator or aircraft manufacturer's published manuals and procedures.

The application of the procedures specified in this document are intended to effectively remove and/or prevent the accumulation of frost, snow, slush, or ice contamination which can seriously affect the aerodynamic performance and/or the controllability of an aircraft. The principal method of treatment employed is the use of fluids qualified to AMS1424 (Type I fluid) and AMS1428 (Type II, III, and IV fluids).

All guidelines referred to herein are applicable only in conjunction with the applicable documents. Due to aerodynamic and other concerns, the application of deicing/anti-icing fluids shall be carried out in compliance with engine and aircraft manufacturer's recommendations.

1.2 Agreements and Contracts

This information is recommended as a basis for operations and service support agreements.

1.3 Hazardous Materials

While the materials, methods, applications, and processes referenced to, or described in, this specification may involve the use of hazardous materials, this standard does not address the hazards that may be involved in their use. It is the sole responsibility of the user to ensure their familiarity with the safe and proper use of any hazardous materials and processes and to take necessary precautionary measures to ensure the health and safety of all personnel involved.

2. REFERENCES

2.1 Applicable Documents

The following publications form a part of this document to the extent specified herein. The latest issue of SAE publications shall apply. The applicable issue of other publications shall be the issue in effect on the date of the purchase order. In the event of conflict between the text of this document and references cited herein, the text of this document takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

2.1.1 SAE Publications

Available from SAE International, 400 Commonwealth Drive, Warrendale, PA 15096-0001, Tel: 877-606-7323 (inside USA and Canada) or +1 724-776-4970 (outside USA), www.sae.org.

AMS1424	Fluid, Aircraft Deicing/Anti-Icing, SAE Type I
AMS1424/1	Deicing/Anti-Icing Fluid, Aircraft, SAE Type I Glycol (Conventional and Nonconventional) Based
AMS1424/2	Deicing/Anti-Icing Fluid, Aircraft, SAE Type I Non-Glycol Based
AMS1428	Fluid, Aircraft Deicing/Anti-Icing, Non-Newtonian (Pseudoplastic), SAE Types II, III, and IV
AMS1428/1	Fluid, Aircraft Deicing/Anti-Icing, Non-Newtonian (Pseudoplastic), SAE Types II, III, and IV Glycol (Conventional and Nonconventional) Based
AMS1428/2	Fluid, Aircraft Deicing/Anti-Icing, Non-Newtonian (Pseudoplastic), SAE Types II, III, and IV Non-Glycol Based

AIR6232	Aircraft Surface Coating Interaction with Aircraft Deicing/Anti-Icing Fluids
AIR6284	Forced Air or Forced Air/Fluid Equipment for Removal of Frozen Contaminants
ARP1971	Aircraft Deicing Vehicle - Self-Propelled
ARP5660	Deicing Facility Operational Procedures
AS5681	Minimum Operational Performance Specification for Remote On-Ground Ice Detection Systems
AS5900	Standard Test Method for Aerodynamic Acceptance of AMS1424 and AMS1428 Aircraft Deicing/Anti-Icing Fluids
AS6286	Aircraft Ground Deicing/Anti-Icing Training and Qualification Program
AS6332	Aircraft Ground Deicing/Anti-Icing Quality Management
AS9968	Laboratory Viscosity Measurement of Thickened Aircraft Deicing/Anti-icing Fluids with a Viscometer

2.1.2 FAA Publications

Available from Federal Aviation Administration, 800 Independence Avenue, SW, Washington, DC 20591, Tel: 866-835-5322, www.faa.gov.

FAA Holdover Time Guidelines: Winter 20xx-20yy (annual publication)

FAA, Ground Deicing Program - General Information, Winter 20xx-20yy (annual publication)

Pilot/Controller Glossary

2.1.3 Transport Canada Publications

Available from Transport Canada, Tower C, Place de Ville, 330 Sparks Street Ottawa, Ontario K1A 0N5, Tel: 1-800-305-2059, www.tc.gc.ca.

Transport Canada Holdover Time Guidelines: Winter 20xx-20yy (annual publication)

Transport Canada, Guidelines for Aircraft Ground Icing Operations, TP 14052E, Issue x (annual publication)

AC 100-001 Glossary for Pilots and Air Traffic Services Personnel

2.1.4 ICAO Publications

Available from International Civil Aviation Organization, 999 University Street, Montreal, Quebec H3C 5H7, Canada, Tel: +1 514-954-8219, <http://www.icao.int/>.

Annex 2 Rules of the Air

Annex 10 Aeronautical Telecommunications - Volume I - Radio Navigation Aids

Annex 10 Aeronautical Telecommunications - Volume II - Communication Procedures Including Those with PANS Status

Annex 11 Air Traffic Services - Air Traffic Control Service, Flight Information Service, Alerting Service

Doc 4444 Procedures for Air Navigation Services - Air Traffic Management

Doc 9640 Manual of Aircraft Ground Deicing/Anti-icing Operations

2.1.5 Nav Canada Publications

Available from NAV CANADA, AEROPUBS Office, 77 Metcalfe Street, Ottawa, ON K1P 5L6, Canada, Tel: +1 866-731-7827, www.navcanada.ca.

Ground Traffic Phraseology

IFR Phraseology

VFR Phraseology

2.1.6 Aircraft Manufacturer Manuals

Aircraft Flight Manuals (AFMs). Available to aircraft owners/operators.

Aircraft Maintenance Manuals (AMMs). Available to aircraft owners/operators.

2.2 Abbreviations and Definitions

2.2.1 Abbreviations

ACARS aircraft communications addressing and reporting system

APU auxiliary power unit

CDF central deicing facility

°C degrees Celsius

CoA certificate of analysis

CoC certificate of conformance

DDF designated deicing facility

DIS deicing/anti-icing supervisor

EASA European Union Aviation Safety Agency

EFB electronic flight bag

FAA Federal Aviation Administration

°F degrees Fahrenheit

FOD foreign object debris or foreign object damage

h hours

HOWV highest on-wing viscosity

IATA International Air Transport Association

IBC intermediate bulk container

ICAO International Civil Aviation Organization

LOUT lowest operational use temperature

LOWV	lowest on-wing viscosity
MB	message board
OAT	outside air temperature
QA	quality assurance
QC	quality control
SDS	safety data sheet
TC	Transport Canada

2.2.2 Definitions

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

2.2.2.1 Advisory Word Definitions

The following advisory words are to be used as defined.

MAY: This means the practice is encouraged and/or optional.

SHALL: This means the practice is mandatory. A synonym for “must.”

SHOULD: This means the practice is recommended or strongly encouraged.

MUST: This means the practice is mandatory. A synonym for “shall.”

2.2.2.2 Definitions

ACTIVE FROST: Condition when frost is forming. Active frost occurs when (1) the aircraft surface temperature is at or below the frost point or (2) there is water in liquid form (e.g., dew) on the aircraft surface and the surface falls to/or below 0 °C (frozen dew).

AERODYNAMIC ACCEPTANCE TEST: A laboratory test establishing whether deicing and anti-icing fluids meet flowoff requirements during takeoff ground acceleration and initial climb.

ALLOWANCE TIME: Estimated time that a Type III/IV fluid is expected to protect against precipitation such as ice pellets, small hail, or mixed precipitation with both (light or moderate intensity only). Types I/II are excluded until further testing has been performed. The allowance time begins at the start of the final application (anti-icing procedure). Allowance times are derived from aerodynamic fluid flowoff performance data and visual inspection of fluids exposed to these precipitation types. A pre-takeoff contamination check cannot be used with allowance times, as failure with small hail or ice pellets may not be visible. Allowance times are published in the FAA and Transport Canada Holdover Time Guidelines.

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

ANTI-ICING FLUID:

1. Mixture of water and Type I fluid.
2. Premix Type I fluid.
3. Type II, III, or IV fluids.
4. Mixture of water and Type II, III, or IV fluids.

NOTE: For deicing/anti-icing purposes in a one-step procedure, fluids in 1, 2, and 4 shall be heated to ensure a temperature of 60 °C (140 °F) minimum at the nozzle.

ANTI-ICING CODE: Report given to the flightcrew that deicing/anti-icing has been carried out and the details of the anti-icing procedure that was applied. Also known as post-deicing/anti-icing report.

BRIX (DEGREES BRIX or °BRIX): Unit of measurement of refraction. See “refraction” and “refractometer.”

BUFFER: See “freezing point buffer.”

CERTIFICATE OF ANALYSIS: A document, issued by a manufacturer, attesting that a lot or batch of a product fulfills the manufacturer's sales specification requirements, listing the tests, the test requirements, the test results on that lot or batch, the lot or batch number, and a date.

CERTIFICATE OF CONFORMANCE: A document declaring that a product fulfills the requirements of a standard. Also known as a certificate of conformity.

CHECK: Examination against a relevant standard by a trained and qualified person to ascertain satisfactory condition.

CHEMICAL CONTAMINATION: Condition when substances (chemicals) are present where they should not be or are at concentrations higher than they should be.

CLEAR ICE: Ice that is transparent or translucent, difficult to detect visually. It is normally formed in the area of the wing fuel tanks by cold-soaking. Clear ice may break loose during or after takeoff and poses a hazard, particularly to aircraft with rear-mounted engines.

COLD-SOAKING: Ice can form on aircraft surfaces even when the outside air temperature (OAT) is well above 0 °C (32 °F). An aircraft equipped with wing fuel tanks may have fuel that is at a sufficiently low temperature such that it lowers the wing skin temperature to below the freezing point of water. The low temperature of the fuel may come from flying at a high altitude, where cold temperature prevails, for a period of time or from fueling with cold fuel. This phenomenon is known as cold-soaking. While on the ground, the cold-soaked aircraft will cause ice to form when water as rain or as vapor (humidity) comes in contact with cold-soaked surfaces.

CONTAMINATION: All forms of frozen or semi-frozen deposits on an aircraft, such as frost, snow, slush, or ice (also known as frozen contamination).

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

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

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

DEICING FLUID:

1. Heated water.
2. Heated mixture of water and Type I fluid.
3. Heated premix Type I fluid.
4. Heated Type II, III, or IV fluids.
5. Heated mixture of water and Type II, III, or IV fluids.

NOTE: Unheated fluids are ineffective to deice.

DEICING SERVICE PROVIDER: The company responsible for the aircraft deicing/anti-icing operations on an airfield.

DEICING PERSONNEL: Groundcrew personnel with roles and responsibilities associated with aircraft ground icing operations.

DEWPOINT: Temperature at which unsaturated air must be cooled to cause saturation with respect to liquid water. The moisture condenses to liquid water either on surfaces as dew or as tiny liquid droplets suspended in air.

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

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

FREEZING POINT: Temperature at which a liquid starts to become a solid.

FREEZING POINT BUFFER: The difference between the OAT and the freezing point of the fluid used.

FREEZING POINT BUFFER, NEGATIVE: Condition when the freezing point of a deicing/anti-icing fluid is above the OAT.

FREEZING POINT DEPRESSANT: A component, usually a glycol, used in the formulation of deicing or anti-icing fluids to lower the freezing point of water.

FREEZING RAIN, LIGHT: Scattered drops that do not completely cover a surface. Freezing rain with a rate up to 2.5 mm/h (0.10 in/h) or 25 g/dm²/h, with a maximum of 0.25 mm/h (0.01 in/h) in 6 minutes.

FREEZING RAIN, MODERATE: Precipitation of liquid water particles that freeze upon impact with the ground or other exposed objects. Moderate freezing rain may appear in the form of large drops or can appear to fall in sheets where individual drops are not identifiable. Moderate freezing rain has a measured rate between 2.5 to 7.5 mm/h (0.10 to 0.30 in/h) or 25 g/dm²/h and 75 g/dm²/h.

FREEZING RAIN, HEAVY: Precipitation of liquid water particles that freeze upon impact with the ground or other exposed objects. Heavy freezing rain can seem to fall in sheets, and individual drops may not be identifiable. Heavy freezing rain has a measured intensity of more than 7.5 mm/h (0.30 in/h) or 75 g/dm²/h.

FROST/HOARFROST: Tiny ice crystal formed on a surface at or below the frost point. Frost generally occurs with clear skies at temperatures below freezing point. Frost can also occur from the freezing of dew.

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

FROST POINT: Temperature, at or below 0 °C (32 °F), at which air undersaturated with moisture must be cooled (at constant pressure) to cause saturation with respect to ice. The moisture directly deposits, without going through the liquid phase, as frost on exposed surfaces, providing nucleation sites. The frost point is higher (warmer) than the dewpoint by about 10% at a given humidity level in air. Air temperature readings given by a thermometer are applicable to the height above ground of the thermometer itself. Because cool air sinks and the ground often cools very quickly, especially on clear nights, the ground temperature on clear, still nights is invariably lower than the temperature only a few feet higher. Thus, frost can form even when a thermometer gives a reading above freezing. The same happens with aircraft - frost can form on aircraft when the thermometer air temperature reading is above 0 °C (32 °F).

FUEL FROST: Frost, normally in the area of the wing fuel tanks, caused by the cold-soaking. Also known as non-environmental frost or cold-soaked fuel frost.

GLYCOL: A class of organic compounds with two hydroxyl groups (-OH) attached to different carbons, for example, ethylene glycol, propylene glycol, diethylene glycol, polyethylene glycol, polypropylene glycol. In aircraft deicing, glycol usually refers to ethylene glycol or propylene glycol.

GROUNDCREW: Personnel with responsibilities for the handling, maintenance, and servicing of an aircraft while on the ground, as well as the coordination of these activities.

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

HIGHEST ON-WING VISCOSITY (HOWV): Highest viscosity of a thickened deicing/anti-icing fluid which is still aerodynamically acceptable.

HOARFROST: A synonym for frost. See "frost/hoarfrost."

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

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

LOWEST ON-WING VISCOSITY (LOWV): Lowest viscosity of a thickened deicing/anti-icing fluid for which the applicable holdover timetable can still be used.

LOWEST OPERATIONAL USE TEMPERATURE (LOUT): For fluids whose glycol concentration is equal to or less than the concentration at which the aerodynamic acceptance test was performed. The fluid's LOUT is the higher (warmer) of either:

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

POST-DEICING CHECK: A check by qualified ground personnel to ensure that all critical surfaces are free of adhering contamination after the deicing procedure has been completed.

POST-DEICING/ANTI-ICING CHECK: A check by qualified ground personnel to ensure that all critical surfaces are free of adhering contamination after the deicing/anti-icing procedure has been completed.

POST-DEICING/ANTI-ICING REPORT: Report given to the flightcrew confirming that deicing/anti-icing has been carried out and the details of the deicing/anti-icing procedure that was applied.

POST-DEICING REPORT: Report given to the flightcrew confirming that deicing (removal of contamination only) has been carried out and the details of the deicing procedure that was applied and no holdover time is applicable.

PRE-DEICING PROCESS: A process to remove large quantities of frozen contamination prior to the regular deicing/anti-icing process with the objective of reducing the quantity of deicing fluid to be used.



PRE-FLIGHT CONTAMINATION CHECK: A check performed by the flightcrew or groundcrew prior to departure to verify the presence of adhering contamination to establish the need for deicing/anti-icing. It may be part of the flightcrew walk-around before the flight.

PRE-TAKEOFF CHECK: A check by the flightcrew prior to takeoff and within holdover time. This check is normally conducted from inside the flightdeck. It is normally accomplished by a continuous assessment of the conditions that affect holdover time and includes an assessment and adjustment of holdover time.

PRE-TAKEOFF CONTAMINATION CHECK: A check of the critical surfaces for adhering contamination. This check is accomplished after the holdover time has been exceeded and must be completed within 5 minutes prior to the beginning of takeoff.

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

QUALIFIED STAFF: Trained staff who have passed theoretical and practical training tests and have been qualified for performing this type of job; refer to AS6286.

QUALITY ASSURANCE (QA): It is process-oriented and focused on preventing quality issues. It is a proactive approach. An audit is done to validate QA processes, the quality procedures to be followed (e.g., “documented”).

QUALITY CONTROL (QC): It is product-oriented and focused on identifying quality issues in manufactured products and performance of service. It is a reactive approach. Inspections/checks/tests are done as part of the QC procedure to verify the quality of the available procedures and operations (e.g., “implemented”).

REFRACTION: The bending of light as it passes from one transparent substance into another. For solutions, the refraction will vary upon the concentration of the solute in the solvent. Using a calibration curve, it is possible to determine the concentration of the solute in the solvent. For example, for aqueous glycol solutions, it is possible to determine the concentration of the glycol in water by measuring refraction with a refractometer and comparing the result to the calibration curve. Refraction can be expressed as a dimensionless number (index of refraction) or as a scale of concentration, e.g., degrees Brix (°Brix) or freezing point (°C or °F). See “refractometer.”

REFRACTIVE INDEX: Unit of measurement of refraction expressed in the form of a dimensionless number. See “refraction” and “refractometer.”

REFRACTOMETER: An instrument to measure refraction. Result of measurement with a refractometer can be expressed as a dimensionless number (index of refraction) or as a scale of concentration, e.g., degrees Brix (°Brix) or freezing point (°C or °F).

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

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

RISK ASSESSMENT: An evaluation based on engineering and operational judgment and/or analysis methods to establish whether the achieved or perceived risk is acceptable or tolerable, then, if required, implementing reasonable control and mitigating measures to remove or reduce the identified risk(s).

SLUSH: Snow or ice that has been combined with water.

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

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

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

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

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

THICKENED FLUID: A fluid that contains polymeric thickeners. AMS1428 Type II, III, and IV fluids are thickened fluids; AMS1424 Type I fluids are not thickened.

3. ROLES AND RESPONSIBILITIES

3.1 Pilot-in-Command

The pilot-in-command has the ultimate responsibility for the aircraft and shall not commence takeoff unless the external surfaces are clear of any deposit which might adversely affect performance and/or controllability, except as permitted in the aircraft operator manuals.

3.2 Aircraft Operator

Shall have responsibility for:

- Aircraft ground deicing programs.
- The pilot-in-command.
- Management responsibilities.

3.3 Deicing Service Provider

Shall have responsibility for:

- The safety and operability of the designated deicing facilities.
- Aircraft ground deicing/anti-icing procedures.

A deicing service provider shall have aircraft deicing/anti-icing procedures, including a quality control (QC) program. These procedures, which ensure compliance with the relevant regulations and global aircraft deicing standards such as AS6285, AS6286, and AS6332, shall cover all aspects of the aircraft ground deicing/anti-icing process, including (but not limited to) instructions, tasks, responsibilities, authorizations, and infrastructure for the deicing/anti-icing process as follows:

- Use of suitable deicing/anti-icing treatment methods according to this standard.
- Remote deicing/anti-icing instructions (when applicable).
- Sufficient number of trained and qualified deicing/anti-icing personnel.
- Qualified staff to coordinate and supervise the deicing/anti-icing treatments.

- Use of suitable deicing/anti-icing equipment meeting specification ARP1971.
- Special handling procedures for Type II, III, and IV deicing/anti-icing fluids to maintain quality.
- Post-deicing/anti-icing check (when applicable).
- Protocol for communications with flightcrew for both gate and remote locations (when applicable).
- Communicating the post-deicing/anti-icing report to the flightcrew.
- Documentation of all deicing/anti-icing treatments.
- Personnel safety arrangements.
- Provisions for tools and clothing for deicing/anti-icing personnel.
- Environmental arrangements.
- A QC program.

Service providers should have a winter operational plan or documented station local procedures indicating how the above-mentioned deicing/anti-icing process and procedures will be implemented and executed locally.

If a winter operational plan or documented station local procedure requires a change, it should be communicated to the affected parties. This can include, but is not limited to:

- Change of deicing location(s), deicing frequencies, fluids, etc.
- Addition to or reduction in equipment type and volume.
- Personnel changes or contact information.

3.4 Airports

Shall have the responsibility for:

- Following local environmental regulations.
- The logistics of bringing fluid onto a field.
- The operability of the dedicated deicing facilities.
- Message boards.
- Weather support.
- Health and safety.

3.5 Regulatory Authority

Has the responsibility for:

- Regulatory and guidance material, plus the advocacy of the clean aircraft concept.
- The policies and standards that support the operability of the clean aircraft concept.
- Review and approval of airline operator ground deicing programs (as applicable).

3.6 Air Traffic Control

Has the responsibility for:

- The flow of aircraft through the regional system.

4. QUALITY MANAGEMENT

All companies providing deicing/anti-icing services shall have a quality program. The purpose of the program is to ensure that deicing/anti-icing of aircraft on the ground is accomplished in accordance with regulatory requirements and guidance, industry standards, and the operator's program. To verify the effectiveness of the deicing/anti-icing of aircraft on the ground, the quality program should include both quality assurance (QA) and quality control (QC) processes and procedures.

4.1 Quality Assurance

To meet QA requirements, a company must provide proof it follows the rules and instructions in any specific field correctly and that it has a proper and efficient QA/QC program. QA is confirmed by auditing. Sometimes audit pools are formed so that companies are not audited several times on the same process by different entities; for example, IATA's Deicing/Anti-Icing Quality Control Pool (DAQCP). All companies should have a QA program in place. QA programs shall follow the standards published in AS6332.

4.2 Quality Control Program

A QC program shall cover all aspects of aircraft ground deicing/anti-icing and follow the standards published in AS6332. This program should encompass all pertinent fluid tests performed before the start of each winter season and the tests performed within the season.

A QC shall include, but is not limited to, the following checks:

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

4.3 Fluid Quality Control

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