



AEROSPACE RECOMMENDED PRACTICE

ARP5660™

REV. B

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Superseding ARP5660A

(R) Deicing Facility Operational Procedures

RATIONALE

ARP5660 has been revised to include additional technical content, as well as to reduce redundant information contained in other SAE documents. All references to ARP5149 and ARP4737 have been replaced by references to AS6286 and AS6285, respectively.

AS6285 forms one part of three related SAE Aerospace Standards (AS) and should be read in conjunction with AS6286 and AS6332. Collectively, AS6285, AS6286, and AS6332 are known to the international community as the "global aircraft deicing standards." The lead document is AS6285, which all the other documents support and should therefore be in agreement.

FOREWORD

This SAE Aerospace Recommended Practice (ARP) establishes recommended practices for the standardization of operational procedures at designated deicing facilities (central deicing facilities/remote deicing facilities) to ensure the safe operation of aircraft, equipment, and personnel during ground icing conditions.

Users of this document seeking central deicing facility (CDF) or designated deicing facility (DDF) construction and design guidance should consult ARP4902.

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1. SCOPE

1.1 Purpose

This SAE Aerospace Recommended Practice (ARP) provides guidelines for the standardization of safe operating procedures to be used in performing services and maintenance at designated deicing facilities (DDFs), comprising both central deicing facilities (CDFs) and remote deicing facilities. These procedures are necessary for the proper deicing/anti-icing of aircraft on the ground and performance of associated checks in accordance with the various approved ground icing programs, while considering applicable local environmental, operational, and economic requirements. This document should be used by operators, regulators, and airport authorities to develop and standardize approvals and permits for the establishment and operation of a DDF.

The coordination of stakeholders is required prior to the approval of design plans for a deicing facility.

Operating procedures shall be agreed to, in writing, by all air operators, airport authorities, regulators, and service providers prior to commencing deicing operations.

1.2 Infrastructure

During the design phase of a DDF, careful attention shall be given to ensure that the infrastructure is in place to support the operating procedures outlined in this document.

Designers of a DDF should refer to the most current revision of ARP4902 for guidance.

1.3 Field of Application

1.3.1 Regulatory Considerations

Regulations governing aircraft operations in icing conditions shall be followed. Specific rules for aircraft are set forth in United States Federal Aviation Regulations (FARs), European Union Aviation Safety Agency (EASA) Regulations, Canadian Air Regulations (CARs), and others. Paraphrased, these rules state that no one should dispatch or take off aircraft with frozen deposits on components of the aircraft that are critical to safe flight.

The ultimate responsibility of determining an aircraft is “clean” (i.e., no frozen deposits on critical surfaces) and meets airworthiness requirements rests with the pilot-in-command (PIC) of the aircraft.

1.3.2 Agreements and Contracts

The information contained in this document is recommended as a basis for deicing pad operations, maintenance operations, and service support agreements.

1.3.3 Safety—Hazardous Materials

While the materials, methods, applications, and processes described or referenced in this document may involve the use of hazardous materials, this document does not address mitigation of the hazards to the user. It is the sole responsibility of the user to ensure familiarity with the safe and proper use of any hazardous materials related processes and precautionary measures in order to ensure the health and safety of all personnel involved.

1.3.4 Applicability of Guidelines

All guidelines referred to herein are applicable only in conjunction with the referenced SAE publications. Specific requirements for airplane model type are not included. Due to aerodynamic and other concerns, application of deicing/anti-icing fluids shall be carried out in compliance with engine and aircraft manufacturers' requirements.

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.

NOTE: Particular airline or aircraft manufacturers' published manuals, procedures, or methods supplement the information contained in this document.

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 Non-Conventional) 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 Non-Conventional) Based
ARP1971	Aircraft Deicing Vehicle - Self-Propelled
ARP4902	Design of Aircraft Deicing Facilities
AS5635	Message Boards (MBs)
AS6285	Aircraft Ground Deicing/Anti-Icing Processes
AS6286	Aircraft Ground Deicing/Anti-Icing Training and Qualification Program
AS5537	Weather Support to Deicing Decision Making
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 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/>.

AN 6-1	Annex 6 - Operation of Aircraft - Part 1 - International Commercial Air Transport - Airplanes
AN 14-1	Annex 14 - Aerodromes - Volume 1 - Aerodromes Design and Configuration
Doc 9157 - Part 2	Aerodrome Design Manual - Part 2 - Taxiways, Aprons, and Holding Bays
Doc 9640	Manual of Aircraft Ground De-Icing/Anti-Icing Operations

2.1.3 Transport Canada Publications

Transport Canada documents are 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.

AC-700-030	Electronic Holdover Time Applications
CARS 602.11	Canadian Aviation Regulations
CARS 622.11	Ground Icing Operations
TP 14052	Guidelines for Aircraft Ground - Icing Operations
TP 312	Aerodrome Standards and Recommended Practices

Transport Canada Holdover Guidelines 20XX-20XX (issued every year)

2.1.4 FAA Publications

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

AC 120-60	Ground Deicing and Anti-Icing Program
AC 150/5300-14	Design of Aircraft Deicing Facilities
AC 120-89	Ground Deicing Using Infrared Energy
AC 120-112	Use of Liquid Water Equivalent System to Determine Holdover Times or Check for Anti-Icing Fluids
14 CFR 121.629	Operation in Icing Conditions

FAA Holdover Time Guidelines Winter 20XX-20XX (issued every year)

FAA Notice N8900 XXX Revised FAA-Approved Deicing Program Updates, Winter 20XX 20XX (issued every year)

2.2 Acronyms and Abbreviations

AAF	Aircraft anti-icing fluid
ACARS	Aircraft Communication Addressing and Reporting System
ADF	Aircraft deicing fluid
AIP	Aeronautical Information Publication (issued by local ATC, or related agencies)
AIRAC	Aeronautical Information Regulation and Control
ATC	Air traffic control
BOD	Biological oxygen demand
CAR	Canadian Aviation Regulation
CDF	Central deicing facility
COD	Chemical oxygen demand

CTM	Coordinator traffic and movement
DDF	Designated deicing facility
EFB	Electronic flight bag
ERD	Emergency response deployment
ERL	Environmental release limit
FAR	Federal Aviation Regulation
GC	Gas chromatograph
GRV	Glycol recovery vehicle
ICP	Inbound control point
IRROPS	Irregular operations
KPI	Key performance indicator
LOUT	Lowest operational use temperature
METAR	Meteorological Terminal Aviation Routine Weather Report
MOU	Memorandum of understanding
NOTAM	Notice to airmen
OCP	Outbound control point
PIC	Pilot-in-command
PPE	Personal protective equipment
R/I	Refractive Index
SCADA	Supervisory control and data acquisition
SDS	Safety data sheet
SOP	Standard operating procedure
TAF	Terminal aerodrome forecast
VHF	Very high frequency (pertaining to radio communication)
VN	Voice NOTAM

2.3 Definitions

Except where specifically stated in this document, the use of the term “deicing” shall also include “anti-icing.”

AIRCRAFT COMMUNICATION AND REPORTING SYSTEM (ACARS): Digital data link system transmitted via VHF radio that allows airline flight operations departments to communicate with aircraft. New communication platforms utilize electronic tablets as an electronic flight bag (EFB) (e.g., iPads) on flight decks and in deicing vehicles. Deicing coordinators can interact with the flightcrew and deicers using web-based dispatching. For pad operations, including movement configuration and guidance, electronic message boards are now commonly used at DDFs.

AIRCRAFT DEICING FACILITY: Designated airport facility designed to conduct aircraft deicing/anti-icing operations while fulfilling all operational, safety, and environmental requirements.

CENTRAL DEICING FACILITY (CDF): Designated airport facility consisting of multiple adjacent located Remote Deicing Facilities designed to conduct deicing/anti-icing of aircraft while fulfilling all operational, safety, and environmental requirements, and controlled by a centralized facility (ice house).

CONTROL POINT: Where transfer of control of an aircraft occurs between controlling agencies.

DESIGNATED DEICING FACILITY (DDF): Accumulation of multiple designated airport infrastructure facilities designed to conduct deicing/anti-icing of aircraft (CDFs or remote deicing facilities, or a combination thereof) while fulfilling all operational, safety, and environmental requirements.

DEICING OPERATOR: Qualified person, defined in AS6286, performing deicing/anti-icing operations on the ground and associated checks at a DDF.

DEICING CREW: Personnel assigned to duties for an individual piece of deicing equipment/aircraft.

DEICING COORDINATOR: Person who controls the movement of the aircraft and coordinates the deicing/anti-icing activities of the deicing vehicle(s) on a deicing pad or, if appropriate, procedures and/or technology for safe separation of deicing/anti-icing operation and communication is established, on multiple deicing bays. This person may communicate with the PIC through the interphone or via VHF radio and/or new communication platforms that utilize EFBs (e.g., electronic tablets/iPads) on flightdecks and in deicing vehicles. Deicing coordinators can interact with the pilots and deicers using web-based dispatching. For pad operations, including movement configuration and guidance, electronic message boards are now commonly used at DDFs for the purpose of communicating associated check (inspection) information. A deicing coordinator may perform these duties at locations that do not utilize a ground coordinator.

DEICING COORDINATOR or PRIMARY DEICING VEHICLE OPERATOR: [Located at any deicing location] Person responsible for coordinating deicing/anti-icing operation of an aircraft and for communicating with the PIC at locations where deicing vehicles are used and a ground coordinator is not used for this purpose. Depending on the location's setup, this coordination may be accomplished by an individual (not assigned to a vehicle) or it may be a vehicle assigned to deice/anti-ice a specific portion of the aircraft. The external interphone system or VHF radio and/or and new communication platforms that utilize EFBs (e.g., electronic tablets/iPads) on flightdecks and in deicing vehicles. Deicing leads can interact with the coordinators, flightcrew and deicers using web-based dispatching. For pad operations, including movement configuration and guidance, electronic message boards are now commonly used at DDFs in order to communicate deicing/anti-icing and associated check (inspection) information to the PIC.

DEICING BAY: Specific area where the deicing and/or anti-icing of aircraft is performed.

DEICING PAD: Operational area within a DDF, including taxiways, taxi lanes, staging bays, and deicing bays, controlled by the Icehouse.

ICEHOUSE: Generalized term to describe DDF tower coordination center, remotely dedicated office space, or mobile supervisory vehicle which coordinates operations at the assigned deicing facility.

ICEMAN: Coordinator of specific deicing/anti-icing ground positions. The iceman is located in the icehouse and is a person who communicates with the PIC via VHF radio and/or new communication platforms that utilize EFBs (e.g., electronic tablets/iPads) in cockpits and deicing vehicles. The iceman (icehouse personnel) can interact with the flightcrew and deicers using web-based dispatching. For pad operations, including movement configuration and guidance, electronic message boards are now commonly used at DDFs. The iceman provides general deicing/anti-icing information and provides directions to the PIC before making contact with the ground coordinator and/or with the deicing coordinator.

GROUND COORDINATOR: Person responsible for coordination of ground deicing operations within a DDF

KEY PERFORMANCE INDICATOR (KPI): A quantifiable measure used to evaluate the success of an organization, employee, operation, etc., in meeting objectives for performance.

PAD CONTROL: Radio call sign of the operating position in the Icehouse that controls aircraft entering the DDF and exiting the deicing bays.

PAD LEADERSHIP: Any of the following positions of leadership: bay lead, lead truck, crew chief, deicing pad team leader, Primary, etc.

PINK SNOW: Snow contaminated with aircraft deicing/anti-icing fluid.

POSITIVE HOLD: The requirement to provide both verbal and visual communication to aircraft on DDFs such that no movement upon the aircraft is permitted until the flightcrew confirm it is safe to do so.

REMOTE DEICING FACILITY: Designated airport infrastructure facility designed to conduct deicing/anti-icing of aircraft preferably close to the take-off runway threshold. The operation is controlled by an individual pad control facility and is designed to permit aircraft engines-on operation while fulfilling all operational, safety, and environmental requirements.

SLOT MANAGEMENT: Departure allocation program intended to meter departing air traffic.

SNOW DESK: Operational position within an airport authority operations control centre where all snow removal operations are coordinated and equipment, logistics and removal methods are dispatched.

STAGING AREA: Dedicated area behind and/or adjacent to each deicing bay, where aircraft await approval to enter the deicing bay.

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.

TANDEM DEICING: The conducting of deicing operations simultaneously in both the staging and deicing bays. Tandem deicing operations requires additional procedures and training to address the variations of operation versus regular CDF/DDF operations.

TRANSFER POINT: Location on apron, ramp, or taxiway where responsibility for the aircraft is transferred between controlling agencies.

WINDROW: A row of snow created by snow removal equipment during snow removal operations.

3. DESIGNATED DEICING FACILITY (DDF) OPERATING PROCEDURES

Operating a DDF is, in most cases, a joint effort of several parties, including facility operators, airport authorities, air traffic control (ATC), apron control, etc. To help ensure the safe operation of a DDF, it is recommended that the aforementioned parties collectively and collaboratively manage possible conflicts or misunderstandings which may hamper safe and efficient operations. This can be achieved by organizing regular and ad-hoc meetings in order to harmonize operational logistics, managerial policy, and informational exchange.

Deicing procedures should follow the guidance of AS6285.

3.1 Management Plan

The management plan should address and define responsibilities associated with the following:

- a. Deicing personnel.
- b. Pilots and operators of aircraft while at the DDF, including basic aircraft operation and adherence to directives/procedures of the DDF location.
- c. Facility operators and/or deicers handling the aircraft at the location, maintenance of deicing equipment and facilities.
- d. Airport authorities constructing and maintaining deicing locations including infrastructure for vehicles.
- e. Air/ground traffic control guidance of aircraft to and from the DDF.
- f. Airport deicing management organization.
- g. Pre-authorization for deicing services between carriers, service providers, and airport authorities.

The responsibilities of all parties can be documented into a memorandum of understanding (MOU) containing an overview of the total operation. This should include items such as a description of the infrastructure, a process model, communication structure, publication strategy, dissemination of information, and logistic support.

3.2 DDF Operations Plan

The following should be addressed and defined in a DDF operations plan:

- a. General.
- b. Equipment.
- c. Approved aircraft types.
- d. Apron management coordination.
- e. Movement of aircraft to the DDF.
- f. Aircraft movement.
- g. Vehicle movement.
- h. DDF configuration.
- i. Engines-on deicing operations.
- j. Procedures—jet powered aircraft.
- k. Procedures—propeller driven aircraft (see item l.).
- l. Tandem deicing operations.

3.3 Alternative Contamination Removal

Alternative methods of contamination removal from aircraft critical surfaces may include infrared deicing and forced air. These alternative methods can be used where local environmental requirements and weather conditions support the use of alternative deicing. Standard operating procedures (SOPs) for these alternatives should be developed if used at DDFs.

3.4 Specific Aircraft Procedures and Precautions

Given the large number of aircraft configurations, their unique characteristics, and regulatory requirements, aircraft manufacturers and operators should be consulted with regard to specific deicing/anti-icing procedures.

3.5 Checks and Responsibilities

The plan should include definitions of and responsibilities for ensuring that the following have been checked:

- a. Wings, tail, and control surfaces.
- b. Pitot heads, static ports and angle of attack sensors.
- c. Engine inlets.
- d. Air conditioning inlets/exits.
- e. Landing gear and landing gear doors.
- f. Fuel tank vents.
- g. Fuselage.

Refer to AS6285 for detailed requirements.

3.6 Anti-Icing Fluid Condition

To avoid confusion between operator and flightcrew as to which fluid shall be applied to the aircraft; all DDF stakeholders should agree to a standard outline of fluid treatment plan decision making factors (i.e., one-step, two-step, spot [no holdover time applies], pretreatment, etc.).

3.7 Aircraft and Vehicle Movement Patterns

Movement patterns for both aircraft and vehicles will be determined by facility layout, aircraft code classification, and weather condition.

3.8 Fluid Application

Refer to guidelines established in AS6285 and AS6286.

3.9 Fluid Mixture

Depending on operational requirements, and equipment available on-site, fluid mixing (blending) tailored to specific weather conditions may be made available. Refer to AS6285 for detailed fluid mixing guidance.

3.10 Pre-Dispatch Procedures

Inspection and contamination removal from areas such as engine inlets and flap/slat tracks remains the responsibility of the individual air carriers. If the aircraft taxis to the DDF on its own power, these areas should be checked and contamination removed prior to departure from gate and subsequent arrival at DDF.

3.11 Pretreatment Procedure

An allowance should be made within the DDF operator's program for air carriers requesting pretreatment of aircraft prior to inclement weather events. All procedures should take into account impact upon the local environment.

3.12 Contingency Plans

Airport stakeholders should jointly develop procedures to be implemented in times of irregular operations (IRROPS). Certain winter weather conditions can create long deicing wait times and a pre-storm departure allocation program can help avoid aircraft congestion and long lineups waiting for deicing.

3.13 Weather Monitoring and Reporting Sources

- a. Terminal aerodrome forecast (TAF) and Meteorological Terminal Aviation Routine Weather Report (METAR) retrieval procedures.
- b. METAR codes.
- c. TAF codes.
- d. Radar weather retrieval procedures.
- e. Real-time weather (nowcasting) (refer to AS5537).
- f. Liquid water equivalent reporting system (refer to AC 700-030, CARS622.11).

4. COMMUNICATIONS

4.1 Communication Protocols

Communication plays a key role in the overall safety of passengers, aircraft, flightcrew, and groundcrew during the deicing/anti-icing operation (per AS6285). Communication between the flightcrew and the groundcrew will usually be achieved using a combination of printed forms, verbal and visual. For treatments carried out with flightcrew on board and after doors are closed, the use of interphone (headset) or VHF radio will usually be required. Electronic message boards may also be used at DDFs, gates, and stands to enhance communications.

Other forms of electronic messaging systems, such as electronic flight bag applications, Aircraft Communication Addressing and Reporting System (ACARS), etc., can also be used.

Following an approved communication protocol as per AS6285 ensures that the PIC is provided with all the correct information during the deicing/anti-icing operation. The communication protocol should be used for all deicing and anti-icing operations whether with running engines or with engines shut down.

Complex operations may require modification of these protocols. Refer to AS6285 for detailed communication guidance.

4.1.1 Terminology/Phraseology

The terminology and phraseology used in this document should be used when radio communications are occurring. Wherever possible, standard names for specific contact functions should be used; e.g., pad control, iceman, etc.

4.1.2 Time References

Different time references are in common use; e.g., local time or 24-hour clock. In all communications between ground personnel and the flightcrew, the time reference in use should be made clear as given in AS6285.

4.1.3 Standardized Aircraft Identification Call Sign

Communications should be consistent with respect to aircraft identification by company, flight number, and/or registration markings.

4.1.4 Visual Communication

Visual communication refers to communication accomplished/performed and received comprehensively by all parties. Visual communication includes electronic signboard messaging, electronic communication devices/platforms such as flightdeck electronic tablets and deicing management coordination platforms, and aircraft marshalling standard practices performed by trained personnel.

4.1.5 Electronic Communication Description

Electronic communication may be used to transfer deicing/anti-icing information.

- a. Electronic communication: Transference/exchange of deicing plan(s) amongst the stakeholders clearly and expeditiously. Electronic communication alleviates traditional verbal communication barriers which includes the need to wait in cue to verbally place a deicing order, await confirmation, and reduction of deicing order miss-understanding.
- b. Equipment: Consists of a stable and reliable transfer of instructions via a wireless media utilizing tools such as a laptop (web-based), electronic tablets (e.g., iPads), or similar application hosting device.
- c. Goal: To quickly and accurately confirm/validate the required deicing/anti-icing treatment plan, monitor the application process and report the post-deicing information.
- d. Process: Connect deicing coordinators, deicing crew, and pilots.

Markings and visual message board displays should be consistent with AS5635. Where illuminated guidance is provided (e.g., for pad lead-in), the applicable lights should be on. During engines-on deicing operations, communications are required to hold aircraft until all equipment and personnel are clear.

4.1.6 Radio Frequencies and Call Signs

Standardized radio frequencies should be used. It is the responsibility of the deicing crew (ground personnel, pad commander/controller, or ice house) to establish direct and consistent communication with the PIC by flight interphone or VHF radio, before, during and after the deicing/anti-icing process. The deicing crew's call signs should include "ice" in the name. Where airports have separate DDFs, use of a unique VHF frequency for each DDF is recommended.

4.1.7 Electronic Communications

Use of electronic communications electronic data links including ACARS/datalink and integrated flight deck communications processes can be utilized to alleviate radio congestion. Communication between the flightcrew and the deicing crew will usually be achieved using a combination of verbal communication, printed forms, and new communication platforms that utilize EFBs (e.g., electronic tablets/iPads) on flightdecks and in deicing vehicles. Deicing coordinators can communicate with the pilots and deicers using web-based dispatching. For pad operations, including movement configuration and guidance, electronic message boards are now commonly used at DDFs. For treatments carried out after aircraft doors are closed, the use of flight interphone (headset) or VHF radio will usually be required. Electronic message boards may also be used in "off stand" situations. Use of hand signals is not recommended except for the final "all clear" signal.

4.2 Communications—Deicers and Facility Operators

To ensure clear, concise communication the protocol for communication between deicers, PIC, and facility operators is divided into several phases (refer to AS6285).

4.2.1 Direct Communication with Flight Deck

The deicing crew shall ensure that all information is understood and that there are no questions from the PIC before communication is terminated.

The aircraft call sign shall precede all VHF radio communications between the PIC and the deicing crew.

Third party communication of any information pertaining to the associated checks (inspection) or deicing/anti-icing operation of an aircraft for the deicing operator/crew/team is not acceptable, except at airports where VHF or pad displays are the standard method for communication of this type of information and/or appropriate procedures and transfer of information to/from qualified third party personnel is established.

Visual hand signals shall NOT be used to relay deicing information to the PIC.

4.2.2 Checks/Inspection Communication

When aircraft contamination checks/inspections occur, the PIC shall be notified of the check/inspection results by interphone, VHF, or person to person.

4.2.3 Request for Deicing Communication

Requests for deicing/anti-icing shall only be made through the published communication channels using the text given in AS6285. Where available, electronic flight bag type platforms may be employed to request/confirm deicing and anti-icing operations with minimal to no verbal communication.

4.2.4 Deicing Communication—Verbal

Before the deicing/anti-icing process begins the pad controller, iceman, deicing coordinator, lead deicing vehicle operator or the deicing operator/crew as appropriate shall verbally communicate with the PIC and/or use electronic communication through a deicing management system. Electronic message boards may be employed to supplement the exchange of information.

- a. Using the text given in AS6285.
- b. Habitually, some time will elapse between the “stand-by” statement and the “aircraft configured for deicing” statement of the PIC due to mechanical inputs and verifications.

4.2.5 Post-Deicing/Anti-Icing Communication

4.2.5.1 Deicing/Anti-Icing Information

After the deicing/anti-icing process is completed, and it has been verified that all deicing equipment are safe and clear of the aircraft, the deicing coordinator or the primary deicing vehicle or the deicing operator/crew shall communicate with the PIC using visual and verbal communication. Additionally, electronic communication through a deicing management system may also be used. Electronic message boards may be employed to supplement the exchange of information.

- a. Using the text given in AS6285.
- b. Communicating the tactile check (if applicable).
- c. Communicating the post treatment check.
- d. Transmission of the anti-icing code.
- e. Communicating that the equipment is safe and clear.
- f. During engines-on deicing/anti-icing operations, both verbal and visual communication are required to hold aircraft until all equipment are confirmed safe and clear.

WARNING: Deicing equipment shall not be in motion while the aircraft is in motion.

When the deicing coordinator or the primary deicing vehicle or the deicing operator/crew states “Post-deicing/anti-icing check is complete,” this indicates that the deicing/anti-icing process has been completed, that all required checks/inspections have been completed and the aircraft is free of frozen contamination, and that all deicing equipment is clear of the aircraft.

When the PIC states “Roger,” it means that the pilot understands the information that has just been given. If the pilot does not understand, clarification will be requested.

4.2.5.2 All Clear Signal to Flightcrew During Engines-on Deicing Operations

The operational plan shall include a process for the communication of an “all clear” signal to the flightcrew. This signal shall be both verbal and visual (e.g., use of electronic signboards) and is performed after the following has been accomplished:

- a. Deicing/anti-icing information has been provided to the flightcrew.
- b. It has been verified that deicing vehicles, equipment, and personnel are safe and clear of the aircraft and in safety zones.
- c. Ground crew has ensured safe taxi clearances.

4.2.6 Marshalling Hand Signals

Deicing facilities with a functional self-park system in conjunction with VHF radio communication with the PIC are not required to use hand signals for aircraft and deicing vehicle guidance. Marshalling signals shall be used in absence of the self-park system and VHF radio communication methodology. It is recommended that all personnel involved in deicing operations should be trained on ICAO marshalling signals for aircraft.

4.2.7 Deicing Equipment Communication

The deicing operator/crew/team shall be in communication at all times either through the use of an intercom or two-way radios. All deicing personnel working on the same aircraft should use a common frequency.

All communication between the deicing crew/team shall be clear and concise.

WARNING: Misunderstood communication can lead to personnel injury, equipment damage, and/or aircraft damage.

All communication equipment should undergo a functional check before the first deicing operation of the day. If the vehicle communication system fails or becomes inoperative during the deicing/anti-icing process, use the “Loss of communication procedures” found in 7.3.1 of this document.

NOTE: Aircraft release or clear-to-taxi communication methods: The flightcrew must hold position and contact [departure control/advisory position (i.e., ATC) or groundcrew (as applicable)] for [departure method; i.e., taxi, pushback, etc.]. Refer to AS6285 for detailed communication protocols.

4.3 Communications—DDF Essential Information

4.3.1 Single Deicing Service Provider (DDF Operator)

Single deicing service providers shall provide information to potential users of the DDF as follows:

- a. Site location with reference to airport chart/associated aprons, taxiways, and runways.
- b. Facility layout indicating associated buildings, facilities, taxiways, taxi-lanes, deicing facilities, staging bays, safe zones, vehicle corridors, entry and exit points, etc.
- c. Explanation of associated in-ground lighting and illuminated signage if available.
- d. Description of the deicing facilities, if segregated, for deicing/anti-icing and/or staging and the capability for reversing locations if possible.
- e. Pilot/crew brief sheet: This information must be laid out similar to TC/FAA/ICAO airport charts, including a descriptive (narrative/explanation) of an aircraft's transition through the deicing facility. This will provide valuable assistance to both flight operations personnel and flightcrews regarding the DDF.

- f. Description of traffic flow and coordination through the DDF with regard to aircraft and vehicles.
- g. Communications protocol for aircraft, vehicles, and associated agencies (ATC, APRON, RAMP, airport authorities, or airlines) involved in the movement of aircraft to and from the DDF.
- h. Personnel responsibilities (ice house, pad control, deicing coordinator, deicing equipment operators/glycol recovery vehicle [GRV] operators/snow removal personnel).
- i. Sample phraseology for flightcrews and deicing vehicles.
- j. Emergency procedures.

4.3.2 Multi-Deicing Service Providers

Multi-deicing service providers using one pad shall:

- a. Obtain orientation package from the facility manager (e.g., location maps, training).
- b. Undergo orientation briefing.
- c. Ensure that all deicing personnel and equipment meet DDF requirements.
- d. Perform on-site orientation and practical simulation with facility manager.
- e. Advise the authorities/facility manager date of commencement of operations.
- f. Appropriate program elements of information available in 4.3.1 of this document.
- g. Use standardized communication procedures.

4.3.3 Information for Pilots

Information for the PIC will be found in the Aeronautical Information Publication (AIP), issued by local ATC or related agencies.

Information to pilots may include the lay-out of the DDF, the use of surrounding taxiway systems, aeronautical installations that are available at the DDF, lighting and markings at the DDF, low-visibility procedures, specific taxiing procedures, and communication aspects such as frequencies to be used. Special attention is necessary for those cases where the DDF is also used as a holding area or a taxiway.

The information may originate from airport authorities, facility operators, or handling agencies, and may be divided into:

- a. AIP and Aeronautical Information Regulation and Control (AIRAC) publications: Standardized information with permanent value which includes drawings of ground movement charts, detailed layouts of the DDF, listing of radio frequencies to be used, etc. Information about DDFs to be included in airport or facility directories.
- b. Notice to airmen (NOTAM): Information with temporary value, which include procedures and/or instructions for a limited period. NOTAM information is not expected to remain current for an extended period and is carried until expiration or cancellation. NOTAMs of a permanent nature are carried until published on the proper charts or in airport/facility directories and/or AIPs.

4.3.4 Information Coordination for Parties Managing Traffic Flow

Coordinated information to parties managing traffic flow to and from the DDF is mandatory. It is recommended that all parties involved (airport authorities, ATC, DDF operators) issue permanent and detailed documents that can be used in conjunction with AIPs. These documents can be condensed into SOPs.

Individual airports may require their own communication procedures and/or requirements. Various airport systems therefore need to be addressed such as phone calls, flight strips, and/or electronic communications.

A DDF aircraft deicing plan should be developed, revised, and published yearly. The plan should be a coordinated effort on behalf of all parties at the airport using the DDF.

For ATC/DDF site agreements, runway selection and flow requirements should be addressed in advance of seasonal operations. Irregular flow operations should also be addressed. This information should be made available to DDF users.

4.3.5 Information for Other Concerned Parties

All pertinent DDF information should be made available to agencies such as airport authority staff, contractors, airport emergency services, etc.

It is recommended that airport authorities, ground handling agencies, and other parties involved should integrate the deicing/anti-icing operation into their respective quality and safety management systems.

5. DEICING/ANTI-ICING FLUIDS—ENVIRONMENTAL CONSIDERATIONS

Environmental considerations reference material should include ARP4902, AS6285, and AS6286, as well as pertinent and current safety data sheet (SDS) documentation as provided by fluid manufacturers.

5.1 Environmental Impact

If not properly managed, spent aircraft deicing fluid (ADF) can be potentially hazardous to the environment.

In high concentrations, deicing fluid runoff can have an adverse affect on both mammalian and aquatic life. Glycol, a primary ingredient in most types of deicing/anti-icing fluid, is biologically oxygen demanding and can deplete oxygen supplies in freshwater.

The need to effectively manage spent fluid has provided the impetus for an increase in the number of DDFs. Properly designed and managed DDFs have proven to be an effective means of controlling the escape of harmful concentrations of effluent from deicing operations into surrounding natural waterways.

5.2 Environmental Standards and Guidelines

The purpose of environmental standards or guidelines is to protect human health and the environment by providing a guide for containment and treatment of storm water runoff before it enters the ecosystems.

The standards or guidelines create an environmental performance criterion, which will assist in the design and implementation of appropriate infrastructure and operational procedures. Local and national legislation or guidelines regarding water quality should always be consulted and followed.

5.3 Collection and Disposal of Effluent from Deicing Operations

All runoff from deicing operations should be contained, collected and disposed of in accordance with the requirements of the authority having jurisdiction. It should be noted that laws and regulations can change and it is the responsibility of the users or facility operator to keep up to date on environmental regulations and guidelines and adjust operating plans as required.

A protocol for tracking recovered glycol should be implemented to ensure that all spent deicing fluids collected, recycled, and all by-products transferred from the DDF are properly accounted.

5.4 Drain Valves

Refer to ARP4902 for further drain valve guidance.

5.4.1 Storm Drain Settings

At the commencement of the winter season, in readiness for the deicing/anti-icing of aircraft, all valves that discharge to the storm water system should be set in a position to prevent escape of effluent into the storm water system. During rain events, when the fluid collected at the facility meets compliance guidelines, the control valves may be reopened to allow discharge to the storm water system. The valves should be reset again as soon as the rain event is over or when the fluid exceeds guidelines for discharge.

5.4.2 Valve Operation

The DDF operator should monitor and operate, as necessary, all associated valves and pumping equipment that are used for the collecting and managing of spent deicing fluid. Through the effective and efficient collection of spent deicing/anti-icing fluid, the risk of environmental damage and unnecessary costs can be reduced. The fluid collection system is to be operated in a constant state of readiness for a deicing/anti-icing event.

5.4.3 Drain Management

Upon commencement of the winter season, all storm valves should be in the closed-to-environment position in readiness for the deicing/anti-icing of aircraft. During rain events, once the fluid collected at the facility meets compliance guidelines, the environmental fluid control valves may be adjusted to storm setting allowing discharge to the storm water system. The valves should be reset again as soon as the rain event is over or when the fluid exceeds guidelines. Exception may be applied for summer months when there is no deicing/anti-icing event and fluid collected meets compliance guidelines.

5.4.4 Valve Control Log

A daily record of the position of each fluid control valve should be kept. Once per shift, a record of the date, time, and valve positions should be noted. Should a precipitation event warrant a change in the valve positions it should be reflected on the log sheet and signed by the responsible operator. Any time that a valve has been repositioned, it should be recorded and initialed. A valve check to maintain a control function over valve positioning should be conducted each shift.

Some DDFs operate with an electronic or supervisory control and data acquisition (SCADA) system to accomplish the valve operations at the DDF. Any failure of the valve system to operate shall be immediately reported and rectified as soon as possible.

Access to the electronic or SCADA system should be limited to trained staff.

5.5 Fluid Run-off Testing and Reporting

5.5.1 Water Quality Program

To ensure that airport effluent does not negatively impact the environment, a program of sampling and analyzing storm water should be implemented. Water quality programs should be established at airports to ensure maximum protection of the environment.

In the absence of other requirements from the authority having jurisdiction, the service provider should produce yearly reports after each winter season. At a minimum, these reports should contain details of the fluids used and the test results taken from selected outfalls detailing the detected levels of glycol.

Facilities designed to contain and divert fluid run off into on-site collection areas/vessels should establish a program to test DDF surfaces for compliance following a deicing/anti-icing event and clean up. Once the fluid is compliant, it can then be redirected to sanitary or storm lines as dictated by permits that are in place. These test results should also be recorded for reference.

5.5.2 Fluid Testing

Fluid testing should determine if the fluid collected from the apron exceeds the environmental release limit (ERL) for glycol. When this effluent is above the ERL the fluid should be collected and stored for later disposal (in this case the pad diversion valves should be positioned to "collection mode"). When the effluent is below the ERL, the fluid may be disposed through the storm water system (valves should be positioned to "storm water mode").

Field-testing for glycol should be accomplished using testing methodologies as described in fluid manufacturer documentation as well as standards documentation AS6285. All persons conducting field testing of glycol should be properly trained and documented as such per testing method and pertinent equipment. Consultation with municipal/provincial/state environmental authorities is strongly recommended.

Each month split samples taken from various discharges should be taken to an external accredited laboratory for independent laboratory analysis to ensure accurate results.

5.6 Environmental Operations

5.6.1 Hours of Daily Operation

During hours of operation dedicated personnel should be available for the monitoring and operation of the environmental systems.

5.6.2 Visual Reconnaissance

A continuous daily visual reconnaissance procedure of the operational area should be created and carried out. This procedure ensures that variables such as valve settings and general conditions of the facilities are in order and to ensure spillage of glycol is handled in an appropriate and timely manner. A daily log sheet should be used to record the general conditions of the deicing operational areas.

Daily checks of equipment should be carried out to ensure that equipment maintenance occurs as required and there are no fluid leaks. Ensure that all storage units associated with the fluid management facilities are continuously monitored and inspected and any leaks or problems rectified as soon as possible.

5.6.3 Preseason

A preseason technical inspection of the fluid storage facilities should be completed and documented. During the winter season, storage tanks and piping should be inspected regularly for leaks and correct operation. Facility inspections should be recorded. Refer to AS6285 for guidance.

5.6.4 Plan of Operation

A successful plan of operation should attempt to harmonize the safe and efficient movement of aircraft through the facility with effective glycol recovery and disposal. The following points highlight general considerations for inclusion in a DDF operating plan:

- a. Clearly define responsibility for environmental management of the facility.
- b. Define criteria/authority for determining temporary suspension or closure of facility.
- c. Develop contingency plan to handle excess fluid volumes and/or possible loss of containment.
- d. Define procedures for co-ordination of manual or mechanical recovery operations with deicing/anti-icing to ensure sustained compliance.
- e. Establish procedures and responsibility for valve management.
- f. Determine responsibility and procedure for control and monitoring of passive fluid collection systems.
- g. Define criteria for high and low concentrate and how the product will be handled.

5.6.5 Reporting and Communication

Weekly summary report should be prepared, detailing the previous week's operational activities and equipment deficiencies. This report should be available to the service provider and the airport operator for review and comment.

A report should be produced at the end of each winter season summarizing fluid management operations, deficiencies and any problems with the operation. The report should recommend any changes required to operations prior to the start of the next season's deicing/anti-icing operation.

5.7 Glycol Management/Mitigation Plan

To ensure responsible environmental management of glycol-based chemicals or other SAE-approved fluids used in deicing operations, the air operator, service provider, and airport operator should prepare detailed glycol management or mitigation plans. These plans should be updated annually and submitted to regulatory authorities, as required.

5.7.1 Glycol Management/Mitigation Plan Development

The glycol management or mitigation plan should detail the deicing/anti-icing operation and the methods used to prevent environmental damage from the deicing/anti-icing operation. The management plan should be developed with input from the airport operator, the deicing service provider, and the air carriers using the airport, and the companies or individuals responsible for collection, disposal and recycling of the used fluid. All parties involved in the preparation of the glycol management plan should be signatory to the plan or have access to the plan.

5.7.2 Typical Glycol Management/Mitigation Plan

A typical plan should, as a minimum, address the following issues:

- a. General information on the companies that will be operating and using the DDF.
- b. Name, phone numbers, and other contact information for the primary contact persons operating, or responsible for, the DDF.
- c. Details of the area where the deicing/anti-icing operation will take place.
- d. Details on the storage and handling of deicing/anti-icing fluids.
- e. Type and product name of fluid(s) used.
- f. How the effluent will be contained and collected.
- g. How the effluent will be disposed or recycled.
- h. Contingency plans for spills and accidents.
- i. Details of the deicing/anti-icing fluid inventory control.
- j. Reporting plan for reporting glycol use and collection.
- k. Environmental monitoring program.
- l. Reporting plan for environmental issues (such as uncontained spills).
- m. Detailed plans of DDF areas showing drainage patterns, storm drains, valves, etc.

5.8 Environmental Emergency/Spill Response Plan

An emergency response plan should be developed and can be a stand-alone plan or included as part of the glycol management/mitigation plan. The emergency response plan should include first response procedures, detailed plans for containing large and small spills, contact information and reporting protocols, and other items as required.

5.9 Handling Spent Fluid

5.9.1 Spills

During fluid handling avoid any spillage and comply with local environmental and health laws. All spills shall be reported to the appropriate supervisor for further action.

In the event of a deicing/anti-icing fluid spill or if fluid leaks from a deicing vehicle, the DDF will immediately attempt to recover spilled fluid through the use of a GRV or other appropriate equipment. Other spilled fluids (e.g., diesel fuel or engine oil) should be contained and cleaned using hydrocarbon-absorbing materials and not mixed with spent ADF.

NOTE: Refer to the manufacturer's SDS for information on handling, protective equipment, etc.

5.9.2 Disposal Program

A spent deicing/anti-icing fluid recovery and disposal program should be created and customized for each DDF. The program should cover all relevant operations, including valve management, fluid transfer, fluid storage, fluid disposal, and treatment.

5.9.3 Disposal Options

Spent deicing/anti-icing fluid can be handled in three ways:

- a. Recycling when and where it is economically feasible or mandated.
- b. Disposal to the municipal sanitary sewer system (waste water treatment plant) or into the storm water system depending on the concentration of glycol and agreements with the municipality.
- c. Transportation to offsite biological treatment/destruction.

5.9.4 Disposal Streams

If segregation is required, fluids can be collected in different concentrations such as:

- a. Low concentration fluids (snow melting, subsurface retention and rain events) may be sent to municipal sanitary sewers (with appropriate agreement between DDF operator and water treatment plant), or to a waste provider for destruction.
- b. Fluids with glycol concentrations less than published guidelines may be pumped to the storm water system.
- c. High concentration fluids (from active deicing/anti-icing and collected after a deicing/anti-icing event) may be suitable for recycling or anaerobic digestion. A high concentration fluid stream may include deicing/anti-icing fluids captured by a GRV from the deicing facility.

5.9.5 Discharge to the Storm Water System

Before the release of fluids to the storm water system, the fluids should be tested to ensure that the concentrations do not exceed the criteria established by the authority having jurisdiction.

5.9.6 Discharge to the Sanitary Sewer System

Prior to the discharging of fluids to the sanitary system the concentration of glycol should be tested to ensure that the concentrations are acceptable for discharge. Samples should be taken every time there is a discharge to the sanitary sewer system. To verify results, a composite sample of each discharge may be collected and sent to an independent accredited laboratory for testing.

Tanks actively collecting fluids should not to be discharged directly to the sanitary system until the fluid has settled and a test to determine concentration has been performed. Testing should first be performed to determine the concentration of glycol in the tank, and then an estimate of the volume of fluid that can be pumped to the sanitary system should be calculated. The maximum allowable discharge is set in the discharge agreements with the waste receiver. This volume of fluid can only be exceeded with written permission from the waste receiver. If it is necessary to share discharge agreements with others, limits for each user should be established to ensure total limit is not exceeded.

5.10 Design Considerations for Management of Spent Fluid

There are a variety of systems, designs, and methods available to effectively manage spent fluid. The following items highlight some of the key considerations to consider when designing or modifying a DDF (refer to APP4902 for design details).

- a. The chosen system should be capable of handling projected volumes.
- b. The design should account for significant volumes of collected effluent due to typically larger containment and collection areas at a DDF.
- c. Surface/storm drains should be equipped to allow the operator to open and close valves and direct fluid as required.
- d. A method for fluid streaming should be incorporated in order to enable to operator to separate high and low concentrates.
- e. Adequate water supply to the DDF to facilitate on-site or on-truck fluid mixing.
- f. Adequate electrical supply to operate fill stations and support equipment.
- g. Slope and contour of pad should be designed to ensure maximum collection of spent fluid.
- h. Slope and contour surfaces to allow collection of high concentrate at source.
- i. Ensure the connection to local sanitary system for controlled release of collected fluid can effectively handle large volumes.
- j. Storage/collection areas need to be sized to projected volumes. Examples of storage may include aboveground or underground tanks, retention ponds, or lagoons.
- k. Research the standards for acquiring local permits for sanitary disposal or controlled release to ensure the facility design can meet the criteria.
- l. A DDF design should be capable of handling all the effluent collected during a sustained deicing/anti-icing operation.
- m. The DDF should be large enough to facilitate safe and reasonable amount of aircraft movement.
- n. Provide crew amenities.

5.11 Glycol Mitigation Methods

A properly designed DDF can greatly improve the management of spent fluid. In addition efforts to reduce the total amount of fluid used can increase the success of glycol management plans, help maintain available storage capacity, and mitigate the potential for exceeding established guidelines and environmental damage. The following items are recommended methods and procedures for reducing the overall use of deicing/anti-icing fluid:

- a. At DDFs designed with a passive fluid collection system, it is important to continue to mechanically clean and scrub designated areas following an event in order to bring surfaces back to compliance. This will reduce the amount of rain and melted snow that becomes contaminated, thus reducing the total amount of fluid collected.
- b. Deicing systems that use infrared energy can significantly reduce the use of deicing fluids.

- c. The use of forced air can remove accumulations of snow on aircraft surfaces thus reducing the amount of fluid required to clear contamination.
- d. Where practical, mechanical methods such as squeegees or soft brooms can be used to remove accumulations of snow on aircraft surfaces and subsequently reduce the amount of deicing fluid required to remove contamination.
- e. Blending fluid to temperature is very effective in reducing the total amount of fluid concentrate used for deicing. Deicing fluid can be blended efficiently with deicing vehicles equipped with on board blending systems or with on-site blending equipment. Fluid can also be manually blended by mixing appropriate quantities of water and ADF concentrate (note: caution shall be used with this method to ensure proper and complete mixing of the fluid).
- f. Reduced flow rate nozzles can be used for lighter deicing operations (such as frost deicing) to limit the amount of fluid used.
- g. Proper training of employees on effective application methods and techniques.

5.12 Storage and Handling of Deicing and Anti-Icing Fluids

NOTE: The following are examples. Refer to AS6285 for definitive guidance.

Storage, handling and management of deicing/anti-icing fluids should comply with all applicable national and local standards, codes, and regulations.

All areas where deicing/anti-icing fluid is stored, transferred, or used should be equipped with appropriate secondary containment. If there are drains that connect to outside drainage systems, they should be managed to prevent the escape of fluid.

SDS should be available for employees handling fluids and accessible for emergency response personnel. ADF storage tanks should have labeling identifying the contents affixed and visible on the exterior of the tank(s).

5.12.1 Transportation and Transferring of Fluids

Deicing fluid and anti-icing fluids are transported to the airport for on-site storage until operationally required. All phases of the fluid transfer operation should be monitored by personnel trained in spill response. Transfer of fluid from bulk storage to the deicing vehicles should take place at a spill protected, designated fill site. Spill kits should be available at all locations where transfer of fluid occurs, and where fluid is stored.

Areas designated for bulk transfer of deicing/anti-icing fluid should have appropriate containment. Ideally, surfaces should be constructed using impermeable materials.

5.12.2 Storage

Type I, II, III, and IV fluids should be stored in single or double wall storage tanks. Underground tanks should be double wall construction. Aboveground tanks may be single or double wall construction. In single wall design, the tanks should be sited in a containment system typically capable of holding 110% of the volume of the largest individual tank. This will allow containment of a leak or spill and will facilitate fluid recovery.

Storage tanks should be made from glass reinforced plastic, fiberglass, stainless steel, or other materials as specified or approved by the fluid manufacturer.

For enhanced protection, storage tanks should be fitted with high level alarms and auto shut offs to prevent overfilling. Preferably, all transfer piping should be fitted with dry break couplings, or as a minimum a means to collect spilled fluids.

All storage tanks, permanent piping, and transport containers must be labeled in accordance with regulations in order to avoid contamination and mishandling.

The DDF operator is responsible for the proper handling and storage of these fluids.

NOTE: Check with the fluid manufacturer for information on mandatory testing of the fluids, to ensure fluid meets specifications.

6. TRAINING

NOTE: Training programs shall follow the guidelines and recommendations published in AS6286.

This section addresses site-specific training requirements; i.e., specific DDF communication equipment, facility equipment, environmental equipment, and electronic remote deicing management.

6.1 Training Course Content and Training Frequency

Personnel who have responsibilities within the operator's ground icing program should receive training in the following subjects:

- a. The effects of contamination on critical surfaces.
- b. Aircraft deicing/anti-icing procedures.
- c. Aircraft checks/inspections and reporting procedures.
- d. The use of holdover timetables.
- e. Communications procedures.

Recurrent training should be given on an annual basis and should include a review of current deicing/anti-icing operations and check/inspection procedures. Training should highlight changes in procedures and cover the latest available research and development information on aircraft ground deicing operations. Prior to the commencement of winter operations, the operator should distribute a ground deicing/anti-icing operations information circular to all affected personnel. The information circular should review procedures and present any new information not covered in the annual recurrent training.

Deicing training instructors should be re-qualified each year.

6.2 Regulatory Compliance Requirements

The course content shall comply with regulatory requirements (e.g., 14 CFR 121.629, CARS 602.11), as applicable training; EASA; or other regulatory requirement, as applicable.

6.3 Training Program

The training program for ground personnel involved in the ground deicing/anti-icing of aircraft should include:

- a. Introduction to winter operations.
- b. Winter operations planning and responsibilities.
- c. Types of contamination.
- d. Effects of ice and snow on aircraft.
- e. Deicing/anti-icing fluids.
- f. Deicing policies.
- g. Personnel safety precautions.
- h. Aircraft-specific precautions and procedures.

- i. Deicing/anti-icing procedures.
- j. Standard communications.
- k. Emergency procedures.
- l. Deicing equipment inspection/walk around.
- m. Hold over times.
- n. Deicing/anti-icing check/inspection.
- o. Deicing/anti-icing records.
- p. Flightcrew reporting requirements.
- q. Overnight aircraft handling.
- r. Type I, II, III, and IV fluids.
- s. Testing fluids.
- t. Final examination.

6.4 Examinations

Records documenting the initial and annual recurrent training of each person shall be maintained. Refer to AS6286 for examination requirements.

6.5 Ground Personnel Training

Ground personnel who have responsibilities within the operator's ground icing operations program should, at a minimum, receive:

- a. Training on the effects of surface contamination.
- b. Training in aircraft deicing/anti-icing procedures.
- c. Training in aircraft check/inspection procedures, which, if necessary, shall be aircraft specific

Ground personnel trained and qualified to apply deicing and anti-icing fluid, in accordance with a certificate holder's approved program, do not require additional training and qualification to deice and anti-ice similar aircraft operated by another certificate holder with a deicing and anti-icing program also approved in accordance with the current regulations. However, specific training is needed for an operator's deicing personnel to deice/anti-ice aircraft with different configurations.

Practical hands-on training is required following classroom training, specifically when deicing in an engines-on operation.

7. DESIGNATED DEICING FACILITY (DDF) EMERGENCY ACTION PLANS

DDFs are situated in the maneuvering area of the airport. Safety and security operations in these areas are strictly regulated by local authorities and other "on airport" stakeholders, as part of standard operation plans and/or emergency plans.

Examples of emergencies and abnormal situations may be fire (or fire related calamities) and adverse weather (snow, storm, thunderstorms, etc.). Each situation may require a different approach and organization. Undertaking pre-season roundtable discussions and exchange of information with all agencies involved in emergency response (e.g., airport authority, fire department, medical response, police, etc.) is strongly recommended. Where possible, physical simulations are recommended.

7.1 Fire

The local procedures for alerting and activating fire and rescue services must be operationally tested to ensure that the emergency services respond in a timely manner. This may require specific awareness and/or communication tools for the staff working at the DDF, that are in addition to alarm methods used by pilots and ATC. Procedures to ensure adequate emergency response to the aircraft in case of an emergency must be part of the operating instructions of the DDF. In all cases, enough space for emergency vehicles to approach the aircraft being deiced must be maintained.

7.2 Adverse Weather Conditions

Special local procedures must be developed to cope with adverse weather conditions. These procedures may include detailed snow removal plans for the DDF, taking into account the higher risk of ground collisions between aircraft and deicing vehicles in the confined space at the DDF.

In case of storms or thunderstorms, both the airport and the facility operator may develop procedures that stop or limit the use of the DDF.

7.3 Communications—Emergencies

7.3.1 Loss of Communication Emergency Procedures—Vehicle Operators

In the event of a communication system failure, the driver will bring the vehicle back to the clearance area or into the designated safety zone/area to positively clear the aircraft footprint area.

7.3.2 Aircraft Emergency Communications

In the event of an aircraft emergency a flightcrew member will contact the deicing coordinator or the primary deicing vehicle or the deicing operator/crew by VHF radio, the flightcrew will also flash the nose wheel lights and/or any other exterior lights on and off to immediately alert ground personnel. All ground personnel will pull away from the aircraft to the safety zone to allow emergency vehicles to approach and they will also standby ready to assist with passenger evacuation if required.

During an aircraft or ground emergency standard terminology should be used to communicate specific commands. During emergencies, The iceman, ground coordinators, deicing coordinator, and deicing operator/crew should use terms that are identified in the following sections to avoid confusion.

- a. The PIC will determine when a problem with the aircraft (when identified by any flightcrew member) is deemed an “aircraft emergency.”
- b. When a ground coordinator and/or deicing coordinator verbally advise the PIC of an aircraft fire (or other emergency), the PIC will determine the appropriate action to safeguard the passengers and crew. During emergency response deployment (ERD), all engines will be shut down. (For three-engine aircraft, the ground/deicer coordinator will need to specify the number 2 engine shutdown on the aircraft, if required.)
- c. The deicing operator/crew will be notified by ground radio. Upon notification they will pull away from the aircraft and standby ready to assist with passenger evacuation, if required.

The following sections identify the responsibilities of each position.

7.3.2.1 Pilot-in-Command (PIC)

- a. The PIC is responsible for notification to the Iceman of an “aircraft emergency” via VHF radio on the appropriate published frequency.
- b. The PIC will then:
 1. Flash the nose wheel lights and/or other exterior lights on and off to alert the deicing crew.
 2. Update the iceman with requirements/needs.

7.3.2.2 Iceman

Upon notification by the PIC via VHF radio of an “aircraft emergency,” the iceman will:

- a. Notify all ground coordinators/deicing coordinators of the “aircraft emergency” in accordance with the communication protocol as given in AS6285.
- b. Contact the appropriate emergency personnel. (Note that emergency contacts (fire, rescue, paramedic, etc.) are station-specific and governed by the local emergency plan.)
- c. Keep in contact with the PIC for further needs or information.
- d. Contact local station management and update.

7.3.2.3 Ground Coordinator/Deicing Coordinator

The following procedures are to be followed upon notification of an “aircraft emergency.”

- a. Upon verbal notification, or by the PIC flashing the nose wheel lights and/or other exterior lights on and off to indicate an “aircraft emergency,” the ground coordinator/deicing coordinator will notify the iceman and the deicing operator/crew in accordance with the communication protocols given in AS8285.
- b. When an aircraft emergency is declared during the ERD process, all aircraft on the same remote location will shut off engines. (For three-engine aircraft the ground/deicer coordinator will need to specify the number 2 engine shutdown on this aircraft.) The deicing operator/crew will pull their deicing vehicle away from the aircraft into the safety zone. Additionally, the ground coordinator will stand-by for instructions from the iceman.
- c. Coordinate the movement of passengers to a designated area.
- d. If an aircraft fire is identified by ground personnel, the ground coordinator/deicing coordinator will notify the PIC in accordance with the communication protocols given in AS6285.
- e. When an “aircraft emergency” is declared, the ground coordinator/deicing coordinator shall notify all aircraft on the same deicing facility via VHF radio to shut down engines (for three-engine aircraft, the ground/deicing coordinator will need to specify the number 2 engine shutdown on this aircraft, if required), and inform all deicing vehicles to clear the aircraft so that emergency vehicles may approach. The deicing vehicle operators will stand by, and if necessary be ready to assist with passenger evacuation.

7.3.2.4 Deicing Operator/Crew

The deicing operator/crew once informed of an “aircraft emergency” will move the deicing vehicle to the safety zone and then be prepared to assist, if necessary, with passenger evacuation.

7.3.2.5 Ground Emergency Communications

In the event of a ground emergency, the ground coordinator/deicing coordinator will contact the flight deck crew by interphone or by VHF radio (this may be relayed through the iceman) and advise the PIC of the nature of the ground emergency. All ground personnel will be notified by VHF radio. Upon notification, they will pull away from the aircraft and standby in the safety zone ready to assist with passenger evacuation if required.

- a. A ground emergency is defined as any problem with a deicing vehicle that affects the safety of ground crews, deicing operators/crews, flightcrews or passengers, or the aircraft.
- b. Equipment failure that affects the ground crews ability to deice/anti-ice the aircraft but poses no threat to ground employees, flight-crew members, or passengers is not considered a ground emergency.

7.3.2.5.1 Position Requirements

The following identifies the requirement of each position:

- a. PIC: The PIC is responsible for evaluating if the declared “ground emergency” requires the declaration of an “aircraft emergency.” The pilot will also determine if the situation requires evacuation of the aircraft.
- b. Iceman: Upon notification by the ground/deicer via VHF radio of a “ground emergency,” the iceman will contact the appropriate emergency personnel.
- c. Emergency contact arrangements (with fire, rescue, paramedic, etc.) are station-specific and governed by the local station emergency plan.
 1. Keep in contact with the ground coordinator/deicing coordinator for further needs for information.
 2. Contact local station management and update.
- d. Ground/deicing coordinator: Upon visual or verbal notification of a “ground emergency,” the ground coordinator/deicing coordinator will:
 1. Notify the PIC in accordance with the communication protocol given in AS8285.
 2. The declaration of a “ground emergency” for a specific aircraft number requires that all deicing vehicles assigned to the specific aircraft number stop deicing/anti-icing. Additionally, the ground coordinator/deicing coordinator will inform the Iceman of the stated emergency.
 3. During ERD on three-engine aircraft, the ground coordinator will need to specify number 2 engine shutdown on the aircraft, if required.
 4. Notify the iceman and deicing operator/crew in accordance with the communication protocols in AS6285.
 5. Additionally; if the PIC deems a passenger evacuation is required the ground coordinator/deicing coordinator will co-ordinate the movement of passengers to a designated area.
- e. Deicing operator/crew: The deicing operator/crew once informed of a “ground emergency” will move the deicing vehicle(s) away from the aircraft to allow emergency vehicles to approach and then, if required, provide assistance to:
 1. Ground personnel needing assistance.
 2. Passengers, if passenger evacuation occurs. The ground coordinator/deicing coordinator will coordinate the assistance provided by the deicing operator/crew if a passenger evacuation occurs.

8. SNOW REMOVAL FROM APRON SURFACES

8.1 Overview

This section outlines how the facility is operated, who is responsible for the development, implementation and oversight of the snow removal plan including who, what and how the plan is communicated.

Operation of the DDF requires a development of a plan for snow removal to ensure continued operation of the facility during winter precipitation conditions.

Specific plans should be established prior to each deicing season for each area of operation.

8.2 Surface Areas to be Considered for Snow Removal

8.2.1 DDF Surfaces

The surfaces for which the DDF is responsible need to be defined in terms of snow clearance, snow removal, and ice control operations, including but not limited to the DDF taxiway system, deicing facilities, the pink snow area, and DDF parking areas.

8.2.2 DDF Taxiway System

Define and describe all taxiways that are the responsibility of the DDF.

8.2.3 Deicing Pads

Description of deicing pads, deicing bays, and staging bays.

8.2.4 Pink Snow Area

A description and location of the glycol contaminated snow area(s) should be given, including how it is utilized. This should include areas from which contaminated snow is to be collected, and included as part of a glycol mitigation plan.

8.2.5 Vehicle Parking Areas

Parking areas include both groundside and airside parking lots and include entrances and sidewalks to ensure barrier free access.

8.3 Snow Removal Responsibilities and Operations

The plan should include a detailed description of areas of responsibility (DDF operator, airport authority, contractors), the equipment to be utilized, the method of plan implementation, and a coordination and communications plan.

8.3.1 Apron Storm Grading

Categories of snow events, or storm grading, specific to apron surfaces should be established. These storm event classifications determine what equipment types are required and in what quantities.

8.3.2 Deicing Facilities and Taxi-Lane Inspections and Monitoring

The DDF general manager, or his designee, should conduct inspections of all DDF surfaces prior to any winter weather activity and should conduct inspections of deicing facilities and taxi-lane surface conditions once snow begins to accumulate, during snowfall, and after the snow has finished. Areas that pose an immediate operational impact should be reported and given the highest priority for snow clearing. All other conditions which require action, but that are not necessarily of an urgent nature should be reported to the appropriate parties for later action.

During rapidly changing winter conditions, the DDF general manager should provide ongoing verbal reports to airport operations. Otherwise, a DDF report completed by the DDF general manager should note all inspections and winter event operational activities and should be kept on file for availability to the airfield technical inspectors upon request.

8.3.3 Examples of Accumulation Classification

Class one: Trace to 5 cm of frozen precipitation.

Class two: 5 to 10 cm of frozen precipitation.

Class three: 10 cm or more of frozen precipitation.

NOTE: When freezing rain is forecast, ice control operations should begin on all apron surfaces in advance of, during, and after an event. Ground surface accumulation of freezing rain is normally minimal, or at least less than 2 mm, as prompt application of chemical deicing material melts the freezing rain upon impact with the treated surface.

8.3.4 Priority Levels

Priorities, in terms of areas where snow removal operations should be focused, are assessed according to which areas are being, or will be, utilized for deicing.

The Airfield maintenance technical inspector and the DDF general manager, or designee, should meet in advance of a storm to discuss and determine the snow removal priorities and winter event operation for the impending event. After priorities are determined and a specific plan devised, the plan shall be forwarded by the airfield maintenance technical inspector to the airfield maintenance crew foreman. The DDF general manager, or designee, shall forward the plan to the snow removal contractor if applicable.

Although winter event operations will typically be carried out on multiple surfaces concurrently, priority should be given to the following areas if and when necessary, in order of importance:

1. DDF taxiways.
2. DDF entry/exit points.
3. Deicing pad entry/exit points.
4. Deicing facilities including lead in lines in specific order.
5. Groundside parking area.
6. Airside parking area.
7. Pink snow area(s).
8. Deicing vehicle safety zones.

Other areas that are considered priorities but are not easily accessible and should be cleared manually during all snow activity include, but are not limited to:

- a. Pad filling stations.
- b. Fresh glycol tank farm area.
- c. Diversion vaults and hatchways.
- d. Sidewalks at entrances.
- e. Signs and light standards.
- f. Garage and warehouse doors.

Every attempt should be made to clear all areas simultaneously. However, maintaining surface safe conditions in all areas is dependent on the severity of the precipitation. During heavier-than-normal periods of precipitation, fixed resources, in terms of equipment and personnel, may not be sufficient or capable of covering all areas concurrently. Whenever priorities shift as a result of weather conditions, the DDF general manager, or designee, should implement the priority levels for snow clearance, snow removal, and ice control operations, in the agreed upon order, as indicated.

8.4 Snow Removal Methods

8.4.1 High-Speed Method

Snow removal utilizing high-speed snow removal equipment is the preferred and most efficient method of snow removal. Depending on the layout of the facility, this method can be used regardless of whether the entire facility is closed or a portion of the facility is closed. It usually includes equipment with a plow and sweeper combination and a snow blower. The plows push the snow towards the centre of the facility, creating windrows, some of which are immediately removed into waiting dump trucks or removed by a “load-and-go” operation.

Expediting the removal of windrows in this manner is essential in making certain the facility is not closed any longer than necessary. Other benefits in using this method are that there is no residual cleanup required and all safe zones remain clear and clean in the event of a reverse flow operation. The same is not true of the “push-and-pile” method.

8.4.2 Push and Pile Method

This method on DDF surfaces requires snow to be pushed into piles and into areas that are not utilized by aircraft or vehicular traffic, where it is later removed.

8.4.3 Load and Go Method

This method of snow removal is principally for picking up windrows left behind by snow removal plows. Any windrows left behind by the plows are picked up by a blower, which blows the snow accumulation directly into an accompanying dump truck for immediate transport to the pink snow area.

8.4.4 Half-Pad Method

This method is employed when there is heavy aircraft traffic. Half the pad is closed for snow clearance while the other remains in operation. This method is dependant on facility layout.

8.5 Communication Protocols

Communication protocols are essential to ensure all parties are aware of areas where operations are occurring due to the potential of multiple snow removal teams performing operations in nearby areas. All operations should be coordinated through one area of command and control (command center or snow desk).

8.6 Closing Deicing Facilities

When closing deicing facilities, either partially or entirely, to carry out snow removal operations, the DDF general manager, or designee, should notify the command center or snow desk as to which areas are closed and the areas that remain operational. As the command center/snow desk is in constant communication with multiple offices, agencies, and teams throughout a storm event, they are able to advise any parties affected by these closures and/or issue a NOTAM. Upon completion of snow removal operations and once the facilities are re-opened, the DDF general manager, or designee, should again contact the command center/snow desk to advise that the deicing facilities are open for operation.

8.7 Cleanup

At the conclusion of every storm event, a thorough cleanup is required. Depending on the time of day the precipitation activity occurred and the duration of the winter storm, a final cleanup should be initiated by the DDF general manager, or designee, or the airfield maintenance technical inspector. Included in the cleanup process is the removal of all residual ice and compacted snow on the aprons.

Snow accumulations such as any windrows and/or snow piles left behind from earlier snow removal operations should be removed immediately after each event as necessary. Cleanup should be arranged between the DDF general manager, or designee, the airfield maintenance technical inspector, and the on-duty site supervisor of the snow removal contractor.

9. SAFETY

9.1 General

Safety of personnel, aircraft, and equipment is the primary priority while operating on the DDF.

Pertinent national and local codes and standards should be respected.

Reference should be made to AS6285.

9.2 Deicing Vehicles

All deicing vehicles, and any other vehicle or equipment that operates on the DDF, should meet an agreed upon standard for mechanical fitness and should be inspected on a regular schedule to ensure compliance (preventative maintenance program).

The following safety equipment is mandatory in addition to locally mandated safety gear.

- a. Open bucket: Four-point body harness and lanyard. Deicing crew members working in an open basket shall wear a full body harness. The harness shall be connected, by a lanyard, to the proper connection point on the deicing vehicle.
- b. Closed bucket/seat belt: Deicing team members working in an enclosed cab must wear the seatbelt.
- c. Open bucket—eye and face protection: Deicing crew members should wear a face shield or eye protection when spraying deicing/anti-icing fluid.

Recommended equipment includes:

- a. Respiratory protection: Respirators should be available as required.
- b. Protective clothing: Deicing crew members should wear protective gloves and clothing when spraying heated deicing/anti-icing fluids.

All vehicles shall be inspected on a daily basis when equipment is in use to ensure the safety equipment is in place and operable.

Confirmation should be made that handheld and base station/truck cab radios are in working order on a daily basis.

Prior to each season, an inspection of each deicing vehicle/deicing equipment should be conducted, including an appropriate follow-up to ensure rectification of any deficiencies found during the inspection.

An annual check should be scheduled for each deicing vehicle and each piece of deicing equipment with the local ground support equipment control station. This check should be performed before each vehicle or piece of deicing equipment is placed in operation.

The deicing operator, prior to starting or moving a deicing vehicle, should perform a “walk around” check.

Availability of refractometers should be verified and each tester should be checked to ensure working order. Each refractometer should be checked monthly during the deicing season. An appropriate supply of distilled or deionized water should be made available in order for the operator to perform the required monthly refractometer check.

A weekly deicing vehicle/deicing equipment check should be performed and records retained for at least 6 months. An adequate and current supply of aircraft weekly deicing vehicle/deicing equipment check forms should be on hand.

Confirm that a sufficient supply of deicing/anti-icing fluid is available and procedures are in place to re-order, as required.

9.3 Aircraft Operators

All aircraft operators should ensure that the PIC is aware of all procedures and communication required for the operation of the DDF. A pilot briefing document should be produced to facilitate this, with a method to distribute and communicate the document.

9.4 Personnel

Personal protective equipment (PPE) including safety materials, equipment, devices, and clothing and safety restraining devices are required to operate on the facility.

Personal duty times will meet the requirement of the local occupational health and safety regulations and the collective agreements of the service providers.

9.5 DDF Operators

A management system and procedures for accident prevention should be in place.

A process to investigate and put in place corrective action in the event of an accident, incident or discrepancy from the SOP is required.

Internal and external safety audits should be performed to ensure compliance and understanding of all SOPs and training requirements. The audits should also include facility maintenance, and roles and responsibility of the facility management.

10. EQUIPMENT

10.1 General Deicing Equipment

Ice, slush, snow, or frost may be removed from aircraft surfaces using fluids, mechanical methods, alternative technologies, or combinations thereof.

NOTE: Equipment utilizing alternative technologies may be used to accomplish the deicing/anti-icing process, provided that the requirements in AS6285 are followed.

NOTE: Pre-step process may be carried out prior to deicing/anti-icing with ADF.

To reduce the quantity of glycol-based deicing fluid that is needed, a pre-step process using mechanical application equipment, but no ADF may be considered.

The pre-step process may be performed with various means (e.g., soft brooms, forced air, heat, heated water, and heated fluids with negative buffer freezing point). If the pre-step procedure is used, it is imperative that the subsequent deicing process removes all frozen contamination including the contamination that may have formed on surfaces and or in cavities due to the pre-step process.

10.2 Equipment Maintenance

A preventive maintenance program should be established to ensure that equipment consistently operates to its design specification.

10.2.1 Equipment Cleaning

To prevent fluid contamination, application equipment shall be clean before being initially filled with deicing/anti-icing fluid. Recommendations concerning fluid handling and storage equipment are given in AS6285.

10.2.2 Concentration Checks

Fluids or fluid/water mixture samples shall be taken on a daily basis when the equipment is in use. Procedures to perform concentration checks shall be established following the guidelines in AS6285.