



AEROSPACE RECOMMENDED PRACTICE

ARP5660™

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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 All references to ARP5149 and ARP4737 have been replaced by references to AS6286 and AS6285, respectively.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.