PEGASUS
AIRLINES

DE-ANTI-ICING MANUAL

Hazırlayan	Kontrol Eden	Onaylayan
Senior Ground Operations Compliance and Documentation Specialist	DCMM Approval Team OCMM Approval Team Ground Operations - Operational Compliance and Documentation Leader	EVP - Ground Operations

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REVIZYONDA ÖNE ÇIKANLAR

Red text indicates that the text had been removed
Orange text indicates that the text had been revised
Green text indicates that the text newly had been added

5.8.8 Fluid Application Tables and Holdover Time Guidelines 5.8.8

FAA Holdover Time Guidelines 2025-2026'ya uygun olarak değiştirildi.
FAA Holdover Time Guidelines 2025-2026'ya uygun olarak değiştirildi.
FAA Holdover Time Guidelines 2025-2026'ya uygun olarak değiştirildi.
FAA Holdover Time Guidelines 2025-2026'ya uygun olarak değiştirildi.
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FAA Holdover Time Guidelines 2025-2026'ya uygun olarak değiştirildi.
FAA Holdover Time Guidelines 2025-2026'ya uygun olarak değiştirildi.

1 PURPOSE

The purpose of this document is to provide industry standards for the methods and procedures used in performing the treatments necessary for the proper deicing and anti-icing of Pegasus aircraft on the ground using AMS1424 and AMS1428 qualified fluids (Type I, II, III, and IV) and non-fluid methods. Exposure to weather conditions on the ground that are conducive to ice formation can cause the accumulation of frost, snow, slush, or ice on aircraft surfaces and components. These contaminants can adversely affect aircraft performance, stability and control, and operation of mechanical devices such as control surfaces, sensors, flaps, and landing gear. If frozen deposits are present, other than those considered in the aircraft certification process, the performance of the aircraft may be compromised.

Regulations governing aircraft operations in icing conditions shall be followed. Specific rules for aircraft are set forth in the United States Federal Aviation Regulations (FAR), EASA EU-OPS and others.

Paraphrased, these rules specify that no one may dispatch or take off an aircraft with frozen deposits on components of the aircraft that are critical to safe flight. A critical surface or component is one which could adversely affect the mechanical or aerodynamic function of an aircraft.

The responsibility for the correct deicing and anti-icing procedures for aircraft always rests with the Pegasus Airlines for Pegasus aircrafts.

The ultimate responsibility for the determination that the aircraft is clean and meets airworthiness requirements rests with the pilot in command of the aircraft.

Bölüm Sonu

2 SCOPE

2.1 FIELD OF APPLICATION

This document establishes the minimum requirements for ground based aircraft deicing/anti-icing methods and procedures to ensure the safe operation of Pegasus aircraft during icing conditions on the ground.

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

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

2.2 AGREEMENTS AND CONTRACTS

This information is recommended as a basis for operations and service support agreements. (See: Ground Operations Manual 6.14 AGREEMENTS/CONTRACTS)

2.3 HAZARDOUS MATERIALS

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

Bölüm Sonu

3 RESPONSIBILITIES

Responsibility for the delegation, regulation and control of aeroplane ground de-icing/anti-icing operations are defined in here.

Pegasus Airlines as Aircraft Operator has responsibility for:

(a) Aircraft Ground De-icing Programs

(b) The Pilot-in-Command

(c) Management Responsibilities

All persons involved in ground de-icing and anti-icing activities to be trained and qualified in the procedures, communications and limitations of each area of responsibility.

Responsibility for the delegation, regulation and control of aircraft ground de-icing/anti-icing operations are defined in this manual and also, Compliance Monitoring Manual (PG-KU-EK-001), Job Descriptions, Compliance Monitoring Program (PG-KU-EK-002) and its attachments, Correction Corrective Action Procedure (PG-KU-PR-002), IATA Pool Denetimleri Prosedürü (PG-KU-PR-010). Personnel carrying out the de-icing/anti-icing operation are responsible for ensuring that the task is performed in accordance with the requirements detailed in the latest edition of the Boeing and Airbus Aircraft Maintenance Manual-AMM, Pegasus Airlines Continuing Airworthiness Management Exposition (CAME: PG-TD-EK-002).

ATA Quality Pool Audit Plan (PG-KU-FR-022) states annual audit plan.

IATA Pool Denetimleri Prosedürü

The following responsibilities apply in regard to aircraft operating under snow and ice conditions

3.1 IPIC (PILOT IN COMMAND)

(Ref: PG-UI-EK-001, OM PART A-8.2.4)

The pilot in command has the ultimate responsibility for the aircraft and shall not commence take-off unless the external surfaces are clear of any deposit which might adversely affect performance and/or controllability except as permitted in this manual and PG-UI-EK-001, OM PART A.

During the pre-flight inspection, the PIC is responsible for ensuring that all snow and ice, which could affect the safety of the airplane, is removed. Care must be taken to clear any snow or slush from control surfaces, shroud gaps, balance panel areas, engine and turbo compressor inlets, wheel wells and static ports. If snow in these areas melts subsequent freezing can interfere with their functions, particularly control surface movements. If there is any doubt, a close inspection should be made, using a ladder if necessary, followed by a full control check.

Frost ice and snow must be removed from the upper surfaces of the wings, stabilizer and associated panels. When take-off is delayed the PIC must satisfy himself that the surfaces remain free of further deposits. It is possible for tires to retain enough heat to melt snow or ice on the ramp and for it to refreeze in a short period of time. When a tire is frozen to the ramp enough distortion can take place to break the seal at the rim and cause partial deflation of the tire.

After de-icing the PIC is responsible for verifying that the airplane is free of snow or ice contamination, before push- back. When snow or freezing rain is falling, de-icing should take place, if necessary after the passengers have boarded, so that the time between de-icing and take-off is kept at a minimum. The wings, particularly the leading edges, must be free of contamination at the time of take-off. If, because of long taxi or other delay to departure, a doubt exists about the wing leading edges being clear, they should be inspected. If necessary return to the ramp to do so.

If conditions warrant it, delay departure until the conditions improves. During taxi in icing conditions, use airplane anti-icing as prescribed in the Airplane Operating Manual. Avoid taxiing close behind another airplane, as this may cause adherence of ice to the wing leading edges and engines.

At en-route stops, where no fuel has been uplifted, the fuel remaining in the tanks is often below the freezing temperature of water. If it is raining, water can run down the underside of the wing and will freeze

in the area of the fuel tanks. A considerable thickness of ice may form in this manner and may require removal before departure.

Be on the alert for frozen water supply systems, frozen toilets and blocked drains or vents. De-icing must be performed as close as possible to departure time.

The PIC has the ultimate responsibility for determining that his airplane is in a condition for safe flight

- After receiving the De/Anti-icing Code, the PIC (pilot in command) is responsible for ensuring that the relevant surfaces remain free of frost, ice, slush and snow until takeoff.
- Ensuring that the aircraft has been de-iced in accordance with the Pegasus Airlines Operations Manuals. The PIC retains overall responsibility for ensuring that all surfaces and components of the aircraft are free from contamination.
- Leaving an aircraft in a configuration suitable for de-icing at the end of each flying day.
- When present, determining the need for de-/anti-icing.
- The Post Holder (Nominated Person) Flight Operations is responsible for the distribution of deicing/anti-icing information within the Flight Operations Department.
- Ground icing conditions, a contamination inspection is mandatory. After receiving the Anti-icing Code, the PIC is responsible for ensuring that the relevant surfaces remain free of frost, ice, slush and snow until take off. The PIC has the final authority for accepting the aircraft.

Notwithstanding, the following regulations apply:

- Where contamination is present on one or more critical surfaces, the PIC shall have the aircraft de-iced; or
- A PIC's decision to order de-icing and/or anti-icing cannot be overruled or reduced to a lower level of protection.

3.2 THE DE-ICING SERVICE PROVIDER (DIO)

The Company responsible for the de-icing/anti-icing operation (further called “The Deicing Service Provider”) shall ensure the availability and use of adequate facilities and equipment for aircraft de- /anti-icing and maintain vehicles/equipment, fluids, training and procedures, in accordance with the latest edition of the relevant SAE Standards.

t is the responsibility of the The Deicing Service Provider (DIO) to ensure that all frozen deposits (with the possible exception of frost which may be allowed as described) are removed from the specified surfaces during the de-icing process.

The De-icing Service Provider shall have the responsibility for:

(a) The safety and operability of the Designated Deicing Facilities

(b) Aircraft Ground De-icing/Anti-icing Procedures.

A Deicing Service Provider shall have aircraft deicing/anti-icing procedures, including a quality control program. These procedures, which ensure compliance with the relevant regulations, shall cover all aspects of the aircraft ground de-icing/anti-icing process including (but not limited to) instructions, tasks, responsibilities, authorizations and infra-structure for the deicing/anti-icing process as follows:

- Use of suitable de-icing/anti-icing treatment method according to this manual.
- Remote de-icing/anti-icing instructions (when applicable).
- Sufficient number of trained and qualified de-icing/anti-icing personnel.
- Qualified Staff to co-ordinate and supervise the de-icing/anti-icing treatments.
- Use of suitable deicing/anti-icing equipment meeting specification ARP1971.

- Special handling procedures for Type II, III and IV deicing/anti-icing fluids to maintain quality.
- Post de-icing/anti-icing check (when applicable).
- Protocol for communications with cockpit crew for both gate and remote locations (when applicable).
- Reporting the anti-icing code to the cockpit crew (when applicable).
- Documentation of all deicing/anti-icing treatments.
- Personnel safety arrangements.
- Provisions for tools and clothing for de-icing/anti-icing personnel. • Environmental arrangements.
- A quality control program.
- Maintenance of vehicles/equipment, fluids, training and procedures, in accordance with the latest edition of the Pegasus Airlines Ground Operations Manual (GOM) and De/Anti-Icing Manual.
- Making the decision on whether or not to protect aircraft overnight and/or early de-ice.
- Ensuring that there is a robust procedure in place for communicating successful completion of the de-icing process between the The Deicing Service Provider in a cherry picker or de-icing rig and the person passing the de-icing code.
- Ensuring that the anti-icing code is not passed until all aircraft surfaces falling under the responsibility of the The Deicing Service Provider are clean in accordance with the clean aircraft definition.
- Completing a self audit questionnaire prior to the start of the Pegasus Airlines de-icing season, this is nominated to commence on 1st October of each year.
- Supplying event and fluid usage data to Pegasus Airlines on a weekly basis
- Determining the need for de-/anti-icing, when the PIC is not present by means of a contamination inspection. Ground icing conditions this inspection is mandatory.
- Maintaining adequate Supervision of the personnel performing the spraying and/or post deicing inspections to ensure that the quality of services provided is maintained. (As a guideline, Pegasus Airlines anticipate that the quality of the work of all personnel performing spraying and/or post de-icing inspections will be validated on a weekly basis.)
- Providing additional Supervision of de-icing personnel who have not carried out duties related to de-/anti-icing within a period of winter season.
- Ensuring that for personnel performing the actual de-icing/anti-icing treatment on aircrafts, practical training with the de-icing/anti-icing equipment and an aircraft shall be included. All ground handling staff involving in de-icing/anti-icing process have to be trained according to the latest edition of AS6286 Aircraft Ground Deicing/Anti-icing of Training and Qualification Program. Ensuring that, prior to receiving final qualification, personnel performing de-icing/ anti-icing operations (driving and/or spraying) shall demonstrate competence in removing frozen contamination under operational conditions, to a qualified trainer or supervisor.
- Personnel performing the de-/anti-icing operation: Personnel carrying out the de-icing/antiicing operation are responsible for ensuring that the task is performed in accordance with the requirements detailed in the latest edition of Pegasus Airlines De/Anti-Icing Manual.
- Maintaining adequate Supervision of the personnel performing the spraying and/or post deicing inspections to ensure that the quality of services provided is maintained. (As a guideline, Pegasus Airlines anticipate that the quality of the work of all personnel performing spraying and/or post de-icing inspections will be validated on a weekly basis.)
- Providing additional Supervision of de-icing personnel who have not carried out duties related to de-/anti-icing within a period of winter season.

- Ensuring that for personnel performing the actual de-icing/anti-icing treatment on aircrafts, practical training with the de-icing/anti-icing equipment and an aircraft shall be included. All ground handling staff involving in de-icing/anti-icing process have to be trained according to the latest edition of AS6286 Aircraft Ground Deicing/Anti-icing of Training and Qualification Program. Ensuring that, prior to receiving final qualification, personnel performing de-icing/ anti-icing operations (driving and/or spraying) shall demonstrate competence in removing frozen contamination under operational conditions, to a qualified trainer or supervisor.
- Personnel performing the de-/anti-icing operation: Personnel carrying out the de-icing/antiicing operation are responsible for ensuring that the task is performed in accordance with the requirements detailed in the latest edition of Pegasus Airlines De/Anti-Icing Manual.
- Advising the PIC or Authorized Technician if there is a requirement for a more detailed inspection of confined areas in the surfaces treated, prior to communicating the anti-icing code. • Advising the PIC or Authorized Technician if there is believed to be a risk that de-/anti-icing fluid may have been applied to pitot heads, static ports, brakes, landing gear or APU intake or that damage to the aircraft may have been caused.
- If the The Deicing Service Provider is contracted to perform a post de-/anti-icing inspection, the DIO also conducts a general ground level inspection to ensure that surfaces and components visible from the ground are free from contamination. Where the PIC and de-icing representative differ as to whether contamination is present, the PIC and First Officer/Safety pilot, in addition to the deicing representative, will jointly perform a tactile inspection or contamination check of the affected area. This step should resolve any disagreement regarding adherence of contamination and the PIC will then take the action deemed appropriate.
- Deciding and communicating the order in which the Pegasus Airlines aircraft requiring de-icing are to be treated.
- Is responsible for the de-/anti-icing operation shall maintain vehicles/equipment, fluids, training and procedures, in accordance with the relevant ISO specification (ISO 11075 to 11078) or equivalent specifications.
- Is responsible for using the correct fluid concentrations and must observe the relevant freezing point and aerodynamic limitations.
- Is responsible for the correct and complete accomplishment of the de-icing/anti-icing of the aircraft.

NOT

All compliance shall be audited by Pegasus Airlines as specified in Chapter 6.

- DIO shall be responsible for ensuring that the necessary infrastructure is in place at the Stations under their control, in order to maintain safe operations during ground icing conditions.
- DIO shall maintain vehicles/equipment, fluids, training and procedures, in accordance with the latest edition of the relevant SAE specifications.
- Personnel carrying out the de-icing/anti-icing operation are responsible for ensuring that the task is performed in accordance with the requirements detailed in the latest edition of this manual and SAE standards.
- The person responsible for final release/dispatch of the aeroplane is responsible for ensuring that the aeroplane has been de-iced/anti-iced in accordance with the requirements detailed in the latest edition of the Aircraft Maintenance Manual oand SAE standards on de-icing ensuring that relevant surfaces are free of frost, ice, slush and snow at the time of dispatch.
- After receiving the Anti-icing Code, the Commander (pilot in command) is responsible for ensuring that the relevant surfaces remain free of frost, ice, slush and snow until takeoff.

3.3 AUTHORIZED TECHNICIAN

The authorized maintenance person responsible for dispatching the airplane is responsible for ensuring that the Pegasus de-icing/anti-icing procedures have been properly and fully applied prior to the departure of the airplane.

- When the PIC is not present, ensuring that prior to treatment, an aircraft is in the correct configuration for de-/anti-icing in accordance with the latest PEGASUS AIRLINES CONTINUING AIRWORTHINESS MANAGEMENT EXPOSITION (CAME) and Boeing and Airbus Aircraft Maintenance Manual-AMM, as appropriate.
- De-icing parts of the aircraft which are not the responsibility of the The Deicing Service Provider

3.4 PEGASUS AIRLINES GROUND OPERATIONS

Ground Operations Department is responsible for ensuring that the necessary infrastructure is in place at the Stations under their control, in order to maintain safe operations during ground icing conditions.

3.4.1 Pegasus Airlines Ground Operations-Ground Document

"GROUND.DOC@flypgs.com "

- Coordinating the revision process for this section of the manual. Ground.Doc Team revises the De/Anti-Icing Manual which is equal Aircraft Ground Deicing Programs in every year according to the current reference documents mentioned in this manual and publishes the ground service providers and related users.
- Authorising and recording any differences to the responsibilities or lines of communication described in this manual, according to local contractual differences.
- Preparation to the winter season and coordinate the attendance to the related activities (meetings ...) conducted by the airport authorities, service providers, TDGCA etc...
- Incorporating the pool audit results into the risk analysis of ground operations and reporting the results to the management.

3.4.2 Pegasus Airlines Handling Agreements Management

"CONTRACTS@flypgs.com"

- Making agreement with all outstations and diversion/alternate airports within the Pegasus Airlines route network where de-icing/anti-icing can be expected.
- Ensuring that appropriate service agreements, which detail the fluids to be used for de- /anti-icing of Pegasus Airlines' aircraft are in place with the contracted agents.
- Ensuring that audits/inspections are performed to verify that the de-/anti-icing service provided by the contracted agents is in compliance with Pegasus Airlines' procedures.
- Ensuring the availability and use of adequate facilities and equipment for aircraft de-/anti-icing operations at applicable locations
- The handling activities are monitored by regularly station checks by Ground Operations-Handling Agreements (Area Auditor) and/or audits by Safety and Emergency Response Management Department and Compliance Monitoring Department of Pegasus Airlines.
- Ground Operations-Handling Agreement Management keep and maintain the De/Anti-Icing Company List current and controls the entire agreement process. Pegasus Airlines De-/Anti-Icing Manual covers all locations where flights might be conducted and that have the potential for ground icing conditions and defines all areas of responsibility pertaining to aircraft de-icing and anti-icing, including functions conducted by external ground handling service providers.

There is no airport where there is a possibility of ground icing conditions and specifically is prohibited the flights from/to within the regional route network due to the Pegasus Airlines provisions (which has been laid out in this manual) are not met. Handling companies which serve the de/anti-icing operation and stations which is required the de/anti-icing service are defined in the agreement phase. Standard Ground Handling Agreement is laid out according to the de/anti-icing operation is conducted or not. If de/anti-icing operations is required and no handling company is available to perform it, Pegasus Airlines does not commence the flight from/to the concerning station.

Handling Agreement Management follows not only commercial operations at an applicable airport but, if applicable, non-commercial operations as well (e.g. positioning flights, delivery flights, test flights, training flights).

3.4.3 Pegasus Airlines Ground Operations-The Postholder (Nominated Person)

Executive Vice President - Ground Operations:

- Has ultimate responsibility and accountability on behalf of Pegasus Airlines for the implementation and maintenance of the safety management system (SMS) that is implemented and integrated throughout the ground operations (including de/anti-icing operations) to ensure management of the safety risks associated with aircraft ground operations (including de/anti-icing operations) throughout the ground operations organization;
- Has the authority to ensure the allocation of resources necessary to manage safety and security risks to aircraft ground de/anti-icing operations;
- Has overall responsibility and is accountable for ensuring ground de/anti-icing operations are conducted in accordance with conditions and restrictions of the Air Operator Certificate (AOC), and in compliance with applicable regulations and standards of Pegasus Airlines.
- Has ultimate responsibility and accountability for the safety of the entire ground de/anti-icing operation together with the implementation and maintenance of the SMS;
- Has responsibility for ensuring the SMS is properly implemented in ground operations areas (including de/anti-icing) of Pegasus Airlines and performing in accordance with specified requirements.
- Has responsibility for ensuring Pegasus Airlines Ground Operations is in compliance with requirements of applicable authorities (i.e. regulations), as well as its own policies and procedures, which may exceed existing regulations or address areas that are not regulated.
- Is responsible for the implementation, maintenance and day-to-day administration of the SMS throughout the ground operations organization (including de/anti-icing) on behalf of the Accountable Executive (President & CEO) and senior management.
- Has responsibility for day-to-day oversight of the SMS in scope of ground operations (including de/anti-icing operations), overall accountability for organizational safety rests with the accountable executive
- Is responsible and accountable for ensuring safety in scope of ground operations (including de/anti-icing) and management of safety risks and security threats to aircraft within the ground operations (including de/anti-icing) in accordance with Pegasus Airlines Safety Policy Statement and department's objectives which is communicated throughout the ground operation organization serves to the Pegasus SMS is designed and implemented to:
    - Identify/address safety hazards and errors in de/anti-icing operations;
    - Ensure remedial action is implemented to control safety risks;
    - Provide for ongoing monitoring and assessment of safety performance;
    - Make continual improvement to the level of safety in ground operations (including de/anti-icing operations).
    - Regular review of performance-based indicators within the senior management;

- Regular analysis of malfunctions or undesirable operational results;
- Follow-up of corrective actions and their effectiveness in improving operational performance
- In his area (ground operations including de/anti-icing).

- Provides that de/anti-icing service is delivered and received in all airports within the framework of optimum cost – maximum productivity.
- Takes, or provides to take, the necessary precautions for the purpose of unproblematic conduction of operations in the new airports in which Pegasus Airlines shall have
- Provides that the necessary precautions regarding the prevention of ground accidents are taken.
- Is responsible for application of "Pegasus Airlines Safety, Quality, Environmental, Occupational Health and Safety Policies requirements within Ground Operations and catching the "Ground Operations Safety Objectives"

See more details Job Description, (PG-YI-GT-001) - Executive Vice President - Ground Operations

3.4.4 Ground Handling Station Manager

- Ensuring that the necessary infrastructure is in place at the Stations under their control in order to maintain safe operations during ground icing conditions.
- Ensuring that a pre-season de-icing check list may be completed for their airport(s) and that the minimum requirements as defined by the Pegasus Airlines Ground Operations team are met.
- Preparation to the winter season and attendance to the related activities (meetings ...) conducted by the airport authorities, service providers, TDGCA etc...

3.5 RESPONSIBILITIES RELATING TO POST DE-ICING CHECKS

The person responsible for final release/dispatch of the aircraft is responsible for ensuring that the aircraft has been de-iced/anti-iced in accordance with the requirements detailed in the latest edition of the Pegasus Airlines De/Anti-Icing Manual, PEGASUS AIRLINES CONTINUOUS AIRWORTHINESS MANAGEMENT EXPOSITION (CAME), PG-TD-EK-002, Boeing and Airbus Aircraft Maintenance Manual-AMM, SAE Standards on de-icing ensuring that relevant surfaces are free of frost, ice, slush and snow at the time of dispatch. Pegasus Airlines process for confirming that an aircraft is clear of contamination is based upon the following principles:

- The final responsibility for ensuring that aircraft surfaces and components are clear of contamination lies with the PIC.
- The absence of contamination on the wings, horizontal and vertical tail surfaces and fuselage can only be verified by trained staff with access to points offering sufficient visibility of these parts.
- The verbal or written communication of the anti-icing code by the DIO to the PIC or Pegasus Airlines Representative confirms that on completion of the de-/anti icing treatment the aircraft surfaces falling under the responsibility of the DIO is clean in accordance with the clean aircraft definition. If the DIO has any doubt as to the status of inaccessible components on the surfaces treated, they will request a more detailed inspection from the Authorized Technician.
- If the DIO is contracted to perform a post de-/anti-icing check, the DIO conducts a general ground level inspection to ensure that surfaces and components visible from the ground are free from contamination.
- If the PIC is unable to satisfy themselves that all surfaces are clean (either by visual inspection of calculation of holdover time further to the DIO's action), then de-icing should be requested. • If any ground staffs involved in the turnaround have any doubt as to the presence of frozen contamination they should inform the PIC. The aircraft should not be permitted to depart until the aircraft has been checked and any contamination removed.

- If two different companies are involved in the “de-icing/anti-icing treatment” and the “post deicing/anti-icing check”, it must be ensured, that the anti-icing code is not given to the PIC before the “post de-icing/ anti-icing check” is completed. This is especially important at stations were deicing is performed by a contracted handling company and the “post de-icing/anti-icing check” (supervision) is performed by Pegasus Airlines' station personnel or any other contracted company.

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According to Safety Information Bulletin published by EASA on 27th of July 2018, a serious incident in Gothenburg is highlighted. The details of the incident can be accessible on

"https://www.havkom.se/en/investigations/civil-luftfart/allvarligt-tillbud-med-flygplanet-scwib-rjih-m-vidgoeteborg-landvetter-flygplats "

EASA SIB No.: 2018-12 (https://ad.easa.europa.eu/ad/2018-12) underlines the following issues before the winter season:

(1) The post De-icing/Anti-icing Check [...] may either be performed as a “separate check” or “incorporated” into the de-icing/anti-icing operation. When the check is “incorporated” into the deicing/anti-icing operation, as was the case in the afore-mentioned serious incident, SAE AS6285 states that “the de-icing/anti-icing sprayer will closely monitor the surfaces receiving treatment in order to ensure that all forms of frost, snow, slush, or ice [...] are removed, and that, upon completion of anti-icing treatment, these surfaces are fully covered with an adequate layer of antiicing fluid”.

(2) Personnel involved in the process of ground de-icing of aircraft must be aware of the importance of conducting effective de-icing procedures, due to the direct impact on the safety of the aircraft.

(3) The post de-icing check is carefully conducted to identify if there is any remaining contamination and repeated de-icing treatment followed by another post de-icing check is needed. When conducting the post de-icing check as part of the “incorporated method”, suitable time must be available to allow for the de-icing steam to disperse to ensure that the de-icing operator has good visibility to conduct the post de-icing check. Lighting must also be effective and serviceable for night operations, and enclosed operator cabins must have efficient washer and wiper systems. It is also important that the cabin is positioned to be able to view the entire surface being de-iced. Suitable time and adequate visibility conditions must be provided for the de-icing personnel to properly conduct the de-icing of the aircraft, including the post de-icing checks.

(4) The training of the involved personnel must be conducted in accordance with the applicable procedures and AS6286 Aircraft Ground Deicing/Anti-icing of Training and Qualification Program. Their competency must be proper.

Pegasus is a member of IATA De-Icing/Anti-Icing Quality Control Pool (DAQCP). All the process is captured through the Pegasus management system by supporting the oversight programmes including DAQCP collaboration.

It will be paid particular attention to the above-mentioned recommendations during the audits by checking compliance of the ground de-icing service providers with the training syllabi and operations manuals.

3.6 SAFETY AND EMERGENCY RESPONSE MANAGEMENT DEPARTMENT

- Ensuring to fulfil safety and quality assurance requirements.

3.7 COMPLIANCE MONITORING DEPARTMENT

- Preparing and publishing the report airline activities within the pool in monthly basis, (PG-KU-FR069).

3.8 NETWORK AUDITORS

"AREA.AUDITORS@flypgs.com"

- Pegasus Airlines is the Active Membership (Voting Members) at IATA The De-Icing/Anti-Icing Quality Control Pool known as DAQCP is an audit organization which was founded in 1997 by a group of international airlines with the target to share their workload and save costs for auditing of companies which are providing de-icing / anti-icing services and post de-icing / anti-icing checks at airports with winter operations. Network Area Auditors Team manage the compliance monitoring the process all over the Pegasus Network under the IATA DAQCP.
- Assigned and authorized Network Auditors who have training in DAQCP and have proper knowledge about DAQCP process are responsible for the communication between Pegasus Airlines and the DAQCP.
- Assigned and authorized Network DAQCP auditors are airline auditors which are embedded in the quality organizations of our own airline and which are additionally trained in de-icing /anti-icing technique by the DAQCP's own training organization and qualified as DAQCP Auditors.
- The quality control is based on this Manual. The audits are accomplished in yearly intervals during the winter season between October and April and are based on checklists developed by DAQCP. Checklists are updated yearly after consideration of the latest developments in de-icing /anti-icing techniques and are in line with the current standards.
- Audit reports as well as the audit related communication are exchanged within the DAQCP Extranet officially within a required timeframe as defined in the pool agreement.
- Safety related findings are reported to all members immediately with Alert-letters if applicable.

  The DAQCP audits comprise the following subjects:

  - Integrity of sprayed De-icing/Anti-icing Fluids
  - Compliance of Procedures and Documentation with acceptable standards
  - Training and Qualification of personnel
  - De-icing/Anti-icing Facilities • De-icing/Anti-icing Equipment

- Pegasus Airlines as an active member has to perform a defined share of DAQCP audits according to the annually established audit plan and depending on the number of its own stations, which we are sharing with other active members and also has voting right in all organizational matters and participates in the development of the DAQCP procedures and requirements.

3.9 GROUND TRAINING MANAGEMENT

"GROUNDTRAINING@flypgs.com "

- Ground Training Organization manage the ground operations training activities within Pegasus Airlines in coordination with concerning departments and process owners.

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4 DEFINITIONS AND ABBREVIATIONS

4.1 ABBREVIATIONS

ACARS Aircraft Communications Addressing and Reporting System

ATC Air Traffic Control

APU Auxiliary Power Unit

CDF Central Deicing Facility

C of C Certificate of Conformance

DDF Designated Deicing Facility

DIS Deicing/Anti-Icing Supervisor

° C Degrees Celsius

° F Degrees Fahrenheit

EFB Electronic Flight Bag

EMB Electronic Message Board

FAA Federal Aviation Administration

FP Freezing Point h Hours

HOWV Highest On-Wing Viscosity

LOUT Lowest Operational Use Temperature

LOWV Lowest On-Wing Viscosity

OATOutside Air Temperature

SDS Safety Data Sheet

TC Transport Canada

4.2 WORDS AND DEFINITIONS

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

Aircraft Operator: May be Pegasus or any other agreed airline shares the same flight as code share. The one which operate the related flight is considered the 'aircraft operator' unless otherwise agreed on Codeshare agreement. If there is a business arangement as joint operation/code share, the rules and regulations of the operating partner airline will be applied in regard to de/anti-icing restrictions and procedures. Codeshare Agreement may be consulted.

- **Advisory Word Definitions:**

May: This is used to describe that the practice is encouraged and/or optional.

Shall: This will mean that the practice is mandatory.

Should: This means that the practice is recommended or strongly encouraged.

- **Words and Phrase Definitions:**

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

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

Anti-Icİng fluid:

(a) Mixture of water and Type I fluid;

(b) Premix Type I fluid;

(c) Type II, III or IV fluids;

(d) Mixture of water and Type II, III or IV fluids.

NOT

Fluids in a) and b) shall be heated to ensure a temperature of 60 °C (140 °F) minimum at the nozzle. SAE Type II and IV fluids for anti-icing are normally applied unheated on clean aircraft surfaces but may be applied heated. SAE Type III fluids for anti-icing may be applied heated or unheated on clean aircraft surfaces.

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

Buffer (Freeze Point Buffer): The difference between the Outside Air Temperature (OAT) and the freezing point of the fluid used.

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

Cold-Soak Effect: The wings of an aircraft are said to be “cold-soaked” when they contain very cold fuel as a result of having just landed after a flight at high altitude or from having been refueled with very cold fuel. Whenever precipitation falls on a cold-soaked aircraft on the ground, clear icing may occur. Even in ambient temperatures between -2 °C and +15 °C (28 °F and 59 °F), ice or frost can form in the presence of visible moisture or high humidity if the aircraft structure remains at 0 °C (32 °F) or below. Clear ice is very difficult to detect visually and may break loose during or after takeoff. The following factors contribute to cold-soaking: temperature and quantity of fuel in fuel cells, type and location of fuel cells, length of time at high altitude flights, temperature of refueled fuel, and time since refueling.

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

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

Cold Soaked Fuel Frost: This is the formation of frost, normally in the area of the wing fuel tanks, caused by the cold soak effect.

Cold Soaked Wing Ice/Frost: Water, visible moisture, or humidity forming ice or frost on the wing surface, when the temperature of the aircraft wing surface is at or below 0 °C (32 °F).

Chemical Contamination: Impurity in a deicing/anti-icing fluid or may be from an inadvertent application of deicing fluid on top of an anti-icing (thickened) fluid.

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

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

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

De Icing/Anti-Icing: Combination of or referring to both of the procedures for ‘deicing’ and ‘anti-icing’. It may be performed in one or two steps.

De Icing Service Provider: The company responsible for the aircraft deicing/anti-icing operations on an airfield.

De Icing fluid:

(a) Heated water

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

(c) Heated premix Type I fluid;

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

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

NOT

Unheated fluids are ineffective to deice.

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

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

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

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

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

Highest On-Wing Viscosity (HOWV): Highest viscosity of a deicing/anti-icing fluid which is still aerodynamically acceptable. Can also be referred to as maximum on-wing viscosity (MOWV). **Holdover Time:** Estimated time for which an anti-icing fluid will prevent the formation of frost or ice and the accumulation of snow on the treated surfaces of an aircraft.

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

Local Frost: The limited formation of frost in localized wing areas cooled by cold fuel or large masses of cold metal in the wing structure; this type of frost does not cover the entire wing. **Lowest On-Wing Viscosity (LOWV):** Lowest viscosity of a deicing/anti-icing fluid for which the applicable holdover time table can still be used.

Lowest Operational Use Temperature (LOUT): The higher (warmer) of:

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

Heavy Freezing Rain: Precipitation of liquid water particles which freezes upon impact with the ground or other exposed objects. Heavy freezing rain can seem to fall in sheets and individual drops may not be identifiable. Heavy freezing rain has a measured intensity of more than 0.30 in/h.

Moderate Freezing Rain: Precipitation of liquid water particles which freezes upon impact with the ground or other exposed objects. Moderate freezing rain may appear in the form of large drops or can appear to fall in sheets where individual drops are not identifiable. Moderate freezing rain has a measured intensity of between 0.10 to 0.30 in/h.

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

Post Deicing Check: A synonym for post deicing/anti-icing check.

Post Deicing/Anti-Icing Check: A check by qualified ground personnel to ensure that all critical surfaces are free of adhering contamination after the deicing/anti-icing has been completed.

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

Preflight Check: A check performed by the flight crew or ground crew prior to departure to verify the presence of adhering contamination to establish the need for deicing/anti-icing. It may be part of the flightcrew walk around before the flight.

Pretakeoff Check: A check by the flight crew prior to takeoff and within holdover time. This test is normally conducted from inside the cockpit. It is normally accomplished by a continuous assessment of the conditions that affect holdover time and includes an assessment and adjustment of holdover time.

Pretakeoff Contamination Check: A check of the critical surfaces for adhering contamination. This check is accomplished after the holdover time has been exceeded and must be completed within 5 minutes prior to the beginning of takeoff.

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

Refractive Index: Refractive index, for any substance, is the ratio of the velocity of light in a vacuum to its velocity in the substance. For solutions, the refractive index will vary upon the concentration of the solute in the solvent. Using a calibration curve, it is possible to determine the concentration of the solute in the solvent. For example, for aqueous glycol solutions, it is possible to determine the concentration of the glycol in water by measuring the refractive index and comparing the result to the calibration curve.

Qualified Staff: Trained staff who have passed theoretical and practical training tests and have been certified for performing this type of job, refer to AS6286 Aircraft Ground Deicing/Anti-icing of Training and Qualification Program.

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

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

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

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

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

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

NOT

For holdover time purposes, treat snow grains as snow.

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

NOT

For holdover time purposes, treat snow pellets as snow.

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

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

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5 APPLICATION

No aircraft shall be allowed to depart with contamination on the airframe and this can be prevented by a process of anti-icing and removed by de-icing. This manual will provide guidelines for safe Anti/Deicing operations based on the references mentioned on this manual.

- The term de-icing will be used throughout this chapter but should also be considered to cover the anti-icing process.
- De-icing operations shall be performed with extreme caution to prevent injury to personnel and damage to aircraft and equipment.
- All staff involved in any stage of de-icing operations shall be properly trained, qualified and have access to information regarding specific procedures for the aircraft they are servicing in accordance with AS6286 Aircraft Ground Deicing/Anti-icing of Training and Qualification Program Current Edition.
- Prior to winter season all involved staff shall undergo refresher training to maintain their qualification. This qualification shall be verified by a written examination.
- Prior to de-icing, accumulations of snow may be removed by a process approved by Pegasus Airlines. This can include the use of brooms, brushes, scrapers or ropes but extreme caution shall be taken to avoid damage to pitot tubes, antennas etc. and all measures to prevent injury by falls from height taken.
- De-icing Fluids shall be stored in accordance with the manufactures instructions and tested regularly to ensure no degradation has occurred.
- Published holdover charts shall be observed.
- Communications shall be in a standard format. Ensure two way communication between Flight Deck and Ground Crew is maintained prior, during and when finalising de-icing.
  - Fluid type
  - Fluid Mix
  - Date and Local start time of final step
  - Fluid brand name
  - Confirmation of final check PIC prior to commencing the de-icing process.
- Post de-icing inspection, where this is delegated to ground staff, can only be performed by a suitably qualified person and this person should be able to identify themselves by issuing a personalised release.

5.1 DE/ANTI ICING OF AIRCRAFT

The various local rules concerning aircraft cold weather operations are very specific and will be strictly adhered to. Pegasus Airlines pilots will not take off with an aircraft that has: frost, snow, slush or ice on any windshield or power plant installation or on airspeed, altimeter, rate of climb or flight altitude instrument systems; snow, slush or ice on the wings or stabilisers or control surfaces or any frost on the upper surfaces of wings or stabilisers or control surfaces. For this reason a contamination check of the aircraft surfaces will be performed prior to departure.

This manual documents specific procedures for the operation of aircraft in ground icing conditions, whether resulting from cold weather operations or cold soaked wing areas, to ensure that aircraft take-off without contamination adhering to surfaces.

It is necessary to ensure that everyone involved in the operation understands their respective responsibilities and are properly trained and knowledgeable in their respective areas. Failure to either identify the need to de-/anti-ice, or effectively confirm that the aircraft surfaces are clean for takeoff could result in the loss of human life, or damage to an aircraft.

Pegasus Airlines utilises ICAO document 9640 'Manual of Aircraft Ground De-icing/Anti-icing Operations' and The 'Global Aircraft De-icing Standards' SAE International® G12 'Aircraft Ground Deicing Committee' which consist of the following documents:

- SAE AS6285 'Aircraft Ground Deicing/Anti-Icing Processes' and ARP6257 'Aircraft Ground De/Anti-Icing Communication Phraseology for Flight and Ground Crews',
- SAE AS6286 'Aircraft Ground Deicing/Anti-icing Training and Qualification Program
- SAE AS6332 'Aircraft Ground Deicing/Anti-icing Quality Management'.

Additionally, EASA considers the FAA Holdover Time Guidelines as an acceptable reference when developing the HOT table to be published. The FAA Holdover Time Guidelines need to be read in conjunction with the corresponding FAA 8900.527 series Notice 'Revised FAA-Approved Deicing Program Updates, Winter 2025-2026'. Both documents are updated annually, typically during early August, and are freely available from the FAA website.

Service suppliers should ensure they have access to the latest SAE Standards and FAA Holdover Time Guidelines' in order to comply with Pegasus Airlines requirements.

During icing conditions in winter time, the handling agent or appointed maintenance staffs are responsible for checking with flight-deck crew and maintenance personnel if de-icing or anti-icing of the aircraft is necessary. Contact with the PIC to receive instructions on which methods, fluids and mix have to be applied. The handling agent or appointed maintenance staffs (authorized technicians) are responsible for ordering and supervising these services when de-icing is likely to be needed.

Frost, ice or snow deposits can seriously affect the aerodynamic performance and/or controllability of an aircraft. Pegasus Airlines accepts the minimum requirements for ground-based aircraft deicing/anti icing methods with fluids and procedures to facilitate the safe operation of transport aircraft during icing conditions. The application of the de-icing/anti icing fluid will be in accordance with the requirements of the airframe/engine manufactures.

All de-/anti-icing fluids currently in use have a certain impact on environmental pollution. Pegasus Airlines is highly committed to this issue and therefore demands a careful, precise and restrictive use of such fluids without compromising safety.

5.2 PERSONNEL SAFETY

The safety factors given below are designed to ensure that in the performance of de-icing an aircraft the safety of personnel performing the task is not compromised.

- Appropriate personal protective equipment should be checked for serviceability and worn by all personnel engaged in de-icing operations.
- To prevent injury, caution shall be taken when filling de-icing vehicles with hot fluid.
- When handling de-icing fluids, personnel should understand and follow the precautions contained in the fluid manufacturer's Material Safety Data Sheets.
- Slippery conditions can exist on the ground and on the equipment surfaces during and following the de-icing processes. Caution should be exercised, particularly under low humidity or nonprecipitating weather conditions due to increased slipperiness following the use of glycol that is not diluted by the weather element.
- All ramp equipment, including steps, shall be clear of the area of the area to be sprayed to avoid contamination by fluid. Do not spray fluids near personnel on the ramp.
- Care should be taken to prevent transfer of fluid by foot onto ground equipment including steps, jet bridges, interiors of aircraft and aircraft cargo holds.
- In a two-person vehicle operation, the vehicle driver and basket shall be in direct communication with each other.

- When maneuvering around an aircraft the driver/operator shall ensure that the de-icing vehicle (and/or any part of it) maintains a minimum distance of 2m (6 feet) from any part of the aircraft.
- De-icing vehicles should be positioned in a safety area before and after the de-icing processes are performed.
- Open basket operations
- Ensure that the fall restraint device is securely anchored and that the safety harness is worn at all times when de-icing from an open basket.
- Ensure that the basket door or safety chain is securely latched.
- Caution should be taken to avoid exposure to a running APU.
- Enclosed cabin operations
- Ensure the seatbelt is always worn.
- Ensure the windows of the cabin are clean.
- Ensure the door of the cabin is securely closed.
- Ensure there are no obstructions to the cabin heater/ventilation system.
- Engines on operations.
- Driving behind an aircraft with engines running should be avoided, if possible.
- Personnel shall be aware of the safety zones around aircraft with running engines.
- Personnel shall be aware of the arc of rotating propellers.

5.3 CLEAN AIRCRAFT CONCEPT

. PEGASUS Hava Taşımacılığı A.Ş. Aeropark Yenisehir Mah. Osmanlı Bulvarı No:11/A 34912 Kurtkoy / ISTANBUL Tel: +90 216 560 7632 / Fax: +90 216 560 7079 Bu dokümanın içeriği PEGASUS Hava Taşımacılığı A.Ş.'nin mülkiyetinde olup, sahibinin yazılı izni olmadan kopya edilemez, çoğaltılamaz ve üçüncü şahıslara açıklanamaz. QDMS'te görüntülenen asıl dokümandır (master kopya), çıktı alındığında ve/veya indirildiğinde kontrolsüz kopyadır. Genel (Public) 5.3 Clean Aircraft Concept The clean aircraft concept must be understood as an important part for the safety of the flight. A clean aircraft is considered to be either totally clean or cleaned and protected with de-icing/anti-icing fluids that still protect the surface and are able to perform aerodynamically correct and the assurance that a take off is not attempted when ice, snow, slush or frost is present or adhering to the wings, propellers, control surfaces, engine inlets or other critical surfaces of the aircraft. Contaminated fluid on the surface must not be misunderstood as a clean aircraft; this contamination must be removed. Under no circumstances shall an aircraft that has been anti-iced receive a further coating of anti-icing fluid directly on top of the contaminated film. If an additional treatment is required before flight, a complete de-icing/anti-icing shall be performed. Ensure that any residues from previous treatment are flushed off. Anti-icing only is not permitted.

It is the responsibility of the The Deicing Service Provider to ensure that all frozen deposits (with the possible exception of frost which may be allowed, as described in this manual), are removed from the specified surfaces during the de-icing process.

5.4 QUALITY

Ref: Ground Operations Manual GOM- Chapter 4&6, IATA POOL Audit Procedure (PG-KU-PR-010) All companies providing deicing/anti-icing services shall have a Quality Program. The purpose of the program is to ensure that de-icing/anti-icing of aircraft on the ground is accomplished in accordance with regulatory requirements and guidance, industry standards and this manual. To verify effectiveness of the de-icing/anti-icing of aircraft on the ground, the Quality Program should include both Quality Assurance (QA) and Quality Control (QC) processes and procedures.

5.4.1 Quality Assurance

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

In order to fulfil quality assurance requirements, Pegasus Airlines Ground Operations distributes the De/anti-icing Manual to de-icing companies through the station supervision personnel and demands a confirmation that the manual will be adhered to.

Pegasus Airlines is active member of the IATA De-/Anti-icing Quality Control Pool (DAQCP) and has access to the DAQCP-database, (*See Network Auditors' within this manual).

DAQCP will audit the de-icing providers and will issue alert messages if safety relevant findings are revealed. Alert messages related to service providers on airports served by Pegasus Airlines Flights will be relayed to Ground Operations Department and Safety and Emergency Response Management Department and Compliance Monitoring Department to initiate further actions.

5.4.2 Station Quality Control Program

A Quality Control Program shall cover all aspects of aircraft ground de-icing/anti-icing and shall include, but is not limited to, the following checks:

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

NOT

Prior to the start of each winter, perform all above listed checks.

NOT

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

5.4.3 Fluid Quality Control/Assurance Checks

Fluid Testing: Fluid shall be checked routinely to assure that no degradation or contamination has taken place, e.g., at delivery and annually prior to the winter season.

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

5.4.3.1 Fluid Delivery/Acceptance Check

This check shall be performed for each delivery of aircraft deicing and anti-icing fluids before the first use of the delivered fluid for filling a storage tank or deicing vehicle tank.

5.4.3.1.1 Delivery Documentation

(a) The delivery shall be accompanied by a Certificate of Analysis or Certificate of Conformance.

(1) For all fluid types, the certificate shall include delivery specifications and test results of the following:

(a) Fluid appearance

(b) Refraction (Refractive Index)

(c) pH

(2) For deliveries of Type II, III, and IV fluids, the certificate shall also include delivery specifications and test results for laboratory viscosity testing.

(b) The documentation and paperwork accompanying the delivery shall be checked to verify the following:

(1) The delivered fluid corresponds to the fluid ordered

(2) The delivered fluid brand name corresponds to product identification labels or tags for each delivery vessel

(3) The delivered fluid concentration corresponds to product identification labels or tags for each delivery vessel

(4) The lot or batch number on delivery documents correlate with other shipping documents provided

(5) The test results noted on the Certificate of Analysis or Certificate of Conformance meet the applicable fluid manufacturer's specifications

5.4.3.1.2 Shipment Seals

(a) Shipment seals shall be checked to ensure:

(1) The product has not been tampered.

(2) Identification numbers align with those noted on delivery documentation (where applicable).

(b) If seals contain identification numbers, the numbers should be noted on acceptance documentation.

5.4.3.1.3 Bulk Shipping (e.g. Road Tankers and Rail Tankers)

The fluid supplier shall provide an assurance that one of the following has been met prior to loading the bulk shipping container for delivery to the customer:

(a) The shipping container and included delivery hoses were cleaned.

(b) The previous load consisted of fluid identical to the delivered fluid.

5.4.3.1.4 Fluid Samples

A fluid sample shall be taken from the delivery vessel.

(a) For bulk shipping containers a sample from each separate compartment is required if applicable.

(b) For deliveries of multiple containers (e.g. totes or drums), only one sample from a common production lot or batch is required.

5.4.3.1.5 Fluid Sample Checks

(a) The following checks shall be performed on each sample:

(1) Visual examination for:

(a) Color

(b) Foreign body contamination (e.g. rust particles, debris, etc.)

(2) Refraction Check (refractive index or freezing point) to verify fluid concentration

(b) The following checks are optional for each sample. These checks can be helpful if fluid degradation is suspected:

(1) PH check

(2) Field viscosity check or laboratory viscosity test for Type II, III or IV fluids

(c) All check results shall be within the fluid manufacturer's specifications.

5.4.3.1.6 Nonconformities or Discrepancies

(a) Service providers shall have a documented procedure in place on the appropriate action to be taken when irregularities or discrepancies are identified during the fluid delivery documentation checks and fluid sample checks.

(b) Fluid manufacturers should have information contained within their documentation outlining specific procedures and/or contact information to assist and provide support to service providers in such occurrences.

5.4.3.2 Fluid Pre-Season and Within-Season Checks

Fluids that are applied to the aircraft shall meet the fluid manufacturer's specification. A program shall be in place that assures the safe use and performance parameters of fluids are always followed and met. One way of complying with this requirement is to carry out a mid-season check.

5.4.3.2.1 Type I Fluid

Checks shall be performed:

- At the start of the de-icing season
- On any vehicle or storage tank when fluid contamination or degradation is suspected. Fluid samples shall be taken from all de-icing/anti-icing fluid spray nozzles of all de-icing/anti-icing spraying equipment in the most common concentrations used for de-icing/anti-icing and from all storage tanks in use. For vehicles without a mixing system, the sample may be taken directly from the vehicle pre-mix tank after ensuring that the fluid is at a uniform mixture

Perform the following checks on the fluid samples:

- Visual examination
- Refractive Index
- pH (*)

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

5.4.3.2.2 Type II, III, and IV Fluids

Checks shall be performed:

- At the start of the de-icing season
- On any vehicle or storage tank when fluid contamination or degradation is suspected

- After equipment maintenance on the fluid pump and spray system that has the potential to affect the quality of the fluid (e.g., pumps, nozzles, etc.).

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

- Visual examination
- Refractive Index
- PH (*)
- Laboratory viscosity

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

5.4.3.2.3 Fluid Sample Check Requirements

- Results of the visual, refractive index, and pH checks shall be within the limits set by the applicable fluid manufacturer.
- Results of viscosity checks on samples from spray nozzles shall be no lower than the Lowest OnWing Viscosity (LOWV) and no higher than the Highest On-Wing Viscosity (HOWV). Fluids with a viscosity less than the LOWV shall not be used with holdover time guidelines.
- Results of viscosity checks on samples from storage tanks shall be within the limits needed to ensure the viscosity of fluid when applied to aircraft will remain within the LOWV and the HOWV. Any expected degradation during fluid storage and handling and during the use of fluid application equipment must be taken into account.

NOT

The LOWV for specific fluids are listed in Transport Canada and FAA holdover time guideline publications. The HOWV for specific fluids are provided by the applicable fluid manufacturer. The LOWV and HOWV are unique for each specific fluid and fluid concentration (i.e., 50%, 75%, and 100%).

5.4.3.3 Daily Concentration Checks

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

NOT

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

NOT

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

5.4.3.3.1 Type I Fluid from Nozzles

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

5.4.3.3.2 Type 1 Fluid in Tanks

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

5.4.3.3.3 Type II, III and IV Fluid

- For fluids from nozzles and in tanks, the concentration shall be within the 'in-service' limits published by the manufacturer for fluid at the applicable concentration.
- For Type II, III and IV fluid/water mixtures (50/50 or 75/25), a tolerance range of 0 to +7% from the setting may apply, depending on the product.

5.4.3.4 Check on Directly or Indirectly Heated Type II, III or IV Fluids

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

5.4.3.5 Fluid Check Methods

The following checks may be performed by any equivalent method.

(a) Visual Contamination Check

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

(b) Refractive Index Check

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

(c) PH Value Check

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

> **NOT**
> In the laboratory this pH check shall be performed with a calibrated or functionally tested pH meter.

(d) Field viscosity check

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

(e) Laboratory viscosity test

Perform the viscosity test using the fluid manufacturer's method or AS9968. Compare the viscosity values with the applicable limits.

5.4.3.6 Fluid Sampling Procedure for Type II, Type III or Type IV Fluids

To ensure that the necessary safety margins are maintained between the start of the deicing/antiicing operation and takeoff, the fluid used to both de-ice and anti-ice aircraft surfaces must meet specification

and be at the correct concentration. Due to the possible effect of vehicle/equipment heating and/or delivery system components on fluid condition, it is necessary for the sampling method to simulate typical aircraft application. This section describes some methods for collecting samples of Type II, III and IV fluids, sprayed from operational aircraft deicing/anti-icing vehicles and equipment, prior to the necessary quality control checks being carried out.

(a) Method using a Purpose Built stand

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

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

(b) Trash can method:

Items required:

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

Procedure for nozzle sample:

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

(c) Sample Identification

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

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

- Mixture strength (e.g., 100/0, 75/25, etc.)
- Station (e.g., BAK, etc.)
- Date sample was taken

5.5 COMMUNICATIONS

5.5.1 Communication Procedures

Persons communicating with the flight crew shall have a basic knowledge of the English language (operational level or equivalent according to the current version of the AS6286 Aircraft Ground Deicing/ Anti-icing of Training and Qualification Program). For local flights involving local flight and ground crews, local language may be used by them (refer to the current version of training document AS6286.

Communication between the flight crew and the deicing crew will usually be achieved using a combination of printed forms and verbal communication. For treatments carried out after aircraft doors are closed, 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.

NOT

No flight crew communication is required and no holdover time applies if the aircraft is deiced using Type I for overnight frost in the absence of further precipitation or active frost.

5.5.2 Communication Prior to Starting Deicing/Anti-Icing Treatment

- Before starting deicing/anti-icing, the flight crew shall be requested to confirm the treatment required (i.e., surfaces and components to be de-iced, anti-icing requirements, plus any special deicing procedures).
- Before fluid treatment starts, the flight crew shall be requested to configure the aircraft for deicing/anti-icing (surfaces, controls, and systems as per aircraft type requirements or recommended procedures). The deicing crew shall wait for confirmation that this has been completed before commencing the treatment.
- For treatments conducted without the flight crew present, suitably qualified staff shall be nominated by the aircraft operatör/Pegasus Airlines to confirm the treatment required (when applicable) and to confirm the correct configuration of the aircraft.

5.5.3 Post Deicing/Anti-Icing Communication

An aircraft shall not be dispatched for departure after a deicing/anti-icing operation until the flight crew has been notified of the type of deicing/anti-icing operation performed (i.e., the Anti-Icing Code).The Anti-Icing Code ."" shall be provided by qualified staff upon completion of the treatment, indicating that the checked surfaces ""are free of frost, snow, slush, or ice; that deicing/anti-icing is complete, that equipment is cleared from the area; and in addition, providing the necessary information for the flight crew to estimate the appropriate holdover time for the prevailing weather conditions when anti-icing fluid has been used. When a treatment is interrupted for a significant period of time (e.g., truck runs out of fluid) the flight crew shall be informed stating the reason, the action to be taken and the estimated time delay. When continuing the treatment, the previously treated surfaces must be fully de-iced and anti-iced again, when the holdover time of the treatment from before the interruption is not sufficient.

5.5.4 The Anti-Icing Code

The following elements comprising the Anti-Icing Code shall be recorded and be communicated to the flight crew by referring to the final step of the fluid deicing/anti-icing treatment procedure; it shall be provided in the sequence given below:

NOT

This information shall not be communicated in circumstances where anti-icing holdover times do not apply, e.g., local frost prevention in cold-soaked wing areas, symmetrical local area deicing, or deicing of specific surfaces only (such as leading edges for removal of impact ice), etc. In these circumstances, upon completion of the treatment, the flight crew shall be provided with the deicing fluid type applied (e.g., “Type I”); a statement that holdover time does not apply (e.g., “Local area deicing only. Holdover times do not apply.”), and confirmation that the post-deicing check has been completed (e.g., “Post deicing check completed.”).

(a) The fluid type (i.e., Type I, II, III, or IV);

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

NOT

Communication of this element is not required for Type I fluid.

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

NOT

Communication of this element is not required for Type I fluid.

(d) The local time (hours and minutes), either:

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

(e) The date in the following format: day, month, year (DDMMMYY (e.g., 28JAN15 = January 28, 2015));

NOT

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

(f) The statement, “Post-deicing/anti-icing check completed.”

NOT

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

EXAMPLE:

The last step of a deicing/anti-icing procedure is the application of a mixture of 75% Type II fluid and 25% water, made by the Manufacturer as Brand X, commencing at 13:35 local time on 20 February 2016, is reported and recorded as follows:

“TYPE II / MANUFACTURER, BRAND X / 75% / 1335 / 20FEB16 / POST DEICING/ANTI-ICING CHECK COMPLETED”

NOT

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

5.5.5 Post-Deicing/Anti-Icing Check and Transmission of the Anti-Icing Code to the Flight Crew

It is clearly defined by Pegasus which company is responsible for conducting the post-deicing/antiicing check and providing the flight crew with the Anti-Icing Code. If two different companies are involved in the

deicing/anti-icing treatment and post-deicing/anti-icing check, it must be ensured that the Anti-Icing Code is not given before the post deicing/ anti-icing check has been completed.

The company conducting the deicing/anti-icing treatment shall be responsible for the treatment and transmit all information about the treatment to the company conducting the post-deicing/anti-icing check. The company conducting the postdeicing/anti-icing check shall have overall responsibility for the performance of the company conducting the deicing/antiicing treatment.

5.5.6 Confirmation that Equipment and Personnel are Safely Away from the Aircraft

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

5.5.7 Off-Gate Communications

During deicing/anti-icing, a two-way communication between the flight crew and the deicing/anti-icing operator/supervisor must be established prior to the deicing/anti-icing treatment. This may be done either by interphone or by VHF radio.

Alternate means of communication may be the use of ACARS, EFBs, and EMBs. In the event of conflict, verbal communication shall take precedence.

During treatment, all necessary information must be transmitted to the flight crew, including the beginning of treatment, treatment of the sections requiring de-activation of aircraft systems, the AntiIcing Code, etc., (using standardized deicing/anti-icing phraseology). Communication contact with the flight crew may be concluded after transmission of the Anti-Icing Code and readiness for taxi-out has been announced. During deicing/anti-icing operations with engines running, both verbal and visual communications shall be utilized and positive control maintained during the deicing/anti-icing operation in accordance with ARP5660.

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

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

(b) Responsibilities: The responsibility to conduct a Contamination Check before dispatch rests with trained and qualified personnel. The results of the Contamination Check must be provided to the flight crew via verbal or visual (written or electronic) means. Subsequently, the flight crew is responsible for acquiring the proper treatment. After treatment, the treated surfaces and components must be checked by a trained and qualified staff""and the Anti-Icing Code must be given to the flight crew ""Subsequently, the flight crew is responsible for the airworthiness of the aircraft.

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

5.5.8 Scripts

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

- (DIS = Deicing/anti-icing supervisor)
- (COMMANDER = Pilot in command)

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

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

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

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

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

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

5.5.9 Phraseology

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

5.5.10 Communication for Proximity Sensor Activation by Physical Contact

For equipment types furnished with a proximity sensor requiring physical contact in order to activate (refer to ""for further information), and, in the event of sensor contact, the Pilot in Command shall be informed using the following phraseology:

Ground Crew to Flight Crew:

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

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

5.6 AIRCRAFT REQUIREMENTS AFTER DE-ICING/ANTI-ICING

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

5.6.1 Wings, Tails, and Control Surfaces

Wings, tails, and control surfaces shall be free of frost, snow, slush, or ice unless the aircraft manufacturer and state regulatory authority permits that a coating of frost may be present on wing lower surfaces in areas cold soaked by fuel between forward and aft spars; and/or on upper wing surfaces within defined areas, in accordance with the aircraft manufacturer’s published documentation.

NOT

Except for frost due to cold-soaked fuel as mentioned above, and unless otherwise specified in the Aircraft Flight Manual or other aircraft manufacturer's documentation, contamination is not acceptable on the upper or lower surfaces of the horizontal stabilizer and elevator/tab; strakes; inboard, outboard, upper, and lower surfaces of the wing and wing tip devices; and either side of the vertical stabilizer and rudder.

5.6.2 Pitot Tubes, Static Ports and All Other Air Data Sensing Devices

Pitot tubes, static ports, and other air data sensing devices shall be free of frost, snow, slush, ice, and fluid.

NOT

Ice ridges can form on the nose of the fuselage while on the ground. These ridges will disrupt air flow into the pitot tubes and which can result in false measurements. All contamination shall be removed from this area.

5.6.3 Engines

Engine inlets (including the leading edge), exhaust, cooling intakes, control system probes, and ports shall be free of frost, snow, slush, or ice. Engine fan blades, propellers (as appropriate), and spinner cones shall be free of frost, snow, slush, or ice, and shall be free to rotate.

5.6.4 Air Conditioning Inlets and Outlets

Air inlets, outlets, pressure-release valves, and outflow valves shall be free of frost, snow, slush, or ice, and shall be unobstructed.

5.6.5 Landing Gear and Landing Gear Doors

Landing gear and landing gear doors shall be unobstructed and free of frost, snow, slush, or ice. Do not spray deicing/antiicing fluids directly onto wiring harnesses and electrical components (receptacles, junction boxes, etc.,) brakes, wheels, exhausts, or thrust reversers.

5.6.6 Fuel Tank Vents

Fuel tank vents shall be free of frost, snow, slush, or ice.

5.6.7 Fuselage

The fuselage shall be free of ice, slush, and snow. In accordance with the aircraft manufacturer's documentation, frost may be present on the fuselage for take-off within specified amounts provided that no other forms of contamination are present, and inlets, outlets, and other devices (as identified by the aircraft manufacturer) are free of contamination.

5.6.8 Flight Deck Windows and Nose or Radome Area

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

If SAE Type II, III, or IV fluid has been used, all traces of the fluid on flight deck windows shall be removed prior to departure, with particular attention paid to windows fitted with wipers. Thickenedfluid (SAE Type II, III, or IV) can be removed by using a diluted Type I mixture, water (where it has been determined that refreezing will not occur), a manual method (ensuring that windscreen heat is turned off), or another cleaner as approved by the aircraft manufacturer.

NOT

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

5.6.9 Dried Thickened Fluid Residues When the Aircraft Has Not Been Flown After Anti-Icing

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

5.6.10 Special Maintenance Considerations

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

5.7 CHECKS

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

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

5.7.1 Contamination Check to Establish the Need for Deicing

A Contamination Check shall include all areas mentioned in 5.6.1 through 5.6.8 and any other surfaces and components of the aircraft as indicated by the aircraft manufacturer and shall be performed from points offering sufficient visibility of these parts (e.g., from the deicing/anti-icing vehicle, a ladder or any other suitable means of access as necessary). Any contamination found on the surfaces or components of the aircraft that are critical to safe flight shall be removed by a deicing treatment; this shall be followed by anti-icing treatment when required.

Where an aircraft has been de-iced and/or anti-iced some time prior to the arrival of the flight crew, an additional ‘Contamination Check’ shall be carried out prior to departure, in order to establish whether further treatment is required.

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

NOT

For specific aeroplane types additional requirements exist e.g., special clear ice checks, such as tactile checks on wings. These special checks are not covered by the contamination check.

Aeroplane operators shall make arrangements for suitably qualified personnel to meet these requirements.

5.7.2 Tactile Check

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

5.7.3 Post Deicing/Anti-Icing Check

An aircraft shall not be dispatched after a deicing/anti-icing treatment until the aircraft has received the following visual check by qualified staff. This check shall include wings, horizontal stabilizers (both lower and upper surfaces), vertical stabilizer, and fuselage, including pitot heads, static ports temperature and angle of attack sensors. This check shall also include any other parts of the aircraft on which a deicing/anti-icing treatment was performed according to the requirements identified during the contamination check.

The post deicing/anti-icing check shall be performed from points offering sufficient visibility of all treated surfaces (e.g., from a deicing/anti-icing vehicle, ladder, or other suitable means of access). Any contamination found shall be removed by further deicing/anti-icing treatment, and the post deicing/anti-icing check shall be repeated. Before takeoff, the flight crew must ensure that they have received confirmation that this post deicing/anti-icing check has been accomplished.

NOT

For specific aircraft types, additional requirements exist, e.g., special clear-ice checks, such as tactile checks on wings. These special checks are not covered by the post deicing/anti-icing check. Aircraft operators shall make arrangements for suitably qualified staff to meet any special check requirements.

When the deicing/anti-icing service provider performs the deicing/anti-icing treatment as well as the post deicing/anti-icing check, it may either be performed as a separate check or incorporated into the deicing/ anti-icing operation as specified below. The deicing/anti-icing service provider shall specify the method used in his winter procedures, by customer where necessary:

(a) As the deicing/anti-icing treatment progresses, the deicing/anti-icing sprayer will closely monitor the surfaces receiving treatment in order to ensure that all forms of frost, snow, slush, or ice (with the exception of cold-soaked fuel frost on the lower surface of wings and light frost on the fuselage, which may be allowed per the aircraft manufacturer and state regulatory authority) are removed and that upon completion of anti-icing treatment, these surfaces are fully covered with an adequate layer of anti-icing fluid.

(b) When the request for deicing/anti-icing did not specify the fuselage, a visual check of the fuselage shall be performed at this time, in order to confirm that it has remained free of contamination (with the possible exception of light frost, which may be allowed as per the aircraft manufacturer and state regulatory authority).

(c) Any evidence of contamination that is outside the defined limits shall be reported to the flight crew immediately and be removed by further deicing/ anti-icing treatment. Then the post deicing/antiicing check shall be repeated.

(d) Once the treatment has been completed, the Deicing Operator will conduct a close visual check of the surface where the treatment commenced, to ensure that it has remained free of contamination (this check is not required for 'frost only' conditions)

5.7.4 Pre Takeoff Check

The flight crew shall continually monitor the weather conditions after the deicing/anti-icing treatment. Prior to takeoff a Flight crew member shall assess whether the applied holdover time is still appropriate and/or if untreated surfaces may have become contaminated. This check is normally performed from inside the flight deck.

5.7.5 Pre Takeoff Contamination Check

This is a check of the critical surfaces for contamination. This check shall be performed when the condition of the critical surfaces of the aircraft cannot be effectively assessed by a pre-takeoff check or when the holdover time has been exceeded.

This check is normally performed outside of the aircraft. The alternate means of compliance for a pretakeoff contamination check is to perform a complete deicing/anti-icing re-treatment of the aircraft

5.7.6 Flight Control Check

A functional flight control check using an external observer may be required after deicing/anti-icing depending upon aeroplane type (see 5.13). This is particularly important in the case of an aeroplane that has been subjected to an extreme ice or snow covering.

5.8 AIRCRAFT GROUND DE-ICING/ANTI-ICING METHODS

5.8.1 Aircraft Ground Deicing/Anti-Icing Methods, General Comments

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

the holdover time needed. If a one-step procedure is used, then both ""and ""apply for guidance regarding fluid limitations.

DIKKAT

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

5.8.2 Pre-Deicing Process to Be Done Prior to Deicing/Anti-Icing

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

5.8.3 Infrared Deicing

This sub-section establishes the procedures for the removal of frozen precipitation by using infrared deicing technology.

Specific information on facility requirements, as well as their inclusion in aircraft ground deicing programs, can be found in publications listed in Section 5.2 of this document.

- General requirements: Frost, snow, slush, or ice shall be removed from aircraft surfaces prior to dispatch from the facility or prior to anti-icing.
- Deicing: Deicing using infrared energy is accomplished through heat that breaks the bond of adhering frozen contamination. The application of infrared energy may be continued to melt and evaporate frozen contaminants. Wet surfaces require an application of heated deicing fluids to preclude refreezing after removal of infrared energy source.

  When required, for operations other than frost or leading edge ice removal and when OAT is at or below 0 °C (32 °F), an additional treatment with hot deicing fluid shall be performed within the facility to prevent re-freezing of water which may remain in hidden areas.

  DIKKAT

  If the aircraft requires re-deicing and de/anti-icing fluids had been applied before flight, conventional de/anti-icing with fluids shall be performed.
- Inspection: The aircraft shall be inspected in accordance with the requirements of Section ""
- Anti-icing: If anti-icing is required, it shall be accomplished in accordance with"" If anti-icing is performed inside the facility, infrared power levels must be adjusted as required during the antiicing process to prevent the reaccumulation of frozen contamination because of snow blowing through the facility and to maintain fluid integrity for the time the aircraft is in the facility. Dehydration of the fluid can negatively impact the fluid performance

5.8.4 De-icing by Fluids

Frost, snow, slush, or ice may be removed from aircraft surfaces by the use of deicing fluids. It is the responsibility of the Deicing Service Provider to ensure that all frozen deposits (with the possible exception of frost which may be allowed as described in Section "") are removed from the specified surfaces during the deicing process.

DIKKAT

Consult aircraft maintenance manuals for limitations for the maximum application pressure and temperature.

5.8.4.1 Removal of Contaminants

For maximum effect, fluids shall be applied close to the surface to minimise heat loss. Fluid temperature and pressure should not exceed aircraft maintenance manual requirements. The heat in the fluid effectively melts any frost, as well as light deposits of snow, slush, and ice. Heavier accumulations require the heat to break the bond between the frozen deposits and the structure; the hydraulic force of the fluid spray is then used to flush off the contamination. The deicing fluid will prevent re-freezing for a period of time depending on aircraft skin and OAT, the fluid used, the mixture strength, and the weather.

5.8.4.2 Removal of Frost and Light Ice

A general procedure consisting of a nozzle setting that gives a solid cone (fan) spray should be used. This ensures the largest droplet pattern available, thus retaining the maximum heat in the fluid.

5.8.4.3 Removal of Snow

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

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

5.8.4.4 Removal of Ice

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

Non-metallic surfaces (e.g., composites) have a lower heat transfer than metallic surfaces. Deicing may take longer and more fluid may be needed. By repeating this procedure a number of times the adhesion of a large area of frozen snow or glazed ice can be broken. The deposits can then be flushed off with either a low or high flow, depending on the amount of the deposit.

5.8.4.5 General Deicing Fluid Application Strategy

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

5.8.4.5.1 Wings, Horizontal Stabilizers, and Elevators

The direction of the spray shall be from the leading edge to the trailing edge in the vicinity of any control surfaces (i.e., the rudder). Caution must be used to ensure fluid is not sprayed directly into any vertical tail or control surface openings.

NOT

There is an exception: On aircraft with no leading edge devices (i.e., hard wing and/or propeller driven), deicing/ antiicing fluid may be sprayed from highest point of the wing surface camber to the lowest, flowing forward over the leading edge of the wing ensuring sufficient rollover, and over the trailing edge. Caution must be used to ensure fluid is not sprayed directly into any wing openings.

5.8.4.5.2 Lower Wing Surface (under side of wing) Deicing Procedures

Treatments must be symmetrical and may include flaps and lower surfaces. Spray the affected areas with a heated fluid/water mixture suitable for a one-step procedure as required, (see caution below), and then spray the same areas under the other wing. Both wings must be treated identically (same areas, same amount and type of fluid, same mixture strength), even if the frozen contamination is only present under one wing. Holdover times do not apply to underwing treatments.

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

DIKKAT

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

5.8.4.5.3 Vertical Surfaces

Start at the top and work down to the base of any vertical surfaces, spraying from forward to aft in the vicinity of control surfaces.

5.8.4.5.4 Fuselage

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

5.8.4.5.5 Nose/Radome Area and Flight Deck Windows

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

When thickened fluids are used, avoid spraying near the flight deck windows, as fluid can cause a severe loss of visibility. Any thickened fluid remaining on the nose areas where it could blow back onto the windscreens should be removed prior to departure, using a diluted Type I fluid, squeegees or equivalent. If flight deck windows are contaminated with thickened fluids use water or an approved windshield cleaner (use of a low windscreen washing fluid is recommended when OAT is at or below 0 °C (32 °F)).

DIKKAT

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

5.8.4.5.6 Landing Gear and Wheel Bays

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

NOT

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

5.8.4.5.7 Engines

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

5.8.4.6 Removal of Local Area Contamination

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

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

It is the responsibility of the Deicing Service Provider to ensure that the treatment is performed symmetrically and that on completion all frozen deposits have been removed. After this check has confirmed that the areas are clean the following statement shall be given to the flight crew: “Local area deicing only. Holdover times do not apply”.

5.8.5 Anti-Icing by Fluids

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

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

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

DIKKAT

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

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

DIKKAT

Acetate- or formate-based fluids when used for aircraft deicing:

- May significantly shorten the Holdover Times of Type II, III, and IV fluids when used in combination with these fluids
- May cause corrosion of aircraft materials.

Refer to aircraft manufacturers documentation and AMS1424/1, AMS1424/2, AMS1428/1, and AMS1428/2 for more information.

Prior to flight, the aircraft must be deiced, unless the integrity of the fluid can be ensured. Deice in accordance with ""

Table 1, whenever possible, to reduce the potential for dried residue build up.

NOT

Dehydration (water evaporation) of Type II, III, and IV fluid can negatively impact the fluid performance.

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

NOT

Type I fluids provide limited holdover effectiveness when used for anti-icing purposes.

5.8.5.1 Anti-Icing Fluid Application Strategy

The process should be continuous and as short as possible. Anti-icing should be carried out as near to the departure time as possible in order to utilize available holdover time. The anti-icing fluid shall be distributed uniformly and with sufficient thickness over all surfaces to which it is applied. In order to control the uniformity, all aircraft surfaces shall be visually checked during application of the fluid.

To use Type I Holdover Times Guidelines in all conditions, including active frost, an additional minimum of 1 L/m2) (~2 gallons/100 ft2) of heated Type I fluid mixture with a nozzle temperature of at least 60 °C (140 °F) must be applied to the surfaces after all frozen contamination is removed. This application is necessary to heat the surfaces, as heat contributes significantly to the Type I fluid holdover times. The required protection can be provided using a one-step method by applying more fluid than is strictly needed to just remove all of the frozen contamination (the same additional amount stated above is required).

For Type II, III, or IV fluids which flow readily over surfaces, the correct amount is indicated by fluid just beginning to run off the leading and trailing edges. For fluids which form a more static layer, the minimum quantity required will typically be 1 litre/square (1 L/m2) metre applied in an even layer across the surface. For further guidance on the amount of fluid, refer to AS6286 Aircraft Ground Deicing/Anti-icing of Training and Qualification Program and/or the fluid manufacturer’s documentation. Spray from the leading edge to the trailing edge on wings, horizontal and vertical stabilisers. The following surfaces shall be treated as specified by the aircraft manufacturer’s documentation:

- Wing upper surfaces including leading edges and upper control surfaces
- Wing tip devices
- Both sides of vertical stabilizer and rudder to receive anti-ice protection when freezing precipitation conditions exist
- Horizontal stabilizer upper surfaces including leading edges and elevator upper surfaces;

- When necessary fuselage upper surfaces dependent upon the amount and type of freezing precipitation (this is especially important on centre-line engine aircrafts).

DIKKAT

Anti-icing fluids may not flow evenly over wing leading edges, horizontal and vertical stabilizers. These surfaces should be checked to ensure that they are properly coated with fluid. It is the responsibility of the Deicing Service Provider to ensure that the surfaces mentioned above are free of frost, snow, slush, or ice prior to the start of the anti-icing treatment and that on completion of the treatment, these surfaces are fully covered with an adequate layer of anti-icing fluid.

5.8.5.2 Local Frost Prevention in Cold Soaked Wing Areas

Wing surface temperatures can be considerably below OAT due to contact with cold fuel and/or close proximity to large masses of cold soaked metal in the wing structure. In these areas frost can build up on wing surfaces and may result in the entire wing needing to be deiced and anti-iced prior to the subsequent departure. This section provides standards for the prevention of local frost formation in cold soaked wing tank areas during transit stops in order to make deicing and anti-icing of the entire wing unnecessary under such circumstances. This procedure does not, however, supersede standard deicing and anti-icing procedures in accordance with 5.8.4 and 5.8.5, and it shall be applied in coordination with these subsections. This procedure also does not relieve the user from any requirements for treatment and checks in accordance with aircraft manufacturer manuals.

NOT

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

(a) Procedure

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

NOT

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

(b) Limits/Precautions for Local Frost Prevention

- Procedure limitation: This local frost prevention procedure is neither a substitute for standard deicing and anti-icing procedures in accordance with 8.4.1 and 8.5.1, clear ice checks, or any other aircraft manufacturer requirement, nor a substitute for the requirement that aircraft surfaces shall be clear of frost, snow, slush, or ice accumulations.
- Operator Approval: This procedure shall only be carried out if approved by Pegasus/ the operator of the aircraft to be treated.
- Training: This procedure shall only be carried out by trained and qualified personnel (reference AS AS6286).

(c) Application limits

This local frost prevention procedure shall be applied to clean wings immediately following arrival of the aircraft. Application is acceptable at the latest when frost just starts to form, but in this case the fluid shall be applied at a minimum temperature of 50 °C (122 °F). If precipitation occurred between application of the fluid and dispatch of the aircraft and/or if precipitation is expected before takeoff, a two-step deicing/anti-icing procedure shall be performed (refer to 5.8.4 and 5.8.5).

(d) Symmetrical treatment requirement

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

DIKKAT

Aerodynamic problems could result if this requirement is not met.

(e) Holdover time

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

(f) Final check - local frost prevention

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

(g) Flight crew Information- local frost prevention

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

5.8.5.3 Holdover Time

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

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

DIKKAT

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

DIKKAT

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

Type I Properties

Due to their properties, Type I fluids form a thin liquid wetting film, which provides a very short holdover time, especially in conditions of freezing precipitation. Most of the HOT comes from the heat of the applied

fluid. With this type of fluid no additional holdover time can be obtained by increasing the concentration of the fluid in the fluid/water mixture.

Type II, III, and IV Properties

SAE Type II, III, and IV fluids contain a pseudo plastic thickening agent, which enables the fluid to form a thicker liquid wetting film on external aircraft surfaces. This film provides a longer holdover time especially in conditions of freezing precipitation. With this type of fluid, additional holdover time will be provided by increasing the concentration of the fluid/water mixture, with a maximum holdover time available typically from undiluted fluid. Undiluted thickened fluids generally provide the longest HOT protection.

DIKKAT

The time of protection will be shortened in heavy weather conditions. High wind velocity and jet blast may cause a degradation of the fluid film. If these conditions occur, the time of protection may be shortened considerably. This is also the case when the fuel temperature is significantly lower than OAT.

THEREFORE, THE INDICATED TIMES SHOULD BE USED ONLY IN CONJUNCTION WITH A PRE-TAKEOFF CHECK. THE RESPONSIBILITY FOR THE APPLICATION OF THESE DATA REMAINS WITH THE USER.

Once a HOT is established, weather conditions must be monitored. If conditions change, the HOT must be increased or decreased as appropriate.

HOT guidelines are for operational planning purposes only and are not a substitute for the pre-takeoff check

NOT

Ongoing testing during winter season operations will allow HOT to be further defined. For use of HOT Guidelines consult the fluid manufacturers technical literature for minimum viscosity limits of fluids as applied to aircraft surfaces.

Approved HOT Guidelines can also be obtained for individual fluid products and these HOTs will differ from the generic tables.

5.8.6 Limits

5.8.6.1 Fluid Related Limits

Applied Fluids: The freezing point depressant concentration of applied fluid must not exceed the highest freezing point depressant concentration (as measured by refractive index) at which the fluid met the aerodynamic acceptance test. For applicable values, refer to the fluid manufacturer’s documentation.

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

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

DIKKAT

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

DIKKAT

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

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

NOT

These fluids shall not be used below -25 °C (-13 °F) in active frost conditions. Frost, snow, slush, or ice dilutes the fluid. Apply enough hot deicing fluid to ensure that refreezing does not occur and all contaminated fluid is driven off.

5.8.6.2 Application Limits

(See also the Application Tables 1 and 2 in "")

Under no circumstances shall an aircraft that has been anti-iced receive a further coating of anti-icing fluid directly on top of the contaminated film. If an additional treatment is required before flight, a complete deicing/ anti-icing shall be performed (see Application Tables). Ensure that any remaining fluid from any previous treatment is flushed off. Anti-icing only is not permitted.

DIKKAT

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

The application of hot water or heated Type I fluid in the first step of a two-step process will minimize the formation of residues. Dried residues may rehydrate and freeze under certain temperature, high humidity and/or rain conditions and may block or impede critical flight control systems. If a Type II, III, or IV fluid is used in a one-step process or in the first step of a two-step process, then an appropriate inspection and cleaning program shall be established dependent on the experience and fleet type. Whenever suitable, deice and antiice with only Type I to help avoid these residue issues.

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

NOT

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

NOT

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

5.8.6.3 Aircraft Related Limits

The application of deicing/anti-icing fluid shall be in accordance with the requirements of the airframe/ engine manufacturers and local procedures.

5.8.7 Procedure Precautions

5.8.7.1 One-Step Deicing/Anti-Icing

This is performed using heated deicing/anti-icing fluids "". The correct fluid concentration is chosen with regard to desired holdover time, dictated by OAT and weather conditions (see application Tables 1 and 2). The fluid used to de-ice the aircraft remains on the aircraft surfaces to provide limited anti-ice capability.

DIKKAT

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

DIKKAT

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

NOT

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

NOT

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

NOT

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

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

(See "")

The correct fluid(s) shall be chosen with regard to OAT (see application Tables 1 and 2). The second step is performed with anti-icing fluid to protect the surfaces. This fluid and its concentration are chosen with regard to desired holdover time, which is dictated by OAT and weather conditions (see application Table 2). The second step shall be performed before the first step fluid freezes if necessary area by area. Sevice providers shall ensure the first step fluid and the second step fluid used on aircraft are compatible. This can be accomplished by contacting the respective fluid manufacturer(s).

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

DIKKAT

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

DIKKAT

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

recommendations. The use of hot water or heated mixture of Type I fluid/water for the first step of a two-step deicing/anti-icing process will minimise the formation of dried residues.

NOT

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

NOT

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

NOT

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

- With regard to holdover time provided by the applied fluid, the objective is that it is equal to or greater than the estimated time from the start of anti-icing to the start of takeoff based on existing weather conditions.
- Aircraft shall be treated symmetrically, that is, left hand and right hand side shall receive the same and complete treatment, even when only one side of the aircraft needs treatment. Procedures in 8.5.1 shall be followed if an anti-icing treatment is to be performed on the aircraft.

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  The aircraft is considered UNSAFE if this requirement is not met.
- During anti-icing and deicing, the moveable surfaces shall be in a position as specified by the aircraft manufacturer.
- Engines shall remain running at idle or can be shut down during deicing/anti-icing operations. Air conditioning and/or APU bleed air shall be selected OFF, or as recommended by the airframe and engine manufacturer. Avoid spraying deicing/anti-icing fluid directly into the engine inlet core.
- Do not spray deicing/anti-icing fluids directly onto wiring harnesses and electrical components (receptacles, junction boxes, etc.) brakes, wheels, exhausts, or thrust reversers.
- Deicing/anti-icing fluid spray shall not be directed into the orifices of pitot tubes (heads), static ports/vents, or directly onto air stream direction detectors probes/angle of attack airflow sensors. This includes all openings.
- All reasonable precautions shall be taken to minimize fluid entry into engines, APU, other intakes/outlets, and control surface cavities. Refer to manufacturer documentation. Deicing/antiicing fluid spray shall not be directed into engine core or directly onto engine probes/sensors
- Do not direct fluid spray onto the flight deck or cabin windows as this can cause crazing of the acrylic or penetration of the window seals. Fluid spray may be directed above these surfaces and allowed to flow over.
- Do not direct fluid spray onto the hinges or bushings of folding wing devices, as this can cause lubricants to be washed away. Overspray is allowed.
- If Type II, III, or IV fluids are used, all traces of the fluid on flight deck windows shall be removed prior to departure, with particular attention being paid to windows fitted with wipers. Any forward area from

which fluid may blow back onto windscreens during taxi or subsequent takeoff shall be free of fluid prior to departure. Failure to do so may result in obscured visibility.

NOT

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

- Landing gear and wheel bays shall be kept free from the buildup of slush, ice, or accumulations of blown snow.
- When removing ice, snow, or slush from aircraft surfaces care shall be taken to prevent it entering and accumulating in auxiliary intakes and control surface balance bays, gaps, or hinge areas.
- Contamination build up on and within aircraft lift devices and other critical surfaces can form in flight or when on the ground. During icing conditions, when flaps and slats are retracted, contamination may not be visible. Conditions where this can occur may include but are not limited to the accumulation of impact ice in flight; the splash up of slush onto the underwing and flaps during ground maneuvering; and flap track contamination where snow and/or other contaminants may blow and compact within these openings. As the possibility exists that this could remain undetected, it is important that when these conditions are present or suspected, these areas shall be inspected and any frozen deposits removed prior to departure.
- Under the conditions of freezing fog, or other freezing precipitation conditions, it is necessary for the front and rear side on the fan blades to be checked for ice buildup prior to start-up. Any deposits discovered are to be removed by directing air from a low flow hot air source, such as a cabin heater, onto the affected areas or other means recommended by the aircraft operator based on information from the aircraft and engine manufacturers.
- After frequent applications of deicing/anti-icing fluids it is advisable to inspect aerodynamically quiet areas and cavities for dried residues of thickened deicing/anti-icing fluid. For these inspections it may be necessary to open access panels. Consult airframe manufacturers for inspection and cleaning details and procedures .
- A deicing/anti-icing treatment should be continuous and as short as possible. If a treatment is interrupted (for example a truck running out of fluid), the cockpit crew shall be immediately informed stating:

  (a) The reason for the interruption;

  (b) Actions to be taken (in consultation with the cockpit crew);

  (c) Expected time of delay.

- Before continuing the treatment:

  (a) Inform the cockpit crew;

  (b) Establish in consultation with the cockpit crew, the further treatment to be carried out, including any surfaces requiring re-treatment in relation to holdover time.

- Carry out the treatment as agreed.

5.8.7.3 Clear Ice Precautions

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

- Wing temperatures remain well below 0 °C (32 °F) during the turnaround/transit.
- Ambient humidity is high and/or precipitation occurs while the aircraft is on the ground.

- Frost or ice is present on lower surface of either wing.
- Ambient temperatures between -2 °C (28 °F) and +15 °C (59 °F) are experienced, although clear ice may form at other temperatures if the other three conditions listed above exist.

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

NOT

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

5.8.7.4 Proximity Sensor Activation Reporting Procedures

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

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

NOT

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

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

In these circumstances, the procedures mentioned above this note shall apply. Should a proximity sensor be activated, all pertinent and relevant details shall be documented, including (at a minimum):

- Date
- Time
- Vehicle operator name(s)
- Vehicle identification (e.g., number)
- Flight number
- Aircraft registration and/or air operator fleet identification (e.g., fin/tail/ship number, etc.)
- Deicing location (e.g., bay or gate number)
- Location on the aircraft where the contact was made, including specifics (e.g., side, aircraft part, etc.)
- Proximity sensor location on the vehicle and point where the contact was made (e.g., nozzle, left side of sensor, etc.)

- Name and job title of the third party individual that performed inspection
- Third party company name (not required if third party is from the de/anti-icing company)
- Result of the third party inspection (e.g., no visual damage detected or damage suspected/present)

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

5.8.8 Fluid Application Tables and Holdover Time Guidelines

(Ref: PG-UI-EK-001 OM PART A, APPENDIX 1, Guideline for Holdover Times)

Hold-Over-Time Tables on Pegasus

There are basically two different tables in use, generic and brand name. The generic table is developed using the lowest holdover times, attained from the certified fluids, for each cell. This table may show lower holdover times than the particular fluid actually provides but the idea is that the table can be used wherever these certified fluids are in use, regardless of brand. The brand name holdover timetable is attained for one particular fluid and cannot be used for any other fluids. If the fluid provided at some station is not the one for the table in use, then the generic table shall be used. The table may also vary in content, regarding columns used (e.g., snow, light snow, very-light snow), between organizations/countries.

Pegasus Airlines uses the latest published versions of the FAA Holdover Times Guidelines Winter 2025-2026 as the reference to usable HOT tables in accordance with EASA Safety Information Bulletin, 'SIB No: 2017-11' issued on 14 July 2017.

The latest 'FAA Holdover Time Guidelines' and the FAA 8900.xxx series Notice 'Revised FAAApproved Deicing Program Updates, Winter 20xx-20yy', are available at

"https://www.faa.gov/other_visit/aviation_industry/airline_operators/airline_safety/deicing/ "

https://www.faa.gov/regulations_policies/orders_notices/ respectively

A new version of 'FAA Holdover Time Guidelines' is published for each winter operating season, typically early in the August preceding the winter operating season. Updates to the winter's document may be published any time after the Original Issue document is published. When a new document is published, either mid-season or each new season, the previous document becomes obsolete. It is the responsibility of the end user to periodically check for document updates on the following website:

https://www.faa.gov/other_visit/aviation_industry/airline_operators/airline_safety/deicing/ .

Following generic HOT Tables should be based but Fluid-specific HOT guidelines may also be used with the confirmation of Pilot in Cockpit-PIC. Final decision remains with the PIC.

(Ref. FAA Holdover Time Guidelines, TABLE 60: GUIDELINES FOR THE APPLICATION OF SAE TYPE I FLUID)

TABLE 60: GUIDELINES FOR THE APPLICATION OF SAE TYPE I FLUID

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

Figür 5-1: TABLE 1: GUIDELINES FOR THE APPLICATION OF SAE TYPE I FLUID)

NOT

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

(2) When anti-icing using the one-step procedure, a minimum quantity of 1 liter/m2 (~2 gal./100 sq. ft.) of Type I fluid mixture heated to at least 60 °C (140 °F) is required after all frozen contamination is removed. This is achieved using a continuous process. This application is necessary to heat the surfaces, as heat contributes significantly to the Type I fluid holdover times.

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

DIKKAT

- This table is applicable for the use of Type I holdover time guidelines in all conditions, including active frost. If holdover times are not required, a temperature of 60 °C (140 °F) at the nozzle is desirable.
- If holdover times are required, the temperature of water or fluid/water mixtures shall be at least 60 °C (140 °F) at the nozzle. Upper temperature limit shall not exceed fluid and aircraft manufacturers' recommendations.
- To use Type I Holdover Times Guidelines in all conditions including active frost, an additional minimum of 1 liter/m2 (~2 gal./100 sq. ft.) of heated Type I fluid mixture must be applied to the surfaces after all frozen contamination is removed. This application is necessary to heat the surfaces, as heat contributes significantly to the Type I fluid holdover times. The required protection can be provided using a 1-step method by applying more fluid than is strictly needed to just remove all of the frozen contamination (the same additional amount stated above is required).
- The lowest operational use temperature (LOUT) for a given Type I fluid is the higher (warmer) of:

  (a) The lowest temperature at which the fluid meets the aerodynamic acceptance test for a given aircraft type; or

  (b) The actual freezing point of the fluid plus a freezing point buffer of 10 °C (18 °F).

  - Wing skin temperatures may be colder or warmer than the OAT. Causes can include: radiation cooling, cold-soaked wing, or hangar storage. Consult the appropriate guidance (HOT Tables and FAA Ground Deicing General Information Document, Winter 2025-2026) for the contaminant in question.
  - When conducting aircraft deicing using a Type I fluid and not using the 10 °C/18 °F buffer, procedures must be developed and approved to ensure refreezing does not occur prior to takeoff.

(Ref. FAA Holdover Time Guidelines, TABLE 1 : ACTIVE FROST HOLDOVER TIMES FOR SAE TYPE I, TYPE II, TYPE III, AND TYPE IV FLUIDS)

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

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

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

Figür 5-2: TABLE 2: ACTIVE FROST HOLDOVER TIMES FOR SAE TYPE I, TYPE II, TYPE III, AND TYPE IV FLUIDS)

NOT

(1) To use the HOTs in this table, ensure that the fluid and dilution being used is listed in the List of Qualified Fluids Tested for Anti-Icing Performance and Aerodynamic Acceptance table (Table 55 - Table 58). Any restrictions on the use of the fluid have to be identified and applied.

(2) Type I Fluid / Water Mixture must be selected so that the freezing point of the mixture is at least 10 °C (18 °F) below outside air temperature.

(3) Ensure that the lowest operational use temperature (LOUT) is respected.

(4) Changes in outside air temperature (OAT) over the course of longer frost events can be significant; the appropriate holdover time to use is the one provided for the coldest OAT that has occurred in the time between the de/anti-icing fluid application and takeoff.

(5) To use the Type III fluid frost holdover times, the fluid brand being used must be known. AllClear AeroClear MAX must be applied unheated.

DIKKAT

The cautions that apply to the holdover times in the table above can be found on page 9.

HOT GUIDELINES FOR SAE TYPE II FLUIDS WINTER 2025-2026

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

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

CAUTIONS

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

Figür 5-3: HOT GUIDELINES FOR SAE TYPE II FLUIDS WINTER 2025-2026

ACTIVE FROST HOLDOVER TIME (HOT) GUIDELINES WINTER 2025-2026

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CAUTIONS

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

Figür 5-4: ACTIVE FROST HOLDOVER TIME (HOT) GUIDELINES WINTER 2025-2026

(Ref. FAA Holdover Time Guidelines, TABLE 7: TYPE II HOLDOVER TIMES FOR CLARIANT SAFEWING MP II FLIGHT)

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

Outside Air Temperature[1]	Fluid Concentration Fluid/Water By % Volume	Freezing Fog, Freezing Mist[2], or Ice Crystals[3]	Snow mixed with Freezing Fog[4]	Very Light Snow, Snow Grains or Snow Pellets[5,6]	Light Snow, Snow Grains or Snow Pellets[5,6]	Moderate Snow, Snow Grains or Snow Pellets[5,6]	Freezing Drizzle[7]	Light Freezing Rain	Moderate Snow mixed with Rain[8,9]	Rain on Cold-Soaked Wing[9]	Other[10]
-3 °C and above (27 °F and above)	100/0	3:30 - 4:00	0:45 - 1:10	2:35 - 3:00	1:35 - 2:35	1:00 - 1:35	1:20 - 2:00	0:45 - 1:25	0:08 - 0:08	0:10 - 1:30	
	75/25	1:50 - 2:45	0:30 - 1:00	2:35 - 3:00	1:20 - 2:35	0:40 - 1:20	1:10 - 1:30	0:30 - 0:55	0:04 - 0:04	0:06 - 0:50	
	50/50	0:55 - 1:45	0:09 - 0:20	0:45 - 0:55	0:25 - 0:45	0:10 - 0:25	0:20 - 0:30	0:10 - 0:15	CAUTION: No holdover time guidelines exist		
below -3 to -8 °C (below 27 to 18 °F)	100/0	0:55 - 1:45	0:35 - 1:00	2:05 - 2:30	1:15 - 2:05	0:45 - 1:15	0:35 - 1:30	0:25 - 0:45			
	75/25	0:25 - 1:05	0:20 - 0:40	1:45 - 2:10	0:55 - 1:45	0:30 - 0:55	0:25 - 1:10	0:20 - 0:35			
below -8 to -14 °C (below 18 to 7 °F)	100/0	0:55 - 1:45	0:30 - 0:50	1:50 - 2:10	1:05 - 1:50	0:40 - 1:05	0:35 - 1:30[11]	0:25 - 0:45[11]			
	75/25	0:25 - 1:05	0:15 - 0:30	1:20 - 1:40	0:40 - 1:20	0:20 - 0:40	0:25 - 1:10[11]	0:20 - 0:35[11]			
below -14 to -18 °C (below 7 to 0 °F)	100/0	0:30 - 0:50	0:06 - 0:20	1:10 - 1:40	0:25 - 1:10	0:08 - 0:25					
below -18 to -25 °C (below 0 to -13 °F)	100/0	0:30 - 0:50	0:02 - 0:07	0:30 - 0:40	0:10 - 0:30	0:03 - 0:10					
below -25 to -29 °C (below -13 to -20 °F)	100/0	0:30 - 0:50	0:01 - 0:05	0:20 - 0:30	0:07 - 0:20	0:02 - 0:07					

Figür 5-5: TABLE 3: TYPE II HOLDOVER TIMES FOR CLARIANT SAFEWING MP II FLIGHT)

NOTES

(1) Ensure that the lowest operational use temperature (LOUT) is respected. Consider use of Type I fluid when Type II fluid cannot be used.

(2) Freezing mist is best confirmed by observation. It is never reported by METAR; however, it can occur when mist is present at 0 °C (32 °F) and below.

(3) Use freezing fog holdover times in conditions of ice crystals mixed with freezing fog or freezing mist.

(4) The Snowfall Intensities as a Function of Prevailing Visibility table (Table 54) is required to confirm the precipitation intensity is no greater than “moderate”. No holdover times exist if the reported visibility correlates to a “heavy” precipitation intensity.

(5) To determine snowfall intensity, the Snowfall Intensities as a Function of Prevailing Visibility table (Table 54) is required.

(6) Use snow holdover times in conditions of very light, light, or moderate snow mixed with ice crystals.

(7) Includes light, moderate and heavy freezing drizzle. Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.

(8) These holdover times apply to conditions of “moderate” precipitation intensity. In cases of very light or light snow mixed with light rain or drizzle, use light freezing rain holdover times. The Snowfall Intensities as a Function of Prevailing Visibility table (Table 54) is required to confirm the precipitation intensity. No holdover times exist if the reported visibility correlates to a “heavy” precipitation intensity

(9) No holdover time guidelines exist for this condition for 0 °C (32 °F) and below.

(10) Heavy snow, ice pellets, moderate and heavy freezing rain, small hail and hail.

(11) No holdover time guidelines exist for this condition below -10 °C (14 °F).

CAUTIONS

• The cautions that apply to the holdover times in the table above can be found on page 14.

(Ref. FAA Holdover Time Guidelines, TABLE-3: HOLDOVER TIMES FOR SAE TYPE I FLUID ON CRITICAL AIRCRAFT SURFACES COMPOSED PREDOMINANTLY OF COMPOSITES)

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

Outside Air Temperature[1,2]	Freezing Fog, Freezing Mist[3], or Ice Crystals[4]	Snow mixed with Freezing Fog[5]	Very Light Snow, Snow Grains or Snow Pellets[6,7]	Light Snow, Snow Grains or Snow Pellets[6,7]	Moderate Snow, Snow Grains or Snow Pellets[6,7]	Freezing Drizzle[8]	Light Freezing Rain	Moderate Snow mixed with Rain[9,10]	Rain on Cold-Soaked Wing[10]	Other[11]
-3 °C and above (27 °F and above)	0:09 - 0:16	0:03 - 0:06	0:12 - 0:15	0:06 - 0:12	0:03 - 0:06	0:08 - 0:13	0:02 - 0:05	0:01 - 0:01	0:01 - 0:05	
below -3 to -6 °C (below 27 to 21 °F)	0:06 - 0:08	0:02 - 0:05	0:11 - 0:13	0:05 - 0:11	0:02 - 0:05	0:05 - 0:09	0:02 - 0:05	CAUTION: No holdover time guidelines exist		
below -6 to -10 °C (below 21 to 14 °F)	0:04 - 0:08	0:02 - 0:05	0:09 - 0:12	0:05 - 0:09	0:02 - 0:05	0:04 - 0:07	0:02 - 0:05			
below -10 °C (below 14 °F)	0:04 - 0:07	0:02 - 0:04	0:07 - 0:08	0:04 - 0:07	0:02 - 0:04					

Figür 5-6: TABLE-4: HOLDOVER TIMES FOR SAE TYPE I FLUID ON CRITICAL AIRCRAFT SURFACES COMPOSED PREDOMINANTLY OF COMPOSITES)

NOT

(1) Type I fluid / water mixture must be selected so that the freezing point of the mixture is at least 10 °C (18 °F) below outside air temperature.

(2) Ensure that the lowest operational use temperature (LOUT) is respected.

(3) Freezing mist is best confirmed by observation. It is never reported by METAR; however, it can occur when mist is present at 0 °C (32 °F) and below.

(4) Use freezing fog holdover times in conditions of ice crystals mixed with freezing fog or freezing mist.

(5) The Snowfall Intensities as a Function of Prevailing Visibility table (Table 54) is required to confirm the precipitation intensity is no greater than “moderate”. No holdover times exist if the reported visibility correlates to a “heavy” precipitation intensity.

(6) To determine snowfall intensity, the Snowfall Intensities as a Function of Prevailing Visibility table (Table 54) is required.

(7) Use snow holdover times in conditions of very light, light, or moderate snow mixed with ice crystals.

(8) Includes light, moderate and heavy freezing drizzle. Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.

(9) These holdover times apply to conditions of “moderate” precipitation intensity. In cases of very light or light snow mixed with light rain or drizzle, use light freezing rain holdover times. The Snowfall Intensities as a Function of Prevailing Visibility table (Table 54) is required to confirm the precipitation intensity. No holdover times exist if the reported visibility correlates to a “heavy” precipitation intensity.

(10) No holdover time guidelines exist for this condition for 0 °C (32 °F) and below.

(11) Heavy snow, ice pellets, moderate and heavy freezing rain, small hail and hail.

DIKKAT

The cautions that apply to the holdover times in the table above can be found on page 11.

HOT GUIDELINES FOR SAE TYPE I FLUIDS WINTER 2025-2026

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

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

CAUTIONS

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

Figür 5-7: HOT GUIDELINES FOR SAE TYPE I FLUIDS WINTER 2025-2026

(Ref. FAA Holdover Time Guidelines, TABLE 4: GENERIC HOLDOVER TIMES FOR SAE TYPE II FLUIDS[1]

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

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

Figür 5-8: TABLE 5:GENERIC HOLDOVER TIMES FOR SAE TYPE II FLUIDS[1]

NOT

(1) To use the HOTs in this table, ensure that the fluid and dilution being used is listed in the Type II Fluids Tested for Anti-Icing Performance and Aerodynamic Acceptance table (Table 56). Any restrictions on the use of the fluid have to be identified and applied.

(2) Ensure that the lowest operational use temperature (LOUT) is respected. Consider use of Type I fluid when Type II fluid cannot be used.

(3) Freezing mist is best confirmed by observation. It is never reported by METAR; however, it can occur when mist is present at 0 °C (32 °F) and below.

(4) Use freezing fog holdover times in conditions of ice crystals mixed with freezing fog or freezing mist.

(5) The Snowfall Intensities as a Function of Prevailing Visibility table (Table 54) is required to confirm the precipitation intensity is no greater than “moderate”. No holdover times exist if the reported visibility correlates to a “heavy” precipitation intensity.

(6) To determine snowfall intensity, the Snowfall Intensities as a Function of Prevailing Visibility table (Table 54) is required.

(7) Use snow holdover times in conditions of very light, light, or moderate snow mixed with ice crystals.

(8) Includes light, moderate and heavy freezing drizzle. Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.

(9) These holdover times apply to conditions of “moderate” precipitation intensity. In cases of very light or light snow mixed with light rain or drizzle, use light freezing rain holdover times. The Snowfall Intensities as a Function of Prevailing Visibility table (Table 54) is required to confirm the precipitation intensity. No holdover times exist if the reported visibility correlates to a “heavy” precipitation intensity.

(10) No holdover time guidelines exist for this condition for 0 °C (32 °F) and below

(11) Heavy snow, ice pellets, moderate and heavy freezing rain, small hail and hail.

(12) No holdover time guidelines exist for this condition below -10 °C (14 °F).

DIKKAT

The cautions that apply to the holdover times in the table above can be found on page 14.

HOT GUIDELINES FOR SAE TYPE II FLUIDS WINTER 2025-2026

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

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

CAUTIONS

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

Figür 5-9: HOT GUIDELINES FOR SAE TYPE II FLUIDS WINTER 2025-2026

(Ref. FAA Holdover Time Guidelines, TABLE 18: TYPE III HOLDOVER TIMES FOR ALLCLEAR AEROCLEAR MAX APPLIED UNHEATED ON HIGH SPEED AIRCRAFT[1])

TABLE 18: TYPE III HOLDOVER TIMES FOR ALLCLEAR AEROCLEAR MAX APPLIED UNHEATED ON HIGH SPEED AIRCRAFT[1]

Outside Air Temperature[2]	Fluid Concentration Fluid/Water By % Volume	Freezing Fog, Freezing Mist[3], or Ice Crystals[4]	Snow mixed with Freezing Fog[5]	Very Light Snow, Snow Grains or Snow Pellets[6,7]	Light Snow, Snow Grains or Snow Pellets[6,7]	Moderate Snow, Snow Grains or Snow Pellets[6,7]	Freezing Drizzle[8]	Light Freezing Rain	Moderate Snow mixed with Rain[9,10]	Rain on Cold-Soaked Wing[10]	Other[11]
-3 °C and above (27 °F and above)	100/0	0:45 - 1:55	0:13 - 0:30	1:20 - 1:45	0:40 - 1:20	0:18 - 0:40	0:25 - 0:50	0:14 - 0:25	0:04 - 0:04	0:05 - 0:40	
	75/25	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
	50/50	N/A	N/A	N/A	N/A	N/A	N/A	N/A	CAUTION: No holdover time guidelines exist		
below -3 to -10 °C (below 27 to 14 °F)	100/0	0:50 - 1:40	0:13 - 0:30	1:20 - 1:45	0:40 - 1:20	0:18 - 0:40	0:25 - 0:45	0:15 - 0:25			
	75/25	N/A	N/A	N/A	N/A	N/A	N/A	N/A			
below -10 to -25 °C (below 14 to -13 °F)	100/0	0:40 - 1:45	0:13 - 0:30	1:20 - 1:45	0:40 - 1:20	0:18 - 0:40					
below -25 to -35 °C (below -13 to -31 °F)	100/0	0:25 - 1:00	0:07 - 0:16	0:45 - 1:00	0:20 - 0:45	0:10 - 0:20					

Figür 5-10: TABLE 6: TYPE III HOLDOVER TIMES FOR ALLCLEAR AEROCLEAR MAX APPLIED UNHEATED ON HIGH SPEED AIRCRAFT[1]

NOT

(1) These holdover times are for aircraft conforming to the SAE AS5900 high speed aerodynamic test criterion. Fluid must be applied unheated to use these holdover times. No holdover times exist for this fluid applied heated. If uncertain whether the aircraft conforms to the low, middle, or high speed aerodynamic test criterion, no holdover time guidelines exist below -16 °C (3 °F).

(2) Ensure that the lowest operational use temperature (LOUT) is respected. Consider use of Type I fluid when Type III fluid cannot be used.

(3) Freezing mist is best confirmed by observation. It is never reported by METAR; however, it can occur when mist is present at 0 °C (32 °F) and below

(4) Use freezing fog holdover times in conditions of ice crystals mixed with freezing fog or freezing mist.

(5) The Snowfall Intensities as a Function of Prevailing Visibility table (Table 54) is required to confirm the precipitation intensity is no greater than “moderate”. No holdover times exist if the reported visibility correlates to a “heavy” precipitation intensity.

(6) To determine snowfall intensity, the Snowfall Intensities as a Function of Prevailing Visibility table (Table 54) is required.

(7) Use snow holdover times in conditions of very light, light, or moderate snow mixed with ice crystals

(8) Includes light, moderate and heavy freezing drizzle. Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.

(9) These holdover times apply to conditions of “moderate” precipitation intensity. In cases of very light or light snow mixed with light rain or drizzle, use light freezing rain holdover times. The Snowfall Intensities as a Function of Prevailing Visibility table (Table 54) is required to confirm the precipitation intensity. No holdover times exist if the reported visibility correlates to a “heavy” precipitation intensity.

(10) No holdover time guidelines exist for this condition for 0 °C (32 °F) and below.

(11) Heavy snow, ice pellets, moderate and heavy freezing rain, small hail and hail (Table 51 provides allowance times for ice pellets and small hail for SAE Type III fluids, applied unheated).

DIKKAT

The cautions that apply to the holdover times in the table above can be found on page 27

(FLUID CONCENTRATIONS IN % VOLUME)

HOT GUIDELINES FOR SAE TYPE III FLUIDS WINTER 2025-2026

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

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

CAUTIONS

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

Figür 5-11: HOT GUIDELINES FOR SAE TYPE III FLUIDS WINTER 2025-2026

(Ref. FAA Holdover Time Guidelines, TABLE 61: (GUIDELINES FOR THE APPLICATION OF SAE TYPE II AND IV FLUID) FLUID CONCENTRATIONS IN % VOLUME

TABLE 61: GUIDELINES FOR THE APPLICATION OF SAE TYPE II AND IV FLUID

(FLUID CONCENTRATIONS IN % VOLUME)

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

Figür 5-12: TABLE 7: GUIDELINES FOR THE APPLICATION OF SAE TYPE II AND IV FLUID

NOT

(1) Fluids used for the anti-icing procedure must not be used at temperatures below their lowest operational use temperature (LOUT). First step fluids must not be used below their freezing points. Consideration should be given to the use of Type I/III fluid when Type II/IV fluid cannot be used due to LOUT limitations (see Table 56 and Table 58). The LOUT for a given Type II/IV fluid is the higher (warmer) of:

(a) The lowest temperature at which the fluid meets the aerodynamic acceptance test for a given aircraft type; or

(b) The actual freezing point of the fluid plus its freezing point buffer of 7 °C (13 °F).

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

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

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

DIKKAT

. For heated fluids, a fluid temperature not less than 60 °C (140 °F) at the nozzle is desirable.

• Upper temperature limit shall not exceed fluid and aircraft manufacturers' recommendations

• Wing skin temperatures may be colder or warmer than the OAT. Causes can include: radiation cooling, cold-soaked wing, or hangar storage. Consult the appropriate guidance (HOT Tables and FAA Ground Deicing General Information Document, Winter 2025-2026") for the contaminant in question.

• Whenever frost or ice occurs on the lower surface of the wing in the area of the fuel tank, indicating a cold-soaked wing, the 50/50 dilution of Type II or IV is not to be used for the anti-icing step because fluid freezing may occur.

• An insufficient amount of anti-icing fluid may cause a substantial loss of holdover time. This is particularly true when using a Type I fluid mixture for the first step in a two-step procedure.

• When conducting aircraft deicing using a Type I fluid and not using the 10 °C/18 °F buffer, procedures must be developed and approved to ensure refreezing does not occur prior to takeoff.

(Ref. FAA Holdover Time Guidelines, TABLE 19: GENERIC HOLDOVER TIMES FOR SAE TYPE IV FLUIDS[1])

TABLE 19: GENERIC HOLDOVER TIMES FOR SAE TYPE IV FLUIDS[1]

Outside Air Temperature[2]	Fluid Concentration Fluid/Water By % Volume	Freezing Fog, Freezing Mist[3], or Ice Crystals[4]	Snow mixed with Freezing Fog[5]	Very Light Snow, Snow Grains or Snow Pellets[6,7]	Light Snow, Snow Grains or Snow Pellets[6,7]	Moderate Snow, Snow Grains or Snow Pellets[6,7]	Freezing Drizzle[8]	Light Freezing Rain	Moderate Snow mixed with Rain[9,10]	Rain on Cold-Soaked Wing[10]	Other[11]
-3 °C and above (27 °F and above)	100/0	1:15 - 2:15	0:20 - 0:40	1:50 - 2:15	0:55 - 1:50	0:25 - 0:55	0:35 - 1:10	0:15 - 0:30	0:06 - 0:06	0:08 - 1:05	
	75/25	1:25 - 2:40	0:30 - 0:55	2:05 - 2:25	1:15 - 2:05	0:40 - 1:15	1:00 - 1:20	0:30 - 0:50	0:07 - 0:07	0:09 - 1:20	
	50/50	0:30 - 0:55	0:07 - 0:20	1:00 - 1:10	0:25 - 1:00	0:10 - 0:25	0:15 - 0:40	0:09 - 0:20			
below -3 to -8 °C (below 27 to 18 °F)	100/0	0:15 - 0:35	0:20 - 0:35	1:35 - 2:00	0:45 - 1:35	0:25 - 0:45	0:25 - 1:00	0:20 - 0:25			
	75/25	0:40 - 1:20	0:25 - 0:50	1:50 - 2:10	1:05 - 1:50	0:30 - 1:05	0:20 - 1:05	0:15 - 0:25			
below -8 to -14 °C (below 18 to 7 °F)	100/0	0:15 - 0:35	0:15 - 0:30	1:25 - 1:50	0:45 - 1:25	0:20 - 0:45	0:25 - 1:00[12]	0:20 - 0:25[12]			
	75/25	0:40 - 1:20	0:20 - 0:45	1:45 - 2:00	0:55 - 1:45	0:25 - 0:55	0:20 - 1:05[12]	0:15 - 0:25[12]			
below -14 to -18 °C (below 7 to 0 °F)	100/0	0:15 - 0:30	0:01 - 0:06	0:30 - 0:45	0:09 - 0:30	0:02 - 0:09					
below -18 to -25 °C (below 0 to -13 °F)	100/0	0:15 - 0:30	0:00 - 0:02	0:10 - 0:20	0:03 - 0:10	0:01 - 0:03					
below -25 °C (below -13 °F)	100/0	0:15 - 0:30	0:00 - 0:01	0:07 - 0:10	0:02 - 0:07	0:00 - 0:02					

CAUTION: No holdover time guidelines exist

Figür 5-13: TABLE 8: GENERIC HOLDOVER TIMES FOR SAE TYPE IV FLUIDS[1]

NOT

(1) To use the HOTs in this table, ensure that the fluid and dilution being used is listed in the Type IV Fluids Tested for Anti-Icing Performance and Aerodynamic Acceptance table (Table 58). Any restrictions on the use of the fluid have to be identified and applied.

(2) Ensure that the lowest operational use temperature (LOUT) is respected. Consider use of Type I fluid when Type IV fluid cannot be used.

(3) Freezing mist is best confirmed by observation. It is never reported by METAR; however, it can occur when mist is present at 0 °C (32 °F) and below.

(4) Use freezing fog holdover times in conditions of ice crystals mixed with freezing fog or freezing mist.

(5) The Snowfall Intensities as a Function of Prevailing Visibility table (Table 54) is required to confirm the precipitation intensity is no greater than “moderate”. No holdover times exist if the reported visibility correlates to a “heavy” precipitation intensity.

(6) To determine snowfall intensity, the Snowfall Intensities as a Function of Prevailing Visibility table (Table 54) is required.

(7) Use snow holdover times in conditions of very light, light, or moderate snow mixed with ice crystals.

(8) Includes light, moderate and heavy freezing drizzle. Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.

(9) These holdover times apply to conditions of “moderate” precipitation intensity. In cases of very light or light snow mixed with light rain or drizzle, use light freezing rain holdover times. The Snowfall Intensities as a Function of Prevailing Visibility table (Table 54) is required to confirm the precipitation intensity. No holdover times exist if the reported visibility correlates to a “heavy” precipitation intensity.

(10) No holdover time guidelines exist for this condition for 0 °C (32 °F) and below.

(11) Heavy snow, ice pellets, moderate and heavy freezing rain, small hail and hail (Table 52 provides allowance times for Type IV EG fluids and Table 53 provides allowance times for Type IV PG fluids in ice pellets and small hail).

(12) No holdover time guidelines exist for this condition below -10 °C (14 °F)

DIKKAT

The cautions that apply to the holdover times in the table above can be found on page 31.

HOT GUIDELINES FOR SAE TYPE IV FLUIDS WINTER 2025-2026

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

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

CAUTIONS

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

Figür 5-14: HOT GUIDELINES FOR SAE TYPE IV FLUIDS WINTER 2025-2026

(Ref. FAA Holdover Time Guidelines, TABLE 10: TYPE II HOLDOVER TIMES FOR KILFROST ABC-K PLUS

TABLE 10: TYPE II HOLDOVER TIMES FOR KILFROST ABC-K PLUS

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

Figür 5-15: TABLE 9: TYPE II HOLDOVER TIMES FOR KILFROST ABC-K PLUS

NOT

(1) Ensure that the lowest operational use temperature (LOUT) is respected. Consider use of Type I fluid when Type II fluid cannot be used.

(2)	Freezing mist is best confirmed by observation. It is never reported by METAR; however, it can occur when mist is present at 0 °C (32 °F) and below.
(3)	Use freezing fog holdover times in conditions of ice crystals mixed with freezing fog or freezing mist.
(4)	The Snowfall Intensities as a Function of Prevailing Visibility table (Table 54) is required to confirm the precipitation intensity is no greater than “moderate”. No holdover times exist if the reported visibility correlates to a “heavy” precipitation intensity.
(5)	To determine snowfall intensity, the Snowfall Intensities as a Function of Prevailing Visibility table (Table 54) is required.
(6)	Use snow holdover times in conditions of very light, light, or moderate snow mixed with ice crystals.
(7)	Includes light, moderate and heavy freezing drizzle. Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
(8)	These holdover times apply to conditions of “moderate” precipitation intensity. In cases of very light or light snow mixed with light rain or drizzle, use light freezing rain holdover times. The Snowfall Intensities as a Function of Prevailing Visibility table (Table 54) is required to confirm the precipitation intensity. No holdover times exist if the reported visibility correlates to a “heavy” precipitation intensity.
(9)	No holdover time guidelines exist for this condition for 0 °C (32 °F) and below.
(10)	Heavy snow, ice pellets, moderate and heavy freezing rain, small hail and hail.
(11)	No holdover time guidelines exist for this condition below -10 °C (14 °F).

DIKKAT

The cautions that apply to the holdover times in the table above can be found on page 14.

Ref. FAA Holdover Time Guidelines, on page 14. HOT GUIDELINES FOR SAE TYPE II FLUIDS WINTER 2025-2026

HOT GUIDELINES FOR SAE TYPE II FLUIDS WINTER 2025-2026

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

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

CAUTIONS

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

Figür 5-16: HOT GUIDELINES FOR SAE TYPE II FLUIDS WINTER 2025-2026

(Ref. FAA Holdover Time Guidelines, TABLE 12:TYPE II HOLDOVER TIMES FOR MKS DEVO CHEMICALS COREICEPHOB TYPE II)

TABLE 12: TYPE II HOLDOVER TIMES FOR MKS DEVO CHEMICALS COREICEPHOB TYPE II

Outside Air Temperature[1]	Fluid Concentration Fluid/Water By % Volume	Freezing Fog, Freezing Mist[2], or Ice Crystals[3]	Snow mixed with Freezing Fog[4]	Very Light Snow, Snow Grains or Snow Pellets[5,6]	Light Snow, Snow Grains or Snow Pellets[5,6]	Moderate Snow, Snow Grains or Snow Pellets[5,6]	Freezing Drizzle[7]	Light Freezing Rain	Moderate Snow mixed with Rain[8,9]	Rain on Cold-Soaked Wing[9]	Other[10]
-3 °C and above (27 °F and above)	100/0	1:55 - 2:45	0:30 - 1:00	2:35 - 3:00	1:25 - 2:35	0:40 - 1:25	1:10 - 2:00	0:45 - 1:00	0:09 - 0:09	0:15 - 1:35	
	75/25	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
	50/50	1:05 - 1:45	0:15 - 0:35	1:35 - 1:55	0:45 - 1:35	0:25 - 0:45	0:50 - 1:15	0:25 - 0:30	CAUTION: No holdover time guidelines exist		
below -3 to -8 °C (below 27 to 18 °F)	100/0	0:45 - 1:25	0:25 - 0:45	1:50 - 2:15	1:00 - 1:50	0:30 - 1:00	0:30 - 1:10	0:25 - 0:35			
	75/25	N/A	N/A	N/A	N/A	N/A	N/A	N/A			
below -8 to -14 °C (below 18 to 7 °F)	100/0	0:45 - 1:25	0:20 - 0:35	1:30 - 1:50	0:50 - 1:30	0:25 - 0:50	0:30 - 1:10[11]	0:25 - 0:35[11]			
	75/25	N/A	N/A	N/A	N/A	N/A	N/A	N/A			
below -14 to -18 °C (below 7 to 0 °F)	100/0	0:15 - 0:25	0:08 - 0:15	0:35 - 0:40	0:20 - 0:35	0:10 - 0:20					
below -18 to -25 °C (below 0 to -13 °F)	100/0	0:15 - 0:25	0:03 - 0:05	0:15 - 0:15	0:07 - 0:15	0:04 - 0:07					
below -25 to -27 °C (below -13 to -17 °F)	100/0	0:15 - 0:25	0:02 - 0:04	0:10 - 0:10	0:05 - 0:10	0:03 - 0:05					

Figür 5-17: TABLE 10: TYPE II HOLDOVER TIMES FOR MKS DEVO CHEMICALS COREICEPHOB TYPE II

NOT

1 Ensure that the lowest operational use temperature (LOUT) is respected. Consider use of Type I fluid when Type II fluid cannot be used.

2 Freezing mist is best confirmed by observation. It is never reported by METAR; however, it can occur when mist is present at 0 °C (32 °F) and below.

3 Use freezing fog holdover times in conditions of ice crystals mixed with freezing fog or freezing mist.

4 The Snowfall Intensities as a Function of Prevailing Visibility table (Table 54) is required to confirm that the precipitation intensity is no greater than “moderate”. No holdover times exist if the reported visibility correlates to a “heavy” precipitation intensity.

5 To determine snowfall intensity, the Snowfall Intensities as a Function of Prevailing Visibility table (Table 54) is required.

6 Use snow holdover times in conditions of very light, light, or moderate snow mixed with ice crystals.

7 Includes light, moderate and heavy freezing drizzle. Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.

8 These holdover times apply to conditions of “moderate” precipitation intensity. In cases of very light or light snow mixed with light rain or drizzle, use light freezing rain holdover times. The Snowfall Intensities as a Function of Prevailing Visibility table (Table 54) is required to confirm the precipitation intensity. No holdover times exist if the reported visibility correlates to a “heavy” precipitation intensity.

9 No holdover time guidelines exist for this condition for 0 °C (32 °F) and below.

10 Heavy snow, ice pellets, moderate and heavy freezing rain, small hail and hail.

11 No holdover time guidelines exist for this condition below -10 °C (14 °F).

DIKKAT

The cautions that apply to the holdover times in the table above can be found on page 14.

HOT GUIDELINES FOR SAE TYPE II FLUIDS WINTER 2025-2026

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

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

CAUTIONS

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

Figür 5-18: HOT GUIDELINES FOR SAE TYPE II FLUIDS WINTER 2025-2026

(Ref. FAA Holdover Time Guidelines, TABLE 54: SNOWFALL INTENSITIES AS A FUNCTION OF PREVAILING VISIBILITY)

TABLE 54: SNOWFALL INTENSITIES AS A FUNCTION OF PREVAILING VISIBILITY

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

Figür 5-19: TABLE 11: SNOWFALL INTENSITIES AS A FUNCTION OF PREVAILING VISIBILITY

NOT

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

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

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

(Ref. FAA Holdover Time Guidelines, TABLE 28: TYPE IV HOLDOVER TIMES FOR AVIAFLUID AVIAFLIGHT EG2

TABLE 28: TYPE IV HOLDOVER TIMES FOR AVIAFLUID AVIAFLIGHT EG

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

Figür 5-20: TABLE 12:TYPE IV HOLDOVER TIMES FOR AVIAFLUID AVIAFLIGHT EG

NOTE

(1) Ensure that the lowest operational use temperature (LOUT) is respected. Consider use of Type I fluid when Type IV fluid cannot be used.

(2) Freezing mist is best confirmed by observation. It is never reported by METAR; however, it can occur when mist is present at 0 °C (32 °F) and below.

(3) Use freezing fog holdover times in conditions of ice crystals mixed with freezing fog or freezing mist.

(4) The Snowfall Intensities as a Function of Prevailing Visibility table (Table 54) is required to confirm the precipitation intensity is no greater than “moderate”. No holdover times exist if the reported visibility correlates to a “heavy” precipitation intensity.

(5) To determine snowfall intensity, the Snowfall Intensities as a Function of Prevailing Visibility table (Table 54) is required.

(6) Use snow holdover times in conditions of very light, light, or moderate snow mixed with ice crystals.

(7) Includes light, moderate and heavy freezing drizzle. Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.

(8) These holdover times apply to conditions of “moderate” precipitation intensity. In cases of very light or light snow mixed with light rain or drizzle, use light freezing rain holdover times. The Snowfall Intensities as a Function of Prevailing Visibility table (Table 54) is required to confirm the precipitation intensity. No holdover times exist if the reported visibility correlates to a “heavy” precipitation intensity.

(9) No holdover time guidelines exist for this condition for 0 °C (32 °F) and below.

(10) Heavy snow, ice pellets, moderate and heavy freezing rain, small hail and hail (Table 52 provides allowance times for Type IV EG fluids in ice pellets and small hail).

(11) No holdover time guidelines exist for this condition below -10 °C (14 °F).

CAUTION

- The cautions that apply to the holdover times in the table above can be found on page 31.

5.9 GROUND EQUIPMENT

5.9.1 De-icing Units

Combustion heaters and trucks shall not be operated in confined or poorly ventilated areas to prevent asphyxiation.

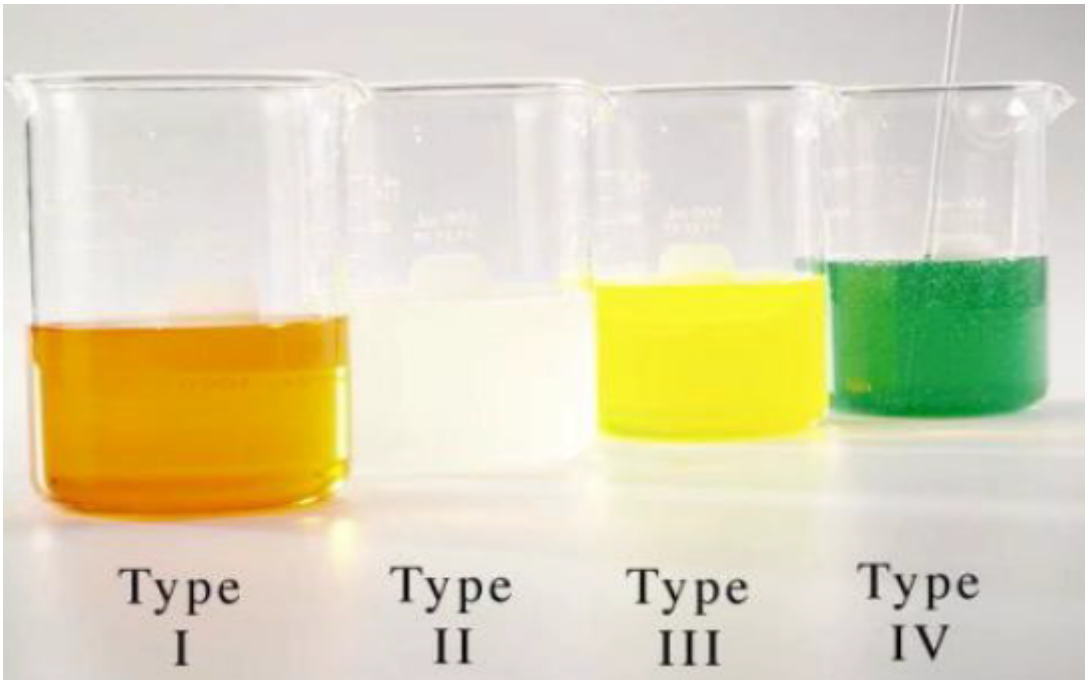
Requirements for suitable equipment are described in ARP1971.

- Motorized/trucks (see ARP1971)
- Non-motorized (tower/gantry/carts)
- Forced air or forced air/fluid equipment for the removal of frozen contaminants (see AIR6284)
- Ice Detection Equipment (see AS5116 and AS5681)

5.9.2 Ice Detection Equipment

(Refer to AS5116 and AS5681)

5.10 FLUIDS



Figür 5-21: 5.10

There are currently four different fluid types. These fluids are called Type I, II, III, and IV. The compound of each individual certified fluid varies but the types are known and accepted all over the world. The qualification is performed according to SAE standards and SMI, APS and AMIL perform them for different tasks. All tests are currently performed in North America to qualify the fluids. SMI, Scientific Material International, located in Miami, Florida in the USA. SMI's role is to conduct AMS Specifications (Aerospace Material Specifications) aircraft materials compatibility testing. These are standards developed by the Aerospace Materials Division under the direction of the SAE Aerospace Council. APS

Aviation Inc. is a company part of the ADGA group. APS is located in Montreal, Quebec in Canada. APS's role is to manage, conduct and analyze testing related to the effectiveness of commercially produced de/anti-icing fluids, methodologies and technologies associated with operations under icing conditions and conduct endurance time (hold over time) testing. AMIL is an icing research laboratory attached to Université du Québec à Chicoutimi (UQAC) in Canada. The main expertise at AMIL lies in the performance evaluation of anti-icing fluids used on ground aircraft.

The fluid must be accepted (among others) according to its type for holdover times, aerodynamic performance and material compatibility. The coloring of these fluids is also standardized. Glycol in general is colorless; as can be seen with older certified fluids when coloring was not standardized (older generation Type I and Type II). Currently orange is the color for Type I fluids, water white/pale straw is the color for Type II fluids and green is the color for Type IV fluids. The color for Type III is yellow. In general deicing/anti-icing fluid may be uncolored if so requested. Fluid tests are performed in laboratory conditions as the environment can be controlled. These tests include a variety of material compatibility tests, aerodynamic performance in wind tunnel tests and holdover time tests according to the set weather conditions in the holdover timetables. Other tests are also conducted that are not mentioned in detail here.

WSET/HHET/Holdover Time

Each fluid is tested in a climatic chamber relevant to the test performed and according to the type category (Type I, II, III, IV) and its related weather and temperature columns. Laboratory testing for qualification of a fluid requires a so- called Water Spray Endurance Test (WSET) and a High Humidity Endurance Test (HHET). The laboratory test includes test plates where the fluid is poured, and also clean plates for reference. The plates are set in a 10 degree angle to simulate the angle of the wing. The precipitation is then set according to what is to be tested. The plates have a line at a 2.5 cm (1 inch) level. The fluid can be interpreted as 'failed' when the ice has reached this line (fluid failure is also depending on other criteria, e.g., ice on the side of the plate). A more detailed and up-to-date description of the test procedures are found in relevant SAE standards.

WSET test involves pouring the fluid at 20 °C (68 °F) ± 5 onto an inclined test plate at -5 °C (23 °F) ± 0.5 and applying a cooled water spray in air at -5 °C (23 °F) ± 0.5. The water spray endurance is recorded as the time for ice formation to reach the failure zone, when the following test conditions are used: water spray intensity is set to 5 g/dm2 ± 0.2 g/hour.

This is equivalent to an average precipitation rate of 0.5 mm (0.02 inch) per hour. The water spray endurance time test gives minimum times to endure before freezing depending on the fluid type, e.g., 30 minutes or 80 minutes. It is a fundamental requirement of this test that the spray impinges onto the surface of the test plate as water droplets, which freeze, on impact. This is verified by observation of the untreated or ice catch plate.

HHET involves pouring the fluid at 20 °C (68 °F) ± 5 onto an inclined test plate at -5 °C (23 °F) ± 0.5, when the air temperature is 0 °C (32 °F) ± 0.5 and the Relative Humidity (RH) is 96% ± 2%. The high humidity endurance is recorded as the time for ice formation to reach the failure zone under these conditions, when the ice formation corresponds to 0.3 g/dm2/hour, this is equivalent to a water accumulation rate (in the form of frost) of 0.03 mm (0.001 inch) per hour. It is a fundamental requirement of this test that the RH value is maintained to an accuracy of ±2% RH in the absence of any visible precipitation (such as mist, fog, or drizzle). The duration of the test depends on the fluid tested, e.g., two hours for Type I and eight hours for Type IV.

All fluids receive a particular holdover time. The fluid holdover time is given for each scenario according to tests made. This time is fluid brand specific. The manufacturer can publish their fluid with a brand name holdover timetable but this table does not cover other fluids' holdover times.

In accordance with EASA Safety Information Bulletin, 'SIB No: 2017-11' issued on 14 July 2017, Pegasus uses the latest published versions of the 'FAA Holdover Time Guidelines' as their reference to usable HOT tables, and to timely inform the contracted de/anti-icing service providers about any change.

To this extent, the contracted de/anti-icing service providers must be familiarise themselves with FAA Holdover Time annual publications before updating accordingly the relevant chapters of their operations manual. Contracted de/anti-icing service providers should consider the 'FAA Holdover Time Guidelines' and the FAA 8900.xxx series Notice are primarily written for US stakeholders, therefore contain information and statements that require careful consideration when being adapted by de/anti-icing service providers as part of their procedures.

If, during preparation of the procedures, an input data required to read an FAA HOT table-cell is not available, an alternative input, that would provide conservative outputs, should be used.

Example: The 'FAA Holdover Time Guidelines' provide HOT values for various snow precipitation intensity bands. A contracted service provider should consider if the information available would permit to distinguish between the different precipitation intensities and, if not, consider in its procedure to apply the most conservative (shorter) HOT.

Each responsible position, title and level on the de-icing process and any other affected personnel, including those from service providers, receive the appropriate training accordingly. The training should be commensurate to the difficulty of the procedure.

The latest 'FAA Holdover Time Guidelines' and the FAA 8900.xxx series Notice 'Revised FAA-Approved Deicing Program Updates, Winter 20xx-20yy', are available at https://www.faa.gov/other_visit/aviation_industry/airline_operators/airline_safety/deicing/ and https://www.faa.gov/regulations_policies/orders_notices/ respectively

Aerodynamic Acceptance

Deicing/anti-icing fluids need to be approved aerodynamically. The intent is that any approved fluid sprayed on the aircraft surface will get off during the takeoff roll leaving only an acceptable wet film on the surface (if any). The velocity of shearing depends on the type of fluid sed (thickened or unthickened). The test for this performance is made in a wind tunnel. Boundary layer displacement thickness (BLDT) measurements is made of the test fluid. Each fluid is tested at selected fluid temperature, e.g., including 0 to -20 °C (32 °F to -4 °F), or to the coldest usable test fluid temperature identified by the fluid manufacturer. Many consecutive test runs are conducted for the BLDT measurement. A more detailed and up-to-date description of the test procedures are found in relevant SAE standards. A typical test run consists of pouring 1 liter of fluid onto the test duct floor of the wind tunnel to obtain an even 2 mm of fluid. After 5 minutes of wind at 5 m/s (16 ft/s) to equilibrate the fluid to the air temperature, an acceleration to 65 m/s over 30 seconds is achieved with an acceleration of 2.6 m/s^2, then the 65 m/s speed is maintained for 30 seconds. There can be only a trace of fluid left on the surface after the test to be acceptable (the acceptable amount is found in detail in the SAE standards). This test simulates an average takeoff speed when the fluid is sheared from the aircraft surfaces. The velocity increases for Type II and IV is 0 to 65 m/s while Type III is 0 to 35 m/s. This result will give a temperature limit for the use of thickened fluid and when used as recommended will guarantee a proper flowoff behavior. Since the acceptance criteria can vary slightly from one test series to another, due to differences in atmospheric pressure, humidity, temperature uniformity etc., fluid data is always compared to this limit.

Material Compatibility and Other Tests

Since aircraft are constructed of complex materials and are sensitive to any foreign substances not encountered in normal flight, all chemical products have to be tested for compatibility when in contact with these materials. These tests include several scenarios relating to fluid compatibility such as corrosion, dissolvent, flammability, embrittlement, stability etc. As glycol additives are considered a trade secret it is not known to the public what compounds in the fluid are involved in the test. However, the fluids are tested with aircraft materials and these results are considered sufficient. Other tests include such items as how the fluid reacts with cold and warm temperatures for certain periods of time. It is also common that operators and airlines evaluate the fluids before use. These tests are specific for each airline/operator demand.

Such tests can include items as flight tests, gel-residue tests, field-tests and shear-tests (viscosity). However, these tests are not for the qualification of fluid, merely for choice of brand. Each manufacturer has a brand specific data sheet and qualification document containing all pertinent information of the fluid.

Non-Thickened Fluids

Type I fluids (so called Newtonian fluids) are without any thickener and thus suits best for deicing operations. Newtonian refers to how the fluid is sheared (viscosity) over time/velocity. Type I fluid is linear in this regard and does not change character by shear rate. Type I fluid, as per AMS1428/1, contains minimum 80% glycol (w/w) and 18 to 19% water and the remaining part additives. Type I fluid as per AMS1428/2 is not covered in this document Type I fluid is used with an orange color (unless uncolored). Type I fluids can also be used as an anti-icing fluid but the holdover time is limited. Type I fluid is generally mixed with water either as a premix or proportional mix. The mixture depends on outside air temperatures. Propylene based Type I fluids do not have as low a usable outside air temperature (around -30 °C (-22 °F)) as ethylene based

Type I fluids have (around -50 °C (-58 °F)), these limits depend on the mixture. Type I fluid should not be used as a neat manufacturer product (100%) unless pre-diluted with water. In general, this limit is 70% to 75% depending on fluid manufacturer.

Since the Type I fluid is more flowing than thickened fluid it will run of the wing surfaces after a certain time leaving only a marginal protective layer. This layer is seldom sufficient for prolonged protection. It is the heated mixture and the spray pressure rather than any chemical reaction that makes the fluid suitable as a deicing fluid. Type I fluids can be sprayed with a higher pressure since they do not consider the viscosity of the fluid as a criterion. The fluid must be heated so that a minimum temperature of +60 °C (140 °F) is reached at the nozzle when used as an anti-icing fluid. The same temperature is desirable when used as a deicing fluid. Check the current data for the fluid in use to verify correct procedures.

The freezing point of the Type I fluid mixture used for either one-step deicing/anti-icing or as a second step in the two-step operation shall be at least 10 °C below the ambient temperature. The buffer may be at OAT or below when used as a deicing fluid. Type I fluids supplied, as concentrates for dilution with water prior to use shall not be used undiluted. For exceptions refer to fluid manufacturers documentation.

Thickened Fluids

Type II, III, IV fluids (so called non-Newtonian fluids) are fluids with thickener and thus suits best for anti-icing Operations (also deicing when diluted). Non-Newtonian refers to how the fluid is sheared (viscosity) over time/velocity. Type II, III, and IV fluid is not linear in this regard and does change character by shear rate (which is the purpose of the fluid to run of the wing at takeoff). Type II, III, and IV fluids contain minimum 50% glycol (w/w) and 48 to 49% water and the remaining part additives. Type II fluid is used with a water white/pale straw (yellowish) color (unless uncolored) and Type IV fluid is used with a green color. The color of Type III fluid is yellow. The purpose of this fluid is to give a reasonable protection, compared to Type I (as defined in AMS1428/1), from re-freezing. AMS1424/2, Type I fluids are not compatible with thickened AMS1428 fluids. With the lower viscosity of this fluid, compared to Type II and -IV, it is better suited for regional aircraft with lower takeoff speeds (<85 knots) or for aircraft with other restrictions on thickened fluids.

Thickened fluids are available as so-called old-generation fluids and new generation fluids. The difference is mainly in that the older fluids only offer a generic holdover timetable while the new fluids have available brand-name holdover times.

Other than that there is a difference in coloring, older certified fluids used no coloring while the new have different colors according to type. Type IV fluids in general where introduced to the market well after Type II fluids. Temperature limits the use of thickened fluids more than it does Type I fluids. Lowest usable outside air temperatures are in the range down to -25 °C (-13 °F). Type III fluid may have a different lowest usable outside air temperature. The application limit may be lower, provided a 7 °C buffer is maintained between the freezing point of the neat fluid and outside air temperature. In no case shall this temperature be lower than the lowest operational use temperature as defined by the aerodynamic acceptance test. Thickened fluids are in general not heated when used as anti-icing fluids. The viscosity will change (lower) if heated. Thickened fluids can be used for anti-icing, as a rule, with a 100/0%, 75/25% and 50/50% mixtures. There are exceptions for using thickened fluids as a deicing fluid. In this case the fluid is diluted below the normal anti-icing mixtures but whenever possible, Type I fluid should be used for deicing to minimize the possibility of residue problems.

5.10.1 Fluid Storage And Handling

Fluid handling is an important part of the deicing operational process. The fluid must be received, stored, pumped and used with the same level of quality throughout all processes. If the batch received is poor or the storage degrades the fluid, then no deicing/anti-icing can be performed with that particular batch. As an example, there is a problem if there is only one storage tank where all received fluids are stored and if the received batch is degraded, then all stored fluid will be degraded. The acceptance of fluids shall include such items as the fluid quality testing, certificates of conformity, batch and shipment documents etc. (reference quality procedures).

For fluid acceptance at delivery it is needed to check that the fluid delivered corresponds to the fluid ordered. Make sure the brand name and concentration of the product specified in the delivery documents

corresponds to the delivered fluid. Each container/road tanker shall be checked. Make sure that the brand name and the concentration of the delivered fluid corresponds to the brand name and the concentration of the storage or vehicle tanks. Before filling a storage tank or vehicle tank, take a sample from the container/ road tanker (each separate compartment if applicable) and perform the following checks (reference quality testing).

Deicing/anti-icing fluid is a chemical product with an environmental impact. During fluid handling avoid any unnecessary spillage, comply with local environmental and health laws and the manufacturer's safety data sheet (SDS). Different products shall not be mixed without additional qualification testing. Consult with the fluid manufacturers. Slippery conditions may exist on the ground or equipment following the deicing/anti-icing procedure. Caution should be exercised, particularly under low humidity or non-precipitation weather conditions.

Tanks shall be dedicated to the storage of the deicing and/or anti-icing fluid to avoid contamination with other fluids. Storage tanks shall be constructed of materials compatible with the deicing/anti-icing fluid, as specified by the fluid manufacturer.

Care should be taken to avoid using dissimilar metals in contact with each other, as galvanic corrosion may form and degrade thickened fluids. Tanks shall be conspicuously labeled to avoid contamination. As a minimum, the following information must be identified:

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

The condition of the tanks shall be examined annually for corrosion, contamination, and/or leaks. If corrosion or contamination is evident, tanks shall be repaired or replaced. Corrosion in tanks most often occurs in the vapor space of partially empty tanks by evaporation and subsequent condensation of water from the deicing fluid. To reduce corrosion, keep tanks containing aircraft deicing fluid full during summer or periods of low use.

NOT

If the quality of the fluids is checked in accordance with "", the tank inspection interval may be longer than 1 year.

Although deicing/anti-icing fluids are generally noncorrosive, the water vapor the water vapor in the head space above the fluids can accelerate corrosion. To reduce head space corrosion, keep the tanks full.

Storage temperature limits for the fluid shall comply with the manufacturer's requirements. Storage tanks should be located away from heat and exposed flames.

If a new tank is to be used, it should be appropriately cleaned and water washed before deicing/antiicing fluid is introduced into it.

The performance characteristics of deicing/anti-icing fluids may be degraded by factors such as excessive mechanical shearing, chemical contamination, or overheating. Therefore, only compatible pumps, control valves, piping and application devices shall be used. Fluid handling systems should be tested periodically or when modified to confirm that fluid meets manufacturer's use specifications in accordance AS6332.

For fluid acceptance at delivery it is needed to check that the fluid delivered corresponds to the fluid ordered. Make sure the brand name and concentration of the product specified in the delivery documents corresponds to the delivered fluid. Each container/road tanker shall be checked. Make sure that the brand name and the concentration of the delivered fluid corresponds to the brand name and the concentration of the storage or vehicle tanks. Before filling a storage tank or vehicle tank, take a sample from the container/ road tanker (each separate compartment if applicable) and perform the following checks (reference quality testing).

Type I Fluid

- Perform a visual contamination check
- Perform a refractive index check
- Perform a pH-value check (Perform this check if it is suitable to identify contaminants in the fluid and/or detect degradation of the fluid used.)

Type II, III, and IV Fluids

- Perform a visual contamination check
- Perform a refractive index check
- Perform a pH-value check. (Perform this check if it is suitable to identify contaminants in the fluid and/or detect degradation of the fluid).
- Perform a field viscosity check

The delivery acceptance is intended as an initial check when no filling of storage tank(s) or vehicle tank(s) is immediately performed. This may be due to the reason that the fluid usage is minimal and also that there is no need to open any seals from the tank(s) at delivery. The quality check is performed whenever the seals are opened and before filling occurs.

AS6286: The visual contamination check is to verify the correct coloring of the fluid and to look for any particles of dirt, rust, or other substances that should not be in the fluid.

AS6286: The refractive index is a way of measuring the concentration of glycol in water. Light passes from air into the mixture and is “bent” (refracted) at an angle. Glycol and water have different refractive indices and measuring the refractive index indicates the concentration of glycol in water for the sample. The correct water and fluid mixture is necessary to obtain the correct freezing point for the fluid. This can also be directly identified with a freezing-point check of the mixture. As tables of refractive index measurements are readily available, with suitable field equipment available (handheld refractometers), this is the easier check to make.

AS6286: The pH-check only identifies if the fluid is a neutral fluid or slightly basic, as the products should be. Because this is very difficult to identify precisely with pH-paper a laboratory test using electronic equipment may be more representative. A change in pH of the fluid may indicate the presence of a problem with the storage tanks, the heating conditions, or possible contamination with other materials.

AS6286: The viscosity test is to identify if the viscosity of the delivered fluid is within tolerances. This may be performed with for example, ‘falling ball’ test a Brookfield viscometer, or a flow cup. For the ‘falling bal’ test, a Brookfield viscometer, or a flow cup. For the ‘falling ball’ test, the fluid temperature of the sample taken should be as close as possible to the reference fluid, and air bubbles should not be present as they change the result of the test. Always conduct a laboratory test if the field test is not reliable. Refer to the fluid manufacturer for guidance on field viscosity testing and equipment for their particular fluid. The fluid temperature of the sample taken should be as close as possible to the reference fluid and air bubbles should not be present as these elements change the result of the test. Always conduct a laboratory test if the field test is not reliable. Refer to the fluid manufacturer for guidance on field viscosity testing and equipment for their particular fluid.

Apart from quality testing, there are some basic rules to follow with the storage of fluids AS6286:

- Different products shall not be mixed without additional qualification testing.
- Tanks shall be dedicated to the storage of deicing/anti-icing fluids used.
- Storage tanks shall be of a material of construction compatible with the deicing/anti-icing fluid, as specified by the fluid manufacturer.
- Care should be taken to avoid using dissimilar metals in contact with each other, as galvanic corrosion may take place and degrade thickened fluids.
- Tanks shall be conspicuously labeled to avoid contamination.

- Tanks shall be inspected annually for corrosion and/or contamination. If corrosion or contamination is evident, tanks shall be maintained to standard or replaced.
- To prevent corrosion at the liquid/vapor interface and in the vapor space, a high liquid level in the tanks is recommended. Corrosion can occur as water evaporates from the fluid onto the tank walls, leaving behind the anti-corrosion agents in the fluid.
- The storage temperature and time limits shall comply with the manufacturer's guidelines.
- The stored fluid shall be checked routinely to ensure that no degradation or contamination has occurred.

5.10.2 Fluid Transfer Systems

The performance characteristics of SAE Type II, III, and IV deicing/anti-icing fluids may be degraded by excessive mechanical shearing or chemical contamination. Therefore, only compatible pumps, control valves, piping, hoses, and application devices (nozzles) shall be used. The design of fluid transfer systems shall be in accordance with the fluid manufacturers' recommendations. Fluid transfer systems shall be dedicated to the specific fluid being handled to prevent inadvertently mixing fluids of different types or manufacturers. All fill ports and discharge points shall be clearly labeled to prevent inadvertent product mixing. All fill ports must be protected to prevent foreign contamination.

Different hose or connection types and sizes should be used to differentiate between the two fluids. Confirm that hose connections are compatible with fluid carrier's equipment: adapters may be required.

NOT

Totes used in the shipment of deicing/anti-icing fluid may not be rated for pressure. In this case, do not pressurize tote to transfer product. A low shear pump or gravity should be used.

All fill ports and discharge points shall be clearly labeled to prevent inadvertent product mixing. All fill ports must be protected to prevent foreign contamination

5.10.3 Pumping And Heating

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

When heating, the fluid must be circulated. Depending on tank configuration, a slow moving stirrer, e.g., paddle or impeller or a low shear pump is acceptable. With a low shear pump, tank outlet and inlet points should be placed at opposite ends of the tank to aid fluid circulation. Circulation through a heater should continue for a few minutes after the heater has been shut off, to protect fluid from overheating. When fluid is heated, manufacturers recommendations on maximum temperature for storage should be followed. Overheating may cause degradation of the fluid and loss of performance. If fluid is diluted for deicing, it should not be stored above 60 °C (140 °F) for more than 2 weeks.

AS6286:

Deicing/anti-icing fluids can degrade when exposed to mechanical shearing. Therefore, only compatible pumps and spraying nozzles shall be used. The design of the pumping systems shall be in accordance with the fluid manufacturer's recommendations. Dedicated transfer lines shall be conspicuously labeled to prevent contamination and shall be compatible with the deicing/anti-icing fluids to be transferred.

Deicing/anti-icing fluids shall be heated according to the fluid manufacturer's guidelines.

For Type I fluids, water loss may cause undesirable aerodynamic effects. For Type II / III / IV fluids thermal exposure and/or water loss may cause a reduction or increase in fluid viscosity, leading to lower Holdover Times or poorer aerodynamics. The fluids shall be checked periodically. Caution must be taken to avoid unnecessary heating of fluid in vehicle tanks. Prolonged or repeated heating of fluids (directly or indirectly) may result in loss of water, which can lead to a performance degradation of the fluid.

- Any of the following situations or a combination of them can accelerate the fluid performance degradation:

- Low fluid consumption
- Trucks being in standby mode with heating system on for extended periods of time
- High temperatures in the fluid tanks
- High temperatures in water tanks which are in direct contact with the fluid tanks (no insulation between tanks)

The storage of fluids can be done in a variety of ways, large stainless steel (acid-proof or plain steel) containers, 1 m3 containers, barrels etc. The storage procedure should be chosen according to the scope and amount needed for the operation. Heating of the fluid in the storage tanks depends on the equipment in use. If the equipment directly heats the fluid before spraying, then heating the fluid in the tanks may be unnecessary. The heating must fulfill any other requirements set for the fluid.

Annual visual inspections of all tanks must be performed. Stainless steel (or acid-proof) tanks must be visually inspected annually (as other tanks) but a more in-depth inspection, such as NonDestructive Testing NDT, may not be necessary on an annual basis. The testing periods should be conducted according to the container manufacturer recommendations or standards set for the deicing operation (reference SAE). Records must be kept for any and all inspections of tanks and station.

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

5.10.4 Application Equipment

Check with the fluid manufacturer's recommendations for filling and fluid transitions in order to prevent fluid contamination and degradation. Requirements for suitable equipment are described in ARP1971.

Application equipment shall be clean before being initially filled with deicing/anti-icing fluid in order to prevent fluid contamination.

- Requirements for suitable equipment are described in ARP1971.
- Special considerations for SAE Type II, III, and IV deicing/anti-icing fluids:
  - The performance characteristics of SAE Type II, III, and IV deicing/anti-icing fluids may be degraded by excessive mechanical shearing or chemical contamination. Therefore, only compatible pumps, control valves, piping, and application devices shall be used. The design of fluid transfer systems shall be in accordance with the fluid manufacturer's recommendations.

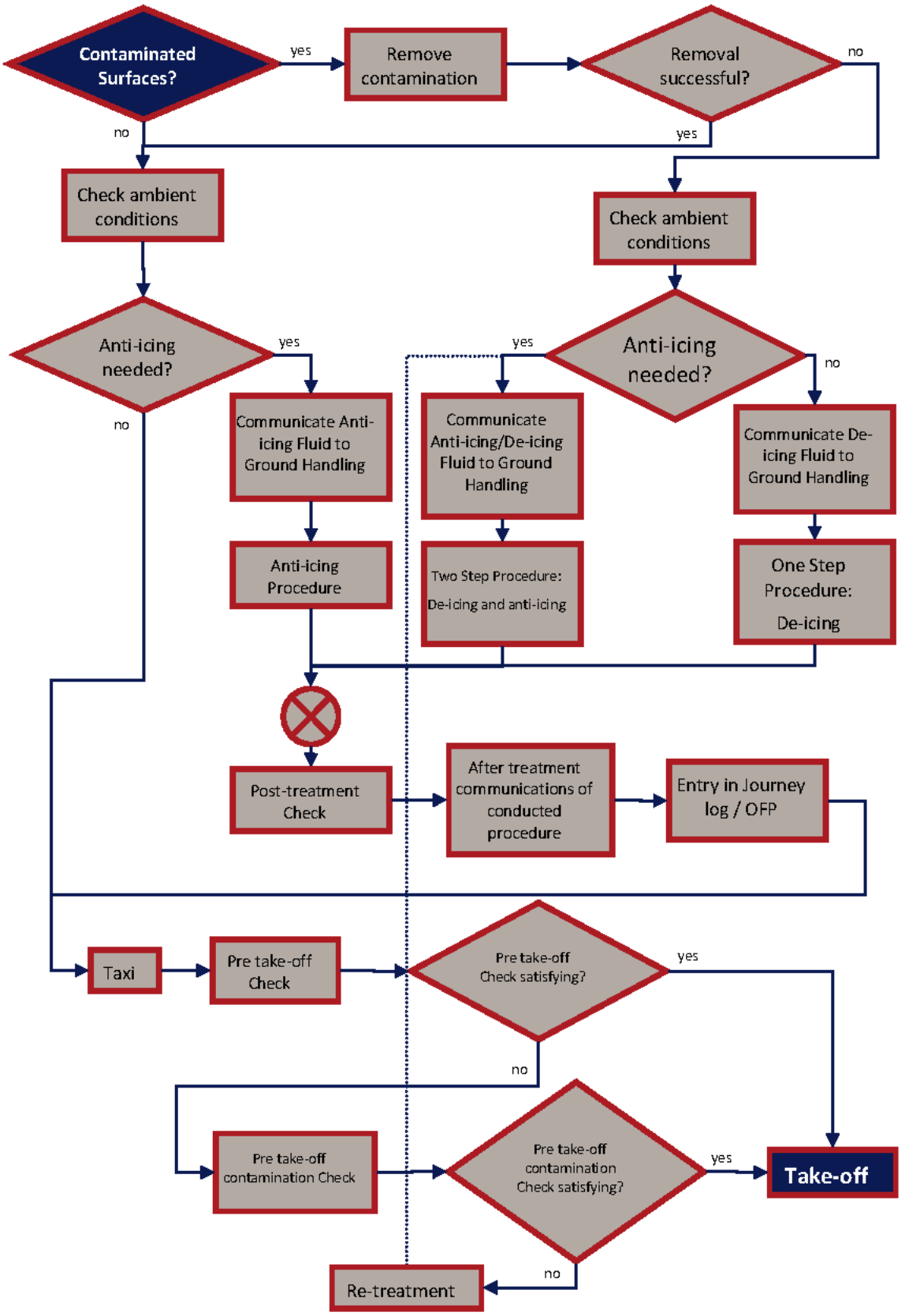
5.11 STAFF TRAINING AND QUALIFICATION

Deicing/anti-icing procedures must be carried out exclusively by personnel trained and qualified on this subject. Companies providing deicing/anti-icing services shall have both a Qualification Programme and a Quality Control Programme to monitor and maintain an acceptable level of competence.

Training programs shall follow the guidelines and recommendations published in AS6286 Aircraft Ground Deicing/Anti-icing of Training and Qualification Program.

5.12 DE/ANTI-ICING PROCESS FLOW CHART

See PG-UI-EK-001, OM Part A-8.2.4.10.1



Figür 5-22: De/Anti-Icing Process Flow Chart

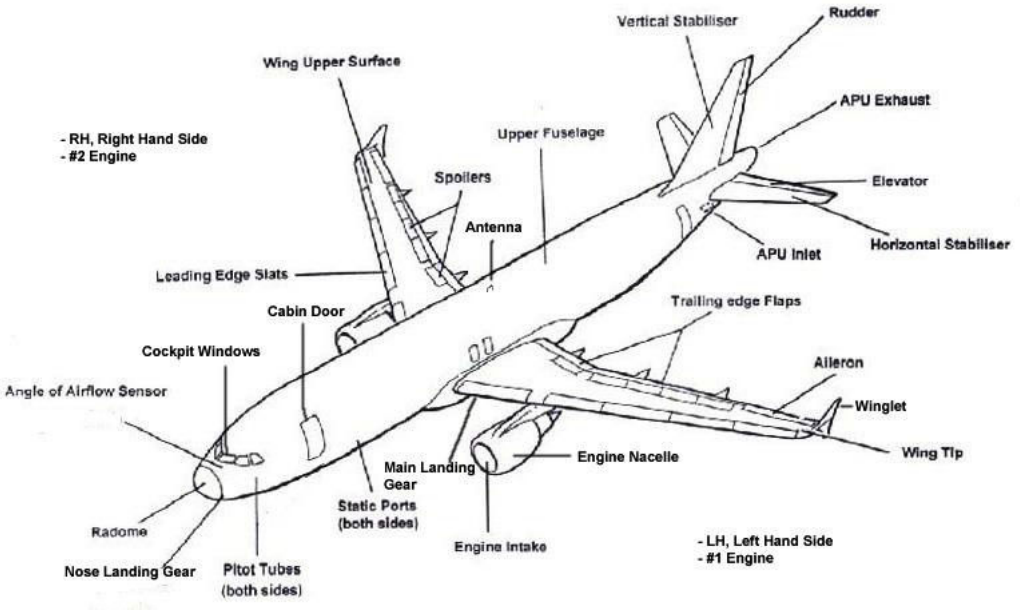
5.13 PEGASUS VARIATIONS

***WARNINGS/PRECAUTIONS AND RESTRICTIONS:**

Take all Warnings/Precautions and Restrictions into consideration given in Aircraft Manufacturer Manuals.

The de-icing/anti-icing procedures can in general be performed according to standard recommendations. However, there are some variations between aircraft, companies, airports and regulations related to a typical A/C scenario. All aircraft related limits shall be taken into account and the differences informed to the de-icing crew. The application of deicing/anti-icing fluid shall be in accordance with the requirements of the airframe/engine manufacturers. The winter operation plan should reflect the particular airport and the aircraft it serves (e.g., passenger traffic, cargo, and business).

Common Aircraft Types and Design: The aircraft even named differently and of different shape and size, have a general concept of design and function. These parts on the aircraft are named alike and refer to the same controls etc. Here is an example of an imaginary aircraft, for an airline, of conventional design and medium size. The parts listed here are for reference only and do not mean that each aircraft should have the same systems and controls. Figure: General Aircraft Controls and Description.



Figür 5-23: General Aircraft Controls and Description

NOT

Dimensions which are given in this section are approximate. These numbers are rounded up for easier use in operation.

5.13.1 Airbus Specifications

5.13.1.1 Surfaces

A320 – A321 Aircraft Characteristics - Airport And Maintenance Planning Nov 01/19

5.13.1.1.1 A320

****ON A/C A320-200 A320neo**

De-Icing on Ground

The mobile equipment for aircraft de-icing and external cleaning must be capable of reaching heights up to approximately 13 m (43 ft).

AIRCRAFT TYPE	Wing Top Surface (Both Sides)		Wingtip Devices (Both Inside and Outside Surfaces) (Both Sides)		HTP Top Surface (Both Sides)		VTP (Both Sides)	
	m^2	ft^2	m^2	ft^2	m^2	ft^2	m^2	ft^2
A320	100	1 076	2	22	27	291	43	463
A320 Sharklet/neo	100	1 076	10	108	27	291	43	463

AIRCRAFT TYPE	Fuselage Top Surface (Top Third - 120° Arc)		Nacelle and Pylon (Top Third - 120° Arc) (All Engines)		Total De-Iced Area	
	m^2	ft^2	m^2	ft^2	m^2	ft^2
A320	138	1 485	24	258	333	3 584
A320 Sharklet/neo	138	1 485	24	258	341	3 670

Figür 5-24: 5.13.1.1.1 A320

NOT

Dimensions are approximate.

5.13.1.1.2 A321

The mobile equipment for aircraft de-icing and external cleaning must be capable of reaching heights up to approximately 13 m (43 ft).

AIRCRAFT TYPE	Wing Top Surface (Both Sides)		Wingtip Devices (Both Inside and Outside Surfaces) (Both Sides)		HTP Top Surface (Both Sides)		VTP (Both Sides)	
	m^2	ft^2	m^2	ft^2	m^2	ft^2	m^2	ft^2
A321	103	1 109	2	22	27	291	43	463
A321 Sharklet/neo	103	1 109	10	108	27	291	43	463

AIRCRAFT TYPE	Fuselage Top Surface (Top Third - 120° Arc)		Nacelle and Pylon (Top Third - 120° Arc) (All Engines)		Total De-Iced Area	
	m^2	ft^2	m^2	ft^2	m^2	ft^2
A321	167	1 798	24	258	365	3 929
A321 Sharklet/neo	167	1 798	24	258	373	4 015

Figür 5-25: 5.13.1.1.2 A321

5.13.1.2 Aircraft Dimensions

Insert paragraph here

5.13.1.2.1 A320

SEE GOM

5.13.1.2.2 A321

SEE GOM

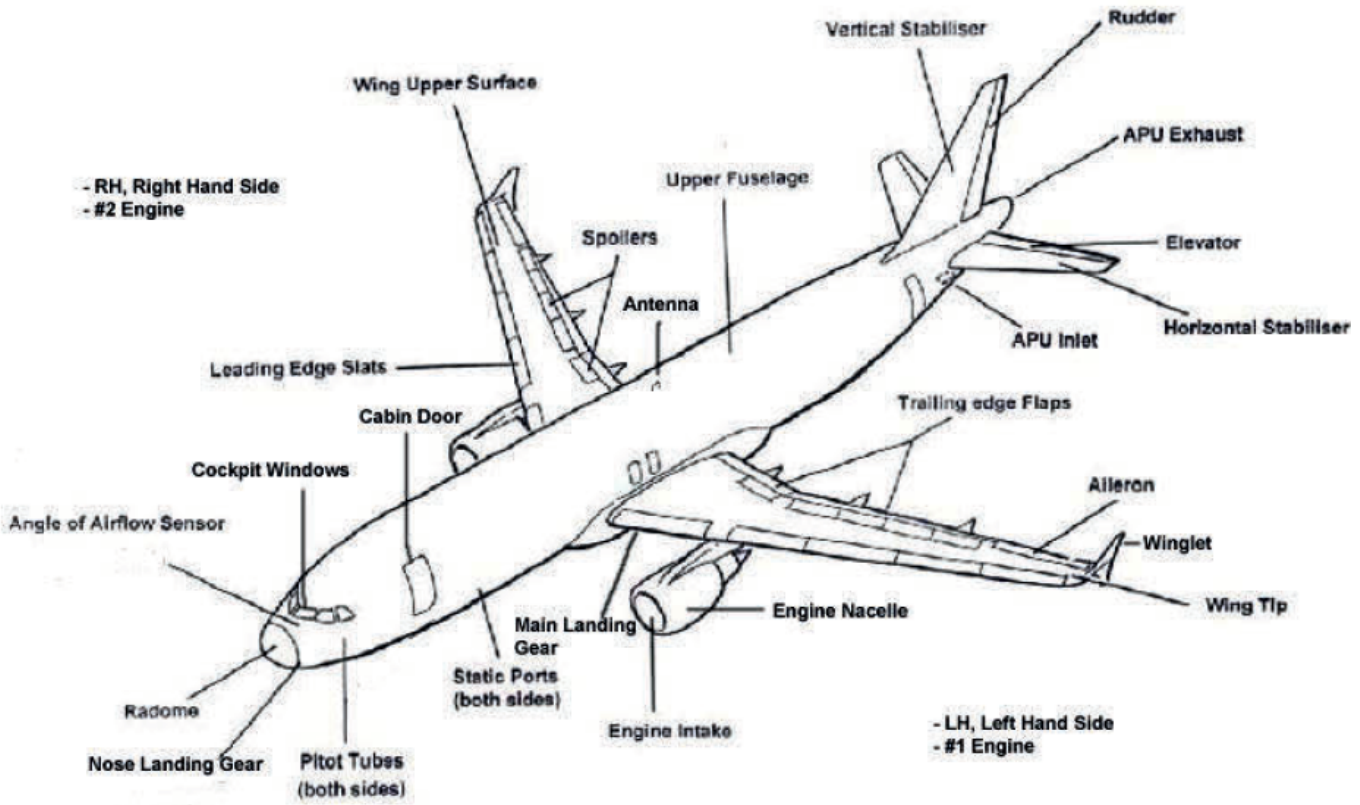
5.13.1.3 No Spray Areas

(REF: AS6286 Aircraft Ground Deicing/Anti-icing of Training and Qualification Program.)

Basic areas of caution when de-icing/anti-icing are engine-inlets, APU inlet/exhaust, windows, doors/seals, brakes/landing gear, vents, probes, sensors, cavities and any opening where sprayed fluid is not allowed. Additionally, composite parts may have their own limitations regarding de-icing fluids and temperatures,

such as composite propellers. There are many variations but these general areas shall be avoided whenever possible. Some splashes of fluid and fluid drained cannot be avoided but direct spray on these parts is not allowed. Areas where fluid is allowed to be sprayed (e.g., the radome), but from where fluid flow-off can cause some problems (e.g., fluid flowing from the nose section on the windows during takeoff), should be noted and the procedure should be discussed together with the flight crew. The reasons why these areas are restricted and the consequences of what might happen if glycol/fluid is sprayed should be understood. Such incidents may be that sensors give false readings, engine and APU produce smoke inside the aircraft via the air intake (or break), glycol may stick on heated cockpit windows causing restricted view for the flight crew, etc.

APU: The APU is critical for de-icing fluid and no spraying shall be directed towards the inlet or exhaust. There have been a number of cases where the APU has been destroyed due to de-icing fluids and some aircraft have restrictions of use during de-icing. The procedure for each case must be clear and general avoidance shall be noted. Engines are normally shut down but may remain running at idle during de-icing/ anti-icing operations. Air conditioning and/or APU air shall be selected OFF, or as recommended by the airframe and engine manufacturer. All the preparations should be performed before hand so the de-icing/ anti-icing operation is not interrupted. Proper communication shall be established so the procedure can be performed accordingly. Aircraft in general have their APU situated in the aft tail section. The APU intake can be on either side of the tail as well as the exhaust. Older design (and some eastern production) can have the APU located in the landing gear section under the wing/fuselage and the exhaust directed through the wing or the wing root. The air-conditioning is usually in operation whenever the APU is. This can cause glycol to be sucked in the air system and thus produce smoke inside the cabin. The flight crew shall be informed before the start of the de-icing so they can make the appropriate adjustments.



Figür 5-26: Aircraft controls and description:

Manufacturer Airbus (Approxiamate)

Type A321 / A320

Wing area 123 m^2

Horizontal stabilizer area 31 m^2

Total surface area 154 m^2

Height overall 13 m / 12 m / 12 m / 12 m

Wingspan 35 m / 35 m / 34 m / 35 m

Fuselage, 1/3 surface area 156 m^2 (A320), 185 m^2 (A321)

A320 vertical stabilizer area: 21,5 m2

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

Coating of frost up to 1/8th inch (3 mm) in thickness on the lower wing surfaces caused by cold fuel in the wing tank areas between the front and rear spar is permissible. However, all leading edge devices, control surfaces, tab surfaces, upper wing surfaces and balance bay cavities **MUST** be free of ice, snow, slush or frost.

Engine intake **MUST** be free of all contaminants and engine fan blades **MUST** freely rotate.

Engine intake **MUST** be free of all contaminants and engine fan blades **MUST** freely rotate. Fuselage **MUST** be inspected prior to engine start when conditions warrant.

Propellers must be free of all contaminants before engine start.

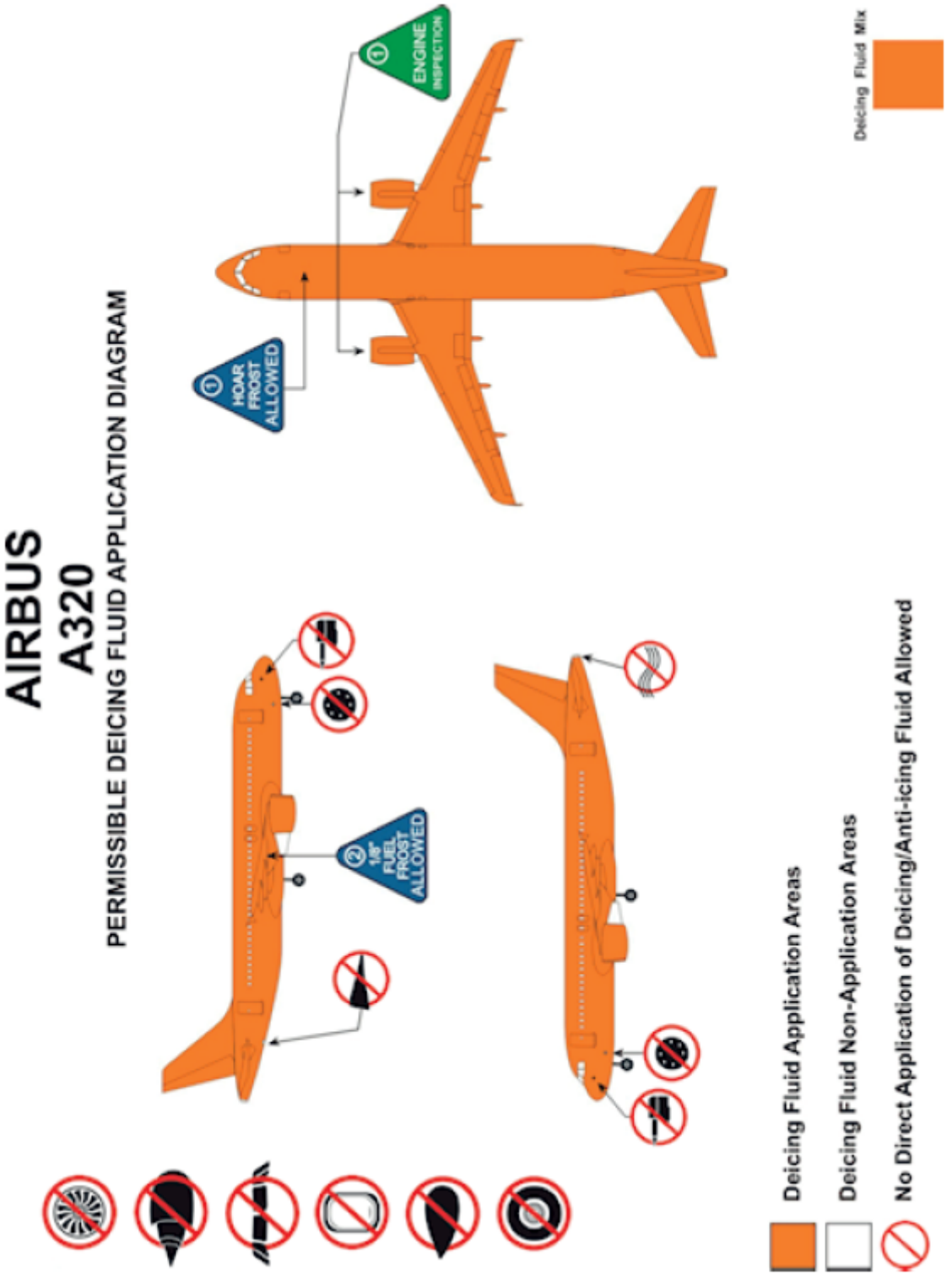
Do not apply undiluted Type II, III or IV fluids forward of the front cabin entry door. Do not apply to windshields or windscreens.

Check upper wing surface to confirm that ice is not present. A physical check (tactile inspection) **MUST** be conducted on the wings upper surfaces at inboard end of wing fuel tank and/or other areas as specified by the aircraft manufacturer. Specific Airworthiness Directive requirements may apply.

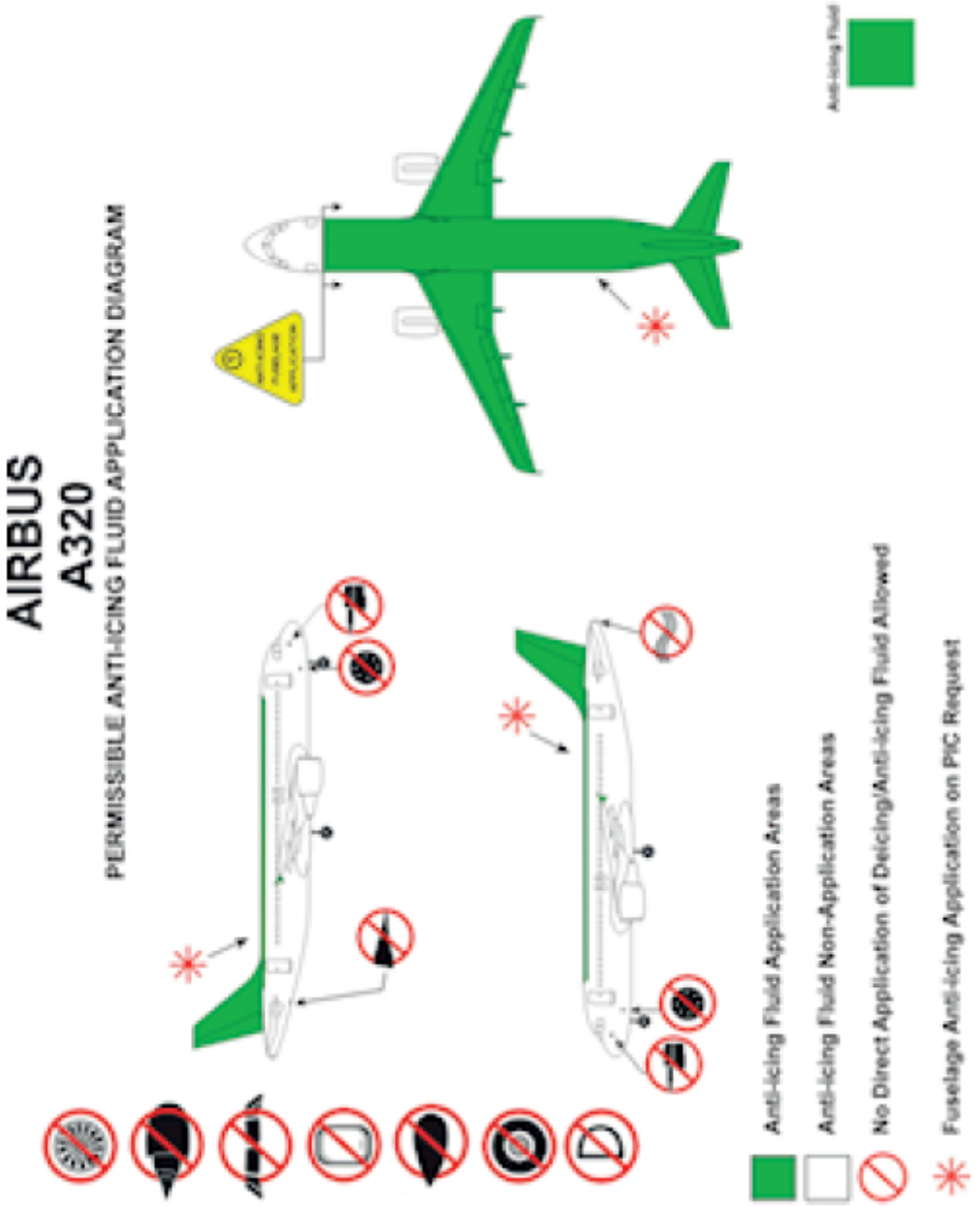
Figür 5-27: Diagram Symbols

Figür 5-28: Diagram Icons

5.13.1.3.1 A320 (REF: AS6286)

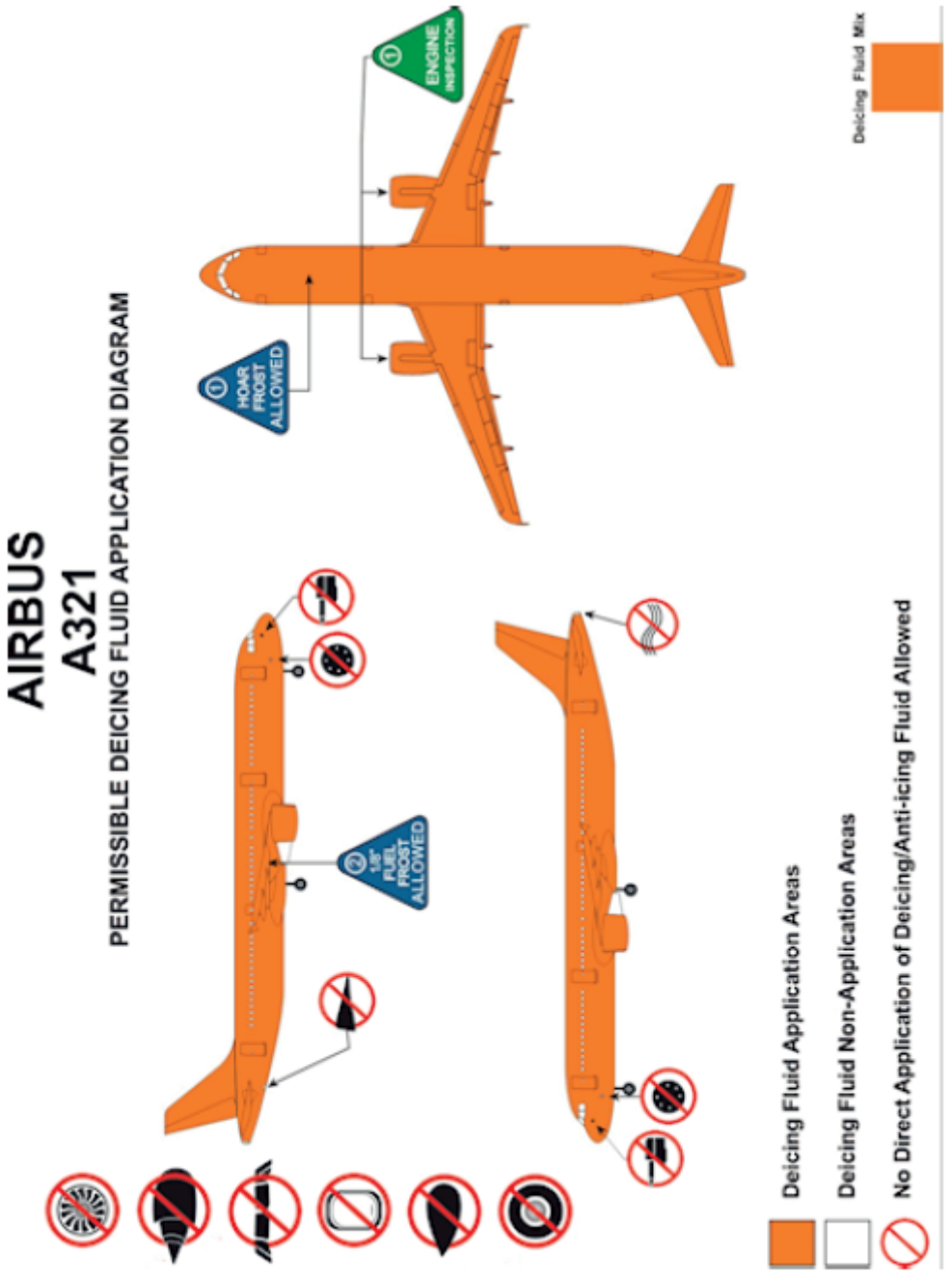


Figür 5-29: A320 (REF AS6286)

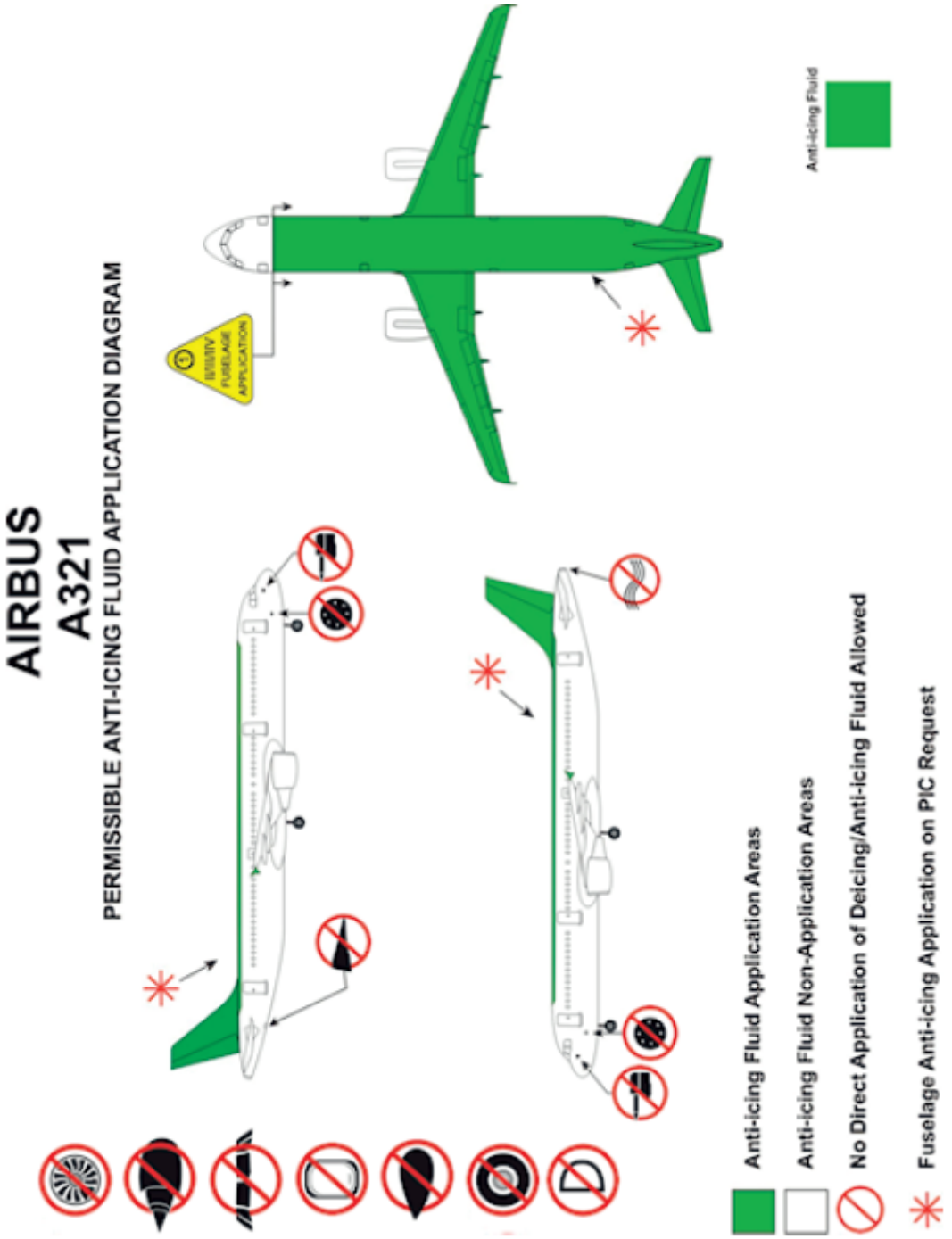


Figür 5-30: A320 (REF AS6286)

5.13.1.3.2 A321 (REF: AS6286)



Figür 5-31: A321 (REF: AS6286)



Figür 5-32: A321 (REF: AS6286)

5.13.1.4 Airbus Specific Cold Weather Maintenance - Anti-Icing Protection

Ref: Manual: Airbus AMM, Rev. Date: Nov 01, 2017

UYARI

Be careful when you use anti-icing and de-icing materials. Obey the material manufacturer's instructions and the local regulations. Make sure

That there is a good flow of air through the work area. Do not breathe the fumes. Use protective clothing, goggles and gloves. If you get one of these materials:

- On your skin or in your eyes, flush it away with a flow of clean water.
- In your mouth, get immediate medical aid.

- Caution: do not apply anti-icing and de-icing fluid directly in:
- The pitot, ice detection and static probes
- The air intakes and exhausts of the engine and the apu - all other air intakes or outlets.
  - If you do, electrical malfunctions and/or damage to equipment can occur.

DIKKAT

Do not use jet exhaust to remove snow or ice from the airframe. The high pressure and high temperature of jet exhaust can cause damage to the aircraft.

DIKKAT

Do not point the jets directly at the cockpit, cabin and door windows. The jets can cause crazing of the acrylic and can push the fluid into the window seals.

DIKKAT

Do not use high-pressure jets or vapor to do the anti-icing/ de-icing procedure. This type of equipment can put fluid in parts, and can cause damage to equipment, specially to:

- Electrical equipment such as harnesses, proximity sensors and connectors (with short circuits or incorrect indications as a result)
- Equipment such as gear box seals, steady bearings, rotary actuators and universal joints.

High pressure jets can push liquids into bearings, joints, brakes, electrical connectors and other sealed components. Liquids that get into these areas can cause corrosion, freeze during aircraft flight, remove necessary lubricants or start incorrect electrical functions.

DIKKAT

the anti-icing/de-icing material holdover-time can decrease.this can occur in one (or more) of these conditions:

- Low temperature
- Heavy precipitation
- Heavy moisture
- High wind speeds
- Jet blasts
- An aircraft skin temperature of less than the oat.

Reason for the Job

This procedure gives the instructions to prevent the formation of ice in some zones (wings, vertical and horizontal stabilizers, rudder). It also gives instructions make the removal of snow from the aircraft easier.

NOT

The source of all the data related to the fluids must be the manufacturer's recommendations for the application and holdover times (supplied with the fluid). The ice protection procedures and all the data related to de-icing/anti-icing fluids are given in the SAE standards available on the website "www.sae.org"

- SAE AS 6285 (Aircraft Ground De-Icing/Anti-Icing Processes).

- SAE AS6286 Aircraft Ground Deicing/Anti-icing of Training and Qualification Program.

NOT

The operators must use the procedures applicable to their special operating procedures and requirements.

NOT

The data given in this procedure are guidelines only.These guidelines and their experience and knowledge of the local weather conditions help the operator to make the correct decision. It is the responsibility of the operator to make the decision about the protection methods.

NOT

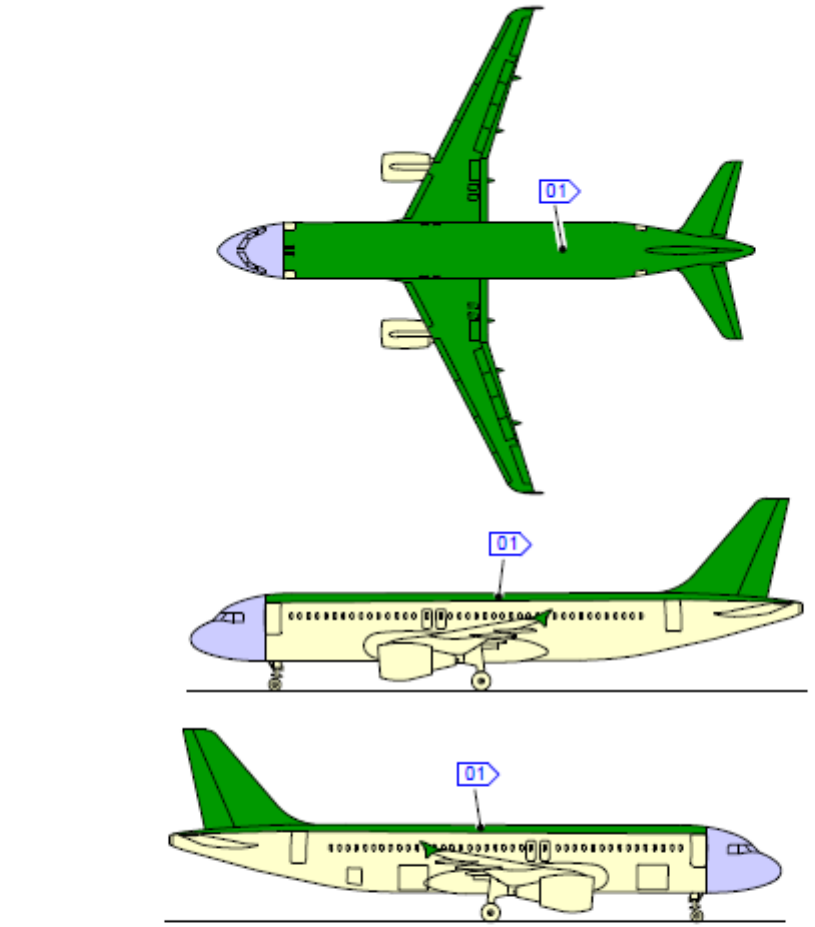
The protection time will be shorter in very bad weather conditions. High wind speeds and jet blast can cause damage to the protective film. If these conditions occur, the protection time will be much shorter.

The protection time can also be much shorter if the wind temperature is lower than the Outside Air Temperature (OAT)

5.13.1.4.1 Anti-Icing Fluid Application

Figure 12-31-11-991-00900-00-A (SHEET 1/2) - Anti-Icing Fluid Application ** ON A/C FSN 051- 150 (TC-DCJ, DCF)

07.11.2019 AMM - A318,A319,A320,A321 - PGT - 01-Nov-2019 - Figure 12-31-11-991-00900-00-A (SHEET 1/2) - Anti-Icing Fluid Application



CAUTION:

DO NOT APPLY TYPE II, III OR IV FLUID DIRECTLY ON THE FUSELAGE AREA FORWARD OF THE PASSENGER/CREW DOOR. DO NOT APPLY FLUID ON THE COCKPIT WINDOWS.

NOTE:

01 ANTI-ICING FLUID APPLIED ON THE FUSELAGE IF SPECIFIED BY THE PILOT IN COMMAND (PIC)

ANTI-ICING FLUID APPLICATION AREAS

ANTI-ICING FLUID NON APPLICATION AREAS

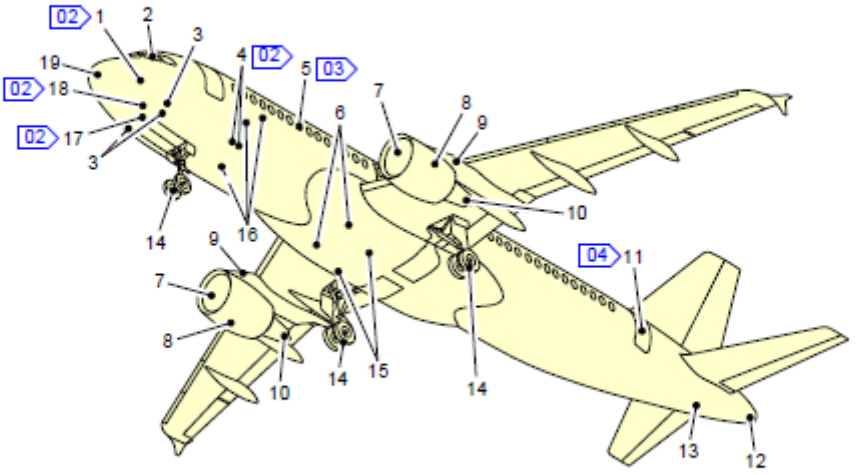
N_MM_123111_2_AJM0_01_01

Figure 12-31-11-991-00900-00-A (SHEET 1/2) - Anti-Icing Fluid Application
** ON A/C FSN 051-150

Figür 5-33: 12-31-11-991-00900-00-A (SHEET 1/2)

Figure 12-31-11-991-00900-00-A (SHEET 2/2) - Anti-Icing Fluid Application ** ON A/C FSN 051-150

07.11.2019 AMM - A318,A319,A320,A321 - PGT - 01-Nov-2019 - Figure 12-31-11-991-00900-00-A (SHEET 2/2) - Anti-Icing Fluid Application



CAUTION:
DO NOT APPLY ANTI-ICING FLUID DIRECTLY ON THE AREAS THAT FOLLOW:

1 - STANDBY STATIC PROBE
2 - COCKPIT WINDOWS
3 - PITOT PROBES
4 - STATIC PROBES
5 - CABIN WINDOWS
6 - AIR-CONDITIONING SYSTEM INLETS
7 - ENGINE AIR INTAKE
8 - ENGINE COWL
9 - BLEED-AIR PRECOOLER-EXCHANGER VENTILATION-GRID
10 - ENGINE EXHAUST
11 - CABIN DOORS
12 - APU EXHAUST
13 - APU AIR INTAKE
14 - L/G (BRAKES, WHEELS, LEG, ETC.)
15 - AIR-CONDITIONING SYSTEM OUTLETS
16 - AOA SENSORS
17 - ICE DETECTOR
18 - TAT SENSOR
19 - RADOME

NOTE:
02 LH SHOWN, RH SYMMETRICAL
03 APPLICABLE FOR ALL CABIN WINDOWS
04 APPLICABLE FOR ALL CABIN DOORS

N_MM_123111_2_AJM0_02_00

Figure 12-31-11-991-00900-00-A (SHEET 2/2) - Anti-Icing Fluid Application
** ON A/C FSN 051-150

Figür 5-34: 12-31-11-991-00900-00-A (SHEET 2/2)

Figure 12-31-11-991-00900-00-F (SHEET 1/2) - Anti-Icing Fluid Application ** ON A/C FSN 001-050, 151-300 (All Airbus 320 Family exclude TC-DCJ, DCF)

07.11.2019 AMM - A318,A319,A320,A321 - PGT - 01-Nov-2019 - Figure 12-31-11-991-00900-00-F (SHEET 1/2) - Anti-Icing Fluid Application

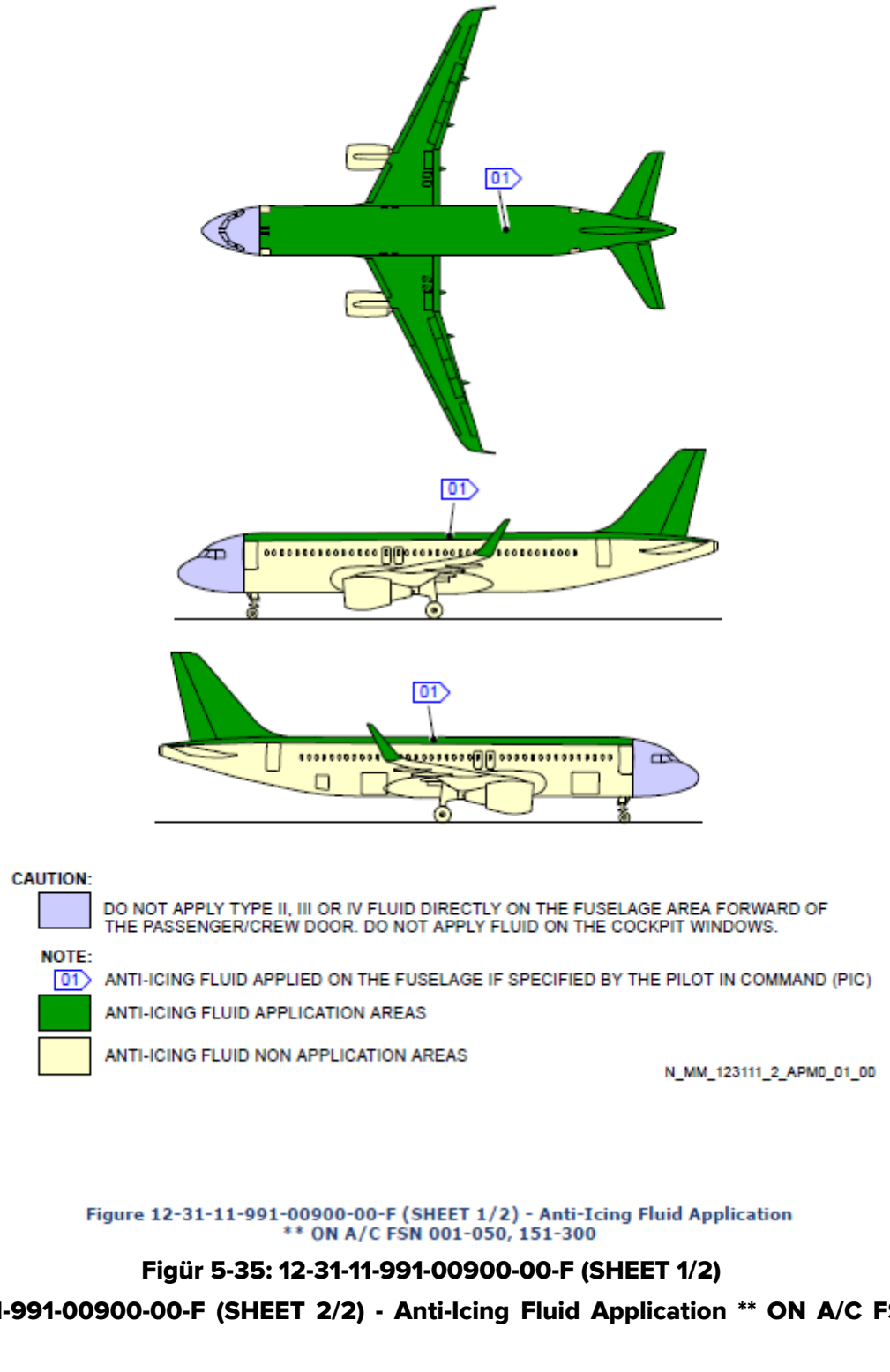
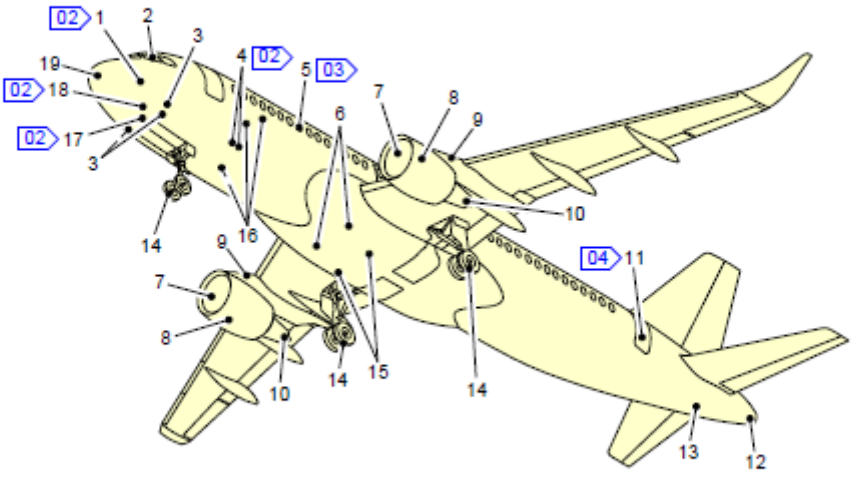


Figure 12-31-11-991-00900-00-F (SHEET 1/2) - Anti-Icing Fluid Application
** ON A/C FSN 001-050, 151-300

Figür 5-35: 12-31-11-991-00900-00-F (SHEET 1/2)

Figure 12-31-11-991-00900-00-F (SHEET 2/2) - Anti-Icing Fluid Application ** ON A/C FSN 001-050, 151-300

07.11.2019 AMM - A318,A319,A320,A321 - PGT - 01-Nov-2019 - Figure 12-31-11-991-00900-00-F (SHEET 2/2) - Anti-Icing Fluid Application



CAUTION:
DO NOT APPLY ANTI-ICING FLUID DIRECTLY ON THE AREAS THAT FOLLOW:

1 - STANDBY STATIC PROBE
2 - COCKPIT WINDOWS
3 - PITOT PROBES
4 - STATIC PROBES
5 - CABIN WINDOWS
6 - AIR-CONDITIONING SYSTEM INLETS
7 - ENGINE AIR INTAKE
8 - ENGINE COWL
9 - BLEED-AIR PRECOOLER-EXCHANGER VENTILATION-GRID
10 - ENGINE EXHAUST
11 - CABIN DOORS
12 - APU EXHAUST
13 - APU AIR INTAKE
14 - L/G (BRAKES, WHEELS, LEG, ETC.)
15 - AIR-CONDITIONING SYSTEM OUTLETS
16 - AOA SENSORS
17 - ICE DETECTOR
18 - TAT SENSOR
19 - RADOME

NOTE:
02 LH SHOWN, RH SYMMETRICAL
03 APPLICABLE FOR ALL CABIN WINDOWS
04 APPLICABLE FOR ALL CABIN DOORS

N_MM_123111_2_APM0_02_00

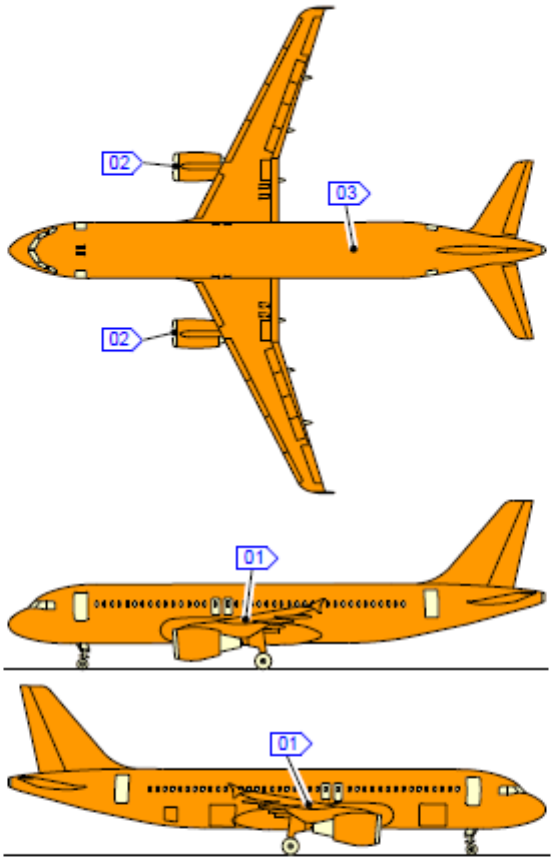
Figure 12-31-11-991-00900-00-F (SHEET 2/2) - Anti-Icing Fluid Application
** ON A/C FSN 001-050, 151-300

Figür 5-36: 12-31-11-991-00900-00-F (SHEET 2/2) - Anti-Icing Fluid Application ** ON A/C FSN 001-050, 151-300

5.13.1.4.2 De-Icing Fluid Application

Figure 12-31-12-991-00900-00-A (SHEET 1/3) - De-Icing Fluid Application ** ON A/C FSN 051- 150

07.11.2019 AMM - A318,A319,A320,A321 - PGT - 01-Nov-2019 - Figure 12-31-12-991-00900-00-A (SHEET 1/3) - De-Icing Fluid Application



CAUTION:

01 THERE MUST BE NO ICE, SNOW, SLUSH OR FROST ON THE LEADING EDGE DEVICES, CONTROL SURFACES, UPPER WING SURFACES AND BALANCE BAY CAVITIES. BUT A LAYER OF FROST OF A MAXIMUM THICKNESS OF 3.17 mm (0.12 in) IS PERMITTED ON THE BOTTOM WING SURFACES BETWEEN THE FRONT AND REAR SPARS (THIS LAYER OF FROST IS CAUSED BY COLD FUEL IN THE WING TANK AREAS).

02 THERE MUST BE NO CONTAMINANTS ON THE ENGINE INTAKE AND THE ENGINE FAN BLADES MUST BE FREE TO TURN.

NOTE:

03 A THIN LAYER OF HOARFROST IS PERMITTED ON THE PROTECTED TOP FUSELAGE IF ALL VENTS AND PORTS ARE CLEAR. YOU CAN SEE THE PAINT LINES, MARKINGS AND LETTERING THROUGH A THIN LAYER OF HOARFROST.

DE-ICING FLUID APPLICATION AREAS

DE-ICING FLUID NON APPLICATION AREAS

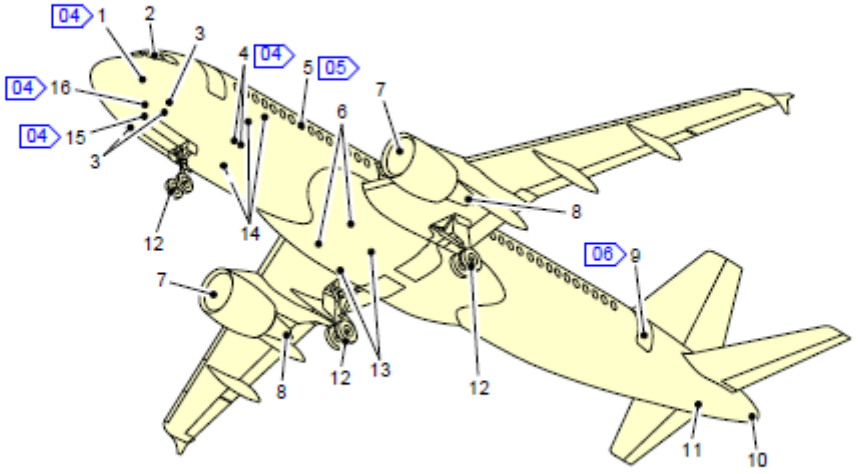
N_MM_123112_2_AJM0_01_02

Figure 12-31-12-991-00900-00-A (SHEET 1/3) - De-Icing Fluid Application
** ON A/C FSN 051-150

Figür 5-37: 12-31-12-991-00900-00-A (SHEET 1/3)

Figure 12-31-12-991-00900-00-A (SHEET 2/3) - De-Icing Fluid Application ** ON A/C FSN 051-150

07.11.2019 AMM - A318,A319,A320,A321 - PGT - 01-Nov-2019 - Figure 12-31-12-991-00900-00-A (SHEET 2/3) - De-Icing Fluid Application



CAUTION:
DO NOT APPLY DE-ICING FLUID DIRECTLY ON THE AREAS THAT FOLLOW:

1 - STANDBY STATIC PROBE
2 - COCKPIT WINDOWS
3 - PITOT PROBES
4 - STATIC PROBES
5 - CABIN WINDOWS
6 - AIR-CONDITIONING SYSTEM INLETS
7 - ENGINE AIR INTAKE
8 - ENGINE EXHAUST
9 - CABIN DOORS
10 - APU EXHAUST
11 - APU AIR INTAKE
12 - L/G (BRAKES, WHEELS, LEG, ETC.)
13 - AIR-CONDITIONING SYSTEM OUTLETS
14 - AOA SENSORS
15 - ICE DETECTOR
16 - TAT SENSOR

NOTE:
04 LH SHOWN, RH SYMMETRICAL
05 APPLICABLE FOR ALL CABIN WINDOWS
06 APPLICABLE FOR ALL CABIN DOORS

N_MM_123112_2_AJM0_02_00

Figure 12-31-12-991-00900-00-A (SHEET 2/3) - De-Icing Fluid Application
** ON A/C FSN 051-150

Figür 5-38: 12-31-12-991-00900-00-A (SHEET 2/3)

Figure 12-31-12-991-00900-00-A (SHEET 3/3) - De-Icing Fluid Application **ON A/C FSN 051-150

07.11.2019 AMM - A318,A319,A320,A321 - PGT - 01-Nov-2019 - Figure 12-31-12-991-00900-00-A (SHEET 3/3) - De-Icing Fluid Application

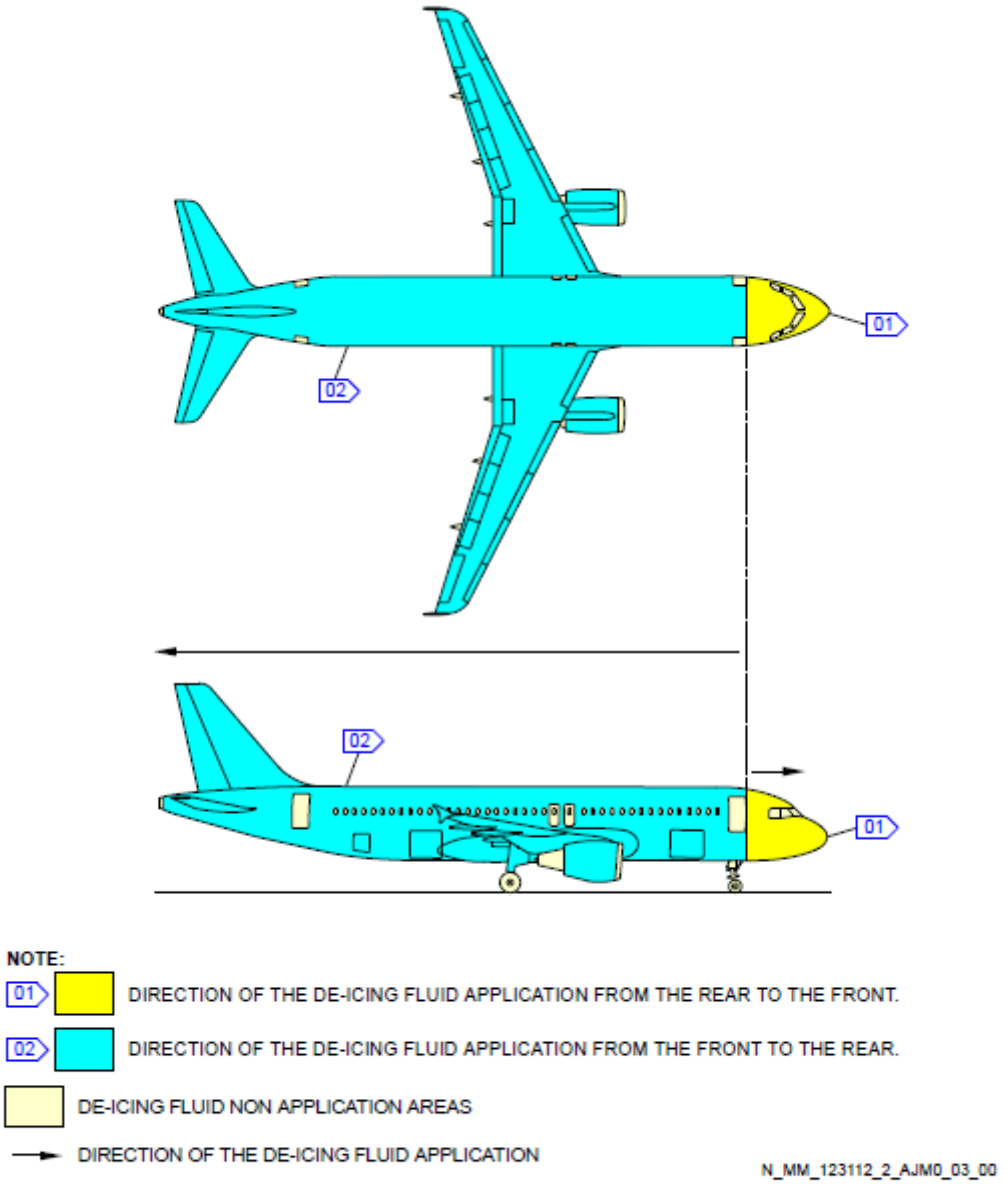
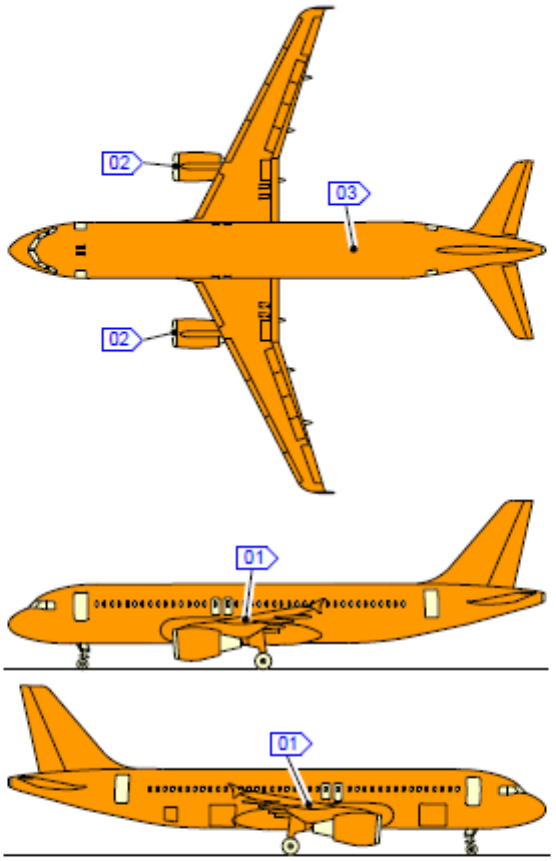


Figure 12-31-12-991-00900-00-A (SHEET 3/3) - De-Icing Fluid Application
** ON A/C FSN 051-150

Figür 5-39: 12-31-12-991-00900-00-A (SHEET 3/3)

Figure 12-31-12-991-00900-00-F (SHEET 1/3) - De-Icing Fluid Application **ON A/C FSN 001-050, 151-300

07.11.2019 AMM - A318,A319,A320,A321 - PGT - 01-Nov-2019 - Figure 12-31-12-991-00900-00-A (SHEET 1/3) - De-Icing Fluid Application



CAUTION:

01 THERE MUST BE NO ICE, SNOW, SLUSH OR FROST ON THE LEADING EDGE DEVICES, CONTROL SURFACES, UPPER WING SURFACES AND BALANCE BAY CAVITIES. BUT A LAYER OF FROST OF A MAXIMUM THICKNESS OF 3.17 mm (0.12 in) IS PERMITTED ON THE BOTTOM WING SURFACES BETWEEN THE FRONT AND REAR SPARS (THIS LAYER OF FROST IS CAUSED BY COLD FUEL IN THE WING TANK AREAS).

02 THERE MUST BE NO CONTAMINANTS ON THE ENGINE INTAKE AND THE ENGINE FAN BLADES MUST BE FREE TO TURN.

NOTE:

03 A THIN LAYER OF HOARFROST IS PERMITTED ON THE PROTECTED TOP FUSELAGE IF ALL VENTS AND PORTS ARE CLEAR. YOU CAN SEE THE PAINT LINES, MARKINGS AND LETTERING THROUGH A THIN LAYER OF HOARFROST.

DE-ICING FLUID APPLICATION AREAS

DE-ICING FLUID NON APPLICATION AREAS

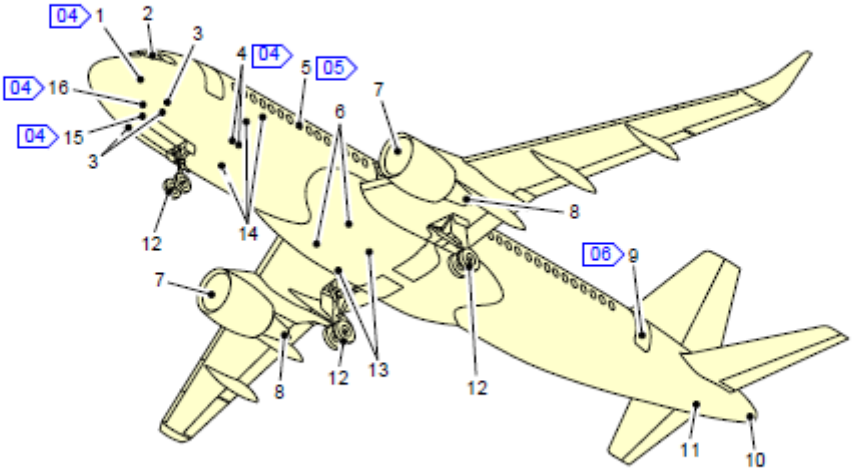
N_MM_123112_2_AJM0_01_02

Figure 12-31-12-991-00900-00-A (SHEET 1/3) - De-Icing Fluid Application
** ON A/C FSN 051-150

Figür 5-40: 12-31-12-991-00900-00-F (SHEET 1/3)

Figure 12-31-12-991-00900-00-F (SHEET 2/3) - De-Icing Fluid Application ** ON A/C FSN 001-050, 151-300

07.11.2019 AMM - A318,A319,A320,A321 - PGT - 01-Nov-2019 - Figure 12-31-12-991-00900-00-F (SHEET 2/3) - De-Icing Fluid Application



CAUTION:
DO NOT APPLY DE-ICING FLUID DIRECTLY ON THE AREAS THAT FOLLOW:

1 - STANDBY STATIC PROBE
2 - COCKPIT WINDOWS
3 - PITOT PROBES
4 - STATIC PROBES
5 - CABIN WINDOWS
6 - AIR-CONDITIONING SYSTEM INLETS
7 - ENGINE AIR INTAKE
8 - ENGINE EXHAUST
9 - CABIN DOORS
10 - APU EXHAUST
11 - APU AIR INTAKE
12 - L/G (BRAKES, WHEELS, LEG, ETC.)
13 - AIR-CONDITIONING SYSTEM OUTLETS
14 - AOA SENSORS
15 - ICE DETECTOR
16 - TAT SENSOR

NOTE:
04 LH SHOWN, RH SYMMETRICAL
05 APPLICABLE FOR ALL CABIN WINDOWS
06 APPLICABLE FOR ALL CABIN DOORS

N_MM_123112_2_APM0_02_00

Figure 12-31-12-991-00900-00-F (SHEET 2/3) - De-Icing Fluid Application
** ON A/C FSN 001-050, 151-300

Figür 5-41: 12-31-12-991-00900-00-F (SHEET 2/3)

Figure 12-31-12-991-00900-00-F (SHEET 3/3) - De-Icing Fluid Application ** ON A/C FSN 001-050, 151-300

07.11.2019 AMM - A318,A319,A320,A321 - PGT - 01-Nov-2019 - Figure 12-31-12-991-00900-00-F (SHEET 3/3) - De-Icing Fluid Application

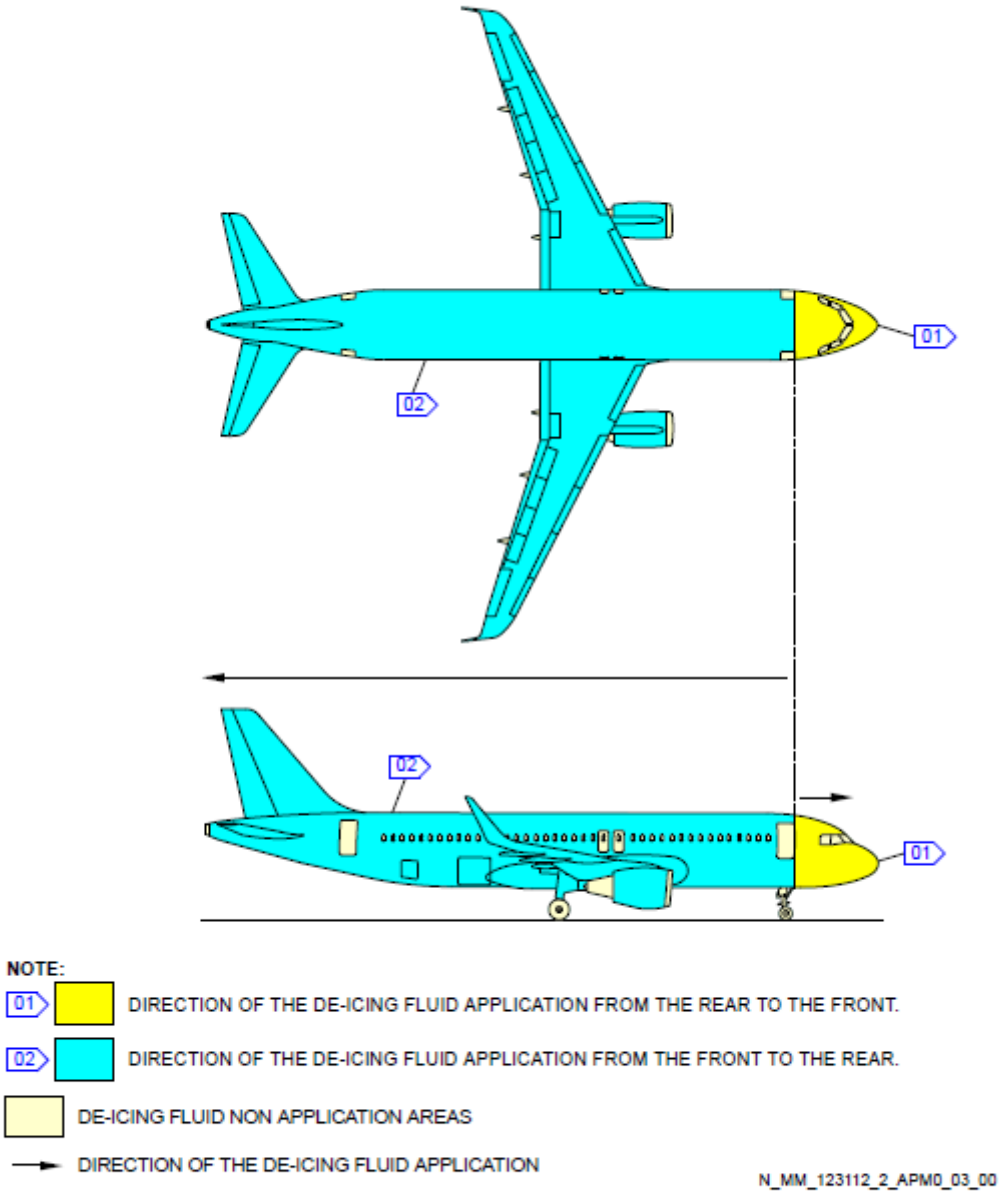


Figure 12-31-12-991-00900-00-F (SHEET 3/3) - De-Icing Fluid Application
** ON A/C FSN 001-050, 151-300

Figür 5-42: 12-31-12-991-00900-00-F (SHEET 3/3)

Job Set-up

A. Anti-Icing General Information on Airbus

- If the aircraft comes to the gate with the flaps/slats in a position other than fully retracted:
  - An inspection of these flaps/slats must be done.
  - It must be removed the ice before retraction, if necessary.
  - Application limits:
    - If you must apply new anti-icing protection before the subsequent flight, than:

Do not apply a new layer of anti-icing fluid directly on a layer applied before.

First, do the de-icing of the aircraft with a hot fluid solution of Type 1 fluid (Ref. Airbus AMM TASK 12- 31- 12-660-002).

- Then, apply the anti-icing protection on the clean aircraft.
- Refer to (Ref. AMM TASK 12-31-00-600-001) for:
  - Definition,
  - Cold weather procedures,
  - De-icing and Anti-icing Guidelines,
  - Useable Materials,
  - General Information on Effects of Icing,
  - De-icing and/or Anti-icing Equipment and Materials.

UYARI

To tell persons to remove snow from their shoes and clothes before they go into the aircraft. This is very important in the cargo compartments. If there is ice or snow on the latches, this can cause defective operation of the cargo loading system.

To prevent contamination of the aircraft interior, all the doors and the sliding windows must be closed.

Preparation of Equipment

DIKKAT

Before you apply anti-icing/de-icing fluids, make sure that the supply pressure is not more than the specified values.

Do not make the anti-icing/de-icing fluid in tanks hot too many times Or for long periods. If you do, the quantity of water in the fluid wil **Decrease and there will be a possible degradation of the fluid performance.**

- Put the DE- ANTI-ICING EQUIPMENT - 12M (39 FT) SPRAYING HEIGHT in position. Make sure that the safety zone of the aircraft is clear so that the DE- ANTI-ICING EQUIPMENT - 12M (39 FT) SPRAYING HEIGHT moves easily.

  NOT

  When used on the ramp, the DE- ANTI-ICING EQUIPMENT - 12M (39 FT) SPRAYING HEIGHT has a storage tank for the anti/de-icing fluid. Do not mix other fluids with the anti/deicing fluid. Use the fluid at the recommended concentration for the temperature to get a correct protection.

- On the DE- ANTI-ICING EQUIPMENT - 12M (39 FT) SPRAYING HEIGHT:

  Set the supply pressure to:

  - not more than 1.5 psi (0.1034 bar) impact pressure on the radome, belly fairing, rudder and elevators.
  - not more than 10 psi (0.6895 bar) impact pressure on all other surfaces.

Procedure

A. Aircraft Anti-Icing

- Apply the anti-icing fluid to all the external surfaces of the aircraft with the DE- ANTI-ICING EQUIPMENT - 12M (39 FT) SPRAYING HEIGHT.
- You must apply the fluid directly from the front to the rear of the aircraft.
- Do not apply Type II, III or IV fluid directly on the fuselage area forward of the passenger/crew door.
- Do not apply fluid directly on:

** **ON A/C 051-150** (TC-DCJ, DCF)

(Ref. Fig. Anti-Icing Fluid Application)

** **ON A/C 001-050, 151-300 (All Airbus 320 Family exclude TC-DCJ, DCF)**

(Ref. Fig. Anti-Icing Fluid Application)

** ON A/C ALL

- The APU air intake (13) and exhaust (12),
- The engine cowls (8), air intakes (7) and exhausts (10),
- The inlets (6) and outlets (15) of the air conditioning system,
- The landing gears (brakes, wheels, leg, etc.) (14),
- The pitot probes (3),
- The static probes (4),
- The standby static probes (1),
- The Angle of Attack (AOA) sensors (16),
- The Total Air Temperature (TAT) sensors (18),
- The ice detectors (17) (if installed),
- The cabin windows (5),
- The cockpit windows (2),
- The cabin doors (11),
- The radome (19),
- The bleed-air precooler-exchanger ventilation-grids (9).
- Do not use too much anti-icing fluid on the rudder, the elevator and in the aileron servocontrol areas

DIKKAT

In the trimmable horizontal stabilizer (ths) area, be specially careful to point the spray from the front to the rear. If you do not obey this precaution, the fluid can go into the rear fuselage non-pressurized compartment and cause damage to the flight data recorder (fdr).

- In the Trimmable Horizontal Stabilizer (THS) area, be specially careful to point the spray from the front to the rear.

  NOT

  If you point the spray in the other direction (from the rear to the front), anti-icing fluid can go into the THS or into the non-pressurized compartment of the rear fuselage.

- To prevent the flow of fluid on the cockpit windows, remove the remaining fluid from the forward areas. You can clean the surface with clean water and a soft cloth.
- If you find fluid on the cockpit or cabin windows, clean the windows with clean water and a soft cloth.
  - Do not use the wipers to remove the fluid from the windshield.
  - Be careful to remove all the fluid from the windshield, specially in the wiper area.

- Inspection of the APU inlet

  Make sure that there is no remaining anti-icing solution on APU inlet.

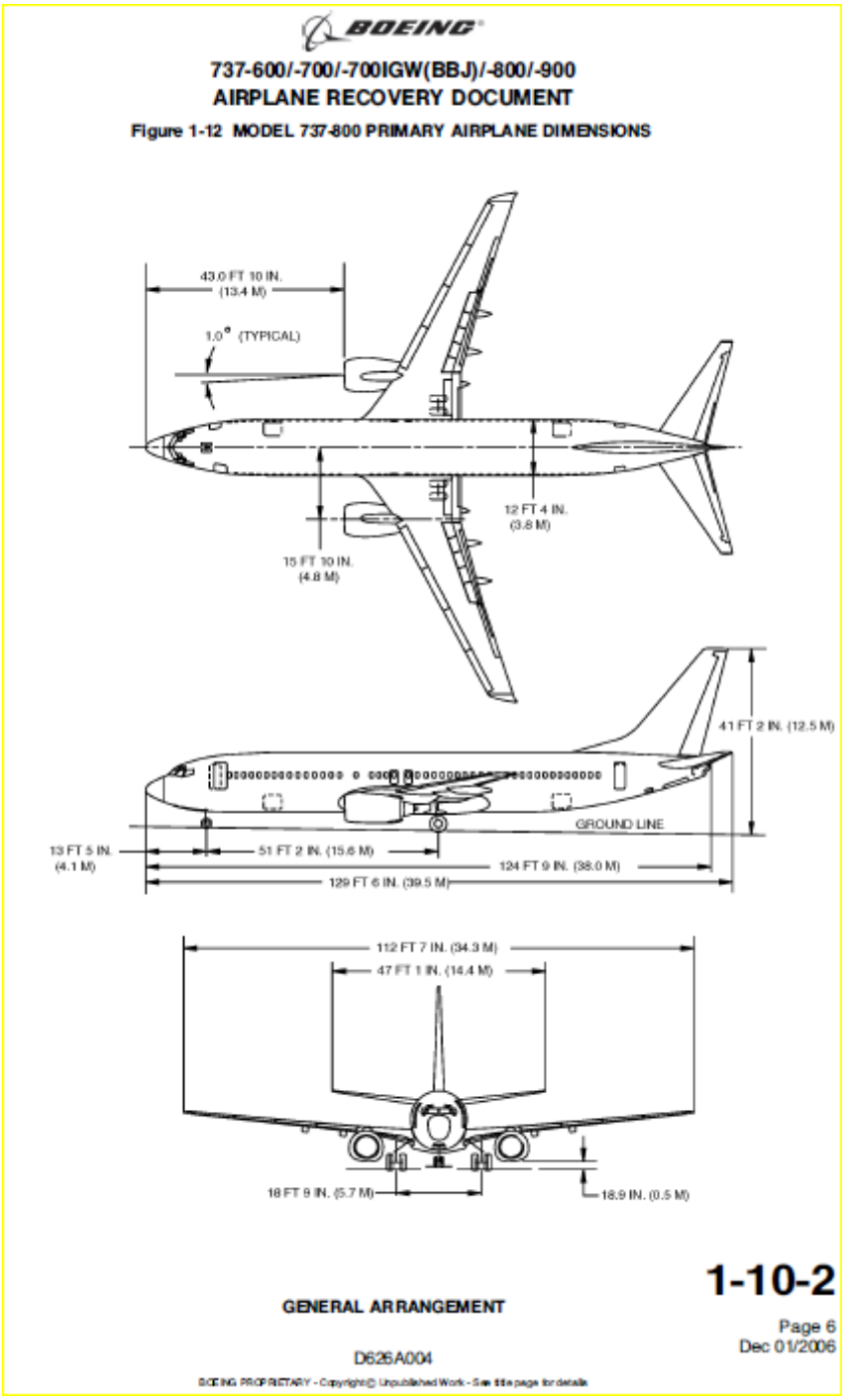
  Clean the APU inlet, if necessary.

5.13.2 Boeing 737-800 Specifications

5.13.2.1 Surfaces- BOEING B737NG and CL (approximate):

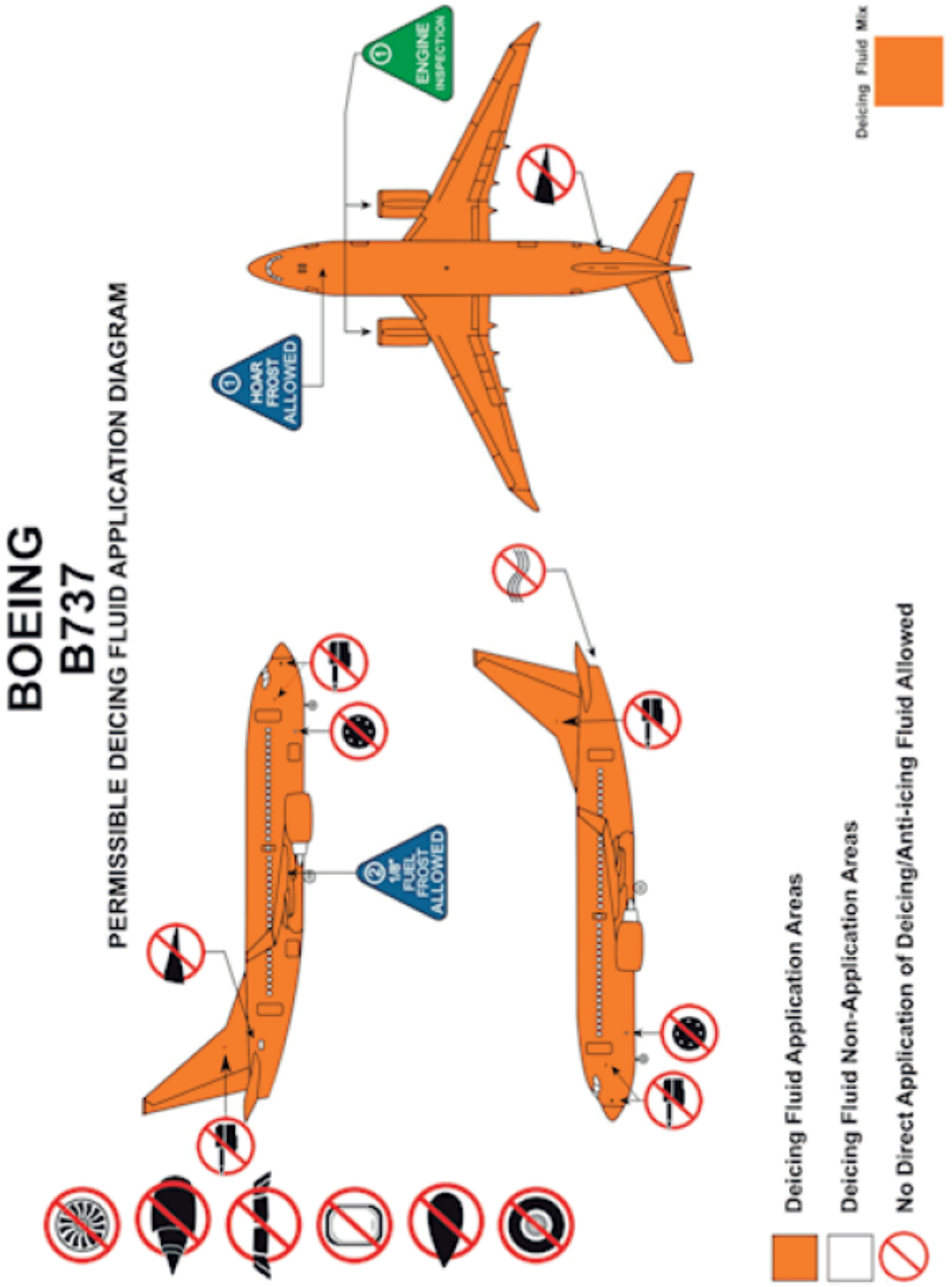
As per Boeing MAINTENANCE FACILITY AND EQUIPMENT PLANNING DOCUMENT.

5.13.2.2 General B737-800 /Aircraft Dimensions

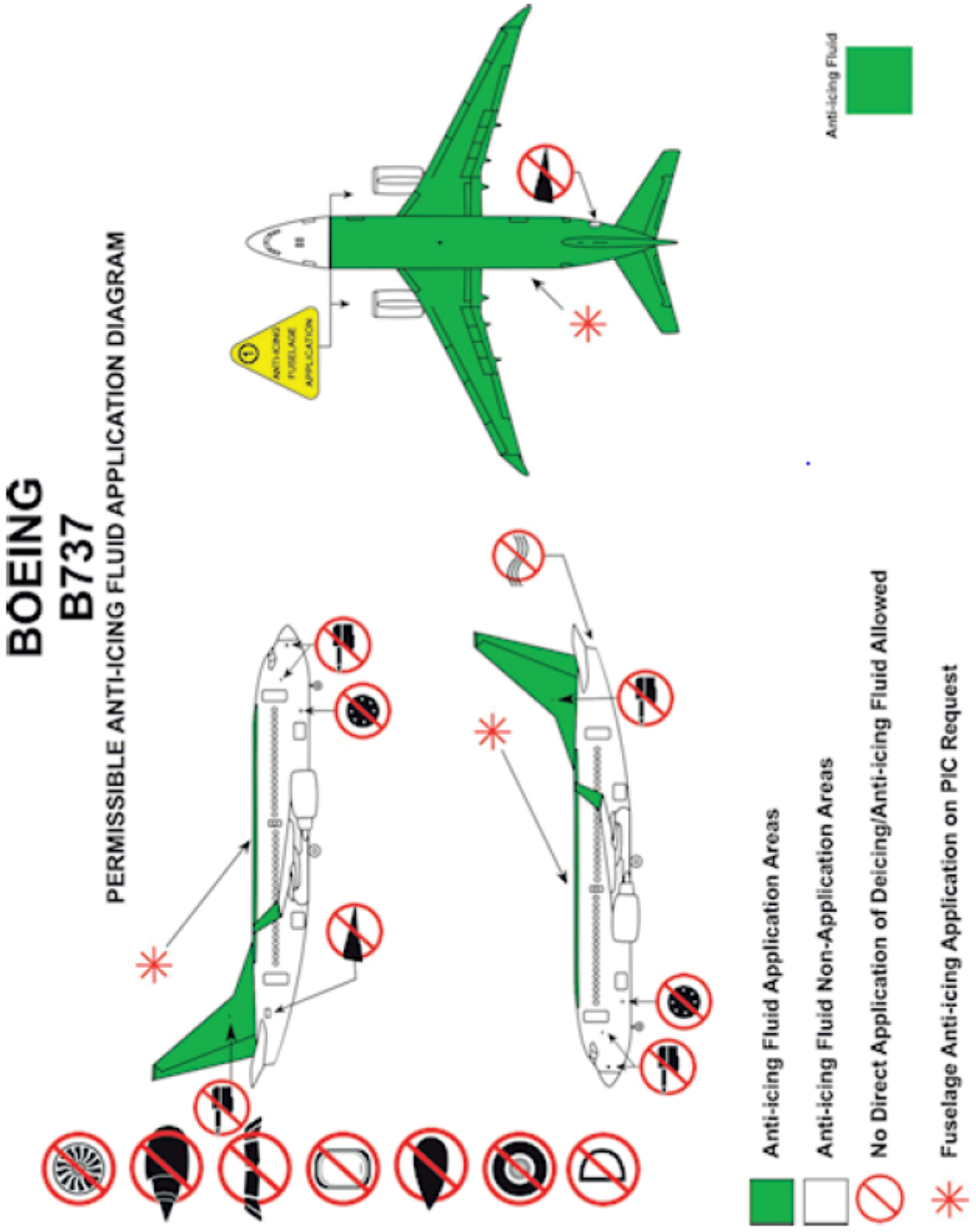


Figür 5-43: 5.13.2.2.

5.13.2.3 No Spray Areas (B737)



Figür 5-44: 5.13.2.3



Figür 5-45: 5.13.2.3

Boeing 737 (Approximate)

Manufacturer Boeing

Type 737-800

Wing area 125 m^2

Horizontal stabilizer area 33 m^2

Total surface area 158 m^2

Height overall 13 m

Wingspan 35 m

Fuselage, 1/3 surface area 156 m^2

Figür 5-46: Boeing 737 (Approximate)

5.13.3 Approved Fluids

Pegasus Airlines approves the fluid(s) in accordance with the latest edition of the relevant ISO specifications and/or SAE documents of the applicable ISO and SAE fluid types as specified follows:

5.13.3.1 De-Icing Fluids

The Alkali Organic Salt-based and Acetate- or formate based fluids shall not be used on Pegasus Airlines flights due to the risk assessment must be done and further actions are needed.Our De/anti-icing service providers can contact with A"REA.AUDITORS@flypgs.com ""GROUND.DOC@flypgs.com" and "OCCM@flypgs.com" if any question about it.Ref: European Aviation Safety Agency (European Union) – EASA Safety Information Bulletin Airworthiness – Operations / SIB No: 2015-27 / Issued: 16 December 2015 / Subject: Potential Adverse Effect of Alkali Organic Salt-based Aircraft De-Icing Fluids on Anti-Icing Holdover Protection and Potential Aircraft Corrosion.

5.13.3.1.1 Boeing B737NG and B737CL

Type I Fluids (producted as per SAE AMS 1424 Type I)

Type II Fluids (producted as per SAE AMS 1428 Type II)

Type III Fluids (producted as per SAE AMS 1428 Type III)

Type IV Fluids (producted as per SAE AMS 1428 Type IV)

5.13.3.1.2 Airbus Family

All de/anti-icing fluids following the specifications mentioned below are approved for all Airbus aircraft (the latest issues always apply):

- Type I: SAE AMS 1424 standard
- Type II: SAE AMS 1428 standard
- Type III: SAE AMS 1428 standard
- Type IV: SAE AMS 1428 standard

Annex 1 References and Related Documents

The following publications form a part of this document to the extent specified herein. The latest issue of SAE publications shall apply. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

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".

Pegasus uses IHS Standards Expert for get the current SAE Standards.

Regulation (EU) No 965/2012, Commission Regulation (EU) No 965/2012 on air operations and related EASA Decisions (AMC & GM and CS-FTL.1) CAT.OP.MPA.250 Ice and other contaminants — ground procedures GM1 CAT.OP.MPA.250 Ice and other contaminants — ground procedures GM2 CAT.OP.MPA.250 Ice and other contaminants — ground procedures GM3 CAT.OP.MPA.250 Ice and other contaminants — ground procedures (also SPO.OP.175, NCC.OP.185)
II (Non-legislative acts) REGULATIONS - COMMISSION REGULATION (EU) No 965/2012 of 5 October 2012 laying down technical requirements and administrative procedures related to air operations pursuant to Regulation (EC) No 216/2008 of the European Parliament and of the Council (Annex II, ARO.GEN.135(c). EASA European Aviation Safety Agency/ Safety Information Bulletin Operations SIB No.: 2017-11 Issued: 14 July 2017 Subject: Global Aircraft De-icing Standards
EASA European Aviation Safety Agency/ Safety Information Bulletin Operations SIB No.: 2018-12 Issued: 27 July 2018 Subject: Post de-icing/anti-icing checks
SAE AS6285 'Aircraft Ground Deicing/Anti-Icing Processes'
SAE ARP6257 'Aircraft Ground De/Anti-Icing Communication Phraseology for Flight and Ground Crews' SAE AS6286 'Aircraft Ground Deicing/Anti-icing of Training and Qualification Program'
SAE AS6332 'Aircraft Ground Deicing/Anti-icing Quality Management'
FAA HOLDOVER TIME GUIDELINES, WINTER 2025-2026 ORIGINAL ISSUE: AUGUST, 2025 "https://www.faa.gov/other_visit/aviation_industry/airline_operators/airline_safety/deicing/" "https://www.faa.gov/regulations_policies/orders_notices/ " Pegasus - Operations Manual Part A Chapter: 8 De-Icing & Anti-Icing On The Ground
Pegasus - Ground Operation Manual
Pegasus - Ground Operation Training Manual
PG-UI-EK-001 OM PART A, APPENDIX 1, Guideline for Holdover Times
IATA AHM 612 Airside Performance Evaluation Program IATA AHM 462 Safe Operating Practices In Aircraft Handling / 10. De/Anti Icing Of Aircraft
PEGASUS - PG-KU-PR-008 Doküman Yönetim Sistemi ve Kayitlarin Kontrolü Prosedürü
ICAO Doc 9640-AN/940, Manual of Aircraft Ground De-icing/Anti-icing Operations
IOSA GRH 4.2.1, 4.2.2, 4.2.3, 4.2.4, 4.2.5
IATA Reference Manual for Audit Programs (IRM)
SHT OPS 1 (Item No: 77/Madde 77-Buz ve Diğer Kirleticiler – Yer Usulleri)

A320 AIRCRAFT CHARACTERISTICS - Airport and Maintenance Planning (May 01 /17- 5-9-0) Boeing 737-600/-700/-700IGW(BBJ)/-800/-900 Airplane Recovery Document (PAGE DATE: Dec 01/2006)
Boeing 737-600/700/800/900 Aircraft Maintenance Manual-Cold Weather Maintenance-Servicing-12-33
Airbus Type: A318/A319/A320/A321 Aircraft Maintenance Manual-12-31 Aircraft Protection European Aviation Safety Agency (European Union) – EASA Safety Information Bulletin Airworthiness – Operations / SIB No.: 2015-27 / Issued: 16 December 2015 / Subject: Potential Adverse Effect of Alkali Organic Salt-based Aircraft De-Icing Fluids on Anti-Icing Holdover Protection and Potential Aircraft Corrosion.
Pegasus - Sabiha Gökçen Havalimani De-Anti Icing Lokal Prosedürü PG-AH-PR-001
Pegasus - Açık Sepet De-Icing Aracı Kullanma Talimatı PG-AH-TL-036
AMS1424 Deicing/Anti-Icing Fluid, Aircraft SAE Type 1
AMS1428 Fluid, Deicing/Anti-Icing, Non-Newtonian (Pseudoplastic), SAE Types II, III, IV
ARP1971 Aircraft Deicing Vehicle – Self-Propelled
ARP5058 Enclosed Operator's Cabin for Aircraft Ground Deicing Equipment
AS5116 Minimum Operational Performance Specification for Ground Ice Detection Systems
ARP5660 Deicing Facility Operational Procedures
AS5681 Minimum Operational Performance Specification for Remote On-Ground Ice Detection Systems
AS5900 Standard Test Method for Aerodynamic Acceptance of SAE AMS1424 and SAE AMS1428 Aircraft Deicing/Anti-icing Fluids
AIR6232 Aircraft Surface Coating Interaction with Aircraft Deicing/Anti-icing Fluids
AIR6284 Forced Air or Forced Air/Fluid Equipment for Removal of Contaminants
AS9968 Laboratory Viscosity Measurement of Thickened Aircraft Deicing/Anti-icing Fluids with the Brookfield LV Viscometer
Airbus Getting to Grips with Cold Weather Operations
Airbus AMM November 2019

All necessary publications, current broadcastings and De/Anti-Icing Manual are accessible via electronic library:" https://document.flypgs.com/" for external users and QDMS for internal users.

Annex 2 System Of Amendment And Revisions

This document has been prepared by GROUND.DOC Team ("GROUND.DOC@flypgs.com") and accepted by Executive Vice President - Ground Operations in accordance with company standards and Pegasus PG-UI-EK-001, OM PART A Chapter 8 and based on the references given in this manual.

Revisions are made by GROUND.DOC in accordance with the latest published references which is based on Annex 1.

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4	COMPLIANCE MONITORING MANAGEMENT		√
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8	PEGASUS FLIGHT ACADEMY		√
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