Introduction

This Incheon International Airport De-icing/Anti-icing Manual describes the general operational procedures provided by Incheon Int’l Airport Corporation, airlines and ground handlers for the de/anti-icing of aircraft during annual de/anti-icing period.

In order to secure that Incheon International Airport meets the international standards for de-icing/anti-icing and related operation procedures, this De-icing/Anti-icing Manual reflects international criteria and recommendations on the basis of AS6285, AS6286, and ARP6257 regulations of the SAE International, a global association that consists of aerospace engineers and related technical experts.

Airlines and ground handlers put in service at Incheon International Airport are responsible to create safe airport operation environments in reference to relevant procedures so that the quality of de-icing/anti-icing in the airport premises can be managed and provided in accordance with international standards.

Airlines and ground handlers need to establish their own procedures in accordance with those specified in this De-icing/Anti-icing Manual, and they shall notify Incheon International Airport Corporation if they find any aspect of this manual that is different from their actual practices, inapplicable, or impractical.

This De-icing/Anti-icing Manual is made public at the website of Incheon International Airport (http://www.airport.kr) so that it can be available anytime to airlines and ground handlers. If there is any inquiry or any aspect that needs to be modified, please contact the Apron Control Tower (Tel.: 032–741–2606; Transmission: 032–741–2600).

Vice President of Operations Division,
Incheon International Airport Corporation
## Manual Revision

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<th>Revision Date</th>
<th>Basis</th>
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Incheon International Airport De/Anti-icing Manual

Chapter 1  Overview

1. Purpose

The procedure is to specify the overall procedure to be performed by the Incheon International Airport Corporation (hereinafter referred to as the “Airport Corporation”) and airlines/service providers in relation to aircraft de-icing/anti-icing performed at the Incheon International Airport (hereinafter the “Incheon Airport”) for safe and efficient implementation of de-icing/anti-icing.

2. Scope of Application

This manual is applicable to the Airport Corporation and airlines/service providers that handle duties related to aircraft de-icing/anti-icing service.

3. Roles & Responsibilities

3.1. The Airport Corporation is responsible to manage distribution and revision of this Manual.

3.2. The Airport Corporation/airlines/service providers may review the contents of this Manual and apply them to their duties related to de-icing/anti-icing service.

3.3. Airlines/service providers may present opinions on aspects that need to be added, revised, or deleted. For this purpose, The Airport Corporation/airlines/service providers may request for meetings frequently or on a regular basis for discussion.

4. Reference

4.1. What is described in this procedure on de/anti-icing facility and its operation at the Incheon Airport is based on the Aeronautical Information Publication (hereinafter the “AIP”) and the Incheon Airport Airside Safety Manual (hereinafter the “ASM”). Provisions not mentioned in this procedure also follow those bases.

4.2. This procedure follows the de/anti-icing-related standards set forth by aircraft manufacturers and airworthiness authorities and manuals provided by individual aircraft manufacturers. Provisions
not mentioned in this procedure also follow those bases.

4.3. AS6285D ‘Aircraft Ground De-icing/Anti-icing Processes’

4.4. AS6286B ‘Aircraft Ground De-icing/Anti-icing Training and Qualification Program’

4.5. FAA ‘Standardized International Aircraft Ground Deice Program’

4.6. AMS1424 ‘Fluid, Aircraft De-icing Anti-icing, SAE Type I’

4.7. AMS1428 ‘Fluid, Aircraft De-icing Anti-icing, Non-Newtonian(Pseudoplastic), SAE Type II, III, and IV’
Chapter 2  De/Anti-icing Pad and Operation of De/Anti-icing Equipment

1. Overview of De/Anti-icing Pad

1.1. Incheon Apron Control Tower (including Apron Control Tower 1/2, hereinafter the “Apron Control Tower”) has the authority for access control of entering/leaving de/anti-icing pads at the Incheon Airport.

1.2. The current state of de/anti-icing pads at the Incheon Airport is shown in <Table 1> below:

<table>
<thead>
<tr>
<th>Zone</th>
<th>Pad #</th>
<th>Aircraft Code F Pad</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alpha</td>
<td>South</td>
<td>821, 822, 823, 825</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(A380) 823</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(B748) 823, 825</td>
</tr>
<tr>
<td>Mike</td>
<td>South</td>
<td>831, 832, 833, 834</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(A380)(B748) 831</td>
</tr>
<tr>
<td></td>
<td>North</td>
<td>551, 552, 553, 554, 557</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(A380)(B748) 551, 552, 557</td>
</tr>
<tr>
<td>Delta</td>
<td>South</td>
<td>841, 842</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(A380) 842</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(B748) 841, 842</td>
</tr>
<tr>
<td></td>
<td>North</td>
<td>851, 852</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(A380) 852</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(B748) 851, 852</td>
</tr>
<tr>
<td>Terminal</td>
<td>Center</td>
<td>814, 815, 816, 817</td>
</tr>
<tr>
<td>Central De-icing</td>
<td>301, 302, 303, 304</td>
<td>(A380)(B748) 302, 303, 304</td>
</tr>
</tbody>
</table>

<Table1> Current State of De/Anti-icing Pads

1.3. De/anti-icing pads are divided by “Zone” (hereinafter “Zone”) and “Pad Number” and they are located as shown below in <Figure 1>.
1.4. For detailed drawings of each de-icing/anti-icing pad and aircraft entry/exit routes, refer to Appendix 1.

1.5. Detailed markings in a de-icing/anti-icing pad are presented in <Figure 2> below:
2. De/anti-icing Preparation & Phase Issuance

2.1. This chapter defines measures to be taken by the Apron Control Tower in the process of preparing de/anti-icing and issuing the phase.

2.2. The Apron Control Tower receives snow forecast from the Integrated Operation Center and then provides individual airlines/service providers with information necessary for the preparation for de/anti-icing situations by means of wired communication or text message.

2.3. The Apron Control Tower issues “De/Anti-icing Phase” taking into account overall de/anti-icing handling progress and communication in air traffic while de/anti-icing situation progresses.

2.4. The criteria and details of the issuance of De/Anti-icing Phase are shown in <Table 2> below, and airlines may provide passengers with service information in reference to this material.

<table>
<thead>
<tr>
<th>De/Anti-icing Phase</th>
<th>Issuance Criteria (EOBT – ATD on average)</th>
<th>Remarks</th>
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<tr>
<td>Phase 1 (Blue)</td>
<td>Delay of less than 60 minutes on average</td>
<td>Phase 2 can be issued if delay is expected to worsen</td>
</tr>
<tr>
<td>Phase 2 (Yellow)</td>
<td>Delay of 60 minutes to less than 120 minutes on average</td>
<td>Phase 3 can be issued if delay is expected to worsen</td>
</tr>
<tr>
<td>Phase 3 (Orange)</td>
<td>Delay of 120 minutes to less than 240 minutes on average</td>
<td>Phase 4 can be issued if delay is expected to worsen</td>
</tr>
<tr>
<td>Phase 4 (Red)</td>
<td>Delay of more than 240 minutes on average</td>
<td></td>
</tr>
</tbody>
</table>

2.5. The Apron Control Tower delivers information on the allocation of de/anti-icing pad to individual airlines/service providers via the Integrated Information System (hereinafter the “IIS”) and may use another communication network, if necessary.

3. Allocation of De/Anti-icing Pad

3.1. This chapter defines measures to be taken by the Apron Control Tower in respect of the allocation of de/anti-icing pads for
3.2. The Apron Control Tower allocates de/anti-icing pads (or zones) to airlines/service providers so that de/anti-icing works are performed in the assigned pad.

3.3. The Apron Control Tower considers the followings when allocating de/anti-icing pads.

3.3.1. Efficiency of overall air traffic handling
3.3.2. Appropriate movement path of an aircraft to be de-iced
3.3.3. Efficiency of equipment of service providers
3.3.4. Priority of aircraft departure according to the air traffic flow management (hereinafter the “ATFM”)
3.3.5. Optimum movement path up to the departure runway after de-icing is completed
3.3.6. Other aspects that are viewed to be considered

3.4. The Apron Control Tower issues an appropriate movement path and provides traffic information so that an aircraft can move to the assigned de/anti-icing pad.

3.5. The Apron Control Tower may change the de/anti-icing pad already assigned in any of the following cases:

3.5.1. A change is necessary due to overall air traffic handling
3.5.2. The de/anti-icing pad is not prepared for de/anti-icing yet
3.5.3. A nearby de/anti-icing pad becomes available
3.5.4. A certain airline/service provider requests an unavoidable change and it is possible to accept the request
3.5.5. It is deemed necessary for other reasons

3.6. The Apron Control Tower notifies the service provider of change in the assignment of de/anti-icing pad, if necessary, by using an available communication network (de-icing TRS, etc.).

3.7. The Apron Control Tower may assign and operate a staging area for each zone in the following cases and the de/anti-icing pad on standby is temporarily excluded from the de/anti-icing zone.

3.7.1. An aircraft needs to be on standby due to an adjustment of departure priority caused by the ATFM
3.7.2. A delay factor occurs due to a specific reason (maintenance, etc.) of
an aircraft whose de-icing is complete

3.7.3. A reason arises that keeps a de-iced aircraft from leaving the de/anti-icing pad

3.7.4. It is deemed necessary for other reasons

4. De/Anti-icing Equipment on Standby

4.1. This chapter defines measures to be taken by service providers in respect of standby of de/anti-icing equipment.

4.2. A service provider maintains de/anti-icing equipment under their control to keep them in the optimized condition for well-ordered de/anti-icing operation in winter during which frequent de/anti-icing is expected.

4.3. A service provider maintains the communication network (de-icing TRS, etc.) linked with the Apron Control Tower to keep it in the optimized condition (available for reception/transmission) for the preparation of de/anti-icing operation.

4.4. A service provider prepares for the operation of de/anti-icing equipment as soon as possible upon the receipt of the information that de/anti-icing is expected (weather forecast, work schedule notification from the Apron Control Tower or airline).

4.5. As soon as a service provider completes the preparation to dispatch de/anti-icing equipment, it notifies the Apron Control Tower of the following information through an available communication network (de-icing TRS, etc.).

4.5.1. Location in which the de/anti-icing equipment is on standby

4.5.2. Quantity of de/anti-icing equipment on standby

4.5.3. Estimated time required to dispatch (move) to the de/anti-icing pad

4.5.4. Other information deemed necessary

5. Arrangement of De/Anti-icing Equipment

5.1. This chapter defines measures to be taken by the Apron Control Tower/service provider in respect of the arrangement of de/anti-icing equipment.

5.2. The Apron Control Tower allocates a de/anti-icing pad (or de-icing zone) where the service provider’s de/anti-icing equipment will
perform the operation, taking into account the air traffic and operation situations, and notifies the service provider of the allocated pad through an available communication network (de-icing TRS, etc.).

5.3. The service provider moves the equipment to the de/anti-icing pad (or de-icing zone) allocated by the Apron Control Tower to prepare for the de/anti-icing operation, and in an inevitable case has separate consultation with the Apron Control Tower to adjust the allocation.

5.4. When the de/anti-icing equipment is located at the allocated de/anti-icing pad (or de-icing zone) and the preparation for de/anti-icing operation is complete, the service provider notifies the Apron Control Tower of the fact through an available communication network (de-icing TRS, etc.).

5.5. The annual equipment arrangement is determined through discussions among the Airport Corporation, airlines and service providers before the winter season arrives every year.

5.6. Each year's equipment arrangement per service provider may be changed as necessary to maintain efficient airport operations and traffic flow, in which case service providers shall actively cooperate.

6. Information Exchange during De/Anti-icing

6.1. This chapter defines elements required for information exchange between the Apron Control Tower and service providers in the course of de/anti-icing operation.

6.2. The Apron Control Tower and service providers use a dedicated TRS (hereinafter the “de-icing TRS”) for communication in the course of de/anti-icing operation.

6.3. The use of an alternative communication means for service providers is allowed only temporarily. Therefore, service providers must take necessary measures rapidly in order to recover the de-icing TRS into normal service.

6.4. The service provider clearly maintains the standby of the de-icing TRS network for smooth communication of information. If it is not possible to keep the de-icing TRS network, it takes the following measures.
6.4.1. Notify the Apron Control Tower by using an alternative communication means (wired/wireless communication, etc.)

6.4.2. Take measures to normalize the de-icing TRS network (equipment replacement, request for maintenance, etc.)

6.4.3. Notify the Apron Control Tower if the de-icing TRS is recovered.

6.5. The Apron Control Tower may give service providers instructions required to smoothly proceed with de/anti-icing operation.

6.6. In case of any change (including the state of equipment movement and withdrawal of the equipment) during de/anti-icing, the service provider shall notify the Apron Control Tower of such change including the following information.

6.6.1. Overview of a situation (e.g. fill-up of fluid, rotation of personnel, de-icing/anti-icing completion, etc.)

6.6.2. Estimated recovery time in the case of a temporary movement (e.g. expected to take approx. 00 minutes)

6.6.3. Other information deemed necessary

6.7. The Apron Control Tower and service providers notify each other of any unusual situation that takes place in the course of de/anti-icing as soon as possible.

7. De/Anti-icing and Handling Priority

7.1. This chapter defines measures to be taken by service providers at the de/anti-icing phase and measures to be taken by the Apron Control Tower/service providers in respect of the operation priority.

7.2. In case an aircraft approaches a de/anti-icing pad on standby, the service provider cooperates with related personnel to take appropriate ground safety measures for de/anti-icing and aircraft stand, and then performs de/anti-icing works.

7.3. The priority of de/anti-icing is based on de/anti-icing pad approach time. If any reason arises to change the priority, it shall be notified to the Apron Control Tower immediately. If necessary, the control tower notifies the flight crew of this.

7.4. If the preparation of de/anti-icing operation is insufficient and as a result it is not possible to start de/anti-icing after the aircraft
approaches the de/anti-icing pad, the service provider notifies the Apron Control Tower of the fact immediately.

7.5. If a delay in de/anti-icing is attributable to an airline, the Apron Control Tower notifies the service provider to relocate the de/anti-icing equipment at the stand to the de/anti-icing pad with the next priority, and the service provider cooperates with the Apron Control Tower as fully as possible.

7.6. The Apron Control Tower may prevent additional delay of another aircraft by lowering the priority of an aircraft whose de/anti-icing is delayed due to a reason attributable to the airline (absence of a mechanic, etc.).

8. De/Anti-icing Operational Procedure for Multiple-use Stand

8.1. This chapter specifies the de/anti-icing operation procedure for multiple-use stand (Terminal Center Zone, #814-817) located at the center of the Passenger Terminal 2 (Apron 3 area).

8.2. As to B747-400 and B777-300ER where de/anti-icing at the multiple-use stand (hereinafter “TC zone”) has been implemented, it is possible to depart only when the parking ramp at the rear side is empty after de-icing/anti-icing.

8.3. An Aircraft to be de/anti-iced at the TC zone must be aligned to nose itself toward the Passenger Terminal 2 direction (#814-815:East, #816-817:West) in order to prevent jet blast on personnel working near Passenger Terminal 2.
8.4. If an aircraft must nose itself toward a different direction due to de/anti-icing operation conditions or ground traffic conditions, the Apron Control Tower shall notify service providers of the fact and provide advice for the pilot (use of minimum power, etc.) so that there is no slipstream effects when the aircraft departs.

8.5. If de/anti-icing personnel and equipment need to pass through the aft side of the aircraft under the service, the service provider shall check aircraft taxi-out at the anti/icing pad on the back and if the taxi-out is expected, they shall not move.

8.6. In principle, service vehicles shall use GSE roads when they move between de/anti-icing pads in the east (#814-#815)/west(#816-#817) inside the TC zone.

8.7. However, an approval from the Apron Control Tower shall be delivered from the controlling department of the service provider to traverse a RB guiding line. In this case, such movement shall be made using the shortest route in a rapid manner.
Chapter 3 De/Anti-icing Operation

1. General Standards for De/Anti-icing
   1.1. This chapter states general aspects of de-icing/anti-icing service. Each airline or service provider shall comply with their own regulations in reference to this material.
   1.2. All the technical standards and procedures regarding de/anti-icing works follow standards in the manuals and procedures stated in the “Reference” in Article 4 of Chapter 1.

2. De/Anti-icing Service Safety Rules
   2.1 The service personnel shall wear the specified uniform and safety gears. While working in a service area or a high place, they shall wear safety gears such as protective mask, safety belt, safety helmet, etc.
   2.2 The mixing ratio and type of fluids are decided through a consultation or agreement between the airline and service provider in accordance with international standards.
   2.3 After de-icing/anti-icing service is completed, the equipment and personnel shall move to the stand-by area and remain there until the aircraft moves out of the de-icing/anti-icing pad completely.
   2.4 During manual de-icing/anti-icing, it is prohibited to tap, stick, or scratch the aircraft surface to remove ice.
   2.5 It is prohibited to use a sharp tool in order to remove ice on the aircraft surface.
   2.6 De-icing/anti-icing service shall be performed only in a designated area. After the service is completed, every FOD generated shall be removed.
   2.7 Be sure that there is no leakage of de-icing/anti-icing fluids during the service out of the area. Environmental pollution shall be prevented by inducing any leak within the de-icing/anti-icing pad.

3. De-icing
   3.1. De-icing means to remove layers of snow, frost, ice, etc. outside
the aircraft by using heated water or de-icing fluids mixed with heated water.

3.2. Provisions on de-icing methods, criteria/methods of spraying de-icing fluids, restrictions, aircraft condition after de-icing and so forth follow standards in the manuals and procedures stated in the “Reference” in Article 4 of Chapter 1.

4. Anti-icing

4.1. Anti-icing means to spray or apply fluids or fluids mixed with water outside the aircraft in order to prevent snow, frost, ice, etc. from being accumulated or frozen on the aircraft surface.

4.2. Provisions on anti-icing methods, criteria/methods of spraying anti-icing fluids, restrictions, aircraft condition after anti-icing and so forth follow the documents stated in the “Reference” in Article 4 of Chapter 1.

4.3. If anti-icing is performed in parallel with de-icing, only TWO-STEP is applied at the Incheon Airport.

4.4. Hold Over Time

This means the time within which the fluids sprayed or applied on the aircraft surface can prevent snow, frost, ice, etc. from being frozen on the aircraft surface. The details are as below:

4.4.1. The Hold Over Time is determined by the anti-icing fluids that remains on the aircraft surface. As for ONE-STEP de-icing/anti-icing, the Hold Over Time starts along with the operation. As for TWO-STEP de-icing/anti-icing, the Hold Over Time begins in the second step when anti-icing fluids starts to be applied.

4.4.2. The Hold Over Time is over when the designated time ends or when the aircraft surface starts to be frozen.

5. Fluids

5.1. De-icing/anti-icing fluids (hereunder, ‘fluids’) means a chemical solvent that removes and decreases the freezing point of ice, snow, sleet, and frost in order to make it difficult for ice, snow, frost, etc. to be accumulated on the surface for a certain time.
5.2. Only those fluids that satisfy the criteria in the documents stated in the “Reference” in Article 4 of Chapter 1 must be used as de/anti-icing fluids.

5.3. Types of fluids

5.3.1. Type I fluids

5.3.1.1. Type I fluids are used only at the de-icing and the first step out of Two-Step.

5.3.1.2. Each service provider prepares a fluids by diluting it according to an appropriate dilution ratio.

5.3.1.3. Fluids shall be of a color that is recommended at AMS1424.

5.3.2. Type IV fluids

5.3.2.1. Type IV fluids are used only at the anti-icing and the second step out of Two-Step.

5.3.2.2. Service providers may decide the fluids mixing ratio through consultation or agreement with the airline, but using undiluted 100% pure fluids is recommended.

5.3.2.3. Fluids shall be of a color that is recommended at AMS1428.

5.4. Handling of fluids

Since de-icing/anti-icing fluids is a chemical product that affects environments, it is required to prevent unnecessary leakage of fluids that is being handled and to comply with national environment/public health laws as well as the manufacturer’s MDSD.

5.5. Fluids Storage and Management

5.5.1. In order to prevent contamination by another type of fluids, Type I and Type IV shall be kept separate.

5.5.2. Fluids shall be stored in the exclusive tank that is made of a material recommended by the fluids producer.

5.5.3. In order to prevent contamination, a label shall be attached on the storage tank, indicating the fluids type, product name, density, and effective period.

5.5.4. Service providers shall check if the storage tank involves corrosion or contamination. If it does, the storage tank shall be repaired or replaced.

5.6. The effective period of de-icing/anti-icing fluids is specified by the
fluids producer.

5.7. Fluids transportation system
Since Type 4 fluids can be degraded by a mechanical reaction or chemical contamination, only compatible pumps, control valves, pipes, hoses, and nozzles shall be used. The fluids transportation system shall be designed to prevent a type of fluids from being mixed with another producer’s fluids. A label shall be attached on the inlet and outlet parts.

5.8. De-icing/anti-icing fluids shall be heated in accordance with the producer’s guideline, and heated fluids shall be checked regularly.

5.9. In order to prevent contamination/degradation during fluids feeding and transportation, the fluids producer’s recommendations shall be followed. In order to prevent fluids from being contaminated, the equipment being used shall be maintained clean before it is filled up initially by de-icing/anti-icing fluids.

5.10. Fluids quality management check
In order to secure that the basic limit of de-icing/anti-icing service is not exceeded, the specific requirements including the proper density of fluids used for aircraft surface de-icing/anti-icing shall be met consistently. Service providers that store fluids shall conduct tests on the levels of contamination, acidity, viscosity, and refraction according to the producer’s recommendations. Results of every test shall be kept.

6. Precautions for De-icing/Anti-icing

6.1. Operation shall be performed with the left side and right side of the aircraft completely symmetric. Thus, operation shall be performed on both sides even if only one side needs the operation.

6.2. It shall be avoided to spray fluids directly on the following areas:
   6.2.1. Terminal box, electronic components (various connecting parts, etc.), brake, wheel, exhaust port, and thrust reverser;
   6.2.2. Differential pressure gauge, static pressure gauge, air velocity/pressure/angle detector, etc.
6.2.3. Engine (engine core, sensor, etc.), APU, intake port/exhaust port, etc.

6.2.4. Aircraft cockpit and passenger window

6.3. De-icing/anti-icing service should be continuous and performed within a time as short as possible. If the service is discontinued, the crew should be informed of the following aspects:

6.3.1. Reason of discontinuance
6.3.2. Measures to be taken to resume the service
6.3.3. Expected time of service delay

Before the service is resumed, the crew should be consulted.

7. Reminders

7.1. Aircraft body condition after de-icing/anti-icing

After de-icing/anti-icing service is completed, be sure that the major surface of the aircraft parts including the following shall involve no frost, ice, thin ice, or ice accumulation prior to take-off:

7.1.1. Wing, tail, control surface
7.1.2. Differential pressure gauge, static pressure gauge, body sensor
7.1.3. Engine, etc.
7.1.4. Air conditioner inlet and outlet
7.1.5. Landing gear, etc.
7.1.6. Fuel tank ventilation
7.1.7. Aircraft body
7.1.8. Cockpit window and nose

7.2. Contamination check prior to de-icing/anti-icing

Contamination check shall be performed, as recommended by the aircraft manufacturer, on the aircraft body and other surface areas or parts stated in Paragraph 6.1. Be sure that sufficient clear view is secured during the service, and every pollutant shall be removed in a way of de-icing/anti-icing. If necessary, anti-icing shall be performed.

7.3. Post De-icing/Anti-icing check

7.3.1. Post De-icing/Anti-icing check (hereunder, “Post check”) shall be performed by a qualified employee with sufficient clear view is secured over the area where de-icing/anti-icing service has been completed (e.g.: while in the de-icing/anti-icing vehicle, on a ladder, or with
another appropriate access means).

7.3.2. After completing de-icing/anti-icing service, the flight crew shall confirm that the post check has been performed prior to aircraft take-off. Without visual inspection through post check, departure is not permitted.

7.3.3. For post check, be sure that frost, snow, ice, and thin ice have been removed from every area where the service was performed in consideration of the need for de-icing/anti-icing service over the general body including such parts as wing, horizontal stabilizer (every side at the top/bottom), vertical stabilizer, differential pressure gauge, static pressure gauge, thermometer, and angle meter. In addition, it shall be checked if the aircraft surface has been coated properly with anti-icing fluids after de-icing/anti-icing service.

7.3.4. Ice formation found during the post check shall be reported to the crew immediately, if any, and shall be removed through additional de-icing/anti-icing service. After additional de-icing/anti-icing service, post check shall be implemented again.

7.3.5. A certain type of aircraft may need additional inspection such as special clear-ice check (tactile inspection on wings, etc.). Such special inspection cannot be replaced with post check. Each airline shall appoint a certain inspector for such special inspection.

7.3.6. When a service provider performs post check, it may be performed in a separate process from de-icing/anti-icing service. However, if it includes de-icing/anti-icing service, the following aspects need to be included. In addition, the service provider shall report to the airline how to perform post check for the winter season if the latter asks for it.

7.3.6.1. During de-icing/anti-icing service, the spray man shall check, at a location near the aircraft surface, whether every ice formation (Excluding cold-soaked fuel frost on the lower surface of wings permitted by the aircraft manufacturer and airport; and light frost permitted by the aircraft manufacturer and airport) is being removed. In addition, the spray man shall check whether a sufficient amount of fluids is applied so that a layer of anti-icing fluids is formed properly.

7.3.6.2. Even if there is no request for de-icing/anti-icing service on the
aircraft body, it shall be confirmed that there is no ice formation on the body. (except light frost permitted by the aircraft manufacturer and airport)

7.3.6.3. If any found ice formation exceeds the upper limit, it shall be reported to the crew and additional de-icing/anti-icing service shall be performed to remove it. Post check shall be then performed again.

7.3.6.4. After de-icing/anti-icing service is completed, the service provider shall perform visual inspection on the area where de-icing/anti-icing service has been completed in order to secure that every ice formation has been removed. (If frost removal has been performed in a weather condition where no frost is likely to be formed any more, this procedure may be omitted.)

7.4. Check before take-off
The flight crew shall continue checking the weather condition even after de-icing/anti-icing service. Before take-off, the crew shall check if the holdover time is still valid and if there is any part of the aircraft where there remains any frozen pollutant. This step is taken at the aircraft cockpit in general.

8. Communications
8.1. General
8.1.1. The person who communicates with the flight crew shall be able to speak English at least for basic communication.
8.1.2. For information on standard terminology for communication, refer to Appendix 4 Standard Phraseology and Appendix 5 ICAO Phonetics and Examples of Use.
8.1.3. Communication between qualified staff and flight crew must be written or verbal form. If de/anti-icing works are performed after the aircraft door is closed, flight interphone (headset) and VHF radio may be used. Electronic Message Board may be used as well in case of “Off stand” situation.
8.1.4. Iceman
During de-icing/anti-icing service, the iceman communicates with the aircraft by means of VHF Radio. Main tasks include monitoring
stoppage of the aircraft on the de-icing/anti-icing pad, safety of vehicles and workers, entry/exit, and other special events; and notifying the pilot and other de-icing/anti-icing workers of relevant information. For information on standard terminology for communication between the iceman and pilot, refer to Appendix 6 Standard Phraseology for Communication between the Iceman and Pilot.

8.1.5. Flag hand signals other than “All Clear” signal may not be used.

8.1.6. If frost is removed before flight crew arrives and frost is not formed any longer, this step may be skipped.

8.2. Communication before starting De/anti-icing

8.2.1. Entry into the de-icing/anti-icing pad
Every operator entering the de-icing/anti-icing pad shall carry the TRS (channel: KAS Iceman, AAP Iceman, SHP Iceman, SPI Iceman) in order to communicate with the service provider or Ice Man. In addition, when other operating personnel should enter the de-icing/anti-icing pad as well, they shall carry the TRS to communicate with the Ice Man.

8.2.2. Prior to de-icing/anti-icing service, the flight crew shall take measures for de-icing/anti-icing and check the general condition of the aircraft. (e.g.: areas that need de-icing/anti-icing service, the need for anti-icing, special requests, etc.). Prior to the service, the service provider shall wait until the flight crew completes aircraft condition checking.

8.2.3. If de/anti-icing is performed in absence of flight crew, the personnel designated by the airline performs the above-mentioned procedure.

8.3. Communication Process During De-icing/Anti-icing

8.3.1. De-icing/anti-icing service personnel shall notify the Ice Man and service providers of any abnormal situations of the aircraft or any unusual situations. The service provider shall then report to the control tower.

8.3.2. When de-icing/anti-icing service is discontinued (for fluids refilling, etc.), the service provider shall notify the flight crew of the reason of discontinuance, measures taken, and expected time of delay. When the service is resumed, de-icing/anti-icing shall be performed again on the surface where the previous service was done. The
Holdover Time of the previous de-icing/anti-icing service will not be valid when the service is resumed.

8.4. Post De-icing/Anti-icing Communication

8.4.1. In case flight crew does not receive all the information including anti-icing code, the aircraft is not cleared for departure for flight operation.

8.4.2. All the information including anti-icing code must be transmitted by qualified staff. Once the work is completed, such information will include the information that all ice was removed, de/anti-icing complete and all pieces of equipment removed from the aircraft.

8.4.3. In addition, if anti-icing is performed, all the information that can be used to calculate the holdover time according to meteorological situations must be delivered.

8.5. Anti-icing Code

8.5.1. The information that consists of anti-icing code shall be recorded and notified to flight crew and shall include the last step (anti-icing) work in the Two-Step.

8.5.2. Anti-icing code may be omitted in case the holdover time does not have to apply (e.g. local frost prevention in cold-soaked wing areas, symmetrical local area de-icing, de-icing of specific areas (removal of impact ice in leading edges, etc.)

8.5.3. In this situation, it shall be notified to flight crew that only de-icing was performed and application of the holdover time is not necessary. Also, the completion of post check shall be notified.

8.5.4. Anti-icing code report includes the followings (refer to Appendix 1):

8.5.4.1. The fluids Type(Type I, II, III, or IV)

8.5.4.2. The fluids name, if necessary (manufacturer of the anti-icing fluids used and the name of the fluids) - This information on Type I fluids is unnecessary.

8.5.4.3. fluids dilution ratio (e.g. 100% = 100% fluids, 75% = 75% fluids and 25% water)

8.5.4.4. Start time of the last step of TWO-STEP (anti-icing) (in local time at the departure airport. Hours and Minutes)

8.5.4.5. The name of equipment used for de/anti-icing, the number of workers, the amount of the fluids used
8.5.4.6. Performance date (e.g. YYYYMMDD, 20170609) - This information is for the purpose of recording and storing. It is selectively determined whether or not to deliver this information to flight crew).

8.5.4.7. Whether or not post de-icing/anti-icing check was complete - This must also include whether or not special check additionally required for certain types of aircraft was completed.

**EXAMPLE:** (Refer to Appendix 1 Template/Sample)

The last step of a de-icing/anti-icing procedure is the application of a mixture of 75% Type II fluids 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 / 75% / MANUFACTURER, BRAND X / 1335 / 20FEB16 / POST De-icing/ANTIICING CHECK COMPLETED” - Sending anti-icing code to flight crew may be replaced by the following means. (e.g. written on paper, EMBs, ACARS, EFBs, etc.)

8.6. Post de-icing/anti-icing check and anti-code notification

Airlines shall make it clear what company will perform post de-icing/anti-icing check and anti-code notification. If de-icing/anti-icing service and post de-icing/anti-icing check are conducted by different companies, the anti-code shall not be notified until the post de-icing/anti-icing check is completed.

In addition, the company entrusted with de-icing/anti-icing service shall provide all the information to the company entrusted with post de-icing/anti-icing check. The company that performs de-icing/anti-icing service takes the responsibility for the general result of the service performed by the de-icing/anti-icing service provider.

8.7. All clear signal

8.7.1. Flight crew shall receive from qualified ground staff the information that confirms that all de/anti-icing was completed and all the personnel and equipment removed before relocating or moving the aircraft.
8.7.2. Flight crew shall request taxi-out approval to leaving from the de-icing pad after verifying that there are no obstacles on the ground.

9. Engines On De/Anti-icing Procedures

9.1. Purpose

9.1.1. The purpose of this section is to provide guidance for the methods and procedures for performing engines on aircraft de/anti-icing at the Incheon International Airport.

9.1.2. The procedures outlined in this section may be used under light to moderate de/anti-icing conditions.

9.2. De/anti-icing of aircraft with engines running

9.2.1. General

To maximize the holdover capabilities of the fluids used, the Incheon International Airport can receive a service to de/anti-ice certain aircraft with engines running.

9.2.2. Airport authority

A service provider willing to provide the aforementioned service shall notify the Incheon International Airport Corporation.

9.2.3. Airline

The airline shall have provision for engines running de/anti-icing operations within their own approved program/procedures. Where permitted, the flight crew shall configure their aircraft for engine on de/anti-icing in accordance with their applicable procedures (i.e. Aircraft Flight Manual, Flight Ops Manual, etc.). Should these conditions not be met, then de/anti-icing shall be conducted with the engines off.

9.3. Equipment

9.3.1. Approved equipment

A service provider shall approve equipment to be used for engines on de/anti-icing. Approved for engines on de/anti-icing means that the equipment has been tested in live conditions to ensure it can withstand jet blast at idle power when in position behind the engines. It ensures that any original features attached to the equipment i.e. number plate, obstruction light etc. are secure and will not blow off.
Further measures may be required on equipment to secure attachments once tested in live conditions.

Due to engine ingestion and FOD concerns, the de/anti-icing truck driver must ensure that there are no loose articles or unsecured pieces of equipment on the truck. The driver must also ensure that all truck doors, windows and access panels, including the hood are closed and properly secured. The Bucket Operator must ensure that all loose articles and equipment are stowed and secured.

9.3.2. <Table 3> below shows aircrafts in Incheon International Airport on which Engine-On de-icing/anti-icing can be performed.

<table>
<thead>
<tr>
<th>Aircrafts Capable of Engine-On De-icing/Anti-icing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Airbus</td>
</tr>
<tr>
<td>Boeing</td>
</tr>
<tr>
<td>B737, B757, B767, B777, B787</td>
</tr>
</tbody>
</table>

*Table 3* Aircrafts Capable of Engine-On De-icing/Anti-icing

9.4. De/anti-icing zones and pads

Engines on de/anti-icing may be performed at all of the de/anti-icing zones and de/anti-icing pads in Incheon International Airport. Airlines/service providers shall secure that during Engine On de-icing/anti-icing service, no foreign substances such as ice or fluids the ground enter the engine.

9.5. Precautions for de-icing/anti-icing facility operation

All personnel must exercise extreme caution when working around operating aircraft engines. Hazard areas are present at the engine inlet as well as exhaust. The hazards around the exhaust are more obvious due to sensory clues such as noise, wind and heat. As much care shall be exercised around the inlet as the hazards may not be so apparent. Inlet vortices are normally only visible when water or steam exhaust is present in them.

9.5.1. Engine exhaust

The de-icing/anti-icing equipment can be operated in areas where the engine jet wash is 20m/s (40Knots) or less as stated in the IATA Airport Handling Manual (AHM 913 – Basic safety requirements for aircraft ground support equipment). When the service is to be
performed in the range of engine jet wash from 20m/s (40Knots) to 33m/s (65Knots), more than usual attention must be paid. The operators shall make careful judgment in comprehensive consideration of various environmental aspects. Operators may enter the authorized engine exhaust area when positioning for the tail or fuselage is not reachable from a position outside of the engine exhaust.

Due to safety considerations, all operating engines must be maintained at ground idle thrust settings. These must not be changed without the express permission of the Ice man. This also includes the use of any engine systems, where such use causes an increase in engine thrust.

9.5.2. Engine inlet
During an Engine On de/anti-icing, the de/anti-icing equipment must maintain a safe distance according to each manufacturer’s manual for the aircraft model (in line with the Ground Idle Power), and all personnel are kept away from the dangerous areas at the front and the sides of the engine.
9.5.3. Movement of de/anti-icing equipment around aircraft

9.5.3.1. An important component of a safe and efficient de/anti-icing operation is the use of pre-determined equipment movement patterns around an aircraft. These patterns ensure that operators become consistent in the handling of their equipment during de/anti-icing operations.

9.5.3.2. In cases of frost or very light snow (≤1cm dry snow) where it can be determined that the contamination is removed instantly on contact due to the fluids thermal energy, and poses no threat of being forced into wing or stabilizer openings. The de/anti-icing vehicle may be positioned behind the wing and the fluids is applied in a light sweeping motion, from the highest point of the surface camber to the lowest.

9.5.3.3. For general equipment movement patterns for each aircraft code depending on the area where de-icing/anti-icing fluids is applied and the number of de-icing/anti-icing facilities to be used, refer to Appendix 6.

9.5.3.4. For dangerous zones to enter for each aircraft type during engine Engine On de-icing/anti-icing (regarding Ground Idle Power), refer to Appendix 7. Such facilities are manufactured in consideration of the engine inlet safety distance and engine outlet area specified in each manufacturer’s Airport Planning
Manual for each aircraft type. For convenience of de-icing/anti-icing equipment operators, visual aids in these manuals can be utilized. For aspects that are impractical to actual de-icing/anti-icing service sites, the on-site workers’ judgment will precede.

9.6. Reminders for communication

9.6.1. According to SAE ARP5660, the Ice man shall communicate with the pilot by means of VHF Radio (Call sign: Iceman) during Engine On de-icing/anti-icing service.

9.6.2. The Ice man shall fix the position of the aircraft until all of the personnel and equipment leave the area safely by means of audio visual communication means during Engine On de-icing/anti-icing service.

9.6.3. Throughout the de-icing/anti-icing process, the communication shall be continued consistently without interruption.

9.6.4. Entry into the de-icing/anti-icing pad

De-icing/anti-icing facilities and workers can enter the de-icing/anti-icing pad when the complete stop of the aircraft is notified by the Ice Man through the TRS.

9.6.5. Withdrawal from de-icing/anti-icing facilities

After de-icing/anti-icing service is completed and all of the equipment and personnel leave the de-icing/anti-icing pad completely, de-icing/anti-icing service workers shall notify the Ice Man through the TRS that all of the equipment and personnel have left the area. After the Ice Man reports the withdrawal of the equipment and personnel, the de-icing/anti-icing service team may ask if it is possible to re-enter the area when necessary. It is not allowed to re-enter without the Ice Man’s permission.

9.7. Engines on considerations

Engines on de/anti-icing is normally performed during conditions of Frost, Light and Medium Snow. For severe weather conditions, service providers and airlines shall consider whether to de/anti-ice with engines shut down, due to potential safety and economic (fuel burn) concerns. During gale warning or gusting conditions, engines off de/anti-icing shall be considered. (Refer to
de/anti-icing equipment manufacturer’s documentation for specific wind speed limitations.)
If special operations such as de/anti-icing of lower wing surface or undercarriage are required, the aircraft engines must be shut down.

10. Spray-restricted area
For each type of aircraft, spray-restricted areas and requirements regarding de-icing/anti-icing fluids are specified. Refer to Appendix 8.
Chapter 4 Contingency plans for de-icing/anti-icing

1. Purpose

This chapter aims to specify aspects necessary for contingency plans for de-icing/anti-icing at Incheon International Airport in case of unexpected interruption of apron control and de-icing/anti-icing.

2. Contingencies related to de-icing/anti-icing

2.1. Basic principles

   In the event that an unusual situation occurs during de-icing/anti-icing service and may lead to casualties or equipment damage, the following measures need to be taken:

2.1.1. The service personnel shall stop working and evacuate from that area.

2.1.2. The service provider shall notify the flight crew of the situation immediately. In the case of Engine-On de-icing/anti-icing, the Ice Man shall order ‘Engine Shutdown’ to the flight crew.

   (e.g.) (aircraft call sign), Ice Man, SHUT DOWN ENGINES due to equipment failure/ truck inoperative/ truck overturned.

2.1.3. The service provider shall notify the apron control tower of the situation immediately.

2.1.4. The apron control tower shall take measures according to the procedures for unusual situations when receiving such a report from the service provider, and the service provider shall cooperate fully.

2.1.5. When it is thought that there is no more problem, the service provider may resume the de-icing/anti-icing service. All of the de-icing/anti-icing service shall be performed in the condition of engine-off.

2.2. Breakdown of de-icing/anti-icing service vehicles

2.2.1. Upon noticing a car breakdown, a de-icing/anti-icing service vehicle driver shall stop working immediately and notify the service provider of it.

2.2.2. In the event that the de-icing/anti-icing service vehicle out of order cannot move, that vehicle shall be transferred out of the standby area and the work shall continue with another vehicle.
2.2.3. In the event that the de-icing/anti-icing service vehicle out of order cannot move, the service provider shall determine if the de-icing/anti-icing service will continue in consideration of the problematic parts of the vehicle and the progress of de-icing/anti-icing.

2.2.4. The service provider shall notify the apron control tower of the situation immediately, and then the latter shall reflect the details in future pad allotment.

2.3. De-icing/anti-icing service vehicles and access to/contact with the aircraft

2.3.1. When a de-icing/anti-icing service vehicle approaches/comes into contact with an aircraft, the de-icing/anti-icing service shall stop immediately.

2.3.2. The service provider shall notify the flight crew of the details regarding the contact area of the aircraft.

(e.g.) (aircraft call sign) BE ADVISED EQUIPMENT PROXIMITY ACTIVATION ON (significant point on aircraft).

(e.g.) DAMAGE (description of damage) OBSERVED. SAY YOUR INTENTION.

2.3.3. The de-icing/anti-icing equipment shall not be withdrawn until the investigation is completed.

2.3.4. Visual inspection on the outer part of the aircraft is required to check if there is any damage outward. If there is no outward damage detected, the de-icing/anti-icing service may be resumed at the captain’s discretion.

2.3.5. The service provider shall notify the apron control tower of the situation immediately, and the latter shall reflect the details in future pad allotment.

2.4. Communication errors

2.4.1. Upon an external TRS communication error, the de-icing/anti-icing service vehicle driver shall discontinue the de-icing/anti-icing service immediately. In the case of Engine Off de-icing/anti-icing, the de-icing/anti-icing service may continue unless the temporary communication error or vehicle driver causes dangers to the de-icing/anti-icing work.
2.4.2. During the de-icing/anti-icing, if there is a VHF communication error between the Ice Man and pilot, the following measures shall be taken:

2.4.2.1. If the Ice Man detects a communication error, the apron control tower and service provider shall be notified of it. The service provider shall move the de-icing/anti-icing service vehicle to the standby area and orders through the interphone the pilot to turn off the engine for engine on de-icing/anti-icing.

2.4.2.2. If the pilot detects a communication error, the pilot shall turn off the engine immediately and turn on every lighting outside the aircraft. The Ice Man and de-icing/anti-icing service personnel shall discontinue the de-icing/anti-icing service as soon as they notice that the aircraft engine is turned off and external lightings of the aircraft are turned on. They also shall move the de-icing/anti-icing service vehicle to the standby area.

2.4.3. The apron control tower shall take measures according to the designated procedures, and the service provider shall cooperate fully.

2.4.4. When it is thought that there is no more problem, the service provider resumes the de-icing/anti-icing service. In this case, the de-icing/anti-icing service shall be conducted in the 'Engine-off' condition.

2.5. Fire on the aircraft

2.5.1. Upon detecting a fire on the aircraft during de-icing/anti-icing service, the pilot shall report it via the VHF. The pilot then shall determine whether to move the aircraft to an appropriate place or to evacuate from it.

2.5.2. If the Ice Man is first informed of a fire by the captain, the Ice Man shall notify the service provider and apron control tower as well.

2.5.3. If the apron control tower first informed of a fire by the captain, it shall notify the service provider immediately and take necessary measures.

2.5.4. The service provider shall discontinue the de-icing/anti-icing service and evacuate the service personnel from the affected area. For prompt recovery of normal airport operation, the service provider shall cooperate fully with the organization concerned.
2.5.5. If it is necessary to move the aircraft on fire and adjacent aircrafts to an appropriate area, the apron control tower shall order the flight crews to move the aircraft.

2.5.6. If emergency evacuation is necessary, the pilot shall follow emergency procedures.

2.5.7. In an emergency escape, the Ice Man orders to stop the engine of any aircraft in a pad near the aircraft on which Engine-on de-icing/anti-icing is in progress.

\textit{e.g.) Upon an aircraft fire in Pad 833, stop the engine at the right side of the aircraft in Pad 832 and the engine at the left side of the aircraft in Pad 834.}

2.6. Threat of aircraft explosion

2.6.1. When obtaining information on an explosive bomb loaded or a terrorist activity, the service provider shall request the identification and contact information of the information provider and check via ‘recall’ whether it is true. The counter-terrorism headquarters and apron control tower shall be informed immediately.

2.6.2. The service provider shall fully cooperate and reflect requests from organizations concerned such as counter-terrorism headquarters and apron control tower.

2.6.3. The service provider shall discontinue de-icing/anti-icing service and move the service personnel to a safe area.

2.6.4. If it is possible to talk to the one who placed the explosives on the phone, efforts need to be put forth to respond calmly and find out where the explosives are placed, the time of explosion, the kind of explosives, and the reason of placing explosives. The phone call shall be extended as long as possible.

2.6.5. The Ice Man shall notify the pilot of the threat without delay if it is possible. In the case of Engine-on de-icing/anti-icing, the flight crew shall be directed to shut down the engine. However, if the contact is lost, the apron control tower shall be notified immediately.

2.6.6. After the incident ends, the service provider shall submit a written report to the airport operator.

2.7. Illegal interference with an aircraft

2.7.1. In the event that the service provider notices an illegal interference with
an aircraft, the apron control tower shall be notified immediately.

2.7.2. The service provider shall discontinue the de-icing/anti-icing service and direct the service personnel to move to a safe area.

2.7.3. The service providers shall cooperate fully with organizations concerned such as apron control tower.

2.7.4. After the incident ends, the service provider shall submit a written report to the airport operator.

2.8. Medical emergency

2.8.1. When noticing a medical emergency during de-icing/anti-icing service, the service provider shall report it to the apron control tower and cooperate fully for proper response at the aircraft.

2.8.2. If necessary, the service provider shall see to it that the supporting equipment is transported from the ground team to the aircraft according to the direction of the apron control tower.

2.9. Fire on ground equipment

2.9.1. Upon noticing a fire on the equipment in a de-icing/anti-icing pad, the service personnel shall evacuate the vehicles around the aircraft and personnel in them out of that area and then notify the airport fire department and service provider.

2.9.2. If possible, the affected equipment shall be moved as far as possible from the aircraft.

2.9.3. The service provider shall inform the flight crew of the situation immediately. In the case of Engine-On de-icing/anti-icing, the Ice Man shall direct the flight crew to shut down the engine.

2.9.4. The service provider shall report the emergency situation to the apron control tower, and the apron control tower shall consider the situation and reflect it in future pad allotment.

3. Severe weather

3.1. Basic principles

3.1.1. In the case of Heavy Snow, the Hold Over Time is 0 hour.

3.1.2. Engine-on de-icing/anti-icing is possible in the case of Frost, Light Snow, and Medium Snow. Upon Heavy Snow or Gale warning, Engine-off shall be considered.

3.2. Sudden severe weather

3.2.1. Gale
3.2.1.1. If a 40 knot or stronger gale is observed during de-icing/anti-icing service, the service shall be discontinued immediately. The service provider will decide whether to continue the de-icing/anti-icing service.

3.2.1.2. When the gale warning is dismissed and the apron control tower approves to resume the Engine-on de-icing/anti-icing service, the service provider may direct the service personnel to return to the designated safety area while securing safety of the persons, equipment, and aircraft involved.
Chapter 5 De/Anti-icing Quality Audit

1. General

1.1. A service provider performing de/anti-icing at the Incheon Airport is responsible for maintaining the good quality of de/anti-icing.

1.2. Quality audit is a process to check if a de/anti-icing service provider maintains an acceptable level of de/anti-icing quality. It is conducted by an airline, the counterpart, or a third party to whom the airline delegated its responsibility and authority.

1.3. Detailed quality audit procedures such as audit types, processes, timeline, handling of results, etc. are subject to agreement between an airline and a service provider.
Chapter 6 Fluids Test

1. Purpose and overview

1.1. The service provider performing de-icing/anti-icing service at Incheon International Airport is responsible to verify the validity of de-icing/anti-icing fluids for safe take-off.

1.2. All of the fluids test methods and intervals shall be in harmony with the fluids producer’s recommendations as well as national and international standards.

1.3. Before conducting fluids tests, the service provider shall check the effective period of fluids recommended by the fluids producer and shall dispose of fluids that has already passed the effective period. However, If the test result shows that the fluids quality involves no problem, the fluids stored in a sealed drum may be used for 2 more years (1+1 years) than the existing effective period.

1.3.1. Fluids stored in a sealed drum: 2 years
1.3.2. Diluted fluids that has not been heated: 6 months
1.3.3. Original fluids that has been heated: 3 months
1.3.4. Diluted fluids that has been heated: 2 weeks

1.4. Every test shall be documented, and the records shall be kept.

2. Recommended cycle of fluids testing

2.1. It is recommended that de-icing/anti-icing service providers’ fluids used at Incheon International Airport is tested at the following interval:

2.1.1. Test prior to the de-icing/anti-icing season

2.1.1.1. fluids that is in a fluids sample container shall be sent to the fluids manufacturer before a season begins for experimental analysis and revalidation.

2.1.1.2. As for Type IV fluids sprayed through nozzles of each de-icing/anti-icing device, experimental analysis shall be conducted in order to verify whether it meets the manufacturer’s requirements as well as international standards.

2.1.2. Mid-term test during a de-icing/anti-icing season

2.1.2.1. Tests shall be conducted in order to verify whether Type I fluids in every storage and equipment fluids tank as well as Type IV
fluids in equipment nozzles meet the manufacturer’s requirements as well as international standards.

2.1.3. Fluids validation test

2.1.3.1. Fluids validation shall be conducted according to the manufacturer’s guideline and the procedures stated below. Fluids samples shall be collected, stored, and tested. The rest results shall be documented and kept.

(i) Documentary review
(ii) fluids color and clarity test
(iii) Reflection test
(iv) pH test
(v) On-site viscosity test (Type IV only)

2.1.4. Daily test

2.1.4.1. Reflection tests shall be conducted on a daily basis on Type I fluids and Type IV fluids stored in every de-icing/anti-icing device and fluids refilling center.

2.1.4.2. Tests shall be conducted on fluids stored in the Type I fluids mixing system that is part of the equipment.

2.1.5. Weekly test

2.1.5.1. Reflection tests shall be conducted on a weekly basis on every fluids tank that contains Type I and Type IV fluids.

3. Fluids test

3.1. Fluids tests shall be conducted in the following manner:

<table>
<thead>
<tr>
<th>Checking item</th>
<th>Checking method</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pollution level</td>
<td>Visual inspection</td>
</tr>
<tr>
<td>Acidity</td>
<td>pH test or pH test sheet</td>
</tr>
<tr>
<td>Viscosity</td>
<td>Viscosity flow cup, viscometer</td>
</tr>
<tr>
<td>Reflection</td>
<td>Refractometer</td>
</tr>
</tbody>
</table>

*In de-icing/anti-icing fluids tests, it is difficult to obtain the accurate value if the ambient temperature is low. Hence, the measuring process shall be conducted as the fluids is at about 20°C (68°F) in accordance with the fluids producer’s recommendations.

<Table 4> Fluids Checking Methods
### 3.2. Delivered fluids check

3.2.1. It is required to check if the fluids delivered by the manufacturer meets the specifications.

3.2.1.1. Check if the product density stated in the manufacturer’s documents corresponds to the actual density.

3.2.1.2. Check the transportation container/storage tank.

3.2.1.3. Check the brand and density of the delivered fluids correspond to those indicated on the existing storage tank and equipment tank.

3.2.1.4. Check if each transportation container/storage tank has the fluids certificate (COC) on it.

3.2.1.5. The COC shall include test results regarding the appropriateness of items below.

3.2.1.6. It is the service provider’s responsibility to check if the fluids manufacturer provides a warranty of the conditions of each container and storage tank/trailer.

3.2.1.7. Certificates and freight invoices shall be referred to.

### 3.3. Fluids sample check

3.3.1. If there is no COC on the current condition of containers/trailers, the service provider shall check the following items:

3.3.1.1. Prior to adding the delivered fluids into storage tanks or equipment tanks, it is required to collect samples from each container/tank and check the following items:

(i) Visual inspection on the colors and foreign substance pollution:
(ii) Reflection test to check the density:
(iii) Acidity (*):
(iv) Viscosity check on Type 2, 3, 4 fluids

3.3.2. Test results shall correspond to the standards specified by the manufacturer.

3.4. Laboratory test

3.4.1. De-icing/anti-icing fluids applied to an aircraft shall meet specifications of the manufacturer. There shall be a program to guarantee the safe use of fluids and compliance with performance indexes. In order to meet this requirement, laboratory tests may be conducted.

3.4.1.1. Type 1 fluids (Type I fluids) tests must be conducted and completed prior to the beginning of each de-icing/anti-icing season.

3.4.1.2. For each de-icing/anti-icing vehicle, at least one nozzle sample test shall be conducted during the season. In addition, when there is a doubt that the fluids is contaminated or degraded, tests shall be conducted on the equipment or storage tank.

3.4.1.3. Fluids samples shall be collected from every de-icing/anti-icing equipment nozzle and storage tank at the density most commonly for de-icing/anti-icing. If the equipment includes no fluids mixing system, samples may be collected directly from the vehicle tank after it is checked if the fluids has been mixed evenly. Tests shall be conducted on the following aspects of fluids samples:
   (i) Visual inspection
   (ii) Reflection
   (iii) Acidity (*)

3.4.2. Tests shall be conducted on Type 2, 3, 4 fluids (Type II, Type III, and Type IV fluids) as well along with Type I prior to the beginning of each de-icing/anti-icing season.

3.4.2.1. For each de-icing/anti-icing equipment, a nozzle sample test shall be conducted at least once during each season.

3.4.2.2. Tests shall be conducted on a vehicle or storage tank when there is a doubt that the fluids in it is polluted or degraded. Such tests shall be conducted after a replacement/maintenance of the equipment pump or stray system that may affect the quality of
fluids. Fluids samples shall be collected from nozzles of each storage tank and de-icing/anti-icing equipment. The following items shall be checked on each fluids sample:

(i) Visual inspection
(ii) Reflection
(iii) Acidity (*)
(iv) Laboratory viscosity test

3.5. Fluids sample test requirements

3.5.1. Results of tests on the visual aspects, reflection, and acidity shall meet the requirements of the manufacturer.

3.5.2. The reasonable viscosity decrease that may occur during fluids storage/handling as well as the spraying process by means of the equipment needs to be considered.

3.6. Measures for non-conformity found in a laboratory test

3.6.1. If a problem is detected in a laboratory test, the following steps need to be taken:

3.6.1.1. The root cause of quality problems needs to be analyzed. If any fluids collected from the equipment involves a problem, it is required to examine the vehicle component and spray nozzle, fluids tank, and fluids transportation path that may be relevant to the non-conformity.

3.6.1.2. If any fluids collected from a storage tank involves a problem, the fluids, transportation path, and transportation devices need to be examined.

3.6.1.3. Necessary measures need to be taken on the problem in order to prevent recurrence. Once a problem is solved, a quality test shall be conducted again (visual inspection, reflection, viscosity, acidity) to verify the fluids quality.

3.6.1.4. Any fluids that has been found non-conforming shall not be used. Such fluids shall be disposed at a designated place after a notification to relevant departments.

3.7. Daily density test

3.7.1. Fluids or fluids/water mixture samples shall be collected from nozzles of the de-icing/anti-icing equipment while the equipment is used on a daily basis.
3.7.2. Reflection tests shall be conducted on collected samples. Samples shall be protected from physical conditions such as external rainfall.

3.7.3. In order to prevent suffocation accidents, heaters and trucks need to be operated in a well-ventilated area.

3.7.4. In the case of devices with no fluids mixing system, samples shall be collected not from nozzles but from tanks. It is also required to check if the fluids is mixed evenly.

3.7.5. In the case of devices with a fluids mixing system, it is required to set up the fluids quantity and pressure. Prior to sampling, density stabilization also needs to be conducted.

3.7.6. In the case of devices with a fluids monitoring system, reflection tests need to be conducted in line with the system design requirements at the interval designated by the service provider.

3.7.7. Type I fluids in nozzles
   3.7.7.1. Type I fluids in nozzles shall not exceed the tolerance range.
   3.7.7.2. As for fluids used for anti-icing in One-step and Two-step de-icing/anti-icing, the freezing point shall be at least 10°C(18°F) lower than the ambient temperature.
   3.7.7.3. For fluids used for de-icing in Two-step de-icing/anti-icing, the freezing point of fluids shall be lower than the ambient temperature.

3.7.8. Type I fluids in fluids tanks
   3.7.8.1. The density of fluids shall meet the ‘suitable for use’ criteria specified by the manufacturer.

3.7.9. Type II, III, IV fluids
   3.7.9.1. The density of fluids in nozzles and tanks shall meet the ‘suitable for use’ criteria specified by the manufacturer.
   3.7.9.2. As for Type II, III, IV fluids/water mixtures (50/50 or 75/25), 0% to 7% difference may be tolerable depending on the products.

3.7.10. Direct/indirect heating of Type II, III, IV fluids
   3.7.10.1. When SAE Type II, III, or IV de-icing/anti-icing fluids is heated directly or indirectly, it shall be heated in a way that does not degrade the quality during storage or use. The integrity of heated fluids needs to be checked regularly.
   3.7.11.1. When the frequency of fluids tests is determined, the heating rate and time shall be considered in addition to the
3.8. Labelling of collected fluids samples

3.8.1. At least the following information shall be indicated on each sample bottle and shall not be erased easily.
(i) fluids/water ratio (e.g.: 100/0, 75/25, 50/50)
(ii) Sampling person’s name, company/organization and address
(iii) Date of sampling
(iv) Name/location of the tank where samples were collected
(v) Amount of fluids in the tank where samples were collected
(vi) Place of sampling: top, middle, and bottom of the tank; or sampling valve
(vii) Brand name of each fluids and product type

3.9. Reminders for fluids tests

3.9.1. In order to secure the accuracy and validity of test results, the gap between the time of sampling and the time of testing shall be managed properly. Keen attention must be paid to the manufacturer’s recommendations.

3.9.2. Samples shall be handled in the following manner:
(i) Avoid exposing them to air: seal the bottles.
(ii) Avoid exposing them to sunlight.
(iii) Avoid exposing them to high or low temperature.
(iv) Avoid shaking them excessively.

3.10. Measures for samples found to be non-conforming in an on-site test

3.10.1. If an on-site test reveals a problem, the following steps shall be taken:
3.10.1.1. The root cause of quality problems shall be analyzed.
3.10.1.2. If a newly introduced fluids product involves a problem, the manufacturer shall be consulted and a laboratory test shall be requested.
3.10.1.3. If the problematic sample was collected from a vehicle, the vehicle component, spray nozzle, fluids tank, and transportation path that may be related to the non-conformity shall be examined.
3.10.1.4. If the problematic sample was collected from a storage tank, the fluids, transportation path, and transportation device involved shall be examined.
3.10.1.5. Measures shall be taken to prevent the same problem from recurring.

3.10.1.6. Once a problem is solved, a quality test shall be conducted again (visual inspection, reflection, viscosity, acidity) in order to verify the quality conformity.

3.10.1.7. Fluids found to be non-conforming shall never be used but disposed at a designated place after a notification to departments concerned.
Chapter 7 A-CDM Cell in Snow

1. Purpose and Overview

1.1. Upon a long-term delay due to heavy snowfall, A-CDM Cell at the Incheon Airport is formed and in place for the purpose of information exchange and cooperative response between related organizations.

1.2. The main duty of A-CDM Cell share information on de/anti-icing service and delay among related organizations in order for managing the congestion and capacity of Incheon International Airport(e.g. airline’s autonomously scheduling in response to the decreased capacity, etc.).

2. Setup of A-CDM Cell in snow

2.1. A-CDM Cell is located nearby the A-CDM operation center at the Incheon Airport and may be installed in a separate location in an inevitable case.

2.2. The Airport Corporation may convene A-CDM Cell upon Stage 4(Red) of de/anti-ice, upon an additional delay, or when necessary for other reasons.

2.3. A-CDM Cell is set up as follows.

<table>
<thead>
<tr>
<th>Type</th>
<th>Dept. in Charge</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Airport Corporation</td>
<td>Aerodrome Planning Team</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>Apron Control Team</td>
<td>-</td>
</tr>
<tr>
<td>Seoul Regional Aviation</td>
<td>Air Traffic Management Division</td>
<td>Incheon Control Tower participates via wired communication</td>
</tr>
<tr>
<td>Administration</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Airline</td>
<td>Operation Control Office</td>
<td>KAL, AAR, JJA, JNA, TWB, ESR, ASV</td>
</tr>
<tr>
<td>AOC-I</td>
<td>Secretariat</td>
<td>If necessary</td>
</tr>
<tr>
<td>Service Provider</td>
<td>Handling Control Office</td>
<td>If necessary</td>
</tr>
</tbody>
</table>

<Table 6> Setup of A-CDM Cell
3. Dismissal of A-CDM Cell in Snow

3.1. The Airport Corporation decides the dismissal of A-CDM Cell at the point of time when the operation of A-CDM Cell is deemed no longer necessary.
Chapter 8  Air Traffic Flow Management at Incheon Airport

1. Purpose and Overview

1.1. When de/anti-icing is performed during the winter season, air traffic flow management is implemented for stable and efficient operation of the Incheon Airport.

1.2. The "Incheon Airport CDM Meeting" is held to discuss the adjusted capacity and share the estimated capacity by time of Incheon International Airport.

1.3. The program is intended to minimize the impact on ground traffic flow at the Incheon airport.

1.4. The Individual institutions should cooperate actively to reduce aircraft congestion and delays and to meet international air traffic flow limitations.

2. Roles of Individual Institutions

2.1. Incheon Airport CDM Meeting

2.1.1. As for snowfall forecasts during the winter season (When the snowfall probability is 70% or higher and at least two hours before the timing when traffic adjustment stage needs to be modified, or in case of unpredicted snow), the "Incheon Airport CDM Meeting" is held to decide adjusted capacity.

2.1.1.1. The holding time of the "Incheon International Airport CDM” can be applied differently depending on the situation at the Incheon airport.

2.1.2. The Incheon Control Tower can present the adjusted capacity considering the operation status of the runway.

2.1.3. The Seoul Approach can present the adjusted capacity considering the departure and arrival conditions of the aircraft.

2.1.4. The Incheon Apron Tower 1 can present the adjusted capacity of Incheon Airport considering the de-icing/anti-icing conditions.

2.1.5. The A-CDM operator can present the adjusted capacity considering the operating conditions of the gates.

2.1.6. “Incheon Airport CDM Meeting” (Seoul Approach) notifies the Air Traffic Control Center (ATCC) of the 'adjusted capacity' of the
airport by compiling opinions from each department. Even after a snowfall ends, traffic control may continue depending on the condition of the de-icing/anti-icing service and runway.

2.2. ATCC

2.2.1. Upon the receipt of a request for adjusted capacity from the Incheon CDM Meeting, the ATCC holds a CDM general meeting and makes a final decision of traffic adjustment at Incheon Airport. Take measures to ensure that the suggested number of arriving flights per hour can be applied as FIX separation.

2.2.2. The ATCC may preemptively control traffic volume even without the request of the Incheon Airport if snow is expected at the Incheon Airport.

2.3. ACC

Incheon / Daegu ACC consult with ATCC to conduct time separation (ATFM) of flights arriving at the Incheon Airport or other corresponding traffic separation while the traffic volume is controlled during snowfall at the Incheon Airport.

2.4. Airlines

Airlines shall adjust passenger boarding time by taking into account their departing flights’ CTOT issued while traffic volume control is in place during snowfall at the Incheon Airport, and shall make every effort to comply with the CTOT for smooth airport operations.
Chapter 9  Appendix
1. Detailed Drawings of De-icing/Anti-icing Pad Entry/Exit Routes
2. Anti-Icing Code Report
   (for Airlines & De-icing/Antiicing service Providers)

<table>
<thead>
<tr>
<th>Date</th>
<th>Station:</th>
<th>Reg No:</th>
<th>Flt No:</th>
<th>Pad No:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operation</td>
<td>Frost[□]</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Snow[□]</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Ambient Temperature: -3°C(OAT)</td>
<td>Fluids Type</td>
<td>First Step: Type ( ) Fluids Mix, Rate</td>
</tr>
<tr>
<td>Type of Equipment</td>
<td>Number of Worker</td>
<td>Fluids Quantity</td>
<td>Type (1) / (4) (Liter/LB)</td>
<td></td>
</tr>
<tr>
<td>Beginning Time</td>
<td>Complete Time</td>
<td>Beginning Time of Final Step</td>
<td>Service Provider</td>
<td>Operator</td>
</tr>
</tbody>
</table>

---

**Sample**

<table>
<thead>
<tr>
<th>Date</th>
<th>Station:</th>
<th>Reg No:</th>
<th>Flt No:</th>
<th>Pad No:</th>
</tr>
</thead>
<tbody>
<tr>
<td>2013-02-13</td>
<td>ICN</td>
<td>HL7777</td>
<td>KE000</td>
<td>801</td>
</tr>
<tr>
<td>Operation</td>
<td>Frost[□][□]</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Snow[□]</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Ambient Temperature: -3°C(OAT)</td>
<td>Fluids Type</td>
<td>First Step: Type (1) Fluids Mix, Rate</td>
</tr>
<tr>
<td>Type of Equipment</td>
<td>Number of Worker</td>
<td>Fluids Quantity</td>
<td>Type (1): 400 (Liter/LB) Type (4): 600 (Liter/LB)</td>
<td></td>
</tr>
<tr>
<td>Beginning Time</td>
<td>Complete Time</td>
<td>Beginning Time of Final Step</td>
<td>Service Provider</td>
<td>Operator</td>
</tr>
</tbody>
</table>

9:30  10:15  9:35  KAS  Hong Gil-dong  838828 Lee Sun-shin
3. Standard Required Time for De/Anti-icing

The following information may be utilized for reference in de-icing/anti-icing service.

1) Engine-off de-icing/anti-icing

<table>
<thead>
<tr>
<th>A/C Code</th>
<th>Frost</th>
<th>Dry snow</th>
<th>Wet snow</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>0:25</td>
<td>0:25</td>
<td>0:30</td>
</tr>
<tr>
<td>D</td>
<td>0:25</td>
<td>0:25</td>
<td>0:30</td>
</tr>
<tr>
<td>E</td>
<td>0:30</td>
<td>0:30</td>
<td>0:35</td>
</tr>
<tr>
<td>F</td>
<td>0:30</td>
<td>0:30</td>
<td>0:35</td>
</tr>
</tbody>
</table>

2) Engine-on de-icing/anti-icing

<table>
<thead>
<tr>
<th>A/C Code</th>
<th>Light Snow</th>
<th>Moderate Snow</th>
<th>Heavy Snow</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>0:08</td>
<td>0:08</td>
<td>Engine-off de-icing/anti-icing</td>
</tr>
<tr>
<td>D</td>
<td>0:10</td>
<td>0:10</td>
<td></td>
</tr>
<tr>
<td>E</td>
<td>0:20</td>
<td>0:20</td>
<td></td>
</tr>
</tbody>
</table>
## 4. Standard Phraseology

<table>
<thead>
<tr>
<th>Phraseology</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acknowledge</td>
<td>Let me know that you have received and understood this message</td>
</tr>
<tr>
<td>Affirm</td>
<td>Yes</td>
</tr>
<tr>
<td>Approved</td>
<td>Permission for proposed action granted</td>
</tr>
<tr>
<td>Break</td>
<td>I hereby indicate the separation between portions of the message</td>
</tr>
<tr>
<td>Break Break Break</td>
<td>I hereby indicate the separation between messages transmitted to different aircraft in a very busy environment</td>
</tr>
<tr>
<td>Cancel</td>
<td>Annul the previously transmitted clearance</td>
</tr>
<tr>
<td>Check</td>
<td>Examine a system or procedure</td>
</tr>
<tr>
<td>Cleared</td>
<td>Authorized to proceed under the conditions specified</td>
</tr>
<tr>
<td>Confirm</td>
<td>I request verification of: (clearance, instruction, action, information)</td>
</tr>
<tr>
<td>Contact</td>
<td>Establish radio contact with ...</td>
</tr>
<tr>
<td>Correct</td>
<td>True or Accurate</td>
</tr>
<tr>
<td>Correction</td>
<td>An error has been made in this transmission (or message indicated)! The correct version is ...</td>
</tr>
<tr>
<td>Disregard</td>
<td>Ignore</td>
</tr>
<tr>
<td>How do you read</td>
<td>What is the readability of my transmission?</td>
</tr>
<tr>
<td>I say again</td>
<td>I repeat for clarity or emphasis</td>
</tr>
<tr>
<td>Maintain</td>
<td>Continue in accordance with the condition specified or in its literal sense</td>
</tr>
<tr>
<td>Monitor</td>
<td>Listen out on (frequency)</td>
</tr>
<tr>
<td>Negative</td>
<td>No or Permission not granted or That is not correct or not capable</td>
</tr>
<tr>
<td>Over</td>
<td>My transmission is ended and I expect a response from you</td>
</tr>
<tr>
<td>Out</td>
<td>This exchange of transmission is ended and no response is expected</td>
</tr>
<tr>
<td>Read back</td>
<td>Repeat all, or the specified part, of this message back to me exactly as received</td>
</tr>
<tr>
<td>Recleared</td>
<td>A change has been made to your last clearance and this new clearance supersedes your previous clearance or part thereof</td>
</tr>
<tr>
<td>Report</td>
<td>Pass me the following information</td>
</tr>
<tr>
<td>Request</td>
<td>I should like to know ... or I wish to obtain ...</td>
</tr>
<tr>
<td>Roger</td>
<td>I have received all of your last transmission</td>
</tr>
<tr>
<td>Say again</td>
<td>Repeat all, or the following part, of your last transmission</td>
</tr>
<tr>
<td>Speak slower</td>
<td>Reduce your rate of speech</td>
</tr>
<tr>
<td>Stand by</td>
<td>Wait and I will call you</td>
</tr>
<tr>
<td>Unable</td>
<td>I cannot comply with your request, instruction or clearance</td>
</tr>
<tr>
<td>Wilco</td>
<td>I understand your message and will comply with it</td>
</tr>
</tbody>
</table>
5. ICAO Phonetics and Sample

<table>
<thead>
<tr>
<th>ICAO Phonetics</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>A</strong></td>
<td>Alfa (al-fah)</td>
<td><strong>S</strong></td>
<td>Sierra (see-air-rah)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>B</strong></td>
<td>Bravo (brah-voh)</td>
<td><strong>T</strong></td>
<td>Tango (tang-go)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>C</strong></td>
<td>Charlie (char-lee)</td>
<td><strong>U</strong></td>
<td>Uniform (you-nee-form)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>D</strong></td>
<td>Delta (del-ta)</td>
<td><strong>V</strong></td>
<td>Victor (vik-tah)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>E</strong></td>
<td>Echo (eck-oh)</td>
<td><strong>W</strong></td>
<td>Whiskey (wis-key)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>F</strong></td>
<td>Foxtrot (foks-trot)</td>
<td><strong>X</strong></td>
<td>X-ray (ecks-ray)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>G</strong></td>
<td>Golf (golf)</td>
<td><strong>Y</strong></td>
<td>Yankee (yang-key)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>H</strong></td>
<td>Hotel (hoh-tel)</td>
<td><strong>Z</strong></td>
<td>Zulu (zoo-loo)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>I</strong></td>
<td>India (in-dee-ah)</td>
<td><strong>0</strong></td>
<td>Zero (zee-ro)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>J</strong></td>
<td>Juliet (jew-lee-et)</td>
<td><strong>1</strong></td>
<td>One (wun)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>K</strong></td>
<td>Kilo (key-loh)</td>
<td><strong>2</strong></td>
<td>Two (too)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>L</strong></td>
<td>Lima (lee-mah)</td>
<td><strong>3</strong></td>
<td>Three (tree)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>M</strong></td>
<td>Mike (mike)</td>
<td><strong>4</strong></td>
<td>Four (fow-er)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>N</strong></td>
<td>November (no-vem-ber)</td>
<td><strong>5</strong></td>
<td>Five (fife)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>O</strong></td>
<td>Oscar (oss-cah)</td>
<td><strong>6</strong></td>
<td>Six (six)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>P</strong></td>
<td>Papa (pah-pah)</td>
<td><strong>7</strong></td>
<td>Seven (sev-en)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Q</strong></td>
<td>Quebec (keh-beck)</td>
<td><strong>8</strong></td>
<td>Eight (ait)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>R</strong></td>
<td>Romeo (row-me-oh)</td>
<td><strong>9</strong></td>
<td>Nine(r) (nin-er)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Sample</th>
<th></th>
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<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>10</strong></td>
<td>One zero (wun, zee-ro)</td>
<td><strong>75</strong></td>
<td>Seven five (sev-en, five)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>100</strong></td>
<td>Hundred (hand-red)</td>
<td><strong>1000</strong></td>
<td>Thousand (tau-send)</td>
<td></td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

| Frequency          | 131.900 One Three One Decimal Niner Zero Zero |
| Time               | 09:20 Zero Nine/Two Zero |
6. Examples of Iceman and Pilot Phraseology

1) Engine-off de-icing/anti-icing

Pad control/Flight Crew Phraseologies for De/Anti-Icing Operations

When aircraft approaching de-icing pad

FLIGHT CREW

PAD CONTROL

Engine Off 1

Pad control, (aircraft call sign), approaching de-icing zone "MIKE SOUTH (MS)"

Stop bar lights on (by ICE MAN)

Roger, taxi to deicing pad #834, (aircraft call sign)
Pad control, (aircraft call sign), parking brake set

(aircraft call sign), Pad control, your de-icing pad #834. Continue taxi to deicing pad #834, (then hold abeam the stop line), report parking brake set.

(aircraft call sign), Roger, contact Iceman 130.850.
Prior to deicing/anti-icing: aircraft configuration confirmation

**FLIGHT CREW**

ICE MAN, (aircraft call sign), de-icing pad #834, parking brake set.

DO NOT SHUT DOWN ENGINES UNTIL INSTRUCTED BY ICE MAN FOR GROUND SAFETY

Affirm, engines shut down deicing, (aircraft call sign).

ICE MAN, (aircraft call sign), engines shut down now.

ICE MAN, (aircraft call sign), ready for deicing.

Roger, stand by, (aircraft call sign)

**ICEMAN**

(aircraft call sign), ICE MAN, confirm engines shut down deicing.

(aircraft call sign), Shut down engines now.

(aircraft call sign), Report ready for deicing.

(aircraft call sign), Type I and type IV wings and tail, Engines shut down deicing, Stand by engines shut down deicing.

(aircraft call sign), ICE MAN, deicing starts now.
Ice Man/Flight Crew Phraseologies for De/Anti-Icing Operations

Upon concluding deicing/anti-icing procedure.

**FLIGHT CREW**

ICE MAN, (aircraft call sign),
We are ready for information.

(aircraft call sign) ICE MAN,
deicing complete, advise when ready for information.

(aircraft call sign) deicing complete,
deiced with type I, anti-iced with type IV
kiirost abc-s plus at 100%, holdover
started at 13:35 local time, post deicing
check completed, all personnel and
equipment are clear of aircraft.

**ICEMAN**

AS 130.750 MHz · MS 130.850 MHz
MN 129.725 MHz · TC/CD 130.250 MHz

(aircraft call sign) deicing complete,
deiced with type I, anti-iced with type IV
kiirost abc-s plus at 100%, holdover
started at 13:35 local time, post deicing
check completed, all personnel and
equipment are clear of aircraft.

[ If only type I is applied ]
1) ~ deiced with type I, holdover time
do not apply ~
2) ~ deiced with type I, kilrost df-plus
at 50%, started at 1340 ~

**Note**

ANTI-ICING CODE
(appropriate anti-icing code)

1. Type of fluid (type I or II or III or IV) at
percent of mix for type II, III or IV
2. Complete name of anti-icing fluid
3. Holdover time started at (local time)
4. Post deicing check completed.
Upon concluding deicing/anti-icing procedure.

**ICEMAN**

(aircraft call sign) ICE MAN, contact C/D 121.6 for ATC clearance,

(aircraft call sign) ICE MAN, engines start up approved, Report ready to taxi,

(aircraft call sign), continue to hold position and contact pad control 121.875 for taxi,

STOP BAR LIGHTS OFF

**FLIGHT CREW**

AS 130.750 MHz • MS 130.850 MHz
MN 129.725 MHz • TC/CD 130.250 MHz

ICE MAN, (aircraft call sign), contact C/D 121.6.

ICE MAN, (aircraft call sign), we have ATC clearance, Request engines start up.

Engines start up approved, (aircraft call sign).

ICE MAN, (aircraft call sign), ready to taxi.

Contact pad control 121.875, (aircraft call sign).

CAUTION : DO NOT TAXI IF STOP BAR LIGHTS ON
2) Engine-on de-icing/anti-icing

Pad control/Flight Crew Phraseologies for De/Anti-Icing Operations
When aircraft approaching de-icing pad

**When Aircraft Approaching De-Icing Pad**
- Pad control, (aircraft call sign), approaching de-icing zone, MIKE SOUTH (MS)
- Roger, taxi to deicing pad #834, (aircraft call sign)
- Pad control, (aircraft call sign), parking brake set

**Stop Bar Lights On**
(by ICE MAN)
- (aircraft call sign), Pad control, your de-icing pad #834, Continue taxi to deicing pad #834, (then hold abeam the stop line), report parking brake set.
- (aircraft call sign), Roger, contact iceman 130,850.
Ice Man/Flight Crew Phraseologies for De/Anti-Icing Operations

Prior to deicing/anti-icing: aircraft configuration confirmation

**FLIGHT CREW**

ICE MAN, (aircraft call sign), de-icing pad #34, parking brake set.

Affirm, engines on deicing, (aircraft call sign).

ICE MAN, (aircraft call sign), ready for deicing.

Affirm, engines set to ground idle, (aircraft call sign).

**ICEMAN**

(aircraft call sign), ICE MAN, confirm engines on deicing.


(aircraft call sign), Type I, type IV wings and tail. Engines on deicing. Confirm engines set to ground idle.

(aircraft call sign), Hold position, Deicing starts now.
Ice Man/Flight Crew Phraseologies for De/Anti-Icing Operations

After deicing/anti-icing start

**FLIGHT CREW**

AS 130.750 MHz  MS 130.850 MHz
MN 129.725 MHz  TC/CD 130.250 MHz

Clearance Delivery contact

Contact C/D 121.6, Monitor ice man frequency,
(aircraft call sign).

Monitor Ice man frequency after ATC Clearance

**ICEMAN**

(aircraft call sign), ICE MAN,
Contact C/D 121.6, Monitor ice man frequency.
Upon concluding deicing/anti-icing procedure.

**FLIGHT CREW**

(aircraft call sign) ICE MAN, deicing complete, advise when ready for information.

**ICEMAN**

AS 130.750 MHz, MS 130.850 MHz
MN 129.725 MHz, TC/CD 130.250 MHz

(aircraft call sign) deicing complete, deiced with type I, anti-iced with type IV kilifrost abc—s plus at 100%, holdover started at 13:35 local time, post deicing check completed, all personnel and equipment are clear of aircraft.

**Note**

**ANTI-ICING CODE**

(appropriate anti-icing code)

1. Type of fluid (type I or II or III or IV) at percent of mix for type II, III or IV
2. Complete name of anti-icing fluid
3. Holdover time started at (local time)
4. Post deicing check completed.

[ If only type I is applied ]

1) ~ deiced with type I, holdover time do not apply ~
2) ~ deiced with type I, kilifrost df—plus at 50%, started at 1340 ~
Upon concluding deicing/anti-icing procedure.

**FLIGHT CREW**

**ICEMAN**

**AS 130.750 MHz . MS 130.850 MHz**
**MN 129.725 MHz . TC/CD 130.250 MHz**

(aircraft call sign), ICE MAN, report ready to taxi.

ICE MAN, (aircraft call sign), ready to taxi.

Contact pad control 121.875, (aircraft call sign).

**CAUTION : DO NOT TAXI IF STOP BAR LIGHTS ON**

(aircraft call sign), continue to hold position and contact pad control 121.875 for taxi.

STOP BAR LIGHTS OFF
7. Paths of De-icing/Anti-icing Facilities

< Class “C” aircraft - 1 truck route in spray over the wings and tail >
< Class “C” aircraft - 2 trucks’ route in spray over the wings and tail >
< Class “C” aircraft - 1 truck route in spray over the entire body >
< Class "C" aircraft - 2 trucks’ route in spray over the entire body >
< Class “C” aircraft – 4 trucks’ route in spray over the entire body >
< Class “E” aircraft - 1 truck route in spray over the wings and tail >
< Class “E” aircraft - 2 trucks’ route in spray over the wings and tail >
< Class “E” aircraft  -  4 trucks’ route in spray over the wings and tail >
< Class “E” aircraft – 1 truck route in spray over the entire body >
< Class “E” aircraft - 2 trucks’ route in spray over the entire body >
< Class “E” aircraft - 4 trucks’ route in spray over the entire body >
8. Dangerous Areas of the Equipment During Engine-On De-icing/anti-icing

<table>
<thead>
<tr>
<th>AIRBUS A318</th>
<th>Airbus A319</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image1" alt="Diagram of Airbus A318 Dangerous Areas" /></td>
<td><img src="image2" alt="Diagram of Airbus A319 Dangerous Areas" /></td>
</tr>
</tbody>
</table>
9. Areas of an Aircraft Where Spray Is Prohibited

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.
Do not spray into engine openings.

Do not spray into engine exhaust.

Do not apply Type II, Type III or Type IV to radome.

Do not spray directly at flight deck windows/windscreen.

Do not spray directly at main deck cabin windows or doors.

Do not spray directly at or into pitot tubes, TAT probes, angle of attack vanes or other data sensing devices/probes/tubes.

Do not spray directly at static ports.

Do not spray directly at or into aircraft intake or exhaust vents, ram air inlets, scoops, drains, outlets or pressurized outflow valves.

Apply deicing fluids at angles below 45 degrees.

Do not spray into avionics vents.

Do not spray directly at aircraft wheels, brakes, oleo struts, mechanisms and switches.

Do not spray into APU inlet.

Do not spray into APU exhaust.

Do not spray onto heat exchanger ventilation grid located on engine pylons.

Do not spray onto propeller blades.

Clear Ice Check (Tactile Check) required prior to deicing and may be required as part of post deicing Check.

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.
AIRBUS A320

PERMISSIBLE DEICING FLUID APPLICATION DIAGRAM

- Deicing Fluid Application Areas
- Deicing Fluid Non-Application Areas
- No Direct Application of Deicing/Anti-icing Fluid Allowed

AIRBUS A320

PERMISSIBLE ANTI-ICING FLUID APPLICATION DIAGRAM

- Anti-icing Fluid Application Areas
- Anti-icing Fluid Non-Application Areas
- No Direct Application of Deicing/Anti-icing Fluid Allowed
- Fuselage Anti-icing Application on PIC Request
AIRBUS
A350
PERMISSIBLE DEICING FLUID APPLICATION DIAGRAM

- Orange: Deicing Fluid Application Areas
- White: Deicing Fluid Non-Application Areas
- Red: No Direct Application of Deicing/Anti-icing Fluid Allowed

AIRBUS
A350
PERMISSIBLE ANTI-ICING FLUID APPLICATION DIAGRAM

- Green: Anti-icing Fluid Application Areas
- White: Anti-icing Fluid Non-Application Areas
- Red: No Direct Application of Deicing/Anti-icing Fluid Allowed
- Yellow Star: Fuselage Anti-icing Application on PIC Request
AIRBUS A380
PERMISSIBLE DEICING FLUID APPLICATION DIAGRAM

Deicing Fluid Application Areas
Deicing Fluid Non-Application Areas
No Direct Application of Deicing/Anti-icing Fluid Allowed

AIRBUS A380
PERMISSIBLE ANTI-ICING FLUID APPLICATION DIAGRAM

Anti-icing Fluid Application Areas
Anti-icing Fluid Non-Application Areas
No Direct Application of Deicing/Anti-icing Fluid Allowed
Fuselage Anti-icing Application on PIC Request
BOEING
B747
PERMISSIBLE DEICING FLUID APPLICATION DIAGRAM

- Deicing Fluid Application Areas
- Deicing Fluid Non-Application Areas
- No Direct Application of Deicing/Anti-icing Fluid Allowed

BOEING
B747
PERMISSIBLE ANTI-ICING FLUID APPLICATION DIAGRAM

- Anti-icing Fluid Application Areas
- Anti-icing Fluid Non-Application Areas
- No Direct Application of Deicing/Anti-icing Fluid Allowed
- Fuselage Application on PIC Request
BOEING
B767
PERMISSIBLE DEICING FLUID APPLICATION DIAGRAM

Deicing Fluid Application Areas
Deicing Fluid Non-Application Areas
No Direct Application of Deicing/Anti-icing Fluid Allowed

BOEING
B767
PERMISSIBLE ANTI-ICING FLUID APPLICATION DIAGRAM

Antifreeze Application Areas
Antifreeze Non-Application Areas
No Direct Application of Deicing/Anti-icing Fluid Allowed
Fuselage Anti-icing Application on PIC Request
BOEING
B777
PERMISSIBLE DEICING FLUID APPLICATION DIAGRAM

Deicing Fluid Application Areas
Deicing Fluid Non-Application Areas
No Direct Application of Deicing/Anti-icing Fluid Allowed

BOEING
B777
PERMISSIBLE ANTI-ICING FLUID APPLICATION DIAGRAM

Anti-icing Fluid Application Areas
Anti-icing Fluid Non-Application Areas
No Direct Application of Deicing/Anti-icing Fluid Allowed

Fuselage Anti-icing Application on PIC Request
Incheon International Airport De/Anti-icing Manual

BOEING B777-8/9
PERMISSIBLE DEICING FLUID APPLICATION DIAGRAM

Deicing Fluid Application Areas
Deicing Fluid Non-Application Areas
No Direct Application of Deicing/Anti-icing Fluid Allowed

BOEING B777-8/9
PERMISSIBLE ANTI-ICING FLUID APPLICATION DIAGRAM

Anti-icing Fluid Application Areas
Anti-icing Fluid Non-Application Areas
No Direct Application of Deicing/Anti-icing Fluid Allowed
Fuselage Anti-icing Application on PIC Request