

Winter Operations Manual



Stuttgart Airport

Part B: Aircraft De-Icing



Table of contents

0. List of abbreviations

1. Responsibilities

- 1.1 De-icing service provider
- 1.2 Flughafen Stuttgart GmbH (FSG)
- 1.3 Deutsche Flugsicherung GmbH (DFS)
- 1.4 Stuttgart Airport Ground Handling GmbH (SAG)

2. Airport infrastructure

- 2.1 De-icing pads
- 2.2 Aircraft radio frequencies
- 2.3 Airport private mobile radio
- 2.4 CSA tool “Web-CaeSAR”
- 2.5 Restrictions for aircraft ground traffic
- 2.6 Provision of light posts

3. De-icing vehicles

4. De-icing fluids

5. De-icing process

- 5.1 Available de-icing capacities and de-icing category
- 5.2 De-icing request
- 5.3 Cancelling a de-icing request
- 5.4 Dispatching the de-icing pads
- 5.5 Occupation of the de-icing pads
- 5.6 De-icing sequence
- 5.7 Guidance of aircraft to the de-icing pads
- 5.8 Execution of aircraft de-icing
- 5.9 Aircraft leaving the de-icing pads
- 5.10 Closing of de-icing pads
- 5.11 Data exchange with the Network Manager
- 5.12 Vehicles and persons on the de-icing pads
- 5.13 Quality monitoring

6. Pre de-icing

7. Fan blade and underwing de-icing

8. Layout plans

Overview of changes:

Version	Last updated	Remarks	Author
1.0	01/10/2020	Initial version	Nico Ruwe

	Created / changed	Reviewed	Approved
Date:	05/10/2020	05/10/2020	13/10/2020
Name (Orga):	Nico Ruwe (AM-OM)	Michael Gassner (AM)	Arne Kirchhoff (A)
Signature:	Ruwe	Gassner	Kirchhoff

0. List of abbreviations

ACDC	Airport Coordination and Data Center
ACFT	Aircraft
ACZT	Actual Commencement of De-icing Time
ADIT	Actual Duration of De-icing Time
ADM	Airport Duty Manager
A-CDM	Airport Collaborative Decision Making
AIP	Aeronautical Information Publication
ATC	Air Traffic Control
CSA-Tool	Common Situational Awareness Tool
CTOT	Calculated Take-off Time (ATC)
DFS	Deutsche Flugsicherung GmbH
DP	De-icing Pad
DPI	Departure Planning Information
ECZT	Estimated Commencement of De-icing Time
EDDS	Flughafen Stuttgart (ICAO-Code)
EDIT	Estimated Duration of De-icing Time
EEZT	Estimated End of De-icing Time
EOBT	Estimated Off Block Time (ATC)
EXOT	Estimated Taxi-Out Time
FSG	Flughafen Stuttgart GmbH
ICAO	International Civil Aviation Organization
MASU	Movement Area Supervision Unit
MHz	Megahertz
NMOC	Network Manager Operations Center (EUROCONTROL)
RTS	Return to stand
SAG	Stuttgart Airport Ground Handling GmbH
SOBT	Scheduled Off Block Time
TOBT	Target Off Block Time
TSAT	Target Start-up Approval Time
TTOT	Target Take-off Time
TWY	Taxiway
Web-CaeSAr	Web-based CSA tool for TOBT management and de-icing service providers
WSPAN	Wingspan

1. Responsibilities

Aircraft de-icing is a particularly important component of the turnaround process. There are multiple partners who cooperate directly in aircraft de-icing, and the quality of de-icing depends on their ability to fulfil their respective responsibilities as well as possible. The following section briefly describes the responsibilities of the key partners in the de-icing process.

1.1 De-icing service provider

Aircraft de-icing at the Stuttgart Airport is handled as an open-market service, and is carried out by two independent de-icing service providers. These service providers conclude either seasonal contracts or agreements for individual flights with airlines or aircraft operators. The de-icing service providers are responsible for ensuring aircraft de-icing is carried out professionally, and for ensuring personnel are trained appropriately.

De-icing service providers must ensure they are able to provide sufficient de-icing capacity in a timely manner, if necessary in coordination with Flughafen Stuttgart GmbH, at the de-icing pads assigned by the FSG in accordance with stipulated de-icing requirements.

De-icing service providers must ensure a de-icing coordinator is available at Stuttgart Airport at all times during business hours, in order to answer inquiries and agree to ad-hoc orders.

De-icing service provider	De-icing coordinator telephone	E-mail
Lufthansa Technik AG	+49 711 58 91 50 33	
Stuttgart Airport Ground Handling GmbH	+49 711 64 90 41 81	

1.2 Flughafen Stuttgart GmbH (FSG)

Aircraft de-icing is carried out at Stuttgart Airport on the de-icing pads explicitly assigned for this purpose. When de-icing is required, Flughafen Stuttgart GmbH (FSG) is responsible for ensuring these de-icing pads are available. FSG carries out a central, coordinating function for de-icing operations, and collaborates with the two de-icing service providers to manage the availability of sufficient de-icing capacity on the de-icing pads.

FSG carries out a comprehensive quality monitoring process through post-analysis. This involves regularly analysing reported delays as well as process quality and stability, along with the quality of the master data used.

Organisational unit	Telephone	E-mail
Airport Coordination and Data Center	+49 711 948 3805	trafficcenter@stuttgart-airport.com
Airport Duty Manager	+49 711 948 3586	adm@stuttgart-airport.com
Security and Maintenance Ops. Center	+49 711 948 2066	leitstelle@stuttgart-airport.com

1.3 Deutsche Flugsicherung GmbH (DFS)

Aerodrome control of Deutsche Flugsicherung GmbH (DFS) determines the de-icing pads assigned for use by de-icing service providers based on the current traffic situation, on request of Flughafen Stuttgart GmbH (FSG). In addition, DFS activates the centreline lights for the respective de-icing pads.

DFS aerodrome control guides aircraft from the aircraft stand to the de-icing pads, and assigns the de-icing pad to be used by each individual flight. After aircraft de-icing is completed, DFS aerodrome control guides the de-iced aircraft to their assigned runway.

The actual commencement of de-icing time (ACZT) and actual end of de-icing time (AEZT) are recorded based on status changes transmitted by DFS aerodrome control to FSG.

1.4 Stuttgart Airport Ground Handling GmbH (SAG)

Stuttgart Airport Ground Handling GmbH (SAG) is responsible for providing the required mobile airport light posts to illuminate the respective de-icing pads and then removing them upon request by Flughafen Stuttgart GmbH (FSG).

SAG will provide the required equipment to handle fan blade de-icing upon request.

In addition, the SAG shift supervisor serves as another contact person for operational matters if the SAG de-icing coordinator is not available.

Organisational unit	Telephone	E-mail
Ground Handling shift supervisor	+49 711 948 3786 +49 711 948 2099	bvd-schichtleitung@sag.aero

2. Airport infrastructure

2.1 De-icing pads

Primarily for environmental protection reasons, some parts of the movement area are explicitly designated for aircraft de-icing. These areas and the individual de-icing pads are published in the German Aeronautical Information Publication (AIP) in maps AD 2 EDDS 2-5 and 2-7 and are also shown in chapter 8 of this document. Aircraft de-icing is permitted only on these de-icing pads. The only exceptions to this are pre de-icing, as well as fan blade and underwing de-icing.

Up to four de-icing pads may be operated at the same time, and are designated as DP1, DP2, DP3 and DP4. The process for assigning de-icing pads to de-icing service providers is described in chapter 5.5. Aircraft are positioned on the de-icing pads either with their nose facing to the southeast or the southwest due to obstacle limitations, depending on the specific pad in question.

The individual de-icing pads are each restricted to the following maximum permitted wingspans (WSPAN), due to height restrictions and required safety distances to the set-up areas for de-icing vehicles and mobile light poles.

De-icing pad	Maximum aircraft category	Remarks
DP1	Code Letter E (max. WSPAN 65 m)	De-icing of ACFT type B747 not permitted
DP2	Code Letter E (max. WSPAN 65 m)	De-icing of ACFT code letter F possible
DP3	Code Letter C (max. WSPAN 36 m)	
DP4	Code Letter C (max. WSPAN 36 m)	

The de-icing pads are equipped with yellow, omnidirectional centreline lights. Because of missing centreline markings, the centreline lights of the respective de-icing pads must be switched on at all times during operation to clearly guide the taxiing traffic. DFS aerodrome control is responsible for switching the centreline lights.

In general de-icing service providers will use at least 2 and a maximum of 4 de-icing vehicles per de-icing pad. These will be operated on both sides of the aircraft being de-iced. Set-up areas are marked out for these vehicles and for the mobile light posts required for illuminating the area at night. These ensure a sufficient safety distance from aircraft taxiing onto or off of the pad, up to the stipulated maximum wingspan. Numbers 1 and 2 indicate the set-up areas for the de-icing vehicles. When both de-icing service providers are available on one de-icing pad at the same time, the first de-icing team will generally use the set-up areas marked with a 1. Only these areas may be used to provide de-icing vehicles and mobile light poles.

When using the de-icing pad DP2 with code letter F aircraft (WSPAN > 65 m), the de-icing vehicles must keep a greater distance from the centre line of the de-icing pad or TWY S when the aircraft is taxiing onto or off of the pad. The FSG-ACDC will inform the specific de-icing team before a code letter F aircraft will be occupying the de-icing pad. At the same time, they will inform the respective de-icing team to take the stand-by position for code letter F aircraft. The de-icing vehicles will be placed directly behind the marked set-up areas,

and within the marked de-icing pad. The following figure shows an example of such a stand-by position.

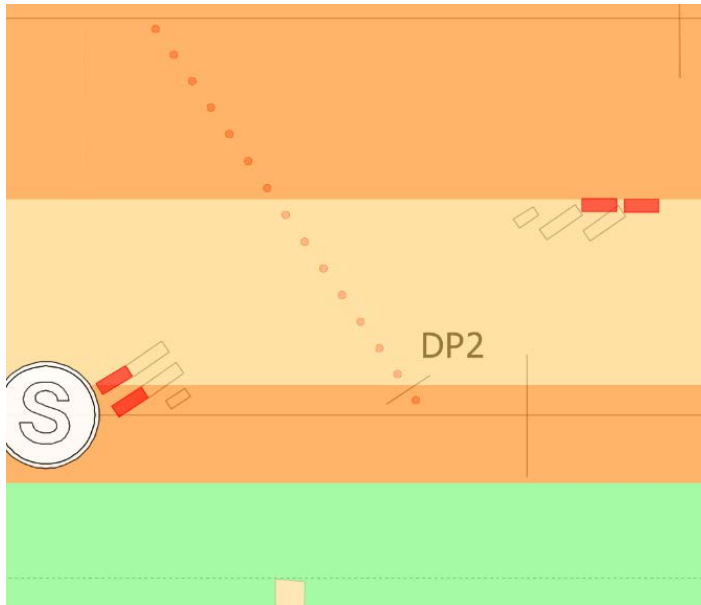


Figure 1: Alternative stand-by area for de-icing vehicles for code F aircraft

The de-icing team will report to the FSG-ACDC once they have taken the deviating stand-by position.

If mobile light posts are set up on de-icing pad DP2 at the time for planned de-icing of the code letter F aircraft, then the FSG-ACDC will coordinate with the shift supervisor of SAG ground handling services to ensure that these are placed farther away, just like the de-icing vehicles.

The SAG shift supervisor will report to the FSG-ACDC once the mobile light posts have been set up at the farther set-up positions.

2.2 Aircraft radio frequencies

Flughafen Stuttgart GmbH operates four aircraft radio frequencies, each assigned to a different de-icing pad, in order to ensure direct communication between the aircraft being de-iced and the respective de-icing team.

De-icing pad	Call sign	Aircraft radio frequency
DP1	Stuttgart De-icing Pad 1	121.630
DP2	Stuttgart De-icing Pad 2	121.955
DP3	Stuttgart De-icing Pad 3	121.660
DP4	Stuttgart De-icing Pad 4	121.855

Aircraft that do not have the required aviation transceivers with an 8.33 kHz frequency grid must report this at the latest when requesting start-up clearance on STUTTGART DELIVERY frequency.

2.3 Airport private mobile radio

The control cabs of de-icing vehicles, the control centres of the de-icing service providers, the FSG-ACDC and DFS aerodrome control are equipped with airport private mobile radio for communication regarding de-icing operations. In general, required operational communication between de-icing personnel and the FSG-ACDC is handled via airport private mobile radio or by mobile phone. Each de-icing service provider has a separate on-call group in the airport private mobile radio.

On-call group	De-icing pad	User
AGS DP1	DP1	SAG Deicing, FSG (ADM/ACDC), DFS
AGS DP2	DP2	SAG Deicing, FSG (ADM/ACDC), DFS
AGS DP3	DP3	SAG Deicing, FSG (ADM/ACDC), DFS
AGS DP4	DP4	SAG Deicing, FSG (ADM/ACDC), DFS
LHT DP1	DP1	LHT Deicing, FSG (ADM/ACDC), DFS
LHT DP2	DP2	LHT Deicing, FSG (ADM/ACDC), DFS
LHT DP3	DP3	LHT Deicing, FSG (ADM/ACDC), DFS
LHT DP4	DP4	LHT Deicing, FSG (ADM/ACDC), DFS

Only the FSG Airport Operations department (ADM and ACDC) and DFS aerodrome control are permitted to use all on-call groups of the airport private mobile radio for aircraft de-icing.

2.4 CSA tool “Web-CaeSar”

De-icing service providers use the web-based CSA tool Web-CaeSar in order to plan their own capacity and resources and to deliver relevant information. This tool lists all departing flights that have placed a de-icing request, with all relevant information for each de-icing service provider.

De-icing service providers enter their currently used or planned de-icing category into Web-CaeSar. The de-icing category is determined based on the type of precipitation or the de-icing process to be used and is required to determine the estimated duration of de-icing time (EDIT).

When accepting ad-hoc aircraft de-icing orders, the de-icing service providers must confirm the airline or aircraft operator’s inquiry in Web-CaeSar. Only then the agreement will be considered binding.



Figure 2: Web-CaeSAR view for de-icing service providers

2.5 Restrictions for aircraft ground traffic

From the time de-icing vehicles and/or mobile light posts occupy a de-icing pad, taxiway S can no longer be used in that area for taxiing traffic. In this case, that part of taxiway S is considered automatically closed by the Airport Duty Manager (ADM).

Because taxiway S is not available, aircraft may not leave the de-icing pad to the west when they are parked with nose facing southeast, and aircraft parked facing southwest cannot leave the de-icing pad to the east.

In general, aircraft enter the de-icing pads from taxiway N. They always exit via taxiway S. A diagram is provided in chapter 8.

After de-icing is completed and all vehicles and ground handling equipment have been removed, the area of the de-icing pads and adjacent areas of taxiway S can be used once again for aircraft taxiing following inspection and approval from the ADM.

If aircraft over 50 meters in fuselage length are parked on the de-icing pads, this will result in restrictions of taxiway N in that area, as shown in the following table.

Fuselage length on DP	ACFT Codes	max. WSPAN on TWY N
< 50 m		60m
50 – 55 m	C17, A306, B753, B763	52 m (Code D)
55 – 60 m	DC10, IL96, B745, A332, A342, B788	52 m (Code D)
60 – 65 m	MD11, B764, B789, A333, A343, A339, B772, B77L, IL96	42 m
65 – 70 m	A359, A345, B78X, A124	36 m (Code C)
> 70 m	B747, A388, A35K, B773, B77W, A346, C5, C5M, B748	24 m

If an aircraft with a fuselage length over 65 m is parked on de-icing pads DP1 or DP2, all aircraft on TWY N adjacent to these de-icing pads have to be guided by a FSG leader vehicle. It has to be ensured first, that the aircraft to be de-iced is at least on the marked stop line, providing a sufficient distance to the centre line of TWY N. If either the aircraft to be de-iced is not sufficiently far away from the centre line of TWY N, or there is no FSG leader vehicle available to guide the taxiing aircraft, TWY N must be closed in the area of de-icing pads DP1 and DP2 during this time period.

2.6 Provision of mobile light posts

Lighting for the de-icing pads is provided by two mobile light posts on each side of the positioning area for de-icing vehicles. Provision of the mobile light posts is requested immediately by the FSG ACDC from the shift management of the SAG ground handling service as soon as de-icing has to be expected or specifically requested by the de-icing providers. In general SAG ground handling service always equips all four de-icing pads with mobile light towers, regardless of the de-icing capacity actually required. In coordination with the de-icing service providers fewer de-icing pads may be equipped with mobile light posts, if a lower demand is anticipated (for instance because pre de-icing has been carried out, or due to less traffic).

Appropriately qualified employees of SAG ground handling services set up the mobile light posts. When extending the posts, the stipulated maximum heights shall not be exceeded. SAG ground handling service staff, MASU or the de-icing teams turn on the light posts and adjust their position as necessary. If there are already de-icing vehicles on the respective de-icing pad, the mobile light posts are switched on by SAG ground handling services staff.

Any technical malfunctions that occur during operation of the mobile light posts must immediately be reported by the team leader of the respective de-icing pad to the FSG-ACDC. The shift management of the SAG ground handling service will arrange for the malfunctioning device to be replaced.

Mobile light posts may only be used up to wind speeds of 50 KT, as per manufacturer specifications.

3. De-icing vehicles

On the de-icing pads the de-icing service providers only use de-icing vehicles with closed control cabs. These vehicles require one operator, move at appropriately low speeds, and are not highly manoeuvrable. Because of this, the vehicles require good surface conditions on the de-icing pads. The priority of winter operations on the de-icing areas is described in detail for Stuttgart Airport in the Winter Operations Manual (Part A).

In general, two de-icing vehicles are used per de-icing pad (de-icing team) and operate on either side of the aircraft fuselage. If necessary, up to four de-icing vehicles from one de-icing service provider may be used on the same de-icing pad.

In addition, de-icing vehicles with an open cab are used in some cases to carry out pre de-icing and other de-icing measures on the apron. These are operated by two personnel. These vehicles may only be used with the engines shut off.

Overview of de-icing vehicles used:

De-icing service provider	Number	Vehicle type	Remarks
Lufthansa Technik AG	2	Vestergaard My	only for pre de-icing
Lufthansa Technik AG	6	Vestergaard Elephant Beta	
Stuttgart Airport Ground Handling GmbH	6	Vestergaard Elephant Beta NG	

Vestergaard Elephant Beta type de-icing vehicles may only be used up to wind speeds of 20.4 m/s or 40 KT, as per manufacturer specifications.

4. De-icing fluids

De-icing service providers are responsible for ensuring the availability of suitable de-icing fluids and for ensuring their quality, as well as for informing the respective airlines of which products they use. SAE specifications AMS 1424 and AMS 1428 must be fulfilled. Only de-icing fluids previously examined and approved for use by the Stadtentwässerung Stuttgart (SES - Stuttgart sewer services) may be used.

Currently, the following de-icing fluids are in use for aircraft de-icing:

Lufthansa Technik AG:

- Type I: Clariant Safewing MP I 1938 ECO (80)
- Type II: Clariant Safewing MP II Flight

Stuttgart Airport Ground Handling GmbH (SAG):

- Type I: Kilfrost DF Plus
- Type IV: Kilfrost ABC-S Plus

5. De-icing process

5.1 Available de-icing capacities and de-icing category

At the beginning of each day of operations, de-icing service providers must indicate their available de-icing capacity in relation to the maximum number of de-icing pads to be used to the FSG-ACDC. If their available capacity changes during the day, they must inform the FSG-ACDC promptly.

While carrying out de-icing operations, de-icing service providers have to determine the expected or currently used de-icing category and must enter this into “Web-CaeSAr”, along with the time period in question. The de-icing category is based on the type of de-icing being carried out and is required in order to calculate the EDIT (estimated duration of de-icing time) as closely as possible. If the de-icing category changes during the de-icing operation, the de-icing service provider has to indicate this immediately in “Web-CaeSAr”.

De-icing category	Name	Explanation
A	Frost	Frost or ice formation on the aircraft
B	Light Snow	Light snowfall
C	Snow	Snowfall
D	Heavy Snow	Heavy snowfall or significant cover of snow
E	Freezing Fog	Freezing fog
F	Freezing Rain	Freezing rain

5.2 De-icing request

Timely requests for aircraft de-icing are essential in order to ensure an orderly turnaround process. This is true in particular if there are no de-icing vehicles available on the de-icing pads.

Due to the influence that aircraft de-icing has on pre-departure sequencing, it is urgently recommended that de-icing is requested by TOBT - 40 min. (time of TSAT publication). If this is not possible due to shorter turnaround times or other factors, the de-icing has to be requested by TOBT - 20 min. at the latest.

De-icing requests may only be placed by the unit responsible for TOBT, by entering the request in the CSA tool “Web-CaeSAr”. Pilots are requested to get in contact with their ground handling service provider or unit responsible for TOBT promptly with de-icing requests.

If the de-icing request is placed by the pilot after receiving start-up clearance from DFS aerodrome control, then start-up clearance will be cancelled. DFS aerodrome control asks the FSG-ACDC to enter the de-icing request in the relevant system. The de-icing request will then be considered in the pre-departure sequence and will result in a recalculation of the TSAT in consideration of the required aircraft de-icing. Start-up clearance will then be granted based on the newly calculated TSAT.

If the pilot places the de-icing request with DFS aerodrome control after leaving the aircraft stand, then a RTS procedure (return to stand) will be executed, and DFS aerodrome control will cancel the start-up clearance afterwards. DFS aerodrome control asks the FSG-ACDC to enter the de-icing request in the relevant system. The de-icing request will then be considered in the pre-departure sequence and will result in a recalculation of the TSAT in consideration of the required aircraft de-icing.

Once a de-icing request has been placed, it is shown in Web-CaeSAr with a symbol * (= asterisk) for the flight in question in the respective column.

Airlines with a contracted de-icing service provider are not obligated to inform the provider directly about a de-icing request. Airlines with no contracted provider must conclude an agreement for aircraft de-icing with a service provider promptly before any required aircraft de-icing operation. The local handling agent (unit responsible for TOBT) can take over the necessary coordination. To conclude an ad hoc agreement with a de-icing provider, the person responsible for TOBT, after prior coordination with the provider, enters the selected de-icing provider in Web-CaeSAr. Once the de-icing request is confirmed by the selected de-icing provider in Web-CaeSAr, the ad hoc agreement is concluded.

If there is no contractual agreement with a de-icing service provider at the time of the de-icing request, nor any confirmation of an ad-hoc agreement, an alert CDM41 is sent to the unit responsible for TOBT and displayed in Web-CaeSAr:

CDM41 – Missing confirmation by de-icing provider

*FLT ID/CDM41/TIMESTAMP/EDDS
CONFIRMATION BY DE-ICING PROVIDER IS MISSING.
CONTACT SELECTED DE-ICING PROVIDER IMMEDIATELY.
NOTE: THE AIRPORT CDM PROCESS WILL BE SUSPENDED AT <TIME>.*

The TSAT and TTOT will be deleted locally until the de-icing request is confirmed by the selected de-icing provider. The flight will be included in the pre-departure sequence after confirmation of the selected de-icing provider.

If no confirmation is received from the selected de-icing service provider within 10 minutes after the de-icing request has been submitted, a C-DPI will be sent to NMOC and the Airport CDM process for this flight will be interrupted. An alert CDM42 will be sent to the unit responsible for TOBT and displayed in Web-CaeSAr:

CDM42 – No confirmation by de-icing provider

*FLT ID/CDM42/TIMESTAMP/EDDS
NO CONFIRMATION BY DE-ICING PROVIDER.
NOTE: THE AIRPORT CDM PROCESS IS SUSPENDED UNTIL RECEPTION OF YOUR
RECTIFICATION.*

If the de-icing request is then accepted by the selected de-icing service provider, the airport CDM process will continue, the flight will be included in the pre-departure sequence, and the data transfer with NMOC will resume.

5.3 Cancelling a de-icing request

If the flight crew requests aircraft de-icing and this later turns out to be unnecessary, then the de-icing request has to be cancelled at the latest until TOBT - 10 min. by deleting the de-icing request in the CSA tool "Web-CaeSAr". The cancelled aircraft de-icing is promptly taken into consideration in pre-departure sequencing.

If the de-icing request is cancelled by the pilot after receiving start-up clearance from DFS aerodrome control, then start-up clearance will be revoked. DFS aerodrome control asks the FSG-ACDC to delete the de-icing request in the relevant system. The deleted de-icing request will be considered in the pre-departure sequence and will result in a recalculation of the TSAT in consideration of the unnecessary aircraft de-icing. Start-up clearance will then be granted based on the newly calculated TSAT.

If the pilot cancels the de-icing request with DFS aerodrome control after leaving the aircraft stand, then the aircraft will remain in the pre-departure sequence and will be guided to its assigned runway by DFS ground control. DFS aerodrome control asks the FSG-ACDC to delete the de-icing request in the relevant system.

If the aircraft de-icing request is cancelled later than TOBT - 10 min., a provision fee may be charged by the relevant de-icing service provider.

5.4 Dispatching the de-icing pads

In general, the de-icing service providers are responsible for ensuring staffing for an appropriate number of de-icing pads based on the current demand for de-icing services. If necessary, this may include up to the maximum available de-icing capacity. Since de-icing service providers can only be responsible for planning their own area of responsibility and since they do not have transparency regarding the overall process, the FSG-ACDC will support them in determining the quantity of required de-icing pads.

When receiving the first de-icing request, the de-icing service provider must ensure that a de-icing team is provided in due time on a de-icing pad. To do so, the de-icing coordinator immediately contacts the FSG-ACDC by phone to request the assignment of a de-icing pad. The point of time from which the de-icing pad in question will be ready for use must be indicated. If further de-icing requests are placed, the de-icing service provider must staff additional de-icing pads as needed with de-icing teams. Additional de-icing pads will likewise be requested by phone from the FSG-ACDC, indicating the estimated readiness.

The FSG-ACDC monitors the de-icing requests placed by the units responsible for TOBT during its operating hours. If there is no de-icing pad available for de-icing requests that have been placed, or if the de-icing service provider has clearly not requested a sufficient number of de-icing pads, then the FSG-ACDC contacts the de-icing service provider in question. The final decision on the amount of staffed de-icing pads however remains with the respective de-icing service provider.

The FSG-ACDC assigns the respective de-icing pads to the de-icing service providers upon request. The infrastructure-based restrictions indicated in chapter 2.1 must be observed. The FSG-ACDC dispatches de-icing pads in RTC Staff De-icing and considers required provision times in addition to assigning pads to de-icing service providers. Before assigning the de-icing pads to the de-icing service providers, the FSG-ACDC has to coordinate the use of the pads with DFS ground control. Due to restrictions for ground traffic during the occupation of de-icing pads, DFS ground control is responsible for assigning the preferred de-icing pads based on the specific situation. If possible, moving de-icing teams to another de-icing pad during ongoing operations should be avoided, and teams should only be moved in specific, justified circumstances.

If the number of de-icing pads requested for use by the de-icing service providers exceeds the maximum available number of four de-icing pads, the FSG-ACDC decides on usage intervals for the individual de-icing pads by the de-icing service providers in consideration of the overall situation.

In case of technical malfunctions of de-icing vehicles on the de-icing pads, or other circumstances that might delay de-icing operations or even require the closure of a de-icing pad, the de-icing team or de-icing coordinator immediately has to inform the FSG-ACDC.

If any process disruptions occur, the FSG-ACDC will coordinate required corrective measures with the involved stakeholders.

5.5 Occupation of the de-icing pads

Since the de-icing pads are in the manoeuvring area, all staff involved in aircraft de-icing has to carry out a manoeuvring area driving training program in accordance with the EASA aerodrome manual before carrying out its work on the de-icing pads. This training program is explicitly designed to complement the requirements of de-icing operations and participants who complete the training are granted an exclusive authorisation to drive to the assigned de-icing pads including crossing adjacent taxiways.

To obtain access to the de-icing pads, de-icing vehicles have to cross taxiway N. De-icing staff has to request the approval necessary for this purpose from DFS ground control by mobile phone. Before granting approval to cross taxiway N and drive onto the respective de-icing pad, DFS ground control has to switch on the centreline lights of the respective de-icing pad. When the centreline lights for the respective de-icing pad are activated, taxiway S is automatically considered closed in that area. An explicit closure by the Airport Duty Manager is not required in such cases. After approval is granted by DFS ground control, de-icing staff is permitted to drive onto the de-icing pads within the marked boundaries without further approval.

Once the de-icing team has completed its preparations on the respective de-icing pad and is ready to commence operations, the de-icing team informs the FSG-ACDC via airport private mobile radio or mobile phone. The FSG-ACDC immediately notifies DFS aerodrome control (PGD) and documents the de-icing team's readiness in the daily report.

5.6 De-icing sequence

The aircraft de-icing sequence is determined based on the pre-departure sequencing for the Airport CDM procedure. The following factors are taken into consideration when determining the de-icing sequence and the calculation of the Estimated Commencement of De-icing Time (ECZT):

- Local capacity at the airport (runway / de-icing pads)
- Network influences by NMOC (CTOT / Calculated Take-off Time)
- Estimated taxi-out time (EXOT)
- TOBT
- TSAT (Target Start-up Approval Time)
- Time of the de-icing request

In the best-case scenario, the ECZT is the same time as TOBT + EXOT 1 (estimated taxi-out time to the assigned de-icing pad).

If a published TOBT cannot be complied with due to technical problems or for other reasons, the airline or aircraft operator are obligated to adjust or delete it immediately.

The EDIT (Estimated Duration of De-icing Time) is not part of the TOBT. For this reason, the TOBT should never be changed for a subsequent aircraft de-icing. The EDIT includes the time

of entering the de-icing pad, actual aircraft de-icing itself, and follow-up work on the aircraft until it taxis out of the de-icing pad.

The following figure shows the definition of the Estimated Duration of De-icing Time (EDIT) and Actual Duration of De-icing Time (ADIT). The DFS transmits the actual commencement (ACZT) and end time (AEZT) for the de-icing process.



Figure 3: Diagram of de-icing team (EDIT / ADIT)

5.7 Guidance of aircraft to the de-icing pads

The sequence of aircraft in the de-icing process is determined by the pre-departure sequence of the sequence planner in consideration of the available de-icing capacities. Once an aircraft to be de-iced has achieved the status “aircraft ready” and is ready to start engines, the flight crew has to report this on the frequency of STUTTGART DELIVERY. Latest at TOBT the flight crew has to ensure a continuous air-ground voice communication watch, even in case of a deviation between the TOBT and TSAT. In general, STUTTGART DELIVERY will grant start-up clearance based on the published TSAT.

DFS ground control (STUTTGART GROUND) will grant relevant approvals for push back and taxi towards the originally planned de-icing pad to the flight crew upon request. In order to optimise the flow of traffic, DFS ground control may change the originally planned de-icing pad at any time during taxi, in consideration of the assigned de-icing service provider. Early enough before reaching the de-icing pad, the flight crew will be instructed by DFS ground control to contact the de-icing team on the respective aircraft radio frequency prior entering the de-icing pad.

Example:

“[ARCID] before entering the de-icing pad contact STUTTGART DE-ICING PAD [No.] on frequency [...]”.

Continued guidance and correct parking of the aircraft on the de-icing pad will be performed by the de-icing team via aircraft radio. If the assigned de-icing pad is still occupied during taxi, DFS ground control can use individual sections of the taxiways located in the direct vicinity of the de-icing pad as a temporary waiting position. In exceptional cases, free aircraft

stands near the de-icing pad may be used as an intermediate stopover point in coordination with the FSG-ACDC. The impacts on apron traffic must, however, be taken into consideration.

5.8 Execution of aircraft de-icing

Communication between the aircraft to be de-iced and the de-icing team on the respective de-icing pad will be performed on the assigned aircraft radio frequency. Once the aircraft to be de-iced has established radio contact with the de-icing team via aircraft radio, it will receive approval to enter the de-icing pad. The de-icing team must ensure that the de-icing vehicles are within the marked stand-by areas and that the required obstacle clearance is granted. The de-icing team will instruct the flight crew to stop at the latest when the nose gear of the aircraft has reached the marked stop line of the de-icing pad.

Before de-icing, the de-icing team will ensure that the flight crew has set the parking brake, and that all other preparations to be carried out on the aircraft before de-icing have been completed. After the flight crew has indicated the aircraft parts to be de-iced, the de-icing team will start de-icing, providing the name of the de-icing fluid it is using.

De-icing can be performed with running engines on jet aircraft and aircraft types ATR42/72 with working propeller brakes. In addition, the so-called 'crossover procedure' for propeller driven aircraft, in which one or the other engine is alternately switched off, is also permitted. In this case, the de-icing service provider must ensure by suitable means, that a de-icing operation of the wings is only performed on the side of the aircraft with engines switched off.

The following communication diagrams describe standard communication between cockpit crew and de-icing team and are shown here only as examples.

One-step procedure:

COCKPIT	DE-ICING TEAM
<p>Stuttgart De-icing Pad XY, [ARCID], [REG], request de-icing.</p> <p>[ARCID], taxi onto DP XY.</p> <p>[ARCID], parking brake is set and aircraft is ready for de-icing.</p> <p>[ARCID], request wings and stabilizer. (or additional: rudder, body, complete aircraft)</p> <p>[ARCID], confirmed.</p> <p>[ARCID], affirmative.</p>	<p>Good morning (good evening) [ARCID], [REG], taxi onto DP XY, follow the yellow line (lights) and stop on my command.</p> <p>[ARCID], stop now. Please prepare your aircraft for de-icing and confirm that the parking brake is set.</p> <p>Which parts of your aircraft require de-icing?</p> <p>[ARCID], wings and stabilizer confirmed. We will use a one-step procedure with TYPE I (XX %).</p> <p>[ARCID], we will start now. I will call you back when de-icing is complete.</p>
After completion of de-/anti-icing	
<p>[ARCID], confirm aircraft de-/anti-iced with TYPE I, begin holdover time hh:mm local.</p> <p>[ARCID], roger, contact 118.605. Goodbye.</p>	<p>[ARCID], post de-icing/anti-icing check is completed. Your anti-icing code is TYPE I (XX %), Kilfrost DF Plus at hh:mm local time.</p> <p>[ARCID], de-icing area is clear of de-icing trucks, for further taxi instructions contact STUTTGART GROUND on 118.605. Goodbye.</p>

Two-step procedure:

COCKPIT	DE-ICING TEAM
<p>Stuttgart De-icing Pad XY, [ARCID], [REG], request de-icing.</p> <p>[ARCID], taxi onto DP XY.</p> <p>[ARCID], parking brake is set and aircraft is ready for de-icing.</p> <p>[ARCID], request wings and stabilizer. (or additional: rudder, body, complete aircraft)</p> <p>[ARCID], confirmed.</p> <p>[ARCID], affirmative.</p>	<p>Good morning (good evening) [ARCID], [REG], taxi onto DP XY, follow the yellow line (lights) and stop on my command.</p> <p>[ARCID], stop now. Please prepare your aircraft for de-icing and confirm that the parking brake is set.</p> <p>Which parts of your aircraft require de-icing?</p> <p>[ARCID], wings and stabilizer confirmed. We will use a two-step procedure with TYPE I (XX %) for de-icing and TYPE IV 100% for anti-icing.</p> <p>[ARCID], we will start now. I will call you back when ready.</p>

After completion of de-/anti-icing

<p>[ARCID], confirm aircraft de-/anti-iced with TYPE IV, begin holdover time hh:mm local.</p> <p>[ARCID], roger, contact 118.605. Goodbye.</p>	<p>[ARCID], post de-icing/anti-icing check is completed. Aircraft anti-iced with TYPE IV 100%. Kilfrost ABC – S Plus. Begin of holdover time hh:mm local.</p> <p>[ARCID], de-icing area is clear of de-icing trucks, for further taxi instructions contact STUTTGART GROUND on 118.605. Goodbye.</p>
--	--

During the de-icing process, the cockpit crew in parallel must maintain listening watch at all times on the DFS ground control frequency (STUTTGART GROUND), so that they can be informed of any changes in operating procedures.

Once de-icing is completed, the de-icing team confirms to the flight crew by transmitting the anti-icing code that the post de-/anti-icing check has been carried out, that the de-iced parts of the aircraft are free from ice and snow and the de-icing pad has been cleared of all vehicles. The anti-icing code also includes the de-icing fluid used.

5.9 Aircraft leaving the de-icing pads

After concluding aircraft de-icing, the de-icing team will instruct the cockpit crew to contact DFS ground control (STUTT GART GROUND) for start-up approval (if necessary) or taxi. DFS ground control is responsible for guiding the aircraft from the de-icing pad to the assigned departure runway.

5.10 Closing of de-icing pads

In general, the de-icing service provider is responsible for deciding to close a staffed de-icing pad. It has to take the current de-icing demand into consideration in this decision. The de-icing service provider may close a de-icing pad based on strategic planning, including temporarily, for instance to exchange personnel or to refill de-icing fluids.

In addition, the FSG-ACDC may suggest that the de-icing service provider closes one or more de-icing pads if it does not seem they will be necessary due to the current or expected de-icing requests. The de-icing service provider, however, is always responsible for making the final decision for whether de-icing pads are closed.

The FSG-ACDC can instruct a de-icing service provider to close one or more de-icing pads if the total number of requested de-icing pads exceeds the available capacity of four pads, and if the overall situation indicates that the other de-icing service provider should use one or more of the pads.

To leave the de-icing pads, de-icing vehicles have to cross taxiway N. De-icing staff has to request the approval necessary for this purpose from DFS ground control by mobile phone. DFS ground control must leave the centreline lights of the respective de-icing pad on. After all de-icing vehicles and mobile light posts have left the respective de-icing pad, DFS ground control must notify the ADM to check and then reopen taxiway S in the adjacent area.

When closing a de-icing pad, the last de-icing vehicle reports to the FSG-ACDC by mobile phone or airport private mobile radio after leaving the de-icing pad.

5.11 Data exchange with the Network Manager

Continuous data exchange between Stuttgart Airport as an A-CDM airport and the Network Manager Operations Centre (NMOC) has been established via Departure Planning Information (DPI). This ensures the Network Manager has all relevant information even on aircraft de-icing at all times.

If a de-icing request is placed for a departure from Stuttgart Airport, the changed EXOT, the relevant adjusted TTOT and the departure status (DEPSTATUS DEICING) are transmitted in a DPI to NMOC immediately.

DPI without de-icing request:

-DPISTATUS TARGET
-ARCID EWG3ZY
-ADEP EDDS
-ADES EHAM
-EOBT 0535
-EOBD 200123
-TOBT 0535
-TAXITIME 0006
-TTOT 0541
-SID OKIBA4H
-ARCTYP A319
-REG DAKNV
-IFPLID AA21968111
-ORIGIN
-NETWORKTYPE AFTN
-FAC EDDSYDYX

DPI with de-icing request:

-DPISTATUS TARGET
-ARCID EWG3ZY
-ADEP EDDS
-ADES EHAM
-EOBT 0535
-EOBD 200123
-TOBT 0535
-TAXITIME 0021
-TTOT 0556
-SID OKIBA4H
-ARCTYP A319
-REG DAKNV
-DEPSTATUS DEICING
-IFPLID AA21968111
-ORIGIN
-NETWORKTYPE AFTN
-FAC EDDSYDYX

An agreement is required between the airline or aircraft operator and one of the de-icing service providers in order to ensure a reliable pre-departure sequence and thus for the continuation of the airport CDM process. If such an agreement is not concluded within 10 minutes after the de-icing request is made, then a C-DPI is sent to NMOC for the flight in question.

C-DPI due to lack of confirmation from the de-icing service provider:

-DPISTATUS CNL
-ARCID VJT426
-ADEP EDDS
-ADES EDDT
-EOBT 0700
-EOBD 200122
-IFPLID AA28056798
-ORIGIN
-NETWORKTYPE AFTN
-FAC EDDSYDYX

In reaction to receiving a C-DPI, the NMOC will send out a Flight Suspension (FLS), which excludes the flight from further airspace planning until a flight plan update (DLA) or an updated DPI is received.

Flight Suspension (FLS) as reaction to receiving a C-DPI:

-ARCID VJT426
-IFPLID AA28056798
-ADEP EDDS
-ADES EDDT
-EOBD 200122
-EOBT 0700
-COMMENT SUSPENDED BY DEPARTURE AIRPORT
PLEASE SEND DLA/CHG OR UPDATE TOBT OF THE FLIGHT
-TAXITIME 0022

Through automated data exchange with the NMOC via DPI the CTOT assignment is provided based on local circumstances (Airport CDM pre-departure sequence). To avoid interfering with the stability of the pre-departure sequence, the aircraft operator should not carry out any additional coordination with the NMOC.

A detailed description of the data exchange between Stuttgart airport and the NMOC is provided in current procedural documentations.

5.12 Vehicles and persons on the de-icing pads

Only authorized vehicles may be operated on the de-icing areas during de-icing operations. This includes the de-icing vehicles and mobile light posts provided for lighting. No other vehicles may drive on the de-icing areas, nor are persons permitted on the de-icing areas outside of the authorized vehicles during de-icing operations. If this is necessary for operational reasons, authorization to drive a vehicle on the de-icing pads must be obtained from the ADM prior contacting DFS ground control. The traffic and safety rules for restricted areas at Stuttgart Airport apply to such other vehicles and persons on the de-icing areas.

Unobstructed short-term parking for vehicles and equipment is available directly beside the stand-by areas marked for de-icing equipment and mobile light posts. Ground handling equipment required by ground handling services (e.g. ground power units) must be stored initially at the nearest equipment parking area.

During de-icing operations, vehicles and equipment must be removed completely from the respective aircraft, with the exception of any required ground power unit.

5.13 Quality monitoring

Quality parameters must be analysed regularly, in order to maintain a stable, high-quality de-icing process. The FSG Quality Monitoring generates regular analyses of the entire process for this purpose. These provide important insight into compliance with stipulated procedures and the quality of the master data used in the planning process. The results of the analyses are evaluated regularly by the local Airport CDM team and discussed with the process partners involved.

Delays assigned by ground handling service providers concerning the de-icing process (delay code DL 75) are generally reviewed by the FSG Quality Monitoring and the local Airport CDM team the next day and transferred to an internal sub-delay code if considered justified. Using internal sub-delay codes provides significantly better transparency regarding the different reasons for delays in the aircraft de-icing process. The following internal sub-delay codes are used by the FSG:

Sub-delay code	Designation	Explanation
75A	Remote de-icing (demand exceeds supply)	The available or dispatched de-icing capacity is not sufficient for the current demand.
75B	Late de-icing request	The de-icing request was not placed in a timely manner.
75C	Remote de-icing (additional de-icing after HOT expired)	The aircraft had to be de-iced again after the end of the HOT.
75D	Lack of- de-icing equipment	The de-icing service provider is unable to provide sufficient vehicle capacity.
75E	Breakdown of equipment	A technical breakdown or fault in a de-icing vehicle resulted in a delay.
75F	Lack of staff / late provision of staff	The de-icing service provider is unable to provide sufficient staff or provides the available personnel too late.
75G	Lack of fluid	The de-icing service provider is unable to provide a sufficient quantity of de-icing fluid.
75H	Late lighting or missing lighting of de-icing pads	Late provision or lack of mobile light posts for illuminating the de-icing pads.
75X	Other reasons	Other reasons, to be specified.

6. Pre de-icing

Pre de-icing is carried out before the morning departure peak in order to ensure flight operations are as free from interruption and punctual as possible. In order to carry out pre de-icing, a bilateral agreement is required between the airlines or aircraft operators in question with the responsible de-icing service providers. The responsible de-icing service provider makes the final decision on whether to carry out pre de-icing on the specific operating day, based on current icing conditions and the current weather forecast. During the defined winter season, the respective de-icing service provider will inform the FSG-ACDC each day by 04:15 at the latest whether and to what extent pre de-icing will be carried out. The FSG-ACDC will inform DFS aerodrome control of the status of pre de-icing.

Pre de-icing may be carried out until 6:00 and may only be carried out on aircraft parked overnight with a scheduled off-block time (SOBT) of 7:30 at the latest. In addition, pre de-icing may be carried out with aircraft that have been parked for a longer period of time, if their departure times would otherwise be endangered if aircraft de-icing is required due to night curfew regulations. A relevant general agreement must be concluded for this purpose between the responsible de-icing service provider and the Airport Operations department of Flughafen Stuttgart GmbH.

Any de-icing fluid remaining on the aircraft stand must be collected by a specialised vehicle before parking of another aircraft on that stand. An on-call service from the Infrastructure Management department of the FSG is available for this purpose from 6:00. If necessary, the FSG-ACDC should request the use of the specialised vehicle at 4:30 from the Security and Maintenance Operations Center.

De-icing service providers must prepare an overview of all aircraft for which pre de-icing was performed directly after completing pre de-icing. This must include all specific information on pre de-icing, such as the de-icing fluid used, the de-icing procedure used, the concentration used and the calculated holdover time (HOT). The de-icing service provider must submit this overview to the local ground handling service providers and other participating partners. The responsible ground handling service provider or ramp agent will forward this information on pre de-icing to the respective cockpit crew.

The de-icing service providers must also provide an overview of all aircraft for which pre de-icing was carried out to the FSG-ACDC and the Security and Maintenance Operations Center, indicating the quantity of de-icing fluid used, via e-mail by 6:30 at the latest. The FSG-ACDC will record that pre de-icing was carried out for these departures retroactively in the Airport Management System (AMS).

7. Fan blade and underwing de-icing

Fan blade de-icing using hot air may only be performed by authorised technical staff and must undergo an inspection afterwards. The required heating devices are provided by SAG ground handling service upon request.

“Underwing” de-icing and propeller de-icing may be carried out by de-icing service providers on the aircraft stand following prior notification to the FSG-ACDC. Any de-icing fluid remaining on the apron must also be collected promptly by a specialised vehicle in such cases. This is requested by phone in the same way as for pre de-icing by the FSG-ACDC from the FSG Security and Maintenance Operations Center.

8. Layout plans

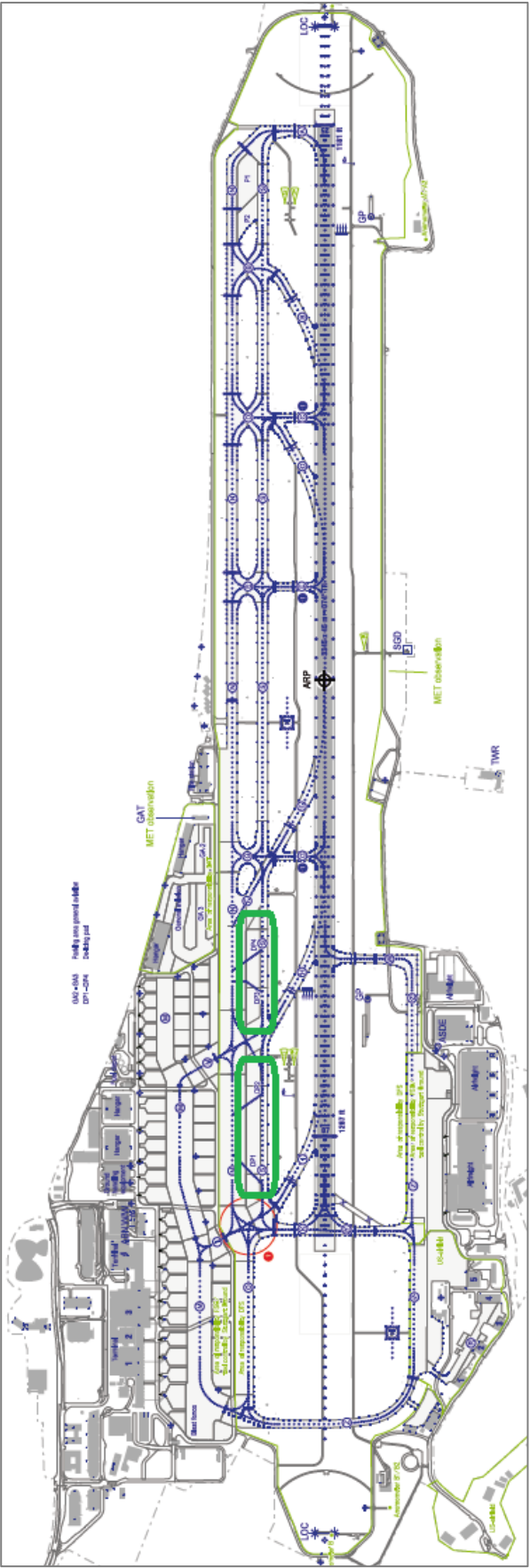


Figure 4: Overall view of the airport, incl. de-icing pads

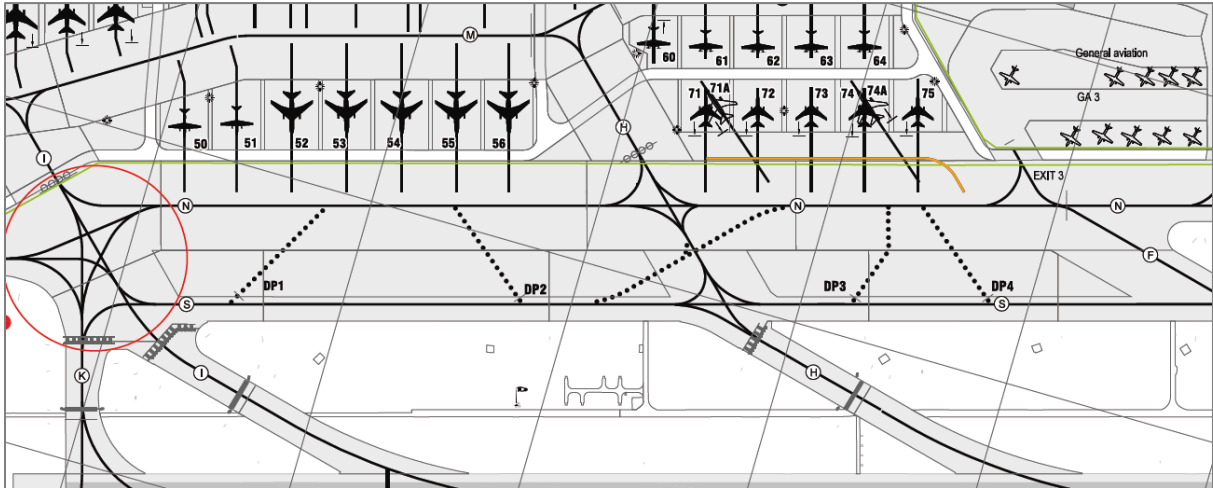


Figure 5: Detailed view of de-icing pads