INTERNATIONAL STANDARD

ISO 11077

First edition
1993-07-01

Aerospace — Self-propelled de-icing/anti-icing vehicles — Functional requirements

Aéronautique et espace — Véhicules automoteurs de dégivrage/antigivrage des aéronefs — Exigences fonctionnelles

Reference number
ISO 11077:1993(E)

Contents

International Organization for Standardization
Case Postale 56 • CH-1211 Genève 20 • Switzerland

Printed in Switzerland

Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

International Standard ISO 11077 was prepared by Technical Committee ISO/TC 20, *Aircraft and space vehicles*, Sub-Committee SC 9, *Air cargo and ground equipment*.

Annex A of this International Standard is for information only.

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Aerospace — Self-propelled de-icing/anti-icing vehicles — Functional requirements

1 Scope

This International Standard specifies the general functional and performance requirements for a self-propelled, boom type aerial device, equipped with an aircraft de-icing/anti-icing fluid (ADF) spraying system.

This International Standard does not specify a comprehensive set of technical design criteria for aircraft de-icing/anti-icing vehicles, but only those relating to functional and performance requirements.

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this International Standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

ISO 6966:1982, *Aircraft — Basic requirements for aircraft loading equipment.*

ISO 7000:1989, *Graphical symbols for use on equipment — Index and synopsis.*

3 General requirements

3.1 Basic requirements

The basic requirements of ISO 6966 shall be met.

NOTE 1 Although a de-icing/anti-icing vehicle is not a piece of aircraft loading equipment, the basic general requirements are identical for aircraft loading and aircraft servicing equipment, designed in the same airport ramp environment.

3.2 Equipment

The vehicle shall be large enough to accommodate the fluid capacity required for narrow-body and wide-body aircraft and may be chosen by the purchaser from the alternatives given in table 1.

Table 1

Type	Tank capacity		Minimum basket-to-floor height	
	l	gal(US)	m	ft
A size	⩽ 4 600	⩽ 1 215	10	33
B size	> 4 600	> 1 215	12	40

The unit shall consist of the following:

a) a suitable self-propelled chassis;

b) an aerial device with personnel basket constructed and mounted in accordance with applicable national safety standards;

c) fluid supply tank(s);

d) a fluid pumping system and heater for applying heated de-icing fluid to aircraft surfaces.

3.3 Basic performance features

3.3.1 The primary function of the vehicle shall be to apply heated de-icing/anti-icing fluid and their mixtures from a variable height boom to the surfaces of stationary aircraft while traversing their perimeter.

A hose stored in a compartment shall also be fitted for ground use. The vehicle shall be acceptable for use around terminal gate areas, airport service roads and aircraft service ramps.

3.3.2 The personnel basket shall have the minimum lift capacity given in table 2.

Table 2

Type	Minimum lift capacity	
	kg	lb
A size	136	300
B size	204	450

3.3.3 The de-icing fluid system shall be capable of a delivery rate at the personnel basket spray nozzle of at least 190 l/min [50 gal(US)/min] at a prenozzle discharging pressure of 655 kPa (95 psi), with the boom fully elevated.

3.3.4 The de-icing fluid system shall be designed for spraying at temperatures of up to 85 °C (185 °F) at the nozzle.

3.3.5 The heating system shall be capable of raising the temperature of the de-icing fluid tank capacity from 5 °C to 85 °C (41 °F to 185 °F) within 1 h.

3.3.6 Where a separate anti-icing fluid system is provided, it shall be designed so as to spray the fluid at a minimum rate of 76 l/min [20 gal(US)/min].

3.3.7 A-weighted noise level in the cab with all systems operating should not exceed 85 dB and shall meet local regulatory requirements.

3.3.8 The vehicle shall be capable of being driven at normal road speeds in accordance with applicable local highway regulations.

3.3.9 The vehicle and all associated systems shall operate satisfactorily between temperatures of − 40 °C and + 50 °C (− 40 °F and + 122 °F) and in continuous relative humidity of up to 100 %.

4 Design and overall dimensions

The de-icing vehicle shall have an adequate chassis and shall meet the following requirements.

4.1 An enclosed, heated cab for the vehicle driver, and optionally a passenger, shall be provided. The cab shall be fitted with windshield wipers and a defroster/heater system.

4.2 The vehicle driver shall be located at the left side of the chassis and shall have the maximum unobstructed view of the operator and basket under all operating conditions.

NOTE 2 The foregoing may be reversed for countries that drive on the left-hand side of the road.

4.3 The maximum width shall be 2,5 m and the maximum height in the lowered boom position shall be 3,8 m.

4.4 Tow hooks shall be installed on the chassis structure, with at least two at the front and one at the rear.

4.5 Storage batteries shall be of the heavy duty type. The vehicle electrical system shall be based on 12 V d.c. or 24 V d.c. power.

4.6 Alternators shall be installed that supply 100 % of the maximum vehicle electrical steady load at engine idle speed.

4.7 The aerial device and its installation on the vehicle shall conform to applicable national and/or local regulatory safety and stability regulations.

4.8 The personnel basket shall have a self-adjusting mechanism to maintain a vertical operating attitude for all boom positions.

4.9 The personnel basket shall provide for safe and easy entry and exit, e.g. with positive latches on entry gate(s) and/or retainer bar(s).

4.10 The aerial device and its attachment to the chassis shall be such that periodic structural inspection can readily be carried out without major disassembly.

4.11 The personnel basket shall be designed to position an operator to apply de-icing/anti-icing fluid effectively to the upper areas of aircraft control surfaces, wings, empennage and fuselage.

Positioning speed during operation shall be in accordance with local safety regulations.

4.12 Stability and safety shall be paramount in the boom and basket design. Operation of the boom and its controls shall be smooth and positive.

4.13 An emergency system shall be provided, which will enable the aerial device and loaded basket to be manœuvered and lowered in the event of system malfunction/engine shut-down.

4.14 A two-way communications set shall be installed between the basket and the driver's cab.

4.15 The vehicle's fluid handling system shall be designed to be compatible with the appropriate ISO de-icing/anti-icing fluid. Special fluid circuit design requirements shall be met to avoid degrading ISO type II anti-icing fluid which can be adversely affected by pumping, heating and spraying.

4.16 Fluid tank(s) shall be made of non-corrosive material and adequately baffled to prevent undue fluid motion and starving of the fluid pump during manœuvering. Suitable vents, overflows, manual fills and liquid level gauges, drains and manhole or equivalent with cover shall be provided on the tank.

4.17 The pump shall be of the demand type, if necessary, to minimize anti-icing fluid degradation.

4.18 System design shall permit easy, non-hazardous access to components for servicing, maintenance or removal. Isolation shut-off valves shall be installed on the fluid tank(s) and at other locations where large spillage would occur if a line was opened.

4.19 The spray pattern shall be able to vary from a fan-shaped spray to a solid stream as selected by the operator. The operator shall have full control of fluid flow by means of a rate-of-flow adjustment mechanism at the nozzle and an open/close lever.

4.20 The fluid heater shall be suitable for continuous operation on the airport and during operation of the vehicle while in motion when de-icing/anti-icing aircraft, unless it is a fluid pre-heat type requiring external energy.

4.21 The fluid heater shall be equipped with appropriate safety devices to prevent the occurrence of conditions which might damage the equipment or create an unsafe condition.

4.22 All steps and platforms shall have a non-skid, self-draining surface.

4.23 The vehicle shall be equipped with devices to automatically shut down systems when a hazardous or self-destruction condition arises while the fluid pumping or heating systems are operating, but which still allow the vehicle to be driven away from the aircraft.

4.24 The unit shall be capable of using proportional or premixed fluids.

4.25 The design of the vehicle shall be such that no de-icing/anti-icing vapours can enter the driver's cab (with windows closed) under any weather conditions.

5 Mobility and stability

5.1 The unit shall provide a safe and stable configuration for easy manœuvering about the aircraft with the boom in any possible position and a capacity load in the basket, at speeds up to 8 km/h (5 mile/h) with wind from any direction at speeds of up to 75 km/h (40 kn, 47 mile/h) with fluid tanks at minimum and maximum operating levels.

5.2 Power steering and a power-assisted braking system shall be provided.

5.3 A parking brake shall be provided.

5.4 Drive wheel tyre clearance shall be adequate for the installation and operation of chains. Any vulnerable components shall be suitably protected.

6 Controls

6.1 All controls necessary for the safe operation of vehicle, basket and boom shall be provided.

6.2 The personnel basket shall be equipped with a complete set of controls which will permit the operator to move the boom and basket through any of its motions.

6.3 Duplicate controls shall also be provided at a location readily accessible to the driver (preferred) or in the vicinity of the boom base. A selector valve shall be provided at the lower station (next to the duplicate controls) to permit selection of the operating station between either the basket or vehicle location. The lower controls shall override the basket controls in any configuration.

6.4 All control levers shall directionally agree with boom movement, be of the "dead-man" type and shall be large enough for grasping with a gloved hand. They shall be identified with permanent graphic symbols in accordance with ISO 7000.

6.5 Controls shall be positioned at the rearward edge of the basket and shall be protected from fluid spray and/or inadvertent snagging from lines or hoses.

6.6 An emergency stop switch shall be provided in the basket to stop all boom movement and to shut down the fluid pump and heater.

6.7 Permanent placards or graphic symbols in accordance with ISO 7000 shall be provided for all operating controls, instruments fluid filling points, electrical switches, caution signs and operating instructions.

6.8 Ample lighting to illuminate the control panels and spray area for night operation shall be provided.

7 Quality assurance

The operator (i.e. the airline or the handling agent) of de-icing/anti-icing equipment shall maintain the equipment in a status which ensures continuous, proper application of ISO type II de-icing/anti-icing fluid.

This can be established by measuring either viscosity or holdover time. These tests shall be performed annually, preferably at the beginning of the winter season.

Provided the equipment is maintained to the same standard, the sample may be limited to one test per vehicle type at each station.

Annex A
(informative)

Bibliography

[1] ISO 11075:1993, *Aerospace — Aircraft de-icing/anti-icing Newtonian fluids, ISO type I.*

[2] ISO 11076:1993, *Aerospace — Aircraft de-icing/anti-icing methods with fluids.*

[3] ISO 11078:1993[1], *Aerospace — Aircraft de-icing/anti-icing non-Newtonian fluids, ISO type II.*

[4] ARP 1247 B-82[2], *General Requirements for Aerospace Ground Support Equipment, Motorized and Non-Motorized.*

[5] *Recommendations for de-icing/anti-icing of aircraft on the ground.* Nov. 1991.[3]

[6] ATA 101[4] *Specification for Ground Equipment Technical Data.*

1) To be published.

2) Obtainable from the Society of Automotive Engineers, 400 Commonwealth Drive, Warrendale, PA 15096-0001, USA.

3) Obtainable from the Association of European Airlines (AEA), Avenue Louise 350, Bte 4, 1050 Brussels, Belgium.

4) Obtainable from the Air Transport Association, 1709 New York Avenue NW, Washington, DC 20006, USA.