



AEROSPACE RECOMMENDED PRACTICE	ARP6059™	REV. A
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	Superseding ARP6059	
Solid De-Icing/Anti-Icing Material Spreader for Airport Application		

RATIONALE

This technical report is being stabilized because it covers technology, products, or processes which are mature and not likely to change in the foreseeable future.

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Documents

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1. SCOPE

This equipment recommended practice defines the requirements for a permanent vehicle-mounted or slip-in accessory device designed to transport and distribute aggregate de-icing, anti-icing, or friction modifying solid materials or wetted solid materials onto runways, taxiways, ramp, and terminal areas and other paved surfaces on an airport. It is not intended for liquid material spreaders which are addressed in ARP5559. The material spreader may be permanently mounted on a carrier vehicle, trailer, or semi-trailer, or temporarily installed on a carrier vehicle trailer, or semi-trailer for seasonal use only. The carrier vehicle may be dedicated to material spreading applications only, or provide additional functions such as a plow vehicle, flat bed or dump body. Carrier vehicles are self-propelled prime movers, generally a commercial or purpose-built truck that provides the mobility to move the material spreader on these paved surfaces. Carrier vehicle recommended practices may be found in ARP5943 plows and ARP5539, rotary plow with carrier vehicle. This recommended practice does not include requirements for the carrier vehicle, snow plow or other applications for the carrier vehicle.

The airport sponsor requires this equipment in order to maintain the airfield prior to, during and after snow and ice events. In combination with other supporting Snow Removal Equipment (SRE), the material spreader will enable the airport to modify the friction on surfaces used by aircraft prior to the accumulation of snow or ice; during or after a snow or ice event; or, after the removal of snow or ice by other snow removal equipment. Material spreader vehicles are often equipped with a displacement plow to provide both plowing and material spreading functionality. Some units may be used for other service such as parking lot or roadway snow and ice control, applying material for spills, for use as a conventional dump truck, or other applications.

It is the intent of this document to describe a hopper type material spreader, or hopper type material spreader combined with a liquid reservoir for pre-wetting the chemical, complete with rear end spreading device and necessary operational controls, suitable for skid mounting or chassis mounting on a carrier vehicle for airport application. The spreader material deposition is controlled by a single operator, normally the driver of the carrier vehicle, employing a control panel conveniently placed near the operator control station close to the driver's position. Material spreaders are primarily defined by the carrying capacity of the hopper (typically expressed in cubic yards) and by the width of the path for reliable and accurate material spreading (typically expressed in feet). Presently, typical hopper capacities vary from about 8 cubic yards to about 16 cubic yards; and, spreading widths vary from about 12 feet to about 80 feet. The material spreading pattern should produce a uniform distribution pattern, an even path from as little as 2 feet wide to the maximum specified spreading width throughout the spreading speed range. The unit should be designed to allow loading with bucket loaders, fixed equipment and manual loading. It should provide for protecting the dry materials in the hopper from direct exposure to the elements, particularly moisture before, during and after a snow event, and the safe and consistent spreading of the material on airport surfaces. In addition, the unit must provide methods of efficiently removing material from the hopper when no longer needed (end of storm/season) or for unit maintenance.

Material spreaders should be designed for operation using any of the typical airport snow and ice control chemicals, specifically including airport sand, sodium acetate, calcium chloride, Sodium Formate Urea and Urea liquid solution and liquid Potassium Acetate. Airport sponsors may specify other chemicals appropriate to their operational needs.

2. REFERENCES

2.1 Applicable Documents

The following publications form a part of this document to the extent specified herein. The latest issue of SAE publications shall apply. The applicable issue of other publications shall be the issue in effect on the date of the purchase order. In the event of conflict between the text of this document and references cited herein, the text of this document takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

2.1.1 SAE Publications

Available from SAE International, 400 Commonwealth Drive, Warrendale, PA 15096-0001, Tel: 877-606-7323 (inside USA and Canada) or 724-776-4970 (outside USA), www.sae.org.

SAE J931 Hydraulic Fluid Power Circuit Filtration - Application & Methods

SAE J1503 Performance Test for Air-Conditioned, Heated, and Ventilated Off-Road, Self-Propelled Work Machines

SAE J1292 Automobile and Motor Coach Wiring

SAE J994 Alarm - Backup - Electric Laboratory Performance Testing

ARP1247 Aircraft Ground Support Equipment - General Requirements

2.1.2 ASTM Publications

Available from ASTM International, 100 Barr Harbor Drive, P.O. Box C700, West Conshohocken, PA 19428-2959, Tel: 610-832-9585, www.astm.org.

ASTM D638

ASTM D256A

2.1.3 FAA Publications

Available from Federal Aviation Administration, 800 Independence Avenue, SW, Washington, DC 20591, Tel: 866-835-5322, www.faa.gov.

AC 150/5210-5B Painting, Marking, and Lighting of Vehicles on an Airport

2.1.4 FMCSR Publications from FMCSA

Available from Federal Motor Carrier Safety Administration, 1200 New Jersey Avenue, SE, Washington, DC, 20590, Tel: 1-800-832-5660, www.fmcsa.dot.gov.

Title 49, Chapter III, Subchapter B-Federal Motor Carrier Safety Regulations

2.1.5 RTCA Publications

Available from RTCA, Inc., 1150 18th Street, NW, Suite 910, Washington, DC 20036, Tel: 202-833-9339, www.rtca.org.

RTCA document DO-186 Minimum Performance Standards for Airborne Radio Communications Equipment Operating Within the Radio Frequency Range 117.975 - 137.000 MHz

2.2 Definitions

AIRPORT SPONSOR: The entity responsible for snow and ice control in aeronautical operational areas, (e.g., ramp areas, taxiways, runways). The airport sponsor, either acting directly or through an agent or third party, and whether or not the actual purchaser of the equipment, acquires the dry material spreader for use in aeronautical operational areas.

APPLICATION RATE (SPREAD RATE): The application or spread rates of dry and liquid materials controlled and expressed in mass per area terminology (e.g., pounds per 1000 square feet). Pre-wet rates controlled and expressed in percentages of mass of liquid added to mass of solid (e.g., 30% pre-wet rate would mean 30 pounds of liquid per 70 pounds of dry chemical).

AXLE CAPACITY: The allowable load on an axle based on supportive engineering data and the best judgment of the manufacturer of the axle. Usually based on all the components in an axle system, tire-wheel-bearings-spindle, etc.

AXLE RATIO: The numerical ratio of the drive shaft speed to the speed of the axle. The numerical ratio equals the torque multiplication factor of the axle.

AXLE, DEAD: A means of support for the wheels at each end that is non-driven.

AXLE, LIVE: A means of support for the wheels at each end that is driven.

CAB: An enclosed area on a vehicle designed and intended to hold and carry an operator.

CARRIER VEHICLE: The prime mover to which a material spreader is permanently or temporarily attached; and, when so attached enables the material spreader to dispense materials on airport surfaces.

CERTIFICATION: Documentation validating the results of testing, engineering analysis, or application approval or other technical approval.

CG (CENTER OF GRAVITY): The imaginary point where the total weight of an object may be considered to act.

CONVEYOR: A mechanism in the material spreader that moves stored material from the hopper to the spreader's dispersing mechanism, or which conveys material by an independent means like a metering feed roller which is sometimes referred to as an "unloaded conveyor."

DIFFERENTIAL: The gear assembly on the drive axle that permits one wheel to turn slower or faster than the other when negotiating a turn. The gear assembly in a transfer case that allows the front prop-shaft to turn slower or faster than the other when negotiating a turn.

DIFFERENTIAL, AUTOMATIC LOCKING: The gear assembly in the transfer case that allows the front prop-shaft to turn slower or faster than the rear prop-shaft when negotiating a turn while providing maximum driving torque to both the front and rear axles. The gear assembly on the drive axle that permits one wheel to turn slower or faster than the other when negotiating a turn while providing maximum driving torque to both wheels. Automatic locking differentials provide positive drive to both driven members.

DIFFERENTIAL, MANUAL LOCKING (BEVEL GEAR): The gear assembly on the drive axle that permits one wheel to turn slower or faster than the other when negotiating a turn but with provisions for the operator to fully lock and unlock the differential action from the cab. Bevel gears provide positive drive to both driven members.

DIMENSIONS:

AE	Centerline of rear axle/tandem to the end of frame.
BA	Bumper to centerline of front axle
BBC	Bumper to back of cab
CA	Back of cab to centerline of rear axle
CE	Back of cab to end of the frame ($AE + CA = CE$)
FH	Frame height from the ground to the top of frame
OAL	Overall Length
WB	Wheelbase

DISPERSING MECHANISM: The mechanism of the material spreader that receives the material and disperses it in a controlled and measured manner onto the airport surfaces.

DROP BOX: A gear box (or chain box) that transmits the power output by an auxiliary engine to its driven implement. A drop box usually lowers the physical height of the power to assist in packaging machinery and equipment. A drop box can have one single ratio or multiple ratios.

EQUIPMENT, AUXILIARY: Any equipment, in addition to the basic chassis that is required for a piece of equipment/vehicle to perform its functions. For example, a winch would be auxiliary equipment for a tow truck. All Auxiliary Equipment necessary to enable the equipment to perform its functions must be included and installed as part of the equipment on delivery.

FMVSS: An abbreviation for the Federal Motor Vehicle Safety Standards.

FRONT/REAR AXLE DISCONNECT: A mechanism within a transfer case designed to engage and disengage drive to the axle.

FUEL CAPACITY, MAXIMUM: The maximum actual volume of fluid able to fit into on-board tanks.

FUEL CAPACITY, USEABLE: The maximum amount of fluid able to be drawn from an on-board tank with the vehicle and tank stationary and in the fixed, operating position.

GAWR: Abbreviation for Gross Axle Weight Rating. The rating of the lowest rated member as defined by the component manufacturer from the following components: tires, suspension, hubs/wheels, rims, bearings, beam, and brakes.

GEAR RATIO: The ratio of the speed of the input to a gearbox to the speed of the output from the gearbox. For a single pair of gears, the ratio is found by dividing the number of teeth on the driven gear by the number of teeth on the driving gear.

GEARED SPEED: The theoretical vehicle speed based on engine RPM, transmission gear ratio(s), driving axle ratio, and tire size.

GEARS, SINGLE AND MULTIPLE REDUCTION: Single reduction gearing refers to one speed reduction through the gearing component. Multiple reduction refers to more than one step of speed reduction through the gearing component.

GRADE-ABILITY: The percent grade that a vehicle will negotiate.

GRATES: Devices installed on the top of the hopper to prevent oversized materials from entering the hopper during hopper filling operations.

GVWR: Abbreviation for Gross Vehicle Weight Rating. The sum of the Gross Axle Weight Ratings (GAWR).

HEAPED LOAD: The capacity of the hopper when loaded to the point at which the hopper is filled above level to a point that the material is stacked or heaped to its natural angle of repose. The maximum volume of dry material that the hopper can carry without spillage.