U.S. Department
of Transportation

**Federal Aviation
Administration**

Advisory Circular

Subject: GUIDE SPECIFICATION FOR LIFTS USED TO BOARD AIRLINE PASSENGERS WITH MOBILITY IMPAIRMENTS

Date: 7/26/96
Initiated by: AAS-100

AC No: 150/5220-21A
Change:

1. PURPOSE. This advisory circular (AC) contains performance standards, specifications, and recommendations for the design, construction, and testing of lifts used in the boarding of airline passengers with mobility-impairments.

2. CANCELLATION. AC 150/5220-21, *Guide Specification For Lifts Used To Board Airline Passengers With Mobility Impairments*, dated February 10, 1993, is cancelled.

3. SCOPE. The Society of Automotive Engineers (SAE) Aerospace Recommended Practices (ARP) were used as the basis for this AC. Additional requirements and clarifications have been added where necessary.

This AC was developed in coordination with the Canadian General Standards Board document CAN/CGSB-189.1-95, *Lifting Systems for Aircraft Boarding of Passengers with Mobility Impairments.* It is intended that, except for certain purchaser-specified requirements (e.g. climatic protection) and other minor modifications, devices meeting the requirements of either the U.S. or Canadian standards should meet the requirements of the other.

4. APPLICATION. The Federal Aviation Administration recommends the use of the guidance in this publication for the preparation of specifications for lifts to assist in the boarding of passengers with mobility-impairments. For airports using Federal grant-in-aid assistance in the purchase of such lifts, the use of this guidance specification is mandatory. Equipment meeting the specifications provided in this circular satisfies the lift device requirements contained in U.S. Department of Transportation regulations 49 CFR Part 27, *Nondiscrimination on the Basis of Handicap in Programs and Activities Receiving or Benefiting from Federal Financial Assistance*, subparagraphs 27.71(a)(2)(v) and 27.71(b)(4), and 14 CFR Part 382 , *Nondiscrimination on the Basis of Handicap in Air Travel*, subparagraph 382.39(a)(2). Alternate means of satisfying these requirements which are in accordance with applicable laws and regulations are acceptable.

5. RELATED READING MATERIAL.

a. AC 150/5210-5, *Painting, Marking, and Lighting of Vehicles Used on an Airport*, current edition. This may be ordered from the Department of Transportation, Utilization and Storage Section, M-433.2, Washington, DC 20590.

b. SAE ARP 1247, *General Requirements for Aerospace Ground Support Equipment, Motorized and Non-Motorized.* This may be ordered from SAE International, 400 Commonwealth Dr., Warrendale, PA 15096-0001.

c. U. S. Architectural and Transportation Barriers Compliance Board (ATBCB) document, *Guidelines for Aircraft Boarding Chairs.* This may be ordered from the United States Architectural and Transportation Barriers Compliance Board, 1331 F Street, NW, Suite 1000, Washington, DC 20004-1111.

5. METRIC UNITS. To promote an orderly transition to metric (SI) units, this circular contains both English and metric dimensions. The metric conversions may not be exact equivalents and, until there is an official changeover to the metric system, the English dimensions will govern.

DAVID L. BENNETT
Director, Office of Airport Safety and Standards

CHAPTER 1. INTRODUCTION

1-1. BACKGROUND. Section 504 of the Rehabilitation Act of 1973 (29 U.S.C. 794) prohibits discrimination on the basis of handicap in any program receiving Federal financial assistance, and the Air Carrier Access Act (ACAA) of 1986 (49 U.S.C. 1374(c)) prohibits discrimination against handicapped persons in air transportation. The ACAA and Section 504 of the Rehabilitation Act were implemented by Final Rules published by the Department of Transportation on March 6, 1990 (14 CFR Part 382) and September 6, 1991 (49 CFR Part 27), respectively. These Final Rules include provisions that "Carriers shall ensure that qualified handicapped individuals are provided the following services and equipment: ... carriers shall use ramps, mechanical lifts, or other devices for enplaning and deplaning...," and that airport "operators at ... airport terminals shall assure that there are lifts, ramps, or other suitable devices ... for enplaning and deplaning wheelchair passengers." 14 CFR Part 382 further specifies that "Contracts or leases between carriers and airport operators concerning use of airport facilities shall set forth the respective responsibilities of the parties for compliance with accessibility requirements under this section and 49 CFR 27.71." It is clear that airport operators and carriers are required to share in the responsibility to make air travel accessible to passengers with mobility impairments.

Larger aircraft at major airports are usually accessible to passengers with mobility impairments via passenger loading bridges, but passengers have often been denied boarding of smaller aircraft since suitable lifts were not available.

1-2. EXPECTED USE. This guide specification covers two classes of lifts: (a) self-propelled and (b) manually transported or towed. In specifying the type of lift, the purchaser should consider the frequency of use of the lift, the need to transport the device between widely separated gates or to transport passengers between the terminal and the aircraft, and the increased costs of purchase and maintenance of a self-propelled unit. In specifying other optional equipment, the purchaser should consider not only the added cost of the additional equipment but also the possibility that fewer manufacturers will be able to provide the unit. Above all, the purchaser should consider all aircraft serving the airport that are required to be accessible. Accessing all such aircraft may require more than one device but should be accomplished in as cost effective a means as possible.

CHAPTER 2. GENERAL DESIGN CRITERIA

2-1. GENERAL. The design standards herein are based on the Society of Automotive Engineers (SAE) Aerospace Recommended Practice (ARP) 1247, "General Requirements for Aerospace Ground Support Equipment, Motorized and Non-Motorized." The issue in effect on the date of the purchase order forms a part of this AC to the extent specified herein. In the event of conflicts between this specification and that document, this specification shall apply. Paragraphs within this specification and SAE ARP 1247 which may require further clarification by the purchaser are listed in Paragraph 15 below.

2-2. PERFORMANCE.

a. Functions. The equipment must perform the following functions while maintaining a safe distance from any moving part of the aircraft. If the device approaches within 12 inches (30 cm) of any moving part of the aircraft, the manufacturer shall demonstrate to the satisfaction of the airline operator that the device can perform all functions without undue risk of damage to the aircraft. The functions are as follows:

(1) Provide a means for boarding wheelchair users and other passengers with mobility impairments onto the lifting platform at ground level.

(2) Elevate the lifting platform carrying the passenger(s) and attendants(s) to the aircraft door-sill height.

(3) Provide a means for transferring passengers using wheelchairs from the elevated lift platform to and from the aircraft door sill.

(4) Provide a suitable boarding chair, compatible with the lift and the aircraft to be served, meeting the requirements of Architectural and Transportation Barriers Compliance Board document, *Guidelines for Aircraft Boarding Chairs*, if specified by the purchaser.

(5) Provide a stairway for the boarding of other passengers, if specified by the purchaser.

(6) Provide protection from wind and precipitation to passengers, if specified by the purchaser.

(7) Provide transportation between the terminal and the aircraft, if specified by the purchaser. (Suspension systems for such devices are typically not suitable for transporting passengers for more than very short distances.)

b. Standards.

(1) Platform. As used herein, the platform shall include all surfaces traversed by the passenger using a wheelchair in boarding the aircraft.

(a) The platform shall have a minimum capacity of 600 pounds (270 kg). The purchaser may specify a higher capacity if the unit is to allow simultaneous boarding of two or more passengers.

(b) The ramp that bridges the gap between the lift and the aircraft shall be designed so as not to damage the aircraft or dislodge when in use. It may rest on the door-sill but shall not induce unsafe loads on the aircraft.

(c) The platform shall be equipped with rigid protective railings or other barriers. Spaces between barrier members, and between the barriers and the aircraft, shall be sufficiently small to prevent injury and provide a feeling of confidence to occupants.

(d) If specified by the purchaser, the platform shall include a system to immobilize each wheelchair it is designed to simultaneously transport. The system shall be easily operated by the attendant or equipment operator.

(e) The interior width of the platform shall be compatible with the boarding chair to be used and aircraft to be served.

(2) Accelerations. The device shall not subject passengers to accelerations/decelerations of more than 5 ft/s/s (1.5 m/s/s) in any direction. The device shall not subject passengers to changes in acceleration/deceleration of more than 8 ft/s/s/s (2.4 m/s/s/s) in any direction.

(3) Deployment Time. The time required to deploy the device upon arrival at the passenger loading area or aircraft shall be 1 minute or less.

(4) Enplaning/Deplaning Time. The time required to convey a passenger onto the lift and to the door-sill level shall be 2 minutes or less. The time to deplane a passenger, that is, from the elevated position to ground level and off the lift shall be 2 minutes or less.

(5) Storage Preparation Time. The time required to prepare the device for standby storage shall be 3 minutes or less.

2-3. AIRCRAFT COMPATIBILITY.

a. Aircraft Types. The aircraft required to be served shall be as specified by the purchaser.

b. Design Considerations. If an aircraft to be served has a stairway which cannot be retracted while the door is open, the lift shall be designed to operate with the stairway deployed. All aircraft models specified by the purchaser to be served should be surveyed by the manufacturer for compatibility. The following aircraft size/configuration factors will have a significant effect on the design of the device:

(1) Aircraft door-sill height.

(2) Aircraft door width.

(3) Aircraft door location.

(4) Aircraft components adjacent to the door constituting obstructions (wing, tail, engine nacelle, propeller, etc.)

(5) Airstairs/airdoor.

(6) Airstair handrails.

(7) Vertical movements of the aircraft (door-sill) during enplaning/deplaning.

2-4. TOTAL LIFE. The device shall be designed to perform its intended function for its "total life" period, when maintained according to the manufacturer's instructions. "Total life" is defined to be the years of use from time of delivery of the equipment to the user until its identity is destroyed by classifying it as salvage and/or subjecting it to cannibalization. The "total life" for which the equipment is designed, assuming it is used and maintained in accordance with the manufacturer's recommendations, shall be a minimum of l0 years, based on a frequency of use of 1000 cycles per year.

2-5. RELIABILITY.

a. Maintenance. The equipment and its accessories shall be designed and constructed with reliability of operation as a primary consideration. The minimum reliability design requirement is that the equipment be designed to operate between periodic preventive maintenance periods of l00 lift cycles or 4 months, whichever occurs first. The above interval does not apply to components in those cases where the component manufacturer recommends more frequent maintenance intervals. (For the purpose of this specification, normal servicing of fuel, oil, tire pressure, battery, and water are not considered preventive maintenance.) The device shall incorporate a cycle counter or hour meter. The type of meter installed should be consistent with the maintenance intervals recommended by the manufacturer.

b. Emergency Removal. The device shall be designed to permit easy removal in the event of an equipment failure while at the side of an aircraft.

2-6. SERVICE AND ACCESS. The device shall meet the requirements of SAE ARP 1247, Paragraph 3.4.3.

2-7. ENVIRONMENTAL.

a. The device shall meet the requirements of SAE ARP 1247, Paragraph 3.6. The temperature ranges specified may be modified by the purchaser if the climate in which the device is to be used is extreme.

b. The device shall be capable of 45 minutes of continuous operation, consisting of any possible combination of passenger loading and maneuvering cycles, at full load within the temperature ranges specified in paragraph 2-7.a. above. For passenger loading, full load shall be considered to be applied during the ascent phase only.

c. The device shall be capable of operating on a level surface in 2 inches (5 cm) of snow if specified by the purchaser.

2-8. TRANSPORTABILITY. If highway transportability, defined as the capability (of a self-propelled device) to be licensed for operation on public highways, is specified by the purchaser, the device shall meet the requirements of SAE ARP 1247, Paragraph 3.7.

2-9. SAFETY. The device shall meet the requirements of SAE ARP 1247, Paragraph 3.8. All design features intended to protect the equipment operator shall provide similar protection to the passenger(s).

a. Personnel Safety.

(1) The device shall meet the requirements of SAE ARP 1247, Paragraph 3.9, except as provided in (2) and (3) below.

(2) If highway transportability is not specified by the purchaser, the provisions of SAE ARP 1247, Paragraph 3.9.1 shall not apply.

(3) If the device is not self-propelled, the provisions of SAE ARP 1247, Paragraphs 3.9.2 through 3.9.4 shall not apply. For the purposes of this specification, motorized devices which do not transport the operator or passengers are not considered self-propelled.

b. Equipment Safety. The device shall meet the requirements of SAE ARP 1247, Paragraph 3.10.

(1) Cushioning devices specified in SAE ARP 1247, Paragraph 3.10.3 shall be approved by the purchaser.

(2) A 5-pound ABC rated fire extinguisher shall be mounted on the device at a location easily accessible to the operator.

(3) Stabilizing devices referred to in SAE ARP 1247, Paragraph 3.10.9.3 shall be painted chrome yellow, in accordance with AC 150/5210-5.

(4) Risers of variable riser stairs shall be no less than four inches (10 cm). The ratio between risers and treads shall be no less than .28. The angle of the stairs shall be no less than 15.5 degrees. The width of the stairway shall be no less than 27 inches (69 cm).

2-10. NOISE AND VIBRATION. The device shall meet the requirements of SAE ARP 1247, Paragraph 3.11.

2-11. MANUALS/PUBLICATIONS.

a. The following manuals shall accompany the delivered equipment. No special format is required.

(1) Operator's handbook.

(2) Illustrated parts breakdown and list.

(3) Preventive maintenance schedule.

b. Tools and Test Equipment. The provisions of SAE ARP 1247, Paragraph 3.12.4 shall apply.

2-12. TRAINING. The manufacturer shall, at no additional cost, provide trained personnel at the time of delivery to place the device into operation. Also, the manufacturer shall provide, at no additional cost, adequate training, as specified by the purchaser, not to exceed three separate 8-hour shifts, for airport and/or airline personnel in operation and maintenance of the device. Training shall include written operating instructions that depict the step by step operational use of the device. Written instructions shall include, or be supplemented by, materials which can be used to train subsequent new operators.

2-13. DESIGN AND CONSTRUCTION. The device shall meet the requirements of SAE ARP 1247, Paragraph 3.13, except as modified herein.

a. Mechanical Design. The device shall meet the requirements of SAE ARP 1247, Paragraph 3.13.1.1. The device may be operated manually or be self-propelled, as specified by the purchaser. Self-propelled units may be operated hydraulically, pneumatically, electrically, or by internal combustion engine.

b. Electrical Design And Equipment.

(1) General. The device shall meet the requirements of SAE ARP 1247, Paragraph 3.13.1.2.

(a) When used for cranking engines of 30 horsepower or less, batteries referred to in SAE ARP 1247, Paragraph 3.13.1.2.1 shall be as recommended by the engine manufacturer.

(b) If highway transportability is specified, or if otherwise specified by the purchaser, lighting equipment shall meet the provisions of SAE ARP 1247, Paragraph 3.13.1.2.21. Lighting shall in all cases meet the requirements of AC 150/5210-5.

(c) A suitable outdoor light shall be attached to the device to provide illumination at the entry/exit doorway of the aircraft.

(2) Battery Powered Devices.

(a) Batteries shall be designed to have a minimum life of 3 years when maintained according to the manufacturer's instructions. For design purposes, a frequency of use of 1000 cycles per year shall be assumed.

(b) A self contained battery charger with automatic voltage control shall be provided. The charging process shall require the operator only to connect a readily-accessible plug to a standard 110 or 220-volt receptacle, as specified by the purchaser.

(c) The battery system shall incorporate a battery condition gauge. If a low voltage condition could result in higher amperage flow and motor burnout, then the status monitoring device shall provide a time warning to the operator.

c. Hydraulic, Pneumatic Design. The device shall meet the requirements of SAE ARP 1247, Paragraph 3.13.1.3.

(1) Hydraulic fluid shall be as recommended by the manufacturers of the hydraulic system components.

(2) The materials used for each hydraulic line shall be consistent with its application.

(3) Hydraulic rams may be used to stabilize the device if all wheels remain firmly on the pavement surface.

d. Engines And Related Equipment. The device shall meet the requirements of SAE ARP 1247, Paragraph 3.13.1.4.

(1) The provisions of SAE ARP 1247, Paragraph 3.13.1.4.4 shall not apply to engines of 30 horsepower or less.

(2) Alternators used on engines of 30 horsepower or less shall be as recommended by the engine manufacturer.

(3) Oil pressure switches shall not be required on engines of 30 horsepower or less.

(4) The type of engine kill switch provided shall be approved by the purchaser.

(5) Engines used to drive systems, other than the vehicle propulsion system, shall be equipped with a tachometer (green-lined within the correct operating RPM range and red-lined above this range) or automatically governed to prevent over-revving.

e. Fuel System Design. The device shall meet the requirements of SAE ARP 1247, Paragraph 3.13.1.5.

(1) The provisions of SAE ARP 1247, Paragraph 3.13.1.5.1 shall not apply to engines of 30 horsepower or less.

(2) The fuel tank shall have a minimum capacity for eight hours of operation.

(3) Fuel tank fillers for engines of 30 horsepower or less shall be as recommended by the engine manufacturer but shall include a flame-arresting cap.

f. Exhaust System Design. The device shall meet the requirements of SAE ARP 1247, Paragraph 3.13.1.6. Engine exhaust systems shall be provided with flame and spark arrestors.

g. Self-Propelled Vehicles. The device shall meet the requirements of SAE ARP 1247, Paragraph 3.13.1.7.

(1) Design Speed. The vehicle design speed shall be as specified by the purchaser.

(2) Braking Systems.

(a) Braking systems for vehicles with a maximum speed of 20 mph (32 km/h) or more shall meet the requirements of SAE ARP 1247, Paragraph 3.13.1.7.2.

(b) Braking systems for vehicles with a maximum speed of less than 20 mph (32 km/h) shall meet the requirements of Title 49 CFR, Paragraphs 393.41 and 393.52. The maximum stopping distance in feet shall be equal to the design speed in mph (in meters shall be equal to the design speed in km/h/5.3).

(3) Vehicle Cabs. On vehicles equipped with an enclosed operator's cab, the cab shall meet the requirements of SAE ARP 1247, Paragraph 3.13.1.7.3.

h. Instruments And Controls. The device shall meet the requirements of SAE ARP 1247, Paragraph 3.13.1.8.

(1) If approved by the purchaser, transmission selector levers may move and operate in the direction of travel of the device. Inclusion or deletion of "Park" position will be as specified by the purchaser.

(2) Unless otherwise specified by the purchaser, controls shall be designed for satisfactory operation when the operator is wearing heavy arctic-type gloves and overshoes.

i. Equipment Stability. The device shall meet the stability requirements of SAE ARP 1247, Paragraph 3.13.1.9.

j. Options. The manufacturer shall not be required to offer particular options referred to in SAE ARP 1247, Paragraph 3.13.1.10.

k. Materials, Parts, And Processes. The device shall meet the requirements of SAE ARP 1247, Paragraph 3.13.2.

l. Standard And Commercial Parts. The device shall meet the requirements of SAE ARP 1247, Paragraph 3.13.3.

m. Moisture And Fungus Resistance. The device shall meet the requirements of SAE ARP 1247, Paragraph 3.13.4.

n. Corrosion Of Metal Parts. The device shall meet the requirements of SAE ARP 1247, Paragraph 3.13.5.

o. Interchangeability And Replaceability. The device shall meet the requirements of SAE ARP 1247, Paragraph 3.13.6.

p. Workmanship. The device shall meet the requirements of SAE ARP 1247, Paragraph 3.13.7.

q. Electromagnetic Interference. The equipment shall meet the current issues of radio suppression specification MIL-STD-461, Class 3D, *Requirements for the Control of Electromagnetic Interference Emissions and Susceptibility*. It shall be capable of operating through the entire amplitude modulated aircraft radio frequency range of 75 MHz - 136 MHz.

r. Identification And Marking. The device shall meet the requirements of SAE ARP 1247, Paragraph 3.13.9. The shifting diagram placard specified in SAE ARP 1247, Paragraph 3.13.9.6 may be provided in a medium other than metal if designed to last for the total life of the equipment. In addition, the device shall be provided with a permanently affixed placard identifying the maximum number of passengers and maximum weight capacity of the lifting platform.

s. Storage. The device shall meet the requirements of SAE ARP 1247, Paragraph 3.13.10.

t. Exterior Finish. The device shall meet the requirements of SAE ARP 1247, Paragraph 3.13.11.

(1) The device shall be primed in accordance with accepted industry standards for heavy duty industrial equipment intended for outdoor use.

(2) The device shall be finished as specified by the purchaser, in accordance with AC 150/5210-5, using the standards for aircraft support vehicles.

u. Human Engineering. The device shall meet the requirements of SAE ARP 1247, Paragraph 3.13.12.

2-14. QUALITY ASSURANCE PROVISIONS. Quality assurance provisions shall meet the requirements of SAE ARP 1247, Paragraph 4.

a. Preliminary Qualification Tests. Preliminary qualification tests may be specified at the purchaser's option.

b. Formal Qualification Tests. Formal qualification tests may be specified at the purchaser's option.

c. Specification Conformance Tests. The manufacturer shall perform any tests referred to in SAE ARP 1247, Paragraphs 4.6.1 through 4.6.10 as specified by the purchaser. The purchaser may elect to accept documentation of previously run tests.

d. Reliability Test and Analysis. A reliability test and analysis may be specified at the purchaser's option.

2-15. PURCHASER SPECIFICATIONS. The following is a list of those paragraphs within this specification which may require clarification by the purchaser.

Paragraph	Item
2-2.a.(4)	Provision of boarding chair.
2-2.a.(5)	Provision of stairway.
2-2.a.(6)	Provision of weather protection.
2-2.a(7)	Provision of transportation between terminal and aircraft.
2-2.b.(1)(a)	Platform capacity.
2-2.b.(1)(d)	Provision of wheelchair immobilization system.
2-3.a.	Aircraft compatibility.
2-7.a.	Temperature range for operation.
2-8.,9.a.(2)	Highway transportability.
2-9.b.(1)	Aircraft interface cushioning devices.
2-12.	Training requirements.
2-13.a.	Mechanical design - manually transported or towed vs. self-propelled.
2-13.b.(1)(b)	Lighting equipment.
2-13.b.(2)(b)	Charging voltage.
2-13.d.(4)	Engine kill switch.
2-13.g.(1)	Vehicle design speed (for self-propelled devices).
2-13.h.(1)	Transmission selector lever - direction of operation and inclusion of "Park" position.
2-13.h.(2)	Requirement for use by operator wearing winter clothing.
2-13.t.(2)	Finish requirements.
2-14.a.	Preliminary qualification tests.
2-14.b.	Formal qualification tests.
2-14.c.	Specification conformance tests.
2-14.d.	Reliability test and analysis.

SAE ARP 1247

Paragraph	Item
3.9.19.2	Types of approved non-slip materials.
3.13.1.2.11	Approval of method of running concealed wiring.
3.13.1.3.5.7	Approval for coated hydraulic tanks.
3.13.5.2	Vehicle undercoating.
3.13.11.1	Paint scheme.
4.3	Inspection.
4.4	Requirement for engineering data and documentation.