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|-------------------------------------------------------------------------|--------------------|---------|
| AEROSPACE<br>STANDARD                                                   | AS8090™            | REV. A  |
|                                                                         | Issued             | 1997-08 |
|                                                                         | Reaffirmed         | 2011-01 |
|                                                                         | Stabilized         | 2016-03 |
|                                                                         | Superseding AS8090 |         |
| Mobility, Towed Aerospace Ground Equipment,<br>General Requirements For |                    |         |

#### RATIONALE

The US DOD standardization community have requested the AGE-2C committee stabilize this document. It is their intention to reinstate the earlier MIL-M-8090 at a later date.

#### STABILIZED NOTICE

This document has been declared "Stabilized" by the SAE AGE-2C Vehicle Maintenance and Aircraft Servicing Committee and will no longer be subjected to periodic reviews for currency. Users are responsible for verifying references and continued suitability of technical requirements. Newer technology may exist.

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## NOTICE

This document has been taken directly from U.S. Military Specification MIL-M-8090F and contains only minor editorial and format changes required to bring it into conformance with the publishing requirements of SAE technical standards.

The original Military Specification was adopted as an SAE standard under the provisions of the SAE Technical Standards Board (TSB) Rules and Regulations (TSB 001) pertaining to accelerated adoption of government specifications and standards. TSB rules provide for (a) the publication of portions of unrevised government specifications and standards without consensus voting at the SAE Committee level, (b) the use of the existing government specification or standard format, and (c) the exclusion of any qualified product list (QPL) sections.

## 1. SCOPE:

### 1.1 Scope:

This specification covers general design and performance requirements for the mobility of towed ground support equipment. The complete mobility requirements for an item of towed aerospace ground equipment not specified herein shall be specified in the individual equipment specification (see 6.4).

- 1.1.1 Applicability: The requirements and tests contained in this specification apply to the mobility aspects of all manually propelled and towed items of ground equipment. They represent the minimum acceptable mobility features. When it is known that the equipment will require mobility features that are more severe than the mobility features stated herein, the mobility features may be modified in the individual equipment specification.

- 1.1.1.1 General application: Prior to use of this specification, the required operating conditions of the item of equipment under consideration should be reviewed to determine which mobility requirements relate directly to the equipment. The tests specified herein may be supplemented to meet the requirements of the individual item of equipment. These tests are considered minimal and should not be reduced in scope. This is considered a performance specification with limited design parameters.

## 2. APPLICABLE DOCUMENTS:

- 2.1 The following documents, of the issue in effect on date of invitation for bids or request for proposal, form a part of this specification to the extent specified herein:

### SPECIFICATIONS

#### Federal

|           |                                                                            |
|-----------|----------------------------------------------------------------------------|
| O-A-548   | Antifreeze, Ethylene Glycol, Inhibited                                     |
| TT-C-520  | Coating Compound, Bituminous, Solvent Type, Underbody (for Motor Vehicles) |
| VV-B-680  | Brake Fluid, Automotive                                                    |
| VV-F-800  | Fuel Oil, Diesel                                                           |
| VV-G-76   | Gasoline, Automotive                                                       |
| ZZ-I-550  | Inner Tube, Pneumatic Tire                                                 |
| ZZ-T-381  | Tires, Pneumatic, Vehicular (Highway)                                      |
| ZZ-T-391  | Tire, Solid Rubber, and Wheels, Solid Rubber Tire, (Industrial)            |
| ZZ-T-410  | Tire, Pneumatic, Industrial                                                |
| ZZ-T-1083 | Tires, Pneumatic, Low Speed, Off Highway                                   |

#### Military

|             |                                                                      |
|-------------|----------------------------------------------------------------------|
| MIL-P-514   | Plates, Identification, Instruction and Marking, Blank               |
| MIL-L-2104  | Lubricating Oil, Internal-Combustion Engine, Tactical Service        |
| MIL-F-3541  | Fittings, Lubrication                                                |
| MIL-H-3992  | Hose and Hose Assembly, Rubber: Air and Vacuum Brake, Automotive     |
| MIL-C-4751  | Castors, Rigid and Swivel, Precision Heavy Duty, and Shock Absorbing |
| MIL-H-5606  | Hydraulic Fluid, Petroleum Base; Aircraft, Missile, and Ordnance     |
| MIL-C-7474  | Castors, Industrial                                                  |
| MIL-W-8005  | Wheels and Hubs, for Industrial Pneumatic Tires                      |
| MIL-L-10324 | Lubricating Oil, Gear, Sub-Zero                                      |
| MIL-G-10924 | Grease, Automotive and Artillery                                     |
| MIL-T-12459 | Tire, Pneumatic; For Military Ground Vehicles                        |

## 2.1 (Continued):

## STANDARDS

## Military

|              |                                                                                                                                                    |
|--------------|----------------------------------------------------------------------------------------------------------------------------------------------------|
| MIL-STD-1223 | Administrative Wheeled Vehicles Treatment, Painting, Rustproofing, Undercoating, Identification Marking, Data Plates and Warranty Notice Standards |
| MIL-STD-1472 | Human Engineering Design Criteria for Military Systems, Equipment and Facilities                                                                   |
| MS24374      | Casters, Rigid and Swivel, Precision, Spring Mounted                                                                                               |
| MS24380      | Casters, Industrial                                                                                                                                |
| MS27149      | Casters, Rigid and Swivel, Precision, Heavy Duty                                                                                                   |
| MS27281      | Casters, Rigid and Swivel, Precision, Spring Mounted, Pneumatic Tired                                                                              |
| MS35387      | Reflector, Indicating, Clearance                                                                                                                   |
| MS35423      | Light, Marker, Clearance - Service                                                                                                                 |
| MS35746      | Coupling, Automotive - Air Brake Lines                                                                                                             |
| MS51117      | Pintle Assembly, Towing - 100,000 Lbs. Capacity, Manual Release                                                                                    |
| MS51118      | Pintle Assembly, Towing - 40,000 Lbs. Capacity, Manual Release                                                                                     |
| MS51335      | Pintle Assembly, Towing - 18,000 Lbs. Capacity, Manual Release                                                                                     |
| MS51336      | Lunette - Coupler, Drawbar, Ring                                                                                                                   |
| MS52105      | Fifth Wheel Assembly - 33 Inch Universal, Truck-Tractor, 25,000 Lbs. Capacity                                                                      |
| MS53034      | Fifth Wheel Assembly - 36 Inch Universal, Truck-Tractor, 45,000 Lbs. Capacity                                                                      |
| MS53036      | Kingpin, Fifth Wheel, 2 Inch                                                                                                                       |
| MS53037      | Kingpin, Fifth Wheel, 3-1/2 Inch                                                                                                                   |
| MS53044      | Wheel, Pneumatic Tire-Disk Type with Ring for Tactical Wheeled Vehicles                                                                            |

## DRAWING

## Ordnance Corps

|          |                                                                                       |
|----------|---------------------------------------------------------------------------------------|
| C7387807 | Wheel Assembly, Disc Type, 16 x 4.50 "OE", 5 Hole, 5-1/2 Dia. Bolt Circle, 3-3/8 Dish |
|----------|---------------------------------------------------------------------------------------|

(Copies of specifications, Standards, drawings, and publications required by suppliers in connection with specific procurement functions should be obtained from the procuring activity or as directed by the contracting officer.)

## 2.2 Other publications:

The following documents form a part of this specification to the extent specified herein. Unless otherwise indicated, the issue in effect on date of invitation for bids or request for proposal shall apply.

### Department of Transportation

#### Federal Motor Vehicle Safety Standards and Regulations

- 393.14 Lamps and Reflectors, Large Semitrailers and Full Trailers
- 393.15 Lamps and Reflectors, Small Semitrailers and Full Trailers
- 393.26 Requirements for Reflectors
- 393.40 Adequacy of Brakes
- 393.41 Parking Brakes
- 393.42 Brakes Required on All Wheels
- 393.43 Breakaway and Emergency Braking
- 393.45 Brake Tubing and Hose, Adequacy
- 393.50 Reservoirs Required
- 393.52 Brake Performance

(Application for copies should be addressed to the Department of Transportation, Federal Highway Administration, Washington, D.C. 20591.)

### Society of Automotive Engineers

#### SAE Standards and Recommended Practices

- J133 Kingpin Performance
- J555 Truck, Truck Tractor, Trailer and Motor Coach Wiring
- J559 Seven Conductor Jacketed Cable for Truck and Trailer Connections
- J560 Seven Conductor Electrical Connector for Truck Trailer Jumper Cable
- J585 Tail Lamps (Rear Position Light)
- J586 Stop Lamps
- J588 Turn Signal Lamps
- J592 Clearance, Side Marker, Identification, and Parking Lamps
- J667 Brake Test Code, Inertia Dynamometer
- J682 Rear Wheel Splash and Stone Throw Protection
- J695 Turning Ability and Off-Tracking
- J697 Safety Chain of Full Trailers or Converter Dollies
- J700 Fifth Wheel Kingpin
- J702 Brake and Electrical Connection Locations
- J848 Fifth Wheel Kingpin - Heavy Duty

## 2.2 (Continued):

J849 Connection and Accessory Locations for Towing Doubles Trailers and Multi-Axle Trailers  
J875 Trailer Axle Alignment

(Application for copies should be addressed to SAE, 400 Commonwealth Drive, Warrendale, PA 15096-0001.)

The Tire and Rim Association, Incorporated

Year Book

(Application for copies should be addressed to the Tire and Rim Association, Incorporated, Command Building, 34 North Hawkins Avenue, Akron, Ohio 44313.)

US Army Test & Evaluation Command

AD-719084 TECOM Material Test Procedures

(Application for copies should be addressed to the Defense Documentation Center, Cameron Station, Alexandria, Virginia 22314.)

State of California

Vehicle Code of California

(Application for copies should be addressed to the Department of Motor Vehicles, 2570 24th Street, Sacramento, California 95809.)

## 3. REQUIREMENTS:

### 3.1 General:

This specification covers the required mobility for, and standard components to be used in, the design of towed or manually-propelled aerospace ground equipment. When self-propulsion means are required by the individual equipment specification, it shall be in addition to the requirements of this specification. Self-propulsion capability shall not interfere with the mobility features for towing. The mobility features shall be classified as shown in table I.

- 3.1.1 Individual equipment specifications: In the event the mobility requirements of this specification conflict with the requirements of an individual equipment specification, the requirements of this specification shall govern. Conflicting specifications and all deviations from these requirements shall be referred to the responsible procuring activity of the Army, Navy, or the Air Force (see 6.5).

TABLE I. Classification of Mobility Features

| TYPE                                                                                                                                    |                                                                                                                          | APPLICABLE GROUP |   |   |   |
|-----------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------|------------------|---|---|---|
|                                                                                                                                         |                                                                                                                          | A                | B | C | D |
| I                                                                                                                                       | Mobile on paved level surfaces (hangar and flight line)                                                                  |                  |   |   |   |
|                                                                                                                                         | Class 1 -Manually propelled for short distances in hangars, shops, and assembly buildings                                | A                | B | C | — |
|                                                                                                                                         | Class 2 -Towable at slow speed in and around hangars, shops, and assembly buildings                                      | A                | B | C | — |
|                                                                                                                                         | Class 3 -Manually propelled for shipboard application                                                                    | A                | B | C | — |
| II                                                                                                                                      | Mobile on paved and unpaved level surfaces (entire airfield, especially flight lines)                                    | A                | — | C | D |
| III                                                                                                                                     | Mobile on highways and generally level or improved cross-country terrain within the perimeter of the airbase or airfield | A                | — | C | D |
| IV                                                                                                                                      | Mobile on snow and ice (type III for arctic airfield)                                                                    | A                | — | C | — |
| *V                                                                                                                                      | Mobile on highways and unimproved cross-country terrain found outside the perimeter of the airbase                       |                  |   |   |   |
| GROUPS                                                                                                                                  |                                                                                                                          |                  |   |   |   |
| Group A - Two wheel running gear<br>**Group B - Three wheel running gear<br>Group C - Four wheel running gear<br>Group D - Semitrailers |                                                                                                                          |                  |   |   |   |

\*Type V mobility tests shall be run only at Aberdeen Proving Ground, Maryland, or alternate recommended by TECOM (Test & Evaluation Command).

\*\* Group B may be used only with the approval of the applicable government activity.

### 3.2 Classification of requirements:

The requirements for mobility are classified as follows:

| <u>Item</u>                        | <u>See Requirement</u> |
|------------------------------------|------------------------|
| General design (applicable to all) | 3.3                    |
| Additional requirements by types   | 3.4                    |
| Additional requirements by groups  | 3.5                    |
| Brakes                             | 3.6                    |
| Bumper                             | 3.7                    |
| Casters                            | 3.8                    |
| Fenders                            | 3.9                    |
| Landing gear                       | 3.10                   |
| Lighting devices and wiring        | 3.11                   |
| Mudflaps                           | 3.12                   |
| Pintle hook, rear                  | 3.13                   |
| Reflectors                         | 3.14                   |
| Safety chains                      | 3.15                   |
| Tires and tubes                    | 3.16                   |
| Towbars and lunette eyes           | 3.17                   |
| Wheels                             | 3.18                   |
| Markings                           | 3.19                   |

### 3.3 General design (applicable to all types, classes, and groups):

The following requirements shall apply to all equipment within the scope of this specification.

- 3.3.1 Ease of operation, maintenance, and repair: The equipment shall be so constructed that normal adjustments, repairs, and overhaul can be readily accomplished by operating personnel. The equipment shall be constructed to provide for the use of conventional, general-purpose hand tools for maintenance purposes.
  - 3.3.1.1 Disturbance to other elements: The equipment shall be constructed to permit the replacement and adjustment of components and accessories with minimum disturbance to and without removal of other elements of the unit.

- 3.3.1.2 Operating clearances: Maintenance provisions and operating features insuring operating clearances for facilitating maintenance and servicing operations at extremely low temperatures by operating personnel wearing heavy gloves or mittens and bulky clothing and footgear shall be in accordance with MIL-STD-1472.
- 3.3.1.3 Intricate devices: Intricate locking devices, controls, and threaded fastenings that can be easily overtorqued by operators shall not be used.
- 3.3.1.4 Quick-disconnect fastenings: Covers or access plates that must be removed for component adjustments or for component or parts removal shall be equipped with durable quick-disconnect fastenings or combinations of quick-disconnect fastenings and hinges.
- 3.3.2 Chassis frame: The chassis frame shall be designed and constructed to support the maximum gross load and maintain chassis alignment under stated conditions of operation and transportability without applying undue stress or load on equipment or stores. When the frame contains a floor, the floor shall be so sloped that spilled liquids can be completely drained from an opening in a central location, without dropping on other components.
  - 3.3.2.1 Interference: The chassis frame of all towable ground equipment with running gear and mounted equipments shall be so designed that there will be no interference between the equipment and the towing vehicle under specified operating conditions.
  - 3.3.2.2 Unit or integral frame: Unit or integral frame construction is permitted wherein all towing and running gear will be mounted directly to the item of equipment without the necessity for a separate chassis frame. Integral frame shall provide the required structural strength of any applicable separate frame.
- 3.3.3 Running gear: Government and industry standard towed AGE components specified herein shall be used. To facilitate logistics, preference shall be given use of government standard towed AGE components. The equipment shall be so designed that it will not sway, skid, yaw, tilt, or jackknife during towing and braking operations.
  - 3.3.3.1 Axles: Axle ratings shall include sufficient safety factor to carry the load specified at the ground, for the operating surface conditions, and for the speeds at which the axle is to be towed.
- 3.3.4 Towing force: The towing force required to move equipment from rest on a smooth, dry, level, paved surface, such as brushed concrete or macadam, free of loose material shall not exceed 75 pounds per ton of maximum gross weight. The towing force shall be measured at the drawbar and shall be considered as acting parallel to the operating surface of the vehicle.
- 3.3.5 Lubrication fittings: Lubrication fittings shall conform to MIL-F-3541 and shall be located in accessible, protected positions. Extended fittings shall be provided to lubricate parts or assemblies that are not readily accessible for direct lubrication or which are likely to be overlooked because of inaccessibility. Pressure relief fittings shall be provided where the use of high pressure lubricating equipment may cause damage.

- 3.3.5.1 Lubrication chart: A lubrication chart shall be provided directing attention to all lubrication fittings and shall specify the range and grade of lubricant required for critical temperatures. The chart shall be permanently attached to the unit in an accessible and convenient location. The chart shall be inscribed on a nonferrous plate conforming to MIL-P-514.
- 3.3.6 Lubricants and service products: All mobility features of towable equipment shall be designed for servicing with the lubricants and service periods specified in table II.

TABLE II. Lubricants and Refill Chart

| ITEM                                                                                                   | TYPE REFILL AND SERVICE                           |                 |                            | OPERATION PERIOD<br>(HRS. OPER.) |       |                      |
|--------------------------------------------------------------------------------------------------------|---------------------------------------------------|-----------------|----------------------------|----------------------------------|-------|----------------------|
|                                                                                                        | SAE                                               | API             | MILITARY<br>SPECIFICATIONS | CHECK                            | CLEAN | REFILL OR<br>REPLACE |
| Chassis lubrication                                                                                    | Multi-<br>purpose                                 | NLGI<br>Grade 1 | MIL-G-10924                | AR                               |       | AR                   |
| Engine crankcase oil<br>(See engine manual<br>for ambient tempera-<br>ture recommendation)<br>Gasoline | 10<br>*20<br>30<br>*40                            | MS              | MIL-L-2104                 | D                                | AR    | 100                  |
| Diesel (1% maximum<br>sulphur in fuel)                                                                 | 10<br>*20<br>30<br>*40                            | DM<br><br>DS    | MIL-L-2104                 |                                  |       |                      |
| Shock absorbers                                                                                        |                                                   |                 | MIL-H-5606                 |                                  |       |                      |
| Hydraulic system                                                                                       |                                                   |                 | MIL-H-5606                 | D                                | 2000  | 2000                 |
| Powershift<br>Transmission<br>Type C1                                                                  | 10W                                               | MS<br>DM        | MIL-L-2104                 | D                                |       | 1000                 |
| Type A                                                                                                 | Automatic transmission<br>Fluid type A - Suffix A |                 |                            |                                  |       |                      |
| Differentials,<br>planetary huts,<br>steering gear box,<br>conventional<br>gear systems<br>Above 32°F  | 140                                               | EP              | MIL-L-2105                 | 200                              | AO    | 1000                 |
| Below 32°F                                                                                             | 90                                                |                 | MIL-L-10324                |                                  |       |                      |
| Hydraulic brake fluid                                                                                  | 70 R3                                             |                 | VV-B-680                   | 100                              | AO    | AR                   |
| Cooling system<br>Below 32°F                                                                           | Ethylene glycol                                   |                 | O-A-548                    | D                                | 1000  | Seasonal             |
| Above 32°F                                                                                             | Water and 5% corrosion<br>inhibitor solution      |                 |                            |                                  |       |                      |

TABLE II. Lubricants and Refill Chart (Continued)

| ITEM                                                                                                    | TYPE REFILL AND SERVICE |                                                                                                             |                            | OPERATION PERIOD<br>(HRS. OPER.) |       |                      |
|---------------------------------------------------------------------------------------------------------|-------------------------|-------------------------------------------------------------------------------------------------------------|----------------------------|----------------------------------|-------|----------------------|
|                                                                                                         | SAE                     | API                                                                                                         | MILITARY<br>SPECIFICATIONS | CHECK                            | CLEAN | REFILL OR<br>REPLACE |
| Fuel system<br>(See engine manual<br>for ambient tempera-<br>ture fuel recommenda-<br>tion)<br>Gasoline | VV-G-76                 | Class A Above 50°F<br>Class B Below 50°F                                                                    |                            | D                                | AO    | AR                   |
| Diesel                                                                                                  |                         | DF2 Regular grade<br>(1% max. sulphur<br>content)<br><br>DF1 Winter grade<br>(0.5% max. sulphur<br>content) |                            |                                  |       |                      |

AR - As required  
AO - At overhaul  
D - Daily (8-10 Hours)

\* Base oils used to get a  
viscosity of SAE 20, 40,  
or 10W-30 are to be qualified  
to MIL-L-2104

3.3.7 Dimensions and loading criteria: The following dimensional and loading criteria shall apply to all towed vehicles that will be used on federal, state, and overseas roads. For the purpose of this specification, combination weights and dimensions will be determined using a truck tractor that would be used for hauling comparable trailers in industry. The tractor data shall be that available in the tractor manufacturer's commercial catalogs of current or revised issue made available to the applicable government agency.

3.3.7.1 Dimensions: The dimensions shall be as follows

Height -132 inches maximum

Width -96 inches maximum (including all appurtenances). Fixtures and equipment permanently attached to the trailer shall not extend more than 9 inches beyond the outside face of the tires or skids on either side of the vehicle

Length -50 foot maximum for combination of trailer and truck tractor

3.3.7.2 Weight: The maximum gross combination weight, subject to the following axle loading limitations, shall be 36,000 pounds when the furthest axle center-to-center spacing is less than 10 feet. For each 1-foot increase above 10 feet, the loading may be increased by 850 pounds up to a maximum weight of 60,000 pounds. For the purpose of this specification, bogies having axles spaced 42 inches or less center-to-center shall be considered as one axle.

3.3.7.2.1 Axle loadings: The axle loading shall be 16,000 pounds maximum. Axle alignment shall be in accordance with SAE J875.

3.3.8 Towing provisions: All equipment, except type I, class 1, and any group D, shall be designed for towing, in train, four trailers of the same weight and sizes behind a prime mover. Group D (semitrailers) shall be designed for towing not more than two in a train with applicable converter dolly installed under the second semitrailer. Bulky stands, shelters, and similar wheeled equipment items shall be designed for towing singly.

3.3.9 Ground clearance, ramp breakover, approach and departure angles: All equipment shall be designed to enter (approach), negotiate (up or down), and leave (depart) a solid surface (i.e., one piece) ramp having a slope of 20°. Ground clearance, angles of approach, ramp breakover, and departure shall be selected accordingly. The length of the incline shall be not less than 1.2 times the wheelbase of the equipment. Ground clearance shall be not less than that specified for a particular type or class of mobility.

#### 3.4 Additional requirements by types:

The following requirements shall apply to individual types of equipment as outlined in table III. Towed vehicles shall comply with all Federal Motor Vehicle Safety Standards in effect on the date of manufacture.

##### 3.4.1 Special requirements by types:

3.4.1.1 Fording ability: When specified (see 6.5), the equipment shall be waterproofed and equipped for fording hard-bottomed water crossings deep enough to submerge its running gear, and shall withstand such submergence for at least 15 minutes in a salt water solution with a specific gravity of 1.03 without damage and with no requirement for preparation or servicing before and after fording operations.

3.4.1.2 Springs and shock absorbers: Equipment designed for type III mobility shall be equipped with multi-leaf, compression coil, torsion bar, torsion coil, air, or equivalent, spring suspensions of sufficient strength to sustain the total gross loads under stated conditions of operation without evidence of overload or permanent set. Clearance between the springs and spring stops shall be sufficient to prevent frequent bottoming. Shock absorbers, vibration-damping devices, or design features shall be provided to meet specified shock and vibration transmission limits. The degree of road shock mitigation may be determined to be critical for specific items of mounted equipment. If so, the limits should be specified by the procuring activity.

TABLE III. Additional Requirements By Types

| ITEM | REQUIREMENT                                                                                 | TYPE I                                          |                                          |                                                        |
|------|---------------------------------------------------------------------------------------------|-------------------------------------------------|------------------------------------------|--------------------------------------------------------|
|      |                                                                                             | PAVED-LEVEL SURFACE<br>(HANGAR)<br>GROUPS A-B-C |                                          |                                                        |
|      |                                                                                             | CLASS 1                                         | CLASS 2                                  | CLASS 3                                                |
| 1    | General design                                                                              | Paragraph 3.3                                   |                                          |                                                        |
| 2    | Roadability:                                                                                |                                                 |                                          |                                                        |
|      | (a) Negotiate obstructions and depressions                                                  | 1 inch high or deep                             | 1 inch high or deep                      | 2 inches high or deep                                  |
|      | (b) Towing power                                                                            | Manual                                          | GSE Tug                                  | Manual                                                 |
|      | (c) Height of towing pintle hook or manual force (inches above ground to center of opening) | 10-24                                           | 10-24                                    | N/A                                                    |
|      | (d) Height of fifth wheel when loaded (inches above ground)                                 | N/A                                             | N/A                                      | N/A                                                    |
|      | (e) Towing speed (mph)                                                                      | 2-1/2                                           | 5                                        | 2-1/2                                                  |
|      | (f) Turning speed right or left at maximum cramping angle (mph)                             | 2-1/2                                           | 5                                        | 2-1/2                                                  |
|      | (g) Withstand sudden stops without damage from (mph)                                        |                                                 | 5                                        | —                                                      |
|      | (h) Slope operation<br>Sides<br>Longitudinal                                                | 8°<br>20°                                       | 8°<br>20°                                | 15°<br>15°                                             |
| 3    | Ground Clearance (3.3.9), minimum, inches                                                   | 2-1/2                                           | 6-1/2                                    | 3-1/2                                                  |
| 4    | Casters (if used), minimum size, inches                                                     | 4                                               | Comply with 3.8<br>6                     | 5                                                      |
| 5    | Tires and tubes, pneumatic:                                                                 | Comply with 3.16.1<br>3.50 x 6,<br>4 ply        | Comply with 3.16.1<br>4.00 x 8,<br>6 ply | Comply with 3.16.1<br>3.50 x 6,<br>4 ply<br>acceptable |
|      | Solid rubber                                                                                | Not to be used                                  |                                          |                                                        |
| 6    | Wheels                                                                                      | Comply with 3.18.1                              | Comply with 3.18.1                       | Comply with 3.18.1, 3.18.3                             |
| 7    | Brakes:                                                                                     |                                                 |                                          | Comply with 3.6.3                                      |
|      | Parking                                                                                     | Comply with 3.6.1                               | Comply with 3.6.1                        | Per equip spec                                         |
|      | Service                                                                                     |                                                 | Comply with 3.6.2                        | Per equip spec                                         |
| 8    | Fenders                                                                                     | None                                            | Per 3.9                                  | None                                                   |
| 9    | Mudflaps                                                                                    | None                                            | Per 3.12                                 | None                                                   |
| 10   | Bumpers                                                                                     | None                                            | Per 3.7                                  | None                                                   |
| 11   | Special requirements                                                                        | None                                            | None                                     | Per equip spec                                         |

TABLE III. Additional Requirements By Types (Cont'd)

| TYPE II                                                              | TYPE III                                                      | TYPE IV                                                                                    | TYPE V                                                    |
|----------------------------------------------------------------------|---------------------------------------------------------------|--------------------------------------------------------------------------------------------|-----------------------------------------------------------|
| PAVED AND IMPROVED<br>UNPAVED SURFACES<br>(ENTIRE LEVEL<br>AIRFIELD) | HIGHWAY AND IMPROVED<br>SURFACE AND CROSS-<br>COUNTRY TERRAIN | TYPE III PLUS<br>SNOW AND ICE<br>(ARCTIC AIRFIELD)                                         | HIGHWAY AND<br>UNIMPROVED<br>SURFACE AND<br>CROSS-COUNTRY |
| GROUPS A-C-D                                                         | GROUPS A-C-D                                                  | GROUPS A-C                                                                                 | GROUPS A-C-D                                              |
| Applicable to all types                                              |                                                               |                                                                                            |                                                           |
| GSE Tug                                                              | Truck-tractor                                                 | All type III<br>requirements<br>plus those<br>specified in<br>equipment speci-<br>fication |                                                           |
| 10-24                                                                | 30-48                                                         |                                                                                            |                                                           |
| 50 +1 -0                                                             | 50 +1 -0                                                      |                                                                                            | 50 +1 -0                                                  |
| Paved highway- 20                                                    | Paved highway- 60                                             |                                                                                            | 60                                                        |
| Graded gravel- 10                                                    | Graded gravel- 25                                             |                                                                                            | 20                                                        |
| Belgian block- 8                                                     | Belgian block- 20                                             |                                                                                            | 20                                                        |
|                                                                      | Cross-country terrain- 20                                     |                                                                                            | 20                                                        |
| 8                                                                    | 8                                                             |                                                                                            | 10                                                        |
| 20                                                                   | 20                                                            |                                                                                            | 60                                                        |
| 8°                                                                   | 11.5° Side slope                                              |                                                                                            | 11.5° Side slope                                          |
| 20° Up and down                                                      | 20° Up and down                                               |                                                                                            | 20° Up and down<br>Compatible with<br>prime mover         |
| 8                                                                    | 14 (Under landing gear)                                       |                                                                                            | 14                                                        |
| Comply with 3.8                                                      |                                                               |                                                                                            |                                                           |
| 20                                                                   | Not to be used                                                |                                                                                            | Not to be used                                            |
| Comply with 3.16.1<br>or 3.16.2                                      | Comply with 3.16.2                                            |                                                                                            |                                                           |
| 6.00 x 9, 6 ply                                                      | 6.70 x 15, 4 ply                                              |                                                                                            | See equipment<br>specification                            |
| Special application<br>only, See 3.16.3                              | Not to be used                                                |                                                                                            |                                                           |
| Comply with 3.18.1<br>or 3.18.2                                      | Comply with 3.18.2                                            |                                                                                            | See equipment<br>specification                            |
| For solid rubber, 3.18.3                                             |                                                               |                                                                                            |                                                           |
| Comply with 3.6.1                                                    | Comply with 3.6.1                                             |                                                                                            | Se 3.6.1                                                  |
| Comply with 3.6.2                                                    | All wheels                                                    |                                                                                            |                                                           |
| Special 3.6.2 and 3.6.3                                              | Comply with 3.6.2                                             |                                                                                            | See 3.6.2                                                 |
|                                                                      | All wheels                                                    |                                                                                            |                                                           |
| Per 3.9                                                              | Per 3.9                                                       |                                                                                            | See 3.9                                                   |
| Per 3.12                                                             | Per 3.12                                                      |                                                                                            | See 3.12                                                  |
| Per 3.7                                                              | Per 3.7                                                       |                                                                                            | See 3.7                                                   |
| None (maybe brakes)                                                  | Slope performance<br>Par. 3.4.1.1<br>Par. 3.4.1.2             |                                                                                            | Slope performance<br>Par. 3.4.1.1<br>Par. 3.4.1.2         |

### 3.5 Additional requirements by groups:

The following requirements shall apply to individual groups of aerospace ground equipment as outlined in table IV.

#### 3.5.1 Special requirements by groups:

3.5.1.1 Steering geometry, group C: Vehicles or towed equipment containing four-wheel running gear shall be provided with a towbar and automotive knuckle-type steering assembly incorporating tie rods having end joints of ball stud and ball socket type. The inside cramping angle shall be not less than 40°. Total load imposed on the trailer shall be so distributed that 35 ±5 percent of the total load is carried on the front axle. The towbar shall steer the wheels through suitable linkage. The towbar and steering mechanism shall be so fabricated that additional turning force cannot be applied to the towbar or the steering mechanism after the maximum cramping angle has been reached. The front and rear tread width shall be equal. Caster, camber, toe-in, turning ability, ball joints, ball studs, and tie-rod sockets shall conform to SAE J695 for the basic Ackerman Principle of Automotive Steering.

3.5.1.1.1 Articulating wheel running gear: When required, group C trailer vehicles shall have a fully articulating type front and rear wheel, balanced chassis frame suspension system, furnished complete as an assembly with all running gear parts and components. This shall afford coupling to the payload container so as to maintain relatively constant wheel loading and ground contact over operating surfaces having as obstacles obstructions not less than a minimum of one-half the wheel diameter used. It shall preclude rack and torque stresses from being transmitted to the payload container. Stops shall be provided to prevent unnecessary vertical wheel movement, and the running gear shall be so designed that the vehicle fully equipped, loaded with gross rated payload equipment, and its front or rear wheels cramped at any operating angle can negotiate such obstacles. Parts failure, interference or objectionable distortion of the running gear articulating assembly or chassis frame shall not occur when blocks 8 inches high are placed under any wheel or under any combination of two or more wheels.

3.5.1.2 Group D: Semitrailers shall be provided with a landing gear and shall be so designed that there will be no interference between the semitrailer and its towing vehicle when the two are coupled and assume angles from 0 to 90° with the semitrailer longitudinal axis during operation. The weight distribution shall be as specified in the equipment specification.