

Ramp Markings

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1. SCOPE:

This SAE Aerospace Recommended Practice (ARP) outlines recommended ramp pavement marking standards for proper guidance and positioning of GSE on commercial transport aircraft parking and handling stands (gates), in line with International Civil Aviation (ICAO) recommendations applicable to airport aprons.

Throughout this document, the minimum essential criteria are identified by use of the key word "shall". Recommended criteria are identified by use of the key word "should" and, while not mandatory, are considered to be of primary importance in providing safety effective ramp markings. Deviation from recommended criteria should only occur after careful consideration and thorough service evaluation have shown alternate methods to provide an equivalent level of safety.

1.1 Purpose:

Experience has demonstrated that ramp safety, both as to prevention of GSE accidents and injury to ramp workers and as to prevention of accidental damage to aircraft, closely depends on GSE operators adherence to safe driving and positioning practices, which in turn are greatly enhanced by the existence of recognized standard ramp markings in order to permanently materialize the variety of driving rules to be met.

The purpose of this Aerospace Recommended Practice is to accordingly provide airlines and airport operators with:

- the definition of standardized ramp markings,
- the corresponding driving and operating rules, to be taught in ramp staff training.

1.2 Field of Application:

This document is intended to apply to the ramp areas of all nose-in aircraft parking stands (gates) used for servicing commercial transport aircraft, and adjacent service roads and GSE or vehicles parking areas where applicable.

It defines the (white or red) ramp pavement markings intended for guidance of GSE and vehicles around the aircraft or in the adjacent areas. It is not applicable to any (normally yellow) markings required for guidance and positioning of aircraft moving under their own power or under tow.

It is not applicable to aircraft stands (gates) in the self-maneuvering mode.

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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, 400 Commonwealth Drive, Warrendale PA 15096-0001.

ASXXX1	Airline Ground Support Equipment - Operation (in preparation)
AIRXXX2	Airline Ground Support Equipment - Ramp Service Personnel (RSP) Qualification and Training (in preparation)

2.1.2 ICAO Publications: Available from International Civil Aviation Organization, 1000 Sherbrooke St W, Suite 400, Montreal, Quebec, Canada H3A 2R2.

ICAO Annex 14 to the Convention on international civil aviation, Aerodromes, Recommendation 5.2.13

ICAO Aerodrome Design Manual, Part 4, Guidance on apron safety lines

2.1.3 IATA Publications: Available from International Air Transport Association, 800 place Victoria, P.O.Box 113, Montreal, Quebec, Canada H4Z 1M1.

Airport Handling Manual AHM 697, Recommendations for apron markings and signs

Airport Development Reference Manual section 5.3.9, Apron ground markings

2.1.4 ACI Publications: Available from Airports Council International, P.O.Box 125, CH 1215 Geneva 15 Airport, Switzerland.

IATA/ACI Ramp Safety Recommendations for ramp markings

2.2 Definitions:

EQUIPMENT RESTRAINT AREA (ERA): An area, extending at least 7.5 m (25 ft) away from any point of the largest aircraft type allowable at the gate, bordered by a marked safety line, where any vehicle or piece of GSE shall come to a complete stop prior to approaching the aircraft. Entry of vehicles and GSE into the ERA should be limited to those having a definite requirement for connecting to the aircraft being serviced.

NO PARKING AREA: An area, marked by stripes hatching on the ground, where for a safety reason (not an administrative one) no stopping or parking of a vehicle or piece of GSE is allowable at any time. Examples include: fuel hydrant pit areas, apron drive passenger loading bridge deployment area, Fire Department access, others.

PARKING AREA: An area, preferably with marked individual locations for identified vehicles and GSE, assigned to vehicle and GSE parking when not in use on the aircraft.

PEDESTRIAN CROSSING: An area marked for pedestrians to safely cross a ramp service road.

PEDESTRIAN WALKWAY: A path marked for pedestrians (staff or passengers) to safely walk through a ramp area in order to access e.g. aircraft passenger stairs from the terminal building or a bus stop.

STAND (GATE) SAFETY LINE: The (red) line defining the limits of the EQUIPMENT RESTRAINT AREA.

TAXIWAY SAFETY LINE (also known as "apron safety border line"): The line (usually behind the aircraft's tail) separating a ramp area, usable by vehicles and GSE for the purpose of servicing parked aircraft, from an aircraft movement (taxiway) area, with the safety clearances required as a function of the largest aircraft type allowable on the taxiway concerned.

3. GENERAL FEATURES:

Ramp pavement markings covered by this document shall meet the following general requirements:

3.1 Type of Markings:

- 3.1.1 Double continuous lines shall be used wherever crossing the line is not allowable at any time.
- 3.1.2 Single continuous lines shall be used wherever crossing the line is allowable only after coming to a complete stop and visually checking the absence of any conflicting aircraft, vehicle or equipment.
- 3.1.3 Single broken lines shall be used where crossing the line is allowable without stopping, e.g. in order to pass another vehicle, but should not permanently be crossed when driving.

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3.1.4 Single continuous frame filled in with hatching shall be used to indicate areas where no vehicle or GSE stopping or parking are allowable. All hatching lines should be at 45° in reference to the aircraft parking position and spaced 0.5 m (20 in) apart from each other. See 3.2.2(b) for applicable color in the event of specifically safety related (e.g., fuel hydrant pits) areas.

3.2 Colors:

3.2.1 Except as noted in 3.2.2 hereafter, all ramp pavement markings intended for other than aircraft shall be white. The paint or other material should be selected to be non slippery and be reflective or equivalent in order to provide high visibility in all foreseeable circumstances, including under rain or subdued lighting at night.

3.2.2 As an exception, the following safety related markings shall be red:

- a. gate safety line (ERA limit): red, lined with white on both sides for higher contrast visibility,
- b. safety no parking areas (e.g., fuel hydrant pits): red frame, filled in with red hatching. A plain white background is allowable where required for higher contrast visibility.

The paint or other material should be of a bright safety red, and selected to be non slippery and reflective or equivalent in order to further enhance visibility.

3.2.3 Under no circumstances shall the color yellow (to be reserved for aircraft guidance markings) be used.

3.3 Dimensions:

3.3.1 All marking lines, except traffic STOP lines and pedestrian crossings and walkways, shall be 0.10 m (4 in) wide minimum. An increased 0.15 m (6 in) width is recommended for better visibility, particularly at large (wide body aircraft) gates. Traffic STOP lines provided at intersections shall be 0.20 m (8 in) wide all across lane width.

3.3.2 Spacing between double lines shall be 0.05 m (2 in). Side linings of the red gate safety line (ERA limit) shall be 0.05 to 0.10 m (2 to 4 in).

3.3.3 Broken lines should consist in 1.5 m (5 ft) long segments separated by 0.9 m (3 ft) spaces, or equivalent.

3.3.4 Traffic STOP lines provided at intersections shall be 0.20 m (8 in) wide across the whole lane concerned.

3.3.5 Pedestrian crossings and walkways shall be marked according to local airport regulations, if any. In the absence thereof, they should meet the following minimum dimensions (see example in Figure 1):

- width of line: 0.5 m (20 in)
- length of line: 2 m (6 ft)
- gap between lines: 0.5 m (20 in)

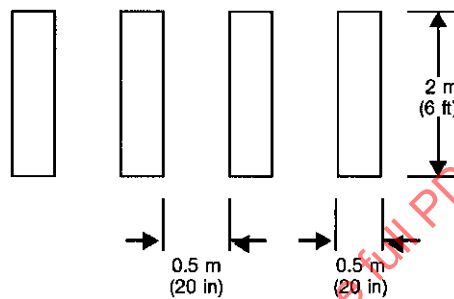


FIGURE 1 - Pedestrian Crossing or Walkway

3.4 Signs:

3.4.1 Directional markings should be in the form of an arrow painted on service road surface. An arrow may be uni- or multi-directional (see example in Figure 2).

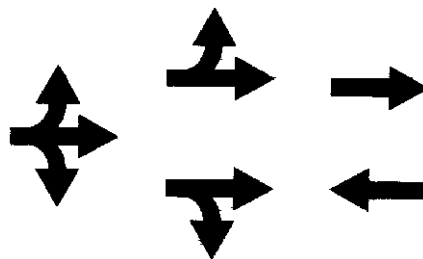


FIGURE 2 - Typical Directional Signs

- 3.4.2 Traffic speed limit signs shall be in accordance with local airport regulations. Traffic speed limit markings should be painted on the service road surface in the form of a white circle, with the maximum speed displayed inside the circle (see example in Figure 3).



FIGURE 3 - Traffic Speed Limit Sign

4. REQUIREMENTS:

4.1 Service Roads:

- 4.1.1 Roadway markings shall be provided to identify any ramp spaces assigned as a service road for vehicles and GSE (see example in Figure 4).

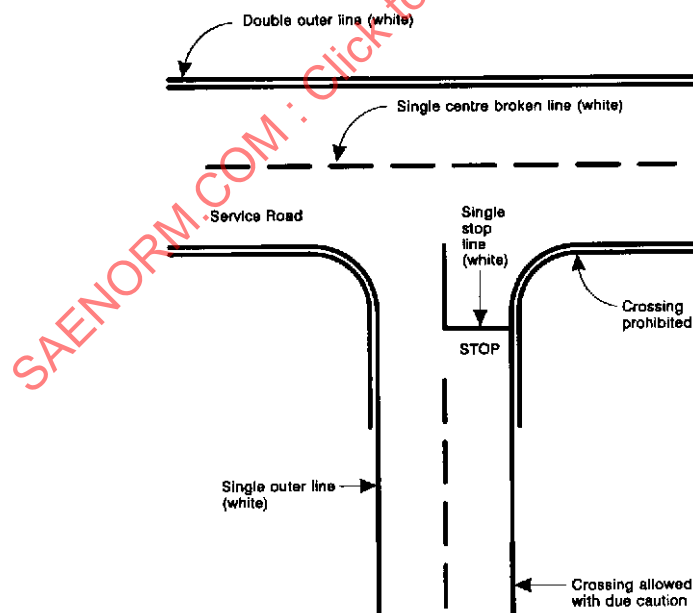


FIGURE 4 - Typical Roadway Markings

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- 4.1.2 Roadway markings should be painted white and should consist of single continuous outer lines indicating that crossing with caution (i.e., coming to a full stop and visually checking the absence of any conflicting aircraft, vehicle or equipment) is allowed.
- 4.1.3 Double continuous white lines should be used to indicate crossing is not allowable in any direction. A double line consisting of a continuous one and a broken one should be used to indicate crossing is allowable with caution in one direction only.
- 4.1.4 Each lane of a service road should be of a minimum width to accommodate the widest piece of equipment normally in use at that location. In case of two opposing directions of travel, there should be a center single broken white line to divide traffic.
- 4.1.5 The corners of roadways should be rounded with consideration given to the turning radius of normally used equipment at that location.
- 4.2 ERA Markings:
- 4.2.1 The Equipment Restraint Area (ERA) limits (stand/gate safety lines) shall be marked on each aircraft parking stand (gate) by a 0.10 m (4 in) to 0.15 m (6 in) red line, lined with white on both sides 0.05 m (2 in) to 0.10 m (4 in) wide. The red line shall be located 7.5 m (25 ft) away from any point in plan view of the most critical aircraft type allowable at the gate concerned (see example in Figure 5).

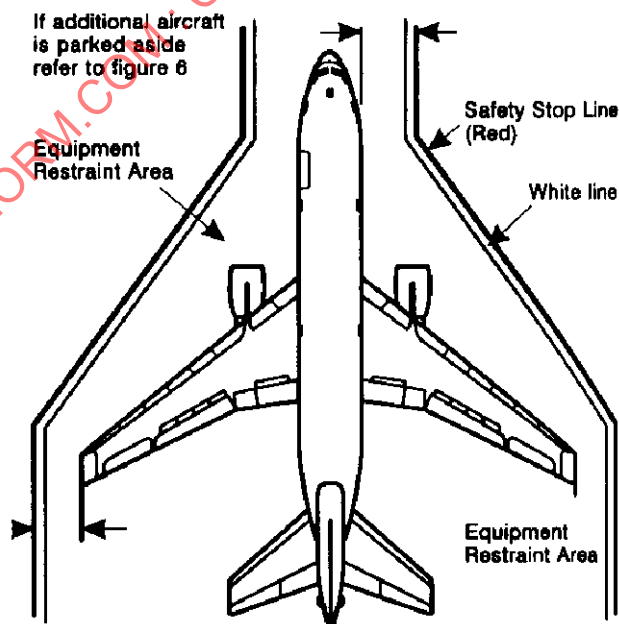


FIGURE 5 - Single Aircraft Gate Safety Line
(Arrows = 7.5 m/25 ft)

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- 4.2.2 Where two or more aircraft are parked alongside each other, the ERA limits between them should be omitted in order for the wing tip spacing between adjacent aircraft to meet ICAO and/or FAA minimum spacing requirements (see example in Figure 6).

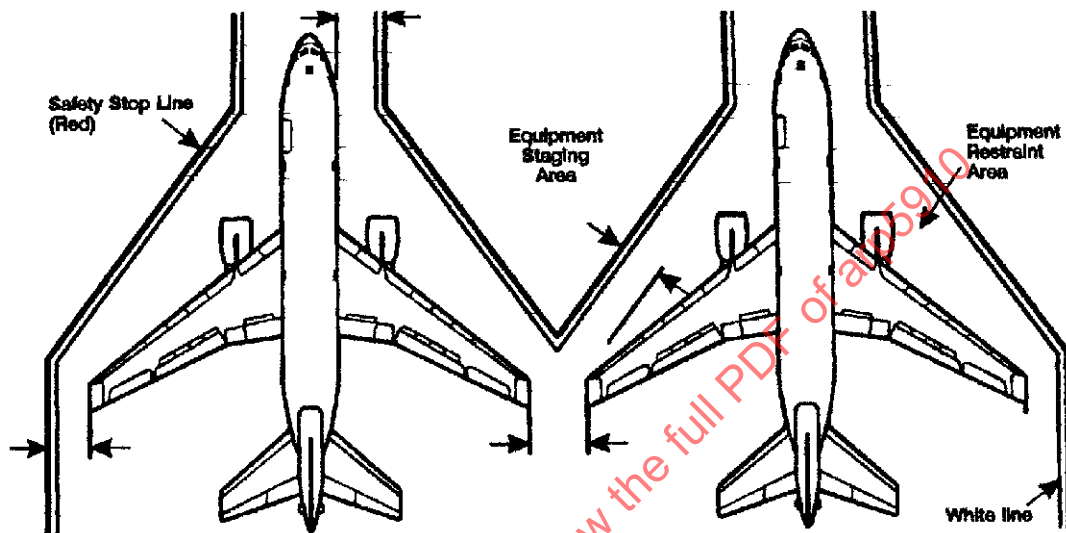


FIGURE 6

- 4.2.3 Where a same parking stand (gate) may be used for either one larger or two smaller aircraft, or other combination, the ERA limit (stand/gate safety line) shall be determined 7.5 m (25 ft) away from the most critical aircraft or aircraft combination (use the outer envelope of the addition of each aircraft's envelopes) (see example in Figure 7).

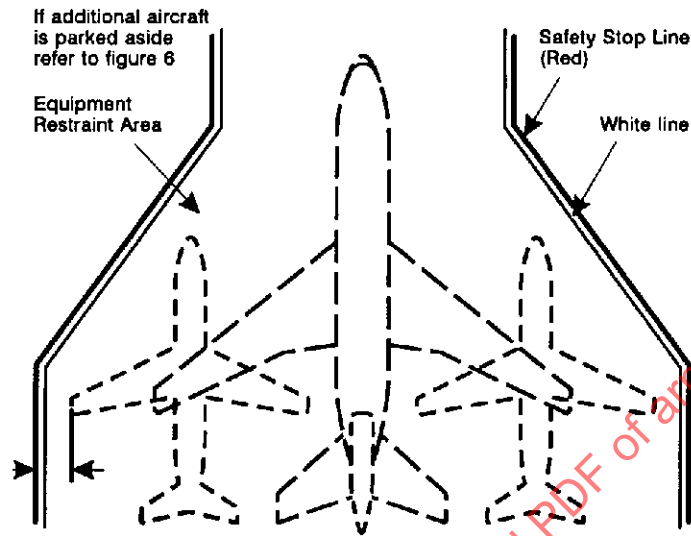


FIGURE 7

4.3 Vehicle and GSE Parking:

- 4.3.1 It is recommended that permanently pre-assigned parking locations be defined and marked for ramp vehicles and GSE normally to be used at each aircraft stand (gate).
- 4.3.2 Parking space shall never be assigned or marked within the Equipment Restraint Area (ERA) or encroaching on it or a designated service road.
- 4.3.3 When allocating ramp space available outside of the ERA for vehicle and GSE parking purposes, consideration should be given to:
 - a. giving precedence to GSE to be used on aircraft over general purpose vehicles,
 - b. selecting parking space assignment in order to preposition, inasmuch as feasible, GSE so as to reduce its travel to/from its working position on aircraft and make it as direct/straightforward as possible,
 - c. ensuring parked vehicles or GSE will not constitute an obstacle for any other piece of GSE which may be required at the aircraft stand (gate) concerned or an adjacent one, and
 - d. particularly, ensuring that at all times a clear escape path away from the aircraft is maintained for any aircraft fueling trucks or hydrant servicers, and an identified clear incoming path is maintained for Fire Department vehicles should their intervention become necessary.

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- 4.3.4 Allocated parking positions should be marked by rectangular continuous line frames of appropriate dimensions. Minimum positions size should be 0.6 m (2 ft), or more, larger than the overall outside dimensions of the vehicle or piece of GSE concerned. Where permanent parking positions assignment is practiced, the abbreviated designation of the vehicle or piece of GSE may be marked within the frame.

5. GENERAL LAYOUT:

- 5.1 The general pavement markings layout on a given airport ramp area should be determined based on the above principles by a study conducted by, or in close association with, the ramp operations department of the airline or aircraft handling agency most using the area concerned.
- 5.2 A typical general layout example is shown in Figures 8 (with service road between the terminal building and the aircraft) and Figure 9 (with service road aft of the aircraft), as an illustration only.
- 5.3 Assignment of GSE parking positions adjacent to the aircraft should be based on analysis of the required movements and intervention timings of the various GSE pieces concerned, in order to minimize their traveling requirements and the possibilities of them interfering with each other. Measurable productivity (turnaround time) improvements can be demonstrated in addition to ramp safety enhancement.
- 5.4 Any general markings layout study in a given airport/ramp area configuration will usually raise difficulties requiring design compromises. Such compromises should be carefully evaluated in order to keep as close as possible to the principles laid out in the present document, and give precedence to maximizing ramp safety over any other consideration.

6. OPERATIONAL RULES:

- 6.1 The effectiveness of ramp safety increase expected from a proper pavement marking system is totally contingent on all ramp drivers being thoroughly trained and implementing the corresponding driving rules. Accordingly, the following rules shall be systematically taught in training courses and enforced ("vehicle" therein equally meaning either a general purpose transportation vehicle or a piece of self-propelled GSE). See AIRXXX2 for Ramp Service Personnel (RSP) qualification and training requirements.
- 6.2 Vehicles shall at all times comply with the maximum speed allowable on the airport for their category, and, if applicable, any locally lower speeds posted through signals in accordance with 3.4.2.
- 6.3 At any point inside the Equipment Restraint Area (ERA) in presence of an aircraft, maximum speed of all vehicles shall at all times be limited to a walking pace (typically, 5 km/h/3 mph).
- 6.4 At any point, e.g. service road/taxiway crossing, where a conflict may occur between a vehicle and an aircraft with engines on or being towed, the vehicle shall in all circumstances give way to the aircraft, and proceed only once it has passed and the potential jet blast hazard has receded.