DATE 11/14/80

ADVISORY CIRCULAR

DEPARTMENT OF TRANSPORTATION
Federal Aviation Administration
Washington, D.C.

Subject: MARKING OF PAVED AREAS ON AIRPORTS

1. PURPOSE. This advisory circular describes the standards for marking paved runways, taxiways, and closed or hazardous areas on airports.

2. CANCELLATION. Advisory Circular 150/5340-1D, Marking of Paved Areas on Airports, dated January 19, 1973, is cancelled.

3. PRINCIPAL CHANGES.

a. Holding position markings, including associated signs, have been included as a part of precision instrument, nonprecision instrument, and visual runway markings.

b. Locations of holding position markings have been revised.

c. The minimum width of centerline marking for nonprecision instrument runways has been reduced.

d. The fixed distance marker has been included as part of the standard precision instrument runway marking.

e. An alternate cross has been introduced for marking closed runways and taxiways.

f. Markers for snow-covered runways have been deleted.

4. METRIC UNITS. To promote an orderly transition to metric units, the text and figures include both English and metric dimensions. The metric conversions are based on operational significance and may not be exact equivalents. Until an official changeover to metric units is effected, the English dimensions should be used.

Initiated by: AAS-200

5. DEFINITIONS. The following definitions apply to terms used in this advisory circular:

a. Visual Runway. A runway having no straight-in instrument approach procedure and intended solely for the operation of aircraft using visual approach procedures.

b. Nonprecision Instrument Runway. A runway having an existing instrument approach procedure utilizing air navigation facilities with only horizontal guidance for which a straight-in nonprecision approach procedure has been approved.

c. Precision Instrument Runway. A runway having an existing instrument approach procedure utilizing a precision instrument landing system.

d. Runway Threshold. The designated beginning of the runway that is available and suitable for the landing of aircraft.

e. Displaced Threshold. A threshold that is located at a point on the runway other than the beginning of the full strength pavement and the paved area between the beginning of the full strength pavement and the displaced threshold is used for takeoff or rollout of aircraft.

f. Relocated Threshold. A threshold that is located at a point on the runway other than the beginning of the full strength pavement and the paved area between the former threshold and the relocated threshold is no longer used for the landing or takeoff of aircraft.

6. APPLICATION. Runway and taxiway markings are essential for the safe and efficient use of airports, and their effectiveness is dependent upon proper maintenance to maintain an acceptable level of conspicuity. The marking elements used for the various runway classifications are illustrated in figure 1. Markings for precision instrument runways are shown in figure 2, and markings for nonprecision instrument and visual runways are shown in figure 3. A runway should be marked in accordance with its present usage (visual, nonprecision instrument, or precision instrument) unless upgrading to a higher classification is imminent. The marking elements for each runway classification, which should never be less but which may contain additional elements normally used on a higher runway classification, are as follows:

a. Visual Runway.

(1) Centerline marking.

(2) Designation marking.

(3) Threshold marking (on runways used or intended to be used by international commercial air transport).

(4) Fixed distance marking (on runways 4,000 feet (1200 m) or longer used by jet aircraft).

(5) Holding position markings (for taxiway/runway intersections).

b. Nonprecision Instrument Runway.

(1) Centerline marking.

(2) Designation marking.

(3) Threshold marking.

(4) Fixed distance marking (on runways 4,000 feet (1200 m) or longer used by jet aircraft).

(5) Holding position markings (for taxiway/runway intersections and instrument landing system (ILS) critical areas).

c. Precision Instrument Runway.

(1) Centerline marking.

(2) Designation marking.

(3) Threshold marking.

(4) Fixed distance marking.

(5) Touchdown zone marking.

(6) Side stripes.

(7) Holding position markings (for taxiway/runway intersections and ILS critical areas).

7. MARKING PRACTICES. The color of markings used on runways is white, while that used on taxiways or for marking deceptive, closed, or hazardous areas is yellow. On light-colored runway pavements, the contrast of the markings can be increased by outlining with a black border at least 6 inches (15 cm) in width. In some locations the use of striated marking, consisting of painted stripes 4 inches (10 cm) to 6 inches (15 cm) wide with equal width of unpainted area, has been effective in reducing frost heave of the pavement. This method also increases the coefficient of friction over the marking area. However, since this method results in reduced marking conspicuity, frequent maintenance is required to provide an acceptable marking system. Due to the reduced conspicuity, striated marking is not used on Category II or III runways. Material specifications and painting procedures are contained in Advisory Circular 150/5370-10, Standards for Specifying Construction on Airports, current edition.

8. RUNWAY MARKINGS.

a. Marking Precedence. Where runways intersect, the markings on the runway of the higher precedence continue through the intersection, while the markings of the runway of the lower precedence are interrupted except that the runway threshold marking, designation marking, and touchdown zone markings are relocated along the lower precedence runway to avoid the intersection area. For intersection of runways of the same precedence order, the preferred runway (lowest approach minimums or most often used) is considered to be of a higher precedence order. For marking purposes, the order of precedence, in descending order, is as follows:

(1) Precision instrument runway, Category III.

(2) Precision instrument runway, Category II.

(3) Precision instrument runway, Category I.

(4) Nonprecision instrument runway.

(5) Visual runway.

b. Runway Designation Marking. Runways are identified by numbers which indicate the nearest 10-degree increment of the azimuth of the runway centerline. The magnetic azimuth of the runway centerline is measured clockwise from the magnetic north when viewed from the direction of approach. For example, where the magnetic azimuth is 183 degrees, the runway designation marking would be 18; and for a magnetic azimuth of 87 degrees, the runway designation marking would be 9. For a magnetic azimuth ending in the number "5," such as 185 degrees, the runway designation marking can be either 18 or 19. Numbers and supplemental letters, where required for parallel runways, are shown in figure 4. The supplemental letter is placed between the designation numbers and the threshold or threshold marking as shown in figure 2. Single digits are not preceded by a zero. The size and spacing of the numbers and letters are reduced only when necessary due to space limitations on narrow runways and should be no closer than 2 feet (0.6 m) from the runway edge (or runway edge stripes if used). For parallel runways, the supplemental letter is determined as follows, in the order shown from left to right, when viewed from the direction of approach:

(1) For two parallel runways: "L," "R."

(2) For three parallel runways: "L," "C," "R."

(3) For four parallel runways: One adjacent pair is numbered as in (1) above, and the remaining adjacent pair is numbered to the next nearest 1/10 of the magnetic azimuth as in (1) above. Example for a magnetic azimuth of 327 degrees: "32L," "32R," "33L," "33R."

(4) For five parallel runways: Three adjacent runways are numbered as in (2) above, and the remaining two adjacent runways are numbered to the next nearest 1/10 of the magnetic azimuth as in (1) above. Example for a magnetic azimuth of 138 degrees: "13L," "13R," "14L," "14C," "14R."

(5) For six parallel runways: Three adjacent runways are numbered as in (2) above, and the remaining three adjacent runways are numbered to the next nearest 1/10 of the magnetic azimuth as in (2) above. Example for a magnetic azimuth of 83 degrees: "8L," "8C," "8R," "9L," "9C," "9R."

c. Runway Threshold Marking. The runway threshold marking consists of eight longitudinal stripes of uniform dimensions arranged symmetrically about the runway centerline as shown in figure 2. The stripes are 150 feet (45 m) long and 12 feet (3.6 m) wide and are spaced 3 feet (1 m) apart except for the center space which is 16 feet (4.8 m). For runways less than 150 feet (45 m) in width, the length of the markings is not changed, but the width of the markings, spaces between markings, and distance of markings from the runway edge are changed proportionally. For runways greater than 150 feet (45 m) in width, the width of the markings and spaces between the markings may be increased proportionally or additional stripes may be added to both sides.

d. Runway Centerline Markings. The runway centerline markings are located on the centerline of the runway and consist of a line of uniformly spaced stripes and gaps. The stripes are 120 feet (36 m) in length, and the gaps are 80 feet (24 m) in length as shown in figure 2. Adjustments to the length of the stripes and gaps, where necessary to accommodate the runway length, are made near the runway midpoint. The minimum width of the stripes is 12 inches (30 m) for visual runways, 18 inches (45 cm) for nonprecision instrument runways, and 36 inches (90 cm) for precision instrument runways.

e. Runway Touchdown Zone Marking. Touchdown zone markings consist of groups of one, two, and three rectangular bars symmetrically arranged in pairs about the runway centerline as shown in figure 2. For runways less than 150 feet (45 m) in width, the markings and spaces are reduced proportionally, but the lengths remain the same. On shorter runways, those pairs of markings which would extend to within 900 feet (270 m) of the runway midpoint are eliminated. The fixed distance markings are a part of the touchdown zone markings but are used alone on certain nonprecision instrument runways and visual runways as indicated in paragraphs 6a and 6b.

f. Runway Side Stripe Marking. Runway side stripes consist of continuous stripes located along each side of the runway to provide contrast with the surrounding terrain and/or to delineate the full strength runway pavement area. The maximum distance between the outer edges of the stripes is 200 feet (60 m). The stripes have a minimum width of 36 inches (90 cm) for precision instrument runways and are at least equal to the width of the runway centerline stripes on other runways. The stripes extend to the end of displaced threshold areas which are used for takeoffs or rollouts.

g. Displaced Threshold Marking. Displaced threshold areas which are used for takeoffs or rollouts are marked as shown in figure 5a. Runway edge stripes, where used on the runway, are continued along the edges of the displaced threshold area. Taxiway centerline markings may extend into the displaced area.

h. Relocated Threshold Marking. Relocated threshold areas where the abandoned runway area is not used for taxiing are marked as shown in figure 5b and where used as a taxiway are marked as shown in figure 5c.

i. Markings for Blast Pads and Stopway. Markings for these areas are shown in figure 5b.

9. TAXIWAY MARKINGS.

a. Marking Colors. All taxiway marking colors are yellow.

b. Taxiway Centerline Marking. The taxiway centerline marking is a continuous line of 6-inch (15 cm) minimum width.

(1) On a taxiway curve, the taxiway centerline marking continues from the straight portion of the taxiway at a constant distance from the outside edge of the curve. For taxiway intersections designed for the straight-through method of taxiing, the centerline markings continue straight through the intersection.

(2) At taxiway intersections with a runway end, the taxiway centerline marking is terminated at the runway edge (with exception of the situation where there is a displaced threshold, in which case the taxiway centerline may be extended onto the runway displaced area). For intersections of taxiways with runways where the taxiway serves as an exit from the runway, the taxiway centerline marking may be extended onto the runway as shown in figure 6. The taxiway centerline marking is extended parallel to the runway centerline marking for a distance of 200 feet (60 m) beyond the point of tangency. The curve radius should be large enough to provide a clearance to the taxiway or runway edge of at least 1/2 the width of the taxiway. For taxiways crossing a runway, the taxiway centerline marking may continue across the runway but must be interrupted for the runway markings.

c. Taxiway Edge Marking. Taxiway edge markings are used where the full strength pavement of the taxiway is not readily discernible or where a taxiway must be outlined when established on a large paved area such as an apron. These markings consist of continuous double lines with the line being 6 inches (15 cm) in width and spaced 6 inches (15 cm) apart as shown in figure 7.

d. Holding Position Markings. Holding position markings consist of a painted hold line and a Type 1 sign (AC 150/5345-44, Specification for L-858 Taxiway Guidance Signs, current edition) as shown in figure 8. An unlighted Type 1 sign may be used on unlighted runways. The solid lines of the holding position markings are always on the side where the aircraft is to hold. The sign is installed on the left side of the hold line as viewed from the holding side. At locations where it is impractical to install the sign on the left side, it may be installed on the right side. For hold lines over 150 feet (45 m) in length, signs are installed on both sides. Where desired to increase the conspicuity of the markings, reflective paint, reflective marking tape, or the addition of in-pavement retroreflective markers (AC 150/5345-39, FAA Specification L-853, Runway and Taxiway Centerline

Retroreflective Markers, current edition) may be used. The hold line markings are installed perpendicular to the taxiway centerline. Signs are installed in accordance with AC 150/5340-18, Taxiway Guidance Sign System, current edition.

(1) Taxiway Holding Position Markings. Holding position markings are installed across taxiways that intersect with runways at the minimum distances shown in table 1. The markings are not required on taxiways which are never used for crossing or access to the runway. The inscription on the associated sign is the runway number. For intersections where takeoffs are conducted, the inscription denotes only that particular runway such as "18." For other intersections, the inscription denotes both runways such as "18-36." In this example runway 18 is to the left and runway 36 is to the right.

Table 1. Location of holding position markings for runway/taxiway intersections.

Aircraft type	Distance from runway centerline in feet (meters)	
	Visual/nonprecision instrument	Precision instrument
Small, 12,500 lbs. (5670 kg)	125 (38)	175 (53)
Large, over 12,500 lbs. (5670 kg) propeller	150 (45)	250 (75) 300 (90)*
turbojet less than 60,000 lbs. (27 200 kg)	150 (45)	250 (75) 300 (90)*
turbojet greater than 60,000 lbs. (27 200 kg)	250 (75)	250 (75) 300 (90)*

*300 feet (90 m) for intersections within 6,000 feet (1800 m) of the runway threshold on the precision instrument approach end and 250 feet (75 m) for other intersections. For taxiways intersecting runways at an angle less than 25 degrees (within 6,000 feet (1800 m) of the precision instrument runway threshold), the holding position marking must be farther from the runway centerline to insure clearance for the tail of large aircraft (B-747, DC-10, L-1011, etc.). For such cases, the distance of the holding position marking from the runway centerline is computed from the formula:

$d = 3T + 200 - L \sin A$ where T = aircraft tail height; L = aircraft length; and A = angle between the runway and taxiway

(2) ILS Holding Position Markings. ILS (instrument landing system) holding position markings are used to protect ILS localizer and glide slope critical areas as shown in figure 8. Pending completion of tests and issuance of

criteria for critical areas, the ILS critical areas should be used for microwave landing system (MLS) and interim standard MLS (ISMLS) facilities to insure signal protection. Where the normal location of the ILS holding position marking and the taxiway holding position marking falls within 25 feet (7.5 m) of each other, the ILS holding position marking may be omitted provided that the taxiway holding position marking is located to protect both the runway and the ILS critical area. An ILS holding position marking should never be installed between a taxiway holding position marking and a runway. The sign inscription for ILS holding position markings is "ILS."

10. MARKING AND LIGHTING OF CLOSED OR HAZARDOUS AREAS ON AIRPORTS.

a. Permanently Closed Runways and Taxiways. For runways and taxiways which have been permanently closed, the lighting circuits are disconnected. For runways, the threshold markings, runway designation marking, and touchdown zone markings are obliterated, and crosses are placed at each end and at 1,000-foot (300 m) intervals. For taxiways, a cross is placed on the closed taxiway at each entrance. The crosses shown in figures 9a and 9c are normally used, but the crosses shown in figures 9b and 9d are more readily seen from aircraft on final approach and may be used where desired.

b. Temporarily Closed Runways and Taxiways. Temporarily closed runways are treated in the same manner as in paragraph 10a except runway markings are not obliterated, crosses are usually of the temporary type (constructed of material such as fabric or plywood), and crosses are required only at runway ends. The crosses are located on top of the runway numerals. For temporary marking, the dimensions of the crosses shown in figures 9a and 9c may be reduced to permit use of standard sheets of 4-by-8-foot (1.22 by 2.44 m) plywood. Temporarily closed taxiways are usually treated as an unusable area as explained in paragraph 10d.

c. Closed Airports. When all runways are closed temporarily, the runways are marked as in paragraph 10b, and the airport beacon is turned off. When all runways are closed permanently, the runways are marked as in paragraph 10a, the airport beacon is disconnected, and a cross is placed in the segmented circle or at a central location if no segmented circle exists.

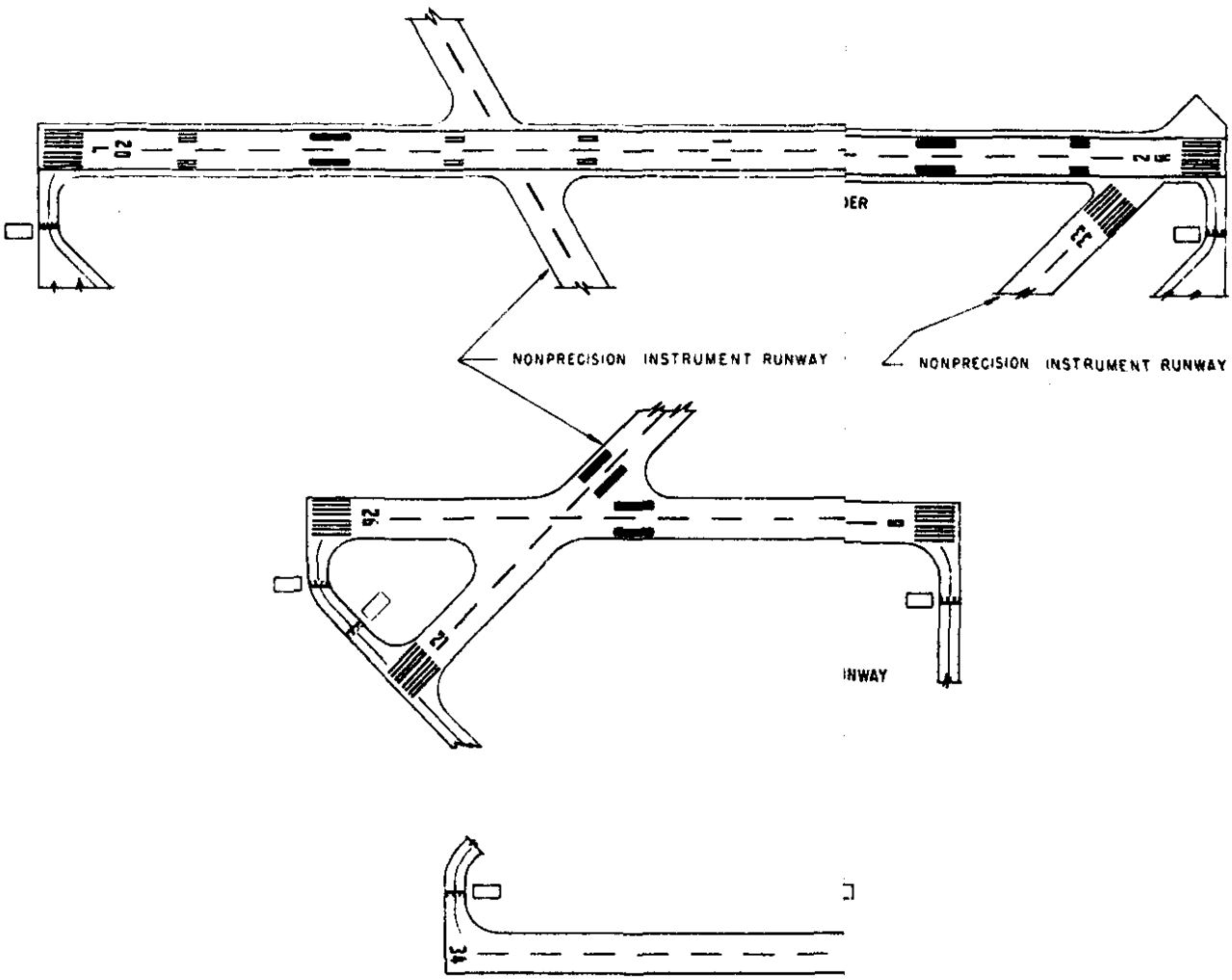
d. Hazardous Areas. Hazardous areas, in which no part of an aircraft may enter, are indicated by use of barricades with alternate orange and white markings. The barricades are supplemented with orange flags a minimum of 20 by 20 inches (50 by 50 cm) square and made and installed so that they are always in the extended position and properly oriented. For nighttime use the barricades are supplemented with flashing yellow lights. The intensity of the lights and spacings for barricades, flags, and lights must be such to adequately define and delineate the hazardous area.

e. Notices to Airmen (NOTAMs). The airport owner (or operator) should provide information on closed or hazardous conditions to the local air traffic control facility (control tower, approach control, center, flight service station) so that a NOTAM can be issued.

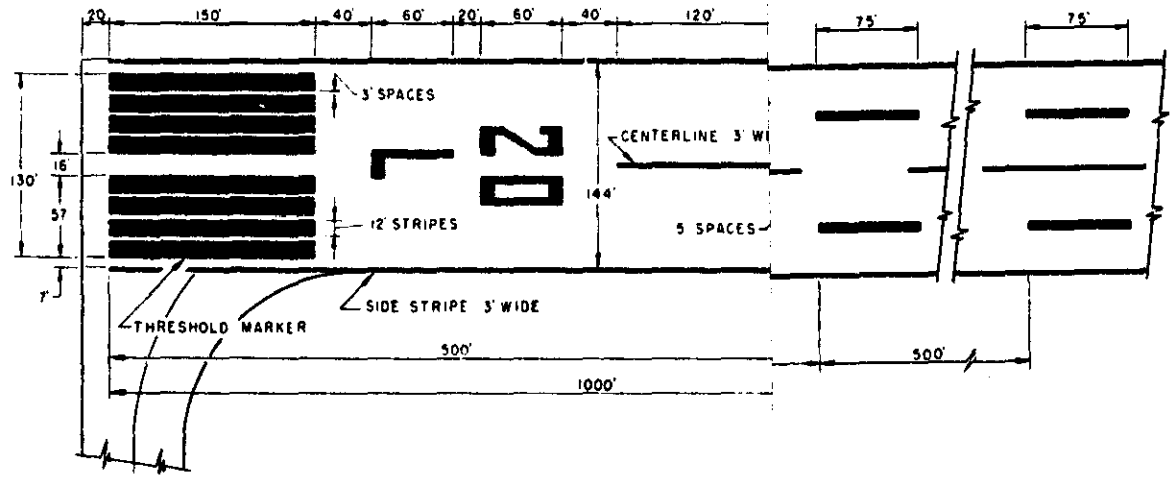
f. Stabilized Areas. Holding bays, aprons, and taxiways are sometimes provided with shoulder stabilization to prevent blast and water erosion. This stabilization may have the appearance of a full strength pavement but is not intended for use by aircraft. Usually the taxiway edge marking will define this area, but conditions may exist such as stabilized islands or taxiway curves where confusion may exist as to which side of the edge stripe is the full strength pavement. Where such a condition exists, the stabilized area is marked with 3-foot (1 m) stripes perpendicular to the edge stripes as shown in figure 7. On straight sections, the marks are placed at a maximum of 100-foot (30 m) spacing. On curves, the marks are placed a maximum of 50 feet (15 m) apart between the curve tangents. The stripes are extended to 5 feet (1.5 m) from the edge of the stabilized area or to 25 feet (7.5 m) in length, whichever is less.

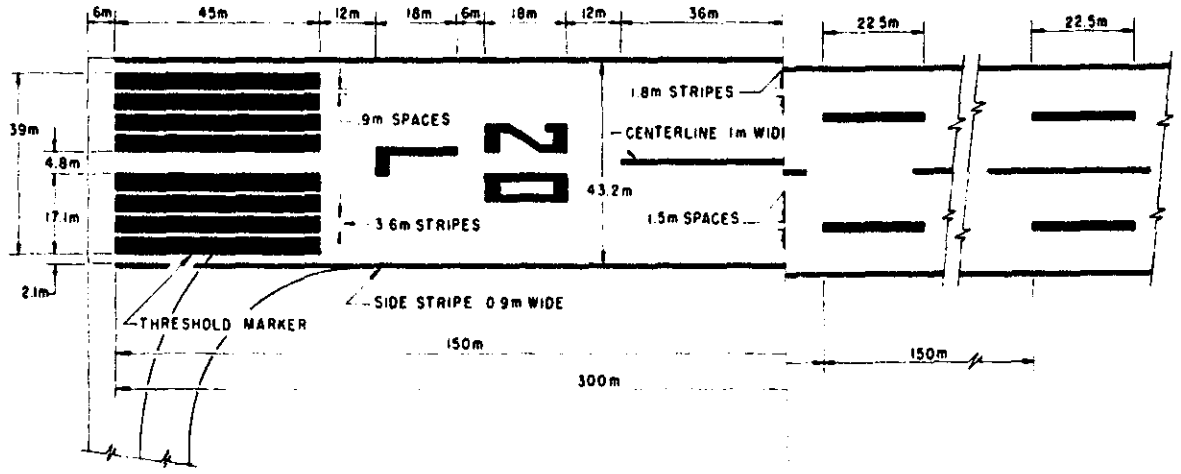
g. Runway Shoulder Marking. Usually the runway side stripes will indicate the edges of the full strength pavement. However, conditions may exist, such as exceptionally wide runways, where there is a need to indicate the area not intended for use by aircraft. In such cases, chevrons, as shown in figure 10, are used.

ROBERT J. AARONSON
Acting Associate Administrator for Airports



NOTE
▭ RUNWAY IDENTIFICATION SIGN


20'
150'
40'
60'
20'
60'
40'
120'
75'
75'
3' SPACES
CENTERLINE 3' WI
16'
130'
57'
144'
12' STRIPES
5' SPACES
1'
THRESHOLD MARKER
SIDE STRIPE 3' WIDE
500'
500'
1000'


6m
45m
12m
18m
6m
18m
12m
36m
22.5m
22.5m
1.8m STRIPES
.9m SPACES
39m
4.8m
CENTERLINE 1m WIDI
43.2m
17.1m
3.6m STRIPES
1.5m SPACES
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SIDE STRIPE 0.9m WIDE
THRESHOLD MARKER
150m
150m
300m

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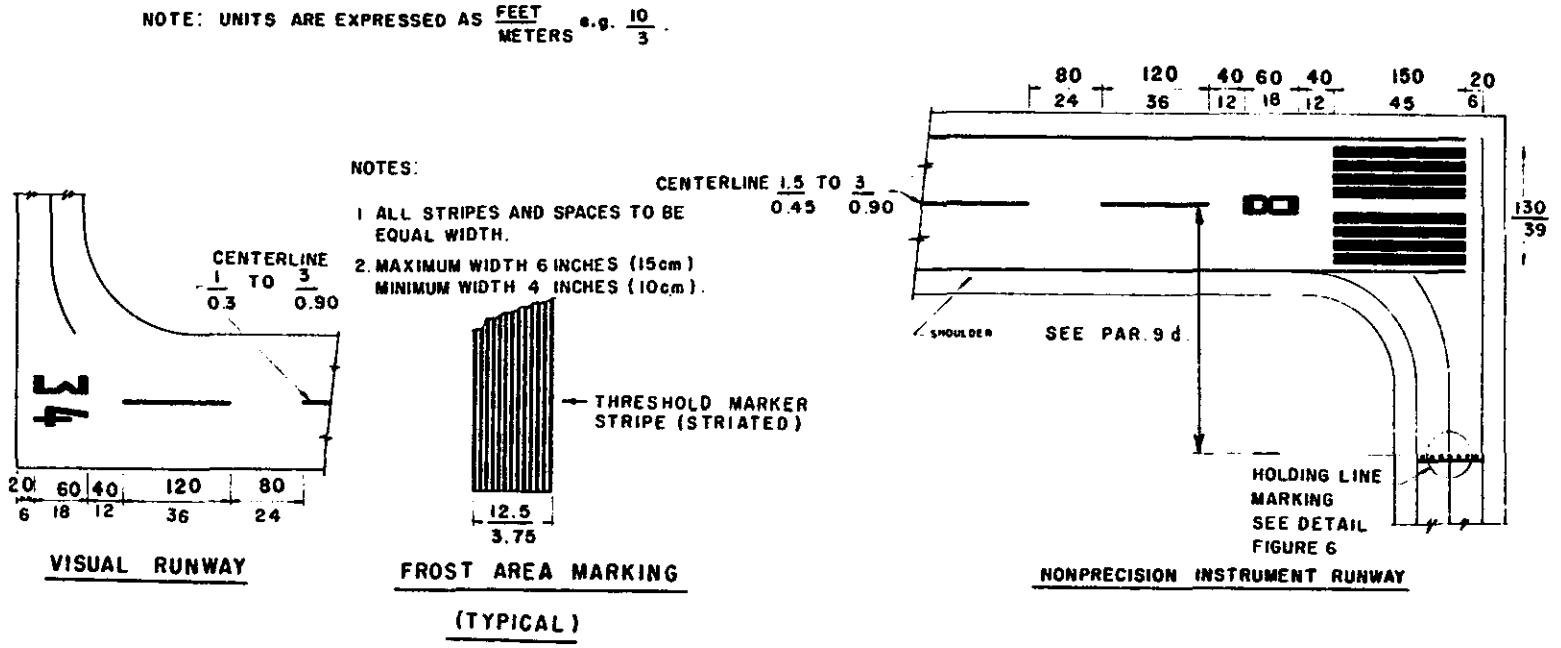
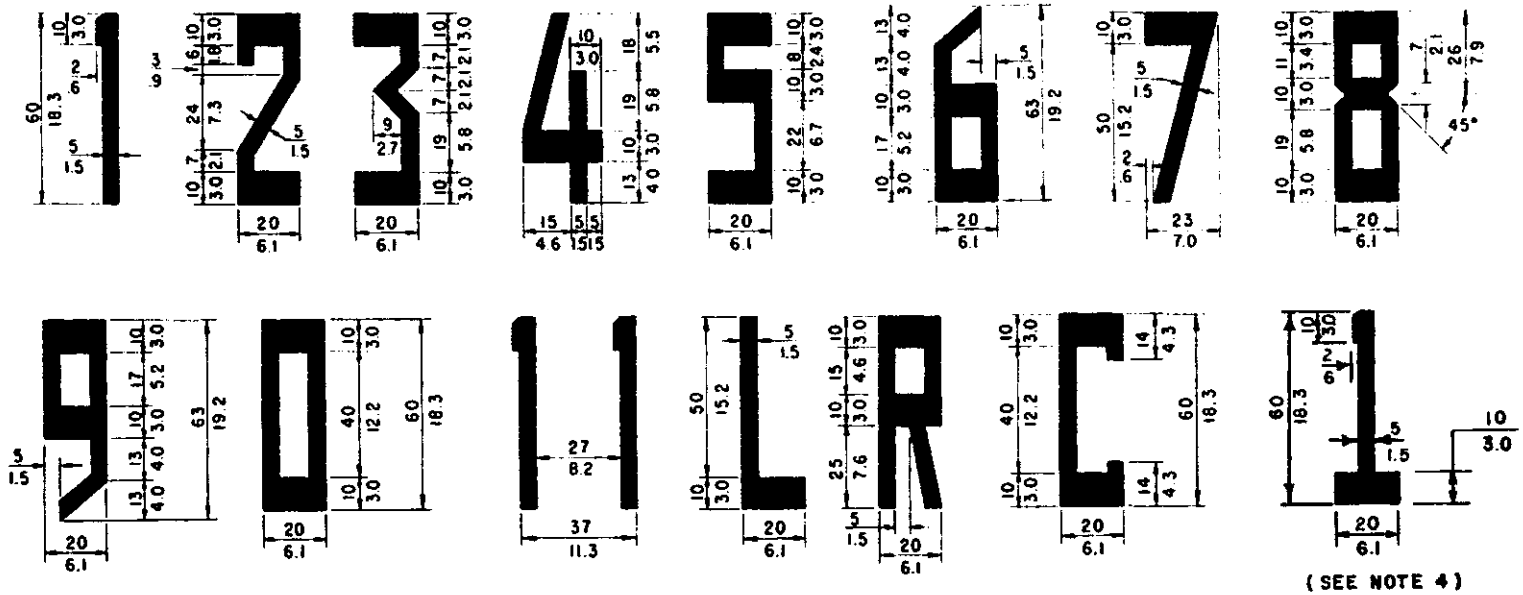


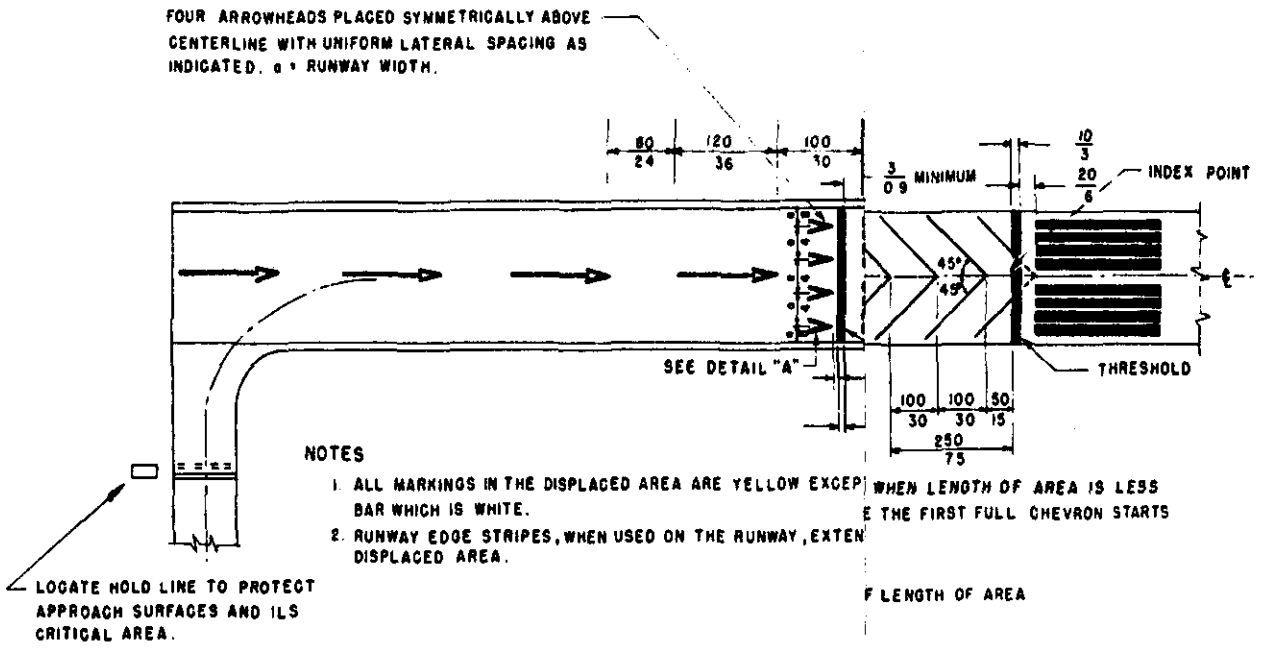
FIGURE 3 - VISUAL AND NONPRECISION MARKING



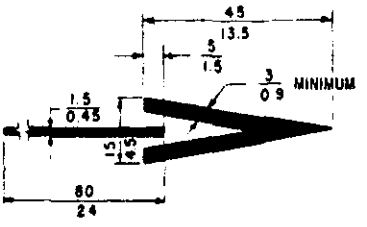
NOTES:

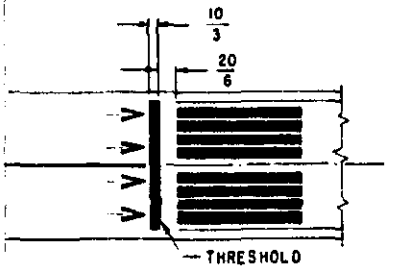
1. ALL LETTERS AND NUMERALS EXCEPT THE NUMBER ELEVEN AS SHOWN ARE HORIZONTALLY SPACED 15 FEET (4.6 METERS) APART.
2. FIGURES ARE TO SCALE.
3. DIMENSIONS ARE EXPRESSED THUS: $\frac{\text{FEET}}{\text{METERS}}$ e.g. $\frac{30}{9}$
4. THE NUMERAL 1, WHEN USED ALONE, CONTAINS A HORIZONTAL BAR TO DIFFERENTIATE IT FROM THE RUNWAY CENTERLINE MARKING

FIGURE 4 RUNWAY NUMERALS AND LETTERS



(a) DISPLACED THRESHOLD MAR BLAST PADS AND





DETAIL "A"

HOLD WHERE THE
AY SURFACE IS
Y

FIGURE 5-

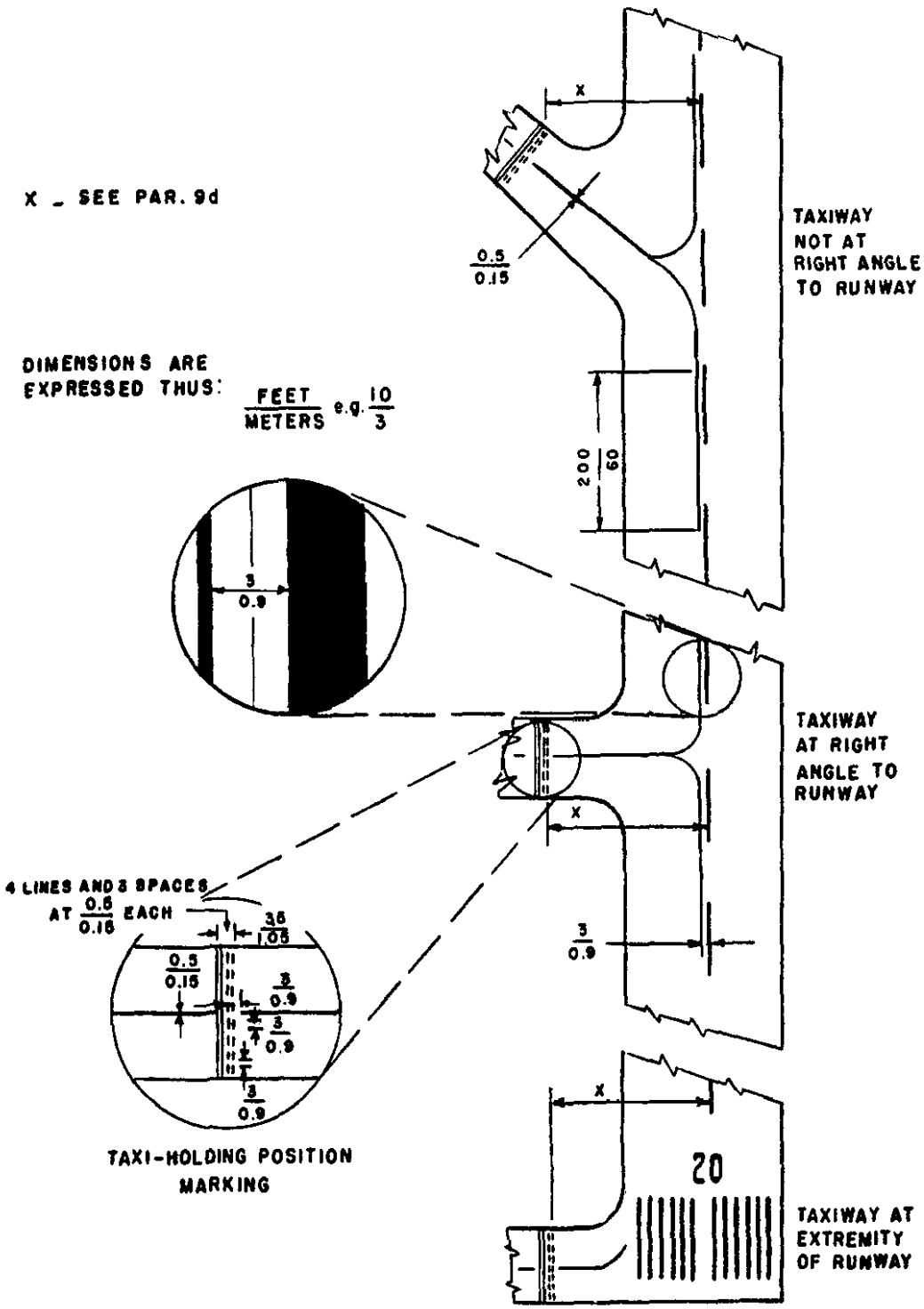


FIGURE 6 - TAXIWAY / RUNWAY INTERSECTION MARKINGS

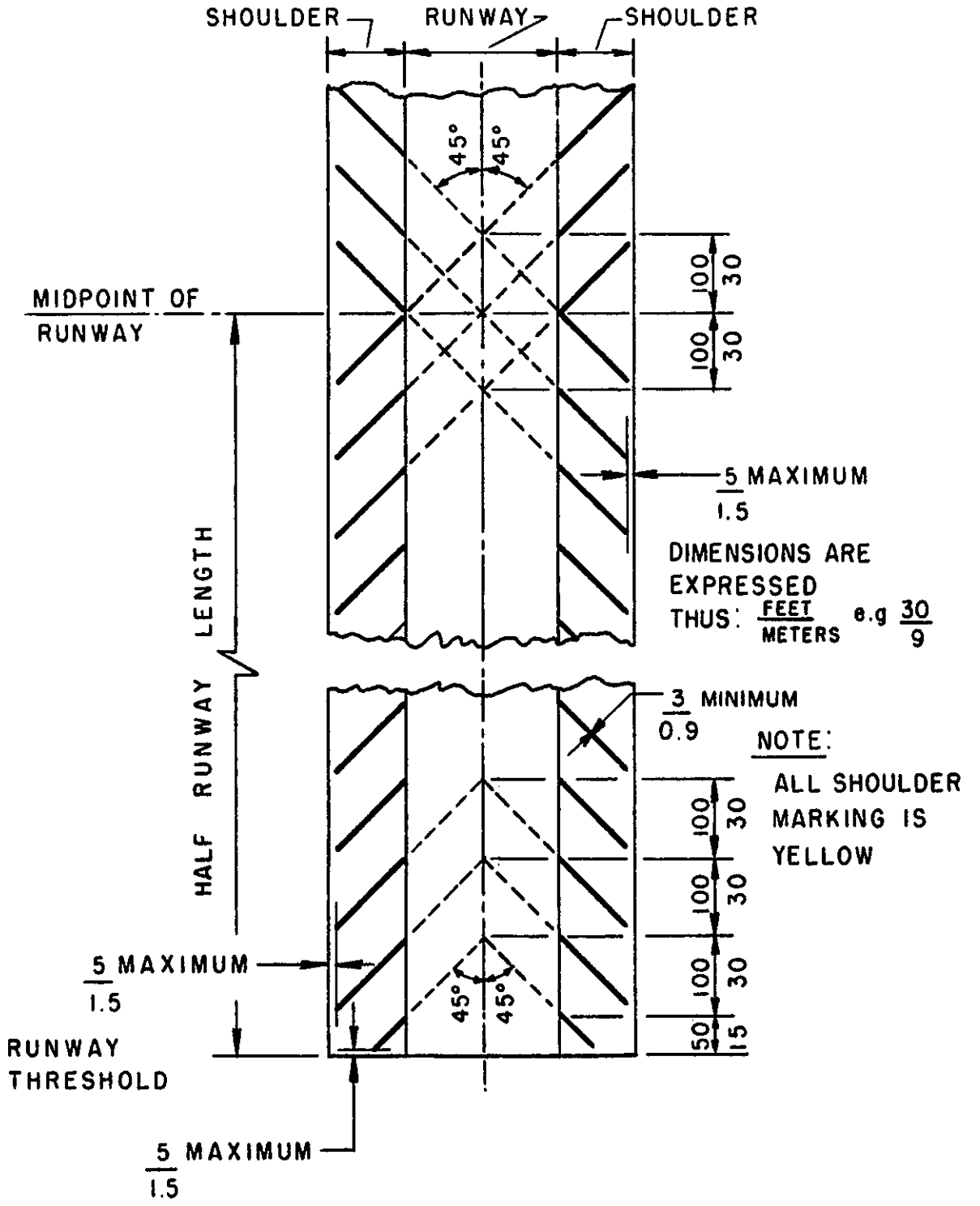
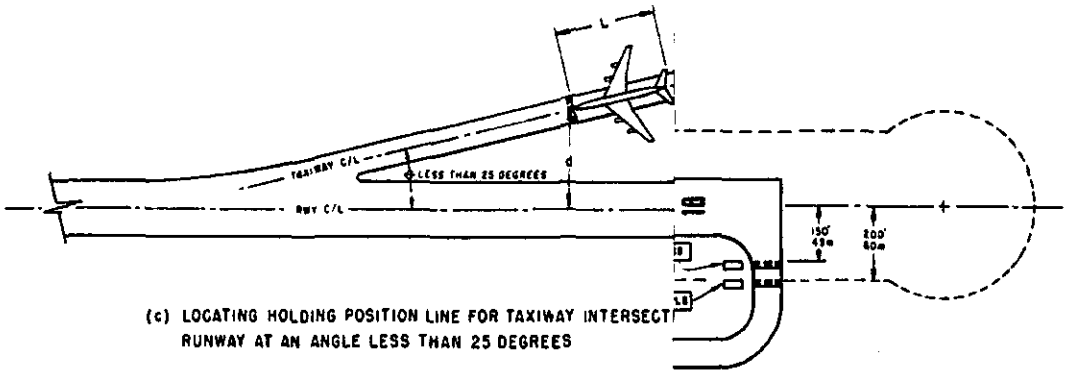
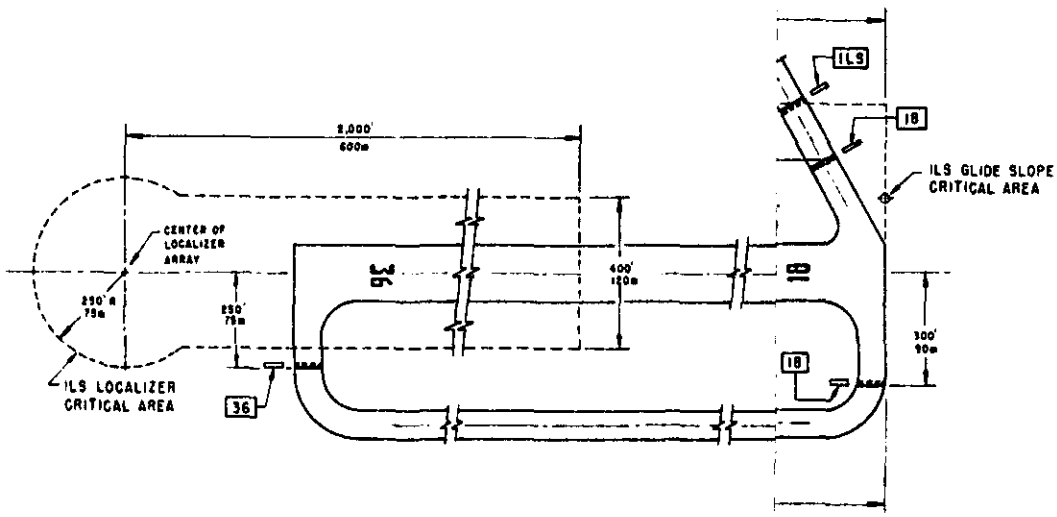


FIGURE 7 - RUNWAY SHOULDER MARKINGS



(c) LOCATING HOLDING POSITION LINE FOR TAXIWAY INTERSECT
RUNWAY AT AN ANGLE LESS THAN 25 DEGREES

LOCALIZER APPROACH)
SS THAN 60,000 LBS



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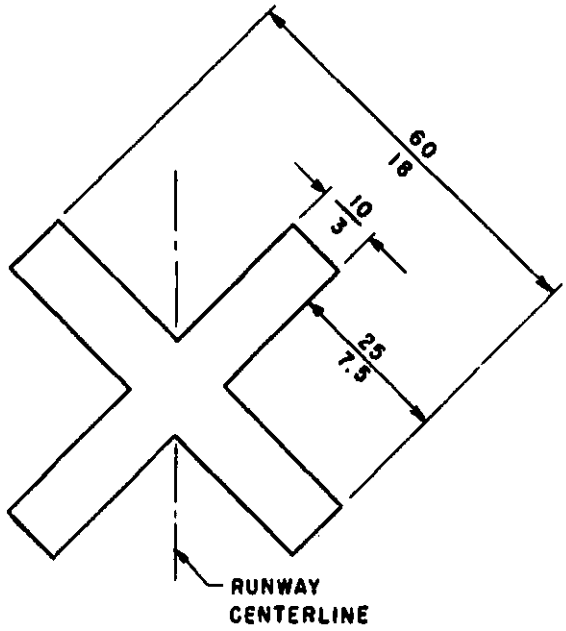
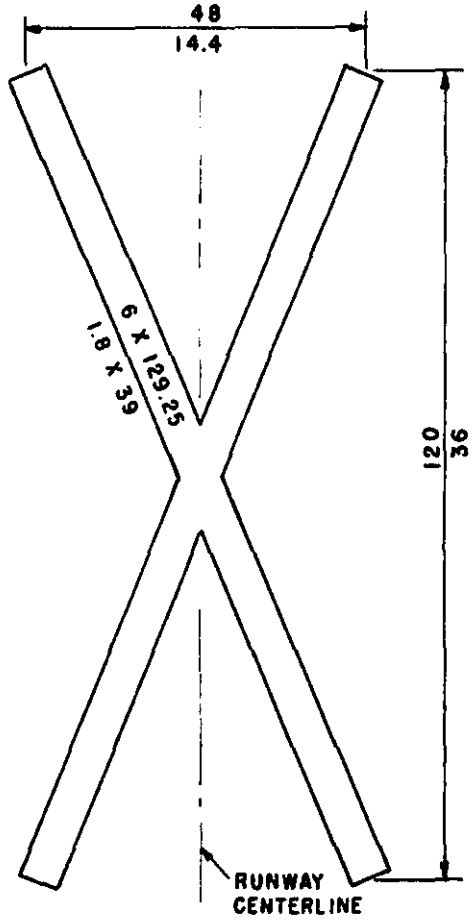
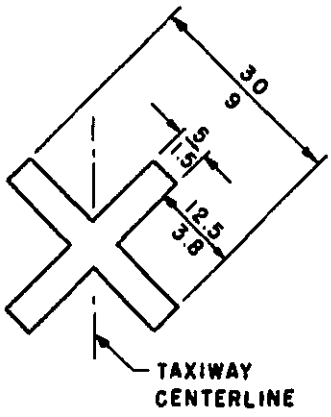


(a) CLOSED RUNWAY

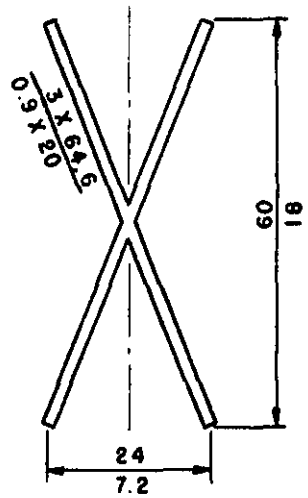
DIMENSIONS ARE EXPRESSED THUS: FEET / METERS e.g. 10 / 3



(b) ALTERNATE CLOSED RUNWAY



(c) CLOSED TAXIWAY



(d) ALTERNATE CLOSED TAXIWAY

FIGURE 9 - CLOSED RUNWAY AND TAXIWAY MARKINGS

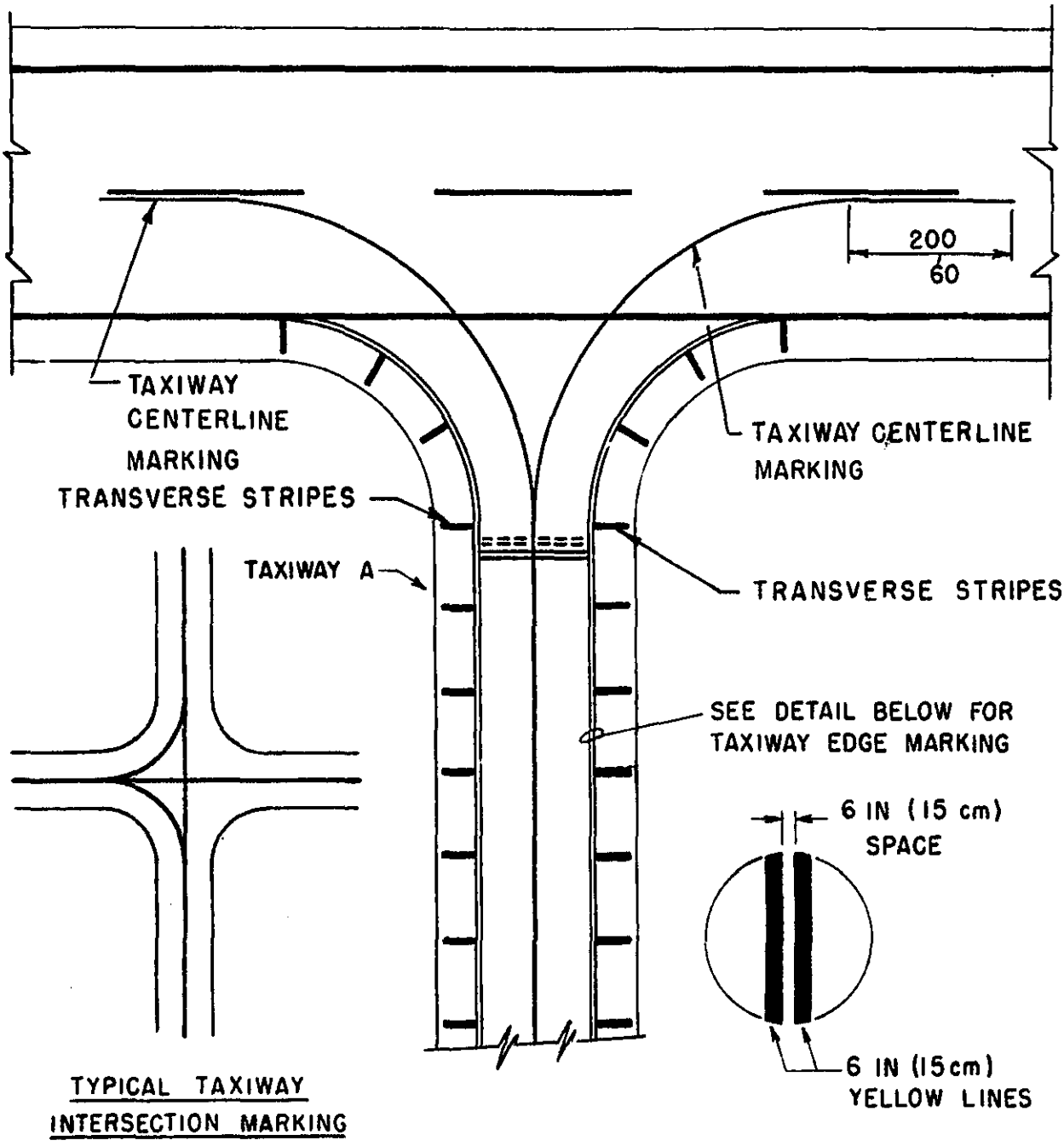


FIGURE 10 - TAXIWAY MARKINGS DETAILS

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