



Airport Markings and Airside Signs

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CEE 4674
Airport Planning and Design

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Organization

- Why airport markings?
- Design requirements
- Runway markings including holding position markings
- Taxiway markings
- Miscellaneous



The Need for Airport Markings

- Common or universal markers are essential in aviation (airport markers have to be learned once)
- A human factors issue
- Markings can contribute to airport safety
- FAA Advisory Circular 150/5340-1K (2013)

Consolidated AC includes Change 1		
 U.S. Department of Transportation Federal Aviation Administration	<h2 style="margin: 0;">Advisory Circular</h2>	
	Subject: Standards for Airport Markings	Date: 9/3/2010
	Initiated by: AAS-100	Change:
<p>1. PURPOSE. This advisory circular (AC) contains the Federal Aviation Administration (FAA) standards for markings used on airport runways, taxiways, and aprons.</p> <p>2. CANCELLATION. This AC cancels AC 150/5340-1J, Standards for Airport Markings, dated April 29, 2005, and subsequent changes, dated March 31, 2008, and June 6, 2008. This AC also cancels the Signs and Marking Supplement (SAMS).</p>		



Runway Markings

- Related to the capabilities of the airport
- Runway types (by visibility minima)
 - **Precision runways** - those that server ILS or LPV approaches with low visibility minima (< 3/4 mile)
 - **Non-precision runways** - GPS, RNAV and VOR approaches with moderate visibility minima (not lower than 3/4 of mile)
 - **Visual runways** - require visual acquisition of the runway before landing



Runway Markings Guidance

Runway Surface Marking Scheme	Threshold Approach Category		
	Visual Approach	Non-precision Approach (Approaches with vertical guidance not lower than $\frac{3}{4}$ -statute mile visibility)	Precision Approach (Approaches with vertical guidance lower than $\frac{3}{4}$ -statute mile visibility)
Landing Designator (par. 2.3)	X	X	X
Centerline (par. 2.4)	X	X	X
Threshold (par. 2.5)	Note 1	X	X
Aiming Point (par. 2.6)	Note 2	Note 3	X
Touchdown Zone (par. 2.7)			X
Side Stripes (par. 2.8)	Note 4	Note 4	X

Note 1: Required on runways serving approach categories C and D airplanes and for runways used, or intended to be used, by international commercial air transport.

Note 2: Required on 4,200-foot (1,280 m) or longer runways serving approach categories C and D airplanes.

Note 3: Required on 4,200-foot (1,280 m) or longer instrumented runways.

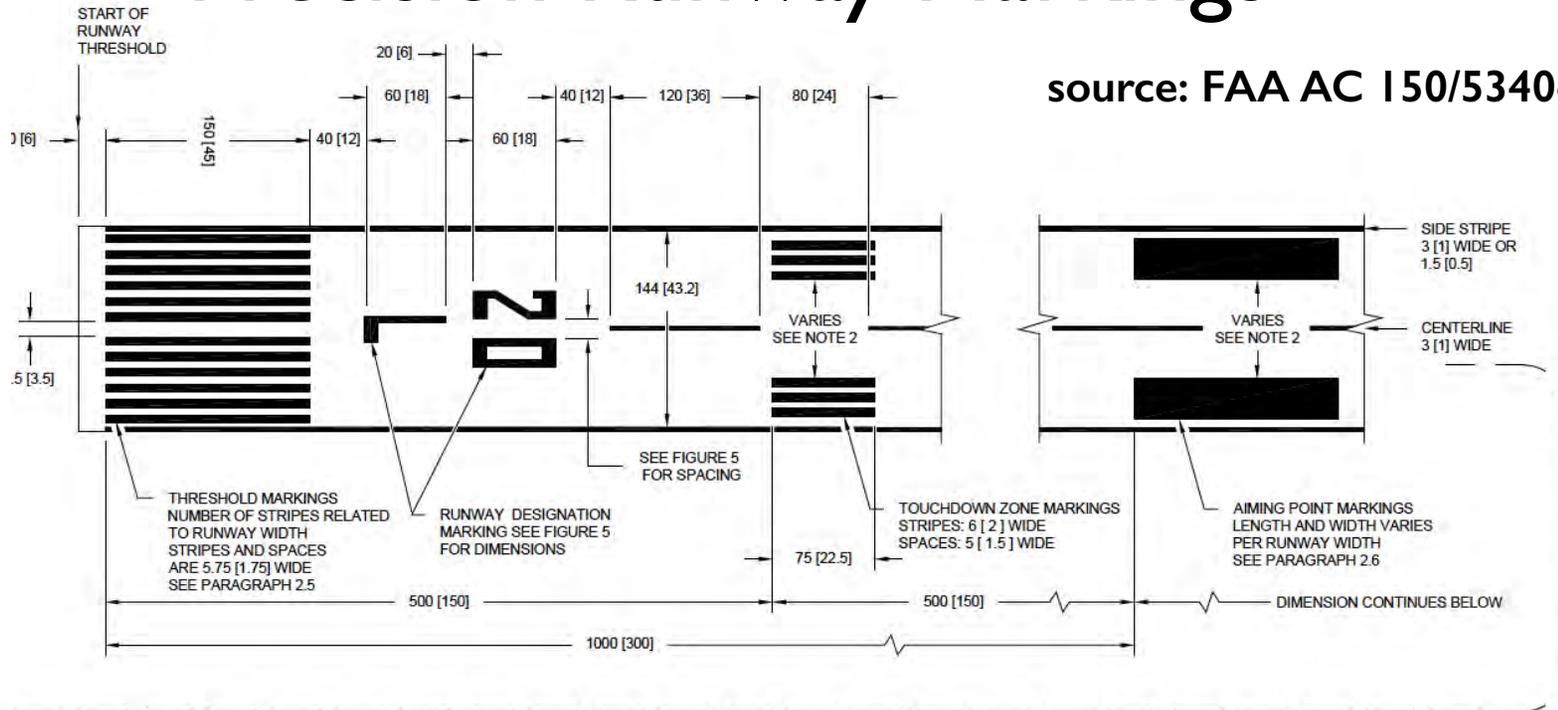
Note 4: Used when the full runway pavement width may not be available for use as a runway.

source: FAA AC 150/5340-1K

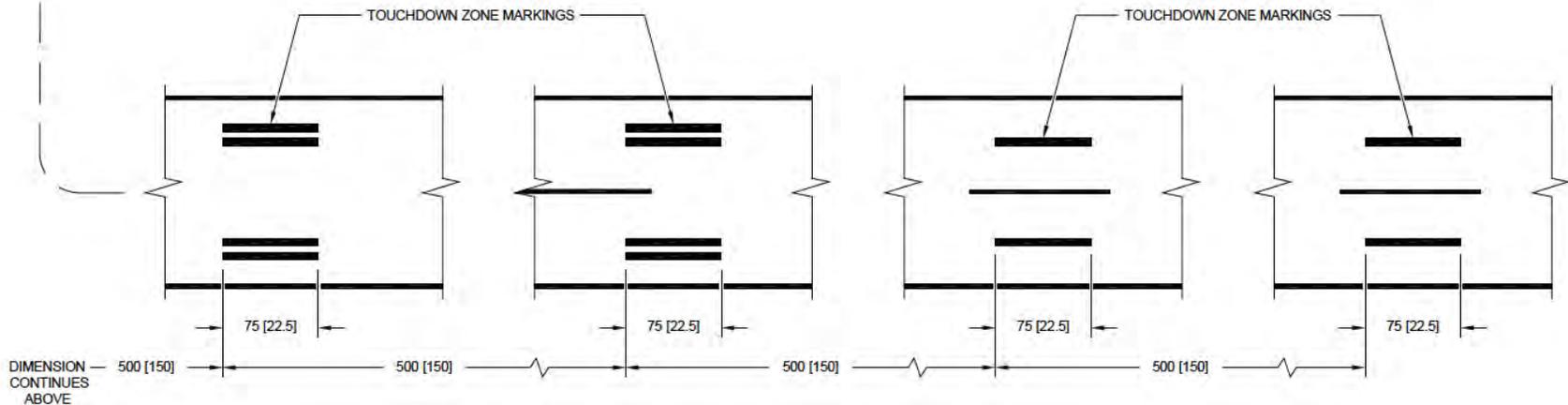


Precision Runway Markings

source: FAA AC 150/5340-1K

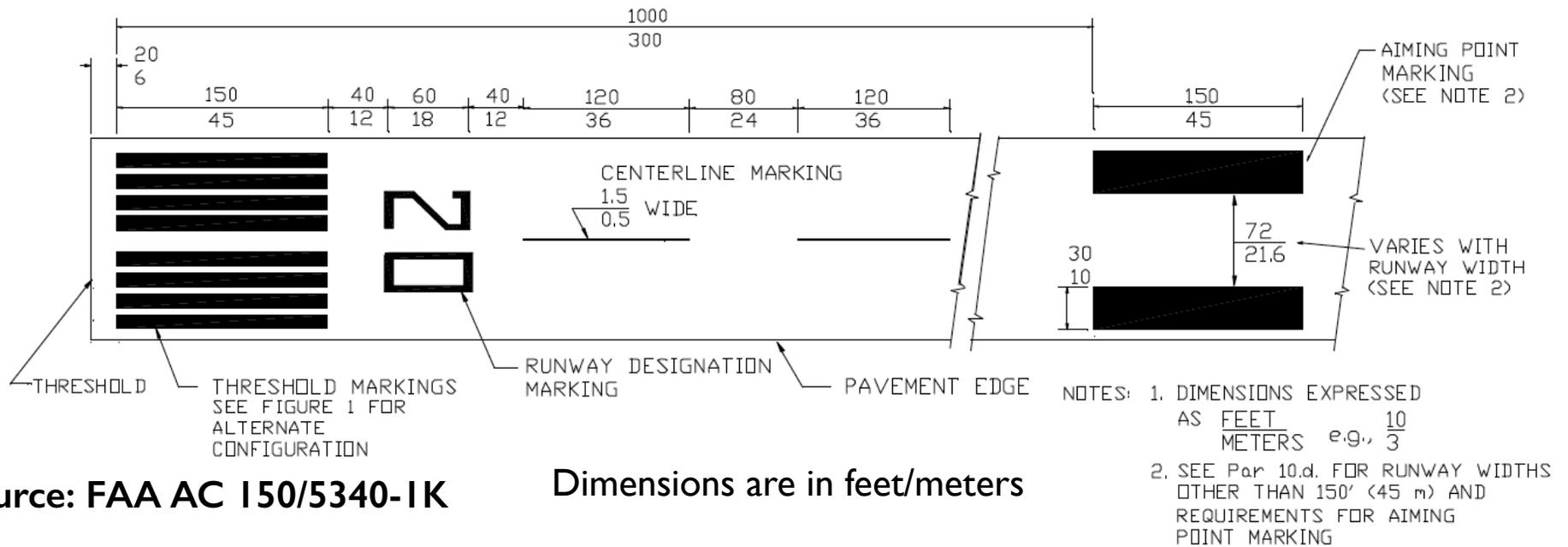


Dimensions are in feet (meters)





Non-Precision Runway Markings



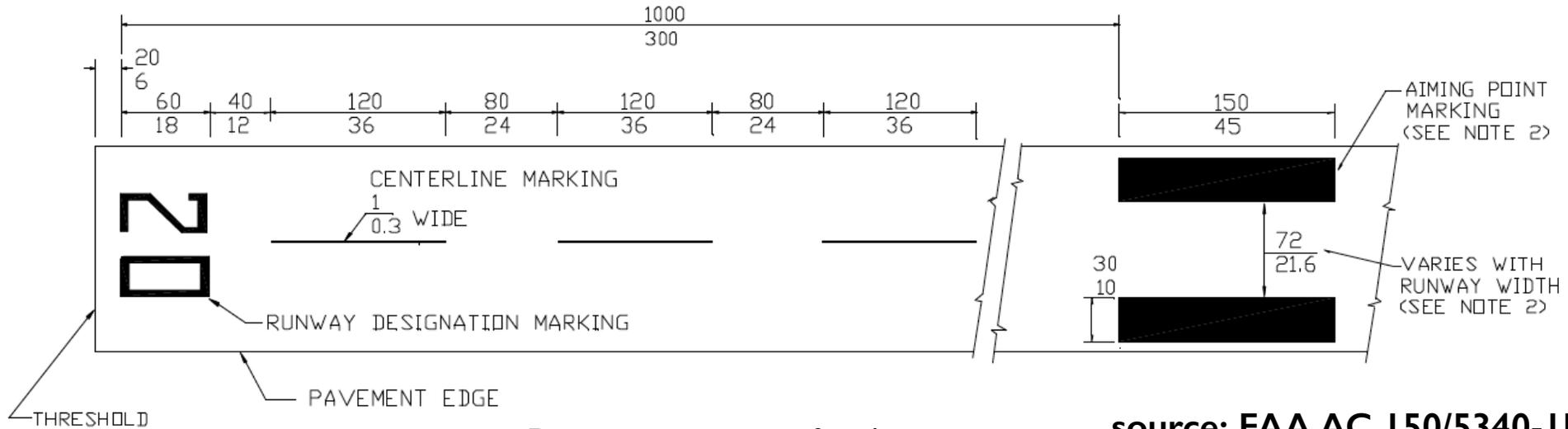
source: FAA AC 150/5340-1K

Dimensions are in feet/meters

- Pilots employ non-precision navigational aids (i.e., GPS, VOR/DME, etc) to perform approaches to these runways
- Marking requirements are less demanding than those used for precision runways
 - Runway numeral and threshold markings
 - Runway centerline markings
 - Runway aiming point marks



Visual Runway Markings



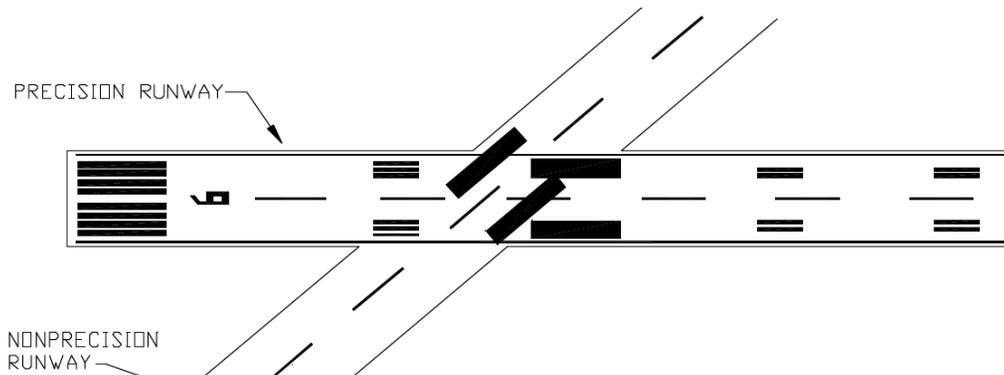
Dimensions are in feet/meters

source: FAA AC 150/5340-1K

- Pilots navigate by sight to the types of runways
- Marking requirements are very modest
 - Runway numeral
 - Runway centerline markings
 - Runway aiming point marks

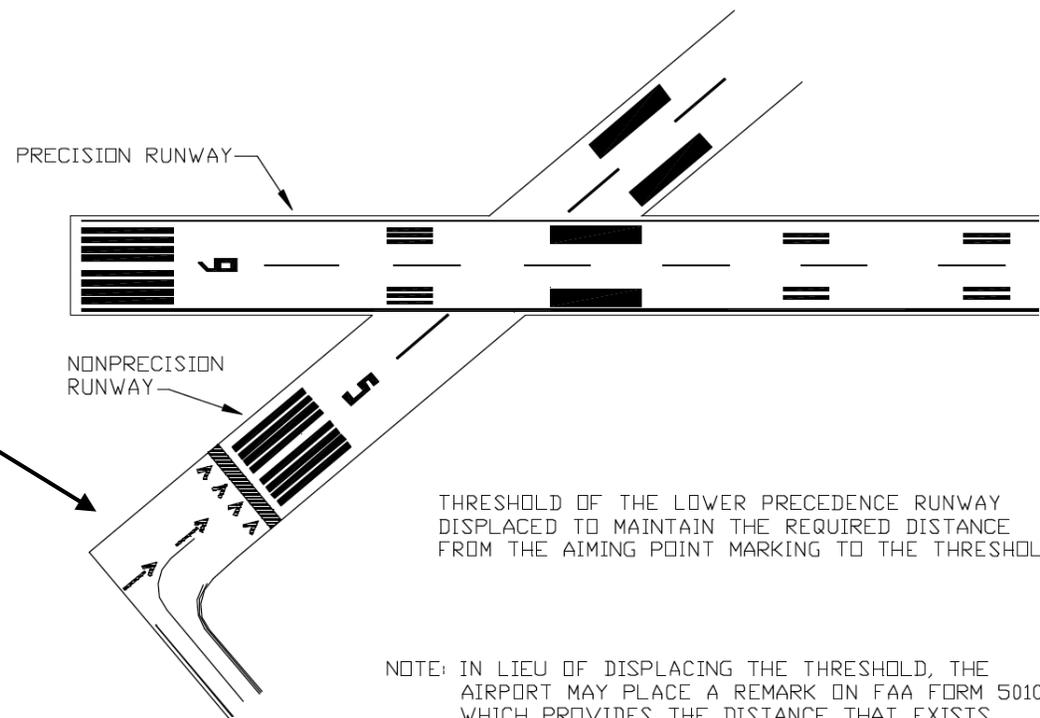


Conflicting Runway Markings



EXAMPLE OF CONFLICTING RUNWAY MARKINGS

Avoided the overlapping of two runway touchdown markings



Displaced the Threshold of Runway 05

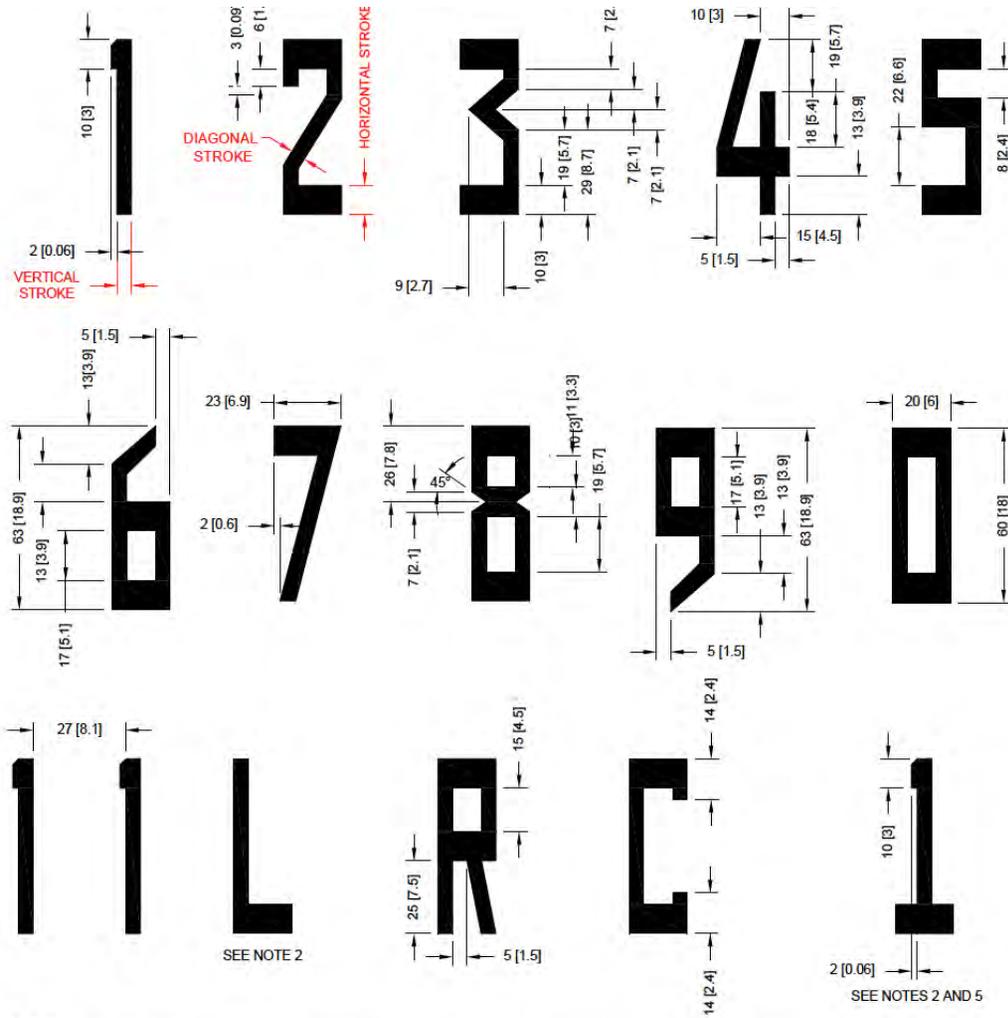
THRESHOLD OF THE LOWER PRECEDENCE RUNWAY DISPLACED TO MAINTAIN THE REQUIRED DISTANCE FROM THE AIMING POINT MARKING TO THE THRESHOLD.

NOTE: IN LIEU OF DISPLACING THE THRESHOLD, THE AIRPORT MAY PLACE A REMARK ON FAA FORM 5010 WHICH PROVIDES THE DISTANCE THAT EXISTS BETWEEN THE THRESHOLD AND AIMING POINT MARKINGS.

source: FAA AC 150/5340-1K



Runway Numerals are Strictly Defined



source: FAA AC 150/5340-1K

NOTES:

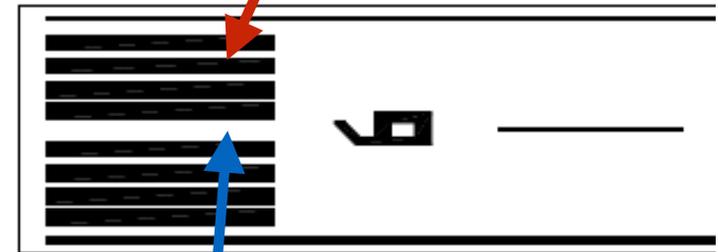
- DIMENSIONS ARE EXPRESSED: FEET [METERS].
- ALL CHARACTERS SHALL HAVE THESE CHARACTERISTICS (UNLESS OTHERWISE SPECIFIED):
60 [18] HIGH
20 [6] WIDE
VERTICAL STROKE OF 5 [1.5]
HORIZONTAL STROKE OF 10 [3.0]
DIAGONAL STROKE OF 5 [1.5]
- ALL NUMERALS EXCEPT THE NUMBER ELEVEN AS SHOWN ARE HORIZONTALLY SPACED 15 [4.5] APART.
- SINGLE DIGITS MUST NOT BE PRECEDED BY A ZERO.
- THE NUMERAL "1", WHEN USED ALONE, CONTAINS A HORIZONTAL STROKE AS SHOWN TO DIFFERENTIATE IT FROM THE RUNWAY CENTERLINE MARKING.
- SINGLE DESIGNATIONS ARE CENTERED ON THE RUNWAY PAVEMENT CENTERLINE. FOR DOUBLE DESIGNATIONS, THE CENTER OF THE OUTER EDGES OF THE TWO NUMERALS IS CENTERED ON THE RUNWAY PAVEMENT CENTERLINE.
- WHERE THE RUNWAY DESIGNATION CONSISTS OF A NUMBER AND A LETTER, THE NUMBER AND LETTER ARE LOCATED ON THE RUNWAY CENTERLINE IN A STACKED ARRANGEMENT AS SHOWN IN FIGURE 1.



Runway Threshold Markings

Standard runway widths	Number of symmetrical stripes
60 feet (18.3 m)	4
75 feet (22.9 m)	6
100 feet (30.5 m)	8
150 feet (45.7 m)	12
200 feet (61 m)	16

Threshold Markings
(white color)



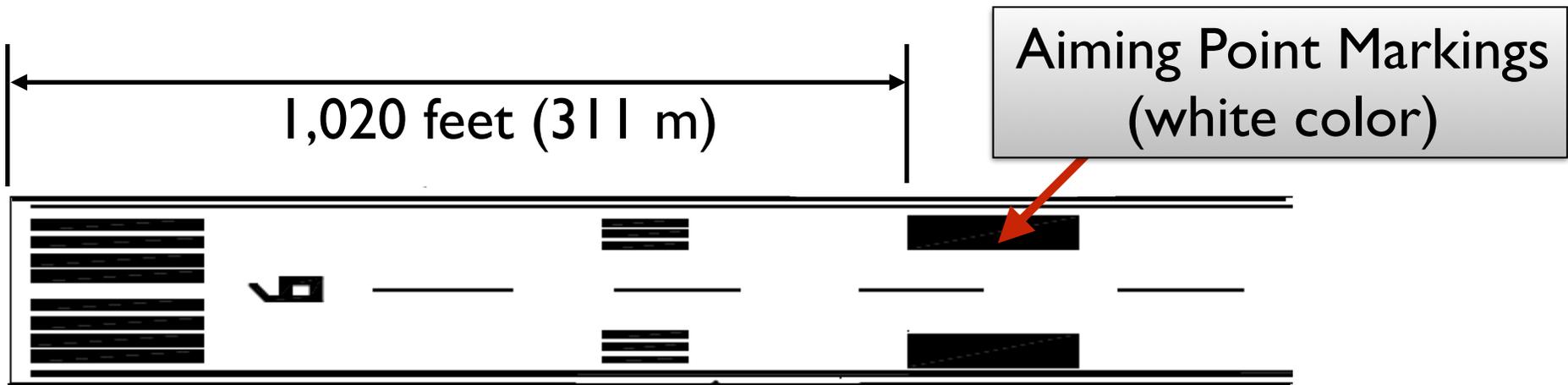
- White stripes are 150 x 5.75 feet in dimension (standard runway width)
- Stripe gap is 5.75 feet (1.75 m)
- Two central stripes are spaced 11.5 feet (3.5 m). This is double the distance between outer edges
- For narrow runways reduce the width proportionately.

source: FAA AC 150/5340-1K



Runway Aiming Point Markings

- 30 feet (9.1 m) for standard runway widths of 150 feet (45.7 m) or greater
- 20 feet (6 m) for standard runway widths of 100 feet (30.5 m).
- 15 feet (5 m) for standard runway widths of 75 feet (22.9 m).double the distance between outer edges
- 12 feet (3.7 m) for a standard runway width of 60 feet (18.3 m).

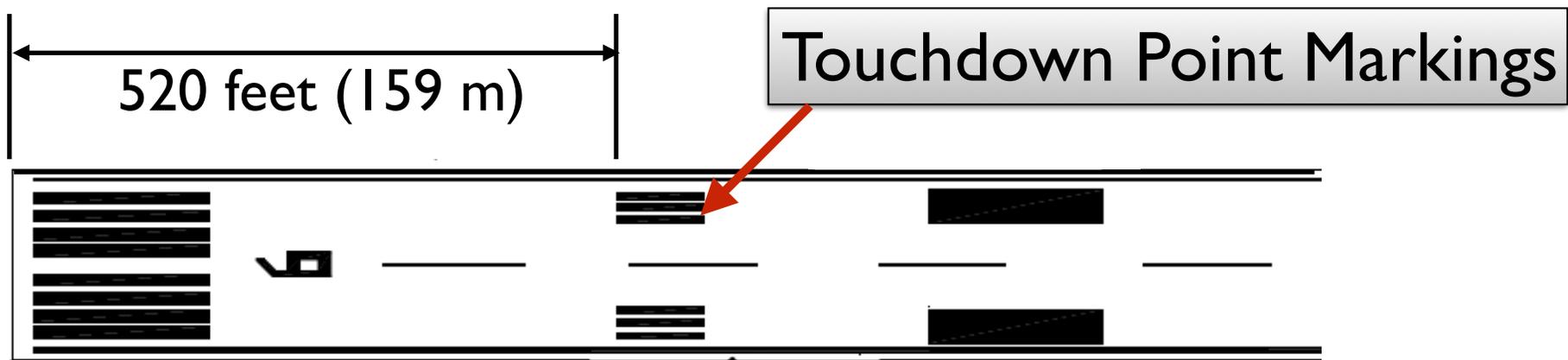


source: FAA AC 150/5340-1K



Runway Touchdown Point Markings

- 30 feet (9.1 m) for standard runway widths of 150 feet (45.7 m) or greater
- 20 feet (6 m) for standard runway widths of 100 feet (30.5 m).
- 15 feet (5 m) for standard runway widths of 75 feet (22.9 m).double the distance between outer edges
- 12 feet (3.7 m) for a standard runway width of 60 feet (18.3 m).



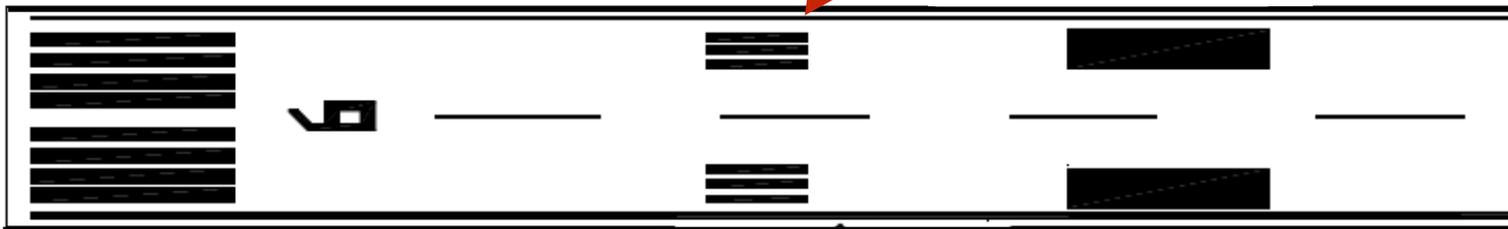
source: FAA AC 150/5340-1K



Runway Edge Stripes (Markings)

- Delineate the runway from surrounding terrain
- Part of the usable runway
- 36 inches in width for runways 100 ft. or wider
- 18 inches if runway width is less than 100 ft.
- Extend to the displaced threshold (if available)

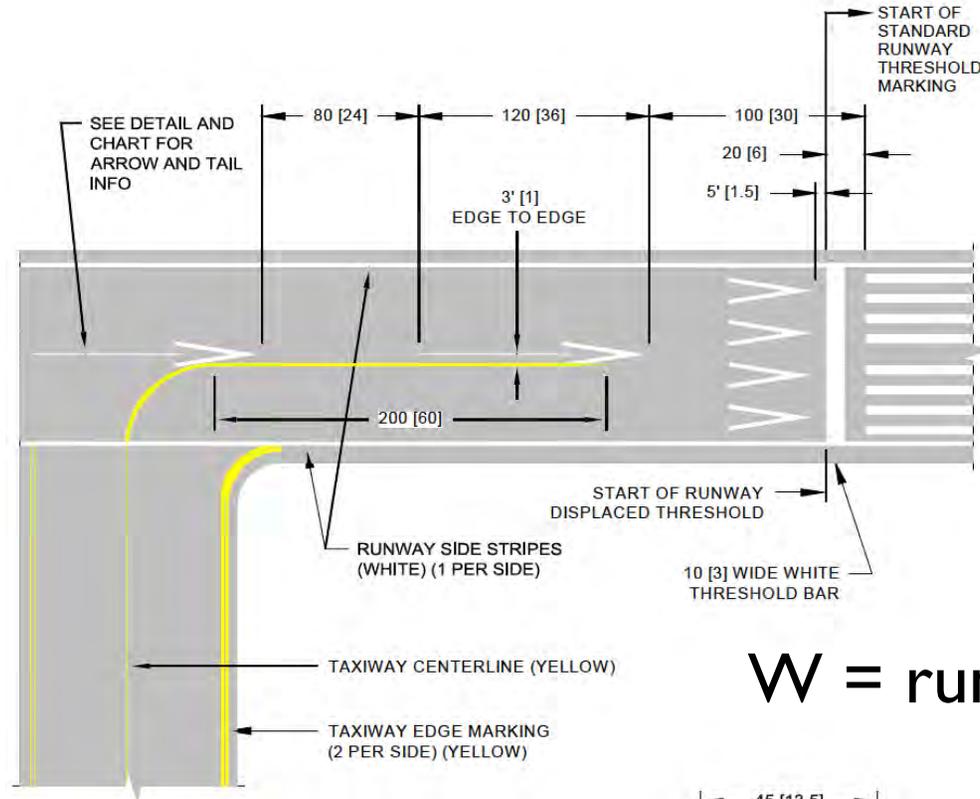
Runway Edge Markings



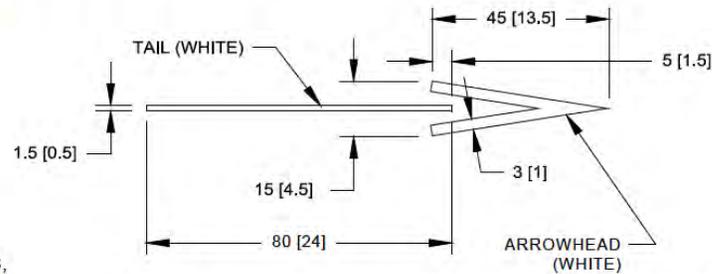
source: FAA AC 150/5340-1K



Runway Displaced Thresholds



$W =$ runway width



NOTES:

1. DIMENSIONS ARE IN: FEET [METERS]
2. RUNWAY SIDE STRIPES, WHEN USED ON THE RUNWAY, EXTEND INTO THE DISPLACED AREA.
3. RUNWAY MARKINGS (EXCEPT HOLDING POSITION MARKINGS) INCLUDING THOSE IN THE DISPLACED THRESHOLD ARE WHITE.

RUNWAY WIDTH	NUMBER OF ARROWHEADS	SPACING BETWEEN ARROWHEADS (W = RUNWAY WIDTH)	SPACING TO RUNWAY EDGE
≥ 100 [30]	4	W/4	W/8
< 100 [30]	3	W/3	W/6
< 60 [18]	2	W/2	W/4

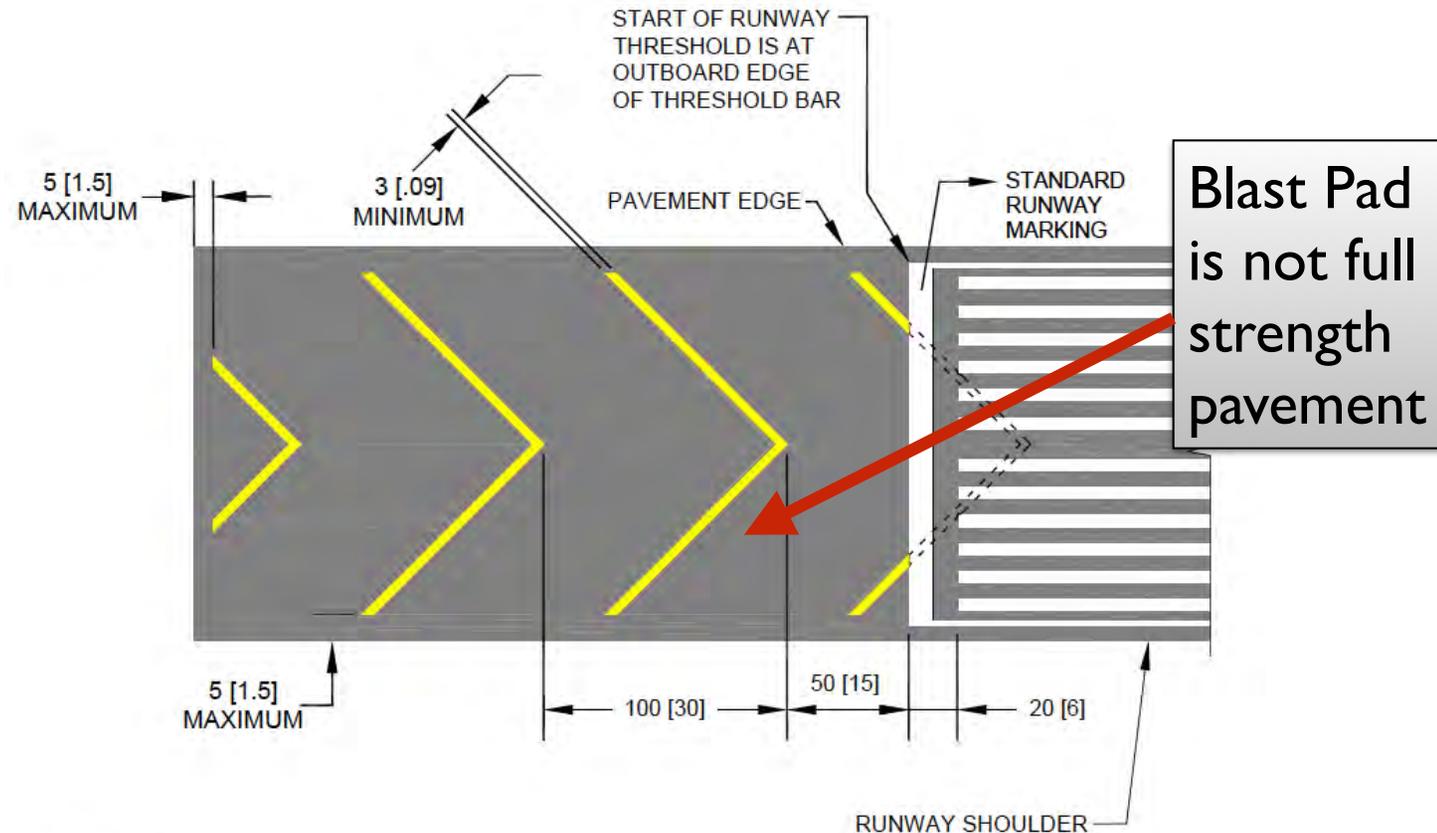
source: FAA AC 150/5340-1K



Runway Blast Pad and Stopway

Note:

- 1) Runway markings are painted white
- 2) Blast pad markings painted yellow



NOTES:

1. DIMENSIONS ARE IN: FEET [METERS].
2. THE WIDTHS OF THE STOPWAYS AND BLAST PADS ARE NOT THE SAME. STOPWAYS EQUAL RUNWAY WIDTH. BLAST PADS EQUAL RUNWAY WIDTH PLUS RUNWAY SHOULDERS. SEE AC 150/5300-13
3. 50 FT [15M] SPACING MAY BE USED WHEN LENGTH OF AREA IS LESS THAN 250 FT [7.5M] IN WHICH CASE THE FIRST FULL CHEVRON STARTS AT THE INDEX POINT (INTERSECTION OF RUNWAY CENTERLINE AND RUNWAY THRESHOLD).
4. CHEVRONS ARE PAINTED YELLOW AND AT AN ANGLE OF 45° TO THE RUNWAY CENTERLINE.
5. CHEVRON SPACING MAY BE DOUBLED IF LENGTH OF AREA EXCEEDS 1000 FT [300M]

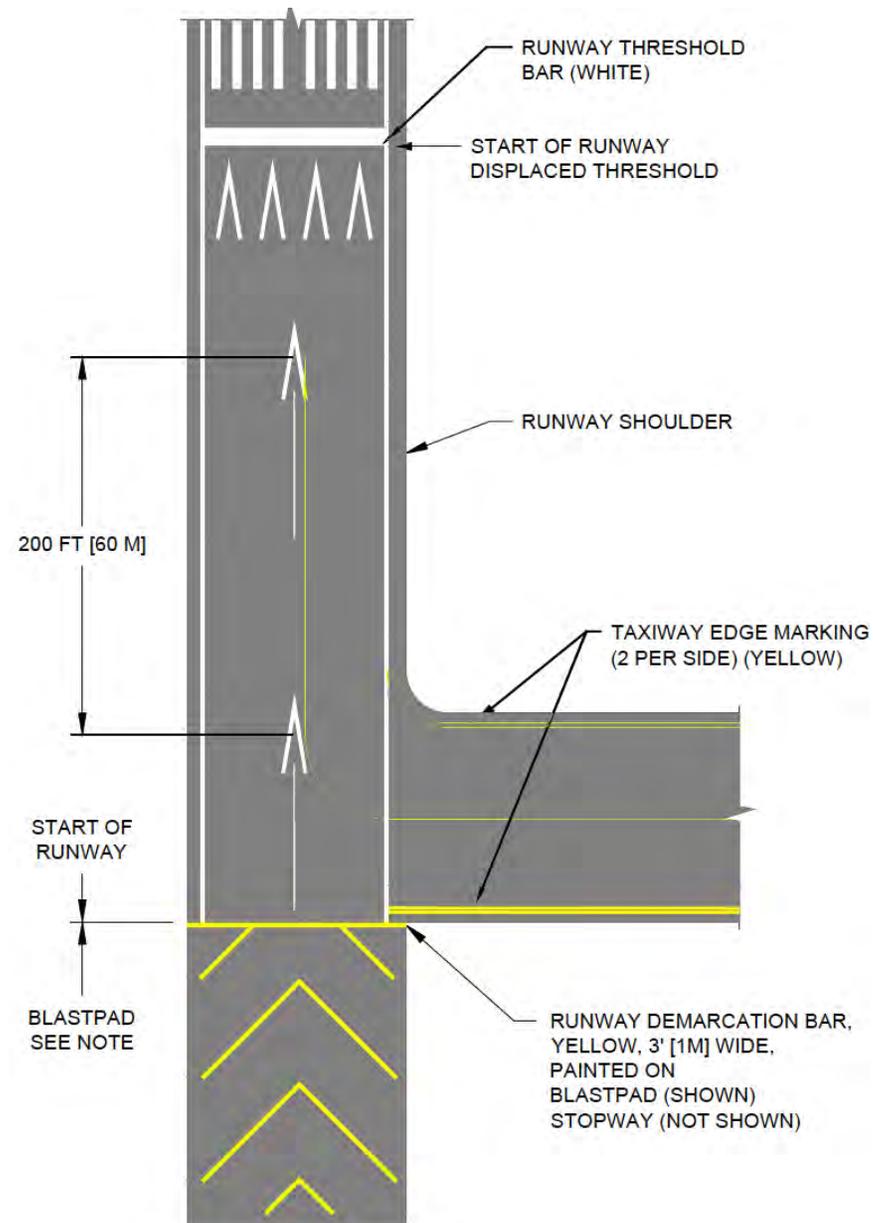
source: FAA AC 150/5340-1K



Runway Blast Pad and Displaced Threshold

Note:

- 1) Runway markings are painted white
- 2) Blast pad markings painted yellow

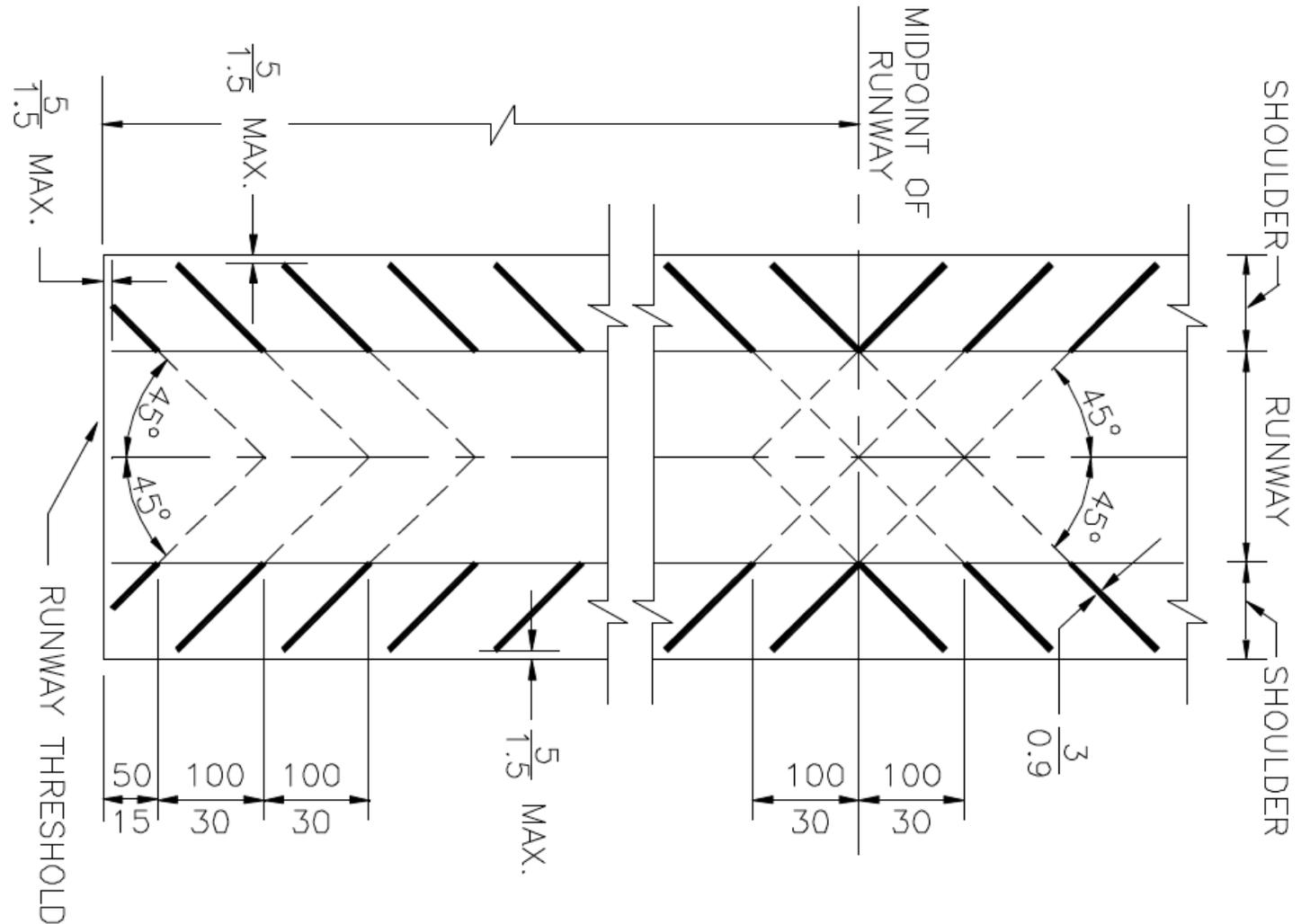


source: FAA AC 150/5340-1K



Runway Shoulder Markings

Objective:
Provide pilots with a clear indication of what is the edge of the runway



Dimensions are feet/meters

source: FAA AC 150/5340-1K

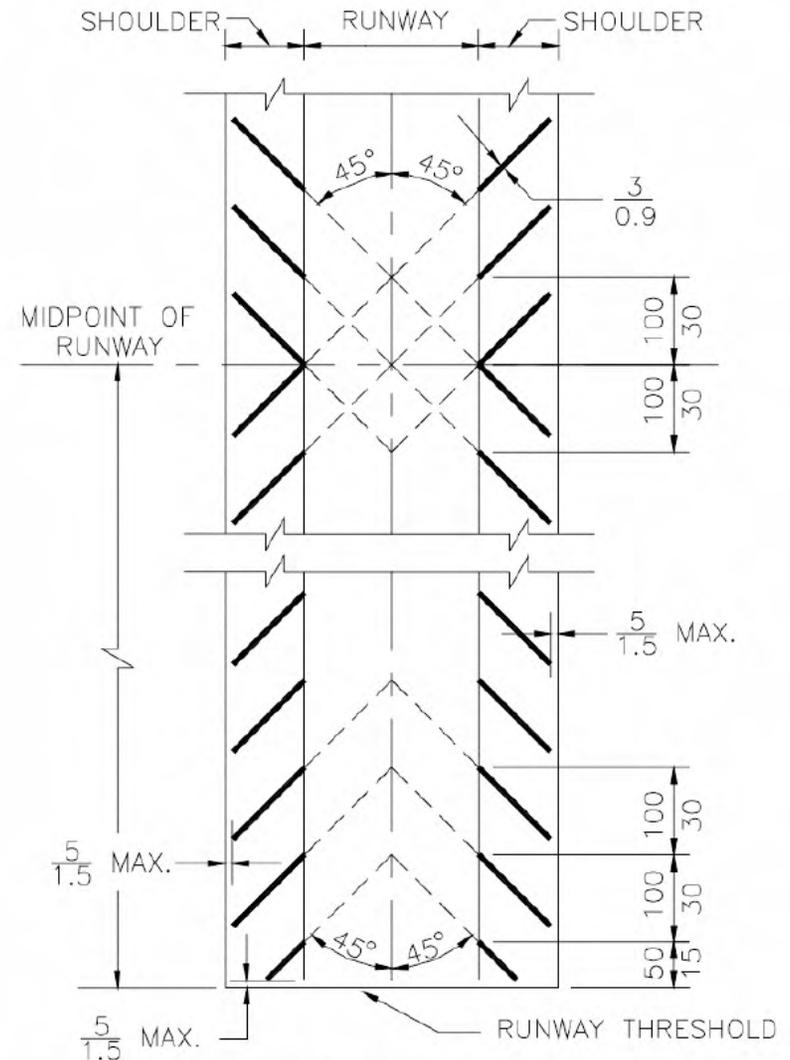


Runway Shoulder Markings (Example SAN Airport)

- Good to advise pilots of where the runway full strength pavement ends



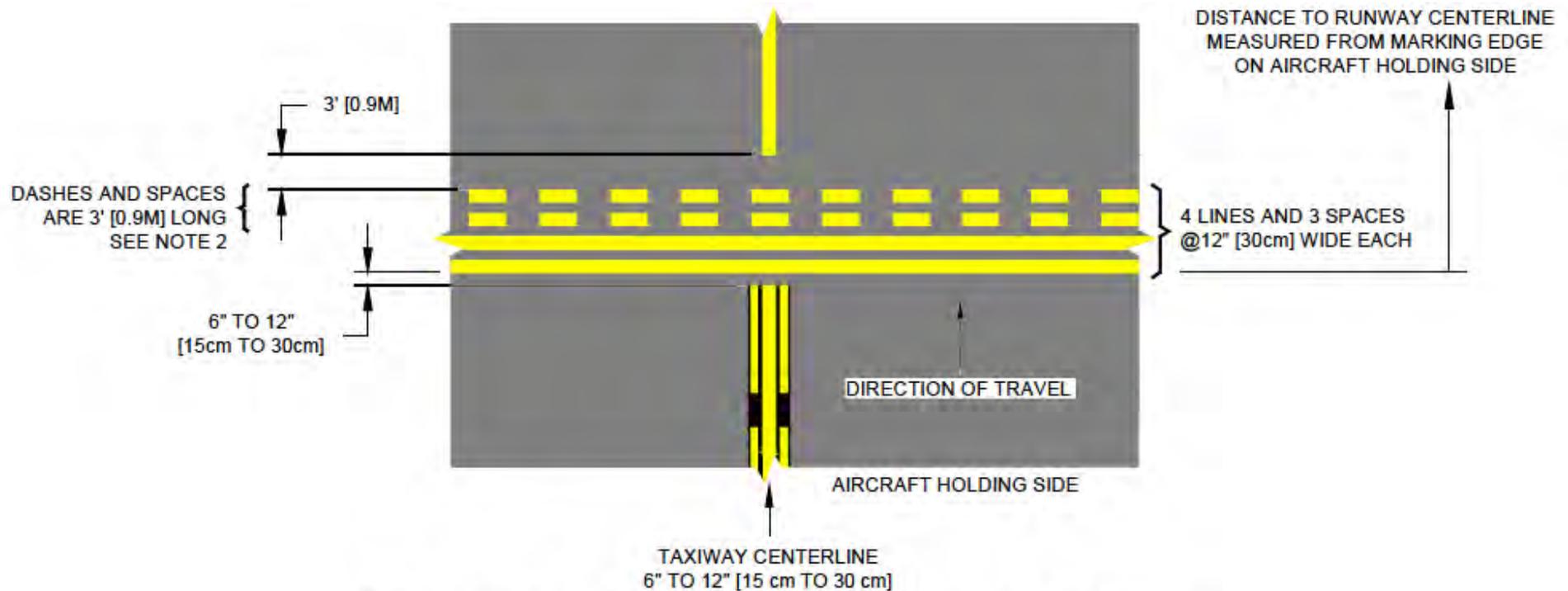
Source: GoogleEarth, 2007



DIMENSIONS ARE EXPRESSED THUS:
 $\frac{\text{FEET}}{\text{METERS}}$ e.g. $\frac{10}{3}$



Runway Holding Markings



PATTERN A - RUNWAY HOLDING POSITION MARKING

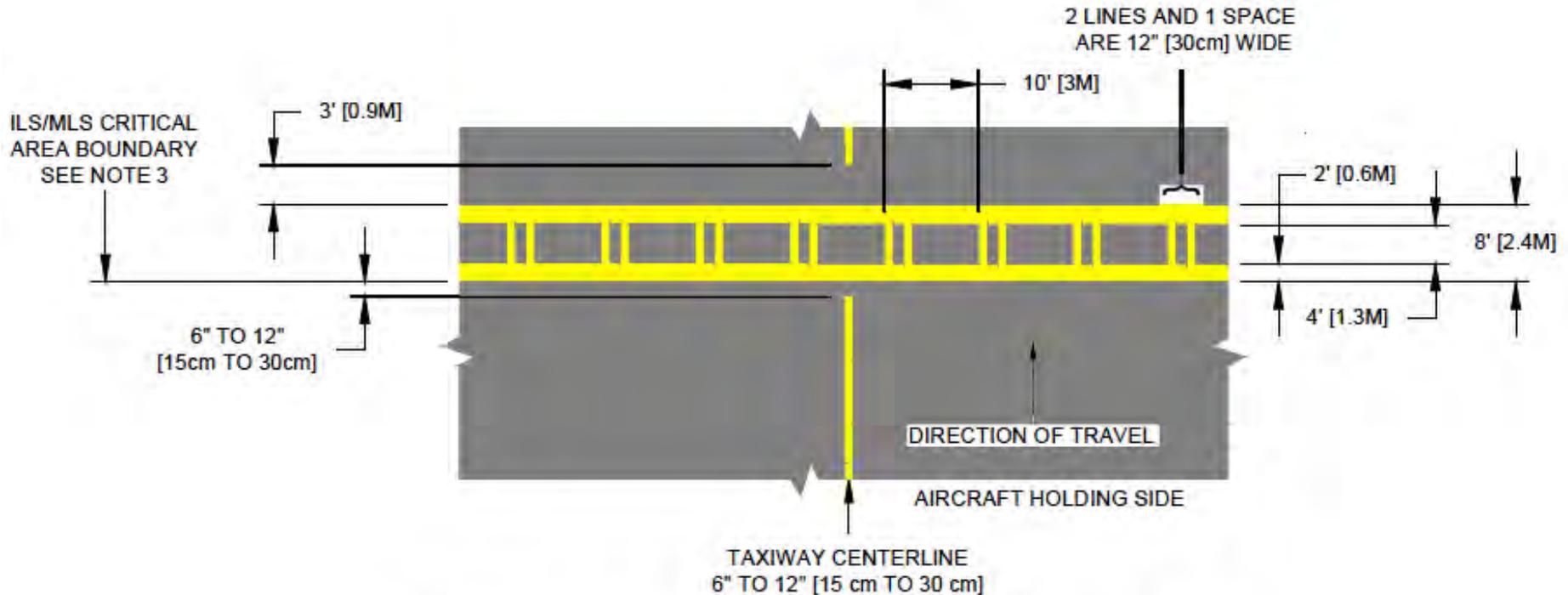
source: FAA AC 150/5340-1K

Notes:

- Inform pilots on where to hold prior to entering a runway
- Dimensions are found in Appendix 7 of FAA AC 150 5300-13



Runway ILS/MLS Holding Markings



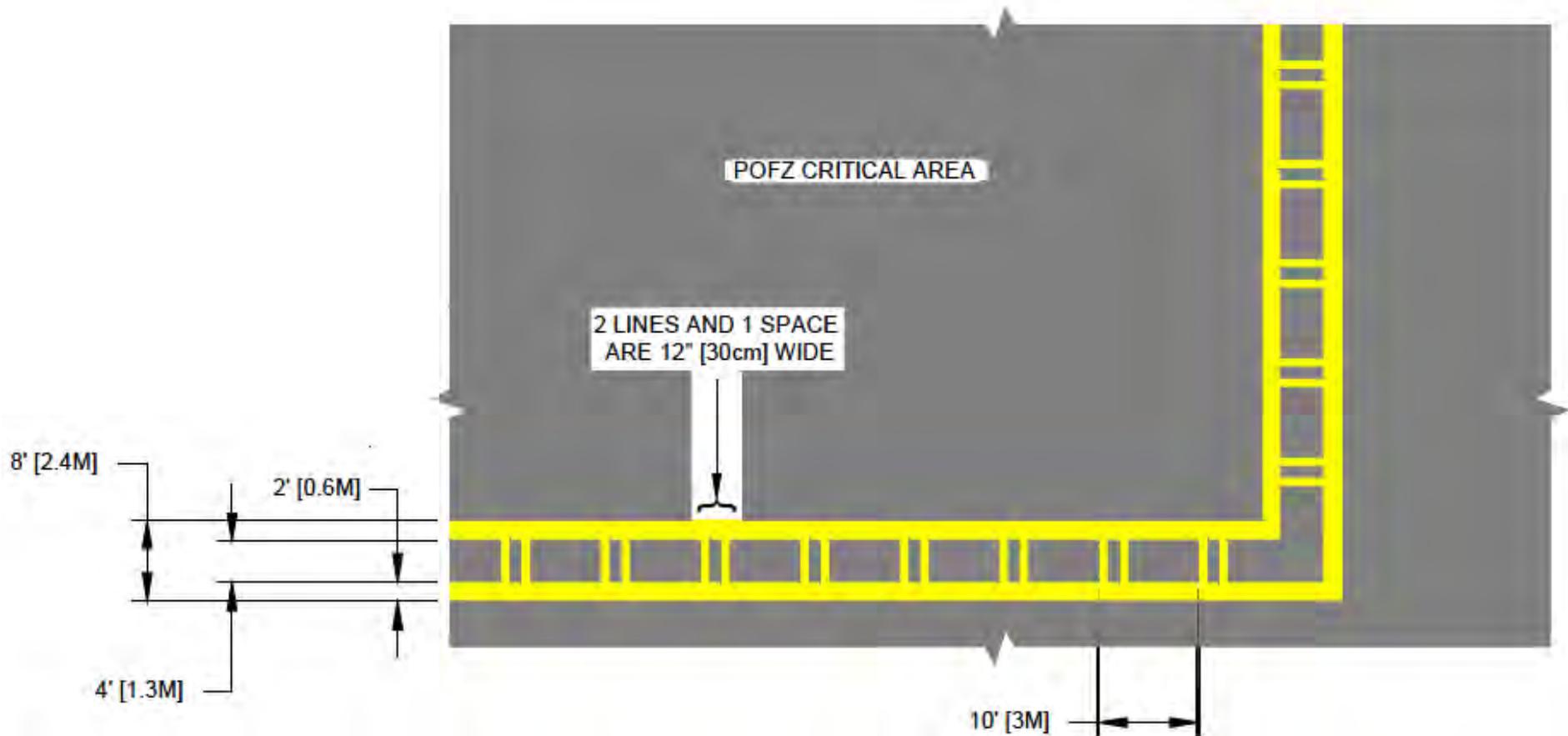
PATTERN B - ILS/MLS HOLDING POSITION MARKING

Notes:

- Inform pilots on where to hold at a location on a taxiway to provide clear ILS signals to others
- Dimensions are assessed based on site specific conditions



Runway POFZ Holding Markings

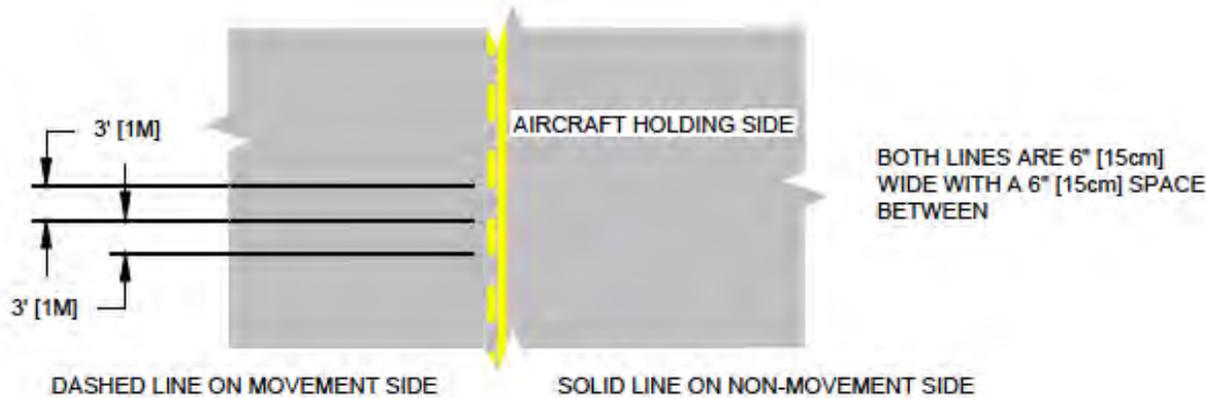


Notes:

- Inform pilots on where to hold at a location on a taxiway to comply with Precision Obstacle Free Zone signals to others
- Typically applicable for ILS Category II and III operations

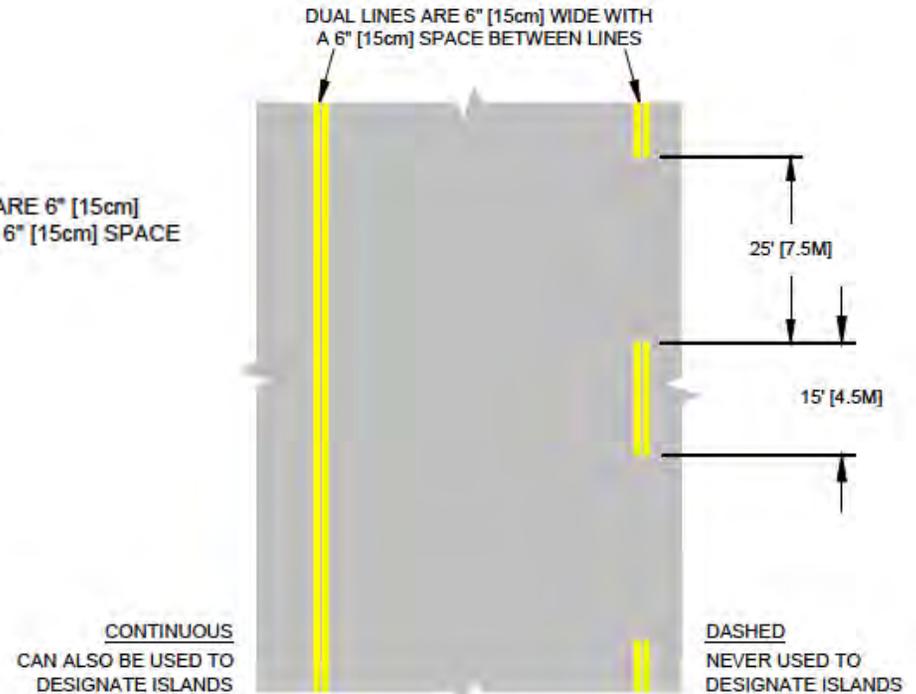


Non-Movement Area and Taxiway Edge Markings



Non-movement area markings

DUAL LINES ARE 6" [15cm] WIDE WITH A 6" [15cm] SPACE BETWEEN LINES



Taxiway edge markings

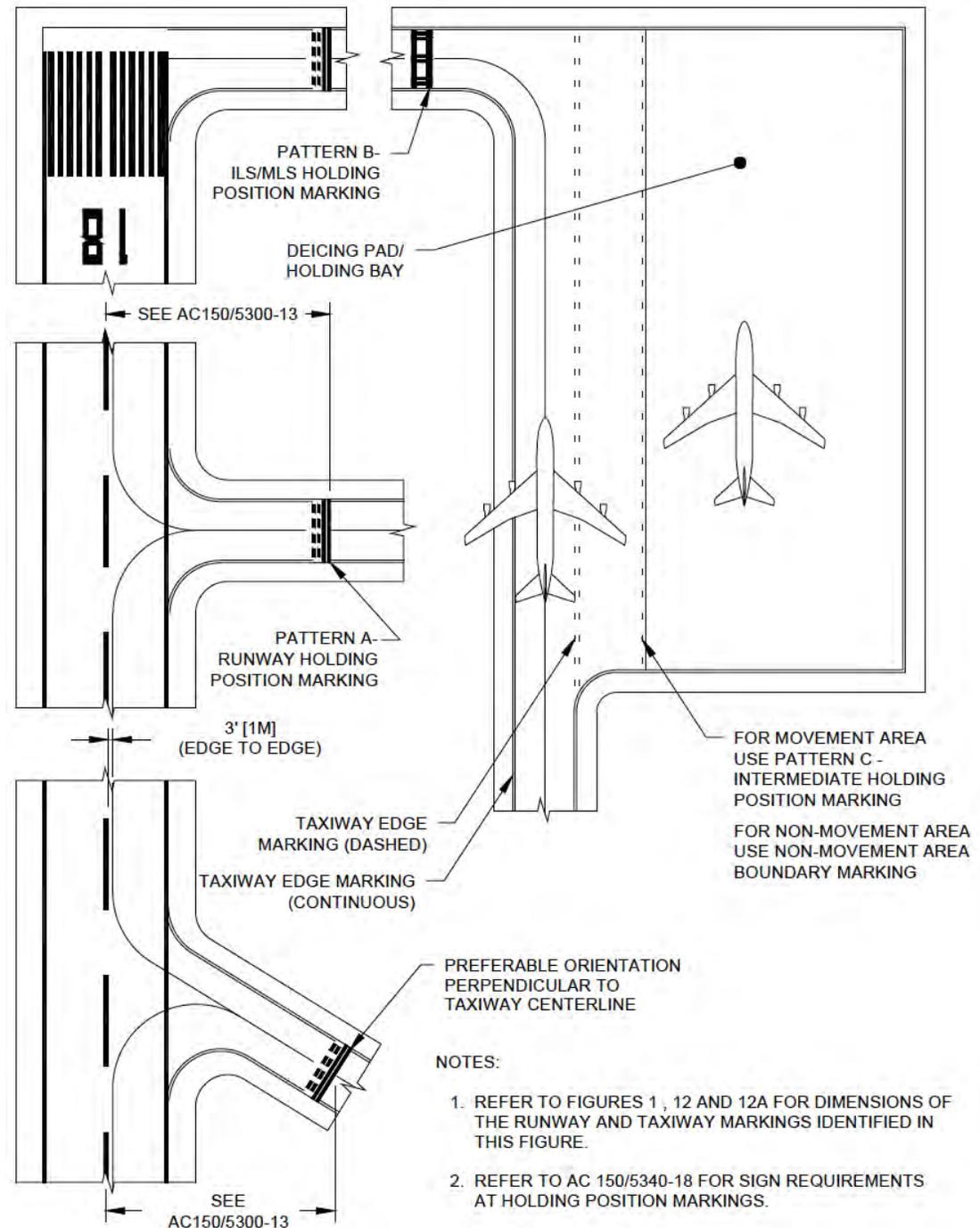
source: FAA AC 150/5340-1K

Notes:

- Inform pilots of intermediate holding position prior to entering a runway
- Inform pilots of non-movement areas



Sample Implementati on of Taxiway and Runway Markings



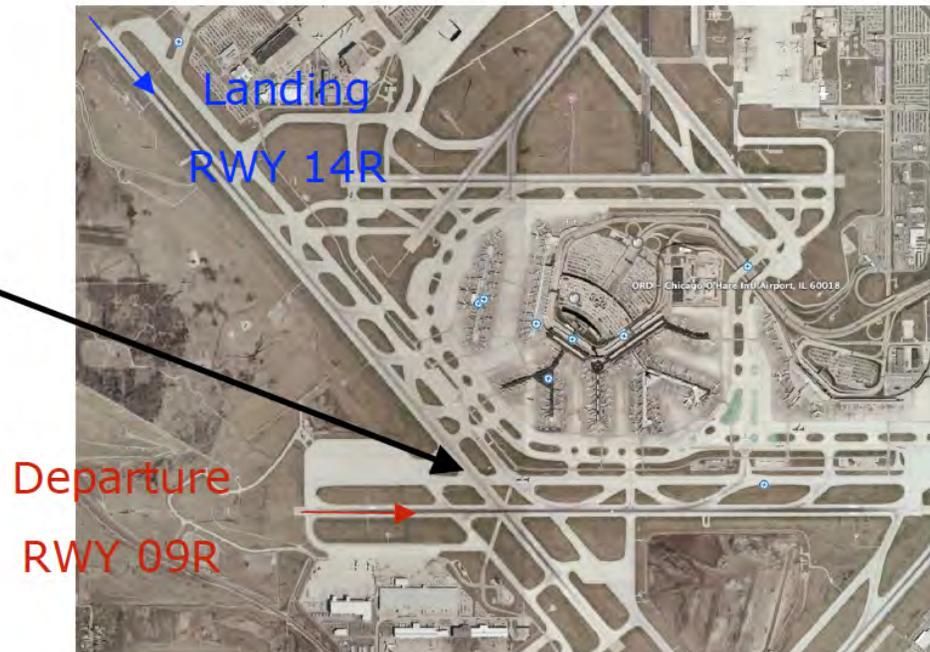
source: FAA AC 150/5340-1K



Runway Holding Markings (Example ORD Airport)

- Sometimes ATC procedures require pilots to stop on a runway before reaching the intersection with another runway (Land and Hold Short Operations (LAHSO))
- Example of runway holding market at ORD Runway 14R

Runway Holding Marker

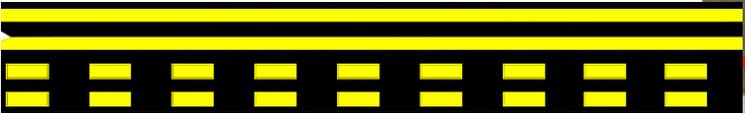
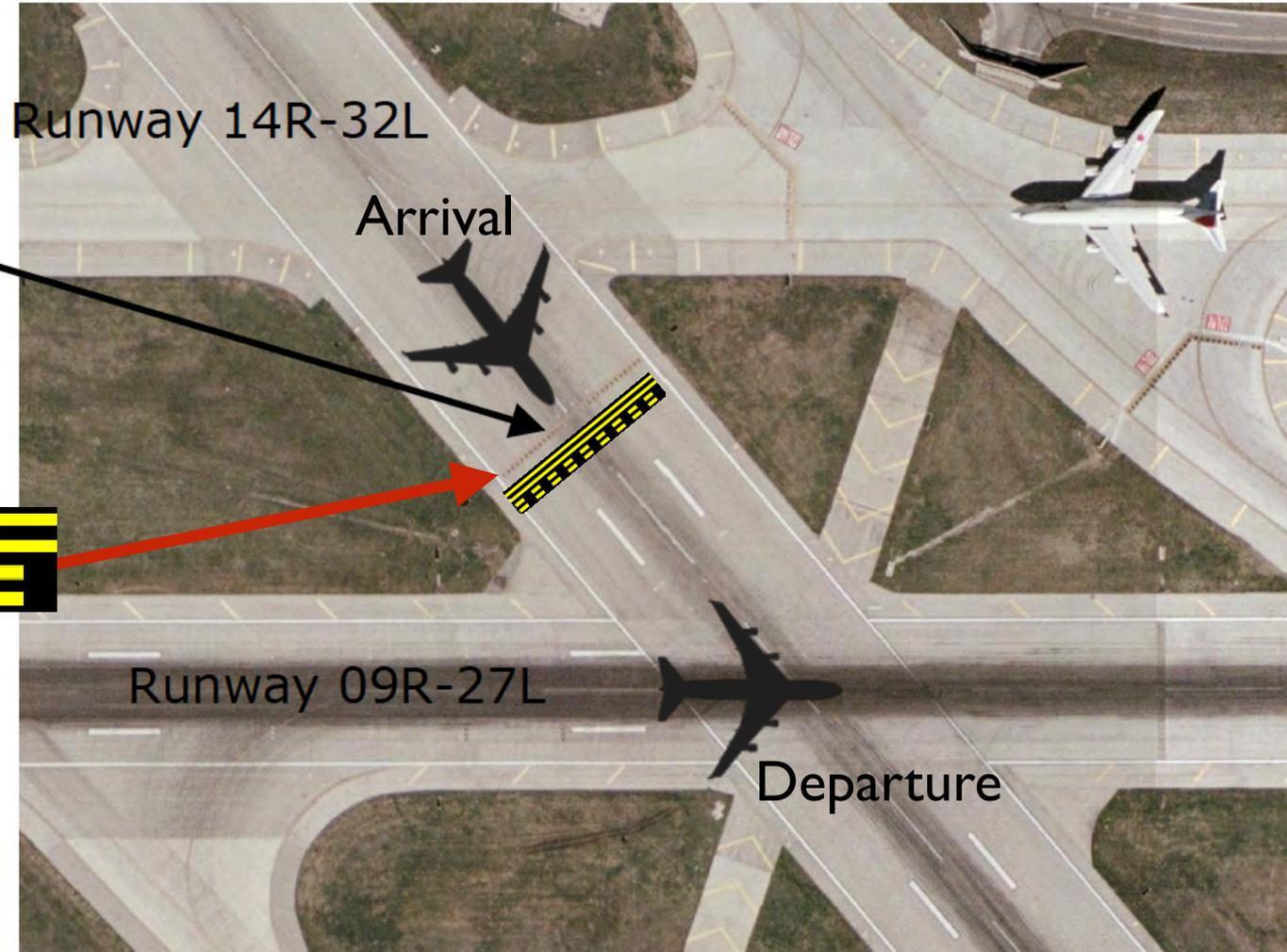


source: Google Earth



Runway Holding Markings (Detail)

Runway Holding Marker

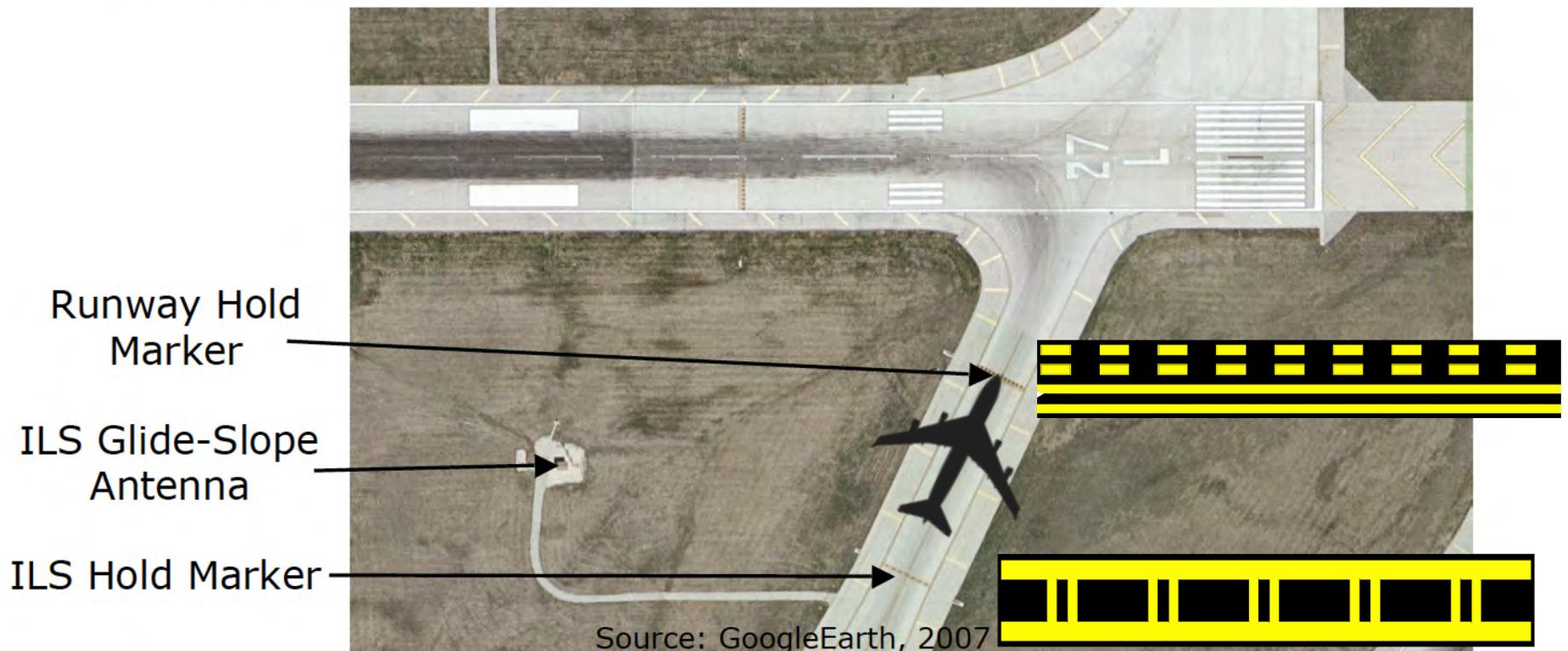


source: Google Earth



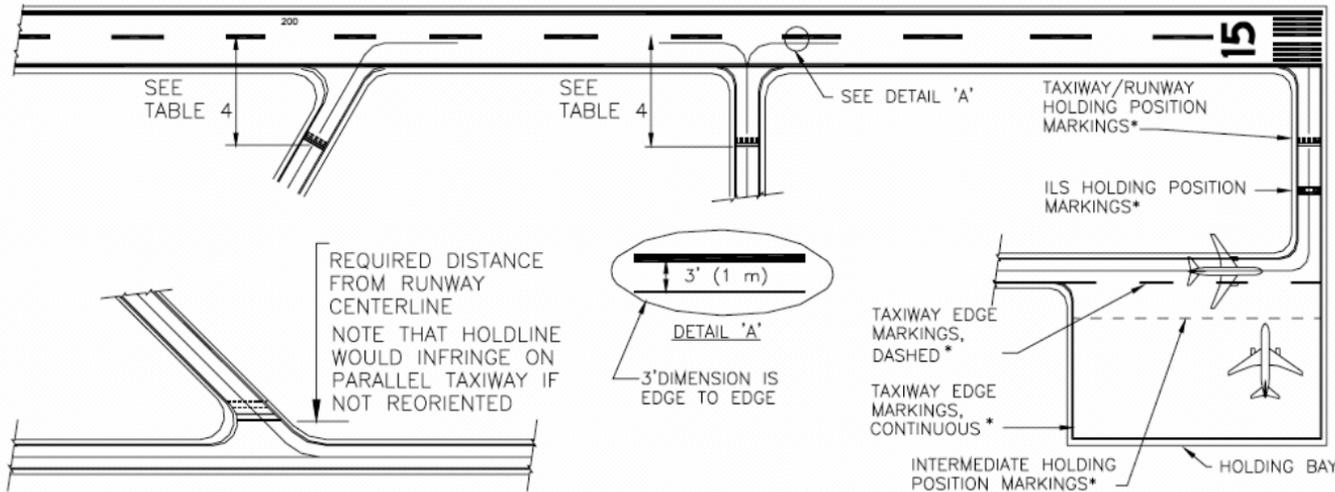
Runway ILS and Holding Markings (Example at ORD)

- Used to avoid interference between aircraft and the Instrument Landing System (ILS)
- Example (ILS taxiways markers at ORD R27L)



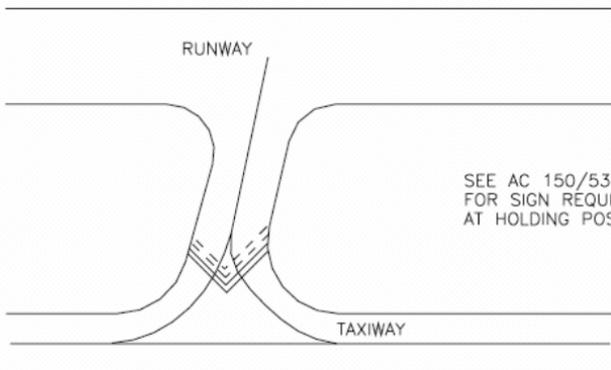


Taxiway Markings

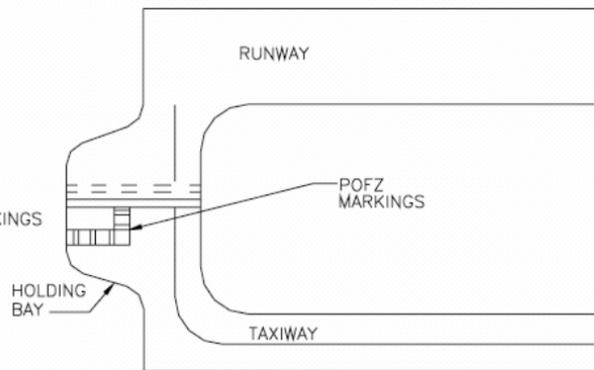


EXAMPLE OF HOLDING POSITION MARKINGS NOT AT RIGHT ANGLE TO TAXIWAY CENTERLINE BECAUSE OF INTERSECTION CONFIGURATION

* REFER TO FIGURE 10 FOR MARKING DETAILS



EXAMPLE WHERE HOLDING POSITION MARKINGS DO NOT EXTEND STRAIGHT ACROSS THE TAXIWAY



EXAMPLE OF HOLDING POSITION MARKINGS EXTENDED ACROSS HOLDING BAY

NOTE: FOR CAT II & III APPROACHES MAINTAIN A CLEAR SECTION 200' X 1000' AT RUNWAY END.

Precision Runway Obstacle Free Zone (POFZ) Marking

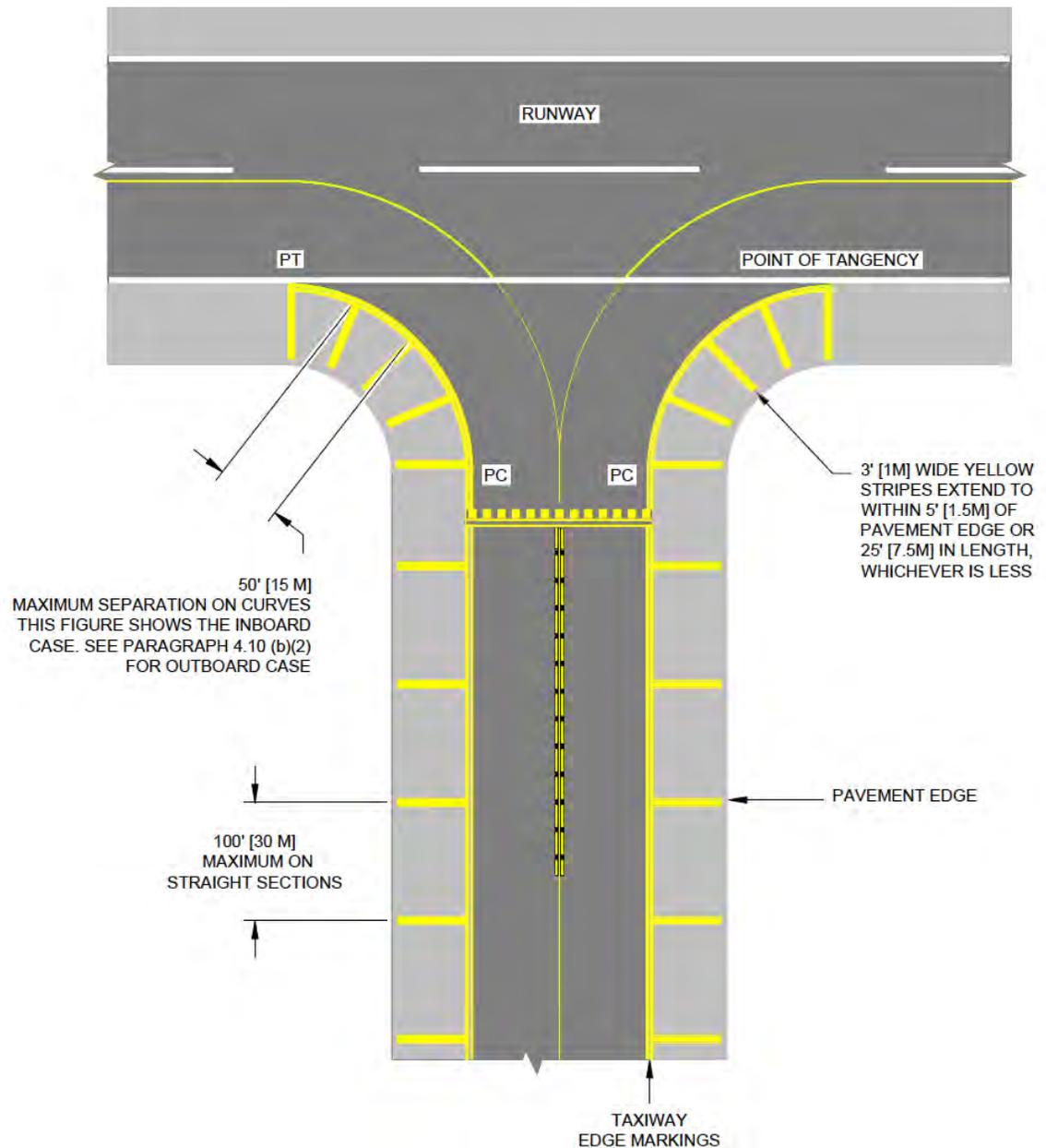
source: FAA AC 150/5340-1K



Taxiway Shoulder Markings

Provide information to the pilot on the location of the full strength pavement of taxiway

This is very important in low visibility and night taxiing conditions



source: FAA AC 150/5340-1K



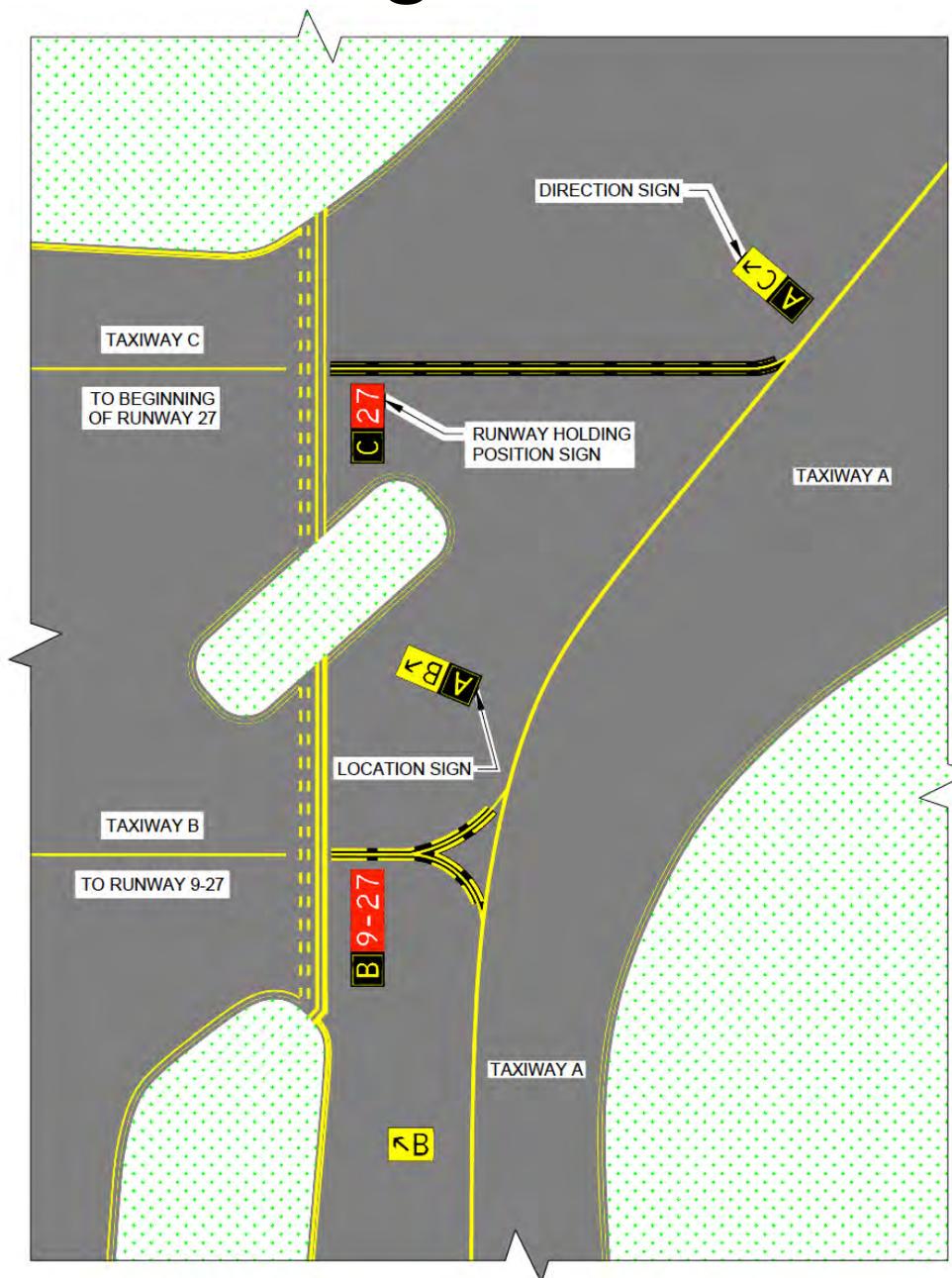
Airport Signs

- Provide pilots guidance on where to locate taxiways, aprons, and runways
- Very critical for safety and situational awareness
- Poor location of signs can induce accidents and runway incursions
- Two types of signs: a) physical and b) surface painted
- Sources of information:
 - FAA Quick Reference Guide to Airport Signs
 - FAA AC 150/5340-1K



Surface Painted Signs

- Help pilot's situational awareness
- Can help avoid runway and taxiway incursions
- Painted signs are complementary to physical signs

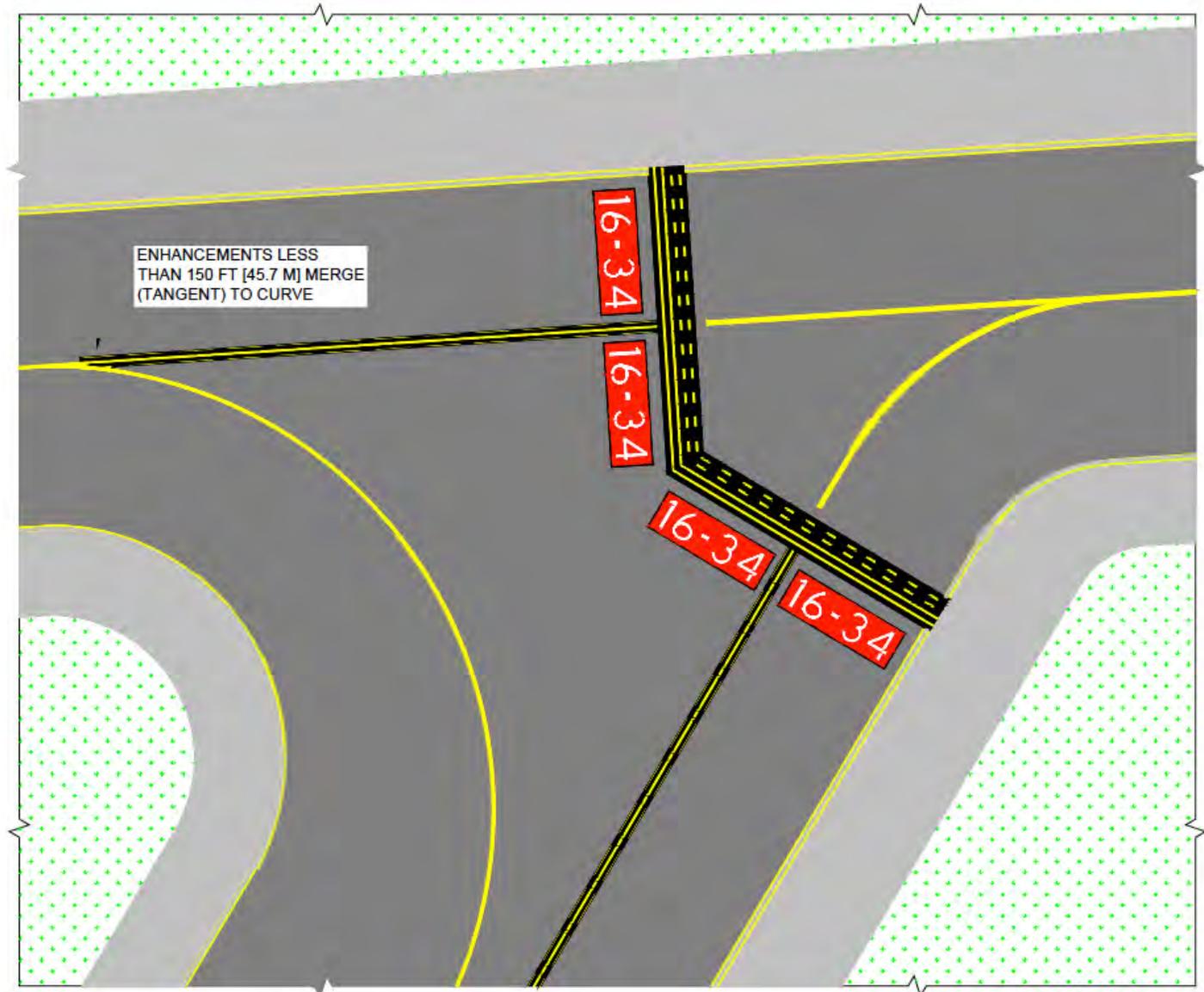


source: FAA AC 150/5340-1K



Surface Painted Signs

- Two taxiways intersect a runway holding position
- Note the variation in the angle of holding line



source: FAA AC 150/5340-1K



Airport Physical Signs

EXAMPLE	TYPE OF SIGN	PURPOSE	LOCATION/CONVENTION
	Mandatory: Hold position for taxiway/runway intersection.	Denotes entrance to runway from a taxiway.	Located <u>L side</u> of taxiway within 10 feet of hold position markings.
	Mandatory: Holding position for runway/runway intersection.	Denotes intersecting runway.	Located <u>L side</u> of rwy prior to intersection, & <u>R side</u> if rwy more than 150' wide, used as taxiway, or has "land & hold short" ops.
	Mandatory: Holding position for runway approach area.	Denotes area to be protected for aircraft approaching or departing a runway.	Located on taxiways crossing thru runway approach areas where an aircraft would enter an RSA or apch/ departure airspace.
	Mandatory: Holding position for ILS critical area/precision obstacle free zone.	Denotes entrance to area to be protected for an ILS signal or approach airspace.	Located on twys where the twys enter the NAVAID critical area or where aircraft on taxiway would violate ILS apch airspace (including POFZ).
	Mandatory: No entry.	Denotes aircraft entry is prohibited.	Located on paved areas that <u>aircraft</u> should not enter.

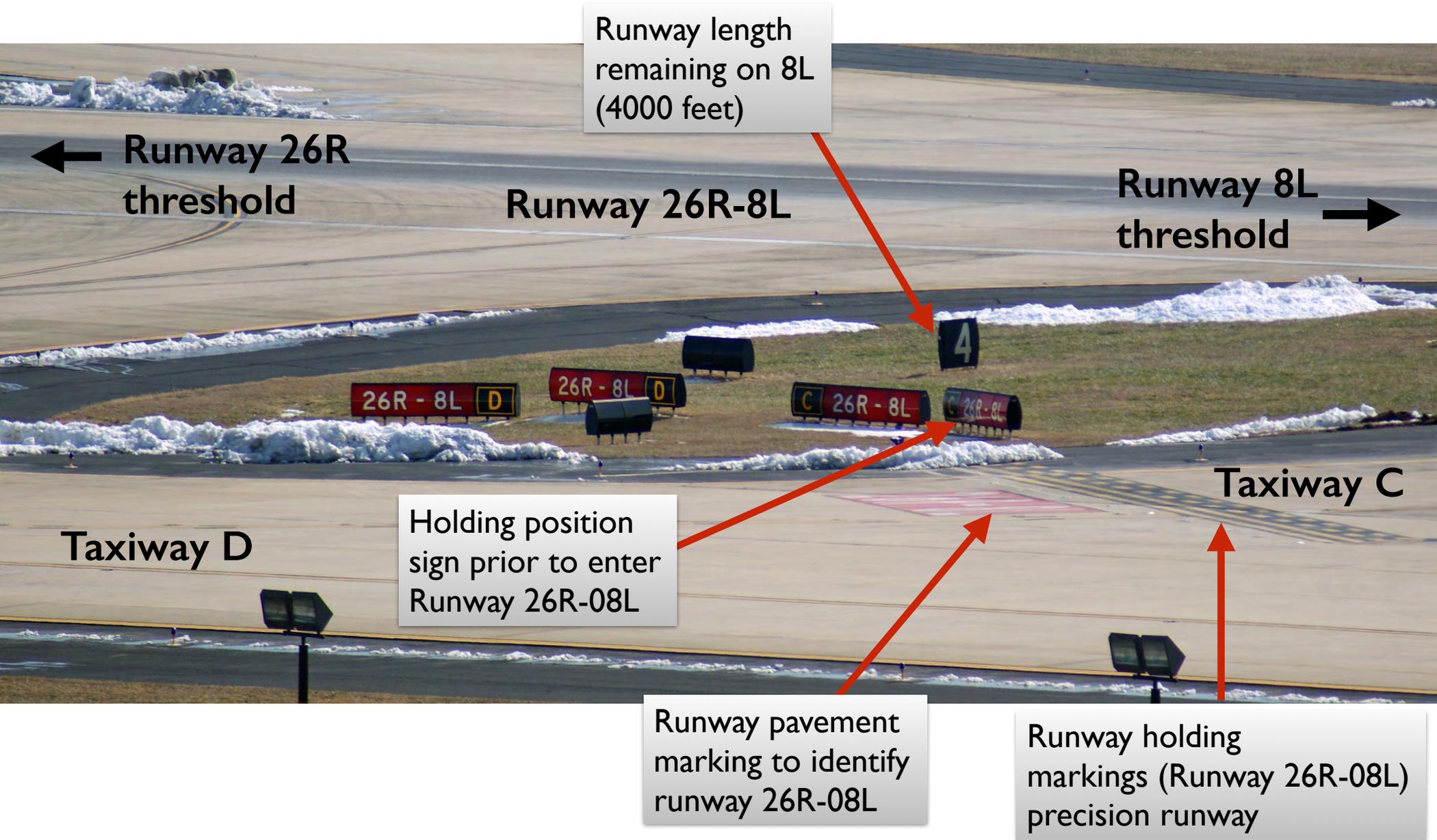
source: FAA Quick Reference Guide to Airport Signs



Taxiway intersection with multiple signs (ATL airport)

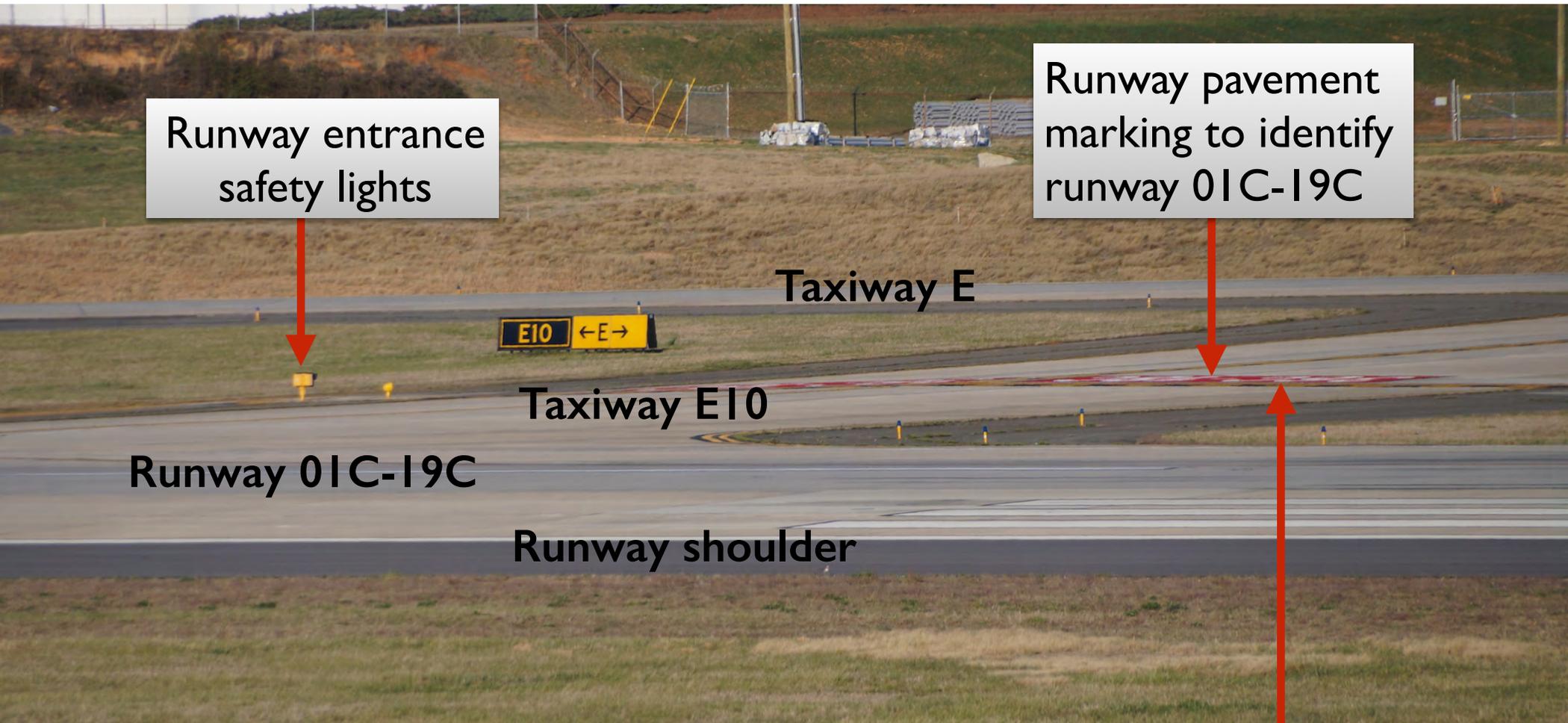


Airport Signs (Example ATL)





Airport Signs (Example CLT)



Runway entrance
safety lights

Runway pavement
marking to identify
runway 01C-19C

Taxiway E

E10 ←E→

Taxiway E10

Runway 01C-19C

Runway shoulder

Runway holding
markings (Runway 26R-08L)
precision runway



Airport Signs (Example LAX)



Darker back side
(to avoid confusion)

Runway remaining
if departing
from threshold 7L
(8000 feet)

← Runway 25R
threshold

Runway 25R-7L

Runway 7L
threshold →

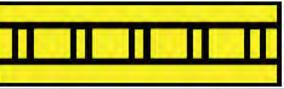
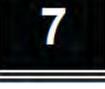
Taxiway E10

Runway sign identifying
Runway 25R-7L

25R- 7L



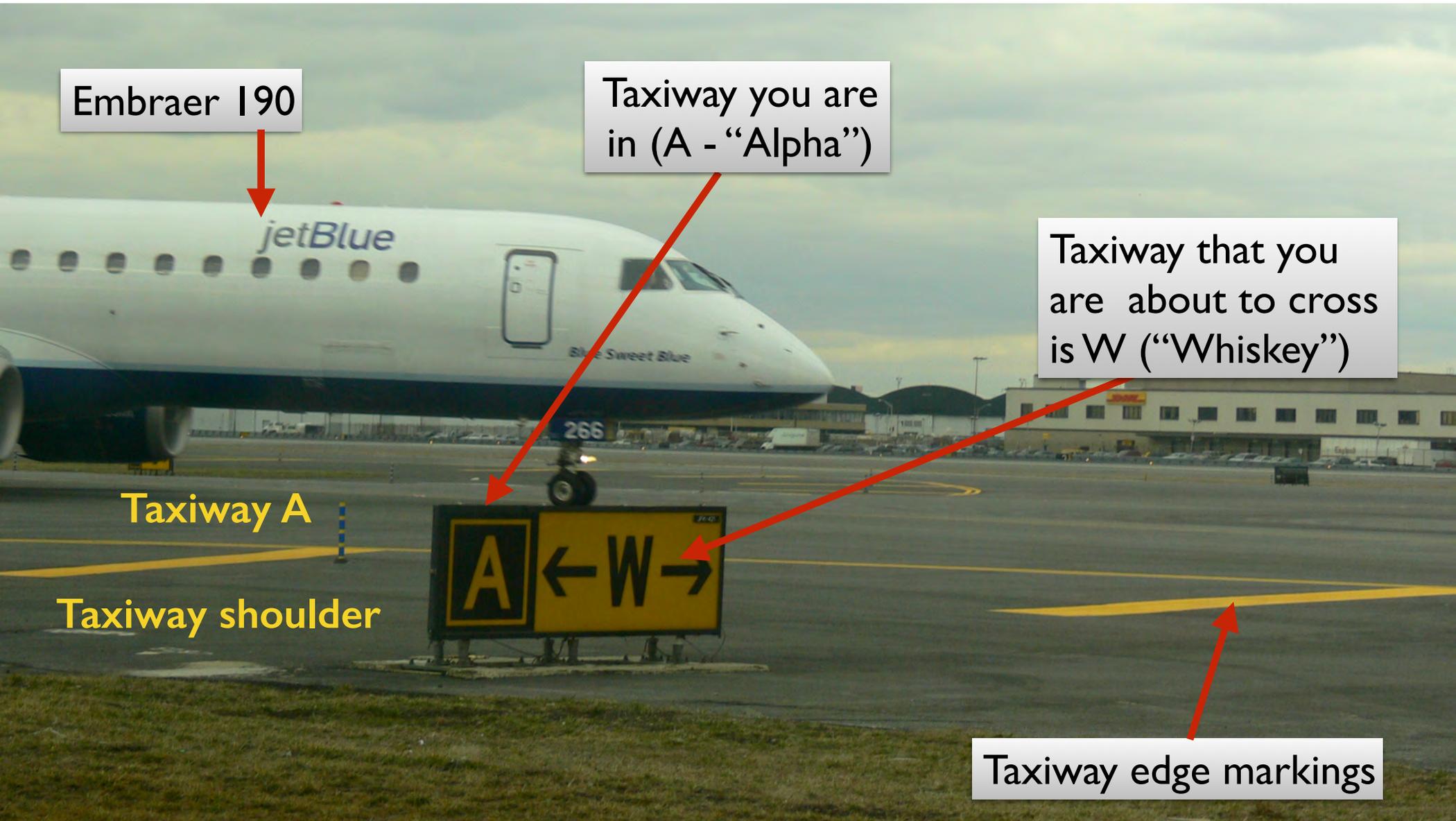
Airport Signs

	Taxiway Location.	Identifies taxiway on which the aircraft is located.	Located along taxiway by itself, as part of an array of taxiway direction signs, or combined with a runway/taxiway hold sign.
	Runway Location.	Identifies the runway on which the aircraft is located.	Normally located where the <u>proximity of two rwys</u> to one another could cause confusion.
	Runway Safety Area / OFZ and Runway Approach Area Boundary.	Identifies exit boundary for an RSA / OFZ or rwy approach.	Located on taxiways on <u>back side</u> of certain runway/taxiway holding position signs or runway approach area signs.
	ILS Critical Area/POFZ Boundary.	Identifies ILS critical area exit boundary.	Located on taxiways on <u>back side</u> of ILS critical area signs.
	Direction: Taxiway.	Defines designation/direction of intersecting taxiway(s).	Located on <u>L side</u> , <u>prior to intersection</u> , with an array L to R in clockwise manner.
	Runway Exit.	Defines designation/direction of exit taxiways from the rwy.	Located on same side of runway as exit, prior to exit.
	Outbound Destination.	Defines directions to take-off runway(s).	Located on taxi routes to runway(s). <u>Never</u> collocated or combined with other signs.
	Inbound Destination.	Defines directions to airport destinations for arriving aircraft.	Located on taxi routes to airport destinations. <u>Never</u> collocated or combined with other types of signs.
	Information.	Provides procedural or other specialized information.	Located along taxi routes or aircraft parking/staging areas. May not be lighted.
	Taxiway Ending Marker.	Indicates taxiway does not continue beyond intersection.	Installed at taxiway end or far side of intersection, if visual cues are inadequate.
	Distance Remaining.	Distance remaining info for take-off/landing.	Located along the sides of runways at 1000' increments.

source: FAA Quick Reference Guide to Airport Signs



Airport Signs (Example JFK)





Airport Signs (Miscellaneous)



You are taxiing on taxiway A (“Alpha”)
Next right is taxiway D (“Delta”)

Close up installation of a taxiway sign





Airport Signs (Miscellaneous)



Information sign: Departing from taxiway T10 on runway 32L provides 8,784 feet of Takeoff Runway Available

Information warning sign: No ground vehicles are allowed beyond this point due to localizer siting criteria (when ILS localizer in use - IFR operations)

