



MUTCD Part 4

Highway Traffic Signals



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slides provided by FHWA**

**Any opinions expressed are those
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2009 MUTCD

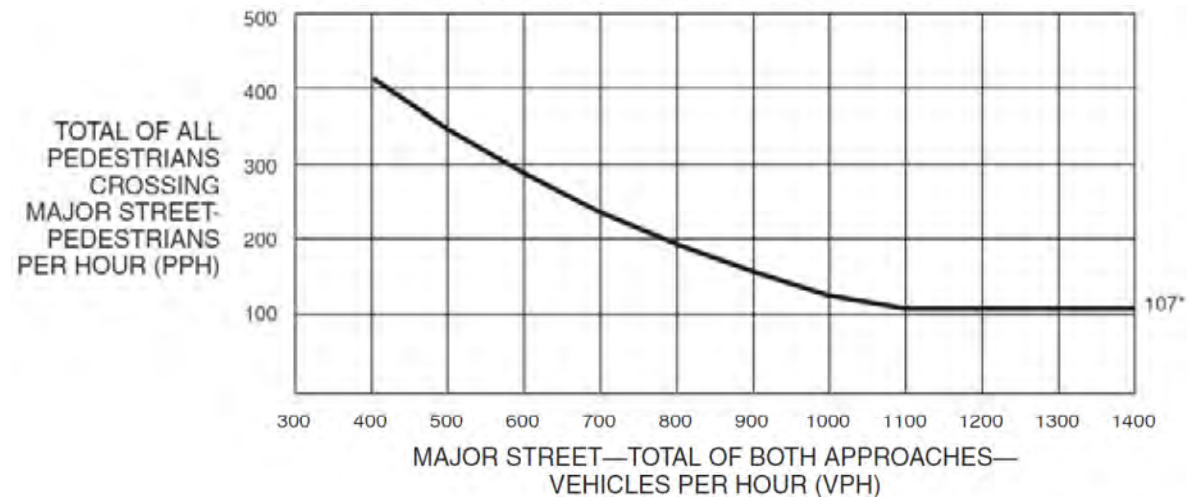
Revisions to Part 4 – Highway Traffic Signals



Signal warrants – revisions to Warrant 4 (Pedestrian Volume)

**More
comparable
to vehicular
volume
warrants**

Figure 4C-5. Warrant 4, Pedestrian Four-Hour Volume

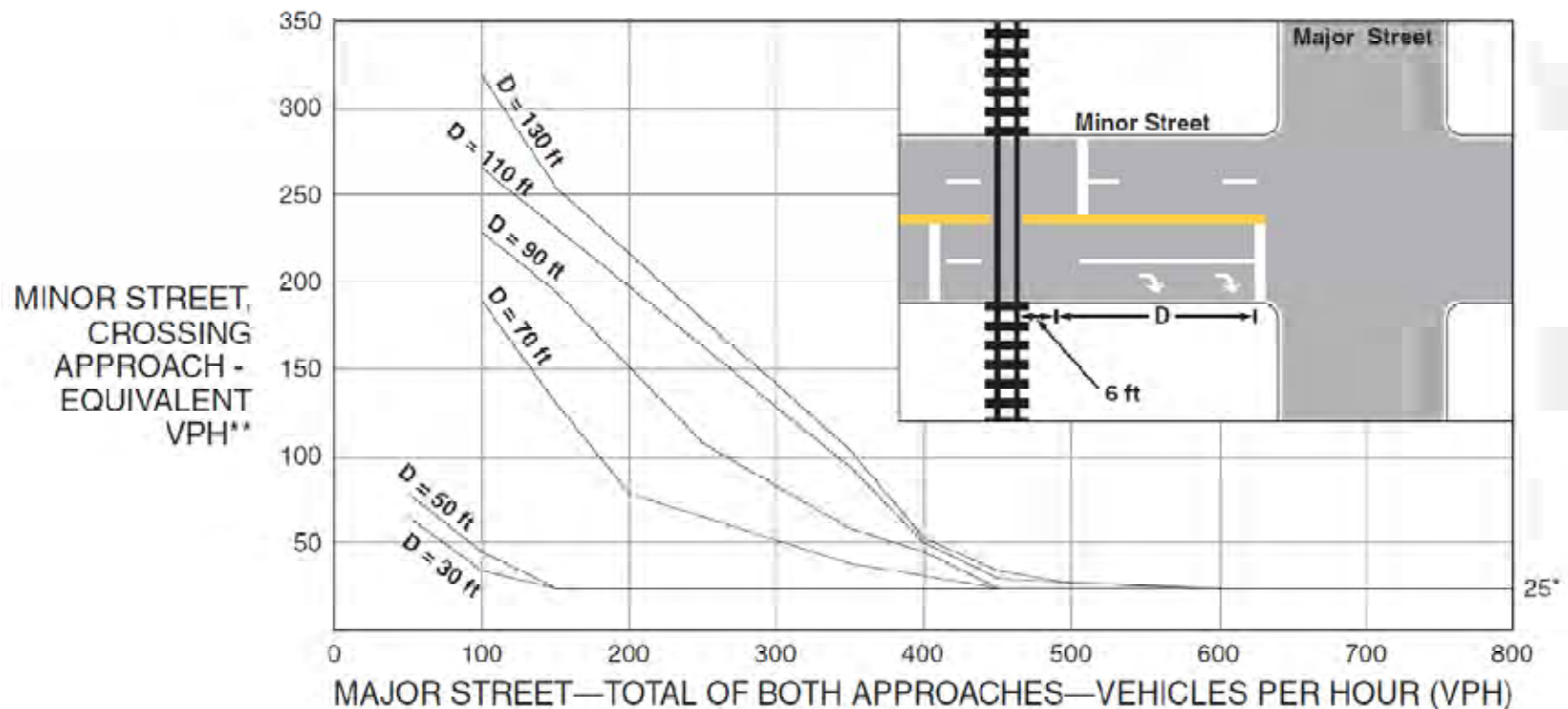


*Note: 107 pph applies as the lower threshold volume.



New Warrant 9 for intersections near grade crossings

Figure 4C-10. Warrant 9, Intersection Near a Grade Crossing
(Two or More Approach Lanes at the Track Crossing)



* 25 vph applies as the lower threshold volume

** VPH after applying the adjustment factors in Tables 4C-2, 4C-3, and/or 4C-4, if appropriate



Signals based only on Warrant 4 (Ped Volume) or Warrant 5 (School Crossing) should also control the minor street or driveway

No “half-signals”



Vehicular signal visibility – 12-inch indications required for all new traffic control signal faces



**Six options for
using new 8-inch
indications
in special
circumstances**

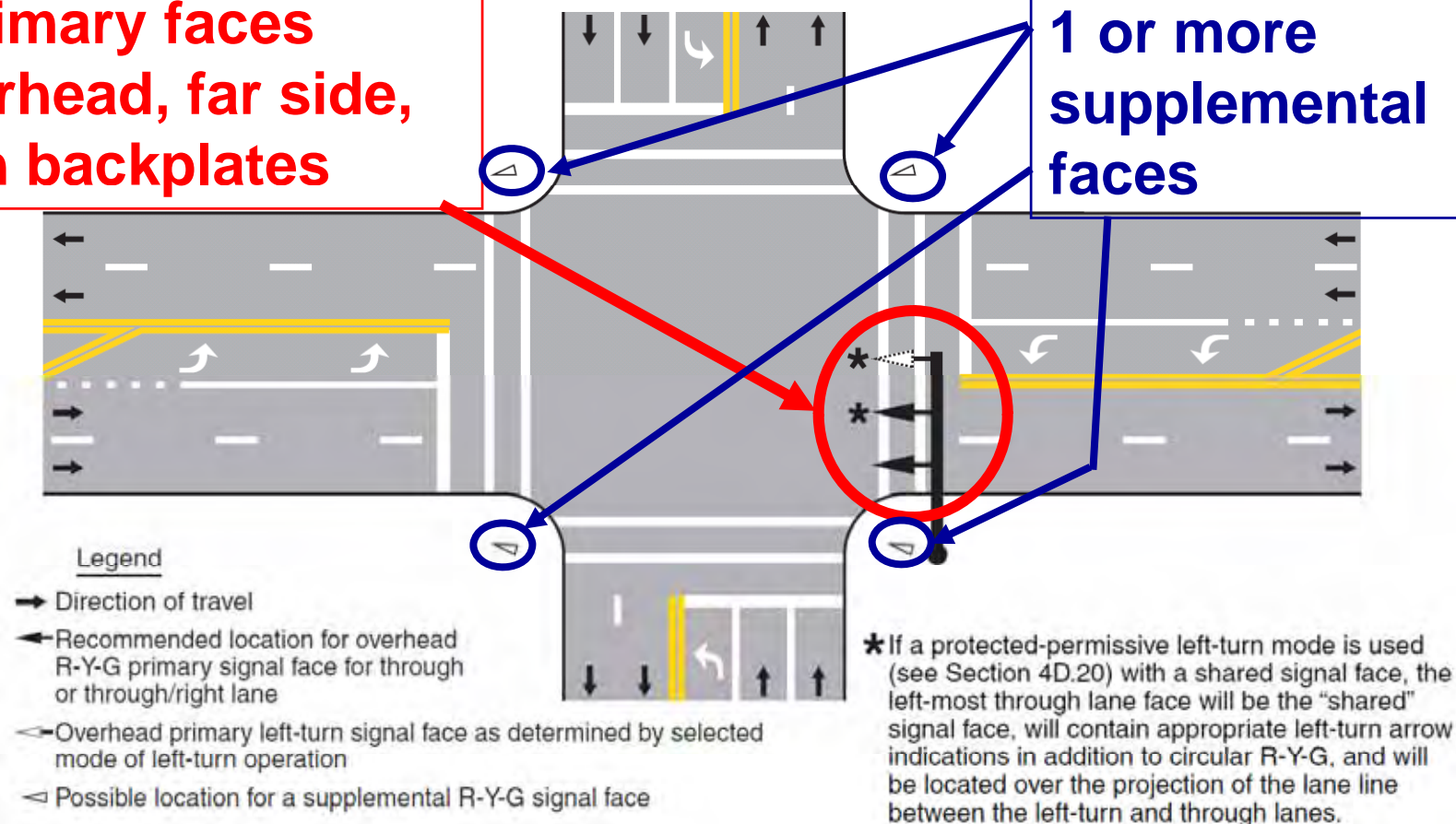
**(incl. ≤ 30 mph if
<120 ft from stop
line)**



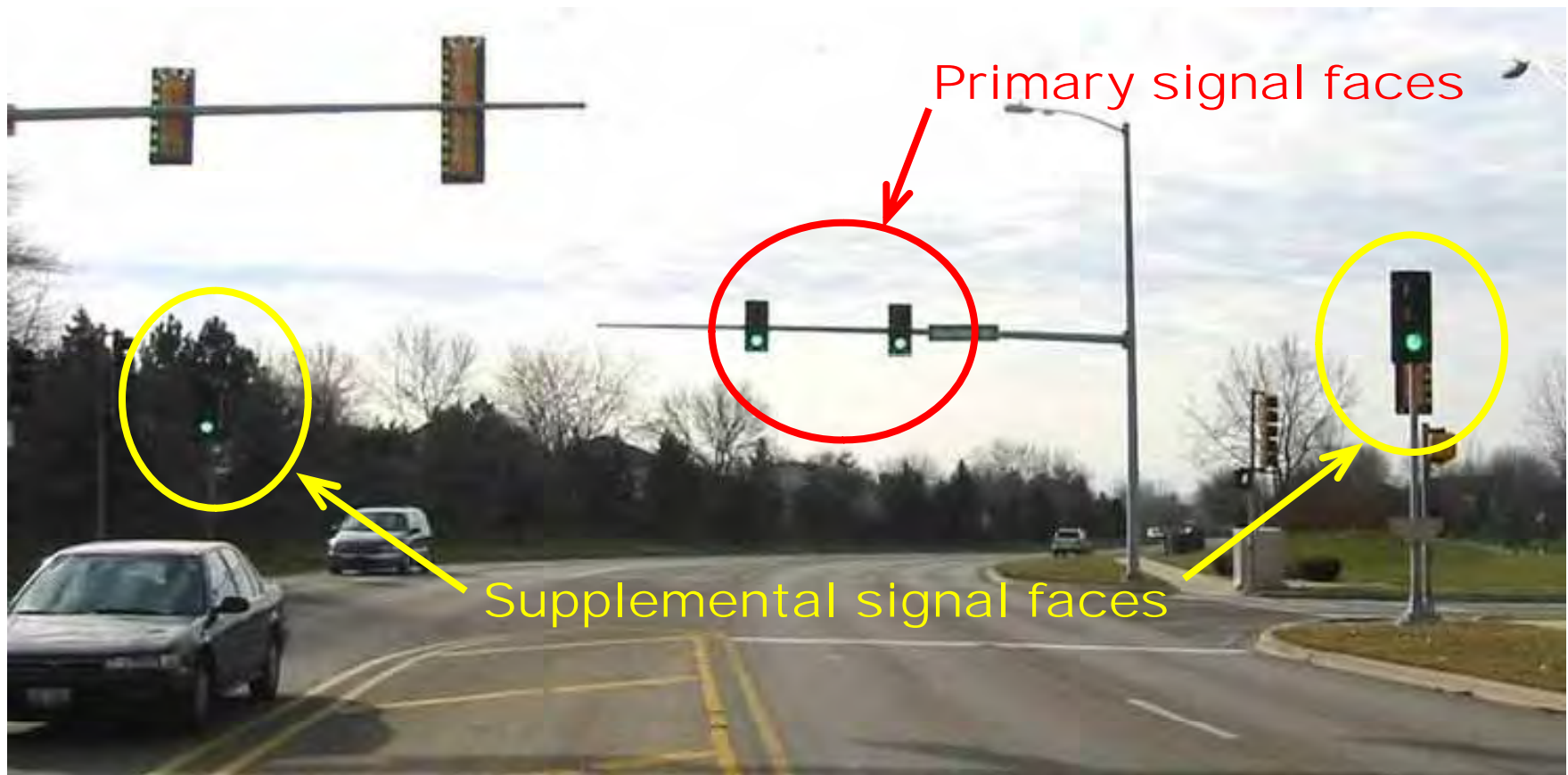
Recommended number, location, and design of signal faces for approaches with speeds ≥ 45 mph

- Primary faces overhead, far side, with backplates

1 or more supplemental faces



Recommended number, location, and design of signal faces for approaches with speeds ≥ 45 mph



Recommended minimum number of through signal faces on approaches with speeds ≥ 45 mph

Table 4D-1. Recommended Minimum Number of Primary Signal Faces for Through Traffic on Approaches with Posted, Statutory, or 85th-Percentile Speed of 45 mph or Higher

Number of Through Lanes on Approach	Total Number of Primary Through Signal Faces for Approach*	Minimum Number of Overhead-Mounted Primary Through Signal Faces for Approach
1	2	1
2	2	1
3	3	2**
4 or more	4 or more	3**

NOTES: * A minimum of two through signal faces is always required (See Section 4D.11). These recommended numbers of through signal faces may be exceeded. Also, see cone of vision requirements otherwise indicated in Section 4D.13.

** If practical, all of the recommended number of primary through signal faces should be located overhead.



**Same provisions should also
be considered for speeds of
less than 45 mph**



Optional yellow retroreflective borders around backplates





Circular green indications for permissive LTs should not be located over or in front of the LT lane



Protected-only mode shall not be used without exclusive turn lane

...unless turn phase always begins and ends simultaneously with the adjacent through movement (“split-phased”)



Optional U-turn arrow indications



R



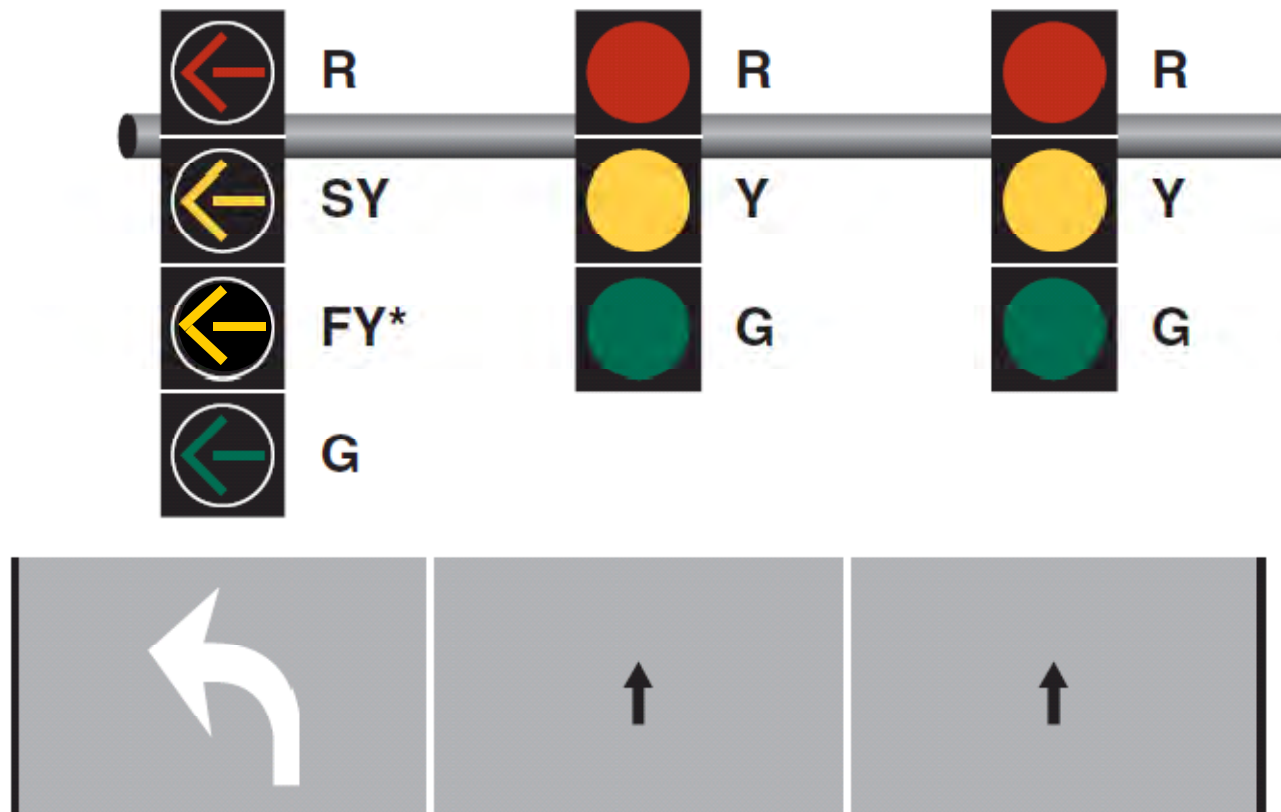
Y



G



Permissive turns – optional use of flashing yellow arrow



Flashing yellow arrow



Provisions that allowed “Dallas” displays have been eliminated



Section 4D.20 –

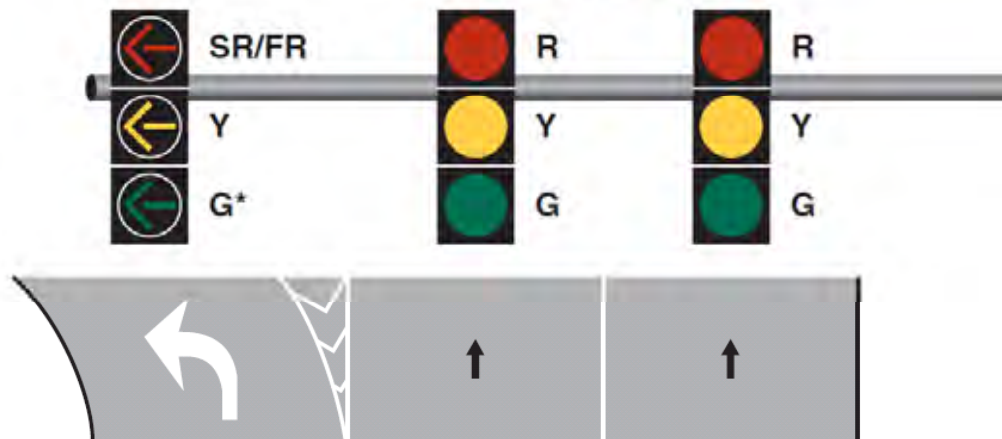
If a separate left-turn signal face is being operated in a protected/permissive left-turn mode, a CIRCULAR GREEN signal indication shall not be used in that face.

Separate Turn Signal Face—a signal face that exclusively controls a turn movement and that displays signal indications that are applicable only to the turn movement.

Shared Turn Signal Face—a signal face, for controlling both a turn movement and the adjacent through movement, that always displays the same color of circular signal indication that the adjacent through signal face or faces display.

Flashing red arrow for permissive turns – optional use in special cases

A - Typical position

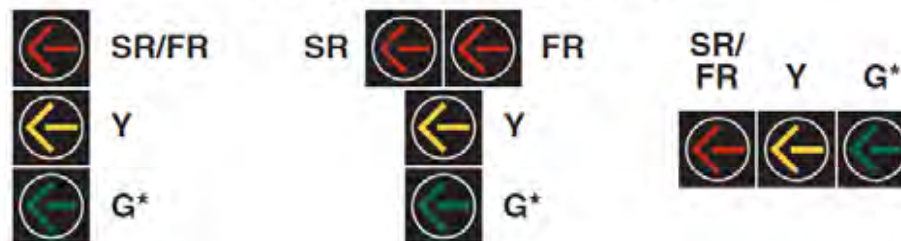


Legend

- Direction of travel
- SR Steady red
- FR Flashing red
- SR/FR Steady red and flashing red

Note: A flashing red arrow controlling a turn movement may be used only when an engineering study determines that each and every vehicle must successively come to a full stop before making a permissive turn

B - Typical arrangements



* Shall not be displayed when operated in the permissive only mode



Protected-only mode left-turn faces must use red arrow, not circular red



Does not apply to right-turn signals



Protected-only mode left-turn faces must use red arrow,
not circular red.

Sign not required – but if used, shall be a
LEFT ON GREEN ARROW ONLY sign



Yellow change intervals and red clearance intervals

- Durations shall be determined using engineering practices
 - Compliance date December 31, 2014 or when timing adjustments are made (whichever occurs first)
- Use of red clearance – changed from option to guidance, when indicated by application of engineering practices



Back-up power should be provided for signals with RR preemption



Overhead lane control signs should be used for certain signalized approaches



Per Section 2B.19 – lane drops, multiple-lane turns, shared through-turn lanes, other unexpected lane-use



Pedestrian Signals



**If signal timing provides only enough time for pedestrians to cross to the median --
ped signals, pushbuttons (if actuated),
and signs are required in the median**



New meaning of flashing upraised hand when pedestrian countdown signals are present was NOT ADOPTED

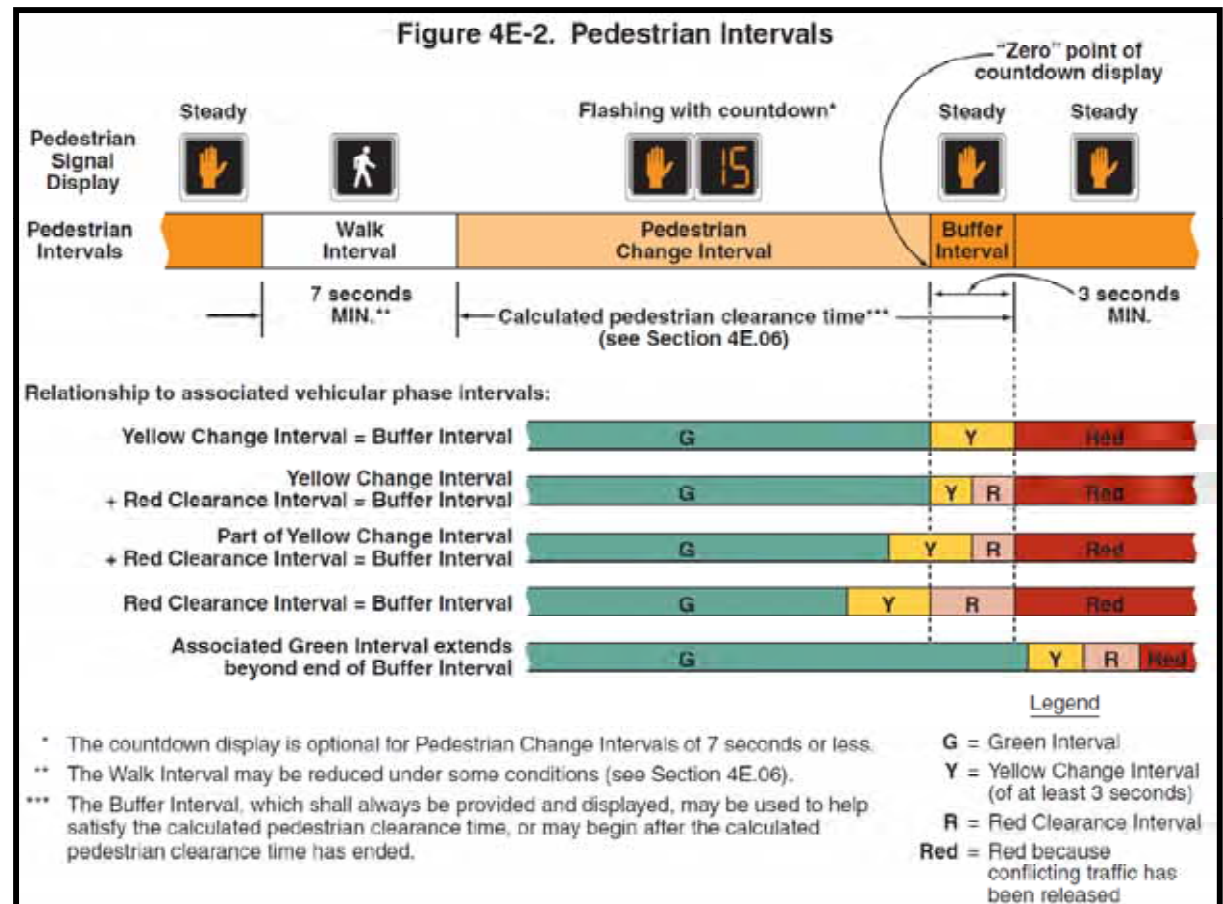


~~Ped may enter the intersection on the flashing upraised hand when a countdown pedestrian signal indication is present if they are able to travel to the far side of the traveled way by the time conflicting traffic receives a green signal~~

Ped change interval (FDW) shall end at least 3 seconds (“buffer”) before release of conflicting traffic

Buffer shall not begin later than the start of the red clearance interval, if used

Compliance date 12/31/2014 or when timing adjustments are made (whichever occurs first)



Slower walking speed for calculating pedestrian clearance time (guidance)

~~4.0 feet per second~~



**Ped. Clearance Time
based on 3.5 feet/sec**

**Exception allows 4.0 ft/sec if extended button press
or passive ped detection allows slower peds to
request additional crossing time**

**Sum of Walk time + Ped. Clearance Time
based on 3.0 feet per second for distance
from ped detector to far side**

Countdown pedestrian displays

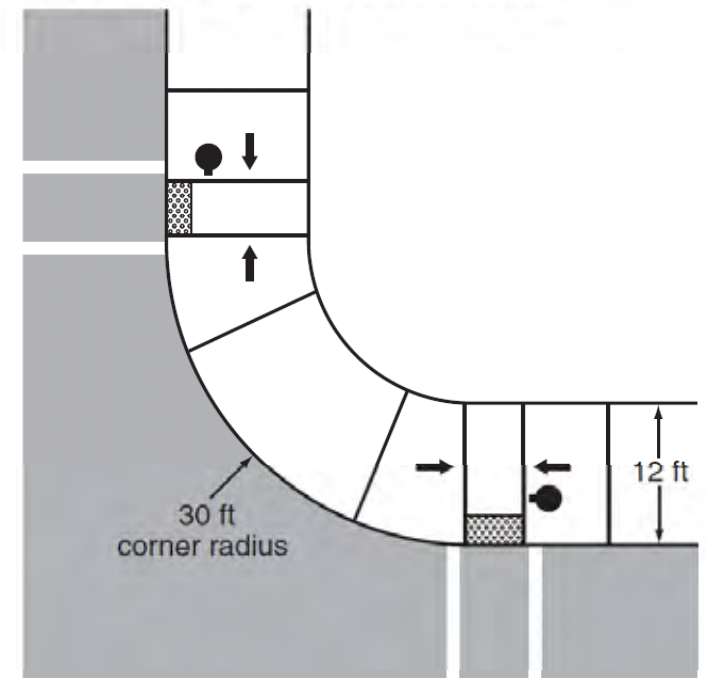
- Required for all ped signals where ped change interval is 7 sec. or more
- No specific compliance date for retrofitting existing ped signals (can remain w/o countdown until ped heads replaced)
- May be used even if ped change interval is 7 sec. or less



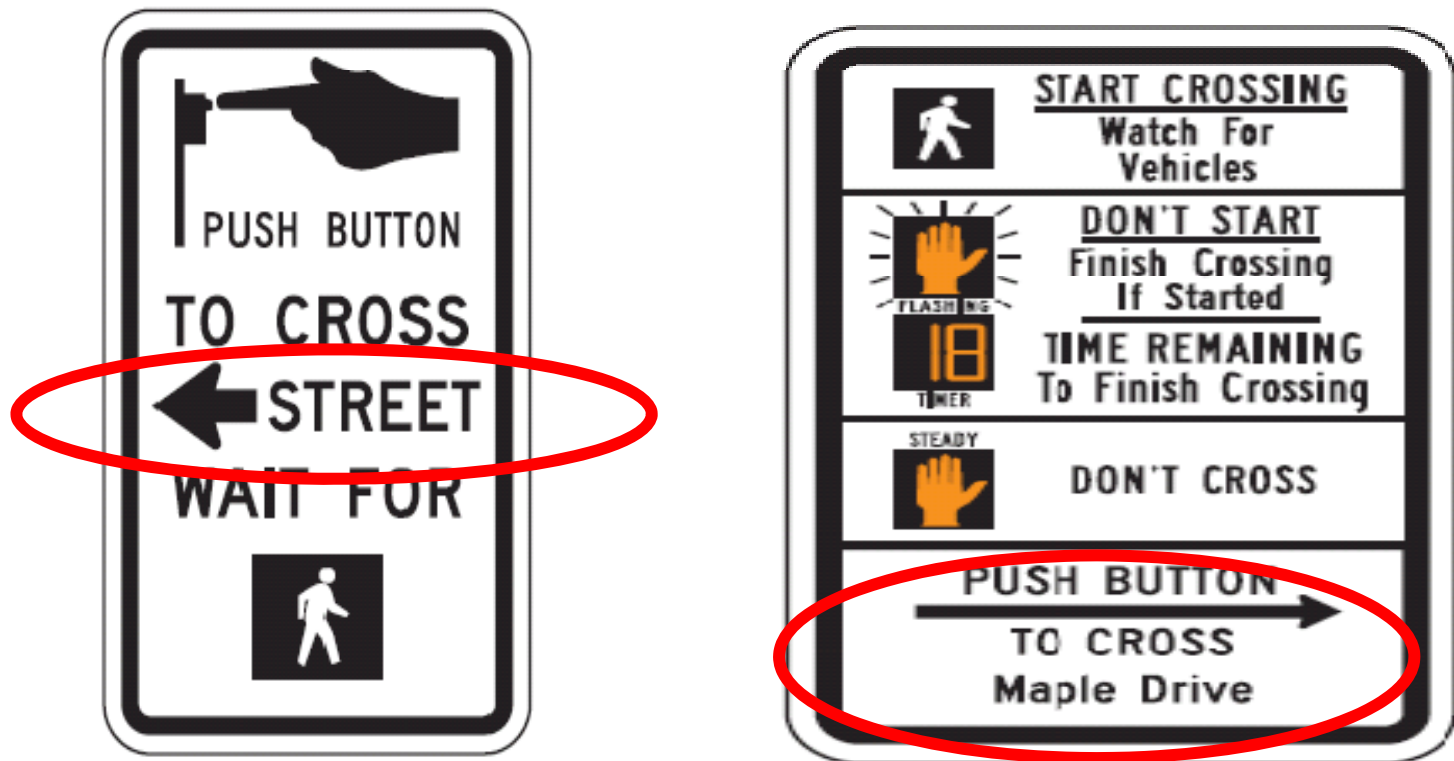
New guidance and figures for locations of pedestrian pushbuttons for a variety of conditions (APS compatible)



A - Parallel ramps with wide sidewalk



Positioning of pedestrian pushbuttons and legends on pushbutton signs shall clearly indicate which crosswalk signal is activated by which pushbutton



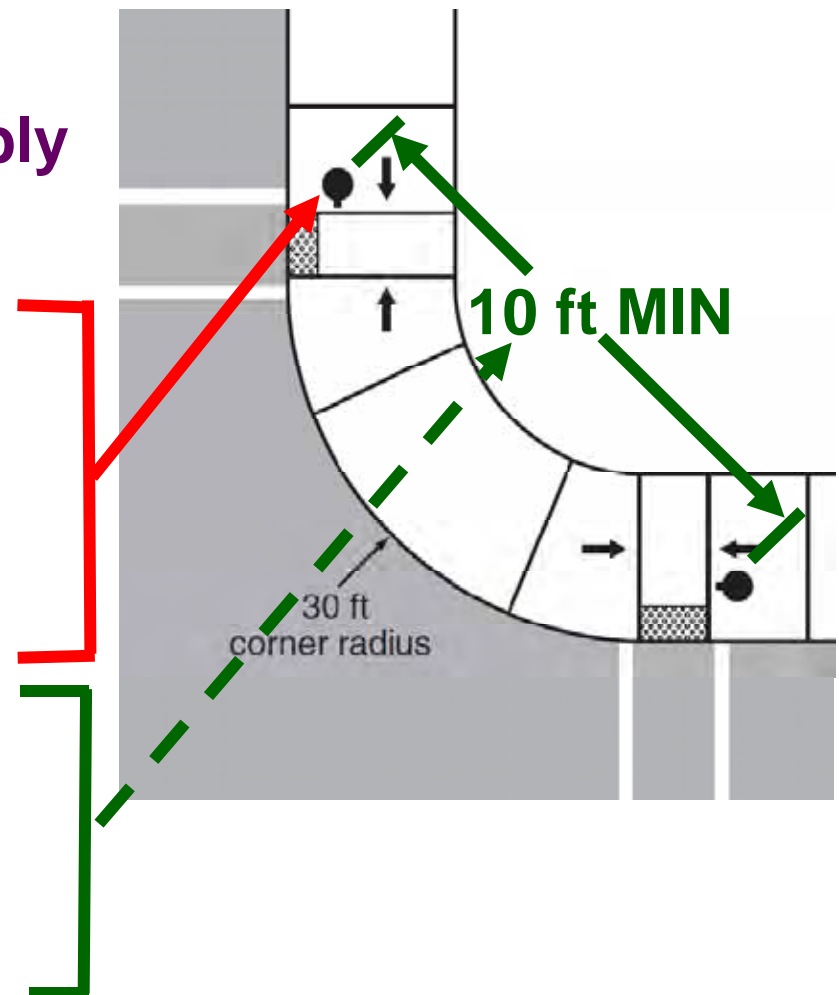
Accessible pedestrian signals (APS) and accessible detectors – combined and reorganized into five new sections

- **4E.09 – General**
- **4E.10 – Location**
- **4E.11 – Walk indications**
- **4E.12 – Tactile arrows and locator tones**
- **4E.13 – Extended press button features**



APS pushbutton locations

- APS pushbutton locations similar to 2003 edition now apply to non-APS pushbutton also (Section 4E.08)
- As close as possible to the crosswalk line furthest from center of intersection, and as close as possible to the curb ramp
- If 2 buttons on same corner, separate them by at least 10 ft. (unless physical constraints make impractical)



APS WALK indications

- Shall provide both in both audible & vibrotactile form
- Shall be same duration as WALK interval
- Audible:
 - Percussive tone (8 to 10 ticks/sec), except if 2 buttons on same corner < 10 ft apart or on same pole – shall use speech WALK message rather than audible tone
 - “(Street Name). Walk sign is on to cross (Street Name).”
- Vibrotactile – vibrating tactile arrow



Tactile arrows and locator tones

- Tactile arrow shall be located on each pushbutton and shall be aligned parallel to the direction of travel on the associated crosswalk
- Locator tone shall be incorporated into each APS pushbutton and shall operate during intervals other than the WALK interval



APS features via extended pushbutton press

- Special features may be actuated by button press of 1 second or more:
 - Longer crossing time
 - Speech information message
 - Audible beaconing



Speech information messages

- Actuated only during intervals other than WALK
- Required if two APS pushbuttons on same corner < 10 ft apart or on same pole (optional otherwise)
- Message format:
“Wait. Wait to cross (Street Name 1) at (Street Name 2)”

Unusual geometry, phasing may also be described



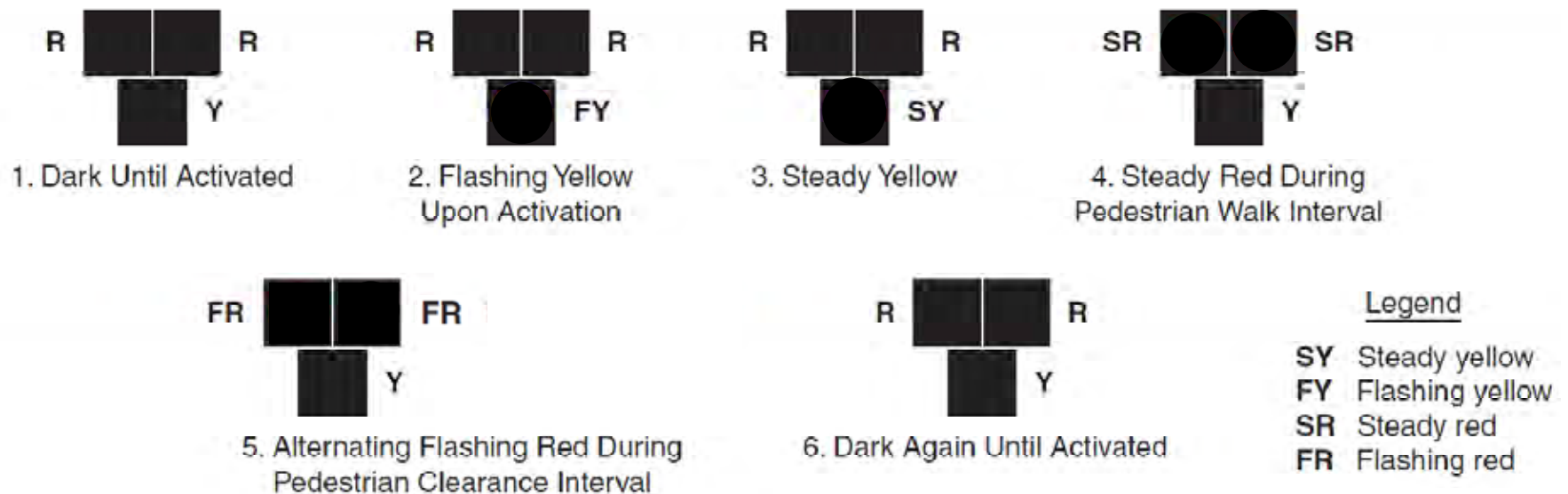
Questions?



**Two new devices in 2009
Federal MUTCD that
may not be included in
the next Texas MUTCD**

Chapter 4F – new pedestrian hybrid beacon: may not be included in Texas MUTCD

Figure 4F-3. Sequence for a Pedestrian Hybrid Beacon

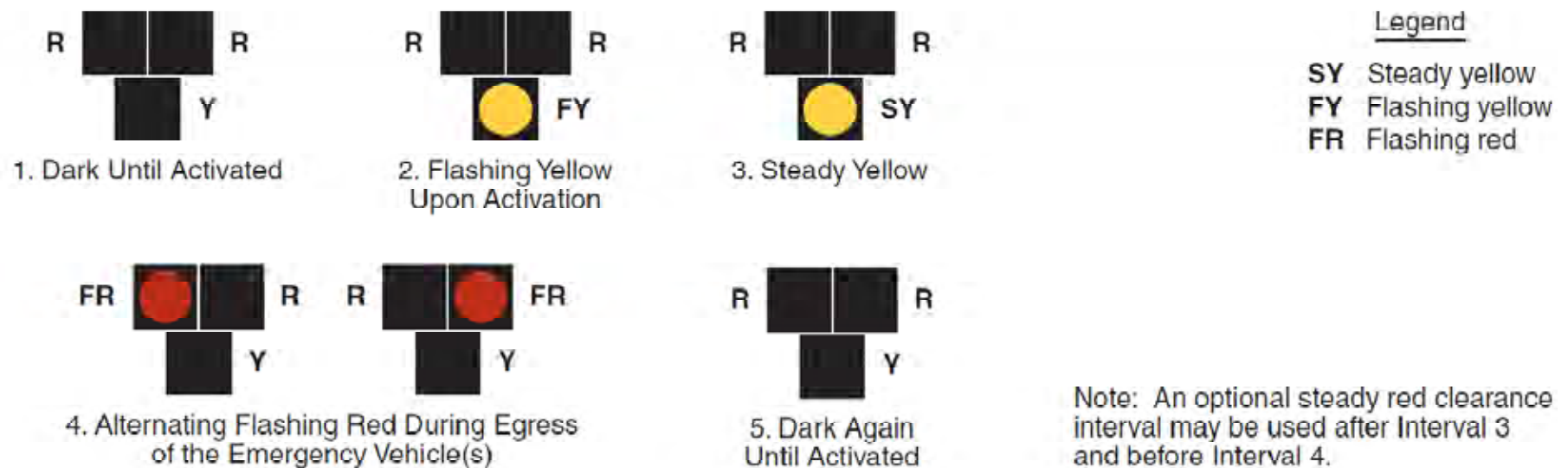


Should not be installed at or within 100 feet of
an intersection



Section 4G.04 – new emergency-vehicle hybrid beacon : may not be included in Texas MUTCD

Figure 4G-1. Sequence for an Emergency-Vehicle Hybrid Beacon



Sec. 544.007. TRAFFIC-CONTROL SIGNALS IN GENERAL

(i) An operator of a vehicle facing a traffic-control signal that does not display an indication in any of the signal heads shall stop as provided by Section 544.010 as if the intersection had a stop sign.

Questions?



Sec. 541.304. *TRAFFIC CONTROL*

(3) "Traffic-control *signal*" means a manual, electric, or mechanical device that alternately directs *traffic* to stop and to proceed.