



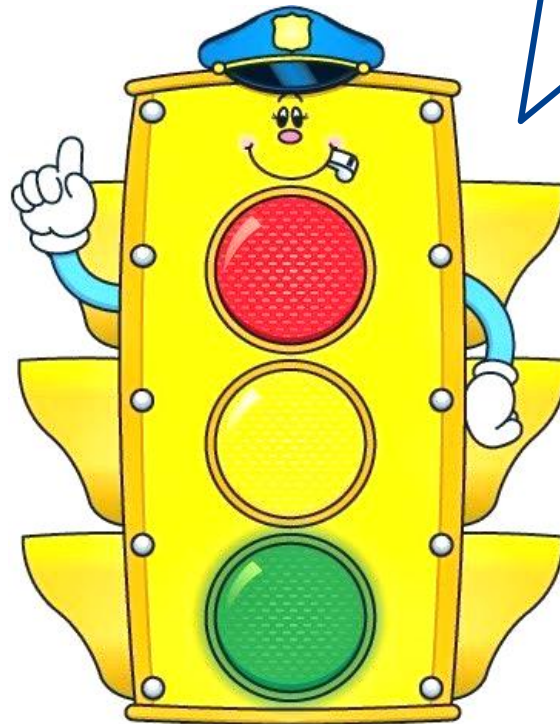
Traffic Signal Design Considerations

Michelle Smith Cavucci, P.E., PTOE

Traffic Signal Industry Forum | October 16, 2017 | Fairfax

Agenda | Signal Design Considerations

- Designing with the new standards & specifications
- Designing for pedestrians
- Recent TE policy
- Common design challenges
- New NRO file repository



A few more things to think about!

Designing for the New Standards and Specifications

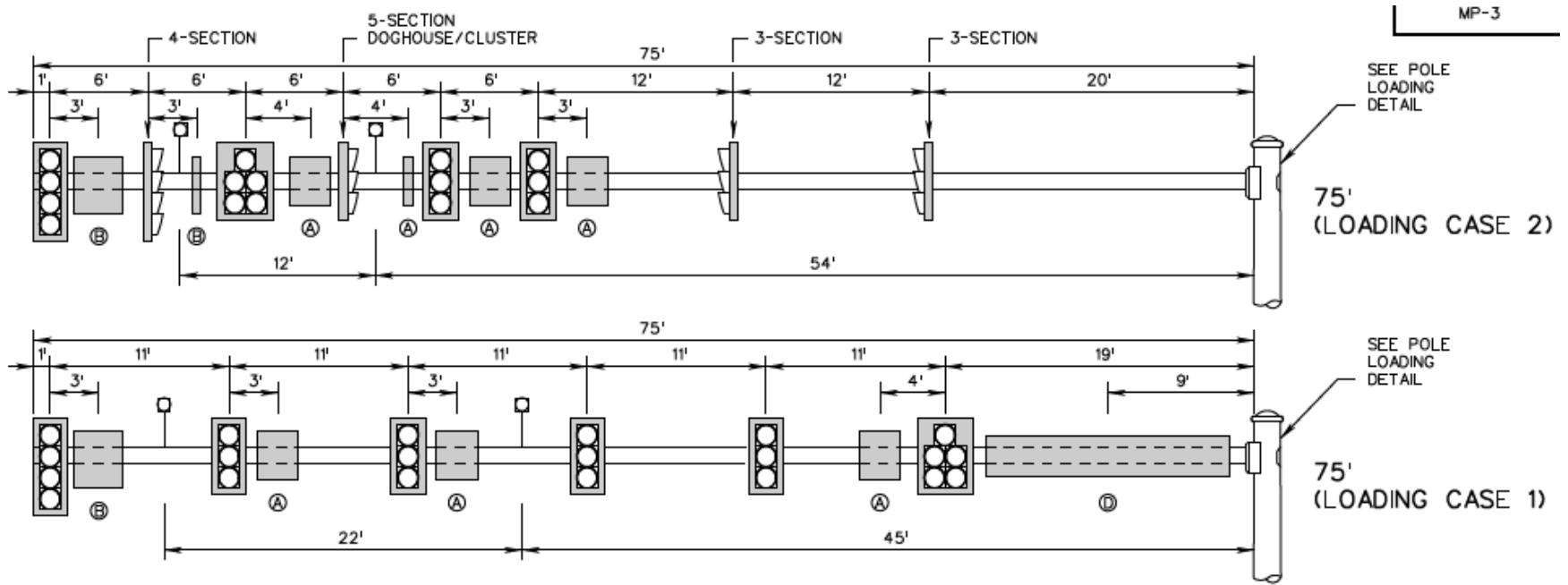
Signal Poles | *Signal Design Considerations*

- New MP-3
- Mast arms and poles are now separate pay items
- New pay items for different arm lengths

Pole Types – Poles without Luminaire Arm

Pole Type	# of arms	Maximum Allowable Loading as per Standard MP-3	Length of Pole (tip to bottom of base plate)
A	1	49 ft Loading Standard	19
B1	1	75 ft Case 1 Loading Standard	19
B2	1	75 ft Case 2 Loading Standard	19
C	2 (mounted at 90 degrees to each other)	70 ft Loading Standard & 60 ft Loading Standard	19

Signal Poles | Signal Design Considerations



- Standard loadings applied for different arm lengths
- When using standard poles/arms, the designer is responsible for verifying the actual loadings do not exceed standard loadings

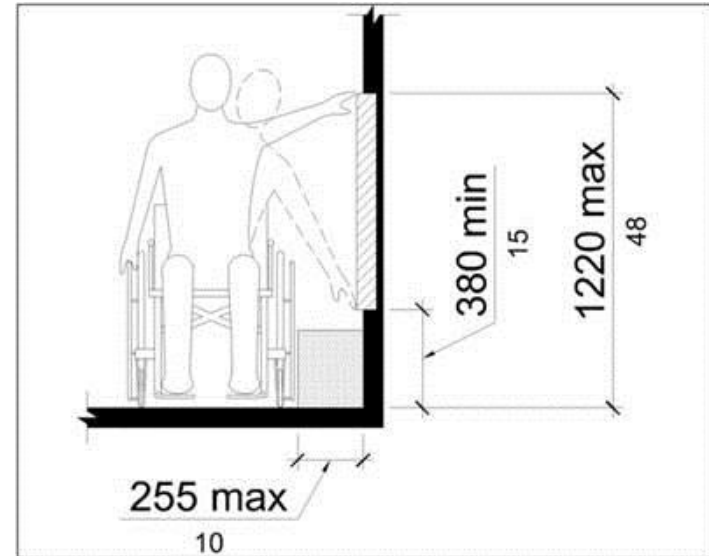
Pole Foundation | *Signal Design Considerations*

- New PF-8
- Foundations are elevated 1-ft above grade
- When constraints make meeting the 1-ft requirement impractical, document rationale
- Ongoing NRO pilot project using smaller diameter foundations & poles ($\leq 49'$ arms)



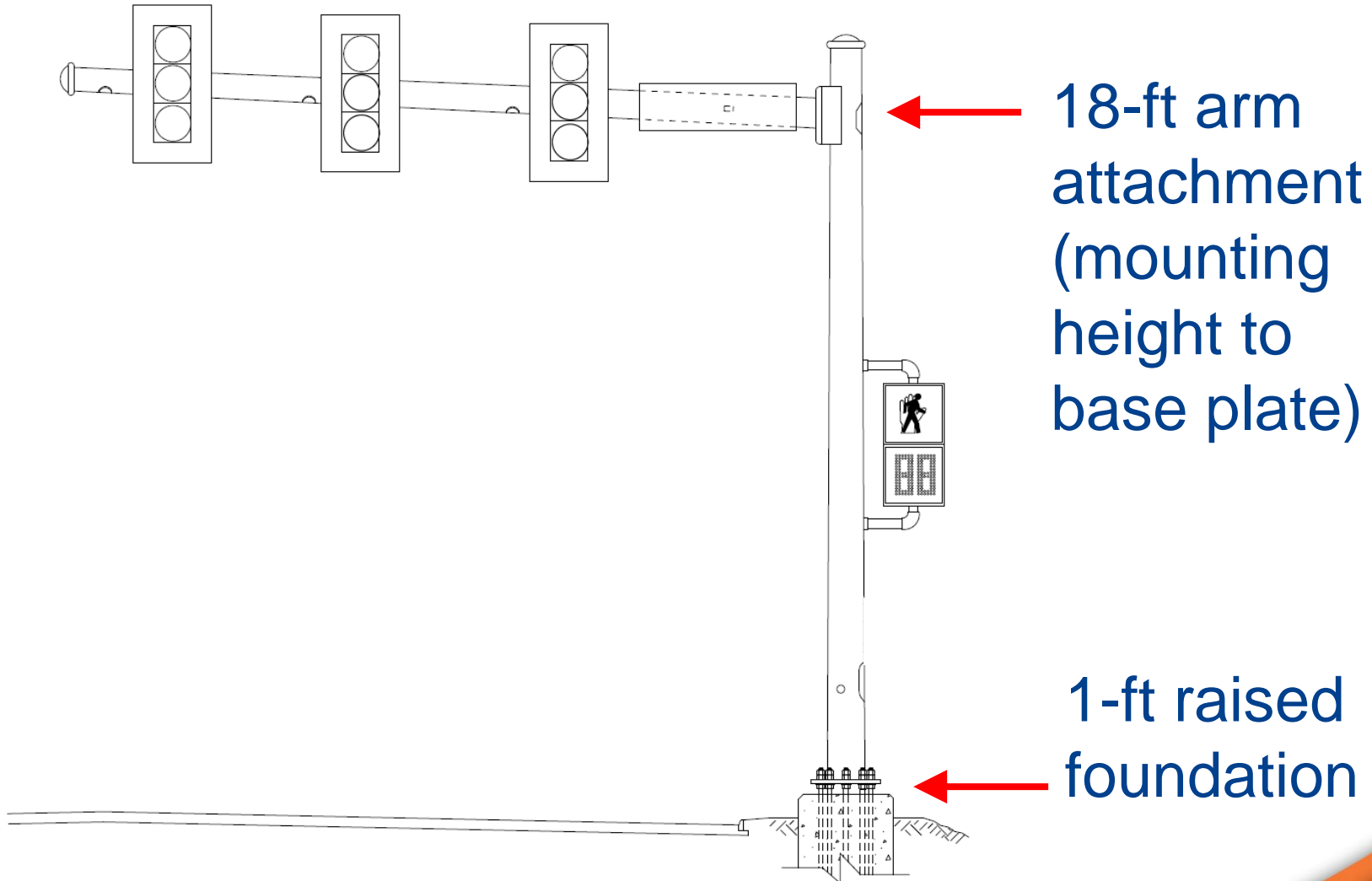
Pole Foundation | *Signal Design Considerations*

- Fixed object is the face of foundation now
- Edge of foundation
 - 1-ft from pedestrian paths
 - 3-ft from shared use paths
- Pushbuttons on separate pedestals to achieve lateral reach distance



PROWAG, Figure R406.3 Unobstructed Side Reach

Signal Poles | *Signal Design Considerations*



Electrical Service| Signal Design Considerations

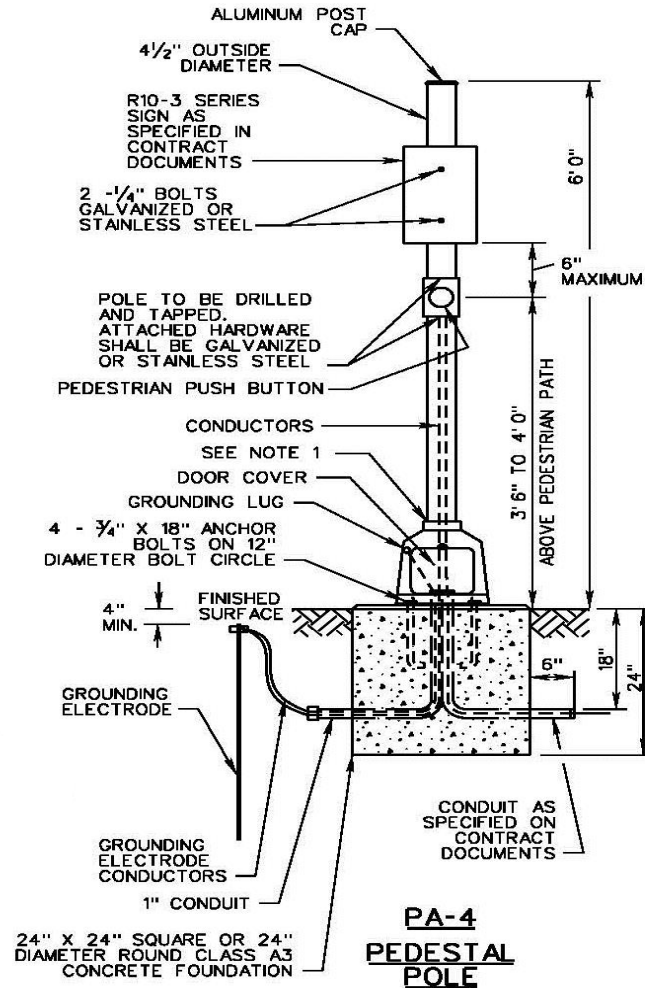
- Electrical service work pad – *a separate pay item*
- The designer should specify this on the design plans when it is needed under:
 - Safety switches
 - Breaker boxes
 - Pole-mounted controller cabinets



Electrical service
work pad needed


New PB Option | Signal Design Considerations

- PA-4 standard with breakaway transformer base
- Remember upcoming change in pay item (pole and foundation separate)



Designing for Pedestrians

Pedestrians| *Signal Design Considerations*

 Northern Region Traffic Engineering Practice	No. 403.1
Pedestrian Accommodations at Traffic Signals	August 7, 2014

- Pedestrian signal heads **shall be provided to serve pedestrians crossing all legs of all intersections, except where one or more noted exceptions applies.**
- Leading Pedestrian Interval (LPI) - *should be used when a pedestrian phase is served at the same time as a conflicting permissive only left turn.*

Pedestrians| *Signal Design Considerations*



- Signal pole hand hole located on side opposite the mast arm attachment
- No pushbuttons on this side of pole – use separate pedestal pole instead
- Pushbutton exceeds maximum height



Pedestrians| *Signal Design Considerations*



- Coordinate signal design with road and streetscape design
- Pushbutton extenders have become more widespread and durable



APS | *Optimal Pushbutton Placement*

- Two poles separated by 10-ft minimum
- 1.5-ft to 6-ft from edge of curb, shoulder, or pavement (no more than 10-ft)
- Less than 5-ft from the edge of crosswalk line extended
- On the side of crosswalk farthest from the intersection (i.e., the outside)



Signal Design - Recent Policy Updates

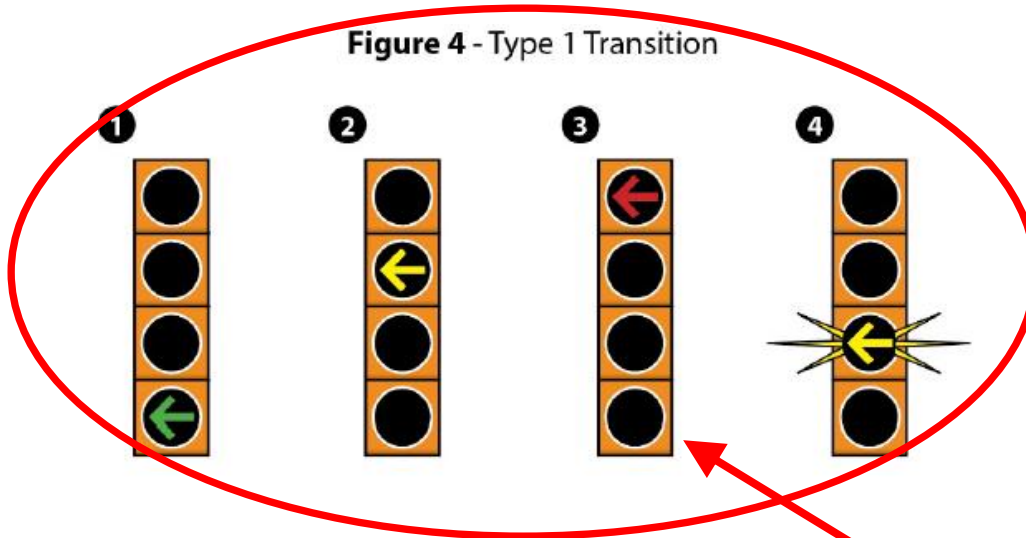
IIM-TE-381 FYA | *Design Considerations*

- Recommends FYA for all protected/permissive left turns when exclusive turn lane exists
- Option for permissive-only left-turn movements when an exclusive turn lane exists
- Recommends use of regulatory sign

Figure 6 - R10-V1



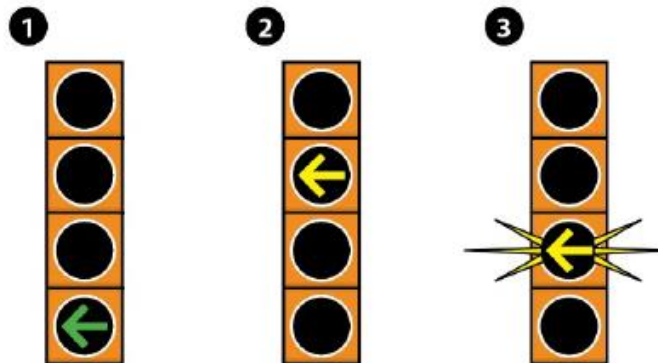
FYA | NoVA Preferred Transition



Clearance Chart

R/W	CLEARANCE		NEXT PHASE
	1	2	
G	Y	R	FY

Figure 5 - Type 2 Transition

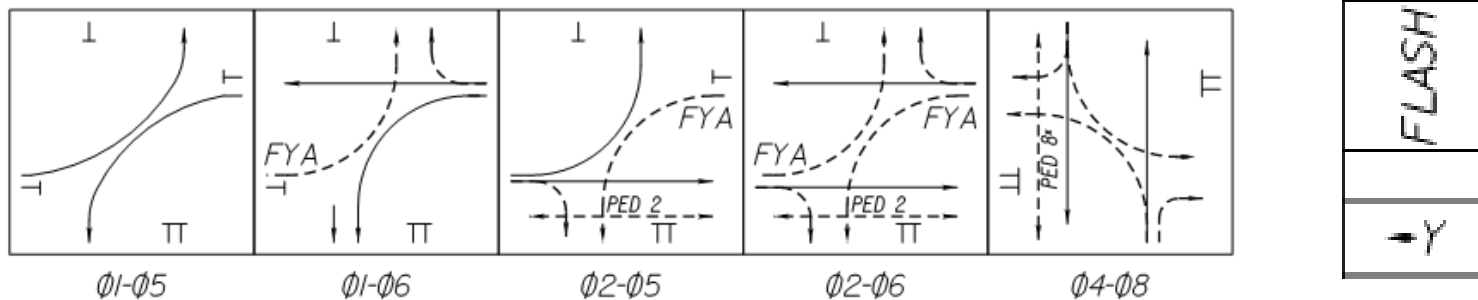


Include full all-red time, calculated per latest IIM-TE-306

FYA | Things to Remember

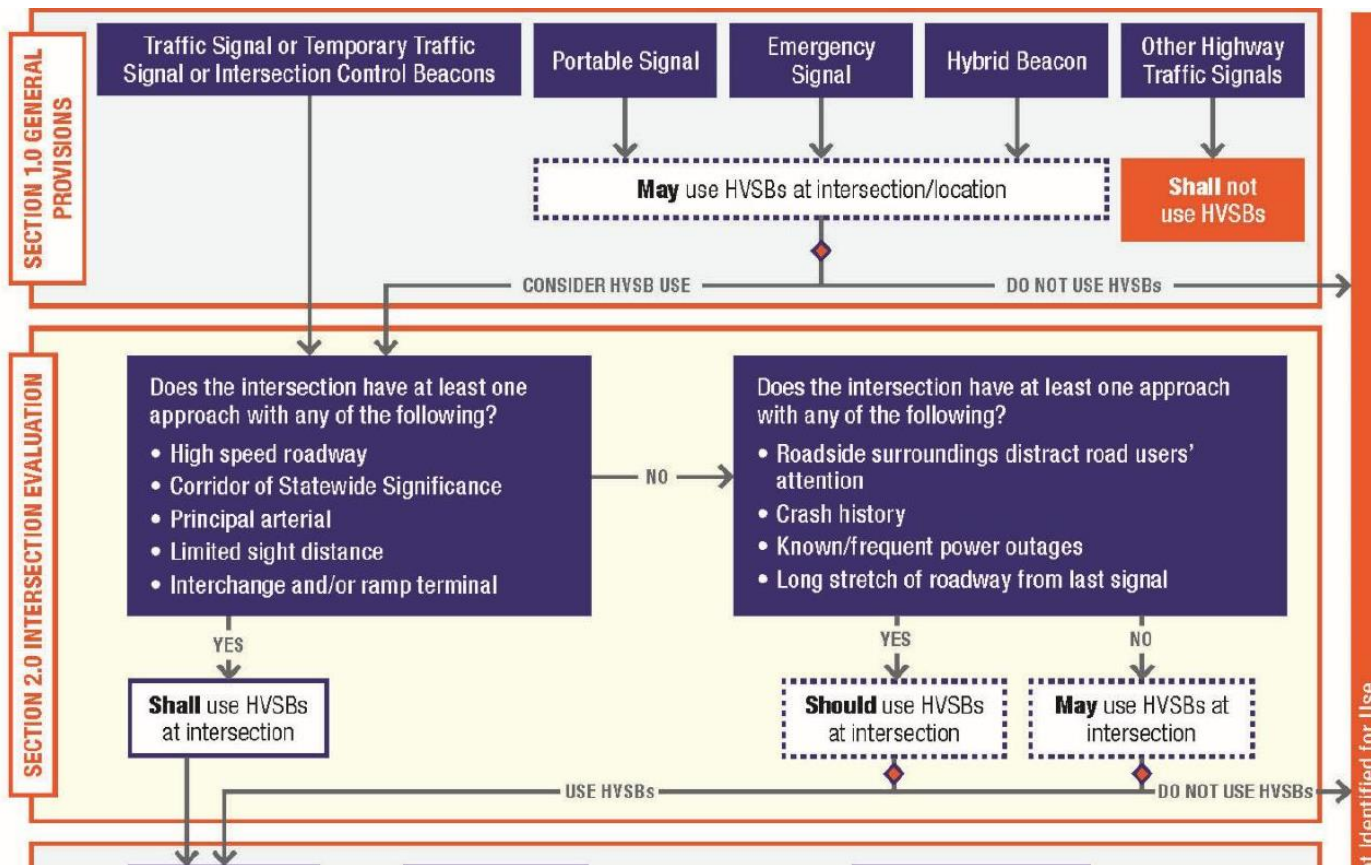
- Protected-permissive no longer a shared signal face with the adjacent through movement
 - Ability to operate permissive phase during opposing approach phase
- When operating on FLASH, the steady yellow indication is the one to flash (not the FY)
- 2070 controller needed (not 170)

Phasing Diagram



TE-378 HVSB | *Design Considerations*

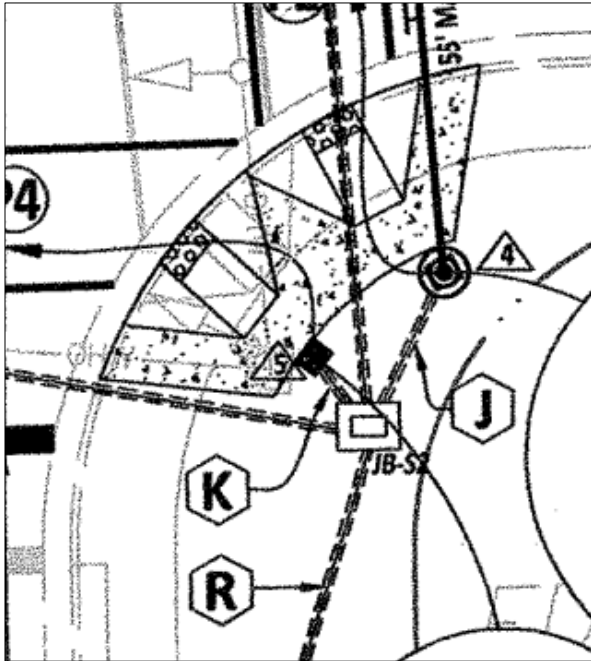
- Requirements, recommendations, and options for use of High Visibility Signal Backplates (HVSBs)



Common Challenges in Signal Design

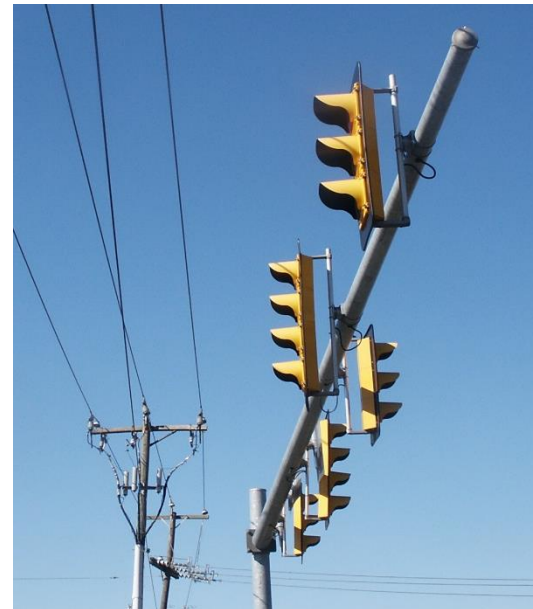
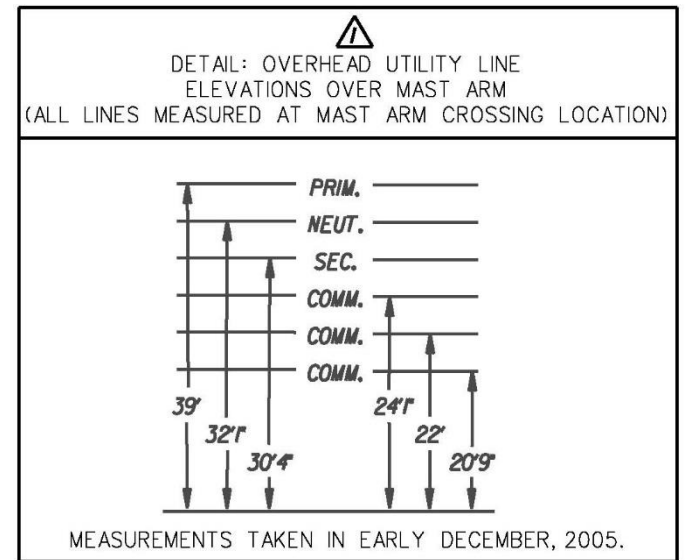
Common Design Challenges | *Signal Plans*

- Consideration of vertical conditions



Common Design Challenges | Signal Plans

- Clearance to overhead utility lines
 - NESC
 - Consider potential sag of heavier lines during warmer temperatures
 - Range of mast arm rise
 - Equipment that extends above the arm
- Clearance to underground utilities
 - Virginia Underground Utility Damage Prevention Act



Common Design Challenges | *Signal Plans*

- Street name signs on diagonal arms



New NRO Website for Public Files

NoVA Documents | *NRO Public Files Website*

VDOT Virginia Department of Transportation

Northern Region Operations
Public Files

VDOT Homepage

- Home
- NRO Practices
- 2015 Signal Industry Workshop
- 2016 Signal Construction Industry Forum

Questions?

For questions regarding use of this website, contact [Michelle Cavucci](#) via email.

Useful Links

- [VDOT Traffic Engineering Division](#)
- [VDOT Traffic Engineering Design Manual](#)

VDOT Northern Region Operations Public Files

Welcome to the Northern Region Operations public file-sharing website. This site contains reference files and region-specific guidelines for use by the industry. You will find files here related to traffic engineering regional practices, the permit process for signals, signal timing, and design preferences, as well as materials from previous and upcoming events led by Northern Region Operations and Traffic Engineering teams.

We appreciate your interest in this information as it relates to your projects on VDOT-maintained roadways in Northern Virginia. If you have any questions related to the document content on this website, please contact [Tina Ho](#) via email.

Public File Categories

- [NRO Practices](#)
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- [VDOT Traffic Engineering Division](#)
- [VDOT Traffic Engineering Design Manual](#)

NRO Practices

-  [NOVA Permits Process for Traffic Signal Construction \(Adobe PDF, 0.2MB\)](#)
-  [NRO Bicycle Marking Reference Guide \(Adobe PDF, 0.2MB\)](#)
-  [NRO Change and Clearance Interval Data Collection Processing Best Practices \(Adobe PDF, 1.5MB\)](#)
-  [NRO Pavement Marking Reference Guide 2014 \(Adobe PDF, 0.3MB\)](#)
-  [NRO TEP 301.1 Pavement marking at intersections \(Adobe PDF, 0.2MB\)](#)
-  [NRO TEP 303.1 Hatch marks \(Adobe PDF, 0.2MB\)](#)
-  [NRO TEP 401.1 Ped crossing time \(Adobe PDF, 0.1MB\)](#)
-  [NRO TEP 403.1 Pedestrians at signals \(Adobe PDF, 0.1MB\)](#)
-  [NRO TEP 406.2 Clearance intervals \(Adobe PDF, 0.1MB\)](#)
-  [NRO TEP 701.1 School Zone Speed Limits \(Adobe PDF, 0.1MB\)](#)
-  [NRO TEP 901.1 BMUFL _Sharrows \(Adobe PDF, 0.2MB\)](#)
-  [NRO TEP 902.1 Signing and Marking For Sidewalks and Sidepaths \(Adobe PDF, 0.1MB\)](#)
-  [Signal Timing Review Process for Permit Projects \(Adobe PDF, 0.3MB\)](#)

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2016 Signal Construction Industry Forum Files

- [0_2016 Forum Opening Remarks_Cavucci \(Adobe PDF, 0.3MB\)](#)
- [1_Traffic Signal Permits_Kroskie \(Adobe PDF, 0.2MB\)](#)
- [2_Statewide Standards Specs Updates_Lipschultz \(Adobe PDF, 1.0MB\)](#)
- [3_Statewide Standards Specs Structural_Larson \(Adobe PDF, 0.6MB\)](#)
- [5_Signal Maintenance Challenges_Horodyskyj \(Adobe PDF, 0.1MB\)](#)
- [6_Q&A Presentation Slides_Cavucci \(Adobe PDF, 1.1MB\)](#)
- [Q&A Summary Responses \(Adobe PDF, 0.3MB\)](#)

Questions – save for later!

