

Chapter 1

INTRODUCTION

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1 INTRODUCTION

The material contained herein is for information purposes only and may be used to aid new employees and those unfamiliar with ODOT traffic engineering practices, in accessing and applying applicable standards, statutes, rules, and policies related to traffic signal operation and design.

There are two main manuals that shall be used to create Traffic Signal Plans and Specifications on the state highway system:

1. ODOT Traffic Signal Design Manual
2. ODOT Traffic Signal Drafting Manual

The ODOT Traffic Signal Design Manual focuses on the design aspects of traffic signals while the second manual focuses on the drafting of the completed design. Both manuals assume you have a basic understanding of the topics presented.

1.1 About Us

The Traffic Signal Standards Unit is responsible for maintaining and interpretation of the ODOT Traffic Signal Design Manual. This group is part of Traffic Engineering Services, which is a unit within the Traffic-Roadway Section.

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1.2 Availability

This manual is a web-only document, which can be accessed and printed in its entirety from the ODOT Traffic Signal Information web site:

<http://www.oregon.gov/ODOT/Engineering/Pages/Signal-Design-Manual.aspx>

1.3 Updates

This manual is updated continually and revisions will be made as necessary, typically on a yearly basis in June or July. The revised manual becomes effective on the official revision date (month/year format). All design work prior to final plans shall follow the requirements of the current version of this manual.

If you wish to receive notification of future revisions of this manual and other updates for ODOT traffic signal standards, subscribe to our e-mail notification system by e-mailing the [Traffic Signal QC Engineer](#).

1.4 Change Requests

If you would like to suggest changes to the ODOT Traffic Signal Design Manual, please contact the [Traffic Signal QC Engineer](#).

1.5 Document Revision Summary

1.5.1 Revision: December 2013

- Complete reformat of document
- New information on video detection
- New information on roadway design
- New procedure for Railroad Preemption Plan Sheet
- New information on operational approval
- New information on design approval

1.5.2 Revision: October 2014

- Minor revisions based on comments received during the draft manual release in December 2013

1.5.3 Revision: January 2016

Chapter 2 Design Approval Process:

1. Figure 2-1 (organization chart) – updated chart
2. Section 2.5 (Design Approval Process): Info on plan requirements at each milestone

Chapter 3 Signal Operation & Operational Approval:

3. Section 3.3.1 (ring and barrier diagram) – added bold note clarifying intent of the ring and barrier diagram; to clearly show the conflicts that require conflict monitoring.
4. New Section 3.3.3 (Flashing yellow left turn arrow with NOT-PED) – This section was added to describe the FYA not-ped feature and explain why it is NOT shown in the ring and barrier diagram.
5. Section 3.3.5 (not-ped overlap phases) – added a note to reference new section 3.3.3 (flashing yellow left turn arrow with NOT-PED) to make sure designers go to the right section for FYA not-ped info.
6. New Section 3.3.6 (Pedestrian Overlap Phases) – This section was added to describe pedestrian overlaps. Added new figure in this section.
7. Updated Figure 3-9 (ring & barrier diagrams: Multiple intersections using a single controller, example 1) – revised OLA designations from “,” to “&” for consistency. Fixed lane use typo.
8. Updated Figure 3-10 (ring & barrier diagrams: Multiple intersections using a single controller, example 2) – revised OLA designations from “,” to “&” for consistency
9. New Section 3.3.11 (dummy phases) – this section was added to describe dummy phases. Added two figures to this section showing a dummy phase.
10. Updated Figure 3-11 (ring & barrier diagrams: Multiple intersections using a single controller, example 3) – revised OLA designations from “,” to “&” for consistency

Chapter 5 Signal Plan:

11. Section 5.2 (Vehicle signal head layout) – added two bullets, signal heads should be mounted overhead and they should be aligned vertically.
12. Added new section 5.2.3 (supplemental near-side signal heads) – added info to clarify and show examples of use of near side signal heads.
13. Section 5.2.5 (signal head louvers and cut-off visors) – added cut off visors to this section and a new figure
14. Table 5-3 (standard signal heads for right turn phases) – added 2 rows to the table to describe standard heads for signalized right turn slip lanes (Type 3R only, NOT type 2). Clarified that the opposing left turn CAN NOT be a permissive left turn if there is single receiving lane. Added figure 5-23 (signal head placement for right turn phases – Right turn slip lanes)
15. Table 5-3 (standard signal heads for right turn phases) – added a reference to the MUTCD section that prohibits a permissive opposing left turn movement and protected right turn movement to occur concurrently.

16. New Section 5.3.2 (Street name signs and guide signs – custom designed signs) – moved some info about custom signs into its own section for easier reference. Added info about max size of custom sign.
17. Section 5.6 (illumination) – hyperlinked lighting manuals to illumination webpage
18. Section 5.6 (illumination) – added new section for LED fixtures & changed standard from HPS to LED as per the Illumination Engineer
19. Section 5.6.2 (illumination wiring) – added a bullet point describing TC cable and a bullet describing bond wire
20. Section 5.9 (battery back-up) – deleted erroneous reference to Signal Policy and Guidelines (SP&G) – added information that was once contained in the SP&G.
21. Section 5.10.1 (Controller Cabinets/Location): Info on opening cabinet door off right-of-way
22. Section 5.13.1 (Conduit Size): 2” spare conduit for detection required between signal pole and first JB in the same quadrant. To allow for future retrofit of alternative detection.
23. Figure 5-17 (signal head types) – updated figure to include Type 1R and Type 1Y.
24. Figure 5-27 (signal head placement for right turn phasing) – updated the sign used with the Type 5 signal head (from OR22-14 to OR10-15)
25. Figure 5-31 & 5-32 (common signs used for traffic control) – updated sign AL/12: removed OR22-14 (“right turn yield to peds on green ball symbol”) info and replaced with OR10-15 (turning vehicles stop for ped) info. Added sign AL/3T (“No trucks” R5-2) and sign AL/20 (“Except bus” OR3-7a)
26. Figure 5-33 (signs no longer used) – added OR22-14 to the list.

Chapter 6 Detector Plan:

27. New Section 6.3.2 (Overlap Phase Detection) – added this section discuss the need for overlap phase detection to be assigned to a parent phase.
28. Section 6.4 (standard detection layout) – revised this section to be more general and moved the chart into the Inductive loop detection section. Added a figure illustrating the standard layout
29. Section 6.6 (detector input file) – added “stretch” to CO (carryover) definition.
30. Section 6.6.1 (332S cabinet: 2070 controller with a C11 connector) – changed the 8 asterisks locations to include “count” as a function, as per Darren Lawrence.
31. Section 6.7.12 (Induction Loop Detection/Conduit): 2” spare conduit for detection required between signal pole and first JB in the same quadrant. To allow for future retrofit of alternative detection.
32. Section 6.7.12 (induction Loop Detection/Conduit): added info as per Region 4 - Regions may have a larger minimum conduit size than the statewide minimum – verify with Region.
33. Section 6.8.3 (Standard video detection zone layout) – revised this section to show new video detection standard layout. Added a figure illustrating the standard layout.
34. Section 6.10 (radar detection) – separated the radar and microwave detection information. Revised and added radar information. Added new radar detection standard layout. Added a figure illustrating the standard layout.
35. Section 6.12 (Use of multiple detection technologies at a single intersection) – added language to limit this to 2 max.

- 36. Figure 6-43 (camera labeling) and section 6.8.1 (camera placement and labeling) – fixed a typo (clockwise changed to counterclockwise)
- 37. Figure 6-52 (use of inductance loops and video detection at the same intersection) – updated illustration to reflect current standards for video detection placement.

Chapter 9 Details Plan

- 38. Section 9.3.3 (equipment on mast arm) – fixed a typo – should be rounded to nearest ½ foot, not 1/10 of a foot.
- 39. Section 9.3.5 (Luminaires) – changed standard from HPS to LED

Chapter 11 Temporary Signal Plan

- 40. Section 11.6.3 (Service Cabinet and Meter Base) – Reference to old standard details was removed and reference to revised standard drawing added.

Chapter 19 Specifications, Bid Items & Cost Estimate

- 41. Section 19.2 (Review & Approval of the special provisions) – added a reference to figure 19-4 as an example of a modification that requires review and concurrence of the technical expert.
- 42. Added new section 19.4 (letter of public interest finding) – this section was added to explain when and why this is needed.

Chapter 20 Cabinet Prints

- 43. Section 20.3 (procedure for producing cabinet prints) – revised this section based on the new procedure established in Sept 2014.
- 44. Section 20.4 (creating the cabinet print) – made a few revisions (file naming convention and added info about FINAL CABINET PRINTS location)
- 45. Chapter 20 (Cabinet Prints) – reformatted chapter to follow 332S cabinet print layout. Added info about 332S cabinet.

Chapter 23 Quick Reference

- 46. Chapter 23 (Quick reference) – Added video and radar detection information. Revised layout of detection/input file info.
- 47. Chapter 23 (Quick reference) – updated sign info (AL/12).
- 48. Chapter 23 (Quick reference) – added info for cabinet limitations (input, output and conflict monitor constraints)
- 49. Section 23.3 (loop detector information): added info as per Region 4 - Regions may have a larger minimum conduit size than the statewide minimum – verify with Region.
- 50. Section 23.6 (sign information): updated chart to include signs AL/3T, AL/20 and the revised AL/12.
- 51. Section 23.7 (junction box & conduit information): 2” spare conduit for detection required between signal pole and first JB in the same quadrant. To allow for future retrofit of alternative detection.
- 52. Section 23.13 (junction box and conduit information): added info as per Region 4 - Regions may have a larger minimum conduit size than the statewide minimum – verify with Region.
- 53. Chapter 23 (Quick reference) – added info about the checklists and hyperlinked examples

1.5.4 Revision: June 2017

1. Updated web link on cover page
2. General, minor wordsmithing on several areas (content and intent remain unchanged).

Chapter 1 Introduction

3. Section 1.1: About Us – Added Jeff Hayes contact information
4. Section 1.2: updated web link to manual
5. Section 1.3: changed updated frequency from twice a year to once a year
6. Section 1.3: added link to our subscribe/unsubscribe list for e-mail notification of changes and updates to the manual

Chapter 2 Design Approval Process

7. Section 2.1: updated Figure 2-1 (organization chart)
8. Section 2.2: added info about Roadway Design Exceptions for ADA pushbutton accessibility and link to section 5.4 for more info.
9. Section 2.5: added “temporary workzone” to list of other disciplines plans that could be helpful during review
10. Section 2.8: Added quick reference section electrical crew preferences form

Chapter 4 Starting the Design

11. Section 4.3.2: updated hwy number cross reference guide web link

Chapter 5 Signal Plan

12. General – added note at beginning to go to quick reference chapter for electrical crew preferences form
13. Section 5.1.2: added language to verify crosswalk closures (even existing closed crosswalks) have been approved by the STRE.
14. Section 5.1.3: added language that doesn’t require curb ramps if there is no sidewalk, such as at rural intersections (specifies curb ramps are required if sidewalk is present)
15. Figure 5-1 Standard Closed Crosswalk Signing support and installation (TM490): updated figure to match current TM490
16. Section 5.1.2: changed clearance from barricade from 4’ to 5’ min as per TM490
17. Section 5.1.3: Added information related to new ADA requirements for ramp design and updated figure 5-4, figure 5-5, figure 5-6, and figure 5-7.
18. Added new section 5.1.4: information on Roadway ramp detail sheets and pole locations.
19. Section 5.1.4: Changed requirement for a two-phase pedestrian crossing configuration from “shall be staggered...” to “should be staggered”. And added language about countdown heads mitigating the confusion associates with non-staggered two-phase pedestrian crossings.
20. Section 5.2.1: deleted bi-modal and one section signals from list of unique heads (now are listed on TM460)
21. Figure 5-17 Signal Head Types: updated to include new signal head types defined on TM460
22. Table 5-2 Standard signal Heads for Left Turn Phases: Added info for Type 3LCF and Type 3LBF signal heads.

23. Figure 5-27 Signal Head Placement for Left Turn Phasing: Updated figure to include Type 3LCF and 3LBF heads. Deleted illustration that showed using a type 4L signal head with an approach that does not have an exclusive left turn lane (this is not allowed by MUTCD section 4D.17 paragraph 06)
24. Figure 5-40 Common signs used for traffic control: Added “STRE approval required” for signs AL/3U and AL/3T (U-Turn Permitted and No trucks)
25. Section 5.4 (Pedestrian Signal Equipment Layout): completely revised with added information related to ADA pushbutton accessibility from technical bulletin TRS16-01(B). Additional info for two ramps sharing one turning space.
26. New section 5.4.8 Pushbutton located behind guardrail: Revised information allowing pushbuttons located behind guardrail.
27. Section 5.4.10 Indication Type: Changed “shall” to “Should” for upgrading all pedestrian signals for an entire intersection at the same time to allow more flexibility for ADA constraints.
28. Section 5.5.5: changed illumination requirements from “if warranted” to a default standard of including illumination on all mast arm and strain poles at an intersection.
29. Section 5.5.7: removed “signalized right turn slip lanes” from list of typical vehicle pedestal installations
30. Section 5.5: added info about pushbutton mounting (pedestals = yes, big poles =no) with reference back to section 5.4
31. Section 5.6: changed illumination requirements from “if warranted” to a default standard of including illumination on all mast arm and strain poles at an intersection.
32. Section 5.15.6: corrected typo for wiring of Type 6L head.
33. Section 5.6.1: deleted statement about contacting illumination engineer for new LED spec (02926) as it is now published.
34. Section 5.7: modified language for fire preemption for clarity
35. Figure 5-56 Standard Drawing TM470 Signal head wiring: updated to include Types 3LBF and 3LCF. Removed Type 4L
36. Updated Figures 5-57 thru 5-63 and corresponding text (wiring for signal head types) to match updated TM460

Chapter 6 Detector Plan

37. Fixed counterclockwise typos for radar and video camera labeling

Chapter 11 Temporary Signal Plan

38. Section 11.2 – added restriction to allow only one signal mast arm to be installed per intersection at day of turn on.
39. Section 11.6.5 – made reference to section 5.4 for pushbutton accessibility requirements
40. Figure 11-15 – fixed typo in lane use in the phase rotation diagram
41. New Section 11.7.3 Stop Line Location

Chapter 12 Flashing Beacon Plan

42. Section 12.4.6 added reference to new moveable bridges chapter
43. Section 12.2: added Standard Detail references for solar power RRFB to list

44. Section 12.6: deleted reference to an old (no longer accessible) standard detail DET4414

Chapter 13 Ramp Meter Plan

45. Removed references to TM497 (details have since been deleted from this drawing).
46. Removed references to TM497 (deleted) and replaced with TM492

Chapter 16 Railroads

47. Section 16.3: added language, "The Crossing Order must be completed prior to PS&E."
48. Section 16.6.1: added provision for allowing one 10 conductor 12 AWG gauge conductor cable instead of individual conductors at the Region Electrical Crew direction.
49. New section 16.4 Railroad Utility Permits

Chapter 17 Fire Signal Plan

50. Section 17.4.1: added a provision for flashing yellow operation on the mainline if the STRE Operational Approval documents the use. For example a unique application: the fire signal in downtown Roseburg on Douglas Ave uses Flashing Yellow due to the extremely close proximity to a traffic signal and is meant to approaching stop vehicles while the traffic signal clears the queue that blocks the fire entrance.
51. Section 17.4.3: Removed single circular green signal indication as an option for a confirmation light. Only option is a tattle-tail indicator due to the simplicity of a direct hardwire.
52. Section 17.4.5: revised information for Tattle-tail indicators and referenced DET4400

Chapter 19 Specifications Bid Items and Cost Estimates

53. Section 19.5.1: added clarification to power hook-up anticipated cost (includes conduit, trenching and wiring from the power source to the service)

Chapter 20 Cabinet Print

54. Section 20.1: added language requiring cabinet prints for temporary signals (for each stage/phase there is a change to interior components)
55. Section 20.4: changed format of prints from 8.5x11 to 11x17
56. Section 20.6: deleted requirement for TSSU to complete the conflict monitor diode card
57. Section 20.6.3: revised section to describe to designers how to complete the conflict monitor diode card
58. Section 20.6.5: fixed typo – A6 (not A4) is not monitored
59. Section 20.9: added Railroad preemption site specific constraints to list of info that should be on the intersection drawing.

Chapter 21 Construction Support

60. Added new section 21.4.1 for Field verification forms (Signal Pole and Signal Pole Foundation)

Chapter 23 Moveable Bridges

61. Added an entire new chapter

Chapter 24 Quick Reference

62. Added section 23.14: electrical crew preferences with forms.