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# Traffic Signal Features

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## A. Traffic Control Signal Features

The MUTCD [Chapter 4D](#) Traffic Control Signal Features establishes traffic signal uniformity and serves as a critical resource for checking each traffic signal design. The features of traffic control signals of interest to road users are the location, design, and meaning of the signal indications. Uniformity in the design features that affect the traffic to be controlled, as set forth in the MUTCD, is especially important for reasonably safe and efficient traffic operations. This chapter includes the following sections:

[Section 4D.01](#) General

[Section 4D.02](#) Responsibility for Operation and Maintenance

[Section 4D.03](#) Provisions for Pedestrians

[Section 4D.04](#) Meaning of Vehicular Signal Indications

[Section 4D.05](#) Application of Steady Signal Indications

[Section 4D.06](#) Application of Steady Signal Indications for Left Turns

[Section 4D.07](#) Application of Steady Signal Indications for Right Turns

[Section 4D.08](#) Prohibited Steady Signal Indications

[Section 4D.09](#) Unexpected Conflicts During Green or Yellow Intervals

[Section 4D.10](#) Yellow Change and Red Clearance Intervals

[Section 4D.11](#) Application of Flashing Signal Indications

[Section 4D.12](#) Flashing Operation of Traffic Control Signals

[Section 4D.13](#) Preemption and Priority Control of Traffic Control Signals

[Section 4D.14](#) Coordination of Traffic Control Signals

[Section 4D.15](#) Size, Number, and Location of Signal Faces by Approach

[Section 4D.16](#) Number and Arrangement of Signal Sections in Vehicular Traffic Control Signal Faces

[Section 4D.17](#) Visibility, Shielding, and Positioning of Signal Faces

[Section 4D.18](#) Design, Illumination, and Color of Signal Sections

[Section 4D.19](#) Lateral Placement of Signal Supports and Cabinets

[Section 4D.20](#) Temporary Traffic Control Signals

[Section 4D.21](#) Traffic Signal Signs, Auxiliary

Accompanying MUTCD figures and tables for signal features include:

[Table 4D-1](#) Minimum Sight Distance

[Figure 4D-1](#) Maximum Mounting Height of Signal Faces Located Between 40 Feet and 53 Feet from Stop Line

[Figure 4D-2](#) Horizontal Location of Signal Faces

[Figure 4D-3](#) Typical Arrangements of Signal Lenses in Signal Faces

## B. Pedestrian Control Features

The MUTCD [Chapter 4E](#) Pedestrian Control Features establishes pedestrian control uniformity and serves as a critical resource for checking each traffic signal design. Pedestrian signal heads provide special types of traffic signal indications exclusively intended for controlling pedestrian traffic. These signal indications consist of the illuminated symbols of a WALKING PERSON (symbolizing WALK) and an UPRaised HAND (symbolizing DONT WALK). This Chapter includes the following sections:

[Section 4E.01](#) Pedestrian Signal Heads

[Section 4E.02](#) Meaning of Pedestrian Signal Head Indications

[Section 4E.03](#) Application of Pedestrian Signal Heads

[Section 4E.04](#) Size, Design, and Illumination of Pedestrian Signal Head Indications

[Section 4E.05](#) Location and Height of Pedestrian Signal Heads

[Section 4E.06](#) Accessible Pedestrian Signals

[Section 4E.07](#) Countdown Pedestrian Signals

[Section 4E.08](#) Pedestrian Detectors

[Section 4E.09](#) Accessible Pedestrian Signal Detectors

[Section 4E.10](#) Pedestrian Intervals and Signal Phases

Accompanying MUTCD figures and tables for pedestrian control features include:

[Figure 4E-1](#) Typical Pedestrian Signal Indications

[Figure 4E-2](#) Recommended Pushbutton Locations for Accessible Pedestrian Signals

## C. Agency Specific Information

Agencies often have design requirements that differ or are in addition to those found in the MUTCD. Therefore, one of the first steps in the traffic signal design process is to learn the design requirements by meeting with agency staff, studying agency specific design manuals, and/or studying the MUTCD. Field observations of existing traffic signals within an agency's jurisdiction can also provide insight to specific design requirements.

Determining agency specific design requirements prior to design can be challenging. It can be difficult to ask all the right questions, give all the necessary answers, and not overlook any details. More challenges can arise when staff is less experienced or a new working relationship is being established. Most design requirements that are overlooked will be caught during the design process or review process. However, taking steps to prevent design requirements from being overlooked will accelerate the design process and minimize costs by eliminating or reducing change orders. The following are some examples of design requirements that can vary between agencies.

- The 2003 edition of the MUTCD requires a maximum distance of 180 feet from the stop line to the 12 inch signal faces unless a near side supplemental signal face is used. The previous version required a maximum distance of 150 feet and some agencies continue to follow the old requirement.
- Some agencies center mast arm mounted signal heads over the lane line and others center them over the center of the lane.
- Certain agencies elect to install supplemental signal heads on the vertical shaft of the mast arm pole and others elect not to.
- Doghouse style five section heads are used for protected / permissive left turns by some agencies but not others.

- Protected / permissive left turn lane operation can vary. Some agencies configure left turn lane loop detectors to call the protected phase only when all loop detectors are covered by vehicles while other agencies always call the protected phase.
- Detector types, sizes, and layouts vary between agencies.
- The size and number of conduits, handholes, and wiring varies greatly among agencies.
- Some agencies share conduit between signal cable, street light power, and/or interconnect while others keep these cables in separate conduits.
- Some agencies choose to install emergency preemption.
- Signal wiring details vary among agencies.
- Some agencies use the “astro” type brackets to mount all signal heads and others do not use this on side of pole mounted heads. Bracketing and banding of all hardware (typically to the poles) varies greatly among agencies.
- Traffic signal cabinets, cabinet risers, and controller types and preferences vary greatly among agencies.
- Mounting heights for signal heads, street light luminaires, detection cameras, monitoring cameras, etc. vary greatly among agencies.

#### **D. Preliminary Signal Design Discussion List**

Signal designers should meet and confer to agree on preliminary signal design details. Having a list of the basic criteria to be discussed at a preliminary stage can be of significant benefit to both the engineer and agency. The following list is based on Mn/DOT's [Signal Design Manual](#) “Pencil Sketch” review list.

1. General nature of the signal project - new installation, minor or major revisions.
2. Phasing of the intersection, relation of proposed phasing to the traffic volumes and turning movements; use of protected-permissive left-turn phasing rather than protected-only; use of overlaps.
3. Determine design standards based on who will operate the system.
4. Use of four and five section heads and non standard bracketing.
5. Head type (LED, optically programmed, etc.).
6. Appropriateness of poles and pedestals for the site.
7. Placement of signal standards to ensure legal placement of all vehicle and pedestrian signal indications.
8. Placement of pedestrian pushbuttons relative to signal standards and in place sidewalks and crosswalks.
9. Need for emergency vehicle pre-emption (EVP) and police door with auto/flash switch, manual/stop time switch, and on/off power switch for signal heads only, including placement of components.
10. Detector placement and functions. See the Signal Design Manual for loop detector placement diagrams.

11. Placement and type of handholes.
12. Design of equipment pad.
13. Type of service equipment.
14. Discuss needs for combined pad with lighting and/or TMC.
15. Need for intersection geometric improvements.
16. For revised systems, the wording of the signal pole notes for the revision.
17. Need for AWF's, supplemental heads, etc.
18. House moving route needs (Mn/DOT uses a mast-arm mount that can swivel).
19. Painting of signal.
20. Luminaires metered or unmetered.
21. Source of power (to determine cabinet location).
22. Interconnect (determine need and type, location of master).

## **E. Additional Information**

The MUTCD [Chapter 4E](#) Pedestrian Control Features establishes pedestrian control uniformity and serves as a critical resource for checking each traffic signal design. Pedestrian signal heads provide:

- [Chapter 4F](#) Traffic Control Signals for Emergency Vehicle Access
- [Chapter 4G](#) Traffic Control Signals for One-Lane, Two-Way Facilities
- [Chapter 4H](#) Traffic Control Signals for Freeway Entrance Ramps
- [Chapter 4I](#) Traffic Control Signals for Movable Bridges
- [Chapter 4J](#) Lane-Use Control Signals
- [Chapter 4K](#) Flashing Beacons
- [Chapter 4L](#) In-Roadway Lights