
Traffic Signal Features

A. Traffic Control Signal Features

The MUTCD [Chapter 4D](#) Traffic Control Signal Features establishes traffic signal uniformity and serves as a critical resource for 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.

B. Pedestrian Control Features

The MUTCD [Chapter 4E](#) Pedestrian Control Features establishes pedestrian control uniformity and serves as a critical resource for 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), an UPRAISED HAND (symbolizing DONT WALK), and a countdown display.

Accessible pedestrian signals (APS) are devices that communicate information about pedestrian signal timing in nonvisual formats and are integrated with pedestrian pushbuttons. For jurisdictions that have adopted PROWAG, APS installation is required with any new traffic signal that has pedestrian signals or where there will be significant changes to an existing signal (R209.1). All intersections where pedestrians are expected, regardless of whether the pedestrian phase is automatic or requires actuation, shall be accessible for people with disabilities. This often means that accessible pushbuttons are installed in locations with automatic pedestrian phases. APS should be installed at locations where signals are retimed to include a Leading Pedestrian Intervals (LPI) or Exclusive Pedestrian Phase (EPP). Without APS units, pedestrians with low or no vision may not be able to maximize the advantage of these signal timing strategies, as they otherwise use the noise of concurrent vehicles to determine when to begin walking. Signal design guidance for pedestrian control and safety is provided in Section 13A-4, F.

C. Agency Specific Information

Agencies often have different design requirements 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 and studying agency specific design manuals, specifications, and/or standard details. 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 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. A 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 operation can vary. Some agencies configure left turn lane detection to call the protected phase only when two to three vehicles are queued, 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 vehicle preemption.
- Some agencies choose to install traffic monitoring (PTZ) cameras.
- 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.
- Pedestrian signals may or may not include Assessible Pedestrian Signals (APS), with or without voice messages.
- Pedestrian signals may or may not have Leading Pedestrian Intervals (LPI)
- Agencies use a variety of signal interconnect and communication systems including fiber optic cable, wireless systems, and GPS timeclocks.
- Pedestrian walking speed for crossing interval timing may vary.

D. Signal Design Criteria

Signal designers should coordinate with the agency regarding specific traffic signal elements to be included in a project. This is particularly important for a first project with a new agency. A list or memoranda regarding signal design criteria for review by and discussion with the agency early in the project development may be of significant benefit to both the engineer and agency. The following is a list of possible signal design criteria items to consider:

1. **General:** General nature of the signal project - new installation, replacement, minor modifications, or major modifications.
2. **Signal Phasing:**
 - a. Phase numbering (Phase 2 southbound or major through movement)
 - b. Left turn phasing for each approach (protected-only, protected-permissive, permissive-only, split-phase)
 - c. Leading pedestrian interval
 - d. Use of overlaps

3. Signal Heads:

- a. Based on proposed left turn phasing
- b. Overhead locations relative to lane lines
- c. Side-of-pole locations
- d. Head configurations, displays, color
- e. Pedestrian signal head type (1-section or 2-section)
- f. Head mounting hardware and bracket types
- g. Backplates, visors

4. Poles:

- a. Pole types (mast arm, combination mast-arm/ lighting, pedestal)
- b. Pole locations considering clear zone, sidewalk, utilities and right-of-way constraints
- c. Pole base types (T-base or anchor base)
- d. Luminaire mounting height for combination poles
- e. Special pole finishes (paint, powdercoat)
- f. Special pole handhole needs

5. Detection:

- a. Type of vehicle detection (video, pavement loops, microwave, other)
- b. Advance detection based on approach speeds
- c. Detection to accommodate Automated Traffic Signal Performance Measures
- d. Emergency Vehicle Preemption (EVP) detectors
- e. Pedestrian pushbuttons (APS or non-APS)
- f. Pushbutton locations per ADA and MUTCD guidance
- g. Special detection needs (bicycles)

6. Controller/ Cabinet:

- a. Controller type or model (NEMA, ATC, 2070)
- b. Cabinet type or model (TS1, TS2, ATC, 2070)
- c. Cabinet location
- d. Pad or pole-mounted cabinet
- e. Battery back-up (UPS)
- f. Cabinet riser height
- g. Meter location
- h. Misc. cabinet equipment

7. Conduit and Wiring:

- a. Conduit sizes and types
- b. Separate conduits for lighting, power and/or fiber optic cable
- c. Signal cable configurations (number of conductors)
- d. Lighting cable sizes
- e. Ground wire, tracer wire and pull tape
- f. Fiber optic cable configuration, routing, termination and splicing
- g. Misc. cables (video, EVP, Cat 5/6, etc.)

8. Handholes: Handhole types and locations, including whether to provide one near the controller, and for the ground rod near the foundation.**9. Interconnect:**

- a. Need for coordinated signal operation
- b. Type of interconnect
- c. Modifications needed at adjacent signalized intersections

10. Power Service:

- a. Coordination with utility company
- b. Power source location and type (overhead or pad-mounted transformer)
- c. Meter requirements
- d. Metered or un-metered lighting

11. Signs:

- a. Street name signs
- b. Lane use signs
- c. Traffic signal signs
- d. Pedestrian pushbutton signs

12. Construction Staging:

- a. Potential need for temporary signals and/or detection
- b. Lane closures
- c. Special requirements

13. Miscellaneous:

- a. Potential need for AWF
- b. Construction schedule and anticipated pole and equipment lead times
- c. Supplemental specifications and/or plan notes as needed
- d. Signal turn-on procedure, possible portable dynamic message signs
- e. Luminaires for combination poles

E. Additional Information

In addition to typical vehicle and pedestrian signals, the MUTCD also provides guidance on the following types of traffic signals:

[Chapter 4F](#) Pedestrian Hybrid Beacons

[Chapter 4G](#) Traffic Control Signals and Hybrid Beacons for Emergency-Vehicle Access

[Chapter 4H](#) Traffic Control Signals for One-Lane, Two-Way Facilities

[Chapter 4I](#) Traffic Control Signals for Freeway Entrance Ramps

[Chapter 4J](#) Traffic Control for Movable Bridges

[Chapter 4K](#) Highway Traffic Signals at Toll Plazas

[Chapter 4L](#) Flashing Beacons

[Chapter 4M](#) Lane-Use Control Signals

[Chapter 4N](#) In-Roadway Lights