

Chapter 9: Traffic Control Devices

9.1 Introduction

This chapter is to ensure uniformity in application of The City of Hilliard traffic engineering policies, guidelines, standards and practices related to traffic signals and beacons, roundabouts, signing, and pavement marking. It establishes the basic, minimum traffic control standards for all public streets in the City of Hilliard and all supplemental traffic engineering design, construction and operations. These standards should be implemented on all new capital improvement or development projects. The extent to which these standards are applied as part of normal city maintenance or rehabilitation projects is dependent on budget.

The location and design of all traffic control devices for all streets, highways, bikeways, and private roads open to public travel are governed by the most current version of the Ohio Department of Transportation (ODOT) *Ohio Manual of Uniform Traffic Control Devices* (OMUTCD) and supplemental City of Hilliard specifications.

The Engineer responsible for applying the concepts and practices assembled in this chapter is required to hold current registration as a Professional Engineer in the State of Ohio with experience in the design of traffic control devices. While this chapter provides technical guidance on design details, engineering knowledge, experience, and judgment must always be used to determine whether, and how, to apply the information included herein and in related design manuals to specific situations.

New or different design techniques presented herein or that are developed subsequent to the adoption of this Manual do not imply that existing traffic control device designs are unsafe, nor does it mandate the initiation of improvement projects. However, attempts should be made to upgrade traffic control devices to meet current standards in a reasonable manner and timeframe based on age of equipment, useful life, and history of maintenance activities associated with the device.

Maintenance of traffic control devices located within the public right-of-way shall be conducted by the City.

9.2 Traffic Signals and Beacons

Traffic signal technology changes at a rapid pace. The City reserves the right to change the traffic signal standards and specifications at any time without advance notice. The City reserves the right to experiment with new technologies on a case-by-case basis before officially adopting a new standard.

Traffic Signals. Chapter 4 of the OMUTCD governs the location and design on all traffic signals in the City. Existing vehicle and pedestrian traffic volumes shall be used in evaluating the need for a traffic signal (also known as a signal warrant analysis). In situations where a new roadway or intersection is being planned or the existing street network will be significantly altered, engineering judgment shall be used to develop appropriate opening day traffic volumes for use in a traffic signal needs study. A traffic signal shall not be installed on opening day of a development if a signal is not expected to meet minimum threshold volumes until a future year.

Traffic signal requirements that are unique to installations within the City of Hilliard are listed below.

1. **Mast Arm Supports.** All new traffic signals shall utilize mast arms and rigid-mounted vehicle signal heads. If existing span-wire traffic signals have been in place greater than 20 years and

development/redevelopment at the subject intersection is initiated, the span wire traffic signal should be converted to mast arm and updated in accordance with these standards at the time of development/redevelopment. All mast arms shall be in accordance with ODOT specifications except that they shall be smooth-sided and dark bronze or black (Old Hilliard only) in color in accordance with Hilliard specifications.

2. Vehicular Signal Heads. Vehicular signal heads shall utilize:

- a. High quality polycarbonate material
- b. Black exterior housing
- c. 12” lenses and compliant high flux LED lamps in all sections

Backplates with yellow reflective tape provide supplemental warning of the presence of a traffic signal at night during power outages and improve visibility at sunrise and sunset of east/west mainline signal indications. Engineering judgment shall be used to determine the need for reflective backplates at Hilliard traffic signals. Factors that should be evaluated include traffic volumes, crash history, mainline east/west orientation, and presence of battery backup or an uninterruptible power supply at the intersection.

3. Vehicle Detection. Vehicle detection shall be provided for all lanes and phases utilized in the signal operation. The method of detection and specific product used is at the discretion of the City based on the signal location, inclusion in a closed loop signal system with established detection hardware, plans for future resurfacing, and unique site-specific challenges. Approved methods of vehicle detection include:

- a. In-pavement loop detection
- b. Radar detection
- c. Video detection

4. Signal Phasing. The minimum number of phases shall be used to safely move traffic with minimal delay. Protected left turn phases shall be used only if traffic volumes or site-specific safety considerations show that using a permissive left turn movement cannot safely accommodate turning traffic volumes. Because of excessive delay for vehicles and pedestrians, split phasing of side streets shall only be used when existing side streets are offset in a manner that the two sides cannot safely move concurrently. Split phasing of a traffic signal is not desired; therefore, a geometric improvement is preferred to correct deficient alignment if physically and financially feasible. If an existing traffic signal is being modified or a new traffic signal is being installed for a new development, split phasing shall not be used and new driveway or new streets shall be appropriately aligned at the intersection to allow side street phases to run concurrently.

5. Signal Timing. Signal timing and clearance intervals shall meet the requirements of the standards specified in the following documents. In case of conflicting specifications, the specification document hierarchy shall be in the order listed below.

- a. OMUTCD
- b. Institute of Transportation Engineer (ITE) *Traffic Control Devices Handbook*
- c. *ITE Manual of Traffic Signal Design*

6. Pedestrian Accommodations. All new traffic signals shall accommodate pedestrians through the use of pedestrian signal heads and pedestrian push buttons for detection unless pedestrians are specifically prohibited from using the intersection. Pedestrian accommodations include:

- a. Pedestrian signal heads shall be clamshell mounted and shall utilize filled LED symbolic displays with countdown timers. The exterior housing color shall be black and shall be consistent throughout the entire material. No louvered covers on the front side of the housing shall be used.
- b. Pedestrian pushbuttons shall be highly vandal resistant, pressure activated with a non-moving button, provide both a two-tone audible beep and a visible LED to notify users that the switch has been activated, and include a five-year warranty from manufacturer’s defects. The exterior body color shall be black.

- c. Supplemental pedestrian signal head or pedestrian pushbutton pedestals shall be smooth-sided. The exterior color of all surfaces, including anchor bolt covers, shall be dark bronze or black (in Old Hilliard only).
 - d. Pedestrian pushbuttons should be located near the end of each crosswalk in a manner that clearly designates the crosswalk for which each pushbutton corresponds in accordance with Section 4E.08 of the OMUTCD. Arrows shall be displayed on a crosswalk sign located above the pushbutton or through the use of a raised arrow integral to the pushbutton.
 - e. Accessible Pedestrian Signals (APS) should be considered on a case-by-case basis using the guidance provided in Section 4E.09 of the OMUTCD. An engineering study shall be conducted to determine the need for APS at a given intersection.
7. Signal Cabinet and Control Equipment. All traffic signal control equipment shall utilize the following:
- a. Ground-mounted control cabinet painted dark bronze (black in Old Hilliard only)
 - b. Econolite controller (latest model)
 - c. Generator inlet to power auxiliary generator during power outages
 - d. Battery back-up shall be provided at the following intersections:
 - i. Cemetery Road/Norwich Street
 - ii. Cemetery Road/Leap Road
 - iii. Cemetery Road/Lacon Road
 - iv. Cemetery Road/Britton Parkway/Parkway Lane
 - v. Cemetery Road/Lyman Drive
 - vi. Cemetery Road/I-270 SB
 - vii. Cemetery Road/I-270 NB
 - viii. Cemetery Road/Trueman Blvd/Fishinger Blvd
 - ix. Fishinger Blvd/Park Mill Run/Ridge Mill Dr
 - x. Scioto Darby Road/Cosgray Road
 - xi. Scioto Darby Road/Leppert Road
 - xii. Davidson Road/Avery Road
 - xiii. Davidson Road/Leap Road
8. Traffic Signal System Requirements. Signalized intersections may be grouped into a signal system based on engineering study and need for progression along a corridor. Delay to side streets shall be considered when evaluating new signal systems. All signal systems shall utilize the following:
- a. Econolite System Master
 - b. Fiber-optic Interconnection
 - c. Broadband Telecommunication System
9. Intersection Lighting at Traffic Signals. Unless the intersection is sufficiently illuminated using an independent street light system, 120-volt lighting (using LED luminaires in accordance with Hilliard street lighting specifications) shall be incorporated into the signal design using combination signal support(s) to achieve the required light level on the pavement at the intersection.
10. Spare Parts. Each new signal installation shall include two spare detection units (radar unit, loop amplifier, or camera).

School Zone Speed Limit Flashing Beacons. Flashing beacons supplement school zone signing and alert motorists when the 20 mph school speed limit is in effect. While flashing beacons are not required

per the OMUTCD, the City of Hilliard has established the following guidance to assist in determining when and where to install the flashing beacons:

- Schools with public street frontage on a street with a posted speed limit greater than 25 mph: 12” flashing yellow beacons supplement the 20 mph school zone signing located at the beginning of the school zone.
- Schools with public street frontage on a through street with a posted speed limit of 25 mph: 8” flashing yellow beacons supplement the 20 mph school zone signing located at the beginning of the school zone.
- Schools with public street frontage on a dead-end street, cul-de-sac, or private driveway: signs only (no flashing yellow beacons) located at the beginning of the school zone.
- Schools without public street frontage: no school zone is established on the public street; therefore, no signs or beacons reflecting a reduced speed limit are provided.

The above guidance applies to public and private K-12 schools located within the City of Hilliard with frontage on a public street that is under the jurisdiction of the City of Hilliard. Establishment of a school zone and installation of school zone speed limit flashing lights for schools that do not meet this criteria, shall be at the direction of the Law Director, Director of Public Safety, and Director of Public Service upon review of specific circumstances provided by the school administrator and review of applicable laws.

The school zone speed limit flashing beacon timing standard in the City of Hilliard is as follows:

- Morning Arrival: Activate flashing lights 30 minutes prior to the tardy bell; deactivate flashing lights at the tardy bell
- Afternoon Dismissal: Activate flashing lights at earliest dismissal; deactivate flashing lights 20 minutes after earliest dismissal
- Half Day Kindergarten: for schools that operate half day kindergarten, activate the flashing lights for 10 minutes after dismissal of morning kindergarten and 15 minutes prior to commencement of afternoon kindergarten; operation of the flashing lights mid-day for half day kindergarten may be eliminated if all kindergarten children are bused during mid-day hours or if the school district officials and city officials determine there is no need to operate the flashing lights over the lunch hour

The tardy bell and dismissal times for each school shall be in accordance with the Hilliard City School District (or private school) official posted school times unless otherwise modified in writing by a specific school.

In large school zones that serve more than one school, the start time of the flashing lights is based on the earliest school tardy bell and dismissal, and the end time of the flashing lights is based on the latest school tardy bell and dismissal time within the multi-school complex.

The above timing guidance is meant to establish a reasonable amount of time before and after school to allow school children to enter and leave the school grounds safely, taking into consideration normal school operating hours and *scheduled* late start or early dismissal times. The flashing lights are not intended to be used to designate special events, before and after school-age child care, extracurricular activities, unscheduled late starts or early dismissals, recess times, or unique schedule times that modify the official posted school times as established by the District.

If special circumstances result in the need to modify the above timing standard, the request shall be made and justification shall be provided in writing by the school administrator. The review and approval/disapproval of such requests shall be made by the City of Hilliard Division of Engineering.

Other Beacons. There are other warning or emergency beacons that provide guidance to motorists, pedestrians, or other road users of unique conditions or hazards within the public right-of-way. Some beacons have been studied extensively, are approved for use in the public right-of-way, and the location and design of the devices have been established in the OMUTCD. Other beacon uses are emerging as new technologies are developed. Design and installation of all beacons in the City of Hilliard shall follow the technical guidance established in the OMUTCD, or an engineering study shall be conducted to justify installation and establish design guidance of any devices not covered in the current edition of the OMUTCD or more recently released National Manual of Uniform Traffic Control Devices (MUTCD).

9.3 Roundabouts

The City of Hilliard recognizes that use of modern roundabouts to control intersections is growing exponentially in central Ohio and throughout the United States because of the benefits to intersection capacity, delay, safety, pedestrian mobility, power consumption, and community character over other methods of intersection control. While roundabouts may not be appropriate in all locations, the City of Hilliard supports and requires the evaluation of a roundabout installation in lieu of a traffic signal for all capital and development projects in the City. In some cases it may be appropriate to consider a roundabout at a location where a traffic signal may not be warranted. This may be at locations where the desire is to:

- slow vehicle speeds;
- provide for a safer pedestrian crossing;
- change the roadway character; or
- provide for better intersection control for land uses that tend to experience variable traffic patterns, such as active parks and recreational areas.

The design of modern roundabouts shall be governed by the National Cooperative Highway Research Program (NCHRP) Report 672 *Roundabouts: An Informational Guide, Second Edition* or subsequent later editions. All consultants responsible for the design of roundabouts in the City of Hilliard, either as part of a public capital improvement project or a private development project, shall be required to show a high level of technical training and design experience in roundabout analysis, design, and operations.

The design of a roundabout is an iterative process that requires flexibility in order to achieve a good design. Therefore, the City of Hilliard does not establish strict design parameters for roundabout design but rather requires a series of performance checks that must be evaluated and adjustments in the design be made until a roundabout design is achieved that controls vehicle speed and balances the needs of all users. The following performance checks are required throughout the design process and shall be documented in a final report once all adjustments to the design have been made:

- Fastest path and natural path with appropriate speed control at entries and pedestrian crossings
- Design vehicle and CAD-generated turning templates for all movements
- Sight distance/visibility and CAD-generated line of sight exhibits (plan view and elevation view) for vehicle entries and pedestrian crossings

If an existing signalized intersection is being studied for an upgrade, modification or capacity improvement, the installation of a roundabout shall be evaluated as an alternative in lieu of a traffic signal unless the signalized intersection is located within a closed loop signal system.

If a new development proposes a medium to high volume access point to a public street that is listed on the City's Thoroughfare Plan and future traffic volumes indicate that a traffic signal may be justified based on an engineering study, a roundabout shall be evaluated as an alternative in lieu of a traffic signal or stop-controlled intersection. Improved pedestrian crossing and corridor traffic calming shall be considered in the roundabout evaluation. A roundabout is considered preferred for all new intersections over signalized intersections provided that the roundabout is expected to function at an equal or better level of service (for all modes of traffic) than the traffic signal.

In situations where a new roadway or intersection is being planned or changes to the existing street network will be significantly altered, engineering judgment shall be used in developing appropriate opening day traffic volumes and long range traffic volumes to use in the intersection evaluation study. If a roundabout is selected as the preferred alternative by the City, engineering judgment shall be used to determine the appropriate design year for a roundabout improvement and consideration should be made to planning for a tiered construction of the roundabout to avoid "over building" in short term. Determination of the appropriate design year for roundabout improvements is subject to the approval of the City Engineer.

9.4 Signing and Pavement Marking

Chapter 2 and 3 of the OMUTCD govern the location and design on all signing and pavement marking, respectively, in the City of Hilliard. Chapter 7 of the OMUTCD governs the signing and pavement marking for public streets surrounding schools in the City of Hilliard. Chapter 9 of the OMUTCD and the AASHTO Bike Guide governs the location and design of all signing and pavement marking for on-street and off-street bicycle facilities in the City of Hilliard.

Signing requirements that are unique to installations within the City of Hilliard are summarized below. Details are provided in Hilliard Standard Construction Drawing TC-1, TC-2, and TC-3.

Street Name Signs. All street name signs shall use white retroreflective sheeting made with prisms with a blue electrocut film to create a blue sign with white lettering. Street name legends, prefixes, and suffixes shall utilize a Clearview Font Type 2-W and shall be centered horizontally and vertically on the sign face. The number of signs per intersection, the height of the sign blade, maximum blade length, and lettering height is dependent on the type of intersection.

Street Name Sign Supports and Anchors. The type of street name sign support and anchor used is dependent on the type of intersection and location.

Signalized intersections. The street name signs shall be rigidly mounted on the appropriate signal support (strain pole or mast arm).

Unsignalized intersections. In all locations *except* the Conservation District street name signs shall be erected on 2-inch square galvanized posts with die-cut knock-outs (painted black in Old Hilliard only) using a single breakaway anchor and pyramid rain caps. When one or more sign erected on a 2-inch square post exceeds 60 inches, the anchor shall be modified with flanges to provide additional stability and reduce torque from wind loading. The length of post, length of anchor, and required overlap is dependent on the type of intersection.

Within the Conservation District, street name signs at unsignalized intersections shall be erected on 6-inch square rough sawed cedar posts with a ½-inch chamfered top. The post shall be anchored with a square steel tube, embedded into the ground a minimum of 42 inches, and concrete encased. Two lag bolts shall be provided on the street side to allow for breakaway function. The length of post is dependent on the type of intersection; all details regarding the length of post and anchor, limits of concrete encasement, and other details are provided in Hilliard Standard Construction Drawing TC-3.

Regulatory, Warning, and Guide Signs. All signs within the public right-of-way shall be retroreflective.

For all basic sign installations, the sign sheeting material shall comply with ASTM D456 Type IV (3M High Intensity Prismatic, Avery Dennison High Intensity Prismatic T-6500, or approved equal).

High priority signs shall utilize a sign sheeting material that complies with ASTM D4956 Type VIII (3M Diamond Grade LDP 3970, Avery Dennison MVP Prismatic T-7500, or approved equal). In the City of Hilliard, the following sign types shall be considered high priority: School Zone Speed Limit signs, School Crossing/Warning signs & placards, Pedestrian and Bicycle Warning signs, STOP signs along or intersecting arterial/collector streets, and YIELD signs at roundabouts. The City may designate other types of signs as high priority and utilize higher reflective sheeting based on site specific conditions.

Two-inch wide reflective sheeting strips shall be used on all sign posts located in raised medians to increase visibility; reflective sheeting strips may be used at other locations as determined by the City.

Signs should be located in a manner that improves visibility to motorists. Signs, particularly high priority signs, shall not be installed directly behind light poles or trees.

Sign Supports and Anchors. All regulatory, warning, and guide signs located within the public right-of-way, *except* within the Conservation District, shall be erected on 2-inch square galvanized posts with die-cut knock-outs (painted black in Old Hilliard only) using a single breakaway anchor and pyramid rain caps. For all signs installed in concrete or paver islands, a six-inch PVC pipe box out shall be provided for the post anchor. The PVC box out shall be installed prior to pouring concrete or placing pavers. After the sign post anchor is installed, granular material shall be installed between the post anchor and the PVC box out.

Within the Conservation District, regulatory, warning, and guide signs shall be erected on 4-inch square rough sawed cedar posts with a ½-inch chamfered top. The post shall be anchored with a square steel tube, embedded into the ground a minimum of 42 inches, and concrete encased. Two lag bolts shall be provided on the street side to allow for breakaway function. The length of post is dependent on the height of sign(s) being installed; all details regarding the length of post and anchor, limits of concrete encasement, and other details are provided in Hilliard Standard Construction Drawing TC-3.