CTDOT’s Division of Traffic Engineering
Number of Traffic Signal Assets - by Type

- State-Owned Traffic Signal Locations: 2,779
  - Overhead Flashing Beacon Locations: 230
  - Traffic Signal Locations: 2,549
    - Locations are Isolated Traffic Signals: 987
    - Locations are part of Traffic Signal Systems: 1,562
      - Locations are part of Time-Based Coordinated Signal Systems: 613
      - Locations are part of Computerized Traffic Signal Systems: 949
Statewide Population Density with State Signals
Major Freight Generators with State Signals
CTDOT Traffic Signal Infrastructure – Fun Facts

• CTDOT owns more traffic signals (2,549) than all of the other New England state DOT’s combined.

• Vehicles travel through CTDOT – maintained traffic signals 57 million times a day.

• 957 of the 2,549 traffic signals (38%) are in a computerized traffic signal system.
• 53% of CTDOT traffic signals are over 20 years old

• 957 of the 2,549 traffic signals (38%) are in a computerized traffic signal system (CTSS).

  o Unfortunately, these are the only signals with communications back to a central office

• Of the 957 signals in a CTSS, 337 intersections (approx. 25 systems) are currently operating on obsolete controllers.
Number of Traffic Signal Assets by Age
100% of CTDOT traffic signals will have functioning vehicle detection

How?

• Eliminate the use of loop detectors for vehicle detection.

  o Instituted using 360-degree cameras for projects in 2017
  o VIP resurfacing and pavement preservation programs began deploying 360-degree cameras statewide in 2019
100% of CTDOT traffic signals will have functioning vehicle detection

**Progress:**

- There are ~400 360-degree cameras in operation today.
- Approximately 280 additional cameras will be deployed in 2020 as part of this year's pavement resurfacing programs and other capital projects.
- In 2022, the number of 360-degree cameras deployed will grow to approximately 400 per year.
- Pushing to accelerate this deployment as resources allow
Establish **communication** to all traffic signals

**Why?**

- Currently, connectivity is limited to *approximately 38% of the State traffic signal system*.
- Communication gets us real-time performance data

**What we can do with it:**

- **Deploy staff proactively**, not in response to driver complaints
- **Diagnose many issues before deploying staff**
- **Assess traffic signal performance from the office**
Establish **communication** to all traffic signals

*Progress:*

- The current version of the 360-degree cameras have the capability to provide traffic signal performance data via a cellular modem back to central location.
  - Has the potential to be a very cost effective approach
  - Highway Operations and the Signal Lab are currently testing this technology.

- *This is a long-term goal, much more challenging to achieve*
CTDOT Traffic Signal Infrastructure – Vision

Component-Based Replacement Program for Traffic Signals

Current State of Good Repair (SOGR):

- Age of entire signal location based on last full equipment replacement.
- Does not account for varying life spans of equipment

Proposed SOGR – under development:

- Rating based on age and condition of components
- Establish statewide component performance goals
- Develop a systemic components-based replacement program
Berlin Turnpike “SPaT Challenge” Project

Advanced Signal Technology Pilot Project

- Signal Phasing and Timing (SPaT) Broadcasts
- Connected Vehicle Technology
- Adaptive Traffic Signal Control
- Automated Traffic Signal Performance Measures
- Snow Plow Priority
- Fiber Communications
- PTZ Cameras
- Extended Length Mast Arms

Current Status

- Project # 007-250
- Berlin Turnpike (northern section)
- 15 Intersections
- PD Phase Ongoing
- CN Award, Fall 2021
Pedestrian Control at signalized intersections falls into one of four categories:

- **Exclusive** (~925 signals)
- **Side Street Green** (~1,400 signals)
- **Concurrent** (approx. 6 in construction)
- **Signed for “No Pedestrian Crossing”** (~170 signals)
Introducing Concurrent Pedestrian Phasing to CT

**Working toward Concurrent (Green) Pedestrian Phasing**

- Pedestrians cross the main road while side street (parallel to crosswalk) motorists have a *green ball* indication

**Benefits:**

- **Install separate pedestrian signal**
- **Clarifies to pedestrians & drivers** when peds should cross
- **Increased pedestrian conformance**
- **Reduced delay** to peds & drivers
Introducing Concurrent Pedestrian Phasing to CT

**Transitioning** to Concurrent Green
- **Pilot** projects
- **Signs** to alert **motorists**
- **Signs** for **pedestrians**
- **Education** with Media Campaign

**Leading** Pedestrian Intervals (LPI)
- **Proven safety benefit**
- To be used wherever possible with concurrent green ped phasing
- **Establishes pedestrian presence** in crosswalk “**prior to**” providing green ball for motorists
ON GREEN, WATCH FOR PEOPLE CROSSING!

NEW SIGNAL OPERATION AT (STREET NAME) AND (STREET NAME)

An intersection near you is being upgraded to include concurrent pedestrian signals, which clarify to both drivers and pedestrians when pedestrians should cross, reduce delays for everyone, and may help reduce the severity of pedestrian-involved crashes.

WHAT ARE CONCURRENT PEDESTRIAN SIGNALS?

Pedestrians cross in the same direction and at the same time as parallel traffic, who have a green light.

DRIVERS: LOOK FOR THIS SIGN! IT WILL LET YOU KNOW THAT PEDESTRIANS MAY HAVE THE WALK SIGN WHEN YOU HAVE A GREEN LIGHT.

MOTORISTS MAY TURN LEFT OR RIGHT OVER THE CROSSWALK AFTER YIELDING TO PEDESTRIANS IN OR ENTERING THE CROSSWALK. This means that turning cars must wait for pedestrian traffic before completing the turn.

SOME LOCATIONS MAY PROVIDE PEDESTRIANS WITH A FEW SECONDS HEAD START BEFORE THE LIGHT TURNS GREEN FOR MOTORISTS. This establishes pedestrian presence in the crosswalk prior to providing the green ball for motorists. Pedestrians should watch for turning cars in case they are not yielding.

CONCURRENT WITH PEDESTRIAN HEAD START

Phase 1: Pedestrians only
Pedestrians are given a 3-7 second head start entering the intersection.

Phase 2: Pedestrians and motorists
Motorists are provided a green light. Turning traffic yields to pedestrians entering or in the crosswalk.

CONCURRENT WITHOUT PEDESTRIAN HEAD START

The walk signal for pedestrians typically begins at the same time as the green light for parallel traffic. Turning traffic yields to pedestrians entering or in the crosswalk.

Space for contact info, logos, etc.
Recent Changes to CTDOT Pavement Marking Installation

• *Installation of Epoxy Pavement Marking in Grooves*
  • statewide
  • all road types

2019 Began to Pilot *Wet-Reflective* Pavement Markings

• *Average # of days in CT with Precipitation = 123 days*

• *Frequency of Complaints during Rainy Conditions*
## Wet-Reflective Pavement Markings

### Wet Pavement Crashes (1/1/16 - 6/30/18)

<table>
<thead>
<tr>
<th></th>
<th>Total Crashes</th>
<th>Crashes with Injury (Serious, Minor, Possible)</th>
<th>Crashes with Fatal</th>
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</thead>
<tbody>
<tr>
<td>Interstate</td>
<td>5,281</td>
<td>1,209</td>
<td>13</td>
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<tr>
<td>US and State</td>
<td>17,557</td>
<td>4,497</td>
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Wet-Reflective Pavement Markings

Night Wet - Standard Markings

Night Wet - Wet-Reflective Markings

Safety Evaluation of Wet-Reflective Pavement Markings, FHWA Publication No.: FHWA-HRT-15-065
Wet-Reflective Pavement Markings

Wet-Reflective
(Dry Conditions)
Wet-Reflective Pavement Markings

Wet-Reflective
(Wet Conditions)
Wet-Reflective Pavement Markings - Installations

Route 8
NB: MP 51.74 to 58.51
SB: MP 51.79 to 58.31
Approx. Exit 45 to end of limited access roadway

US 6
MP 27.60 to 32.36
Approx. Rte 47 to Rte 61

Route 2
EB: MP 25.35 to 30.79
WB: MP 25.52 to 30.01
Approx. Exits 20-22

Route 9
NB: MP 3.83 to 10.63
SB: MP 3.84 to 11.54
Approx. Exits 3-7

I-95
NB: MP 0.61 to 5.58
SB: MP 0.68 to 5.54
Approx. I-95 to Exit 5
2022-2026 Strategic Highway Safety Plan (SHSP)

- Identifies emphasis areas and establishes safety goals for CT to achieve by 2026, replacing the 2017-2021 SHSP

Regional Transportation Safety Plans (RTSP)

- Similar to SHSP but focused on each of the 9 planning regions in CT and their member towns/cities
- NHCOG (Northwest Hills) RTSP complete; remainder are in progress
- Basis for future Local Road Safety Program grants
**CT Roadway Safety Management System (CRSMS)**

- Suite of safety analytical tools created by UConn and based on the FHWA Highway Safety Manual to generate spot/systemic safety projects
  - Modules:
    - Network Screening
    - Countermeasure Selection
    - Project Prioritization
    - Diagnosis
    - Economic Appraisal
    - Safety Evaluation

**Network Screening – High Frequency Crash Location (HFCL) List**

- CRSMS module that screens the roadway network and identifies sites that have the highest potential for crash reduction
# Traffic Engineering - Safety Engineering

## CTDOT Assessment Tool for Pedestrian Safety Countermeasure Guidance at Marked Uncontrolled Crosswalks

Here is an extract from the document: **Pedestrian Safety Countermeasure Guidance at Marked Uncontrolled Crossings** provides guidance on selecting appropriate countermeasures for marked uncontrolled crosswalks based on average daily traffic (ADT) and posted speed limit. The table outlines various countermeasures and their applicability under different traffic conditions.

### Table: Pedestrian Safety Countermeasure Guidance at Marked Uncontrolled Crossings

<table>
<thead>
<tr>
<th># of Lanes</th>
<th>0.5 ADT ≤ 1,000</th>
<th>1,000 &lt; ADT ≤ 4,000</th>
<th>4,000 &lt; ADT ≤ 7,000</th>
<th>ADT &gt; 7,000</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3 (w/ raised median)**</td>
<td>A</td>
<td>A</td>
<td>A</td>
<td>A</td>
</tr>
<tr>
<td>5 (w/ median)***</td>
<td>A</td>
<td>A</td>
<td>A</td>
<td>A</td>
</tr>
<tr>
<td>10 (w/ median)***</td>
<td>A</td>
<td>A</td>
<td>A</td>
<td>A</td>
</tr>
</tbody>
</table>

**Countermeasures include A as a minimum:**

- **A** - LED Crossing with markings and sign (average cost of $2,500 / average cost of $7,500 if including overhead lighting)
- **B** - LED Crosswalk with edge lights (average cost of $1,100 per ft)
- **C** - Rectangular Rapid Flashing Beacons (RFBs) (average cost of $22,500 per 2 emblems) — Minimum crossing volume of 20 pedestrians/hour recommended
- **D** - Pedestrian hybrid refuge area (PRPA, previously median) (average cost of $22,500) — Refer to MUTCD Figures 7-1 and 7-2 for minimum criteria conditions

Additional countermeasures (less commonly used):

- **Curb extensions** (average cost of $12,000 per crossing)
- **F** - Bus stop (average cost of at least $30,000 per mile) — Consider this countermeasure for all roadways with four or more lanes without a raised median. Typically, bus stops are considered for roadways with current and future ADT equal to or less than about 20,000 vehicles per day.
- **G** - Street Pedestrian Crossing Sign (average cost of $1,100 per sign) — Towns may request this countermeasure on State roads under encroachment permit
- **K** - Pedestrian Crosswalk (average cost depends on material, size and drainage conditions, $10,000 or more) — Not used on State roads but can be installed by municipalities on local roads
- **L** - Crossing treatments generally not installed at locations where the ADT is lower than 1,500 vehicles per day. Exceptions may be made at school and trail crossing locations where the peak hour vehicle traffic exceeds 10% of the ADT. School crossings are defined as locations where 10 or more student pedestrians are crossing per hour.

For questions or guidance on using this form, please contact trafficsafety.ck@ct.gov.

For questions regarding installation of countermeasures on State roads, please contact DOT.trafficeengineering.ck@gov.

This table was created using the Federal Highway Administration’s *Guide for Improving Pedestrian Safety at Uncontrolled Crosswalk Locations*.

*If available, 85th percentile speed should be used instead of the posted speed.

**Assumes raised median of at least 4’ wide and 6’ long to adequately serve as a refuge area for pedestrians.

Rev. 01/23/2020
Focus on Local Road Safety

Partnerships essential
University of Connecticut’s Transportation Institute, along with the CT Regional Planning Agencies, Municipalities and other CT Safety Stakeholders:

• Regional Local Road Safety Planning Projects
• Safety Circuit Rider Program
  • providing technical assistance and education in local road safety efforts
• Traffic Signal Circuit Rider Program
  • assisting local agencies in traffic signal related topics and bringing this group together with CTDOT efforts
• Educational Programs for Local Traffic Authorities
• Systemic Safety Projects on local roads
Streamlining Communications

All requests/inquiries/concerns to be sent to:

DOT.TrafficEngineering@ct.gov

NEW simplified email to contact us.

Requests are acknowledged, then disseminated to appropriate Unit for assignment.