Traffic Signal Basics

Neighborhood University
October 10, 2019
Westtown Township

Traffic Signal Basics

* Purpose
* Advantages
* Disadvantages
* Additional Considerations
* Permit
* Physical components
* Costs and Maintenance

Advantages

* Orderly movement of traffic.
* Increase the traffic-handling capacity of the intersection.
* Reduce the frequency and severity of certain types of crashes, especially right-angle collisions.
* Coordinated to provide for continuous or nearly continuous movement of traffic at a definite speed along a given route under favorable conditions.
* Interrupt heavy traffic at intervals to permit other traffic, vehicular or pedestrian, to cross.

Disadvantages

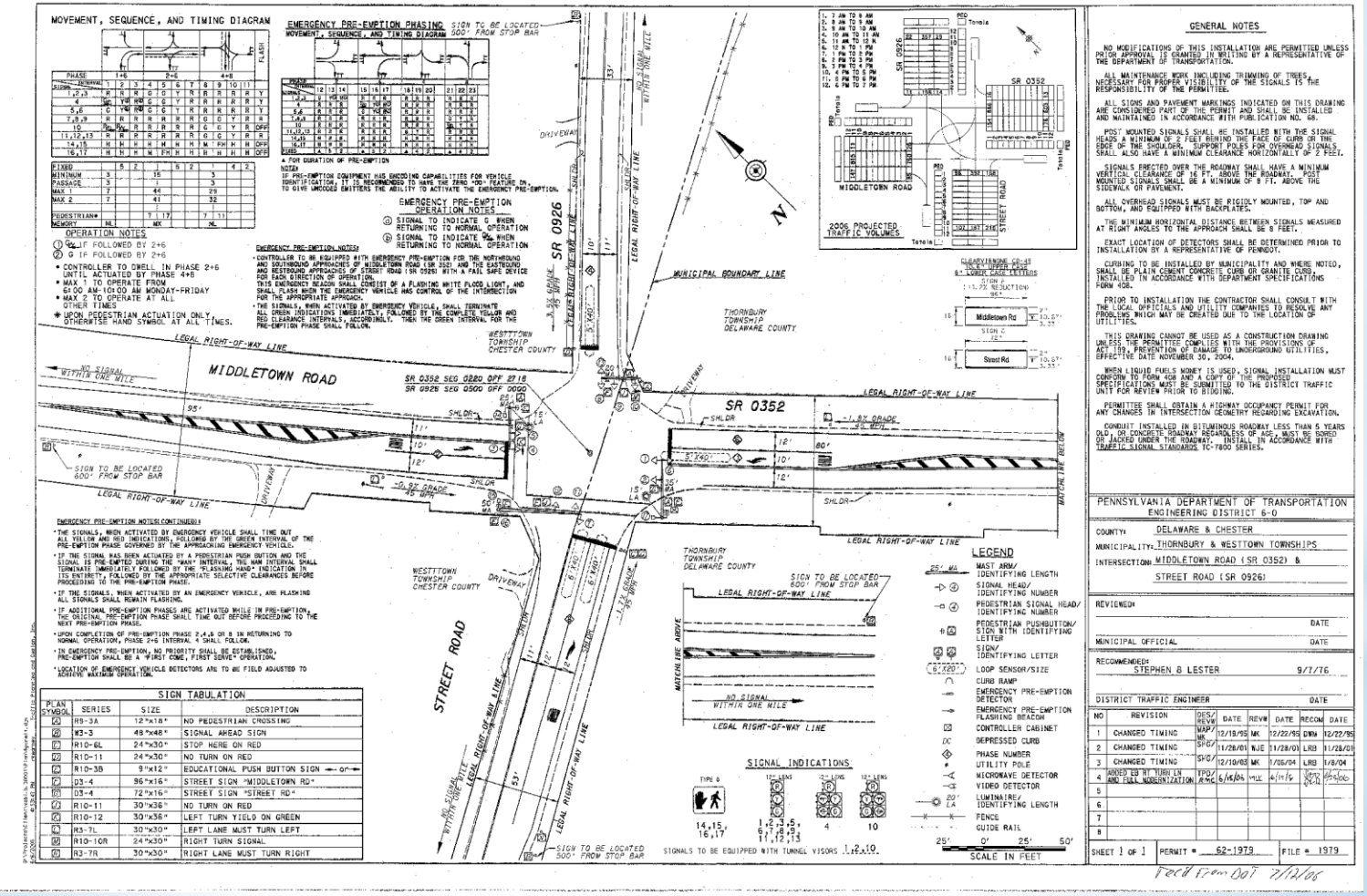
* Excessive delay
* Disobedience of the signal indications
* Increased use of less adequate routes as road users attempt to avoid the traffic control signals
* Significant increase in the frequency of collisions (especially rear-end collisions)

Additional considerations

* Flashing Warning Devices are considered Traffic Signals
* In Pennsylvania, traffic signals are owned by municipalities; however there are limited examples of privately owned signals.
* PennDOT has review and approval authority and issues permits for signals
* Owners are legally bound to maintain signals in a condition consistent with the approved PennDOT permit

Permit

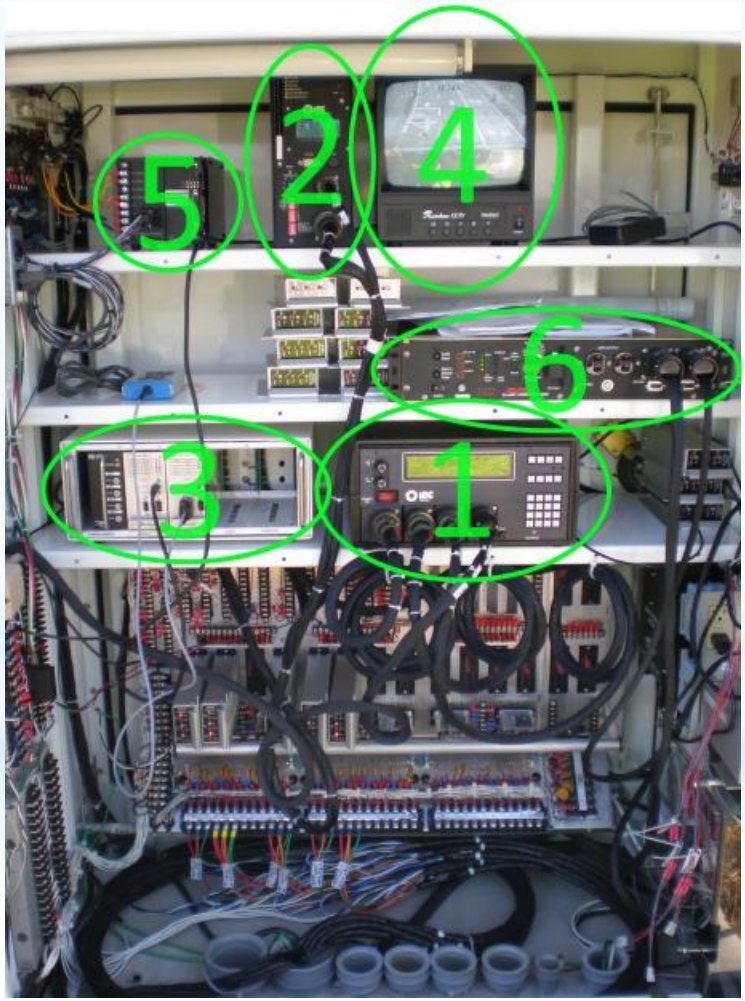
(plan)


MOVEMENT, SEQUENCE, AND TIMING DIAGRAM
EMERGENCY PRE-EMPTION PHASING SIGN TO BE LOCATED 500' FROM STOP BAR
EMERGENCY PRE-EMPTION OPERATION NOTES
OPERATION NOTES
EMERGENCY PRE-EMPTION NOTES:
EMERGENCY PRE-EMPTION NOTES:CONTINUED:
SIGN TABULATION
SR 0926
SR 0352
MIDDLETOWN ROAD
STREET ROAD
2006 PROJECTED TRAFFIC VOLUMES
MUNICIPAL BOUNDARY LINE
THORNBURY TOWNSHIP DELAWARE COUNTY
WESTTOWN TOWNSHIP CHESTER CO.
LEGAL RIGHT-OF-WAY LINE
NO SIGNAL WITHIN ONE MILE
SIGN TO BE LOCATED 500' FROM STOP BAR
SIGNAL INDICATIONS
LEGEND
GENERAL NOTES
PENNSYLVANIA DEPARTMENT OF TRANSPORTATION
ENGINEERING DISTRICT 6-0
COUNTY: DELAWARE & CHESTER
MUNICIPALITY: THORNBURY & WESTTOWN TOWNSHIPS
INTERSECTION: MIDDLETOWN ROAD (SR 0352) & STREET ROAD (SR 0926)
REVIEWED
MUNICIPAL OFFICIAL
DATE
RECOMMENDED: STEPHEN B LESTER 9/7/76
DISTRICT TRAFFIC ENGINEER
DATE
SHEET 1 OF 1
PERMIT # 62-1979
FILE # 1979
Fax from DOT 7/12/06

Physical Components

* Foundation
* Pedestal
* Mast-Arm
* Span wire

Signal Cabinet Electronics



(1) Signal Controller

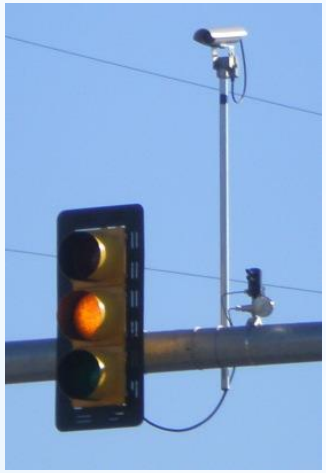
The traffic signal controller is the brain of every traffic signal. It contains all of the programming information necessary for the proper functioning of the signal. Information such as green, yellow, and red timings for each movement, emergency preemption programming, pedestrian movements, and coordination plan timings are all stored in this device. Signals are sent out from the traffic controller to change the signal's lights.

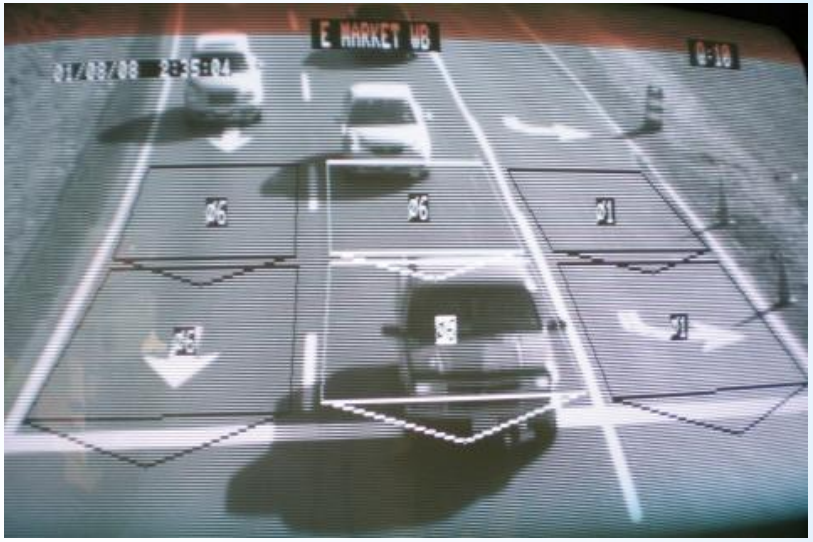
(2) Conflict Monitor

Every outgoing command sent from the controller is checked by the conflict monitor. If there is a problem with a controller, the monitor itself, or if signal light wiring is removed or damaged, the conflict monitor automatically puts the signal into flash mode until the issue is resolved.

(3,4) Detection

Video detection





Inductive Loops

Loop or camera detection is what senses the presence of a vehicle and sends a “call” to the controller to change movement at the intersection.

(5) Emergency Preemption System (Opticon)

Many intersections are equipped with an emergency preemption system that allows for faster and safer travel of emergency vehicles through a signal. Emergency vehicles are equipped with an emitter that sends a communication to a receiver installed on the signal's mast arm. The receiver sends a signal to the traffic controller to give priority to the approaching emergency vehicle.

West Chester Pike Adaptive Signal Control

* West Goshen, East Goshen, and Westtown Townships has partnered to complete t**he West Chester Pike Adaptive Signal Control Technologies Project**
* Main benefits of the project:
  * Continuously distribute green light time equitably for all traffic movements
  * Improve travel time reliability by progressively moving vehicles through green lights
  * Reduce congestion by creating smoother flow
  * Prolong the effectiveness of traffic signal timing
* The project involved the following:
  * Installation of adaptive signal control technology, fiber optic cables, four-way video detection systems;
  * Upgrade of traffic signals;
  * Installation of ADA curb ramps and replace and relocation of existing signage and pavement markings at varying intersections

West Chester Pike Adaptive Signal Control

- The adaptive signal control technology process is simple:
  1. Traffic sensors collect data
  2. Traffic data is evaluated and signal timing improvements are developed
  3. The adaptive signal control technology implements signal timing updates

The process is repeated every few minutes to keep traffic flowing smoothly. In comparison, traditional signal retiming might only repeat this process every 3 to 5 years.

- Project's Cost is $1,882,300
  - Partially (50%) funded by the PennDOT's "Green Light-Go" initiative designed to improve the efficiency and operation of existing traffic signals located in the Commonwealth.
- Operational since Spring 2019

* **Rt 3 & Rt 352 looking westbound**

(6) Backup Power Supplies

UPS – Uninterrupted Power Supply

In the event of a power loss, the systems instantly transition to battery power to keep the signal in operation.

Portable Generator

Used for prolonged power outages that exceed the capacity of the batteries. Generators are placed at each location to provide standby power.

LED vs. Incandescent Lamps

Cost

Red LED -$77

Yellow - $84

Green - $112

Light bulb - $3

Service life

LED – 100,000 hours

Lamp – 2,200 hours

Replacement Cost - $65 per unit

Energy use

LED – 12 watts

Incandescent – 116 watts

Disadvantage of LED

Does not produce heat for snow melting

Costs and Maintenance

* A typical 4 way intersection installation costs approximately $220,000

* Monitored daily for operational and physical deficiencies – Repaired as top priority

* Annually inspected for permit compliance

* Yearly energy costs to operate a 4 way intersection

  LED - $75

  Incandescent - $675

Questions?

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