Using Portable Traffic Signals to Solve Common Work Zone Dilemmas

Kirk Thrasher
Horizon Signal Technologies, Inc.
Common Work Zone Dilemmas

1. Controlling traffic at residential driveways within a work zone
2. Conveying pertinent information to the motorist
3. Slow-moving vehicles through a work zone
4. Permanent signals / intersections near or within a work zone
5. Railroad crossings intersecting work zones
A Quick Review...
IMUTCD

Section 4D.32 – allows for the use of Portable Signals on roads and drives within a one-lane, two-way work zone
Phasing / Timing Plans per IMUTCD

- Shall be in accordance with FHWA Signal Timing Manual which is now NCHRP Report 812 (available online)

- Cycle lengths limited to 255 seconds

- Red intervals limited to 99 seconds

- Minimum Green interval = 15 seconds for major arterials, 10 seconds for minors
Malfunction Management System per IMUTCD

- Real-time monitoring of signal functionality to ensure safe operation

- Any potentially unsafe scenario causes a signal fault (Flash)

- Conflicting indications, lamp loss, communication loss, low voltage
“The deployment of Portable Signal Systems results in safer and more efficient operations.”

-MNDOT Efficiencies Efforts Report, 2014
Portable Traffic Signals

• The next step in work zone safety technology
• Removes flaggers from the dangers of traffic control
• Automatic, 24-hour operation
• Several different types available for a variety of applications
• Gives engineers a more efficient and cost-effective solution for traffic control in work zones
Benefits of Using PTS

• Eliminates need for human traffic control
• Traffic signals are familiar and universally recognized
• Add-on components adapt to unique situations
• Reduces long term costs over use of flaggers
Why Use PTS?

• SAFETY

  • Improve drivers’ ability to react to unfamiliar work zone

  • Safely manage multiple phases of traffic including side roads, driveways, intersections, etc
Portable Traffic Signals can do so much more!
Dilemma #1: How do you effectively control traffic at residential driveways that fall within a work zone?
Previous Solutions – The Flagger

Flaggers at each driveway is impractical, and an inefficient use of manpower.
Previous Solutions - Signals

- 3-color traffic signals at each driveway is inefficient due to cycle length issues.

- Each driveway must be serviced one at a time, while main phases are held.
The Driveway Assistance Device, or “DAD,” safely alerts motorists to the direction of traffic flow in one-lane, alternating work zones. It is designed specifically for residential driveway use, and improves traffic flow efficiency by keeping cycle lengths at a minimum without compromising safety.
Each DAD is activated by PTS on the main traffic phase. All arrows flash in the direction of traffic flow, allowing driveway vehicles to join or follow the queue out of the zone.
NO TURN ON RED

PROCEED ON FLASHING RED ARROW AFTER STOP
FHWA Experimental Use

• DADs are not currently mentioned in the MUTCD

• Several states have done official Experimentation under the FHWA

• Other states have used the device under special provisions or permits
Dilemma #2: How do you convey pertinent signal and work zone information to the motorist?
Wait Time / Fault Display System

• Displays messages in real-time as signals operate
• Increases driver awareness
• Improves safety during fault modes
Modes of Operation

• Display wait time until next green indication

• 2 methods:
  • Real-time countdown
  • Maximum wait time (overall cycle length)
Green Indication

- “Slow / Work Zone”
- “Proceed with Caution”
- Wait Time message appears again as soon as green expires
Fault Management

• Traditional fault mode for PTS is FLASH RED (Stop Sign)

• This is not an effective or safe way of handling faults for bi-directional traffic through a lane closure.

• If drivers can’t see the other end of the work zone, they could meet in the middle on a flash red scenario.
Fault Management

• Instead...

• One side displays “Road Closed” message with SOLID RED indication.

• “Seek alternate route”
Fault Management

• Other side displays FLASH RED indication, allowing drivers to proceed.

• This method decreases likelihood of drivers from both sides meeting in the middle

• Allows some traffic to keep moving until repairs can be made
Dilemma #3:
How do you manage slow-moving vehicles in a work zone?
The Problem

- Slow-moving, or stopping vehicles require more time to clear the work zone
- Red clearance times are calculated based on speed vehicles are moving and distance traveled.
- Vehicles moving too slowly may not exit the zone before an opposing green indication
The Solution

- Clearance Extension System detects vehicles that are still in the work zone when green time is expiring

- Extends red time until vehicles leave the work zone
Clearance Extension

- Allows the user to program more precise red times – no need to overcompensate for slow vehicles that may not be there every cycle

- Increases overall traffic efficiency
Dilemma #4 (a): Permanent signals / intersections near or within a work zone.
The Problem

- Lane closures can impose into an existing intersection

- Existing signals, and bi-directional traffic through the lane closure are not synchronized.
The Solution

- PTS can wirelessly interface with permanent installations to adjust/extend the existing intersection.

- Signal shown here is being controlled by cabinet that is 2 intersections away.
Dilemma #4 (b): Permanent signal knockdown or span wire break.
The Solution

• Wireless connectivity allows PTS to be installed as a temporary replacement for damaged poles

• Street corner controller operates PTS

• Full conflict monitoring via cabinet’s MMU
Wireless Knockdowns

- Excellent temporary solution until repairs can be made or poles can be installed
- Easy set up – approx. 30 minutes
- Can also be hardwired to cabinet
Dilemma #5: Railroad Crossings intersecting a work zone.
The Problem

- Trains intersecting the work zone cause disruptions to traffic flow and can cause vehicles to get stuck inside the work area after the red time has expired.
The Solution

• PTS can be pre-empted by approaching trains

• PTS on both sides of tracks go ALL RED until train has cleared
RR Pre-Emption

• Signals connect wirelessly to gate/wig wag controls for actuation

• As long as gates are down / wig wags are on, signals are RED
Kirk Thrasher
Regional Manager
Horizon Signal Technologies

kthrasher@horizonsignal.com
(800) 852-8796

www.horizonsignal.com