OVERHEIGHT VEHICLE DETECTION SYSTEM (OVDS)

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WHY?

- In 2014
  - 35 reported bridge hits due to overheight loads.
  - 11 during peak hours
  - more than any of previous 3 years for **ALL** types of bridge hits.
  - Majority occurred **INSIDE** 610 Loop, primarily along I-10 & I-45 near downtown.

- Avg. cost to repair = $200K-$300K.

- Since 2012, overheight permitting (required for loads higher than 14 feet) has become an online, self-reporting process.
Selected TWO project demo sites, outside Loop 610 (inbound) along I-10
OVDS Demo Sites

Demo Site I-10 West (Wirt Site)

Demo Site I-10 East (Mercury Site)
WHAT?

- Dual-beam, active infrared, direction-discerning system manufactured by Trigg Industries.

- Dedicated camera and dynamic message sign integrated with each OVDS demo site.

- TTI completed performance evaluation study.
OVDS Sensor Spec Sheet

**Specifications**

**Model # 3403 Z**

**Double Eye Z-Pattern**

Visible Red / Infrared

Overhead Vehicle Detection System

*PATENTED Z-Pattern®*

**INPUT POWER**

115 VAC, +/- 20%, 50/60 Hz. Other options include 24 VDC solar or 230 VAC, +/- 10%, 50/60 Hz operation.

**OUTPUT**

Two Form C, dry relay contact closures for Overheight Alarm Functions. One Form C, dry relay contact closure for Fault Reporting. Contacts rated 240 VAC 10A, protected by 8A circuit breakers.

**CERTIFICATIONS**

CE Marking.

**FAULT REPORTING**

Factory configuration per customer selection of operational modes, loss of source/detector/power or total failure. See Options and Accessories section.

**ALARM TIME**

Adjustable by customer from 5 to 60 seconds.

**ELECTRONICS**

Sensors are NEMA 6P enclosure rated.

**EFFECT OF AMBIENT LIGHT**

Use of Dual Beam RED/IR Z-Pattern® provides automatic switch to Single Beam Detection Mode of Overheight Protection if the sun or other interference saturates one detector.

**MAXIMUM RANGE**

700 feet (213 m). Suggested maximum range 200 feet (61 m) to allow for bad weather and lens contamination.

**DIRECTION SELECTION**

Selection switch. No tools or adjustment required.

**ALIGNMENT**

Four LEDs and meter (GO-NOGO functions) provided for ease of alignment and testing.

**REACTION SPEED**

1 to 75 MPH (1 to 121 km/h) for a 2.5 inch (6.25 cm) diameter object 1 inch (2.5 cm) above the detection height. Custom speed/size available.

**TEMPERATURE RANGE**

-40° to +150° F (-40° to +57° C).

**ENVIRONMENTAL CONTROL**

Internal thermostat with heater and fan controls air flow which reduces moisture and maintains internal temperature during cold weather.

**HOUSINGS**

External housing is heavy ALMAG casting and sheet aluminum (not less than 1/8 inch or .318 cm thickness) for rugged durability and extended life. Cabinet design minimizes effects of vandalism and provides rigid mounting. NEMA 3R Certified.

**MOUNTING**

The pole cap serves as a mounting bracket and sighting base with our poles, or a 3-tub mount is available. See Options and Accessories section.

**DIMENSIONS**

Remote Cabinet: 12% x 16% x 8% inches (32 x 42 x 22 cm).

Master Cabinet: 12% x 18% x 8% inches (32 x 48 x 22 cm).

**SHIPPING WEIGHT**

60 lbs (27 kg).
HOW?

- Infrared beams are aligned across inbound lanes at a threshold height of 14 feet.

- Whenever threshold height is met or exceeded, an automatic alert of violation will be texted, emailed (w/5 sequential photos), and video archived.

- Additionally, downstream flashing beacons and warning message will automatically be activated.
Detection Concept

A = Overheight vehicle is detected by OVDS
B = Alarm bell triggered (NOT selected) upon detection
C = Warning sign activated upon detection
I-10 East Demo Site
I-10 West Demo Site
OVDS Components
OVDS Components

OVERHEIGHT MUST EXIT I-610
Project Timeline

Installation: January 5, 2015

Pre-Deployment Testing: February 7-8

Final OVDS Performance Evaluation & Recommendations Report: August 31
Evaluation Goals

• Identify any technical concerns with the OVDS
• Document institutional lessons learned
• Document general characteristics of overheight vehicles
• Effectiveness of OVDS in diverting overheight vehicles
• Document any changes in bridge hits as a result of OVDS
• Cost effectiveness of the system.
Evaluation Process

- Collect Before and After data
  - Alarm emails
  - Video data at the interchange (> 10 days)
  - Video clips from OVDS Camera
  - Bridge hits data
  - OVDS Cost data
  - Modem logs for alarms

<table>
<thead>
<tr>
<th>Action</th>
<th>I-10 West</th>
<th>I-10 East</th>
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<tbody>
<tr>
<td>Before Data</td>
<td>March 12</td>
<td>March 4</td>
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<tr>
<td>DMS Activation</td>
<td>April 15</td>
<td>April 7</td>
</tr>
<tr>
<td>After Data</td>
<td>April 16</td>
<td>April 8</td>
</tr>
</tbody>
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Sample Violators – I-10 East
General Characteristics - Overheight Vehicles

- Proportion in heavy vehicles per day
  - Average 0.5% at Mercury
  - Average 0.87% to 0.7% at Wirt

- At I-10 East (Mercury Site)
  - On average 18 to 23 alarms/day
  - 24 violations/avg. weekday
  - 15 violations/day on weekends.

- At I-10 West (Wirt Site)
  - On average 49 to 55 alarms/day at Wirt
Evaluation Findings - OVDS Operations
• 10-12 seconds of alarm state

• Doesn’t measure actual vehicle height
DMS Integration

OVDS detects Alarm

Contact closure relay

Radio receiver in DMS with pre-set alarm time (30 seconds)

After 30 seconds, DMS goes back to blank till next alarm

Triggers the Message Display
OVDS Findings - Institutional Lessons Learned

- Plan additional time and budget for procurement when procurement needs to be sole source, particularly when the product does not have standard/special specifications for reference and is not on the TxDOT QPL.

- Very important to know actual bridge clearance versus marked bridge clearance
  - reasonable threshold height
  - integration with an enforcement program.

- Cell communications in the urban areas
  - quite reliable
  - provide a convenient and less expensive way to deploy similar systems.
Effectiveness in Diverting Overheight Vehicles

- Increased ~5% at both sites
- Statistically significant at 90%, but not at 95% confidence level.
Bridge Hits Findings

- Bridge hits possibly detected at Mercury
  - Before period (April 7, 2014 thru July 28, 2014) -4
  - After period (April 7, 2015 thru July 28, 2015) -0

- Bridge hits possibly detected at Wirt
  - Before period (April 15, 2014 thru July 28, 2014) -2
  - After period (April 15, 2015 thru July 28, 2015) -1

- Overall Bridge hits in Houston District
  - Before period (April 7, 2014 thru July 28, 2014) -13
  - After period (April 7, 2015 thru July 28, 2015) -2
Cost Effectiveness of OVDS

- Costs - $135k per demo site for equipment, labor, and installation
- Average cost of bridge hit - $200k to $300k
- Savings of $65k to $165k
- B/C = 3.7 (low estimate) and = 5.5 (high estimate) if we attribute the reduction in bridge hits solely to OVDS
- It is likely that overheight vehicle drivers have learned of the presence of OVDS and possibility of enforcement, therefore are paying more attention to their vehicle heights and bridge clearances resulting in fewer bridge hits in the After period.
Going Forward - Recommendations

- Develop a plan to integrate the OVDS system with an enforcement program including identification of any technical, funding, and legal impediments to the integration.
- Continue monitoring bridge hits in order to better document the benefits of the OVDS.
- Need to develop an updated and accurate bridge clearance inventory.
- Conduct a study to determine if OVDS should be deployed at other locations.
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