In-Roadway Warning Light Systems

Overview, Evaluation, Installation and Investment Considerations

Traffic Safety Corp
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IMSA
Vancouver, WA
June 5, 2012

In-Roadway Warning Light Systems

Traffic Safety Headquarters
Sacramento, CA

In-Roadway Warning Light Systems

- **Agenda**
  - **Overview**
    - **Need for Safety Enhancements**
    - **Planning for Pedestrian Safety**
    - **Goals**
    - **Application Areas**
    - **MUTCD Standards/Recommendations/Guidelines**
    - **Crosswalk Configuration Examples**
  - **Evaluation**
    - Components
    - Criteria
    - System and Vendor Evaluation
    - Third Party Testing and Evaluation
  - **Installation**
    - Standard Site Survey
    - Solar Site Survey
    - AC vs. Solar Powered Systems
    - Installation Techniques
  - **Investment Considerations**
    - Installation Costs
    - Investment Considerations
  - **Open Discussion (Q & A)**

In-Roadway Warning Light Systems

Need for Safety Enhancements

National Highway Traffic Safety Administration Traffic Safety Facts

- Pedestrian Deaths in 2010: **4,280 - Approx. 12/Day**
- Pedestrian Injuries in 2010: **70,000 – Approx. 196/Day**
- Approximately **75%** of Pedestrian Fatalities Occur in Urban Areas
- Top Four States for Pedestrian Fatalities are **California, Florida, Texas, and New York**
- Approximately **70%** of all Pedestrian Fatalities Occur at Night (4 PM to 4 AM)
- In Urban Areas, **53%** of Pedestrian Deaths Occurred on Roads with Speed Limits of 40 mph, or less
- In Rural Areas **26%** of Deaths Occurred on such Roads

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Planning for Pedestrian Safety

- "Pedestrians must be included as a matter of course in the planning and design of roadway plans. This includes reconstruction, repaving, and retrofits of existing streets. Only by integrating pedestrian facilities wholesale will the transportation system work in totality."

- **Examples of Pedestrian Design Elements:**
  - Bicycle Lanes
  - Roadway Narrowing
  - Lane Reduction
  - Raised Medians
  - One-Way vs. Two-Way Streets
  - Roundabouts
  - Sidewalks and Walkways
  - Curb Ramps
  - Roadway Lighting Improvements
  - Street Furniture/Improving the Walking Environment

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Goals of In-Roadway Warning Light Systems

- **To Provide an Alternative to Signal Lights where the use of signal lights would cause …**
  - Excessive delay
  - Excessive disobedience of the signal indications
  - Increased use of less adequate routes as road users attempt to avoid the traffic control signals
  - Significant increases in the frequency of collisions (especially rear-end collisions)
- **To Create a Safer Environment for People by Reducing or Eliminating Accidents at Locations Prone to Accidents**

… "Pedestrian Safety is the Major Concern"

In-Roadway Warning Light Systems

Application Areas for IRWLS:

- **FHWA: MUTCD (2009 Edition), Section 4 (Highway Traffic Signals) , Part N (In-Roadway Lights)**
  - **In-Roadway Lights are used as an alternative to traffic lights where pedestrian safety is a concern**
  - **Typically Placed At:**
    - Midblock Crossings
    - Crosswalks on Uncontrolled Approaches
    - Crosswalks in Advance of a Roundabout
    - School Crosswalks
- **Private Applications (Colleges, Hospitals, Retail, Ports, Industrial Campuses, Etc.)**
  - **Where there is Heavy Traffic , Many Pedestrians or Both**
  - **Typically Placed At:**
    - Pathways around or leading to Facilities
    - Crosswalks between Parking and Facilities
    - Crosswalks between Facilities

In-Roadway Warning Light Systems

MUTCD Standards/Recommendations/Guidelines

- **MUTCD Specifies the Placement, Operating Characteristics, and Specifications of an In-Roadway Warning Light System**

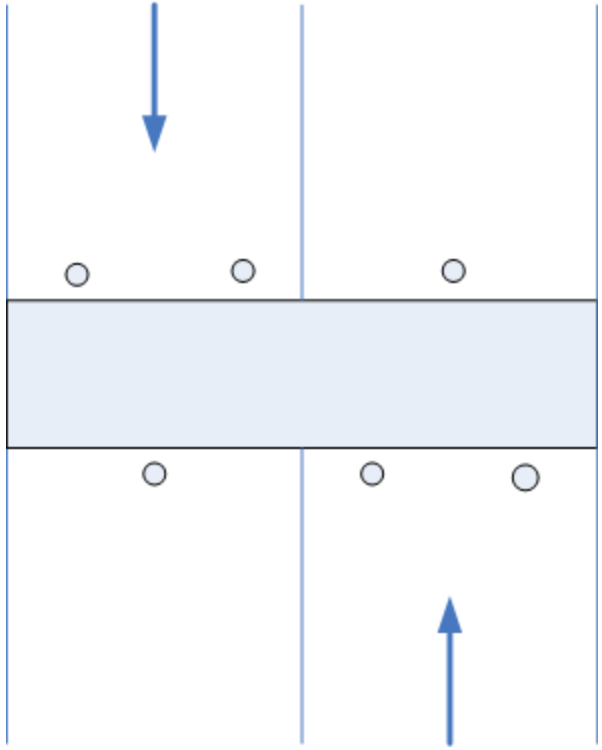
  - **Placement of Lights**
    - One Lane (2 on Approach Side), Two Lanes (3 per lane, 3 per side), Three or More Lanes (2 per Lane, one on each side)
    - Shall be Installed on Both Sides of the Crosswalk and Span its Entire Length
    - Placed Outside Crosswalk Lines and Within 10’ from the Outside Edge of the Lines
    - Placed at the Center of Each Travel Lane, Center Line of the Roadway, or at the Edge of the Roadway or Parking Lanes

  - **Operating Characteristics**
    - Flash Rate: 50 to 60 FPM
    - No Steady Burn
    - Enhanced Flash Mode: May Flicker During Flash Period
    - Synchronous Flashing of all In-Roadway Lights

  - **Specifications**
    - Directionality: Unidirectional (one light) or Bidirectional Design (two lights)
    - Color: Yellow Light
    - Profile: Not to Exceed ¾” Above Roadway Surface
    - System Activation Duration: Minimum of one second/3.5 feet of Crosswalk Length

In-Roadway Warning Light Systems

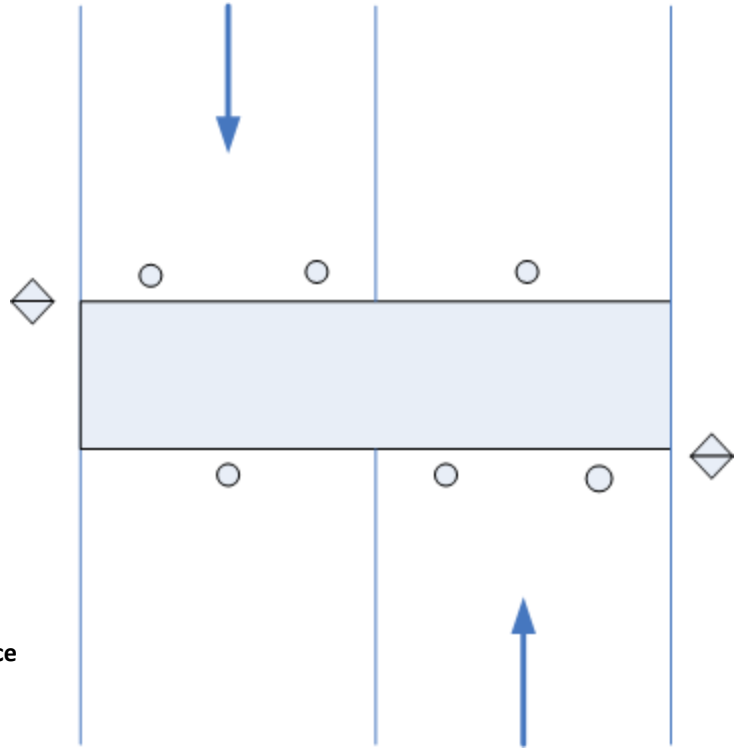
IRWLS Crosswalk Configuration Example
Core System (No Above Ground Warning Devices)



In-Roadway Light

In-Roadway Warning Light Systems

IRWLS Crosswalk Configuration Example
Core System with Local Above Ground Warning Device



Above Ground Warning Device

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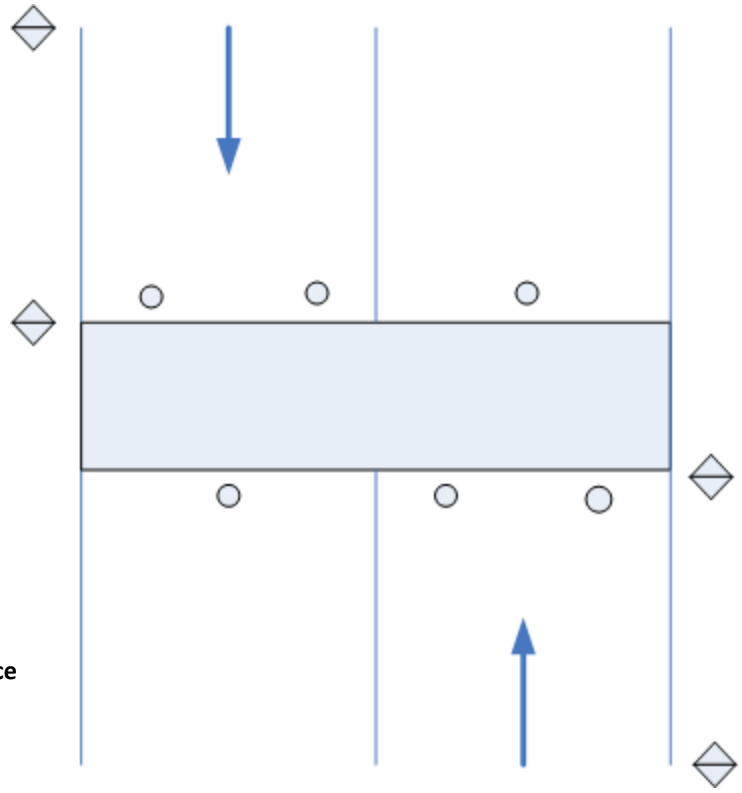
IRWLS Crosswalk Configuration Example
Core System with both Local and Advance Above Ground Warning Devices



Above Ground Warning Device

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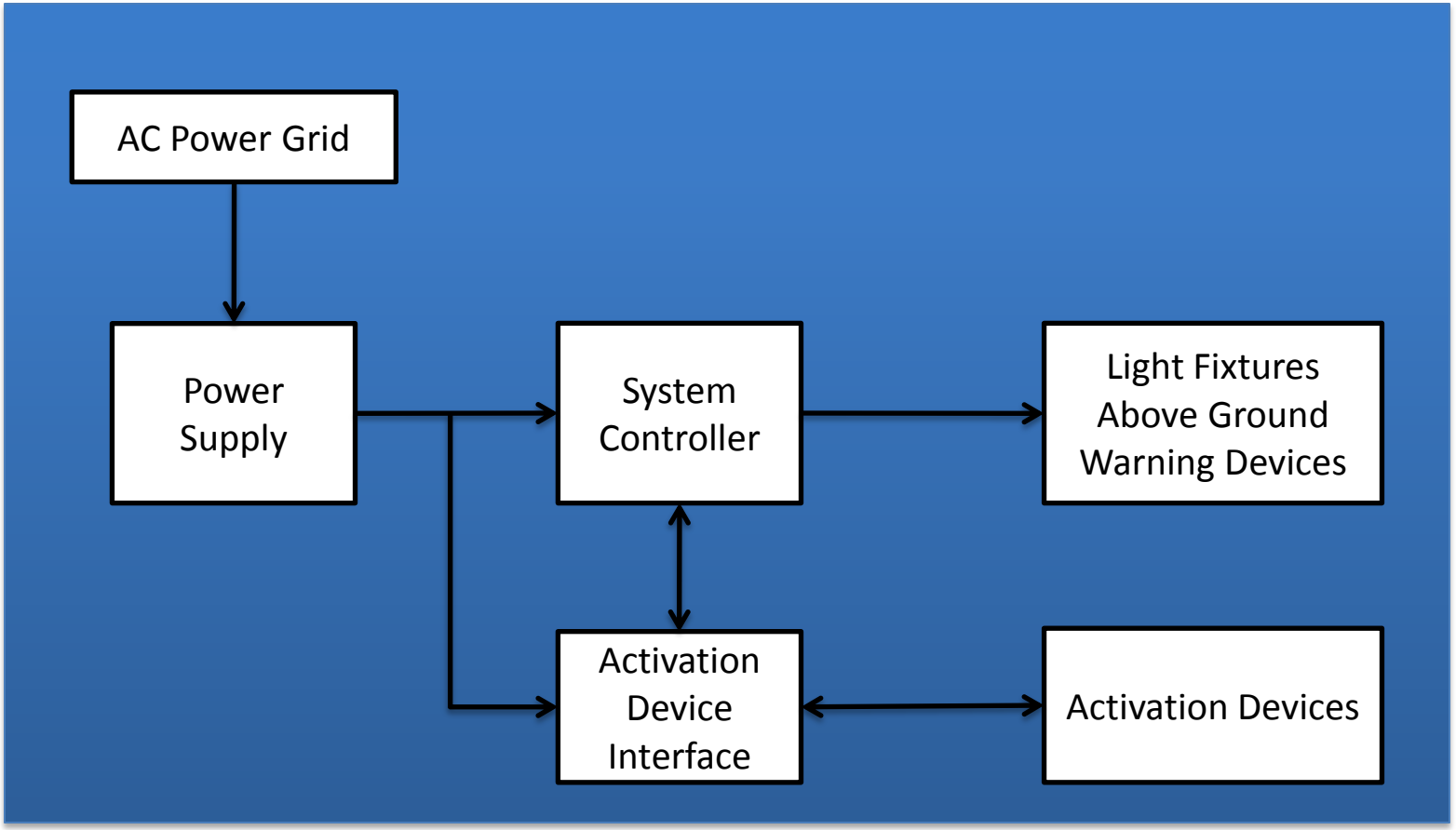
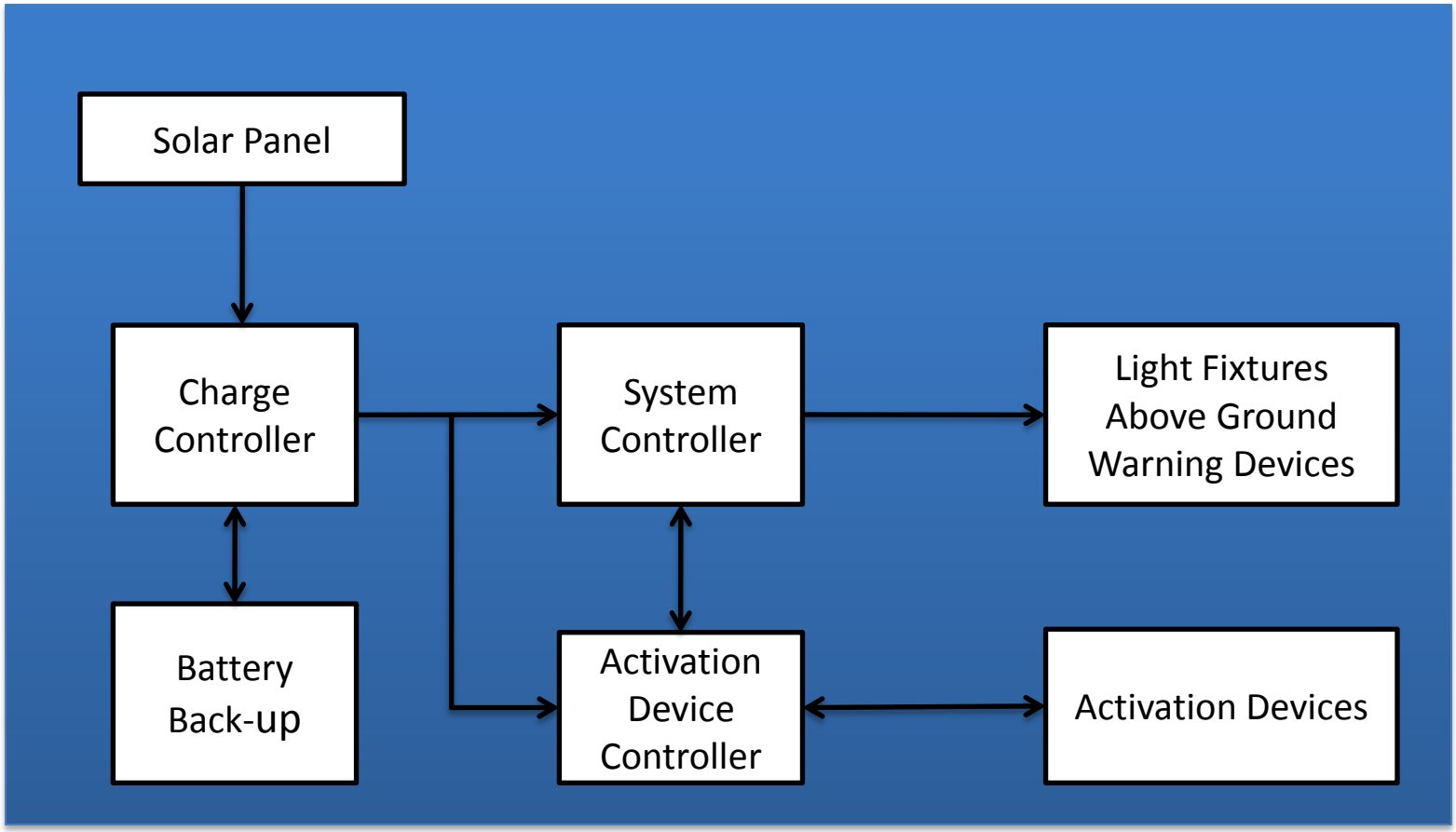
In-Roadway Warning Light Systems

System Components (AC Powered)



In-Roadway Warning Light Systems

System Components
(Solar Powered System)



In-Roadway Warning Light Systems

Evaluation Criteria – System and Vendor

- **Effectiveness**
  - Improve Driver's Awareness that the Crosswalk is in Use → Visibility
  - Improve Driver's Awareness of Pedestrians in Crosswalk at Night → Visibility
  - Versatility of System to fit the Site's Needs (Fixture Beam Widths, Activation Devices)

- **Quality**
  - **Reliability**
    - Low Failure Rate → Low Down Time and Repair Costs
    - Low Maintenance → Low Down Time and Maintenance Costs
  - **Durability (Expected Useful Life)**
    - Expected Useful Life of the System (How Quickly does the System Wear Out?)
    - Can the System's Useful Life be Extended → New Technology or Functional Upgrades
    - Design: Mounting Technique, Fixture Profile

- **Support**
  - **Pre-Sale:** Knowledgeable Staff, Site Survey and System Configuration Assistance
  - **Ordering:** System Submission and Warranty Acknowledgement Forms
  - **Production QC & QA:** System Integration, System Test, and Burn-in
  - **Pre-Installation:** Available Documentation, Installer Briefings
  - **Installation:** Support During Installation and Setup
  - **Post Installation:** Availability of Technical Support Center, System Warranty

- **Investment**
  - Initial Investment and Lifetime Costs → Does it Fit My Budge? Best Value?

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System Components and Company Evaluation

System	System Components				Company Support		
	Fixtures	**System Controller**	**Activation Device**	**Above Ground Device**	**Sales**	**Production**	**Technical Support**
Effectiveness	Visibility Directionality Beam Width	Enhanced Flash Patterns Auto-Sequencing Activation Flexibility	Match Device to the Application	Visibility	X	X	X
Reliability	Light Engine Self-Cleaning	Circuit Board Anti-Corrosive Treatments	Design	Design	X	Integration Test Burn-in	X
Durability	Materials Mounting Method	Enclosure Design and Materials	Materials	Materials	X	X	X
Support	Warranty	Warranty	Warranty	Warranty	Knowledge Site Survey Configuration	X	Pre-Installation Installation Tech Center

In-Roadway Warning Light Systems

Third Party Testing and Evaluation

Florida Department of Transportation

RICK SCOTT
GOVERNOR

605 Suwannee Street
Tallahassee, FL 32399-0450

ANANTH PRASAD, P.E.
SECRETARY

February 27, 2012

Mr. Ted Vaeches
Traffic Safety Corp.
2708 47th Avenue
Sacramento, CA 95822

FEID # 94-3331652

Dear Mr. Vaeches:

In compliance with Section 316.0745, Florida Statutes, the following products have been evaluated against FDOT specification A670, approved, and placed on the Florida Department of Transportation's Approved Product List (APL).

CERTIFICATION NUMBER	PRODUCT	DESCRIPTION
67031002717011	In-Roadway Lights Assembly	Model TS1100 Series Push Button Activation
67031002717021	In-Roadway Lights Assembly	Model TS1100 Series Push Button and Loop Detector Activation

In-Roadway Warning Light Systems

Third Party Testing and Evaluation

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In-Roadway Warning Light Systems

Standard Site Survey

- Recommend that a **complete site inspection** be conducted prior to system configuration, to ensure that all site variables have been taken into account in the design of the system

- Excessive **crowning**, steep up/down-hill **slopes** immediately following the crosswalk area, **uneven road surfaces**, and **curves** in the road should be evaluated to determine their affects of the system configuration and performance

- Conditions affecting **drainage**, such as road depressions and soil conditions, should be evaluated to determine the drainage requirements

- **Based on the site inspection, the system can be properly specified and configured for the intended site**

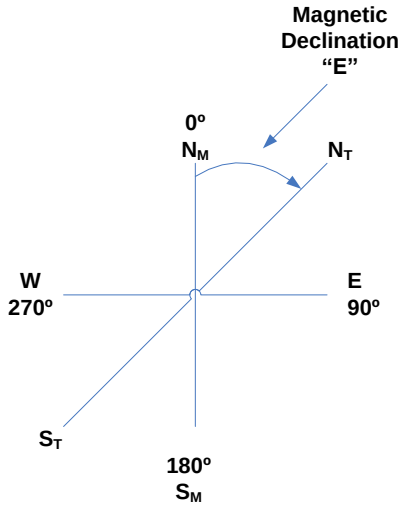
- An additional **solar site survey** is recommended for solar installations

In-Roadway Warning Light Systems

Solar Site Survey

- **Key Parameters for Solar Powered Systems:**
  - **Incoming Solar Energy - Insolation Measured in Sun Hours at a given Location and Solar Panel Size**
  - **Outgoing Electrical Energy - Determined by the System Load and Usage**

- **Solar Site Survey Determines how much of the Incoming Solar Energy is Received by the Solar Panel**
  - **First Determine True (Geographic) South**
    - Look Up the Magnetic Declination for the Location (Angle Between Magnetic North and True North)
    - Use the Magnetic Declination to Determine True South
      - » West (Subtract from Magnetic South (180°) to get True South
      - » East (Add to Magnetic South (180°) to get True South



Magnetic Declination Correction

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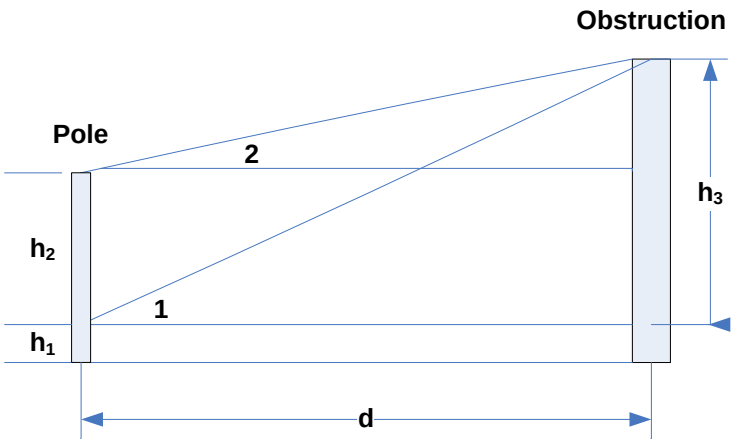
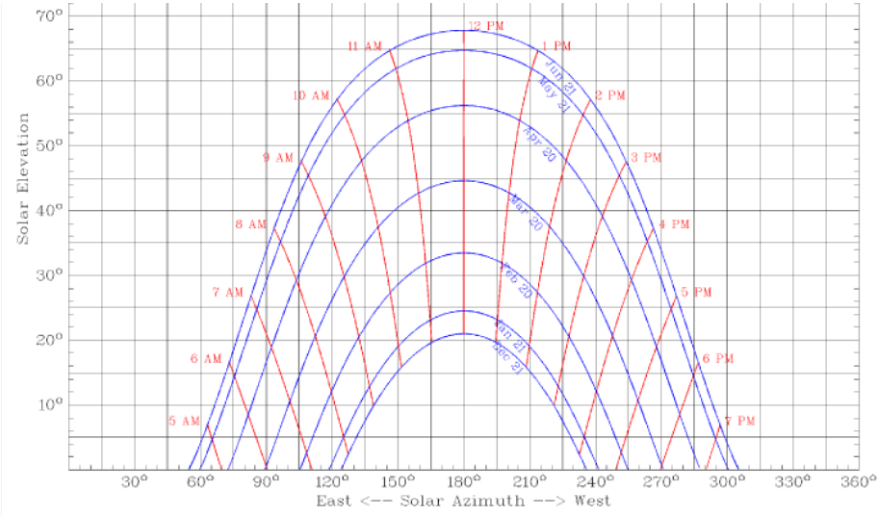
Solar Site Survey

- **Solar Site Survey Determines how much of the Incoming Solar Energy is Received by the Solar Panel**
  - **Then Check for potential sources of shadows between 9am (270°) and 3 pm (90°), where True South is Set as 180°**
    - Starting from 90°, Adding 15° Increments, Ending at 270° Measure Angles (Altitude) from Pole Location to Top of Obstacles
    - Record Angle and Distance to Obstacles
- **Using Sun Plots for the Location, the Percentage of Insolation Available can be Estimated**



Altitude and Distance Measurements



Sun Plot

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AC Power Grid VS. Solar Powered Systems

- **AC Power Grid Powered Systems**
  - Easy Access to AC Grid (Generally)
  - However – If not, Trenching may be Necessary ($$$)
  - Hook-up must be Scheduled Well in Advance
  - In Some Cases – The Grid May not be Accessible

- **Solar Powered Systems**
  - Total Cost of Installation may be Lower than AC Grid
  - Faster Deployment
  - Lower Operating Costs
  - Site may not be Suitable for Solar due to Location, Panel Size Issues, or Shading and, or Wind Loading Issues
  - Solar Panel must be Mounted (Typically) on a Pole ($$$)

In-Roadway Warning Light Systems

Installation Techniques

- **Core Drill and Saw Cut**

Core Drill

Saw Cut

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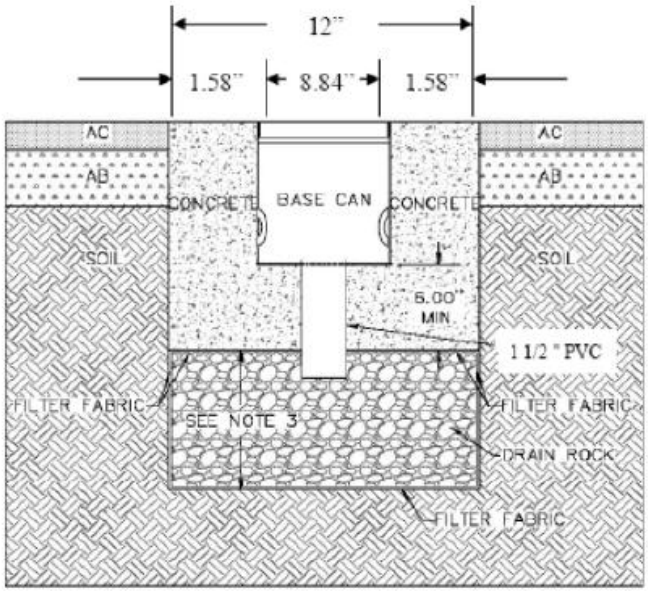
Installation Techniques

- **Core Drill and Saw Cut**



Drainage and Street Cable Routing

In-Roadway Warning Light Systems

Installation Techniques

- **Trench and Fill**

Trench

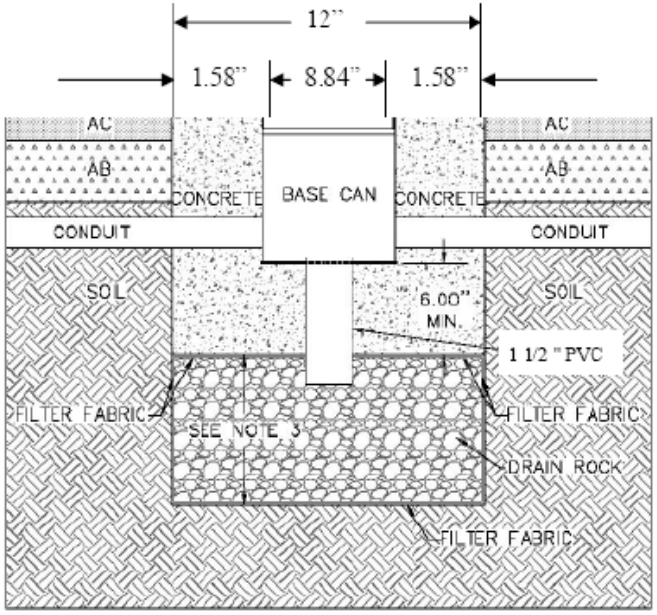
Fill

In-Roadway Warning Light Systems

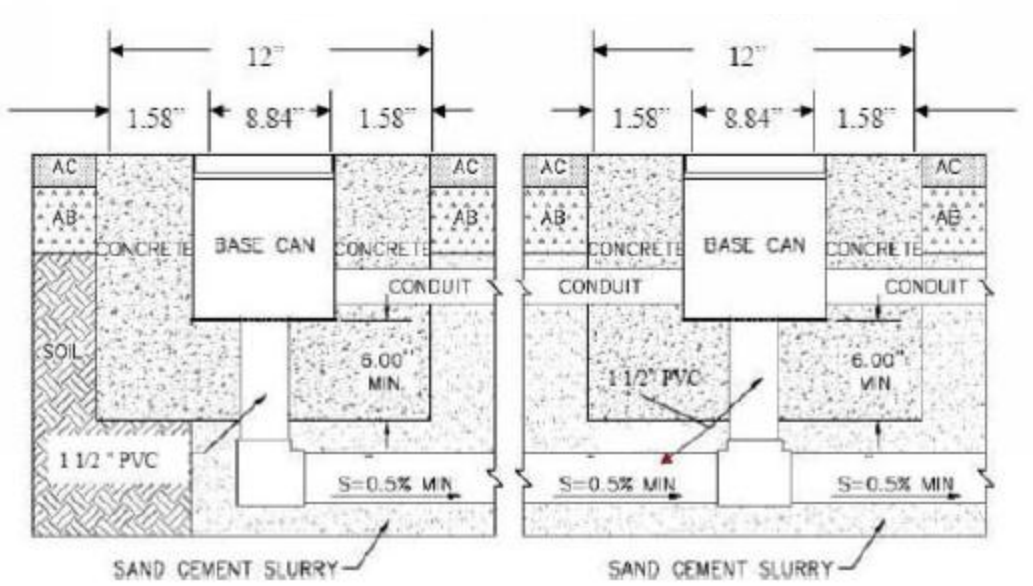
Installation Techniques

- **Trench and Fill**

Option 1



Option 2



Drainage and Street Cable Routing

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Installation Costs

Area	Comments	Examples
IRWL System Components	50% Cost	Fixtures, Controller, Activation Devices
Installation Materials	10% Cost	Concrete, Wire, Asphalt
Equipment, Tools	10% Cost (Rent, 3rd Party)	Core Drill, Saw
Man Power	30% (Staff/Contractor)	2 Lane (50 Man Hours) 4-5 Lane (80 Man Hours)

Note: Overall Investment will Depend on the Quality of the System Components Used, the Type of the Installation Required, and Availability of Equipment and Staffing.

In-Roadway Warning Light Systems

Investment Considerations

Area	Short Term Perspective	Long Term Perspective
Initial Investment	**Lower**	Higher
Lifetime Cost	Higher	**Lower**
Maintenance Cost	Higher	**Lower**
Failure Rate	Higher	**Lower**
Down Time	Higher	**Lower**
Warranty	Shorter	**Longer**
Usable Life	Shorter	**Longer**
Expandability	More Difficult	**Easy**
Upgradability	More Difficult	**Easy**
Support	Limited	**Comprehensive**

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Open Discussion

Q & A