Florida Department of Transportation Research

Design and Construction of an Integrated Solar Lighting Pedestrian Crosswalk(s) and Sidewalks with Enhanced Visibility

May 2021

Project Number
BDV31-977-78

Project Managers
Ronald Chin
Trey Tillander
FDOT Traffic Engineering and Operations Office

Principal Investigator
Jonathan Scheffe
University of Florida

Current Situation

Lighting and signage can sometimes be hardest to see when they are needed the most. During normal times, electricity powers street lights, pedestrian crosswalk lighting, pedestrian alert lights, and more, making streets safer for pedestrians and helping to prevent vehicle-pedestrian collisions. But during a disaster, electricity may not be available, and electrically powered lighting and signage may not be operating.

Research Objectives

University of Florida researchers studied approaches to providing lighting for pedestrian crosswalks and other roadway and pathway applications that are not dependent on the electrical grid.

Phosphorescent stones glow after dark in both concrete and asphalt text patches on a campus walkway.

Project Activities

The researchers intended to investigate two approaches: solar photovoltaic modules for path lighting and photoluminescent stones for lighted pathway marking. The innovative solar modules selected for this project were not available because the manufacturer canceled all current projects pending resolution of production issues. Preliminary designs for that part of project were completed, and that research will be conducted when the solar modules are available.

For this project, the researchers focused on using photoluminescent stones for pathway marking. From many potential sources of these stones, the researchers selected a product based on its high luminance and longer-lasting glow.

Emerald green stones were chosen for construction of the test facilities, a 150-foot sidewalk and a 200-foot asphalt pathway constructed at the Florida Department of Transportation's Traffic Engineering Research Laboratory (TERL). Equipment was installed to take time-lapse photography and monitor solar irradiance so that performance could be quantified as a function of weather conditions.

A second concrete pathway, 30 feet long, was installed on the University of Florida campus to assess performance with less ambient light and to evaluate the use of templated designs. The researchers chose a UF logo alternating with a high density spread of stones.

Results indicated that the stones glow throughout the nighttime but the luminescence was observed to last 3-4 hours at an intensity visible by motorists approximately 40 feet away. Additionally, the amount of aggregate and coverage (spread rate) required for this application was estimated to be 1.5 pounds per square foot. With the cost of aggregate estimated at $27 per pound, a mile of sidewalk at 5 feet wide would cost approximately $1.07M to implement. Due to the cost, it is not recommended to implement this technology at this time.

Project Benefits

Additional lighting modes that operate independently from community electricity will add a useful dimension to road safety during nighttime hours and in situations where community electricity is not available.

For more information, please see dot.state.fl.us/research-center