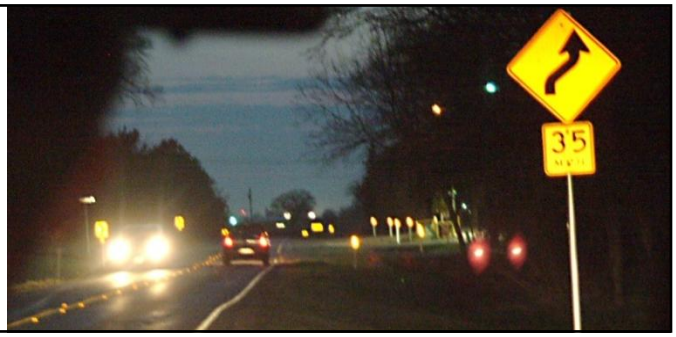
Visibility Research Laboratory

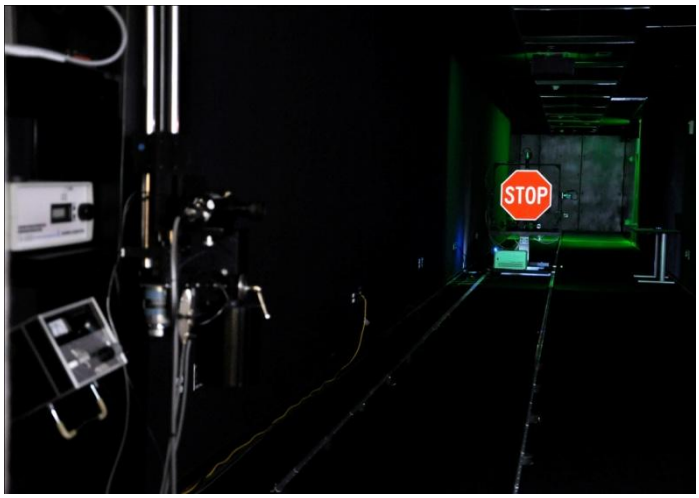
According to the Federal Highway Administration (FHWA), about half of traffic fatalities occur at night, although only about 25 percent of all travel occurs after dark. Although driving while intoxicated or fatigued driving probably contributes to the high rate of nighttime crashes, nighttime driving is inherently hazardous because of reduced driver visibility.



About the Laboratory

In 2009, the Texas Transportation Institute (TTI) added a one-of-a-kind Visibility Research Laboratory to its collection of world class research facilities. The laboratory is located in the Institute's State Headquarters and Research Building in the Research Park at Texas A&M University in College Station, Texas. The laboratory features a 125-foot-long corridor that is used to test retroreflective materials and coatings, lights and other technologies designed to provide nighttime visibility for highway drivers.

For the last 50 years, TTI researchers have conducted full-scale, closed-course nighttime driving studies at TTI's Bryan, Texas, location at the Texas A&M University Riverside Campus, which is located at a decommissioned U.S. Air Force base. This outdoor facility allows for static and dynamic visibility and human factors research at up to 70 mph. The Visibility Research Laboratory complements this full-scale testing facility.



Measuring LED-enhanced traffic control devices.

Now, with support of the Visibility Research Laboratory, a new research tool is available to assess the nighttime visibility of the entire roadway scene (rather than isolated devices), accounting for all retroreflective and light emitting sources that may be adding delineation to the roadway. TTI researchers designed and calibrated a mobile luminance system in the Visibility Research Laboratory.

The equipment is now being used to establish a test method that agencies can use to determine situations in which overhead sign lighting is needed, and if so, how much lighting is needed.

Mobile luminance system captures roadway and roadside scene from the driver's perspective.

Example of captured luminance heat map.

Testing Opportunities

Private Sector Examples

The Visibility Research Laboratory has been used to measure the visibility of traffic control devices, retroreflective and luminescent materials, as well as light sources such as work zone lighting, light-emitting diodes (LEDs) and vehicle headlamps. Human factors studies have been performed in the laboratory to better understand how drivers interpret various traffic control devices, particularly new and innovative devices such as those enhanced with special visibility coatings or LEDs. Through the capabilities of the laboratory, TTI researchers now have the ability to build and calibrate unique data collection equipment to use in the field to evaluate in-situ nighttime visibility, using measures such as retroreflectivity, illuminance, luminance and glare.

Private-sector sponsors have used the laboratory's capabilities for a variety of testing, such as measuring the performance of innovative coatings to enhance nighttime visibility and the performance of various retroreflective optics at standard and non-standard measurement geometries. The laboratory also has supported the testing of mobile pavement marking and sign retroreflective technologies. Public-private partnerships have emerged as a result of the testing that has been conducted in the laboratory.

Public Sector Examples

State agencies also use the laboratory in their visibility research efforts. The Texas Department of Transportation has sponsored several research projects, including the study of LED-enhanced traffic control devices. The Florida Department of Transportation is sponsoring a project in which researchers are measuring the effectiveness of steady-burn work zone channelizer lights. Researchers also recently used the laboratory to build, test and calibrate specialized data collection equipment to assess the visibility of pavement markings along lit and unlit sections of roadways for the Alaska Department of Transportation. Other ongoing testing includes an accelerated pavement marking wear protocol and a new test method for glass beads.

Designing and calibrating specialized field photometric equipment.

Using field luminance equipment in Alaska.

The Federal Highway Administration (FHWA) has used research findings from the laboratory to support new regulations on minimum maintenance levels of retroreflectivity for traffic signs. Federal pavement marking and sign sheeting specifications have been updated with research results produced in the laboratory. Testing results from the laboratory also have been used to support the development of ASTM specifications, as well as AASHTO specifications. Researchers are currently working to revise the *Roadway Lighting Design Guide* for the American Association of State Highway and Transportation Officials (AASHTO).

Representative Sponsor List

3M
AASHTO
ASTM International
Advanced Mobile Asset Collection (AMAC)
American Glass Beads Manufacturers Association
American Traffic Safety Services Association
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Evonik Industries
FHWA
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State Departments of Transportation
Trinity Industries, Inc.
USDOT

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About TTI's Visibility Research

TTI has a distinguished record of research and service in the areas of advanced traffic control materials and highway safety measures for nighttime travel. From more legible traffic signs, to pavement markings that are visible at night in rainy conditions, TTI's research results are visible everywhere on our nation's roadways. TTI's research in these areas led to a new federal regulation for maintained retroreflectivity levels of traffic signs on all roads open to public travel. Researchers at TTI also tested the only alternate font approved by the U.S. Department of Transportation (USDOT) for highway signs other than the original font developed more than 50 years ago. Scientists also are researching materials to find brighter and longer-lasting pavement marking materials that can withstand snow plows, studded tires, de-icing chemicals and pavement temperatures that can reach well above 150 degrees.

For more information about TTI's Visibility Research Laboratory, visit **tti.tamu.edu/visibility**.