



# Development of New Work Zone Traffic Signs for Road Reconstruction Processes

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## Introduction

After a natural disaster, one of the infrastructure sectors requiring rapid recovery is the transportation network. Rescuers, emergency management officers, and supplies of vital commodities use the highway system to access the affected zones. Therefore, it is necessary to expedite the reconstruction of roads to serve the community better. After hurricane María, 17% of the bridges in Puerto Rico were damaged, 1.1% collapsed and more than 70,000 landslides greatly affected the island's roads system.

Searching for alternatives to improve safety for both drivers and construction workers during the reconstruction process, a total of 11 contractors and highway project managers were interviewed to identify which have been the most recurrent incidents involving workers' safety on their projects. In addition, an online survey was performed to gather driver's road safety concept and work zone signage interpretation

Based on the results of the interviews and an online survey, several alternative signs will be developed to guide drivers when traveling through a construction work zone. These alternatives will then be tested using a driving simulator.

## Methodology

# 1

### Contractors Interviews

- Focused on identifying what type of safety issues related to drivers and construction workers they experience in developing of their projects.
- Also, they were asked about other alternatives to improve safety in construction work zones.

# 2

### Online Survey

- To assess driver's road safety knowledge and signage interpretation, an online survey was performed.
- The survey was distributed using Google Form and was administrated in Spanish.
- Social media like Facebook, LinkedIn, Instagram and WhatsApp were used to advertising drivers to participated in the survey. Also, the University institutional email was used for announcements during November to December 2019.
- Participant had to be at least 18 years old and be an authorized driver in Puerto Rico.
- The survey results provided the basis for generating of new traffic signs to be use in construction work zones.

## Results

### Contractors Interviews

81.8% Experienced intrusion of a vehicle into the construction work zone.



40% 33% 20%

They identified speeding, distraction, and the lack of traffic signs as main factors of crashes in construction work zones



Contractors also suggested the use of flashing arrows and variable message sign as a safety countermeasure.

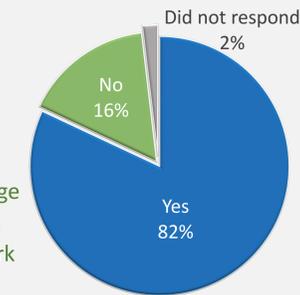
### Online Survey



Age range 18 -80

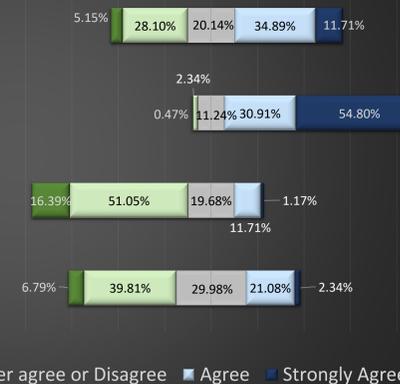
82%

Would like changes in signage currently used in construction work zone.

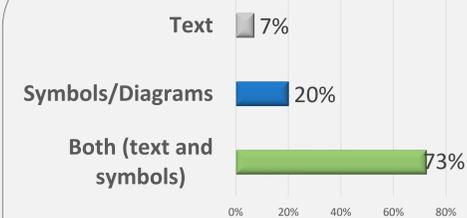


### Drivers' Opinion About Construction Work Zone Signage

- Traffic control devices such as: cones, drones and barriers are sufficient to clearly delineate and define a construction zone.
- I would like to have another way of receiving information about the proximity of a construction work zone.
- Drivers follows the instructions, warning messages and speed limits posted on signs throughout construction zones, even when no workers are present.
- Workers in construction work zones are protected with the number of devices and signage that is currently used.



Drivers suggested using more traffic signs in advance and throughout construction work zone to improve safety.



Most of the respondents indicated that they prefer traffic signs with diagrams or symbols in combining with text.

## Findings

- Both contractors and drivers suggested using more traffic control devices in advance to construction work zones as safety countermeasure.
- Education for both workers and drivers was identified as a necessary measure to improve safety in construction work zones.
- Although statistically, in Puerto Rico, no significant fatalities are reported in construction areas, more than 80% of contractors and project manager reported witnessing vehicles entering construction zones. This fact shows the daily occurrence of dangerous situations to which workers are exposed.
- After a natural disaster and during the response process mobility, is vital, so alerting drivers with enough information about what they can expect ahead is a prevailing need. Based on the information collected in this study, it is evident that drivers would like changes to existing signage in construction zones.
- Based on the drivers' needs and preferences, a signage alternative will be generated, which will then be tested using a driving simulator located at the Transportation Laboratory at UPRM. That evaluation will allow the opportunity to safety examine drivers' behavior in the presence of signs incorporating the suggested changes. This is an ongoing PhD research work.

## References

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