



FROM THE MANAGER

NCDOT Research and Development, in conjunction with the UNC Highway Research Center, will be hosting the second annual (and first virtual) Research and Innovation Summit. Originally planned to be in person, this event was made virtual due to the challenges posted by COVID-19 restrictions. While we are disappointed not to be able to have the in-person conversations that helped make many connections last year, this was really the only feasible solution. On the plus side, we have “room” for up to 500 attendees and you can attend from the comfort of your office or living room sofa. Going virtual has also allowed us to make the event free to attend.

Additional information and the link to register as well as submit presentation abstracts can be found at the event homepage: <https://www.hsrc.unc.edu/ncdot-ri-summit/>

Note that we plan to offer PDH credits for attendees.

In addition to attending, we encourage NCDOT employees and our partners to submit presentation ideas on unique and innovative projects, research and solutions as well as particular challenges for which they are seeking new ideas.

To review the great content from the 2019 event hosted at NC A&T, please visit our Research Project Page: <https://connect.ncdot.gov/projects/research/Pages/ProjDetails.aspx?ProjectID=2019-46>

We hope to see you there!

Neil Mastin,
Research and Development Unit Manager



Photo: Wilmington Waterfront

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Recently Completed Research Projects

RP 2018-17: [State of Practice and Literature Review on Foundations for Coastal Traffic Signal Mast Arm Structures](#)

Carlos M. Rodriguez, Graduate Research Assistant (MS), Miguel A. Pando, Ph.D., Principal Investigator

Project Manager: Mustan Kadibhai, P.E., CPM

This report presents a state of practice and literature review study conducted as part of NCDOT Research Project RP 2018-17 on foundations for coastal mast arm traffic signal structures. The original scope of this project involved experimental and computation research on alternative foundation systems for support of coastal mast arm traffic signal structures in areas with high wind loads, limited right-of-way, and poor geotechnical conditions. However, at the request of the Steering and Implementation Committee (SIC) of this project, the focus was changed to entail a state of practice (SOP) study to document the foundation systems used by coastal departments of transportation to support coastal mast arm traffic signal structures. A total of 12 DOTs participated in this SOP study.

The main objective of this SOP study was to document the predominant foundation systems used and identify any special foundation design practices used for mast arm traffic signal structures in coastal environments with high wind loads, small right-of-way, and poor geotechnical conditions.

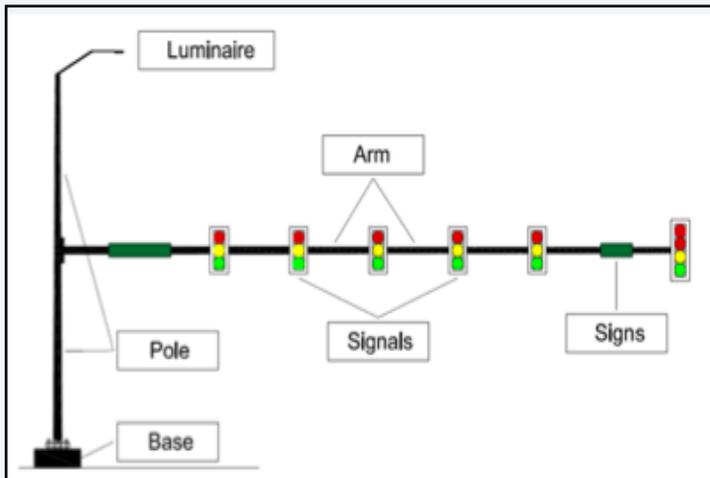


Image: Schematic of a Typical Mast Arm Structure

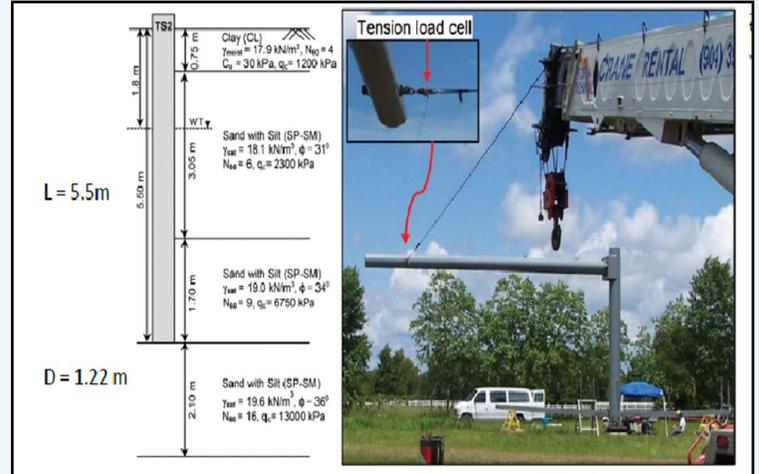


Photo: Subsurface Profile and Field Testing Setup

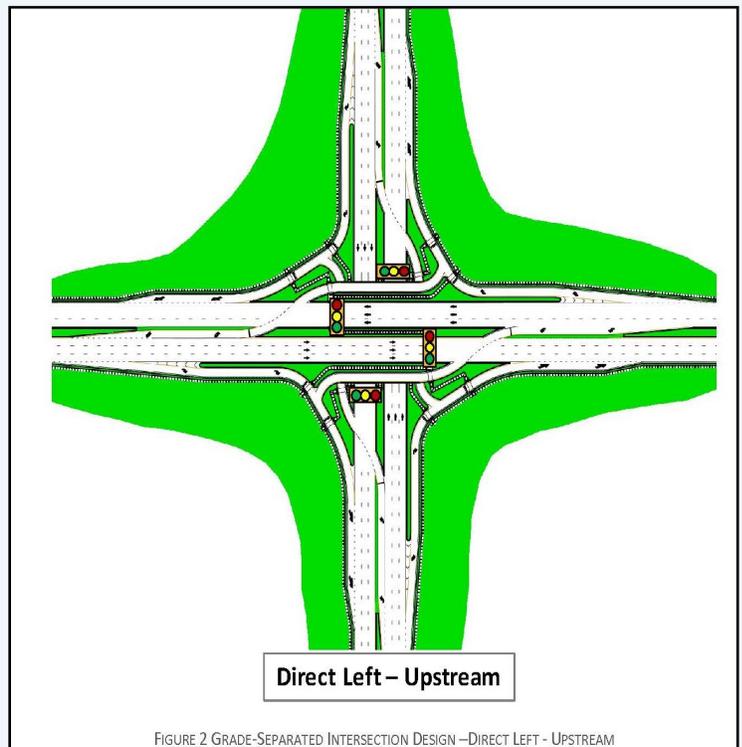
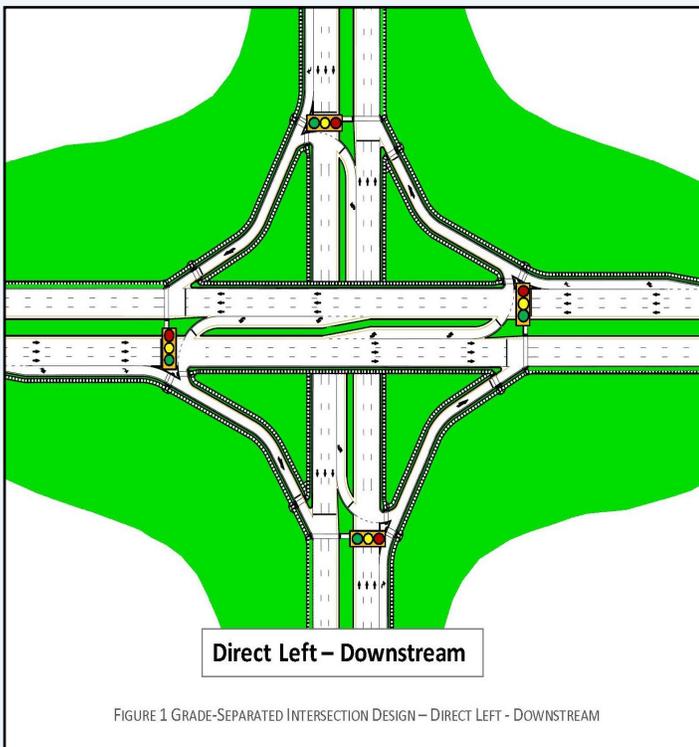
RP 2018-20: [Reasonable Alternatives for Grade-Separated Intersection](#) -R. Thomas Chase, Principal Investigator

Project Manager: Lisa E. Penny

Grade-separated intersections increase the capacity of two non-freeway roads by elevating two or more approaches, thereby removing conflict points. Over 150 grade-separated intersections exist today in North Carolina, with most designs utilizing interchange style

ramps. The traditional interchange configurations have significant limitations in arterials where right of way is limited, freeway speeds are unsafe, and additional access is needed for bicycles, pedestrians and driveways. Additionally, the traditional Crash Modification Factor (CMF) preliminary safety analysis for intersections relies on pre-existing sites with a crash history to predict relative crash performance and the new designs are not yet

Reasonable Alternatives For Grade-Separated Intersections (Cont.)



built to develop these factors.

The purpose of this study was to develop the operational and safety performance evaluation methods for grade-separated intersection designs and provide quantitative results for various traffic volume conditions. The outputs of this study are expected to be used as guidance for engineers and planners in choosing an appropriate design during the planned stage of a project. This study investigates the operational and safety effects of seven grade-separated intersection designs: direct left-downstream (DL-D), direct left-upstream (DL-U), single point left (SPL), three types of restricted cross U-turn (RCUT (U-R), RCUT (R-U), and contra-RCUT), and quadrant - Southeast (QUA (SE)) intersections are already available in CAP-X for alternatives analysis and do not fully grade separate the two arterial through movements for future conversion and therefore were not included in this study. This project developed seven new grade-separated intersection styles for the upper or

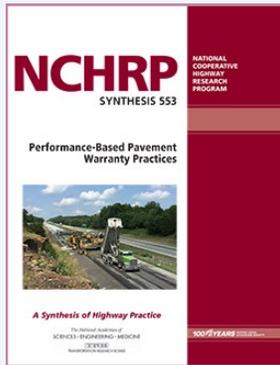
lower half of the intersection design, resulting in over 40 new intersection styles for the upper or lower half of the intersection design, resulting in over 40 new intersection designs in combination. These designs were analyzed for operational and safety performance with the creation of two new computational methods. The overall best design is entirely site specific and the planning level operational and safety models developed in this project can be used to identify preferred alternatives for a given volume condition.

Library Notes

- Come across a resource you need that's not available in our [Online Catalog](#)? I may be able to get the item for you via Interlibrary Loan at minimal or no cost to you.
- Contact the NCDOT Librarian, [Lamara Williams-Jones](#), for assistance: 919-707-6665, Monday through Friday from 8:30 to 4:30. Since there is only one Librarian, customers should call before visiting the Library.

New Publications from Transportation Research Board

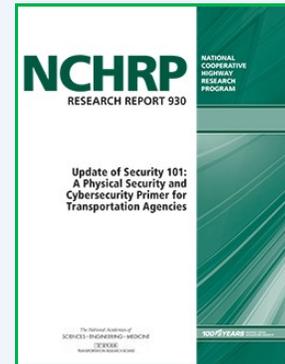
Performance-Based Pavement Warranty Practices



Pavement warranties have been common in the United States at various points in time, coming back into favor during the 1990s. While there is no national pavement warranty standard, agencies have developed their own specifications with varying criteria.

This synthesis documents highway agency practices associated with the use of performance-based pavement warranties, focusing on asphalt, concrete, and composite pavement projects (new, preservation, and rehabilitation) with warranty periods of at least one year.

Update of Security 101: A Physical and Cybersecurity Primer for Transportation Agencies



There have been significant advances in transportation security approaches, including new strategies, programs, and ways of doing business that have increased the security of transportation systems as well as ensured their resiliency.

Transportation agencies are at increasingly greater risk from system-disrupting events due to natural causes, unintentional human intervention, and intentional criminal acts, such as active-shooter incidents. This report provides valuable information about current and accepted practices associated with both physical and cyber security and its applicability to surface transportation.

Many more publication links can be found at [TRB Publications by Subject](#)

August 2020

- NC DOT Board of Transportation Meeting, August 13, 2020(Live Webcast)

September 2020

- NC DOT Board of Transportation Meeting, September 2-3, 2020



October 2020

- NC DOT Board of Transportation Meeting, October 7-8, 2020
- NCDOT Research and Innovation Summit, October 13-14, 2020 (Virtual Event)

NCDOT Research and Development Office General Information

How to find us:

We are located at:

1020 Birch Ridge Dr, Building B

Raleigh, NC 27610

The [Research & Development web page](#) contains more information about the Office and what we do.

The Research Library's [catalog](#) is also available on the web.

NCDOT RESEARCH AND DEVELOPMENT

The Research & Development Office oversees transportation-related research that investigates materials, operations, planning, traffic and safety, structures, human environments, natural environments, and more. Please contact one of our engineers or the transportation librarian listed on this page if you have questions.

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