

Executive Summary, Research Readiness Level Assessment, and Technology Transfer

Crashworthy Perforated Square Steel Tube (PSST) Mailbox Support – Phase I

Research Objectives

The objective of this research project is to develop a non-proprietary mailbox support using PSST support posts that is MASH TL-3 crashworthy. The design should consider single and multiple mailbox configurations. The design may start with the previous NDOT mailbox support or could be developed independently depending on NDOT's preference. The Phase I objective will be to design and evaluate the mailbox support utilizing bogie testing.

Research Benefits

Development of a PSST mailbox support that meets MASH TL-3 requirements will provide NDOT with a crashworthy solution for mailboxes adjacent to state roadways. Additionally, the adoption of a design using PSST similar to current NDOT sign supports will reduce and simplify the state inventory.

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Background

Federal requirements have made it mandatory that safe mailbox support systems be designed to yield or breakaway when impacted by a vehicle. NDOT has previously used a non-proprietary, u-channel post mailbox support that was evaluated at MwRSF in the 1980's to NCHRP 230, as shown in Figure 1 (MwRSF Report No. TRP-03-09-87). This design was successfully evaluated to AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals (1985) with a small car vehicle in weak and strong soils as well as at 20 mph and 60 mph speeds. Single and double mailbox configurations were also evaluated. This design was implemented into NDOT's standard plans. However, this standard plan is now obsolete. NDOT desires that the mailbox support be updated to meet MASH 2016 TL-3 safety performance criteria. Very few mailbox supports have been evaluated according to MASH TL-3 specifications. The Texas A&M Transportation Institute (TTI) evaluated locking architectural mailboxes on thin-wall, steel-tube supports to MASH TL-3 (TTI Report No. 9-1002-12-9). A single-mailbox mount was tested and was successful. Two multiple-mailbox (combined standard and locking architectural mailboxes) mounts were tested and both configurations failed to meet MASH TL-3. The mailbox support for multiple mailboxes was subsequently redesigned and resulted in successful MASH TL-3 tests. Due to the limited number of tested mailbox supports, NDOT desired to design and evaluate a MASH TL-3 mailbox support. Additionally, NDOT prefers to use perforated square steel tubing (PSST) for the mailbox support post to be consistent with their sign supports. PSST sign supports are also being evaluated in NCHRP project 03-119 to MASH TL-3 specifications, and the breakaway behavior of varying sized PSST will be assessed. However, in order to accommodate NDOT desires, the existing mailbox mount will need to be redesigned and the breakaway performance of the PSST will need to be evaluated in combination with the desired mailbox configurations. The design would consider single and multiple mailbox configurations, as desired by NDOT.

Conclusion

Federal requirements have made it mandatory that safe mailbox support systems be designed to yield or breakaway when impacted by a vehicle. The Nebraska Department of Transportation (NDOT) has previously used a non-proprietary, u-channel post mailbox support that was evaluated at the Midwest Roadside Safety Facility (MwRSF) in the 1980's. NDOT desires that the mailbox support be updated to meet MASH 2016 TL-3 safety performance criteria and be redesigned to use perforated square steel tubing (PSST) for the mailbox support post.

The objective of this research project is to develop a non-proprietary mailbox support using PSST support posts that is MASH TL-3 compliant. Following a literature review, single and double PSST mailbox support prototypes were developed. The performance of these prototypes was investigated through dynamic component testing under impact conditions similar to MASH test no. 3-61 with a non-compliant, surrogate 1100C vehicle. Test no. NMB-1 impacted both the single and dual PSST mailbox supports in a single vehicle pass at angles of 0- and 10 degrees, respectively. Both PSST mailbox support options performed adequately in the dynamic testing with no issues observed with respect to occupant risk values or occupant compartment deformation or penetration. Recommendations were made following the testing regarding further research and testing of different mailbox configurations and critical impact angles.

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Interested in finding out more?
Final report is available at:
[HERE](#)

NDOT Recommendations Based Off Research Project - 2025

This research has provided the NDOT with two designs for crashworthy perforate square Steel Tube (PSST) mailbox designs, a single and a double. The Department has implemented both the single and double mailbox designs in all districts since March 2024, and they have been installed successfully. There has been concern about acquiring proprietary parts involved in this design; however, there is also a non-proprietary single mailbox configuration. These designs are all available on Special Plan Sheet 3072 1 R3 Mailbox Post available on the [NDOT Website](#). The Department would like to continue monitoring the installation and maintenance of the current design, possibly through surveying the districts. This would then be evaluated in 5 years.

- *As provided by Austin White, Lead TAC Member*

Research Readiness Level (RRL) Assessment

Level 4: Implementation with Follow up

Technology refined and adopted. Follow up in 5 years.

RRL 4

Technology Transfer

Principal Investigator did not have any technology transfer for this research project.

**This brief summarizes Project SPR-FY21(010)
“Crashworthy Perforated Square Steel Tube (PSST) Mailbox Support – Phase I”
Nebraska Department of Transportation Research Program**