



## Repair of Impacted Concrete Bridge Beams

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### Summary

Reinforced and prestressed concrete bridge superstructures impacted by overheight trucks may require the bridge to be categorized as structurally deficient in case the impact causes moderate to severe damage. Consequently, load posting on the bridge may be required. In some instances, the bridge will be closed. A number of incidences have been reported where concrete blocks have come loose from the impacted region, days or weeks following the impact, and fell on vehicles traveling under the impacted beams causing harm, or even death, to the vehicle occupants.

This paper presents a two-stage approach for the containment and repair of the damage area in impacted concrete bridge beams. The first approach outlines the immediate action following an impact to prevent loose concrete blocks from falling on the traveling public. The second approach outlines the methodology for repairing the impacted area and also providing containment in the event future impacts were to occur. A discussion of the advantages and limitations of this approach, along with the lessons learned from the field applications are presented in the paper

**Keywords:** Repair; Concrete; Bridge; Beam; Strengthening

### 1. Introduction

Numerous bridges in the United States and all over the world are damaged due to overheight truck impacts. While height restrictions exist and are enforced, these impacts occur frequently, often causing a load posting to be placed on the bridge and in certain instances requiring bridge closure. Damage caused by impacts include cracking of beams, damage to reinforcement and/or prestressing strands, yielding of steel, spalling of concrete, and failure of joints and connections etc. While impacts to steel beams and built up steel girders are comparatively 'fixable' by welding or bolting of replacements, the damage to both reinforced concrete (RC) and prestressed concrete (PC) beams are more complex. There have been several studies on how to repair impact damages in different types of bridges. NCHRP Report 226 [1], for example, provides guidelines on the inspection and repair of prestressed concrete girders. Due to cracking and spalling of concrete, damage to both RC and PC girders sometimes require immediate attention even when the impact may not be severe due to the possibility of loose concrete blocks falling on vehicles travelling under the impacted beams.

Following an overheight truck impact, most state departments of transportation (DOTs) in the US evaluate the damage and if required load post the bridge. Unless it is severely unsafe requiring immediate attention, these impact damages would only be fixed sometimes several years after the actual impact, when funds are available. The prolonging of the repair as well as not being able to address the issue of possible debris falling on the travelling public is magnified due to several reasons. Most impacted locations have low clearances, and are often impacted multiple times. The prolonging of the repair or not addressing the damage immediately can result in subsequent impacts being undetected, and the damage unevaluated. This again will become a safety concern for the travelling public. The corrosion of exposed rebar or prestressing strands gets exponentially worse