

ABSTRACT

This project continues the research sponsored by the Project Development Division of the Iowa DOT and the Iowa Highway Research Board which addressed numerous bridge problems on the Iowa secondary road system. It is a continuation (Phase 2) of Project HR-382 in which two replacement alternatives (Concept 1 - Steel Beam Precast Units and Concept 2 - modification of the Benton County Beam-in-Slab Bridge (BISB)) were investigated).

Work continued on both of the replacement alternatives in this study, the results of which are presented in two volumes. This volume (Volume 1) presents the results of Concept 1 - Steel Beam Precast Units, while the continued work on Concept 2 - Modification of the Beam-in-Slab Bridge is presented in Volume 2.

In previous research (HR-382), a precast unit bridge was developed through laboratory testing. The steel-beam precast unit bridge requires the fabrication of precast double-tee (PCDT) units, each consisting of two steel beams connected by a reinforced concrete deck. The weight of each PCDT unit is minimized by limiting the deck thickness to four inches which permits the units to be constructed off-site and then transported to the bridge site. The number of units required is a function of the width of bridge desired. Once the PCDT units are connected, a cast-in-place (CIP) reinforced concrete deck is cast over the PCDT units and the bridge railing attached. Since the steel beam PCDT unit bridge design is intended primarily for use on low-volume roads, used steel beams can be utilized for a significant cost savings.

This project involved three major tasks during the design/fabrication/construction and testing of the replacement bridge. The first task involved documenting the fabrication of the PCDT units through photographs, slides and a video. As part of this effort, a design methodology was developed that includes the development of standard plan sheets from computer templates. The second task involved transporting the completed units to the bridge site where final construction was completed by an independent contractor. The final task involved the service load testing of the bridge at different stages in the construction process and after completion of the construction. This process was also documented through slides and video.

Based upon the construction and service load testing, the steel-beam precast unit bridge was successfully shown to be a viable low volume road bridge alternative. The construction process utilized standard methods resulting in a simple system that can be completed with a limited staff. Results from the service load tests indicated adequate strength for all legal loads. An inspection of the bridge one year after its' construction revealed no change in the bridge's performance.