ABSTRACT: Minimizing construction-related traffic delays and improving work zone safety on future projects have been two reasons for the New Hampshire Department of Transportation’s (NHDOT) foray into rapid construction of bridges. The NHDOT has pursued project innovations that could significantly affect methods of design, detailing, and construction of bridges in the future. This bridge project replaced two existing spans with a 115 ft (35.1 m) single-span precast, prestressed concrete box beam superstructure and precast concrete substructure. The contract required the bridge to be assembled and ready for traffic in two weeks. The contractor accomplished the task in only eight days. This article focuses on the substructure details and how the project schedule, design, specifications, and contractual arrangements for a conventional bridge-replacement project are affected by specifying rapid bridge construction. The general consensus is that all parties involved in this project are pleased with the outcome of this job.


ABSTRACT: This paper discusses how a two-lane pre-stressed concrete bridge can be designed and constructed so that it can be widened easily into a three- or four-lane bridge in the future. The methods presented are the strutted box widening method (SBWM), which applies to concrete box girder bridges, and the strutted girder widening method (SGWM), which applies to precast concrete girder bridges. Two design examples are given. The first is a detailed example that demonstrates how the SBWM can be applied to the popular case of a span-by-span precast segmental bridge. The second example shows how the SGWM can be used to double the traffic capacity of an existing bridge. Four “what-if” studies are included to demonstrate how two elevated median-based expressways and two major long-span crossings could have been designed and constructed using the SBWM to allow for future widening. The paper concludes with a discussion of a proposed precast segmental extradosed bridge that is to be constructed and widened using the SBWM.


ABSTRACT: Prestressed concrete double tees are sometimes set on non-parallel supports to facilitate drainage; this practice induces twisting in the members. If the twist angle is large enough, cracks may occur in the flanges adjacent to the web-flange junction. This paper identifies the important modes of deformation and presents an analysis of the stresses and deformations caused by twisting. Local distortions of the cross section near the member ends are shown to play a pivotal role in bending and cracking of the flanges of double tees. A new theory of torsion that includes those deformations is developed, and a parametric study is carried out to show the effect of variations in the dimensions of the member. Finally, based on the new theory, the paper presents several graphs that facilitate the computation of the twist angle that causes cracking in a double tee of common dimensions.


ABSTRACT: This paper presents the results of a study of the horizontal shear resistance of the connection between full-depth precast concrete bridge deck panels and prestressed concrete girders. This connection consists of isolated shear connectors extending from the precast I-girder into a block-out pocket in the precast deck panel. The blockouts and the haunch between the panel and the beam are grouted. To investigate the strength and behavior of the connections, 36 push-off tests were performed. The primary parameters investigated were type of grout, haunch height, and area of reinforcing steel crossing the interface. In addition, several alternate shear connector details were tested. It was concluded that of currently known horizontal shear resistance equations, the one presented in the AASHTO LRFD Bridge Design Specifications is the best predictor of the strength of the specimens.

ABSTRACT: In 1990, the University of Nebraska-Lincoln began conducting research to develop a novel precast concrete alternative to traditional wood framing for residential homes in the United States. The main objective of this effort was to produce a new housing system, called the “Nebraska University (NU) Concrete House,” a precast concrete design that would offer superior benefits over conventional construction, including resistance to fire, termites, high winds and storm damage; reduction in home maintenance, dust, and noise; and high energy efficiency for homeowners. Research focused on three new precast concrete systems—a patented fully insulated exterior sandwich wall panel, a floor joist panel, and an under-roof girder framing system designed for fast assembly. The NU Concrete House used only bolted connections, eliminating the need for welding or grouting during erection.


ABSTRACT: Two 50-year-old 45 ft (13.7 m) long precast, post-tensioned concrete bridge I-girders were tested to determine their ultimate strength and to verify the performance of similar girders remaining in service. The girders were post-tensioned with four 1½ in. (29 mm) diameter steel bars. Two of the bars were prebent into a harped profile prior to post-tensioning. A small section of the concrete deck slab was attached to the top flange of the girders at the time of testing. The condition of the girders was judged to be good with the exception of longitudinal cracks in the concrete running along the post-tensioning bar and small pieces of the bottom flange that were broken during transportation of the girder. Further, a part of the deck slab adhering to the top of the girders was severely deteriorated. Cracking of the girders during testing was limited along the length of the girders, consisting of two or three major cracks forming in each girder that opened wide as the girders approached failure. The tested capacity of the girders was still sufficient to carry anticipated loads, both at service and ultimate limit states.