

# Continuity Diaphragm for Skewed Continuous Span Precast Prestressed Concrete Girder Bridges

Starting date: 07/01/01  
 Duration: 15 months  
 Completion date: 09/30/02  
 Funding: State  
 Principal Investigator:  
 Dr. Aziz Saber, P.E.  
 Louisiana Tech University

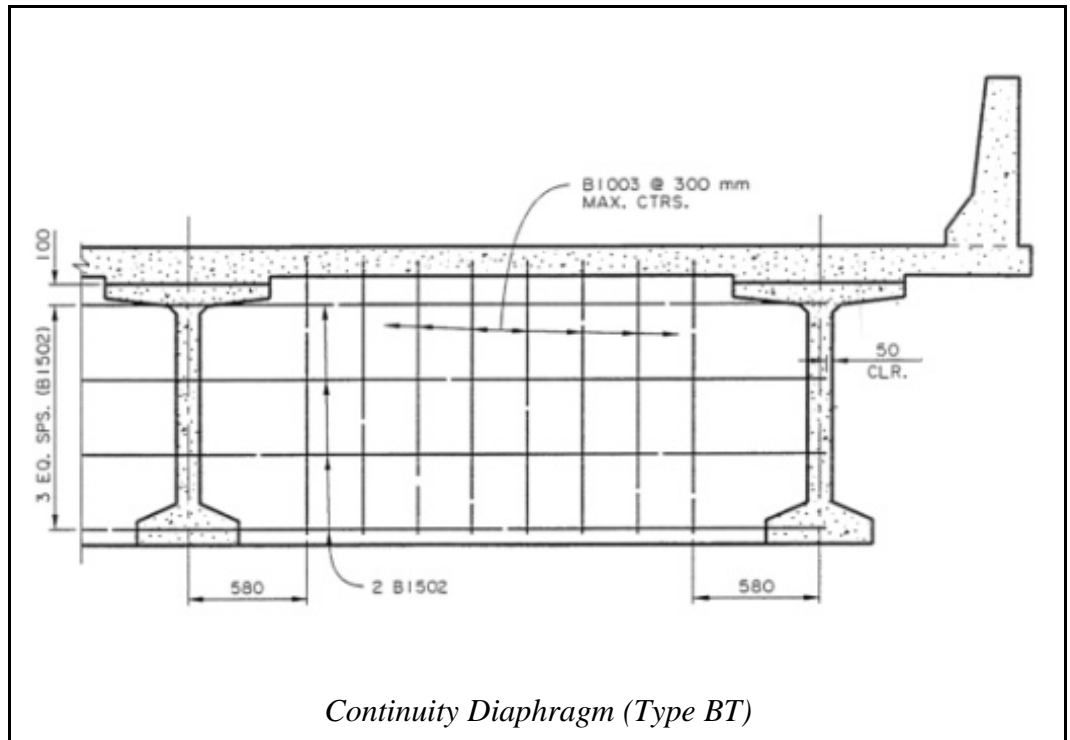
LTRC Contacts:  
 Administrative:  
 Harold "Skip" Paul, P.E.  
 Assoc. Director, Research  
 (225)767-9102

Technical:  
 Walid Alaywan, P.E.  
 Structures Research  
 Manager  
 (225)767-9106

## Problem

The majority of highway bridges are built as cast-in-place reinforced concrete slabs and prestressed concrete girders. Composite action between the slabs and girders is assured by shear connectors on the top of the girders. AASHTO design guidelines for bridges indicate that diaphragms may be installed for T-girder spans, but the effect of diaphragms is not accounted for in the proportioning of the girders.

Continuity diaphragms used in prestressed girder bridges on skewed bents cause difficulties in detailing and construction. Details for small skewed bridges (more than 30° from perpendicular) have not been a problem, but as the skew angle increases, or when the girder spacing decreases, the connection and the construction become more difficult. The effectiveness of diaphragms at high skew angles is questionable.



Continuity Diaphragm (Type BT)



**LTRC**



Louisiana Transportation  
 Research Center

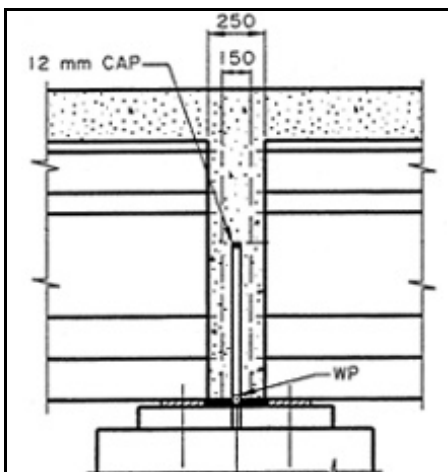
Sponsored jointly by the  
 Louisiana Department of  
 Transportation and Development  
 and  
 Louisiana State University

4101 Gourrier Avenue  
 Baton Rouge, LA 70808-4443

## Objectives

This research is an attempt to provide a fundamental understanding of the load transfer mechanism in diaphragms on skewed bridges. The objectives include:

- 1) Determine the need for continuity diaphragms.
- 2) Study the load transfer mechanism through diaphragms.
- 3) Determine when a full depth diaphragm is required.
- 4) Determine the minimum skew angle at which a diaphragm becomes ineffective.



*Continuity Diaphragm  
Connection Detail*

## Description

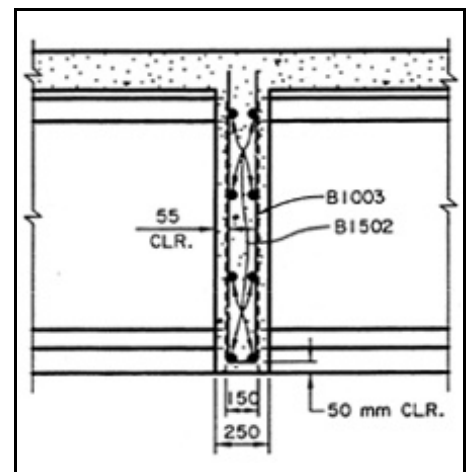
Many parameters of the bridge will affect the load distribution. The parameters of the bridge that will be considered in this research are the skew angle, span length, beam spacing, ratio of beam spacing to span length (aspect ratio), and girder/slab stiffness ratio.

Research tasks include:

- 1) Review literature and current use of continuity diaphragms.
- 2) Identify primary factors that contribute to the structural performance of continuity diaphragms.
- 3) Develop and analyze model of bridge with continuity diaphragm, using finite element analysis techniques. If feasible, typical construction details for use of continuity diaphragms will also be developed.
- 4) Based on results of preceding tasks, a scale bridge will be recommended for instrumentation and testing in a structural laboratory.

## Implementation Potential

The results of the proposed research may be implemented in the design and construction of bridges in Louisiana. This research may lead to reduced bridge construction and maintenance costs.



*Typical Section  
Between Girders*