

## HR-319 Lateral Road Resistance of Diaphragms in Prestressed Concrete Girder Bridges

**Key Words:** Prestressed Concrete Girder Bridges, Bridge Damage

### ABSTRACT

Each year several prestressed concrete girder bridges in Iowa and other states are struck and damaged by vehicles with loads too high to pass under the bridge. Whether or not intermediate diaphragms play a significant role in reducing the effect of these unusual loading conditions has often been a topic of discussion. A study of the effects of the type and location of intermediate diaphragms in prestressed concrete girder bridges when the bridge girder flanges were subjected to various levels of vertical and horizontal loading was undertaken. The purpose of the research was to determine whether steel diaphragms of any conventional configuration can provide adequate protection to minimize the damage to prestressed concrete girders caused by lateral loads, similar to the protection provided by the reinforced concrete intermediate diaphragms presently being used by the Iowa Department of Transportation.

The research program conducted and described in this report included the following: A comprehensive literature search and survey questionnaire were undertaken to define the state-of-the-art in the use of intermediate diaphragms in prestressed concrete girder bridges. A full scale, simple span, prestressed concrete girder bridge model, containing three beams was constructed and tested with several types of intermediate diaphragms located at the one-third points of the span or at the mid-span. Analytical studies involving a three-dimensional finite element analysis model were used to provide additional information on the behavior of the experimental bridge.

The performance of the bridge with no intermediate diaphragms was quite different than that with intermediate diaphragms in place. All intermediate diaphragms tested had some effect in distributing the loads to the slab and other girders, although some diaphragm types performed better than others. The research conducted has indicated that the replacement of the reinforced concrete intermediate diaphragms currently being used in Iowa with structural steel diaphragms may be possible.