Research Problem Statement

ODOT Research Section
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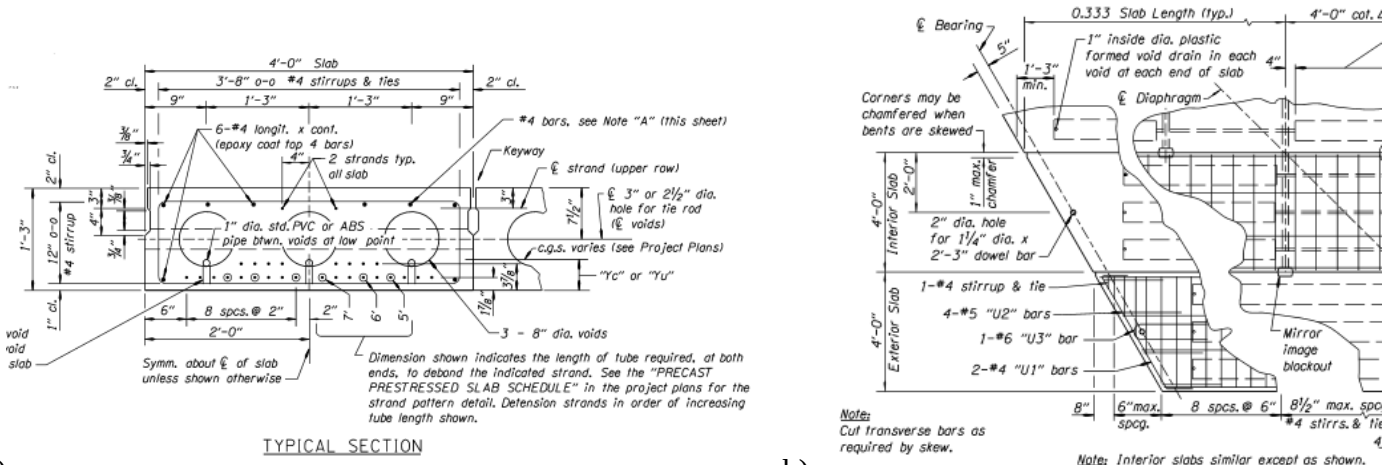
I. TITLE

17-027 Evaluation and Strengthening of Prestressed Concrete Voided Slab Bridges

II. PROBLEM

The bridge inventory of the Oregon Department of Transportation contains large numbers of prestressed concrete voided slab bridges. An example cross section for this bridge type is shown in Fig. 1a. These bridges commonly have large skew angles at the abutments as illustrated in Fig. 1b. Recent specification changes in the skew correction factor produce higher shear demands on the slabs than those considered in the original design. Thus, existing skewed voided slab bridges will now rate as inadequate for shear. There will be a need to strengthen large numbers of these bridges in the near-future to achieve the required ratings. Given the cross section and limited access to the sides of the members, internal supplemental reinforcement will be required and need to fit in the congested cross section. Further, there is little space available between the voids to anchor the materials. Given the large numbers of bridges, economical, high-strength, and environmentally insensitive materials are required to ensure long-term performance of the structures.



a) b)

Fig. 1 – a) Example of prestressed concrete slab bridge cross section and b) skew at abutment location (ODOT standard drawings 2015).

III. PROPOSED RESEARCH, DEVELOPMENT, OR TECHNICAL TRANSFER ACTIVITY

Analytical and experimental research is proposed. The inventory of voided slab bridges in OR will be surveyed to characterize the range of parameters. Shear demands will be analytically predicted using finite element analysis considering Oregon-specific axle load spectra. The existing shear strength of voided slabs will be experimentally characterized and alternative strengthening approaches will be developed and tested to establish structural efficacy. Experimental tests will be performed on full-size slabs typical of those presently in service. Finally, based on the experimental results and analyses, retrofit design tools will be developed to enable effective shear strengthening of voided slab bridges.

IV. POTENTIAL BENEFITS

This is a project that will enable ODOT to effectively evaluate and strengthen a large number of bridges that now rate as deficient. The timing of the research will enable ODOT to have effective and economical answers in hand when strengthening designs will be needed.

V. IMPLEMENTATION

Meetings and workshops will be held with ODOT Bridge section personnel to present research findings in-progress as well as summary findings. Background information and findings will be described in reports, papers, and peer-reviewed journals. Design examples will be provided for the methods developed. Web-based access to in-progress test data and images, analytical methods, and summary findings will be available on-line where appropriate.

VI. LIST OF REFERENCES *(optional)*

Qaqish, M., Akawwi, E., and E. Fadda (2009). “Comparison between Computed Shearing Forces by AASHTO Specifications And Finite Element Method of Two Continuous Spans of Voided Slab Bridge,” WSEAS Transactions on Information Science and Applications, Issue 4, Vol. 9., pp. 621-636.

Fu, C., Briner, T. and T. Getaneh (2012). ”Theoretical and Field Experimental Evaluation of Skewed Modular Slab Bridges,” Maryland State Highway Administration, Final Report *SP109B4N*.

VII. CONTACT INFORMATION

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