

# Failure Mode Prognosis of Highway Grillage Girder Bridge Considering Shear Resistance of Diaphragms

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## Summary

Recent damage survey on highway grillage girder bridges showed that the diaphragm fracture was frequently observed. The reason may be due to that the length/depth ratios of the diaphragms are generally around 1~3 and thus the shear effect will dominate its failure but was not appropriately concerned in design. This will induce unpredictable structural global and local failure mode and should be investigated. This paper presents a study on failure mode prognosis for a highway grillage girder bridge considering the shear resistance capacity of diaphragms. The bridge concerned is composed of 5 main girders and 3 diaphragms. The plastic yielding of the main girders considering of the moment capacity and the diaphragms considering of the shear capacity is concerned. The incremental analyses are conducted to evaluate bridge vehicle-carrying capacity. During the incremental analysis, the ductile or brittle shear failures of the diaphragm are considered. The results tell that the shear resistance capacity of diaphragm will induce the variation of structure failure mode under the traffic loads and should be designed to be of more redundancy to avoid the local failure, especially if uncertainty is considered.

**Keywords:** grillage, integrity, shear failure, uncertainty, ductility

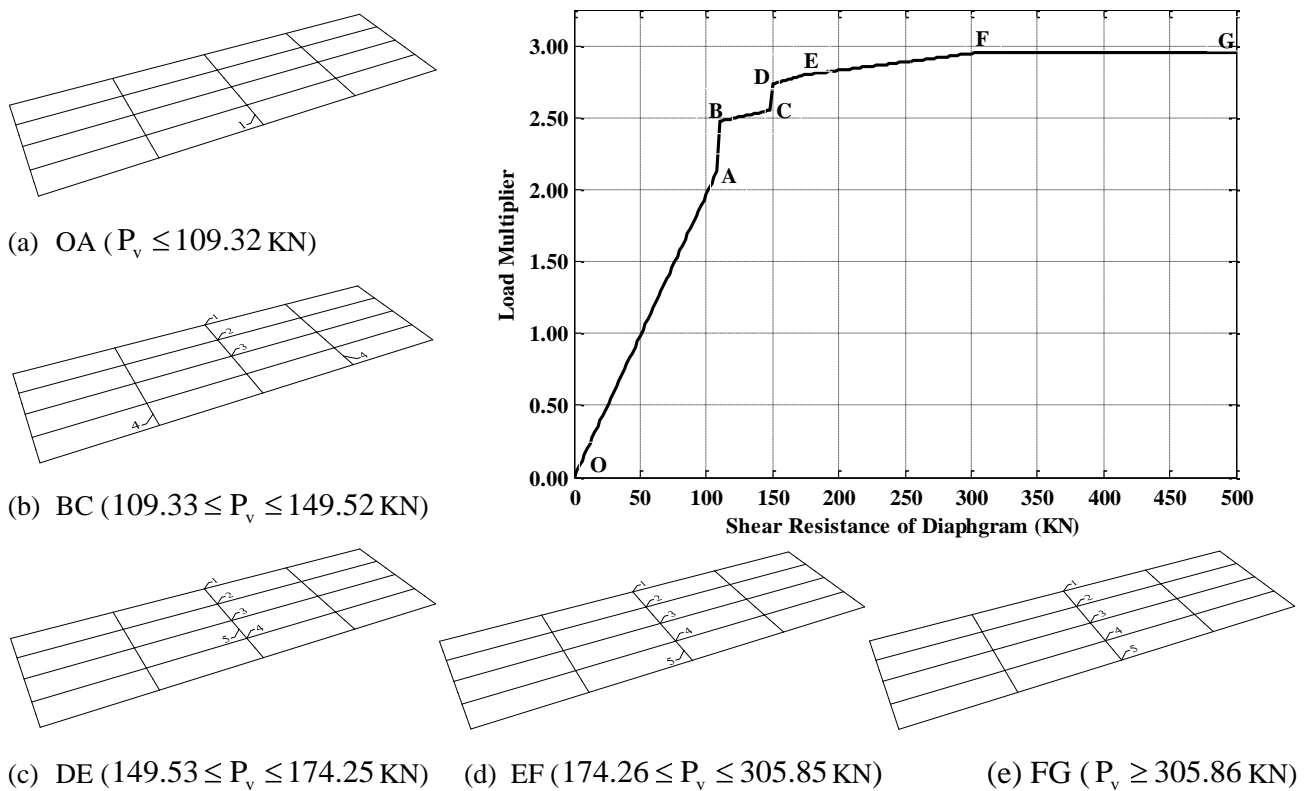


Fig. 1: Bridge load carrying capacity and failure mode considering brittle shear failure of diaphragm