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Abstract: Investigation of Pack-out Corrosion on Steel Built-up Compression Flexural Members

There is a lack of quantitative guidance to address the deterioration of steel and build-up of corrosion product between plates of steel inducing local distortion to structural steel member. This form of distortion due to corrosion is also known as pack-out or pack-rust. This research aims to determine the factor(s) of in-service bridges which have the most effect on the overall capacity of the members and to provide direction to state departments of transportation (DOTs) to accurately assess the strength and buckling limit states. The research is focused on the compression flange of flexural members built-up from multiple plates and mechanically fastened.

Previously performed experimental studies looked at the effects of such distortion on the capacity of flexural members under compression. The results were used to benchmark the finite element analysis (FEA) modeling used in the analytical studies of this work. Variables considered in the parametric study include: the shape of the built-up member, the fasteners (rivets and bolts), and the method of attachment (straight, staggered, stitching and sealing). The results revealed that the total section area lost has the greatest effect on remaining capacity of a member damaged by pack-out deformation and deterioration. Other factors were found to have measurable, but smaller influences.

For continuously braced damaged built-up components, the capacity reduction can be calculated by using the corresponding AASHTO code specification equations after an updated effective compression flange thickness is determined based on lost section area. For unbraced members, the expected decrease in capacity can be calculated with an effective compression flange width and thickness adjustment based on the amount of section loss and after additional proportioning factors including material grade and web depth ratios are applied. These results are expected to be adopted into AASHTO Guide Specification for bridge inspection of pack-out corrosion.