

Investigation of rigidity of shear tab connections in heavy steel girders

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Abstract

Shear tab connection has proven to be economical and easy to erect. This kind of connection is assumed to be hinged connection by most of the designers. In this research, we have investigated the end rotation of the heavy steel girders with shear tab connection. The finite element software, ANSYS, has been used to determine the rigidity of shear tab connections. 125 models with different sizes of beam and tab plate were examined. Results show that the rigidity of shear tab connection for heavy beams is high in compare with smaller beams and the hinged connection assumption may not be true for heavy beams with shear tab connection. The thickness and height of the shear tab plays a significant role in rigidity of connection at the end of the beam.

Keywords: hinged connection, semi rigid connection, finite element, shear tab, weld.

1. INTRODUCTION

One of the most common types of shear connections is the single plate shear connection, often called a 'shear tab'. Classified as a type of shear connection, single plate connections are idealized as a pinned connection subjected to shear forces only. Although this connection is thought to be relatively simplistic, the behavior of the single plate connection is complex. One inherent reason for the complexity is because the connections do sustain some moment as created by beam end rotation. In general, the connection consists of a plate welded to the supporting member and bolted or welded to the web of the simply supported beam. Some details of this connection are shown in Fig. 1.

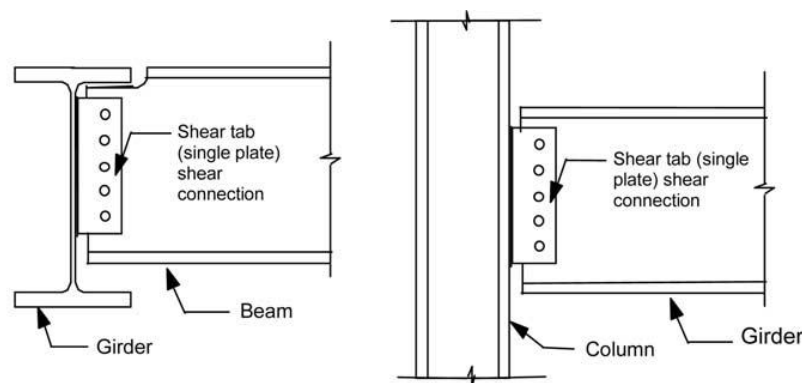


Figure 1. Single plate shear connections.

It is well known that single plate shear connections should satisfy dual criteria of strength and ductility, which means the shear connections should have sufficient shear strength to transfer the beam end reaction and should possess sufficient ductility to rotate the amount that the beam end demands without failure. On account of rotational stiffness, shear tab connection resists and develops an amount of end beam moment which makes connection's weld undergo undesirable combination of shear force and bending moment. Steel beam to column connections are traditionally divided into three major categories of simple; semi-rigid; rigid. The division is based on rotational stiffness and bending moment strength of the connections. The problem is complex in shear connections since variation of shear force and bending moment is non-proportional.