Structural Performance of Stainless Steel bolted Connections

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Introduction

Stainless steel is a favourite of architects designing the world's tallest buildings, the longest bridges, and the most popular public arts projects as shown in figure 1. Stainless steel provides a wide range of benefits for architectural and construction projects including:

- Aesthetic appeal and inherent long-life
- Resistance to high heat, corrosion, pitting, and stress corrosion cracking Cost-savings on initial material and over the lifecycle of the project
- Maintenance free with a minimum increase in investment cost .

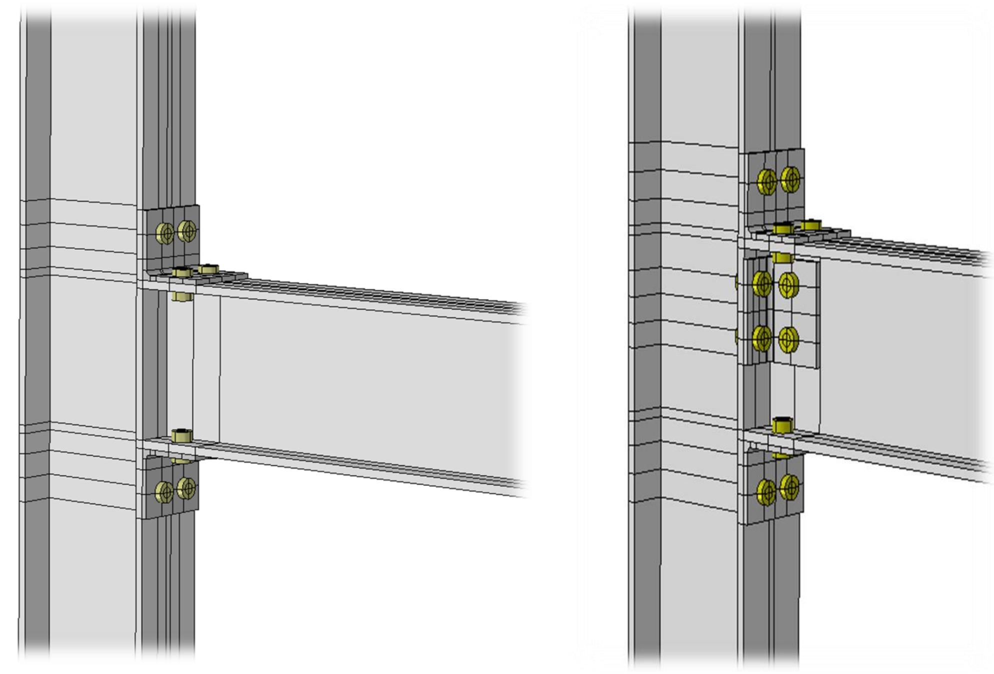
Figure 1: The use of stainless steel members at One World Trade Centre, New York, USA and at Putrajaya Stainless Steel Bridge, Malaysia

Aim & Methodology

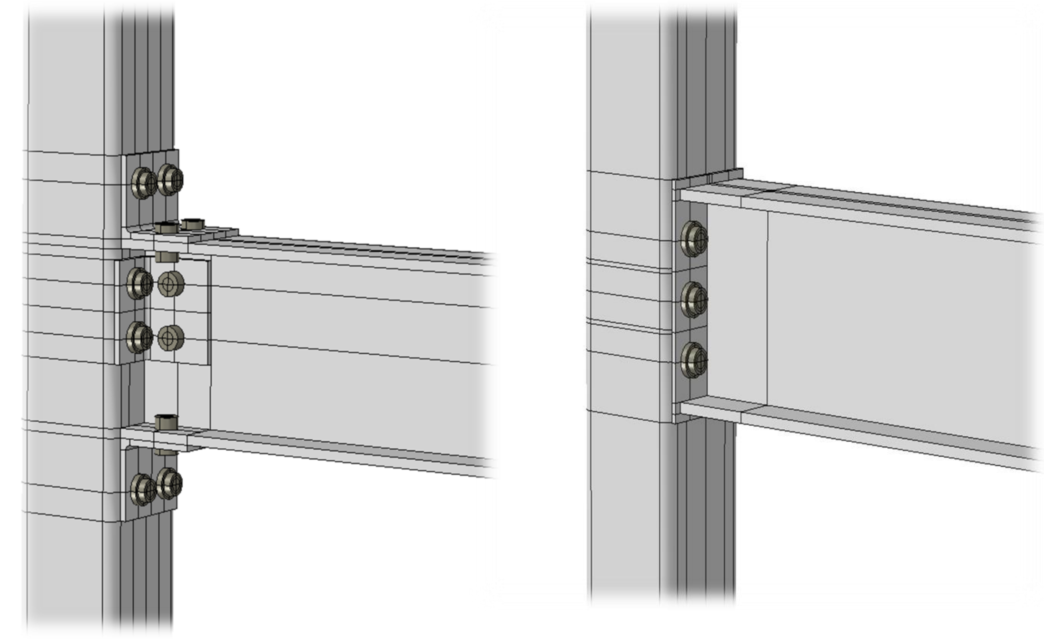
The main purpose of this study is to assess current and develop novel design guidance for bolted stainless steel joints, thus facilitating the more widespread use of stainless steel in construction.

To achieve this aim, open beam to open column and open beam to tubular column connections with different configurations as shown figure (2) under monotonic loads will be investigated both experimentally and numerically.

Figure 2 : The using carbon steel standards to design stainless steel connections



(a) Open beam to open column joints

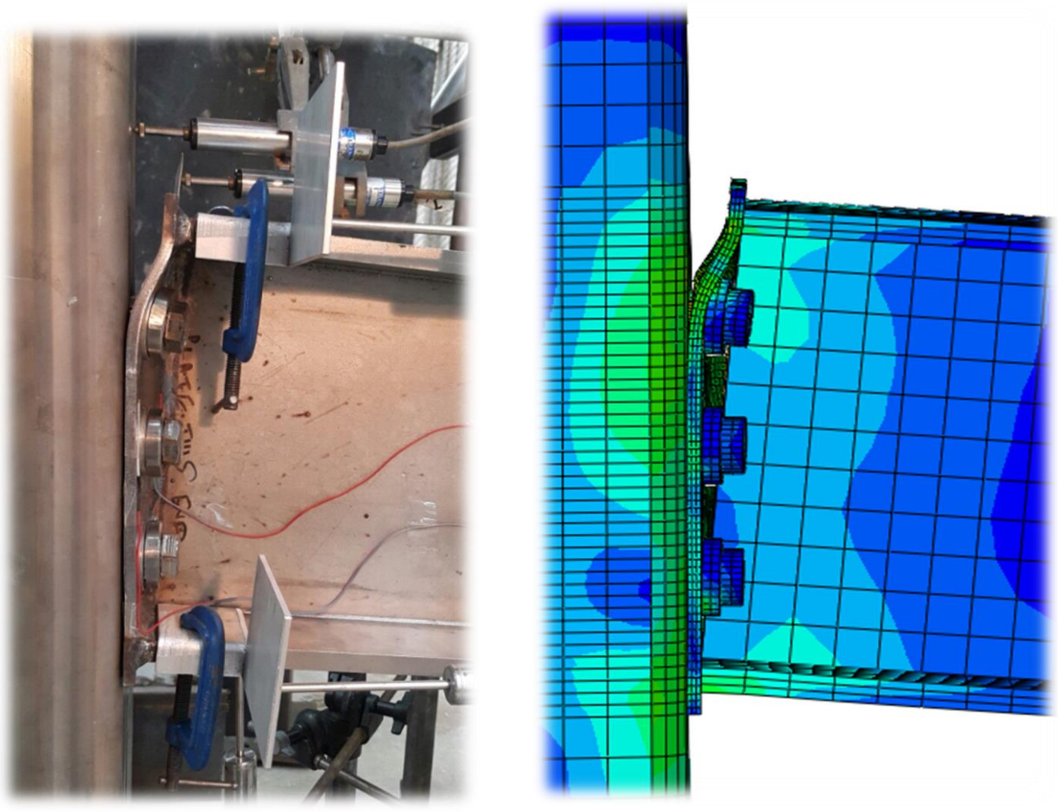


(b) Open beam to tubular column joints

Figure 3: The types of joints used in this study .

Results

❑ Flush endplate connections



(a) Experimental Specimen 2 (b) FE using ABAQUS(1).

Figure 4 : Comparison of the ultimate deformation of the endplate from the tests and FE models

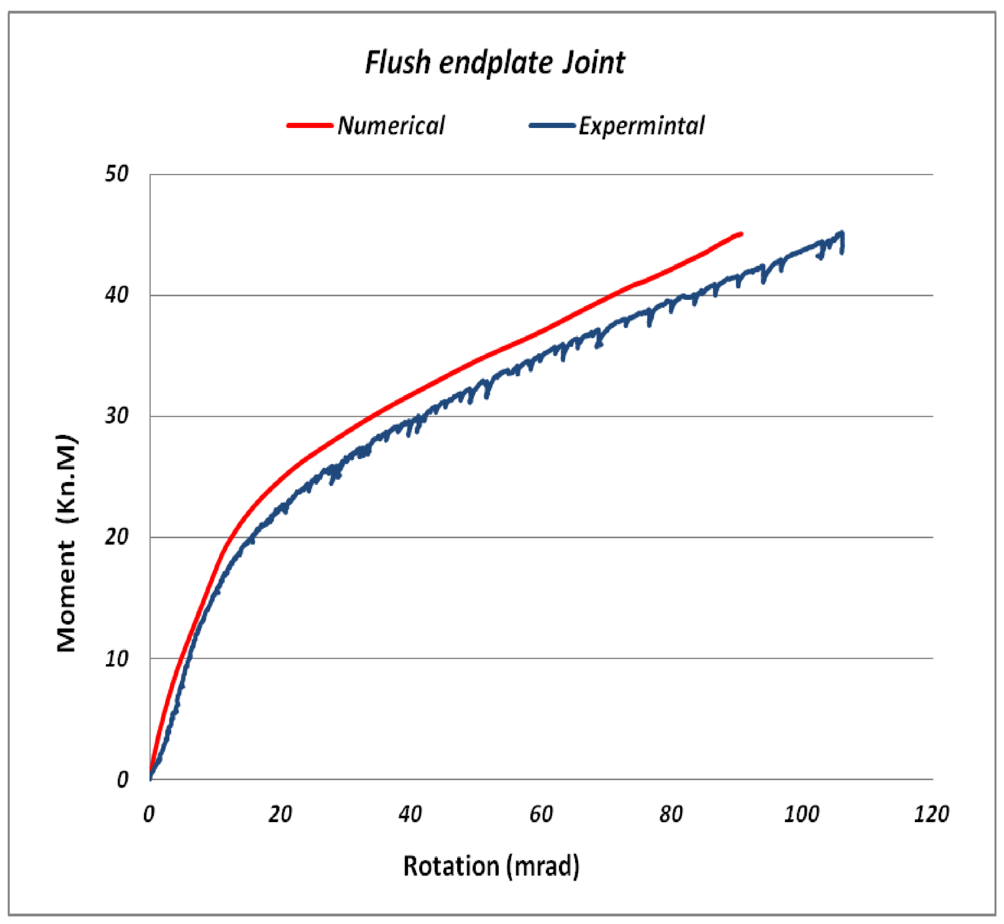
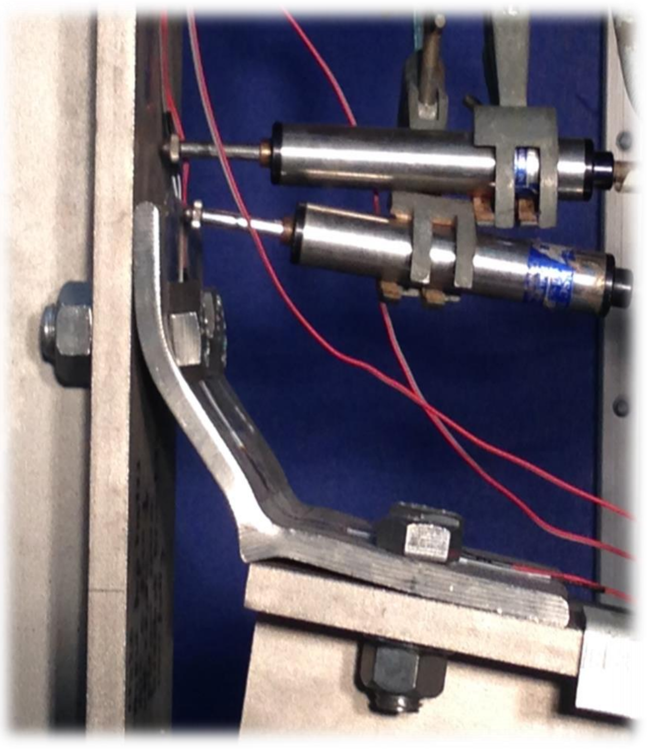
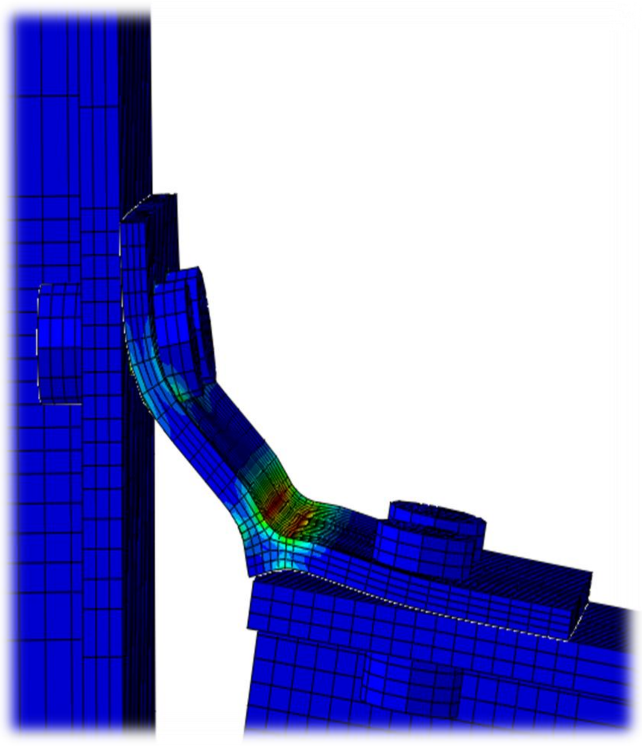


Figure 5 : Comparison of connection moment-rotation relationships of specimen 2

❑ Top and seat angle connections



(a) Experimental Specimen 7



(b) FE using ABAQUS(1).

Figure 6 : Comparison of the ultimate deformation of the top angle from the tests and FE models

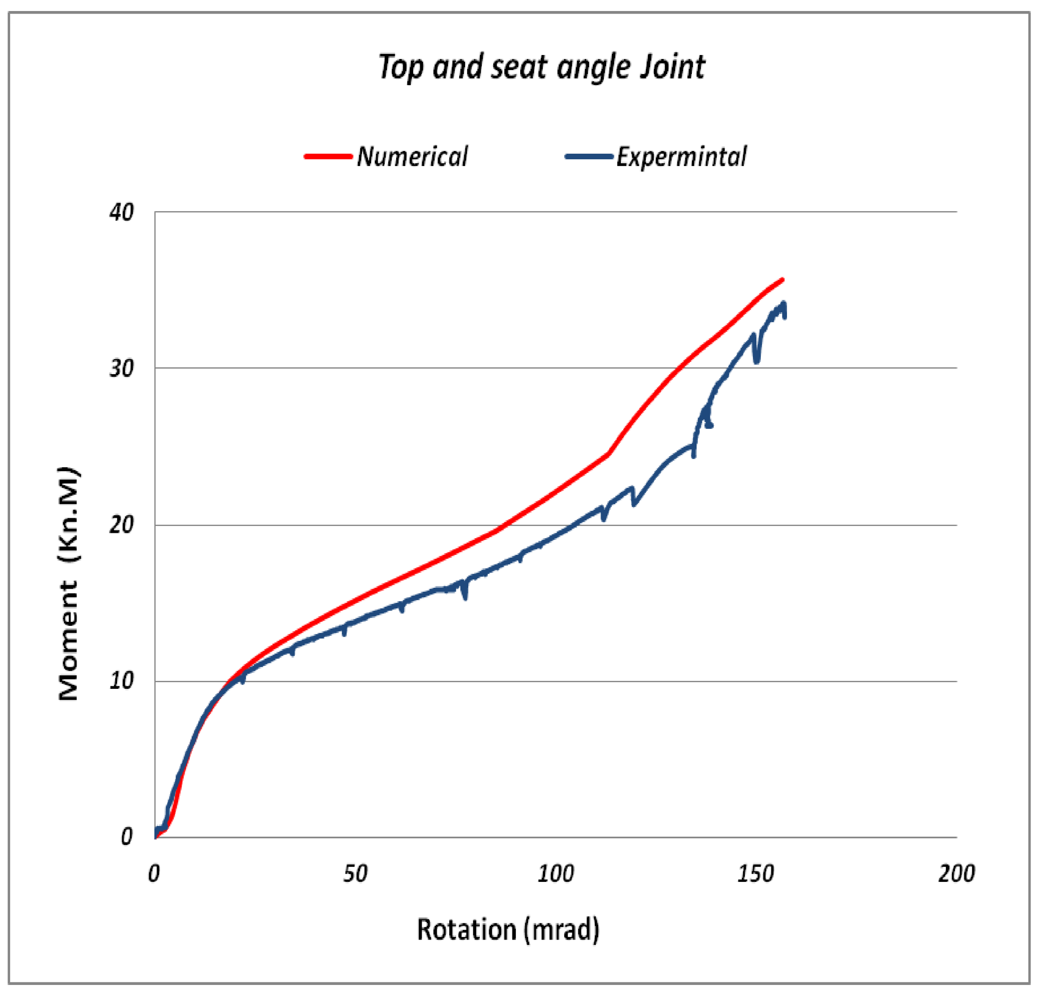


Figure 7 : Comparison of connection moment-rotation relationships of specimen 7

Bibliography

1. ABAQUS (2013) Theory Manual, ver 6.13,DASSAULT SYSTÈMES SIMULIA CORP Providence, RI, USA.