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Name of Candidate:	Wei Ye
Faculty:	School of Engineering
Title of the Thesis:	A study of the rotational behaviour of the bolted connections in the cold-formed steel purlin system
Degree for which thesis is submitted:	PhD

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Abstract

Cold-formed steel purlin systems are widely used in modern building construction, for supporting the roof and floor structures. The rotational behaviour of beam-to-beam bolted connections, which are used between the sections, significantly affects the performance of purlin systems and is hard to predict. The behaviour models currently available for the connections only offer linear or multilinear predictions with low levels of accuracy. The aim of the research presented in this thesis is to develop and propose a nonlinear, more accurate behaviour model for the sleeved modified Z bolted connections, by means of experimental and numerical analysis.

Finite element models are presented for the single-bolt, single-lap connection, sleeved modified Z connections in the simply supported arrangement, and a six-span purlin system. Based on the numerical results that have been validated by the experiments, a nonlinear behaviour model is proposed for the sleeved modified Z connections. In the model, the behaviour of the connections is divided into four stages, based on the dominant mechanism that provides the resistance to the rotation. Different formulas are used in different stages to determine the behaviour of the connection, boundary conditions, and magnitudes of bolt forces. The new model reflects well the true behaviour of the connections, and provides a good understanding of what happens inside the connections. The model reveals the failure pattern of the connections and enables optimization in the design of purlin systems, for improving efficiency in material usage.

WJG

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**A STUDY OF THE ROTATIONAL BEHAVIOUR OF THE
BOLTED CONNECTIONS IN THE COLD-FORMED
STEEL PURLIN SYSTEM**

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