

**FINITE ELEMENT MODELLING OF PRELOADED GUSSET PLATE  
CONNECTION BETWEEN POLYGONAL BUILT-UP MEMBERS**

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**ABSTRACT**

In the last decades the demand for renewable energies, including wind energy, is increasing. With this increase more powerful wind energy converters that require higher supporting structures are needed. The solution to reach higher heights is construction of lattice towers. The major disadvantage of lattice towers is large number of the installed bolts. Therefore, the steel hybrid tower that combines the advantages of steel lattice (lower part) and tubular tower (upper part) was proposed in SHOWTIME project. The sections used in lattice portion of the tower are built-up polygonal sections composed of cold-formed pieces connected together with preloaded bolts. The goal with using built-up polygonal cross-section is to improve fatigue life of the connections and members. The focus in this paper is numerical investigation of preloaded gusset plate connections between these types of members. The highly detailed three-dimensional (3-D) finite element model has been created using ABAQUS software. The connection model has been analyzed through the elastic and plastic ranges up to failure. Bolt shear and bending, and gusset plate and brace bearing have been observed as failure modes.

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