

**TESIS**  
**PERILAKU SAMBUNGAN KOLOM - BALOK BAJA**  
**AKIBAT VARIASI GAYA PRATEGANG BAUT DAN**  
**KETEBALAN PENGAKU *EXTENDED END-PLATE***  
**MENGGUNAKAN PERMODELAN ELEMEN HINGGA**

**YANES KRISTIANUS HEDI**



**REKAYASA STRUKTUR**  
**PROGRAM STUDI MAGISTER TEKNIK SIPIL**  
**FAKULTAS TEKNIK**  
**UNIVERSITAS LAMBUNG MANGKURAT**  
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**MENGGUNAKAN PERMODELAN ELEMEN HINGGA**

**Karya tulis sebagai salah satu syarat  
untuk memperoleh gelar Magister dari  
Universitas Lambung Mangkurat**

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**2024**

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## PERNYATAAN

Saya yang bertanda tangan di bawah ini menyatakan dengan sesungguhnya bahwa Tesis ini merupakan penelitian yang telah saya lakukan. Segala kutipan dari berbagai sumber telah diungkapkan sebagaimana mestinya. Tesis ini belum pernah dipublikasikan untuk keperluan lain oleh siapapun juga.

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## ABSTRAK

### PERILAKU SAMBUNGAN KOLOM - BALOK BAJA AKIBAT VARIASI GAYA PRATEGANG BOUT DAN KETEBALAN PENGAKU *EXTENDED END-PLATE* MENGGUNAKAN PERMODELAN ELEMEN HINGGA

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Efek penggunaan pengaku/*rib stiffener* pada *extended end-plate* mampu meningkatkan kekakuan sambungan, meningkatkan kapasitas momen dan kapasitas rotasi ultimit, penggunaan pengaku mencegah terjadinya kegagalan pada *head plate* atau kegagalan pada pengelasan antara *flange* dan *head plate*. Gaya prategang baut adalah salah satu parameter penentu tahanan friksi pada sambungan, oleh sebab itu studi yang lebih detail mengenai pengaruh gaya prategang baut dan ketebalan pengaku *end-plate* dilakukan menggunakan pemodelan elemen hingga ANSYS untuk mendapatkan gambaran perilaku sambungan kolom – balok baja.

Penelitian ini bertujuan menganalisis perilaku sambungan kolom - balok baja dan mengetahui pola kegagalan sambungan akibat variasi gaya prategang baut dan ketebalan pengaku *extended end-plate* menggunakan permodelan elemen hingga, dengan membuat 15 model penelitian dengan variasi gaya prategang 75%, 70% dan 55% serta ketebalan *rib stiffeners* berturut – turut 10 mm, 12 mm, 16 mm, 8 mm dan tanpa menggunakan *rib stiffeners*.

Hasil penelitian menunjukkan penggunaan tebal pengaku *extended end plate/rib stiffeners* yang sama terhadap pemberian gaya prategang yang berbeda, tidak memberikan nilai rotasi dan *displacement* yang signifikan, seperti pada model YN-EEP-75-10, YN-EEP-70-10 dan YN-EEP-55-10 berturut – turut menghasilkan nilai *displacement* 159,26 mm, 159,51 mm dan 160,68 mm, begitu pula dengan model YN-EEP-75-16, YN-EEP-70-16 dan YN-EEP-55-16 menghasilkan nilai *displacement* berturut - turut 127,00 mm, 127,27 mm dan 128,00 mm, sedangkan pada model yang diberikan gaya prategang baut yang sama dan ketebalan *rib stiffeners* yang mengalami peningkatan ketebalan 20%, menghasilkan perbedaan nilai *displacement* yang cukup signifikan. Pada model YN-EEP-75-10, YN-EEP-75-12, dan YN-EEP-75-16 menghasilkan nilai *displacement* berturut – turut 159,26 mm, 157,45 mm dan 127,00 mm, menghasilkan penurunan nilai rotasi dan *displacement* sebesar 15 – 20%. Pola kegagalan yang dihasilkan pada sambungan kolom balok baja akibat variasi gaya prategang baut dan ketebalan pengaku *extended end-plate*, adalah berupa tekuk pada *end-plate* dan *flange* kolom, tekuk pada pengaku *rib stiffeners* akibat tekan dan *fracture* pada baut.

Kata Kunci : Gaya Prategang Baut, Ketebalan *Rib Stiffeners*, Momen – Rotasi, *Load – Displacement, Working Load*

## **ABSTRACT**

### **BEHAVIOUR OF STEEL COLUMN - BEAM CONNECTION DUE VARIATION OF BOLT PRETENSION AND THICKNESS OF EXTENDED END-PLATE RIB STIFFENERS USING FINITE ELEMENT MODELLING**

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The effect of using stiffeners on the extended end plate is able to increase the stiffness of the connection, increase the moment capacity and ultimate rotational capacity, the use of stiffeners prevents failure of the head plate or failure of the weld between the flange and the head plate. Bolt pretension force is one of the determining parameters of friction resistance in the connection, therefore a more detailed study of the effect of bolt prestressing force and end-plate rib stiffener thickness was carried out using ANSYS finite element modelling, to obtain an overview of the behaviour of the steel column - beam connection.

This study aims to analyse the behaviour of steel column-beam connections and determine the failure pattern of the connection due to variations in bolt pretension force and thickness of extended end-plate rib stiffeners using finite element modelling, by creating 15 research models with variations in pretension force of 75%, 70% and 55% and thickness of extended end-plate rib stiffeners of 10 mm, 12 mm, 16 mm, 8 mm and without using rib stiffeners, respectively.

The results showed that the use of the same thickness of extended end plate/rib stiffeners against the application of different pretension forces did not give significant rotation and displacement values, such as in the YN-EEP-75-10, YN-EEP-70-10 and YN-EEP-55-10 models which respectively produced displacement values of 159.26 mm, 159.51 mm and 160.68 mm, as well as the models YN-EEP-75-16, YN-EEP-70-16 and YN-EEP-55-16 produce displacement values of 127.00 mm, 127.27 mm and 128.00 mm, respectively, while in models given the same bolt pretension force, the thickness of rib stiffeners that have increased thickness by 20%, produce significant differences in displacement values. Models YN-EEP-75-10, YN-EEP-75-12, and YN-EEP-75-16 produced displacement values of 159.26 mm, 157.45 mm and 127.00 mm, respectively, resulting in a decrease in rotation and displacement values by 15-20%. The resulting failure patterns in the steel beam column connections due to variations in bolt pretension force and thickness of the extended end-plate rib stiffeners are buckling of the end-plate and column flange, buckling of the rib stiffeners due to compression and fracture of the bolts.

**Keywords:** Bolt Pretension, Rib Stiffeners Thickness, Moment – Rotation, Load – Displacement, Working Load

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