ABSTRAK

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Judul : Perilaku Mekanik Model *Castellated Beam* Pada Struktur Girder Baja *Pedestrian Bridge* Dengan Metode Elemen Hingga

Castellated Beam merupakan inovasi struktur baja yang efisien, namun memiliki potensi *Local Buckling* akibat lubang pada *web*. Pembentukan profil *Castellated Beam* dari profil *Hot Rolled Section* WF 350x175x11x7 menjadi CB 525x175x11x7. Penelitian ini bertujuan memperoleh perilaku model *Castellated Beam* dengan variasi sudut potong lubang heksagonal, geometri struktur datar dan camber serta konfigurasi *hybrid*. Analisis metode elemen hingga dengan *Software* ANSYS R2025 aplikasi struktur *steel girder* dimodelkan 3D *Shell Element* SHELL181. Proses analisis dilakukan dengan penerapan pembebanan statik, selanjutnya hasil numerik dievaluasi untuk memperoleh perilaku distribusi tegangan serta respons deformasi struktur. Hasil penelitian sudut potong 52° menghasilkan kekuatan maksimum. *Castellated Beam* camber dengan *stiffener* meningkatkan beban ultimit 88,78% dan menurunkan deformasi 40,36%. Konfigurasi *hybrid* dengan meningkatkan mutu *top flange* dapat meningkatan performa struktur 40,38% dengan menurunkan tegangan maksimum 10%. Penambahan diafragma pada *double hybrid Castellated Beam un-camber* panjang bentang (L) 12 m dan jarak antar girder (S) 2,65 m dapat menurunkan deformasi sebesar 33,41%. Hasil penelitian dapat disimpulkan hybrid *Castellated Beam* camber optimal dalam meningkatkan performa struktur secara efisien. Didapatkan penambahan kekuatan struktural dengan peningkatan beban maksimum yang menghasilkan tegangan lentur mendekati tegangan leleh masing-masing elemen hybrid *Castellated Beam* sekitar 90%-95%.

Kata Kunci: *Castellated Beam, Baja Hybrid, Camber, ANSYS, Metode Elemen Hingga, Jembatan Pedestrian*

ABSTRACT

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Title : Mechanical Behavior of *Castellated Beam* Model in Steel Girder Structure of Pedestrian Bridge Using Finite Element Method.

Castellated Beam is an efficient steel structure innovation, but it has the potential for Local Buckling due to holes in the web. Formation of *Castellated Beam* profiles from Hot Rolled Section WF 350x175x11x7 profiles to CB 525x175x11x7. This study aims to obtain the behavior of the *Castellated Beam* model with variations in hexagonal hole cutting angles, flat structure geometry and camber and hybrid configuration. Element method analysis up to ANSYS R2025 Software application steel girder structure modeled 3D Shell Element SHELL181. The analysis process was carried out by applying static loading, then the numerical results were evaluated to obtain the stress distribution behavior and structural deformation response. The results of the 52° cutting angle study resulted in maximum strength. *Castellated Beam* camber with stiffener increases ultimit load by 88.78% and decreases deformation by 40.36%. Hybrid configuration by improving the quality of the top flange can increase the performance of the structure by 40.38% by lowering the maximum voltage by 10%. The addition of a diaphragm to a double hybrid *Castellated Beam* un-camber span length (L) of 12 m and a distance between girders (S) of 2.65 m can reduce deformation by 33.41%. The results of the study can be concluded that hybrid *Castellated Beam* camber is optimal in improving the performance of the structure efficiently. It is obtained from structural strength with an increase in the maximum load that produces a bending stress approaching the yield stress of each hybrid *Castellated Beam* element of around 90%-95%.

Keywords: *Castellated Beam*, *Hybrid Steel*, Camber, ANSYS, *Finite Element Method*, *Pedestrian Bridge*