

ABSTRAK

Struktur billboard portable merupakan salah satu media informasi luar ruang yang membutuhkan kemampuan stabilitas terhadap pengaruh lingkungan, terutama beban angin. Beban angin yang bekerja pada bidang billboard dapat menyebabkan terjadinya gaya lateral yang berpotensi menimbulkan kecenderungan terguling (*overturning*) pada struktur. Oleh karena itu, diperlukan perancangan dan analisis stabilitas untuk memastikan struktur mampu mempertahankan kestabilannya selama menerima pembebanan angin. Penelitian ini bertujuan untuk merancang dan menganalisis stabilitas struktur rangka billboard portable terhadap beban angin melalui pendekatan perhitungan manual dan simulasi *Computer Aided Engineering* (CAE). Metode penelitian dilakukan melalui tahap pemodelan tiga dimensi menggunakan SolidWorks, penentuan parameter desain, analisis beban angin, perhitungan momen pengguling dan momen penahan, serta validasi menggunakan simulasi CAE. Objek penelitian berupa struktur billboard portable dengan dimensi bidang billboard sebesar 6 m × 3 m menggunakan material ASTM A36 Steel. Berdasarkan hasil *Mass Properties* pada model *full assembly*, diperoleh massa total struktur sebesar 5.451,08 kg. Hasil analisis beban angin berdasarkan data kecepatan angin Kota Bandung sebesar 25,90 knot menghasilkan kecepatan angin sebesar 13,32 m/s, tekanan angin sebesar 108,90 N/m², dan gaya angin total sebesar 1,96 kN. Hasil analisis stabilitas terhadap *overturning* menunjukkan bahwa struktur memiliki momen pengguling sebesar 10,78 kN.m dan momen penahan sebesar 160,47 kN.m, sehingga diperoleh faktor keamanan terhadap *overturning* sebesar 14,89. Hasil simulasi CAE menunjukkan tegangan maksimum sebesar 44,985 MPa dan perpindahan maksimum sebesar 2,903 mm. Nilai faktor keamanan (*Factor of Safety*) hasil simulasi CAE sebesar 5,557

Kata kunci: billboard portable, beban angin, stabilitas struktur, overturning, SolidWorks Simulation.

ABSTRACT

A portable billboard structure is one of the outdoor advertising media that requires adequate structural stability against environmental effects, particularly wind loading. Wind loads acting on the billboard surface generate lateral forces that may cause the structure to experience an overturning tendency. Therefore, structural design and stability analysis are required to ensure that the billboard remains stable under operational wind loading conditions. This study aims to design and analyze the structural stability of a portable tilting billboard frame under wind loading through analytical calculations and Computer Aided Engineering (CAE) simulation. The research methodology consisted of three-dimensional modeling using SolidWorks, determination of design parameters, wind load analysis, calculation of overturning and resisting moments, and validation using CAE simulation. The object of this study was a portable tilting billboard with a billboard panel dimension of $6 \text{ m} \times 3 \text{ m}$ constructed from ASTM A36 steel. Based on the Mass Properties analysis of the full assembly model, the total structural mass was 5,451.08 kg. Wind load analysis, using the average wind speed data for Bandung City of 25.90 knots (13.32 m/s), produced a wind pressure of 108.90 N/m^2 and a total wind force of 1.96 kN. The overturning stability analysis resulted in an overturning moment of $10.78 \text{ kN}\cdot\text{m}$ and a resisting moment of $160.47 \text{ kN}\cdot\text{m}$, yielding an overturning safety factor of 14.89. Furthermore, the CAE simulation produced a maximum von Mises stress of 44.985 MPa and a maximum displacement of 2.903 mm. The simulation also resulted in a **Factor of Safety of 5.557**, indicating that the designed portable tilting billboard structure is capable of safely resisting the applied wind load and meets the structural safety requirements for operational use.

Keywords: Portable billboard, structural stability, wind loading, overturning, Computer Aided Engineering.