

INTISARI

Optimasi struktur atas *overpass* dilakukan untuk meningkatkan efisiensi penggunaan material dan biaya konstruksi, khususnya pada infrastruktur pendukung sektor pertambangan. Perancangan ulang ini bertujuan merancang ulang struktur atas *overpass* di proyek tambang nikel Morowali, Sulawesi Tengah, yang merupakan salah satu kawasan pengembangan tambang terbuka (*open-pit mining*) dengan kebutuhan konektivitas tinggi antara lokasi tambang dan fasilitas pengolahan. Hasil perancangan ulang dievaluasi terhadap batas layan (*serviceability limit state*) dan batas ultimit (*ultimate limit state*), selanjutnya dibandingkan dengan desain eksisting dari segi volume material dan biaya konstruksi.

Perancangan ulang dilakukan dengan mengurangi jumlah gelagar beton prategang dari 7 menjadi 6 buah dengan konsekuensi menambah 10 *strand* pada masing-masing gelagar. Gelagar prategang yang digunakan berupa profil I setinggi 1,7 m dengan luas penampang 0,6695 m². Setiap gelagar memiliki 4 tendon berisi masing-masing 18 *strand* tipe 7 *Wire Super Strands* ASTM A-416 Grade 270. Analisis struktur dilakukan menggunakan *software* SAP2000 sedangkan kontrol terhadap batas layan dan ultimit dihitung manual menggunakan *software* Microsoft Excel. Pembebanan struktur mengacu pada SNI 1725:2016 dan SNI 2833:2016 serta beban hidup berupa kendaraan tambang Volvo A60H dengan bobot maksimal 98,75 ton.

Hasil menunjukkan bahwa tegangan dan lendutan memenuhi batas izin berdasarkan SNI 2847:2019 dan AASHTO LRFD 2020. Gaya dalam ultimit yakni momen ultimit 13766 kNm, geser 2149 kN, dan torsi 156 kNm masih di bawah kapasitas rencana menurut AASHTO LRFD 2020. Volume material hasil perancangan ulang seperti beton *f_c* 50 MPa, beton *f_c* 30 MPa, Baja BjTS 420A, dan *strand* ASTM A-416 Grade 270 mengalami penurunan volume berturut-turut sebesar 14,29%, 1,45%, 0,46%, dan 13,62%. Biaya konstruksi diperkirakan mengalami penurunan sebesar 11,15% terhadap desain eksisting.

Kata kunci: *Overpass*, PC-I girder, perancangan ulang.

ABSTRACT

Optimization of the overpass superstructure was carried out to improve the efficiency of material usage and construction costs, particularly for supporting infrastructure in the mining sector. This redesign aimed to reengineer the superstructure of the overpass in the Morowali nickel mining project, Central Sulawesi, which is part of an open-pit mining development area with high connectivity demands between mining sites and processing facilities. The redesign results were evaluated based on the serviceability limit state and ultimate limit state and subsequently compared to the existing design in terms of material volume and construction cost.

The redesign was carried out by reducing the number of prestressed concrete girders from 7 to 6, consequently increasing the number of strands per girder by 10. The prestressed girders used an I-shaped profile with a height of 1.7 m and a cross-sectional area of 0.6695 m². Each girder consisted of 4 tendons, each containing 18 strands of 7-Wire Super Strands ASTM A-416 Grade 270. Structural analysis was conducted using SAP2000 software, while serviceability and ultimate limit state checks were performed manually using Microsoft Excel. Structural loading referred to SNI 1725:2016 and SNI 2833:2016, with the live load taken from the Volvo A60H mining truck with a maximum weight of 98.75 tons.

The results showed that stresses and deflections satisfied the allowable limits based on SNI 2847:2019 and AASHTO LRFD 2020. The ultimate internal forces, namely moment, shear, and torsion, were 13,766 kNm, 2,149 kN, and 156 kNm, respectively, all remaining below the design capacities according to AASHTO LRFD 2020. The amounts of materials used in the new design, like concrete f'_c 50 MPa, concrete f'_c 30 MPa, BjTS 420A steel, and ASTM A-416 Grade 270 strands, went down by 14.29%, 1.45%, 0.46%, and 13.62%, respectively. The construction cost was estimated to decrease by 11.15% compared to the existing design.

Keywords: *Overpass, PC-I girder, redesign.*