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STUDI KOMPARATIF PENERAPAN TEKNOLOGI CORRUGATED STEEL PIPE PADA JEMBATAN BENTANG 40 METER. ASPEK: BIAYA DAN WAKTU
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INTISARI

Indonesia sebagai negara kepulauan membutuhkan pembangunan jembatan yang efisien dari segi biaya dan waktu. Teknologi *Corrugated Steel Pipe* (CSP) berkembang sebagai alternatif jembatan konvensional (PCI Girder), namun kajian komparatif yang terukur antara keduanya masih terbatas. Penelitian ini bertujuan membandingkan biaya dan waktu pelaksanaan konstruksi jembatan bentang 40 meter antara teknologi CSP dan struktur konvensional, serta menentukan alternatif yang paling efisien.

Studi kasus dilakukan pada Proyek Perencanaan Jembatan Murung Raya, Kalimantan Tengah. Enam alternatif desain disusun berdasarkan kombinasi jenis struktur (CSP/konvensional), jenis timbunan (tanah/mortar busa), dan metode penyediaan beton (*ready mix*/*mobile batching plant*). Estimasi biaya disusun melalui Rencana Anggaran Biaya (RAB) berbasis *Quantity Take-Off* dari model tiga dimensi Autodesk Revit dengan acuan SE 182/SE/Dk/2025 dan Harga Satuan Dasar Perbup Murung Raya 2025, sedangkan waktu pelaksanaan dihitung menggunakan *Critical Path Method* (CPM) pada Microsoft Project. Pemilihan alternatif terbaik dilakukan dengan pendekatan *Multi-Criteria Decision Analysis* (MCDA).

Hasil penelitian menunjukkan seluruh desain berbasis CSP lebih ekonomis dan lebih cepat dibandingkan desain konvensional. Biaya konstruksi berkisar antara Rp7,79 miliar hingga Rp9,69 miliar (selisih 24,51%), sedangkan durasi pelaksanaan berkisar antara 50 hingga 74 hari (selisih 48%). Berdasarkan analisis MCDA pada tiga skema pembobotan, Desain 1 (CSP, timbunan tanah, *ready mix*) secara konsisten menempati peringkat pertama dengan skor sempurna 1,000, sehingga direkomendasikan sebagai alternatif paling efisien.

Kata kunci: *Corrugated Steel Pipe*, jembatan, biaya, waktu, MCDA

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ABSTRACT

As an archipelagic country, Indonesia requires bridge construction that is efficient in terms of both cost and time. Corrugated Steel Pipe (CSP) technology has been developing as an alternative to conventional bridges (PCI Girder); however, measurable comparative studies between the two remain limited. This study aims to compare the construction cost and time of a 40-meter-span bridge between CSP technology and conventional structures, as well as to determine the most efficient alternative.

A case study was conducted on the Murung Raya Bridge Planning Project, Central Kalimantan. Six design alternatives were developed based on combinations of structure type (CSP/conventional), embankment type (soil/foamed mortar), and concrete supply method (ready mix/mobile batching plant). Cost estimation was prepared through a Budget Plan (RAB) based on Quantity Take-Off derived from a three-dimensional Autodesk Revit model, referring to SE 182/SE/Dk/2025 and the 2025 Murung Raya Regent Regulation on Basic Unit Prices, while the construction time was calculated using the Critical Path Method (CPM) in Microsoft Project. The selection of the best alternative was carried out using the Multi-Criteria Decision Analysis (MCDA) approach.

The results show that all CSP-based designs are more economical and faster than the conventional designs. Construction costs range from IDR 7.79 billion to IDR 9.69 billion (a difference of 24.51%), while construction durations range from 50 to 74 days (a difference of 48%). Based on the MCDA analysis under three weighting schemes, Design 1 (CSP, soil embankment, ready mix) consistently ranks first with a perfect score of 1.000, and is therefore recommended as the most efficient alternative.

Keywords: *Corrugated Steel Pipe*, bridge, cost, time, MCDA