

ABSTRAK

Perhitungan *Quantity Take-Off* (QTO) konvensional berbasis gambar 2D rawan memicu kesalahan estimasi biaya dan pemborosan material pada proyek konstruksi. Penelitian ini bertujuan untuk mengevaluasi efektivitas penerapan 5D *Building Information Modeling* (BIM) dengan Autodesk Revit dalam mengestimasi volume dan biaya pekerjaan struktur pada proyek pembangunan *Closed House* di Kota Tasikmalaya. Analisis ini difokuskan pada penelusuran faktor penyebab deviasi kuantitas material dan rencana anggaran biaya di antara kedua metode.

Pendekatan kuantitatif komparatif diterapkan dengan mengolah data sekunder berupa gambar 2D *Detailed Engineering Design* (DED), *Bill of Quantities* (BoQ), dan Analisis Harga Satuan Pekerjaan (AHSP) proyek tahun 2021. Data tersebut diolah untuk merekonstruksi model 3D parametrik guna mengekstrak volume material secara otomatis melalui fitur *Schedules/Quantities*. Lingkup pemodelan dibatasi pada elemen penopang struktur utama, yang mencakup struktur bawah beton (lantai kerja, pondasi, balok sloof, pedestal) dan struktur atas baja profil IWF 150.75.5.7.

Hasil studi menunjukkan estimasi biaya metode konvensional sebesar Rp223.913.707,68, sedangkan metode BIM 5D menghasilkan Rp187.346.101,38, sehingga diperoleh efisiensi anggaran sebesar Rp36.567.606,30 (16,33%). Deviasi biaya ini dipicu oleh kemampuan otomatisasi kuantitas bersih (*net quantity*) BIM yang sukses mengeliminasi perhitungan ganda (*double counting*) beton, mengoreksi taksiran berlebih (*overestimation*) tinggi pedestal sebesar 0,20 meter, mengatasi luput hitung (*error of omission*) panjang sloof 15x20 cm sejauh 17,2 meter, serta mengoptimalkan sisa potongan baja profil melalui simulasi pola pemotongan (*nesting schedule*). Penerapan BIM 5D terbukti meningkatkan presisi kuantitas material dan efisiensi biaya pada bangunan industrial yang bersifat repetitif.

Kata Kunci: BIM 5D, Autodesk Revit, *Quantity Take-Off* (QTO), Estimasi Biaya, Deviasi, Struktur Repetitif.

ABSTRACT

Conventional 2D drawing-based Quantity Take-Off (QTO) calculations are prone to cost estimation errors and material waste in construction projects. This study aims to evaluate the effectiveness of implementing 5D Building Information Modeling (BIM) using Autodesk Revit to estimate the volume and cost of structural works in an industrial Closed House project in Tasikmalaya. The analysis focuses on tracing the factors causing deviations in material quantities and budget plans between the two methods.

A comparative quantitative approach was applied by processing secondary data, including 2D Detailed Engineering Design (DED) drawings, Bill of Quantities (BoQ), and Unit Price Analysis (AHSP) from the 2021 project. These data were used to reconstruct a 3D parametric model and automatically extract material volumes using the Schedules/Quantities feature. The modeling scope was limited to the main structural support elements, comprising concrete substructures (lean concrete, isolated footing, tie beams/sloof, and pedestal columns) and steel superstructures (IWF 150.75.5.7 profile).

The results show a conventional cost estimation of IDR 223,913,707.68, whereas the BIM 5D method yields IDR 187,346,101.38, generating a cost saving of IDR 36,567,606.30 (16.33% efficiency). This deviation was driven by BIM's automatic net quantity calculations, which eliminated concrete double counting, correcting pedestal height overestimation by 0.20 meters, resolving tie beam (sloof 15x20 cm) length omission by 17.2 meters, and optimizing structural steel scrap through cutting pattern simulations (nesting schedule). The implementation of BIM 5D is proven to improve material quantity precision and cost efficiency in repetitive industrial structures.

Keywords: BIM 5D, Autodesk Revit, Quantity Take-Off (QTO), Cost Estimation, Deviation, Repetitive Structure.