INTISARI

Beton bertulang baja adalah material yang paling umum dan banyak dipakai sebagai material utama infrastruktur, khususnya struktur bangunan gedung karena memiliki harga yang murah dan mudah didapatkan. Meskipun demikian, proses analisis struktur dan desain penulangan elemen beton bertulang melibatkan proses yang dilakukan secara berulang dan cukup panjang sehingga tidak efisien dan rawan kesalahan. Integrasi serta otomatisasi proses analisis dan desain dibutuhkan agar proses analisis dan desain bangunan gedung beton bertulang lebih cepat, efisien, dan aman. Penelitian ini dilakukan untuk mengembangkan program yang dapat melakukan integrasi dan otomatisasi proses analisis dan desain penulangan elemen balok dan kolom bangunan gedung tipikal.

Dalam penelitian ini, dikembangkan suatu program yang dapat melakukan pemodelan, analisis struktur, dan desain berdasarkan SNI 1727:2020, SNI 1726:2019, dan SNI 2847:2019. Program yang dikembangkan berbasis *Visual Basic for Application* (VBA) yang terpasang pada Microsoft Excel dan diintegrasikan dengan CSi SAP2000 melalui *Open Application Programming Interface* (OAPI). Proses pemodelan dilakukan di CSiSAP 2000 sementara penarikan dan pengolahan data *input*, desain penulangan, serta pengolahang dan penampilan data *output* dilakukan di Microsoft Excel. Desain penulangan yang dilakukan adalah tulangan longitudinal dan transversal untuk balok dan kolom. Proses desain penulangan dilakukan berdasarkan kemampuan penampang dalam menahan gaya dalam elemen yang terjadi.

Hasil penelitian menunjukkan deviasi atau rerata deviasi kapasitas penulangan antara hasil program dengan referensi yang sudah dipublikasikan atau perangkat lunak lain lebih kecil dari 10%. Selain itu, metode desain dalam program ini juga dapat memangkas kebutuhan tulangan hingga 50% jika dibandingkan dengan metode desain konservatif yang dilakukan dengan hitungan manual. Dengan demikian, dapat disimpulkan bahwa program yang dikembangkan sudah memiliki keakuratan yang cukup dan dapat dipercaya.

Kata kunci: OAPI, pemodelan gedung, kapasitas elemen, desain elemen, kebutuhan tulangan.

ABSTRACT

Steel reinforced concrete is the most common and widely used material for infrastructure, especially buildings because it is cheap and easy to obtain. However, the analysis and design process of reinforcement in reinforced concrete involves processes that are carried out repeatedly and are quite lengthy so they are inefficient and prone to errors. Integration and automation of the analysis and design process is needed so that the analysis and design process for reinforced concrete building is faster, more efficient, and safer. This research was conducted to develop a program that can integrate and automate the analysis and design process of reinforcement in beam and column elements in typical buildings.

In this research, a program was developed that can carry out modeling, structural analysis and design based on SNI 1727:2020, SNI 1726:2019 and SNI 2847:2019. The program is build based on Visual Basic for Application (VBA) installed in Microsoft Excel and integrated with CSi SAP2000 via the Open Application Programming Interface (OAPI). The modeling process was carried out in CSi SAP 2000 while the retrieval and processing of input data, reinforcement design, as well as processing and display of output data was carried out in Microsoft Excel. The reinforcement design performed in this program includes longitudinal and transverse reinforcement for beams and columns. The reinforcement design process is carried out based on the cross-section's ability to withstand the internal forces in the elements that occur.

The research results show that the deviation or average deviation of the reinforcement capacity between the program results and published references or other software are all smaller than 10%. Apart from that, the design method in this program can also cut reinforcement requirements by up to 50% when compared to conservative design methods carried out using manual calculations. Thus, it can be concluded that the program developed has sufficient accuracy and can be trusted.

Keywords: OAPI, building modeling, element capacity, element design, reinforcement requirements.