INTISARI

Jembatan Pandansimo merupakan salah satu infrastruktur penting di Daerah Istimewa Yogyakarta. Jembatan ini dirancang dengan struktur utama berupa pelengkung baja bergelombang (*Corrugated Steel Plate* atau CSP) yang ditimbun dengan material mortar busa ringan. Teknologi ini dikenal sebagai *Corrugated Steel Mortar Busa Pusjatan* (CMP). Selain itu, jembatan ini juga dilengkapi dengan sistem *base isolation* berupa *Lead Rubber Bearing* (LRB) untuk mereduksi gaya gempa yang diteruskan ke struktur atas jembatan. Sistem isolasi ini berfungsi untuk meningkatkan ketahanan seismik jembatan dengan cara memperpanjang periode getar struktur, sehingga respon dinamik terhadap gempa menjadi lebih kecil. Seiring dengan berkembangnya penerapan teknologi CMP, muncul inovasi dalam bentuk struktur komposit antara CSP dan lapisan beton bertulang. Penambahan lapisan beton ini berfungsi sebagai perkuatan tambahan pada baja gelombang. Akan tetapi, pendekatan inovasi tersebut belum diterapkan pada Jembatan Pandansimo.

Berdasarkan hal tersebut, penelitian ini bertujuan untuk merancang ulang struktur Jembatan Pandansimo dengan menambahkan lapisan beton bertulang pada baja gelombang, sehingga membentuk sistem struktur komposit yang juga tetap mengintegrasikan sistem isolasi seismik. Kemudian, juga akan dilakukan analisis perbandingan terhadap struktur *eksisting* (struktur non-komposit) dari berbagai aspek teknis. Perancangan serta analisis dilakukan pada segmen bentang tengah jembatan yaitu P12-P17, dengan panjang setiap bentang 25 meter dan menggunakan perangkat lunak MIDAS Civil. Desain lapisan beton bertulang mencakup ketebalan beton, tulangan utama, tulangan susut, dan *shear* connector.

Hasil perancangan menghasilkan dua alternatif desain lapisan beton bertulang setebal 25 cm dan 30 cm. Kemudian hasil analisis menunjukkan bahwa struktur komposit mampu mereduksi tegangan, lendutan, serta gaya dalam pada CSP dibandingkan dengan struktur non-komposit. Tegangan tekan dan tarik pada dinding tepi serta potensi kegagalan mortar busa juga bisa tereduksi. Namun, pada elemen balok pedestal, struktur komposit menunjukkan peningkatan tegangan dibandingkan struktur non-komposit. Penambahan massa akibat lapisan beton juga menyebabkan periode struktur menjadi lebih besar dan peningkatan gaya aksial pada LRB, disertai juga dengan peningkatan perpindahan dan gaya geser isolator.

Kata kunci: Jembatan Pandansimo, *Corrugated Steel Plate* (CSP), *Lead Rubber Bearing* (LRB), lapisan beton, struktur komposit.

ABSTRACT

Pandansimo Bridge is one of the important infrastructures in the Special Region of Yogyakarta. The bridge is designed with a main structure in the form of a corrugated steel plate (CSP) arch, which is filled with lightweight foam mortar material. This technology is known as Corrugated Steel Mortar Busa Pusjatan (CMP). In addition, the bridge is also equipped with a base isolation system using Lead Rubber Bearings (LRB) to reduce earthquake forces transmitted to the superstructure. This isolation system functions to improve the seismic resistance of the bridge by extending the natural period of the structure, thereby reducing its dynamic response to earthquakes. Along with the development of CMP technology, innovations have emerged in the form of composite structures between CSP and reinforced concrete layers. The addition of the concrete layer serves as additional protection against potential corrosion that may accelerate structural failure. However, this innovative approach has not yet been applied to the Pandansimo Bridge.

Based on these considerations, this study aims to redesign the structural system of the Pandansimo Bridge by adding a layer of reinforced concrete over the corrugated steel, forming a composite structure that also maintains the use of a seismic isolation system. A comparative analysis will then be conducted between the redesigned composite structure and the existing non-composite structure from various technical aspects. The design and analysis are focused on the central span segment of the bridge, specifically between piers P12 and P17, with each span measuring 25 meters in length. Structural modeling and analysis are carried out using MIDAS Civil software. The design of the reinforced concrete layer includes concrete thickness, main reinforcement, shrinkage reinforcement, and shear connectors.

The design resulted in two reinforced concrete layer alternatives with thicknesses of 25 cm and 30 cm. The analysis results showed that the composite structure was able to reduce stress, deflection, and internal forces in the CSP compared to the non-composite structure. Compressive and tensile stresses on the side walls, as well as the potential failure of foam mortar, can also be reduced. However, in the pedestal beam element, the composite structure showed increased stress compared to the non-composite structure. The additional mass due to the concrete layer also resulted in an increased structural period and higher axial forces on the LRB, along with increased displacement and shear forces on the isolator.

Keywords: Pandansimo Bridge, *Corrugated Steel Plate* (CSP), *Lead Rubber Bearing* (LRB), concrete layer, composite structure.