

INTISARI

Lead Rubber Bearing (LRB) merupakan salah satu jenis isolator seismik yang umum digunakan pada struktur jembatan. Isolator ini berperan dalam meredam gempa sekaligus menahan pengaruh beban dinamis seperti beban kereta yang dapat memicu lendutan pada girder maupun perpindahan pada isolator. Pada salah satu *pier* jalan layang LRT Jakarta, ditemukan kondisi LRB yang mengalami kemiringan mendekati batas izin perpindahan untuk kondisi layan. Hal ini menunjukkan perlunya evaluasi lebih lanjut terhadap respons LRB terhadap berbagai jenis pembebanan yang terjadi selama masa layan maupun dalam kondisi ultimit. Penelitian ini bertujuan untuk mengetahui pengaruh perbedaan urutan pemasangan isolator terhadap nilai perpindahan LRB dan lendutan girder akibat pembebanan layan bertahap.

Studi dilakukan pada bentang girder sepanjang 40 meter antara *pier* 28 dan 29 pada struktur jalan layang LRT Jakarta. Beban layan diberikan secara bertahap dari 25% hingga 100%. Serta, evaluasi dilakukan berdasarkan 2 skenario, yaitu pemasangan yang sesuai dan tidak sesuai urutan konstruksi di mana masing-masing skenario dibandingkan terhadap batas izin perpindahan LRB. Analisis mengacu pada kombinasi pembebanan menurut standar ACI 358.1R-12 dan AS 5100:2017. Pemodelan struktur disimulasikan menggunakan perangkat lunak MIDAS Civil. Hasil analisis menunjukkan bahwa pembebanan bertahap tidak menyebabkan lonjakan perpindahan yang signifikan, baik pada kondisi layan maupun ultimit. Skenario pemasangan yang mengikuti prosedur urutan konstruksi menghasilkan perpindahan longitudinal pada LRB yang lebih rendah dibandingkan skenario yang tidak mengikuti prosedur. Pada kondisi layan, selisih perpindahan tercatat sebesar 57.2% berdasarkan standar ACI 358.1R-12 dan 76.3% berdasarkan standar AS 5100:2017. Pada kondisi ultimit, selisih perpindahan antara kedua skenario tetap terlihat namun tidak sebesar pada kondisi layan, yaitu sebesar 2,32% berdasarkan standar ACI 358.1R-12 dan 1,06% berdasarkan standar AS 5100:2017. Perpindahan LRB melebihi batas izin hanya terjadi pada kombinasi pembebanan ultimit berdasarkan ACI 358.1R-12 yang dipengaruhi oleh keberadaan beban gempa. Sementara itu, seluruh nilai perpindahan berdasarkan standar AS 5100:2017 masih berada dalam batas izin.

Kata kunci: isolator seismik, *lead rubber bearing*, *light rail transit*, perpindahan

ABSTRACT

Lead Rubber Bearing (LRB) are commonly implemented in bridge structures to improve seismic performance and reduce structural responses under dynamic loads such as train traffic which can potentially result in girder deflection and displacement in the isolator. Inspection at one of the Jakarta LRT piers revealed LRBs with deformation approaching its service displacement capacity which suggests the importance of further assessing the isolator's behavior under different types of loading, both during service and under ultimate conditions. The objective of this research is to comprehend the effect of different isolator installation sequences on the longitudinal displacement of LRBs and girder deflection when subjected to gradually increasing service loads.

This study focused on a 40 meter girder span located between piers 28 and 29 of the Jakarta LRT elevated structure. Service loads were applied progressively from 25% to 100%. The evaluation is also based on 2 scenarios, one following the procedural installation sequence and one that does not, each compared against the allowable displacement limits for the isolator. The analysis refers to load combinations specified in ACI 358.1R-12 and AS 5100:2017 with all structural modelling performed using MIDAS Civil. The analysis showed that such gradual loading did not result in significant increases in LRB's displacement, either under service or ultimate conditions. The installation scenario that followed the procedural installation sequence resulted in lower longitudinal displacement in the LRB compared to the one that did not. During service loading, the difference in LRB displacement between the two installation scenarios was 57.2% under ACI 358.1R-12 and 76.3% under AS 5100:2017. In ultimate conditions, the difference remained observable but was notably smaller, at 2.32% for ACI 358.1R-12 and 1.06% for AS 5100:2017. Notably, only the ultimate load combination based on ACI 358.1R-12 resulted in displacement exceeding the allowable limit, primarily due to the presence of seismic loads. Meanwhile, all displacement results under the AS 5100:2017 standard remained below the allowable limit.

Keywords: *base isolator, lead rubber bearing, light rail transit, displacement*