

Reuse of Steel Structures Aiming Reduction of CO₂ Emissions

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This paper studies reuse of steel structures to reduce the environmental burden. The reuse of entire buildings, or at least reuse at the structural member level, is extremely effective for limited term and short life buildings. Scrapping steel structural members for recycling requires energy for melting, and this melting process causes substantial CO₂ emissions. However, reusing structural members requires only ancillary energy for demolition, transportation, and adjustments, causing less environmental burden.

The results obtained in this study are as follows.

First, Calculation method of CO₂ emissions for reuse in steel circulation process and effectiveness of reduction of CO₂ emissions are shown using database of steel structures.

Next, the careful demolition procedure developed to minimize the damage to structural members for reuse is verified and performance evaluation of steel structural members is also shown by a non-destructive test. Furthermore, performances of structural members obtained by steel structure completed in 1970s are evaluated by experiments.

Finally, the composite steel and timber structure as for application of steel structure for reuse is proposed based on a damage-controlled structure. Its structural performance is verified on the experimental tests and its design method using buckling-restrained knee braces is shown.