

C-section Cold-Formed Steel as Structural Members in Housing Construction in the Philippines

Bernardo A. LEJANO

Professor/Dr.

De La Salle University (DLSU)

Manila City, Philippines

bernardo.lejano@dlsu.edu.ph

The author is a full professor of the Civil Engineering Department of DLSU. He has MS degree from University of the Philippines and Doctor of Engineering from Nihon University, Japan.



Contact: bernardo.lejano@dlsu.edu.ph

1 Abstract

Getting good lumber for housing construction is becoming difficult in the Philippines due to existing partial log ban. Although, the use of reinforced concrete is still the most popular in construction, an emerging alternative is the use of cold-formed steel (CFS). It is gaining popularity because of its high strength-to-weight ratio. However, information about the structural performance of locally-produced cold-formed steel is almost nonexistent. Although, design provisions are stipulated in the local Code, these are based on formulas developed abroad, hence the need to investigate these cold-formed steel. This study focuses on the C-section cold-formed steel, which is the most popularly used. The objective is to verify its performance when subjected to axial compression and flexure, both experimentally and computationally. For the computational part, the formulas stipulated in the National Structural Code of the Philippines were followed. For the experimental part, the cold-formed steel members were subjected to compression loads and flexural loads. Aside from usual sensors, high-speed cameras were used to capture the failure modes. For axial compression test, 80 specimens with different lengths and thicknesses were tested. For flexure, 24 specimens of back-to-back C-sections were subjected to 4-point bending test. Results showed the predicted strengths were well below the experimental values. In design, this means the use of Code-based formulas is conservative. Failure modes observed were torsional buckling and distortional buckling. Comparison of failure modes between experiment and computation shows 70% agreement for compression and 75% for flexure. Finite element method calculations were also done and were compared with experimental results.

Keywords: cold-formed steel, compression, flexure, C-section, buckling, torsional buckling, distortional buckling.

2 Introduction

Since late 1980s, the Philippine government attempted to stop logging by imposing tax to loggers and prohibiting logging virgin forests.

However, logging forests planted by man was still allowed. Recently, the government is studying total log ban. Although this is favorable for the environment, this resulted to difficulty in getting good lumber for housing construction. Although the use of reinforced concrete is still the most