The 2021 World Congress on
Advances in Structural Engineering and Mechanics (ASEM21)
GECE, Seoul, Korea, August 23-26, 2021

Cyclic behaviour and modelling of stainless-clad bimetallic steels with various clad ratios

Xinpei Liu[1)], *Huiyong Ban[2)], Juncheng Zhu[3)] and Brian Uy[4)]

[1),4)] *School of Civil Engineering, Faculty of Engineering, The University of Sydney, NSW 2006, Australia*
[2)]*Key Laboratory of Civil Engineering Safety and Durability of China Education Ministry, Department of Civil Engineering, Tsinghua University, China*
[3)] *School of Civil Engineering, Beijing Jiaotong University, Beijing, China*
[1)] banhy@tsinghua.edu.cn

ABSTRACT

Stainless-clad (SC) bimetallic steels that are manufactured by metallurgically bonding stainless steels as cladding metal and conventional mild steels as substrate metal, are kind of advanced steel plate products. Such advanced composite steels are gaining increasingly widespread usage in a range of engineering structures and have great potential to be used extensively for large civil and building infrastructures. Unfortunately, research work on the SC bimetallic steels from material level to structural design level for the applications in structural engineering field is very limited. Therefore, the aim of this paper is to investigate the material behaviour of the SC bimetallic steels under the cyclic loading which structural steels usually could encounter in seismic scenario. A number of SC bimetallic steel coupon specimens are tested under monotonic and cyclic loadings. The experimental monotonic and cyclic stress-strain curves of the SC bimetallic steels are obtained and analysed. The effects of the clad ratio that is defined as the ratio of the thickness of cladding layer to the total thickness of SC bimetallic steel plate on the monotonic and cyclic behaviour of the SC bimetallic steels are studied. Based on the experimental observations, a cyclic constitutive model with combined hardening criterion is recommended for numerical simulation of the cyclic behaviour of the SC bimetallic steels. The parameters of the constitutive model for the SC bimetallic steels with various clad ratios are calibrated. The research outcome presented in this paper may provide essential reference for further seismic analysis of structures fabricated from the SC bimetallic steels.

[1)] Ph.D., Postdoctoral Research Associate
[2)] Ph.D., Assistant Professor
[3)] Postgraduate student
[4)] Ph.D., Professor

This paper was published in Steel and Composite Structures, 34 (2), (2020) 189-213.