Wind Engineering Joint Usage/Research Center
FY2018 Research Result Report

Research Field: Wind Hazard Mitigation
Research Year: FY2018
Research Number: 183002
Research Theme: Aerodynamic Modification to Reducing Wind Loads on Leading Edge of Noise Barriers

Representative Researcher: Wonsul Kim

Budget [FY2018]: 150,000Yen

*There is no limitation of the number of pages of this report.
*Figures can be included to the report and they can also be colored.
*Submitted reports will be uploaded to the JURC Homepage.

1. Research Aim

Effects of aerodynamic modifications of free standing walls with leading edges of various forms were investigated through high-frequency pressure measurement test

2. Research Method

The high-frequency pressure measurement test was carried out the boundary layer wind tunnel at Wind Engineering Research Center, Tokyo Polytechnic University, Japan.

3. Research Result

Net force coefficients on the noise barrier with square leading edge are good agreement with those of ASCE 7-10. Further leading edge of CASE 4 which is the leading edge of narrow stepped shape of the free standing wall were most effective in reducing the net force coefficients. These results can be useful for improvement in wind loading codes related in structural design of the free standing walls.

4. Published Paper etc.

[Underline the representative researcher and collaborate researchers]
[Published papers]
1. None.

[Presentations at academic societies]
1. W. Kim. (2019). A study on Enhancement of Wind-Resistant Design of a Free Standing Wall Considering Climate Change, 2019 annual meeting of Architectural Institute of Korea, April 26-27, Korea University, Korea

[Published books]
1. None.

5. Research Group

1. Representative Researcher
Dr. Wonsul Kim

6. Collaborate Researchers

1. Akihito Yoshida, TPU
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7. Abstract (half page)

Research Theme: Aerodynamic Modification to Reducing Wind Loads on Leading Edge of Noise Barriers

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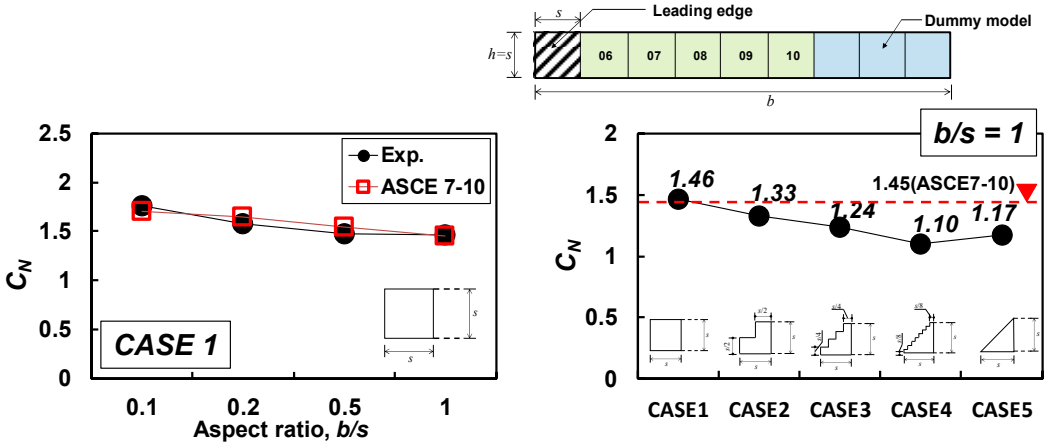
Noise barriers (generally referred to as free standing walls) along freeways or motorways, and hoardings have may be of lesser economic importance, but are often sensitive to wind loads, fail early during a strong wind and provide a source of flying debris. To reduce wind loads on free standing walls, Letchford and Holmes (1994) suggested the return corner of the free standing wall. There results have been codified for design in ASCE 7-10 and Eurocode 1. However, there are restrictions on practical application in the aspects of securing the installation space, since the return corner is installed in direction perpendicular to the free standing wall. In this study, effects of aerodynamic modifications of the noise barrier with various leading edges are investigated by wind tunnel tests. Further, the return periods for design wind speed are discussed to determine reasonable wind loads on the noise barrier. As a result, net force coefficients on the noise barrier with square leading edge are good agreement with those of ASCE 7-10 as shown in Fig. 1(a). Further leading edge of CASE 4 are most effective in reducing the net force coefficients as shown in Fig. 1(b). These results can be useful for improvement in wind loading codes related in structural design of the free standing walls.



(a) Validation of experimental results (b) Aerodynamic modifications

Fig. 1. Comparison of net force coefficients between experiments and ASCE 7-10