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Sound transmission loss of multi-layered sound-proof material with edges of cut out compressed

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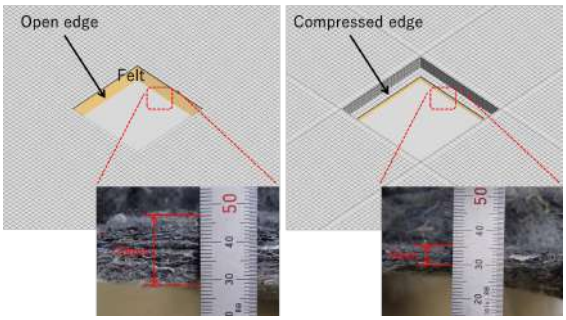
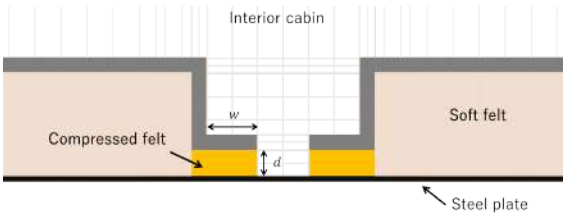
Sound proof structure such as dash silencer is cut-out for wire-harnesses that are passed through from an engine compartment to a passenger compartment. In this paper, a compressed edges of the cutouts for a sound-proof structure with a soft sound-absorbing layer combined with a impervious film layer and compressed felt are proposed to enhance sound transmission loss (STL). Moreover, the compression ratio and the width of the compression part are also investigated numerically to improve sound transmission loss. The size of sound-proof material is 1000 mm × 1000 mm, and the size of the opening slots are studied for 100 mm × 100 mm, 50 mm × 50 mm, and 25 mm × 25 mm at the opening ratio of 0.01. The compression ratio of 50 % and 75 %, and the width of the compression width of 5mm, 10mm, and 20 mm are compared for each specification of the opening slots. As a result, higher compression ratio and the wider compression part lead higher sound transmission loss in the low and mid frequency range below 1.2 kHz. Area density of the soft sound-absorbing layers of 0.5 kg/m^2 and 1.5 kg/m^2 give the same trend in terms of sound transmission loss.



(a)



(b)

Fig.1 Modeling of compressed edge. Thickness d and width w are defined.

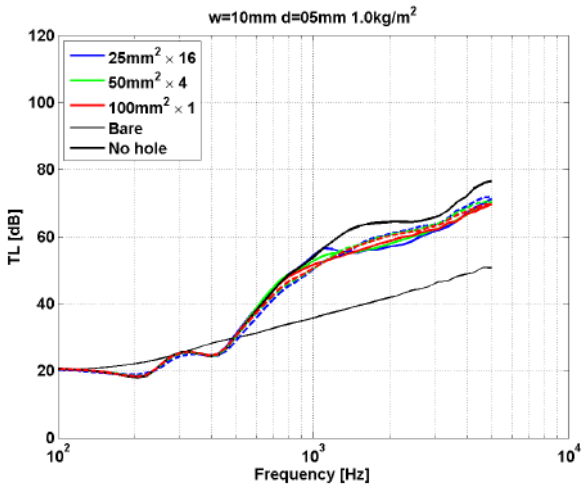


Fig.2 Comparisons between sound transmission loss for open end condition and for compressed end condition.