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An Equivalent-Acoustic Finite Element Method for Modeling
Sound Absorbing Materials

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An equivalent-acoustic finite element method is developed for modeling sound absorbing materials, such as seats and interior trim in the automobile passenger compartment. The equivalent-acoustic method represents the sound absorbing material using acoustic finite elements with frequency-dependent material properties determined from the measured acoustic impedance of sound absorbing material samples. Solution of the equivalent-acoustic model within the Nastran computer capability and coupling of the model with an acoustic finite element model of a surrounding enclosure, such as the passenger compartment, are developed. The accuracy of the equivalent-acoustic method is assessed for modeling a sound absorbing material in a one-dimensional impedance tube, a foam layer in a rectangular box enclosure, and an automotive seat in a semi-reverberant enclosure.