ASTM Sound Testing Summary

The following information describes the technical ASTM acoustics testing performed on prefabricated metal stairs. Testing was conducted to compare sound levels commonly associated with metal stairs. The Quiet Tread application was compared to traditional checker plate / diamond plate metal stairs, concrete pan filled metal stairs, and spray on acoustic applications.

TEST RESULTS

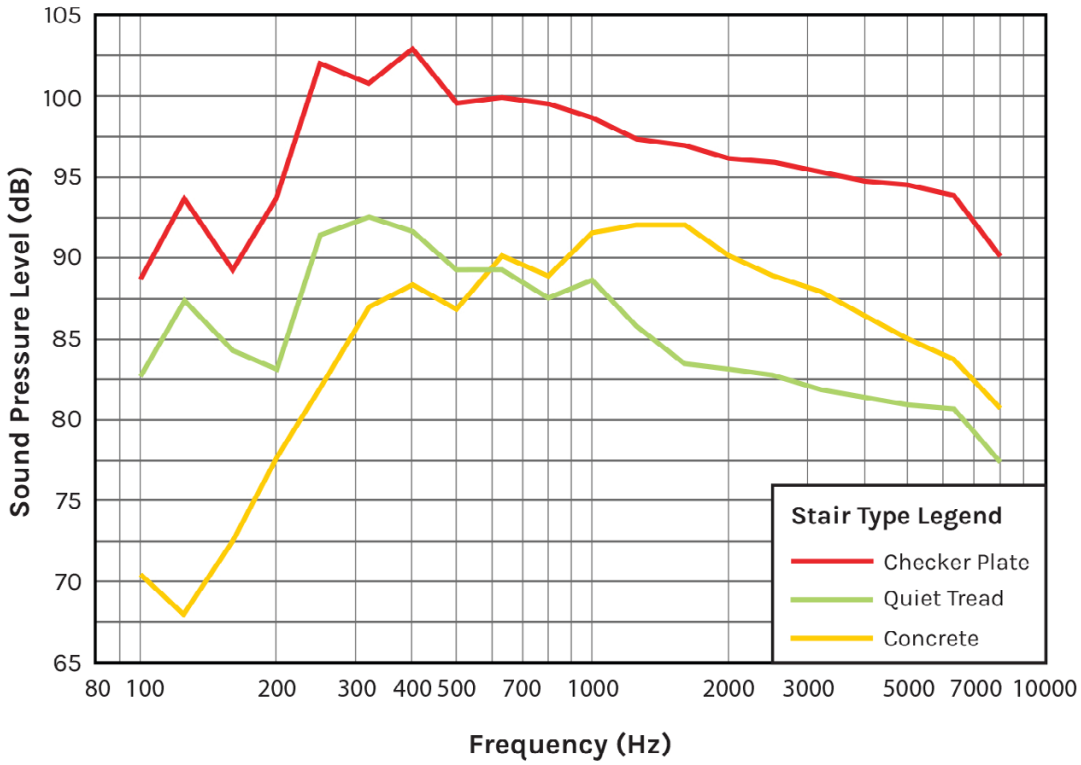
Quiet Tread vs. Traditional Concrete Filled Metal Pan

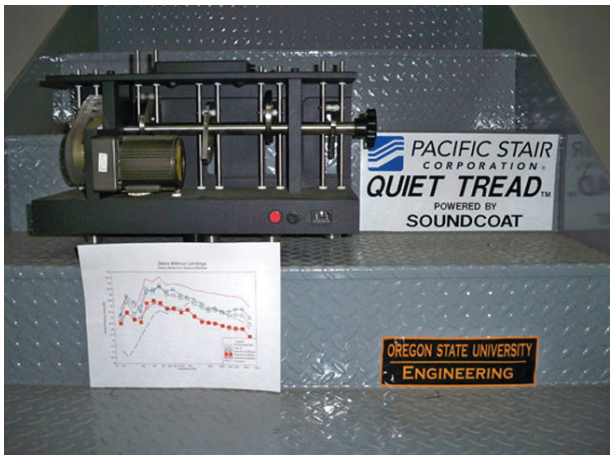
When applied to the step only, Quiet Tread's sound dampening is comparable to traditional concrete filled stair pans on prefabricated steel stairs.

	Normal Walking On Stairs Alone Test	Hammer Drop On Stairs Alone Test	Hammer Drop On Stairs Connected to Landing Test	Hammer Drop On Landings Connected to Stairs Test
Bare Diamond / Checker Plate Stair Treads	**98.7 dB**	**122.7 dB**	**124.0 dB**	**127.1 dB**
Quiet Tread Applied to Stair Tread Only	**89.4 dB**	**115.4 dB**	**113.0 dB**	**120**
Quiet Tread Applied to Stair Riser and Tread	88.5 dB	116.5 dB	112.4 dB	120.6 dB
Quiet Tread Applied to Stair Riser Only	89.7 dB	120.7 dB	121.4 dB	124.0 dB
Concrete Filled Metal Pan	**85.5 dB**	**115.5 dB**	**Not Tested**	**Not Tested**
Line-X (Spray Coating)	90.8 dB	119.4 dB	119.7 dB	125.3 dB

Stair Sound Comparison

Steady Noise From Tapping Machine

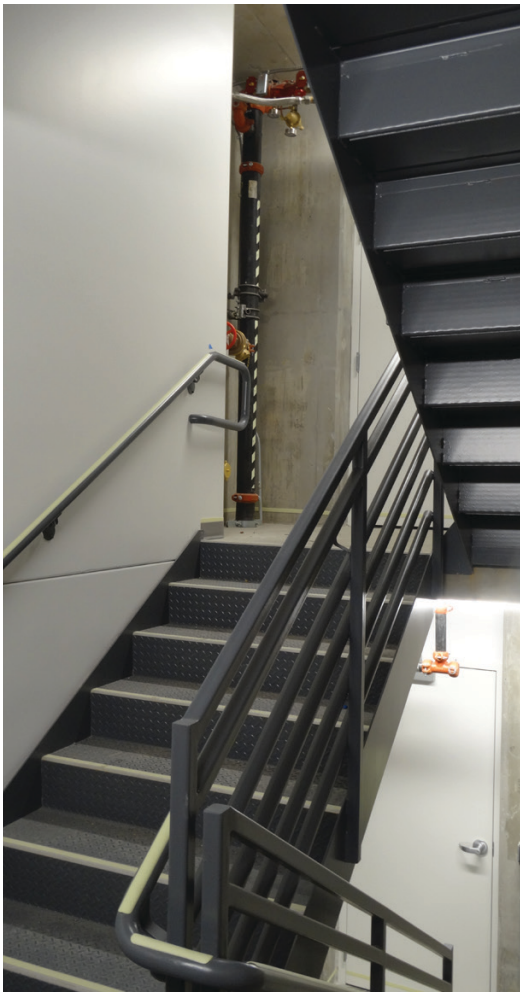




BACKGROUND

Prefabricated steel stair assemblies are commonly used in industrial, commercial, and residential applications. In some situations, stairways can be a source of noise that can adversely affect the comfort of occupants in adjacent areas. Generally, steel stairs with concrete filled pans have been considered quieter than steel tread covered stairs. However, concrete filled pans are more expensive, must be protected during construction, and can require remediation if cracked or damaged before occupancy. The purpose of the present research was to quantify the relative acoustic performance of different stair treatments under different mechanical inputs. Six different stair treatments were investigated. These included:

1. Traditional concrete filled pan stairs
2. Traditional steel checkered plate stairs
3. Steel checkered plate stairs with proprietary use of Line-X™
4. Steel checkered plate stairs with proprietary use of Quiet Tread applied to risers alone
5. Steel checkered plate stairs with proprietary use of Quiet Tread applied to steps alone
6. Steel checkered plate stairs with proprietary use of Quiet Tread applied to steps and risers



- ASTM E 492-04: Standard Test Method for Laboratory Measurement of Impact Sound Transmission through Floor-Ceiling Assemblies Using the Tapping Machine
- ASTM E 2235-04: Standard Test Method for Determination of Decay Rates for Use in Sound Insulation Test Methods
- ISO 140.6-2006: Acoustics – Measurement of Sound insulation in buildings and of building elements. Part 6: Laboratory measurements of impact sound insulation of floors.
- ISO 3741: Acoustics – Determination of sound power levels of noise sources using sound pressure – Precision methods for reverberation rooms

REVERBERATION CHAMBER

Description and Acoustic Characteristics

A reverberation chamber was constructed to test the acoustic performance of the stair assemblies. The chamber was designed to reject background noise, allow acoustic reverberations (exhibit low acoustic absorption), and to simulate the geometric conditions of use for prefabricated steel stairs (representative of a stairwell). The chamber floor was a cast-in-place concrete slab and j-bolts were installed to allow attachment of the stair landings. The walls and roof were wood framed with 2×6 lumber and sheathed in ¾ in. thick MDO plywood. Fiberglass insulation was placed between the studs.

Epoxy paint was applied to the sheathing to produce a hard surface. As suggested in ASTM E 492, sound diffusion panels employed in order to create a more diffuse sound field within the chamber. Two diffusing panels, also made of ¾" MDO, were hung from the ceiling of the chamber. The inside plan dimensions of the final room were 105 in. by 125 in. and the chamber was 144 in. tall. These dimensions meet the requirements of ASTM E 492 that dimensions not be ratios of small whole numbers and that the ratio of the largest dimension to the smallest be less than two. The total volume of the room was 1094 cubic feet.

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