

A Quantitative Comparison of Resilient Channel Products for Use in Floor – Ceiling Assemblies

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The brand and model of resilient channel has a large effect on the acoustic performance of floor ceiling assemblies. This paper continues a series of studies that systematically quantify the difference between the varieties of resilient channel available.

1.0 EXECUTIVE SUMMARY

ClarkDietrich RC-Deluxe (RCSD) resilient channel continues to outperform all other resilient channels for floor-ceiling assemblies. Compared to other channels, it improves the performance of a floor-ceiling assembly by 4 – 13 IIC points, 3 – 10 HIIC points, 10 – 22 LIIC points, and 4 – 7 STC points.

A new channel product (Brand V) was evaluated for this study. Brand V showed a considerably lower performance in floor-ceiling assemblies.

2.0 INTRODUCTION

2.1 Resilient Channel

Metal furring channel marketed as “resilient channel” is commonly used to increase the sound insulation of wall and floor-ceiling assemblies, due to its combination of acoustical performance, small size, and low cost. Its purpose is to acoustically decouple the gypsum board from the underlying structure (usually studs or joists). There are many manufacturers of resilient channel, which is sometimes referred to in marketing or on architectural drawings as “RC-1”. RC-1 was the designation of the original resilient channel developed by United States Gypsum (USG) in the 1960s but is currently used in a generic sense and does not refer a specific product.

Unlike other common construction products such as type X gypsum board or structural steel studs, there are no established specification standards or requirements for the design and/or performance of resilient channel. There is a wide variety of resilient channel designs, but broadly, resilient channels are nominally 25 gauge, which is a range of material between 18 Mil (0.0179 inch) to 22 Mil (0.022 inch) Base metal thickness, 0.5 inch (13 mm) deep, and have a “Z”-shaped cross-section with a narrow flange screwed to the studs, and a wide flange to which gypsum board is attached. Some examples are shown in Figure 1.

While it has long been anecdotally believed in the acoustical community that there are differences in acoustical performance due to the brand and model of resilient channel,

until LoVerde/Dong papers and information dissemination from 2009-2016, the only published information was a 2002 paper¹ that compared a few tests. The previous studies clearly demonstrated and quantified the difference between brands and model of channel, as summarized in the following sections.

ClarkDietrich RC-Deluxe resilient channel is the closest to the original USG RC-1 in design compared to all other channels in the market. This channel is marketed with the product code RCSD.

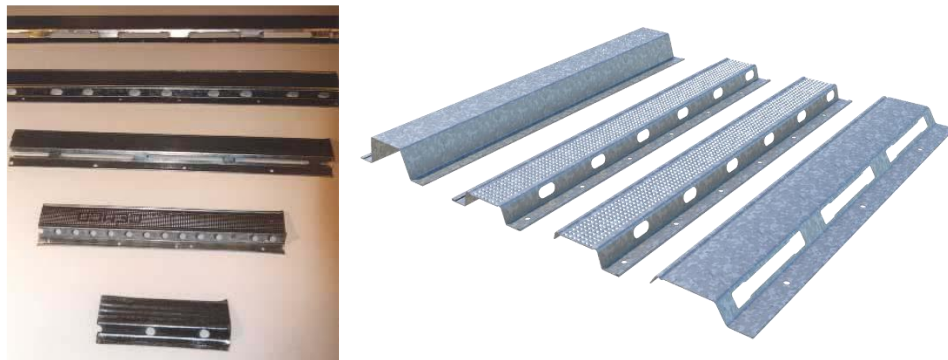


Figure 1: Various resilient channels. Source: Lilly, 2002 (left), ClarkDietrich 2026 (right)

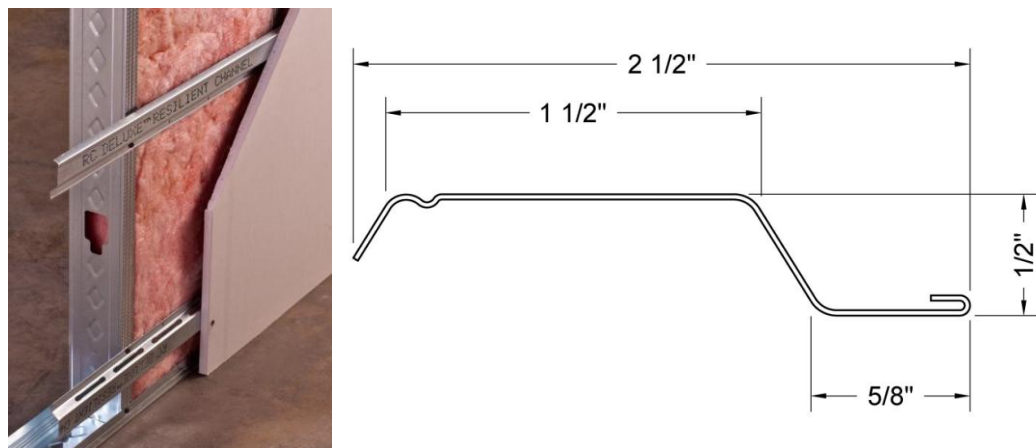


Figure 2: A sketch showing dimensions of resilient channel and image of the typical installation on steel studs beneath gypsum board (Source: ClarkDietrich, 2026)

2.2 Sound Insulation Measurements

The sound insulation provided by floor-ceiling assemblies is typically determined by laboratory testing. There are two categories of sound insulation, airborne sound and impact sound.

Airborne sound refers to sources that transmit their energy primarily into the air, such as voices, televisions, and loudspeakers. Airborne sound insulation is described using *transmission loss* (TL), measured according to ASTM E90. Sound Transmission Class (STC) is calculated from the measured transmission loss according to ASTM E413 and provides a single number rating where higher STC ratings indicate better insulation. In most jurisdictions in the United States, separating walls and floor-ceiling assemblies between residences must achieve a minimum STC rating of 50, for laboratory evaluated assemblies.

Impact sound refers to sources that transmit their energy primarily into a structure, such as footsteps, dragging furniture, or dropped objects. Impact sound insulation is described using *impact sound pressure level* (ISPL), measured according to ASTM E492. Impact Isolation Class (IIC) is calculated from the ISPL according to ASTM E989 and provides a single number rating where IIC ratings indicate better insulation (i.e., lower sound level). In most jurisdictions in the United States, separating floor-ceiling assemblies between residences must achieve a minimum IIC rating of 50, for laboratory evaluated assemblies.

Additional single number ratings have been defined to provide additional information for impact sound insulation. These metrics were first published in the Journal of the Acoustical Society of America in 2017 (LoVerde/Dong), which shows the impact sound is independent in low and high frequency ranges. Low-frequency Impact Isolation Class (LIIC) describes the amount of thudding from footfalls, and High-frequency Impact Isolation Class (HIIC) describes the loudness of sources such as heel clicks and dragging furniture. Higher numbers mean better performance. These metrics have been adopted into ASTM standards and are further defined within ASTM E3207 and ASTM E3222.

While the building code only specifies the minimum performance requirements, recommended ratings for higher performing assemblies are available from other sources. For example, the ICC Guideline for Acoustics² defines two additional levels of performance, Acceptable (STC and IIC 55, minimum, with field acoustical performance NNIC and NISR 52) and Preferred (STC and IIC 60, minimum, with field acoustical performance NNIC and NISR 57). These higher rated assemblies are often used for developers and designers for apartment, senior living and condominium buildings where higher performance is desired.

LoVerde/Dong have also defined additional levels of performance for LIIC and HIIC (2018-2026).

2.3 Previous Comparison Studies

Westside staff have conducted several systematic studies to document the differences between ClarkDietrich's RC-Deluxe (RCSD) and various competitor's resilient channels.

The first study³ compared RCSD to three unidentified manufacturers (Brands X, Y, and Z), and a later study⁴ added another manufacturer (Brand W). The base assembly was a 2X6 wood stud wall. Those studies showed that the airborne sound insulation for walls that included RC-Deluxe were higher than any other resilient channels for all wall configurations tested. Channels X, Y and Z were 3 – 6 points lower than RC-Deluxe for the same wall configuration, while Brand W was similar to RCSD. The improvement due to RC-Deluxe over the remaining channels extended from approximately 100 Hz to 1250 Hz one-third octave bands.

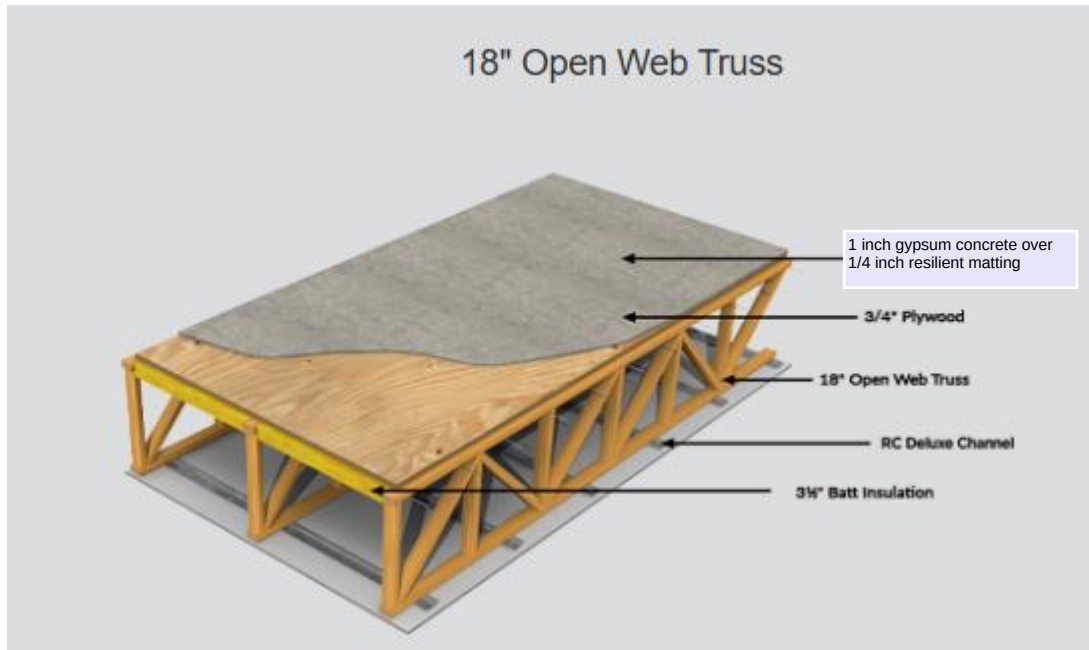
The 2015 study⁵ presented a similar systematic analysis for wood-joint floors, performed on a 2X10 wood joist assembly with a gypsum concrete topping. Eight finish floors were tested, both with and without a sound mat below the gypsum concrete. In this study assemblies with RC-Deluxe performed approximately 3 IIC points better on average than the assemblies with Brand Y, with differences up to 5 dB from 100 – 200 Hz one-third octave bands. The difference appeared to be independent of the overall rating of the assembly, the type of finish floor, or the presence of the acoustical sound mat.

2.4 New channel for this study

An additional channel (Brand V) was tested and included in the studies. This channel was added since it had claimed equivalence in performance to the RCSD and had been submitted on a number of projects. This is an 18mil (0.0179in) Bare Metal thick by 2 inch tall by 1/2 inch deep resilient channel.

3.0 COMPARISON TESTING ON FLOOR-CEILING ASSEMBLIES

Airborne and impact sound insulation testing was performed on a floor-ceiling system consisting of 18 inch (457 mm) open web wood trusses spaced at 24 inch (610 mm) on center with 1 inch (25.4 mm) gypsum concrete and 1/4 inch (6 mm) sound mat with R-13 batt insulation and comparing RCSD and Brand V Resilient Channels Table 1 shows the results.



RCSD significantly outperformed Brand V channels in all ratings.

Table 1: Impact sound ratings for floor assemblies with different resilient channels

Base Assembly	Finish Floor	Resilient Channel	IIC	HIIC	LIIC	STC
18-in OWT + 1-in gypsum concrete + 1/4-in mat	Bare	RCSD	55	55	61	61
		Brand V	51	52	51	57
	5.5mm LVT + 1.5mm attached pad	RCSD	59	70	54	61
		Brand V	52	64	44	57

Figure 3 shows a representative test result. The ISPL (Impact Sound Pressure Level per ASTM E492) measured with a finish floor of 5.5mm LVT with integrated pad is shown for RCSD and Brand V using the orange and gray lines, respectively. Recall that higher ISPL means louder sound and therefore a lower IIC rating. The rank-order with these channels is clear.

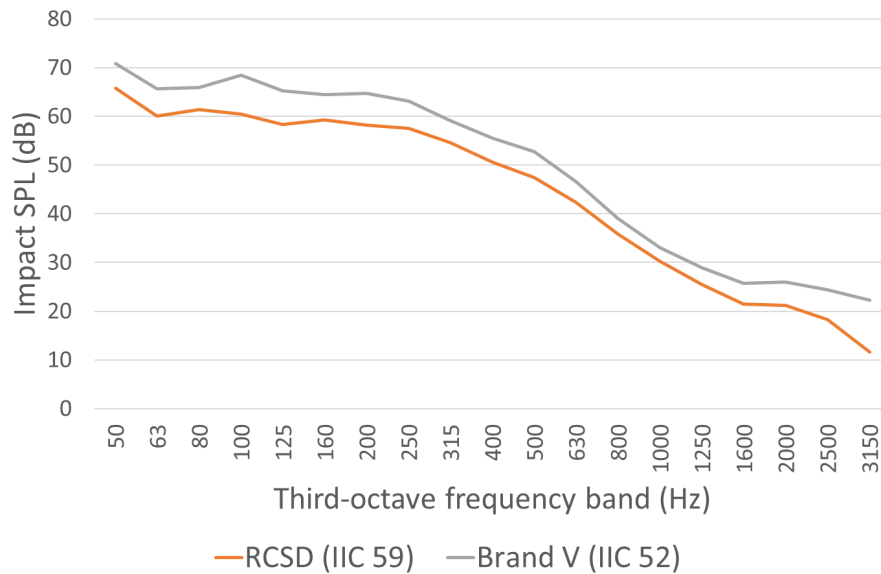


Figure 3: Impact SPL measured with different resilient channels on 18OWT with LVT and pad

For the same assembly, if the RCSD channel was replaced with the Brand V resilient channel, the performance is expected to decrease as shown in Figure 4. Negative numbers show that using Brand V will lead to a reduction in performance as compared to RCSD.

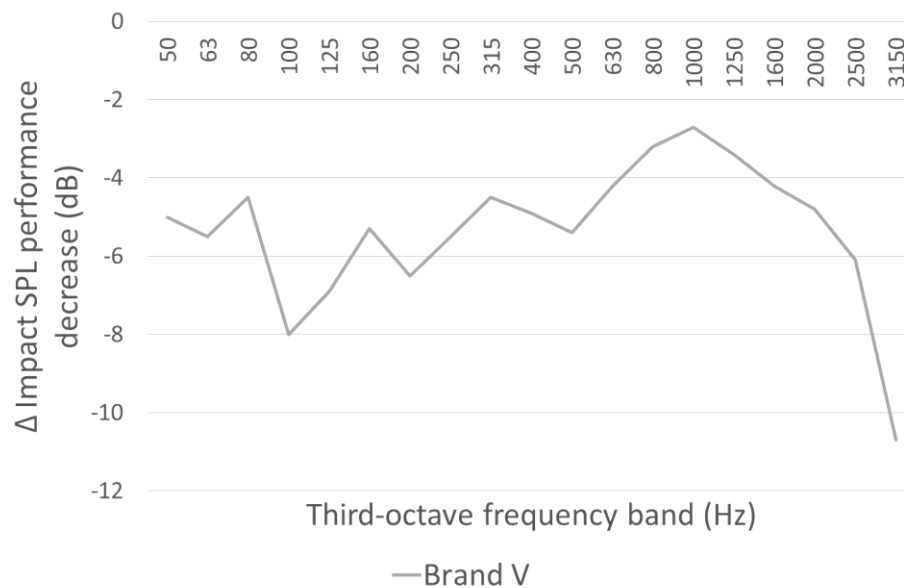


Figure 4: The reduction in performance if RCSD was replaced with the Brand V channel

4.0 CONCLUSIONS

Compared to other resilient channels, ClarkDietrich RCSD continues to be unsurpassed in airborne and impact sound insulation in floor-ceiling assemblies. This work showed that the RCSD channels performed better than the newly tested channel (Brand V) by 4 – 7 IIC points, 4 STC points, 10 LIIC points, and 3 – 6 HIIC points.

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