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RESILIENT CHANNELS: GUARANTEED TO FAIL

Analysis of the Failure Modes of "Resilient" Channel

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For the last 50 years, resilient channels (RC) have been used in assemblies to attempt to achieve acoustically code compliant results even though they have proven to be unreliable in the field. They are so unreliable that they should not be called “resilient” channel. Due to RC failures and low performance, more advanced noise control techniques have been developed.

HISTORY

A very good summary of the history of the RC was reported by Lilly.[1] From what he found, RC was first introduced in the 1960s by USG as a crack suppression method. It was called RC-1. It was soon discovered that RC provided some acoustical benefit as well. USG stopped making the product around 1990. Since then the rights to the design have had a long and confusing history that is well documented by Lilly.[1] Since Lilly wrote his paper, Worthington Industries formed the joint venture, ClarkDietrich, which now manufactures the original USG RC-1 design under the RC Deluxe® name.

WHY IT WILL FAIL

Since the first RC was introduced, many other companies have released their own version creating confusion in the marketplace. Some of these are not manufactured with the same quality as the original and have been shown to fail to perform. There are many reasons why all brands of RC will fail. A summary of just a few of these are below:

1. Original No Longer Exists

The original RC-1 used in most laboratory tests that are cataloged in design manuals such as the Gypsum Association "Fire Resistance Design Manual" no longer exists.

2. No Standard Design

There is no standard design for RC in either ASTM C645 "Standard Specification for Nonstructural Steel Framing Members" or the Steel Stud Manufacturers Association (SSMA) "Product Technical Guide" as there is for drywall furring channel or other steel members. Since there is no standard design for RC, the resiliency of available RC varies greatly. (See ***Table 1***)

3. Measured Performance is Different

Different brands of RC have different performance as documented by Lilly[1] and LoVerde.[2] They show that very few are as good as the original.

4. Many Different Models from Same Manufacturer

Some companies sell several products that are labeled as RC, each one having different resilient properties (see ***Table 1***). For example, ClarkDietrich, the manufacturer of RC Deluxe, sells a total of five different versions of RC. This makes it very unlikely that a contactor will pick up the right product from the supply yard.

5. Double Legged RC

Double legged RC is offered by companies including ClarkDietrich, Phillips, MarinoWare, CEMCO, Telling, STUDCO and ConFab (see ***Table 1***). This double leg greatly reduces the resiliency of the channel by supporting both sides of the mounting face of the channel. ***Figure 1*** shows the illustrations of both single and double legged STUDCO channels.

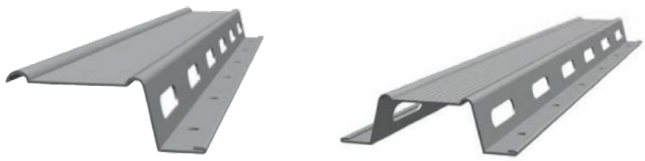


Figure 1: Illustration of single (left) and double (right) legged RC sold by STUDCO[24]

6. The RC is Drawn/Shown Incorrectly

In at least one respected building acoustics text[3], the RC is drawn upside down (***Fig. 2***). It is also drawn incorrectly in online blogs and how-to videos. The Green Building Advisory blog[4] shows the channel installed in a nearly impossible configuration with the drywall ceiling screwed into the leg of the channel (***Fig. 3***). A popular YouTube installation video[5] not only shows the channel being installed upside down but also shows it incorrectly being sandwiched between two layers of drywall (***Fig. 4***). This illustrates how easy it is to install RC incorrectly.

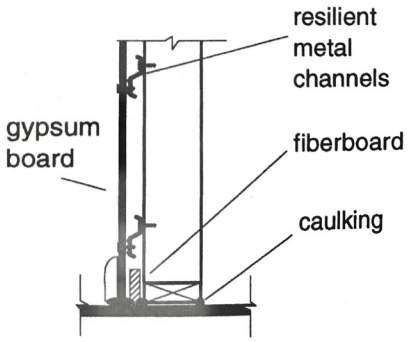


Figure 2: Harris's "Noise Control in Buildings" showing RC installed upside down

When the RC is installed upside down, the weight of the drywall pushes the channel into the studs (instead of pulling it away from the studs when installed properly) thus causing a short circuit in the wall, resulting in poor sound insulation.

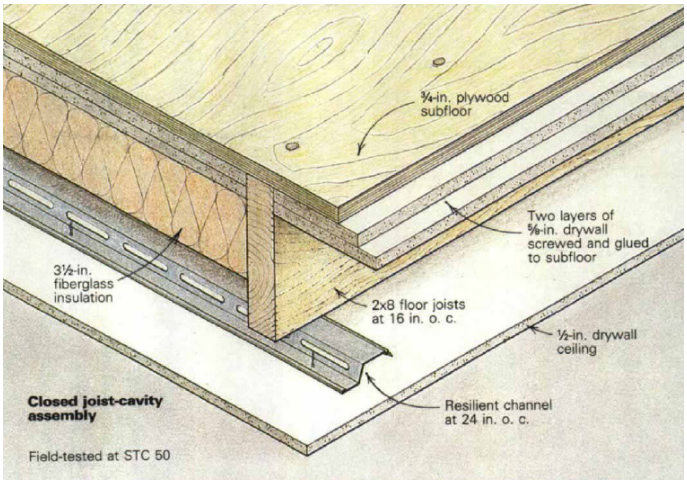


Figure 3: Graphic from online blog[4] showing RC installed in a nearly impossible configuration

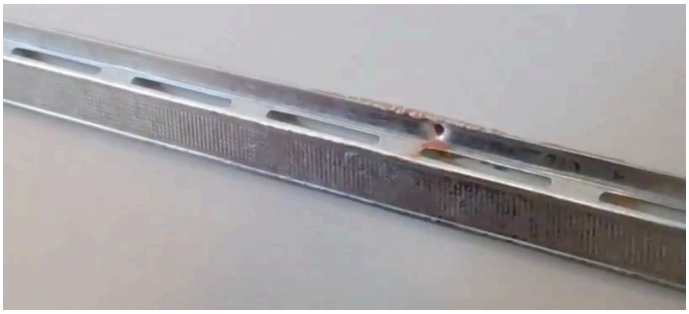


Figure 4: Still image from a how-to video[5] that shows RC being installed incorrectly

7. Damage in storage and shipping

RC are thin and prone to damage from shipping or on-the-job storage. Any bend in the channel can cause shorting. Damaged RC are often used because by the time the damage is discovered, it is too late to re-order.

8. Screw is installed incorrectly

During installation, the RC can easily be unintentionally shorted out. A screw that is too long or positioned incorrectly can accidentally touch or embed into the joist or stud (***Fig. 5***). This has been shown to significantly reduce the sound insulation.[6]

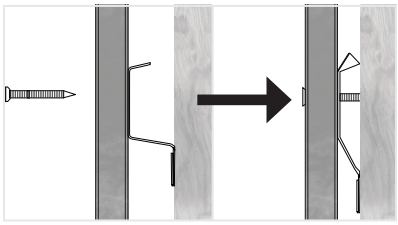


Figure 5: Illustration of screw shorting out RC

9. Shorted Out on Purpose

Some contractors short-out the RC on purpose because they inaccurately believe that this will prevent cracks developing in the ceiling.

SUMMARY OF RC ON THE MARKET

There are many different manufacturers of RC, and as pointed out above, they are not equal. Some manufactures also make several different products that they refer to as RC. The most common RC types are summarized in ***Table 1*** with the following attributes:

- Manufacturer
- Model name
- Thickness of metal used
- Number of supporting legs
- Shape of holes
- Location of screw holes relative to the holes

The physical attributes are important to the performance of RC. The thicker the metal the stiffer the RC will be. RC with two legs will be much stiffer

than RC with one leg. The shape of the holes and the locations of the screw holes will also affect the overall stiffness of the channel. With all of these different designs on the market, it is incumbent upon the consumer to verify the performance of the RC as it most likely is different from the original.

ALTERNATIVE TECHNIQUE

To overcome these shortcomings that cause RC to fail, **Pliteq**® developed the **GenieClip**® **RST** (***Fig. 6***) which is used to reduce the transmission of airborne and impact sound through wall and floor/ceiling assemblies. To install **GenieClip RST**:

- The **GenieClip RST** is screwed into the stud or joist
- The furring channel is simply snapped in (***Fig. 7***)
- The drywall is then screwed to the furring channel.

This creates a much larger gap that cannot be short-circuited (***Fig. 8***). Not only will the **GenieClip RST** not fail like RC in the field, but it outperforms perfectly installed RC in laboratory tests. ***Figure 9*** shows the sound transmission loss for the three wood-stud walls tested and ***Figure 10*** shows the drawings. The Sound Transmission Class (STC) for the direct attached wall is 36, the RC wall is 50 and the **GenieClip RST** wall is 57. While both the RC and the **GenieClip RST** increase the acoustical performance, the **GenieClip RST** performs much higher.

Figure 6: **Pliteq GenieClip RST**

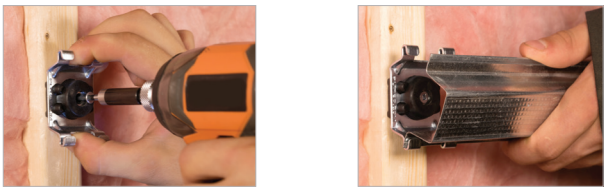


Figure 7: Installation of **Pliteq GenieClip RST**

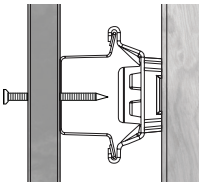


Figure 8: Cross section of installed **GenieClip RST**

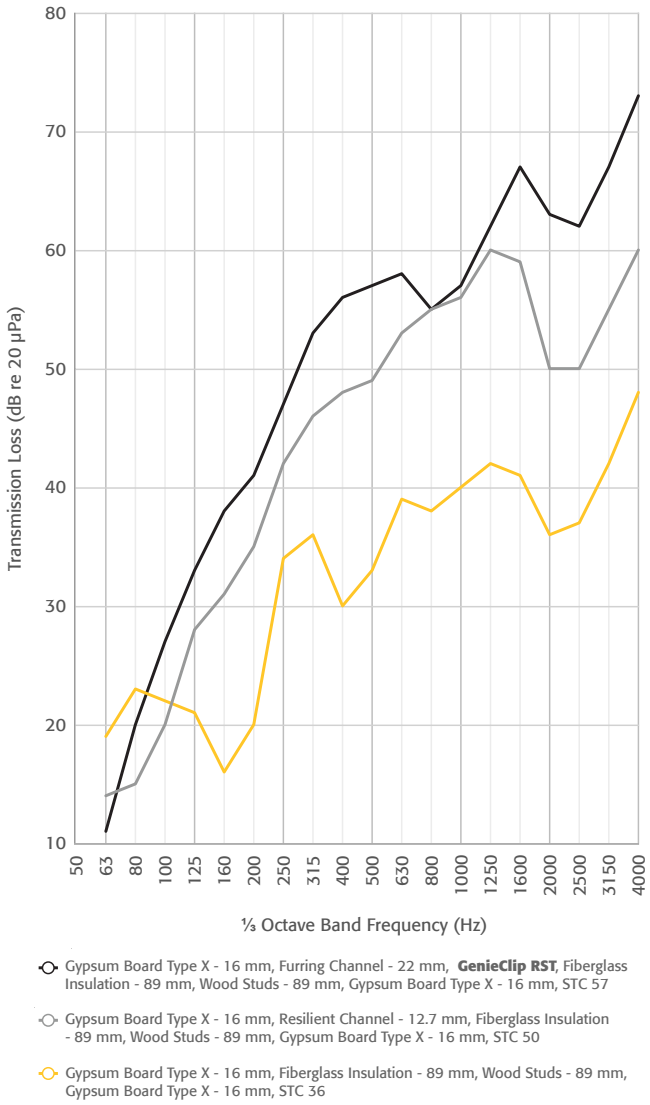


Figure 9: STC of wood stud wall with **Pliteq GenieClip RST**, RC and direct attached.

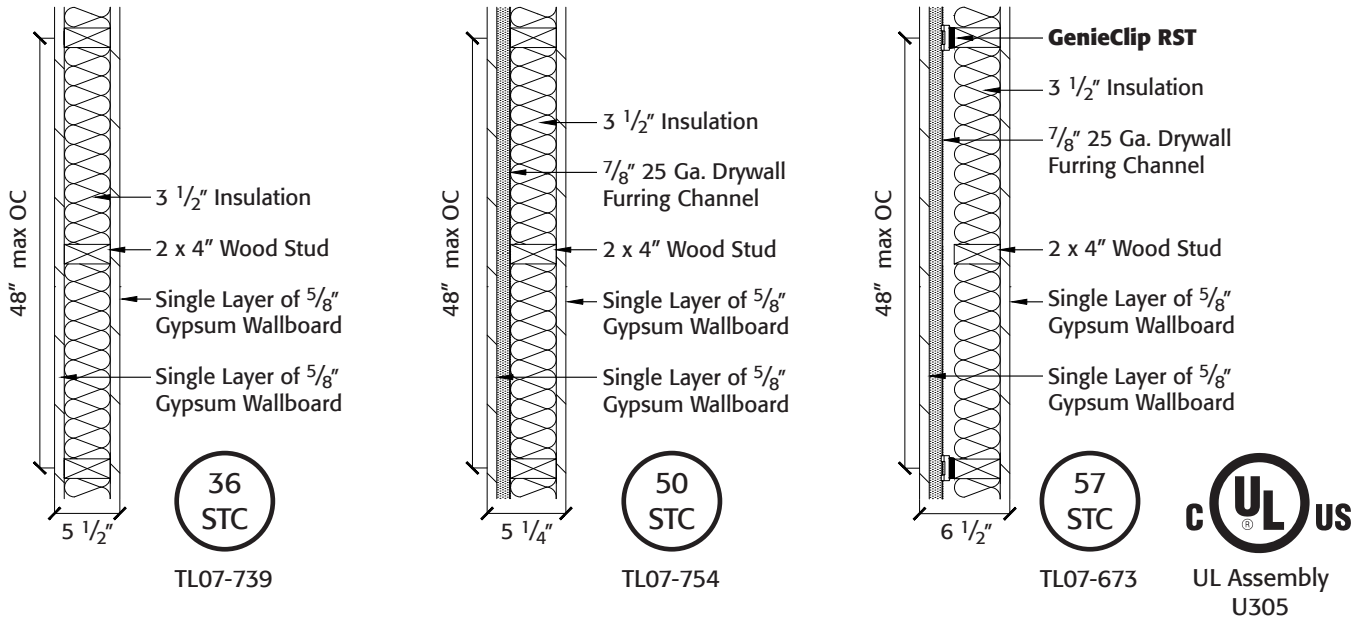


Figure 10: Three different single stud walls: direct attached, perfectly installed RC and **Pliteq® GenieClip® RST**.

CONCLUSION

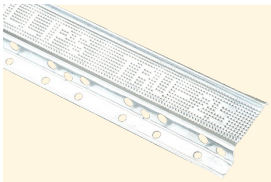
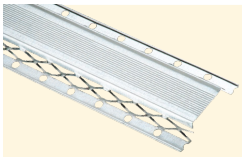
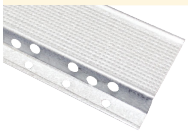
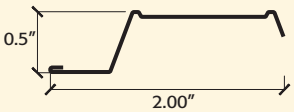
"Resilient" channel has had a long and complicated history, and it was not originally manufactured as a method of acoustical isolation. We have outlined nine reasons why RC will fail:

1. Original no longer exists
2. No standard design
3. Measured performance is different
4. Many different models from same manufacturer
5. Double legged RC
6. The RC is drawn/shown incorrectly
7. Damage in storage and shipping
8. Screw is installed incorrectly
9. Shorted out on purpose

Further, there is wide variation on the design of RC in terms of thickness, legs, hole shapes, and screw locations.

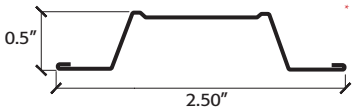
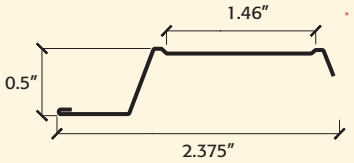
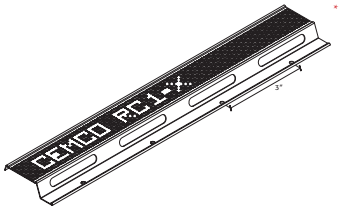
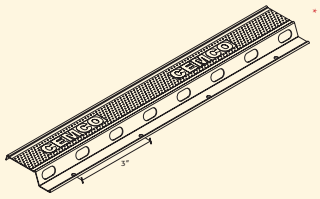
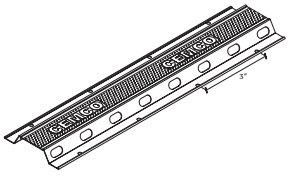
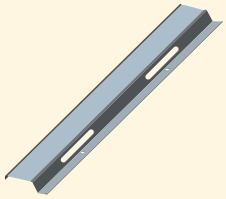
If an architect or builder would like to avoid this failure while having increased acoustical performance, the **GenieClip RST** should be used.

Table 1: Design Summary of most RC on the market today.

Resilient Channels						
	Manfacturer	Model	Thickness	Legs	Holes	Screw Holes (relative to holes)
	ClarkDietrich	RC DELUXE® RESILIENT CHANNEL (RCSD)[7]	22 mil	1	Dogbone slots	Centered
	ClarkDietrich	RC-1 PRO™ RESILIENT CHANNEL (RCUR)[8]	18 mil	1	Ovals	Offset
	ClarkDietrich	RC-1 PROPLUS™ RESILIENT CHANNEL (RCUR HEAVY)[9]	22 mil	1	Ovals	Offset
	ClarkDietrich	RC-2 PRO™ RESILIENT CHANNEL[10]	18 mil	2	Ovals	Offset
	ClarkDietrich	RC-2 PROPLUS™ RESILIENT CHANNEL[11]	22 mil	2	Ovals	Offset
 *	Phillips	RC-1 Tru 25® [12]	21 mil	1	Circles	Centered
 *	Phillips	RC-1 Resilient Sound Channel[13]	18 mil	1	Circles	Centered
 *	Phillips	RC-2 Resilient Sound Channels[14]	25 gauge (18 mil)	2	Expanded mesh	Centered One screw required per attachment point, alternating flanges
 *	Phillips	RC-XL Resilient Sound Channel[15]	20 mil	1	Circles	Centered
 *	MarinoWare	RC-1 Resilient Channel[16]	18 mil	1	Oval	Offset
	MarinoWare	RC-1 Resilient Channel[16]	30 mil	1	Oval	Offset

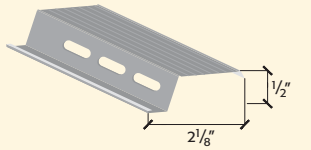
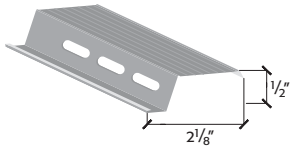
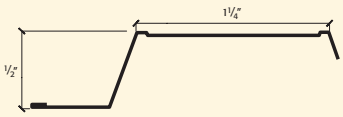
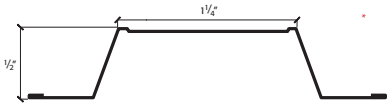
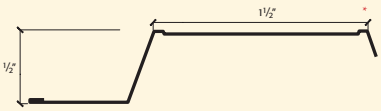
* Drawing recreated based on manufacturer's literature.

Table 1 continued: Design Summary of most RC on the market today.

Resilient Channels	Manfacturer	Model	Thickness	Legs	Holes	Screw Holes (relative to holes)
 *	MarinoWare	RC-2 Resilient Channel[16]	18 mil	2	Oval	Offset
	MarinoWare	RC-2 Resilient Channel[16]	30 mil	2	Oval	Offset
 *	MarinoWare	RC-Max Resilient Channel[16]	20 mil	1	Oval	Offset
 *	CEMCO	RC1-X Resilient Channel[17]	18 mil	1	Slots	Centered
 *	CEMCO	RC1 Resilient Channel[18]	18 mil	1	Oval	Offset
 *	CEMCO	RC2 Resilient Channel[19]	18 mil	2	Oval	Offset
 *	SCAFCO	RC-1 - Resilient Sound[20] Channel	18 mil	1	Slots	Centered
	Steeler	12 SRC (Resilient Channel)[21]	Not Available	1	Circles	Offset

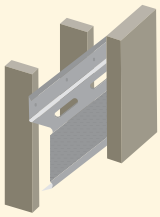
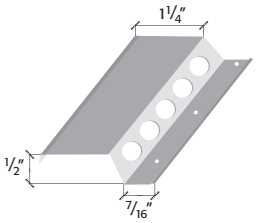
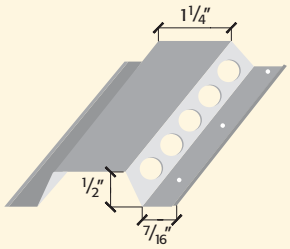
* Drawing recreated based on manufacturer's literature.

Table 1 continued: Design Summary of most RC on the market today.

Resilient Channels						
	Manfacturer	Model	Thickness	Legs	Holes	Screw Holes (relative to holes)
 *	Telling	RC-1 Resilient Furring Channel[22]	25 gauge (18 mil)	1	Slits	N/A
 *	Telling	RC-2 Resilient Furring Channel[22]	25 gauge (18 mil)	2	Slits	N/A
 *	CRACO	RC-1[23] Resilient Channel	25 gauge (18 mil)	1	Oval	N/A
	CRACO	RC-1[23] Resilient Channel	20 gauge (33 mil)	1	Oval	N/A
 *	CRACO	RC-2[23] Resilient Channel	25 gauge (18 mil)	2	N/A	N/A
	CRACO	RC-2[23] Resilient Channel	20 gauge (33 mil)	2	N/A	N/A
 *	CRACO	RC-XL[23] Resilient Channel	22 mil	1	N/A	N/A
	STUDCO	RC1-25[24]	25 Gauge (18 mil)	1	Oval	Centered
	STUDCO	RC1-20[24]	20 Gauge (30 mil)	1	Oval	Centered
	STUDCO	RC2-25[24]	25 Gauge (18 mil)	2	Oval	Centered
	STUDCO	RC2-20[24]	20 Gauge (30 mil)	2	Oval	Centered
 *	Bailey	RC Plus™ Resilient Channel[25]	Not Available	1	Dual Layered Slits	N/A

* Drawing recreated based on manufacturer's literature.

Table 1 continued: Design Summary of most RC on the market today.

Resilient Channels	Manfacturer	Model	Thickness	Legs	Holes	Screw Holes (relative to holes)
 *	Frametek	RC-1 Resilient Channel[26]	18 mil	1	Oval	Offset
 *	ConFab	RC-1 Resilient Channel[27]	18 mil	1	Circles	Offset
 *	ConFab	RC-2 Resilient Channel[28]	18 mil	2	Circles	Offset

* Drawing recreated based on manufacturer's literature.

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