

Gypsum Joint Ridging and Cracking Prevention

Overview

Revised 2/16/2017

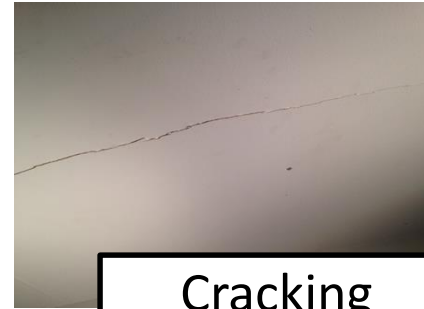
SBCA

SBCA has been the voice of the structural building components industry since 1983, providing educational programs and technical information, disseminating industry news, and facilitating networking opportunities for manufacturers of roof trusses, wall panels and floor trusses. **SBCA** endeavors to expand component manufacturers' market share and enhance the professionalism of the component manufacturing industry.

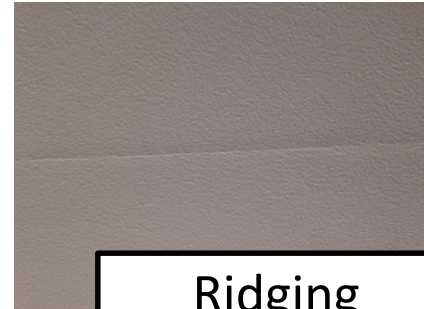
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Introduction

- Cracking and ridging are common problems that typically occur along large open spans.
- Both occur after drywall is exposed to alternating periods of high and low temperature and humidity.



Cracking



Ridging

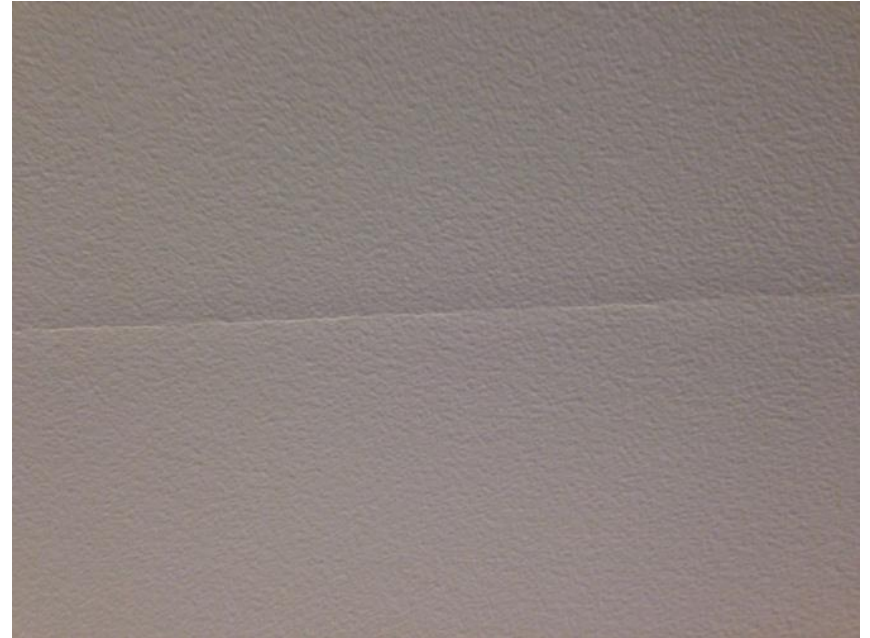
Introduction

- Cracks
 - Often develop in the center of taped joints running parallel to tapered edges or factory seams.
 - May tear the drywall tape and grow over time.
 - May vary in width cyclically as the seasons change.



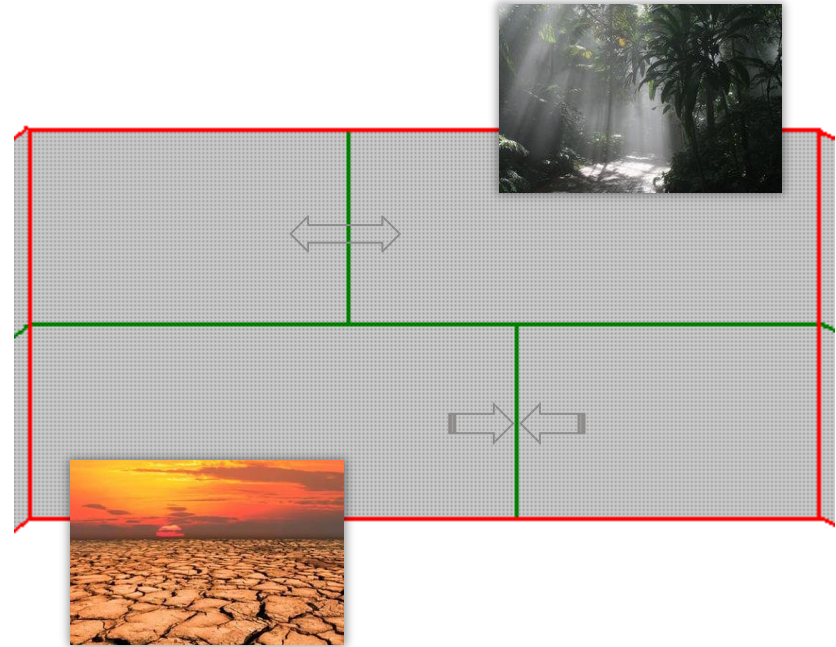
Introduction

- Ridges:
 - Are small humps ($\approx 3/8$ " wide) along the taped joint of ceilings.
 - Are caused by the compression of panel ends or edges.



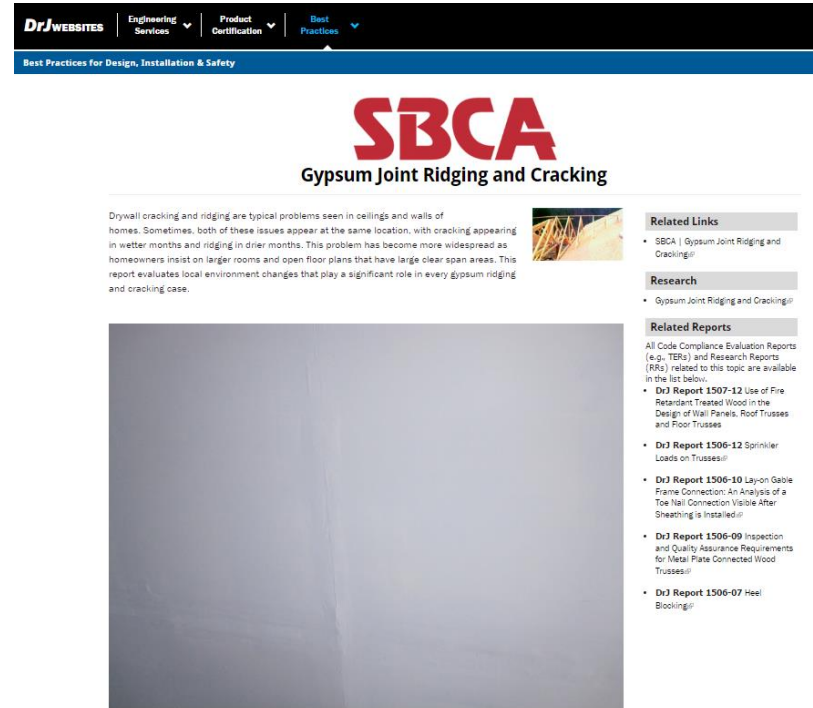
Background

- Both cracking and ridging can occur cyclically in the same location.
 - Cracks appear in wetter months.
 - Ridges appear in drier months.
- With the rise of larger rooms and open floor plans in recent years the problem has increased.
 - Dry areas of the US, Australia and New Zealand, where humidity changes drastically from season to season, are particularly affected.



Background

- Seasonal changes alone are not sufficient to cause gypsum ridging and cracking (GRC).
- Proper ventilation is helpful, but it impossible to control the climatic conditions of attic spaces.
- Follow design and installation best practices to reduce problems with GRC.



The screenshot shows the SBCA website page for 'Gypsum Joint Ridging and Cracking'. The page features a navigation bar with 'DrJWEBSITES', 'Engineering Services', 'Product Certification', and 'Best Practices'. The main content area includes a title, a descriptive paragraph, a small image of a ceiling with cracking, and a list of related links, research, and reports. A large image of a ceiling with significant gypsum joint ridging and cracking is shown in the lower half of the page.


DrJWEBSITES | Engineering Services | Product Certification | Best Practices

Best Practices for Design, Installation & Safety

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Gypsum Joint Ridging and Cracking

Drywall cracking and ridging are typical problems seen in ceilings and walls of homes. Sometimes, both of these issues appear at the same location, with cracking appearing in wetter months and ridging in drier months. This problem has become more widespread as homeowners insist on larger rooms and open floor plans that have large clear span areas. This report evaluates local environment changes that play a significant role in every gypsum ridging and cracking case.



Related Links

- SBCA | Gypsum Joint Ridging and Cracking

Research

- Gypsum Joint Ridging and Cracking

Related Reports

All Code Compliance Evaluation Reports (e.g., TCRs) and Research Reports (RRs) related to this topic are available in the list below.

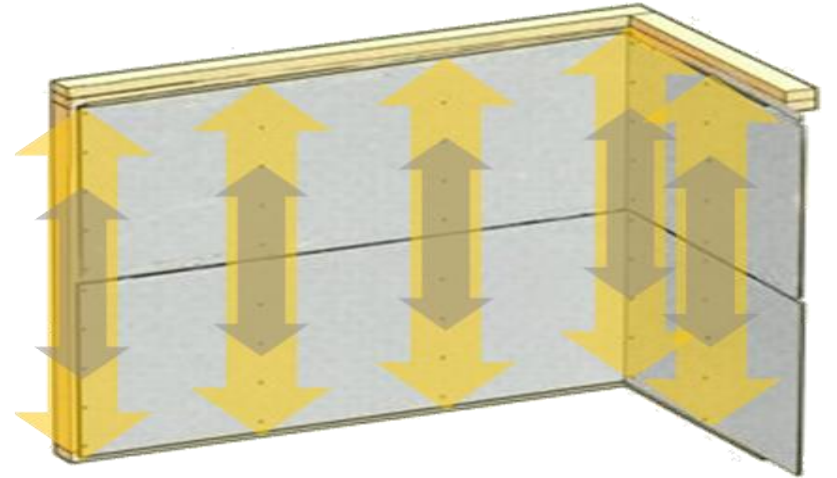
- **DrJ Report 1507-12** Use of Fire Retardant-Treated Wood in the Design of Wall Panels, Roof Trusses and Floor Trusses
- **DrJ Report 1506-12** Sprinkler Loads on Trusses
- **DrJ Report 1506-10** Layon Gable Frame Connection: An Analysis of a Toe Nail Connection Visible After Sheathing is Installed
- **DrJ Report 1506-09** Inspection and Quality Assurance Requirements for Metal Plate-Connected Wood Trusses
- **DrJ Report 1506-07** Heel Blocking

Analysis – Climate

- In the late 1990s, two groups researching GRC concluded that due to the cyclical nature of the problem, movement of wood members was the cause of GRC.
- However, the reason for the movement of wood members was not determined.
 - The first group, sponsored by the Drywall Finishing Council, collected data using an electronic monitoring system in two Las Vegas homes.
 - The second group, a joint effort of the Drywall Association of Nevada and Monash University in Melbourne, Australia, constructed a 20-meter square structure consisting of a framed wall, ceiling and roof structure within a climate-controlled test chamber.

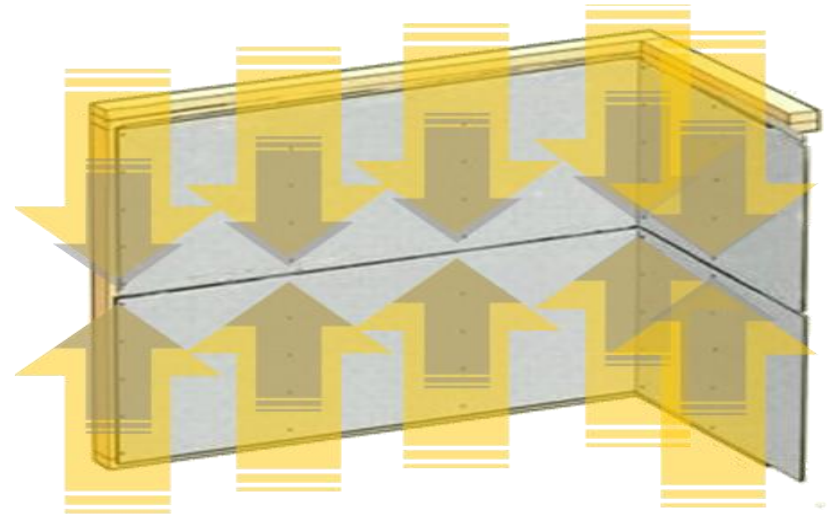
Analysis – Climate

- When residences constructed in summer are subjected to increased humidity in winter, all of the construction materials expand.
- However, the framing lumber increases in length to a greater extent than the drywall.
- The different increase in length causes tension in the drywall, pulling the taped joints apart.



Analysis – Climate

- When the same assembly is constructed in winter, the materials shrink in the drier summer months.
- Because the lumber shrinks more than the drywall, compression occurs in the drywall, producing ridging at the tape joint.



Analysis – Climate

- Humidity levels must change by at least 50% and be maintained for 18-30 days for GRC issues to occur.

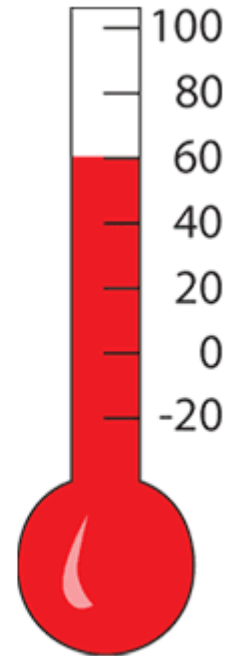
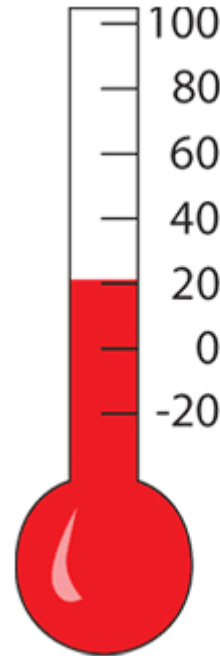
50% change



18-30 days

Analysis – Climate

- Temperature shifts do not impact GRC strongly.
- Effects are generally immediate (within 24-36 hours) and small (less than 20% of the overall movement required to generate a crack).



Analysis – Framing Issues that contribute to GRC

- Unseasoned (wet) lumber used in ceilings.
- Misaligned studs and headers around doors and windows.
 - Joints must fit tightly. There should be no gaps between the jack studs and the headers.
 - Headers need to be tight against the top plate of the wall or the cripple studs above the header.



Analysis – Framing Issues that contribute to GRC

- Gaps:
 - Between wall top plates due to improper attachment.
 - Between studs and plates.
 - Caused by studs that vary in length.
- Long walls or ceilings with no breaks.



Analysis – Framing Issues that contribute to GRC

- Crooked framing
 - Often missed until drywall is being attached or taped, or trim is being attached.
- Poor insulation installation
 - Can make drywall difficult to attach.
 - Can lead to excessive stresses in the gypsum joints.



Analysis – Strategies to prevent GRC

- Use kiln-dried lumber in trusses.
- Condition homes for 24 hours prior to installing gypsum board.
- **Use resilient channel between the drywall and ceiling framing.**
 - This is the most consistently effective strategy.



Gypsum Construction Handbook – Chapter 2

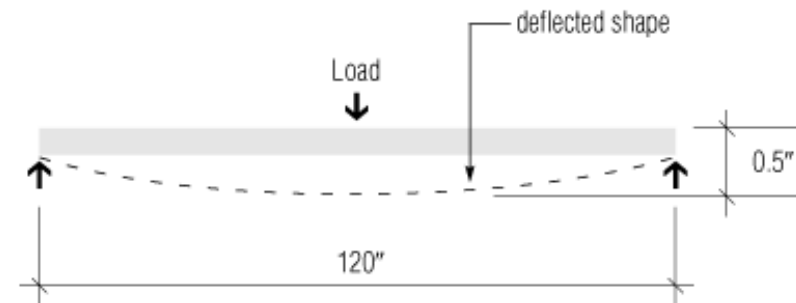
- Allowable deflection criteria:
 - For drywall assemblies:
 - **L/240 is desirable**
 - **Limit of L/120 (L/180 in some codes)**
 - For veneer assemblies:
 - **L/360 is desirable**
 - **Limit of L/240**
- Minimum lateral loading:
 - For interior partitions: 5 psf
 - For exterior walls: 15-45 psf (or greater depending on building height and geographic location)

Calculating deflection for a 10' span between framing members:

$$D = \text{Deflection Limit} = \frac{L}{240}$$

$$L = 10' \text{ or } 120''$$

$$D = \frac{120}{240} = 0.5''$$



Conclusion

- Understanding what causes GRC can help all parties to work together on a project to produce a result that everyone is proud of—and that minimizes owner call backs.
- Many of the problems associated with GRC can be avoided if proper precautions are taken.



Installation Resources

- [Gypsum Association](#)
- [Drywall Finishing Council](#)
- [DrJ Best Practices](#)

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References

- Campbell, Greg, 2001, “Walls and Ceilings: Drywall Cracking on a Global Scale.” www.wconline.com
- Drywall Finishing Council, 2011, “Jobsite Conditions for Applying Interior Finishing Materials.” www.dwfc.org
- Gypsum Association, 2014, “Repair of Joint Ridging.” GA-221-2014, www.gypsum.org
- Gypsum Association, 2013, “Joint Treatment Under Extreme Weather Conditions.” (GA-236-13), www.gypsum.org
- Gypsum Association, 2008, “Control Joints for Fire-Resistance Rated Systems.” (GA-234-08), www.gypsum.org
- Gypsum Association, 2006, “Gypsum Board Winter Related Installation Recommendations” (GA-220-06), www.gypsum.org
- National Oceanic and Atmospheric Administration, National Weather Service (NOAA/NWS), www.noaa.gov
- USG, 2000, “The Gypsum Construction Handbook; Centennial Edition.” www.msgraphicsandweb.com