



GYPSUM CONSTRUCTION TROUBLESHOOTING GUIDE JOINT TREATMENT

1. SCOPE

The purpose of this document is to serve as a guide for identifying common interior wall construction and finishing problems, list probable causes, typical corrective actions and tips for prevention.

2. TERMINOLOGY

The following definitions are applicable to this document.

coat (n): Paint varnish or lacquer applied to a surface in a single application (one layer) to form a properly distributed film when dry. - **ASTM**

critical lighting (adj): A condition whereby interior surfaces are flooded by natural or artificial lighting at an oblique angle; such as lighting from large expanses of windows, glass curtain walls, skylights, or surface-mounted light fixtures. - **ASTM**

gloss (adj): A subjective term used to describe the relative amount and nature of mirror like (specular) reflection. - **FSCT**

gypsum board (n): The generic name for a family of sheet products consisting of a noncombustible core primarily of gypsum, with paper surfacing. – **ASTM C11**

gypsum panel products (n): The general name for a family of sheet products consisting essentially of gypsum. – **ASTM C11**

inspection lighting: Inspection lighting shall be representative of normal lighting conditions in intensity and location.

joint photographing (n): The shadowing of the finished joint areas through the surface decoration. Syn telegraphing. - **GA-214**

normal lighting conditions: Normal lighting conditions are described as those in place when the project is finished. This includes, but not limited to, design lighting (e.g. wall washers, spots and floods, etc) and natural lighting." - **PDCA**

normal viewing position: The normal viewing position shall be at any angle provided it is established at a minimum distance of five feet perpendicular from the surface to be viewed.

paint (n): Any pigmented liquid, liquefiable, or mastic composition designed for application to a substrate as a thin layer which is converted to an opaque solid film after application. Used for protection, decoration or identification, or to serve some functional purpose, such as filling or concealing surface irregularities. – **FSCT**

primer (n): First complete coat of paint applied in a painting system to an uncoated surface prior to application of an intermediate coat or topcoat. Note: A primer used in gypsum board construction is typically a paint material specifically formulated to fill the pores and minimize suction differences between gypsum-board surface paper, texture and/or the compound used on finished joints, angles, fastener heads, accessories, and over skim coatings.



properly painted surface (n): A surface that is uniform in appearance, color, and sheen. It is one that is free of foreign material, lumps, skins, runs, sags, holidays, misses, strike-through, or insufficient coverage. It is a surface that is free of drips, spatters, spills, or overspray which a contractor's workforce may cause. Compliance to meeting the criteria of a "Properly painted surface" shall be determined when viewed without magnification at a distance of five feet or more under normal lighting conditions and from a normal viewing position. Note: A surface uniform in appearance, color, and sheen may not be achieved with a coat of primer or a single coat of topcoat. - **PDCA**

topcoat (n): The finish coat(s) of a coating system, formulated for appearance and/or environmental resistance. - **PDCA**

3. DESCRIPTION OF DEFECT

DRYWALL CONSTRUCTION

Irregularities during the drywall construction and finishing process can occur. Invariably, unsatisfactory results show up first in the areas over joints or fastener heads. Improper application of either the board or joint treatment may be at fault, but other conditions existing on the job can be equally responsible for reducing the quality of the finished gypsum board surface.

To help identify a particular imperfection, what follows is a physical description of each problem along with a discussion of the common factors related to the unsatisfactory result(s). Also provided is a list that identifies possible causes for the irregularity, as well as some common remedies and preventions.

Fastener Imperfections - A common defect, which takes on many forms. May appear as darkening, localized cracking; a depression over fastener heads; pop or protrusion of the fastener or the surface area immediately surrounding the fastener. In new construction, fastener imperfections are usually caused by improper framing, wall movement, or improper fastener installation.

Joint Defects - Generally occur in a straight-line pattern and appear as ridges, depressions or blisters at the joints, or darkening over the joints or in adjacent panel areas. Imperfections may result from incorrect framing or joint treatment application, or fluctuating / changing environmental conditions during or after construction if remedial action has not been taken.

Loose Panels - Board does not have tight contact with framing, rattles when impacted or moves when pressure is applied to the surface. Typically caused by improper installation of panels, framing out of alignment or improper fastening.

Joint Cracking - Appears either directly over the long edge or butt ends of boards, or may appear along the edge of taped joints. Often caused by structural movement and/or hygrometric and thermal expansion and contraction, or by excessively fast drying of joint compounds.

Field Cracking - Usually appears as diagonal crack originating from a corner of a partition or intersection with structural elements. Also seen directly over a structural element in center of a partition. May originate from corners of doors, light fixtures and other weak areas in the surface created by penetration. Caused by movement described previously.



Angle Cracking - Appears directly in the apex of wall-ceiling or interior angles where partitions intersect. Also can appear as cracking at edge of joint reinforcing tape near surface intersections. Can be caused by structural movement, improper application of joint compound in corner angle or excessive build-up of paint.

Bead Cracking - Shows up along edge of flange. Caused by improper bead attachment, faulty bead or joint compound application.

Wavy Surfaces - Boards are not flat but have a bowed or undulating surface. Caused by improper board fit, misaligned framing, hygrometric or thermal expansion due to fluctuating / changing environmental conditions during or after construction.

Board Sag - Occurs in ceilings, usually under high-humidity conditions. Caused by insufficient framing support for board; board too thin for span; poor job conditions; improperly installed or mislocated vapor retarder; use of unsupported insulation directly on ceiling panels; or improperly fitted panels.

Surface Defects - Fractured, damaged or crushed boards after installation may be caused by abuse or lumber shrinkage. Also, see Discoloration below.

Discoloration - Board surface has slight difference in color over joints, supports or fasteners. Caused by improper paint finishing, uneven soiling and darkening from aging or ultraviolet light.

Water Damage - Stains, paper bond failure, softness in board core or mildew growth are caused by sustained high humidity, standing water and improper protection from water leakage during transit and storage.



GYPSUM CONSTRUCTION TROUBLESHOOTING GUIDE

JOINT TREATMENT

3.1 Blisters In Tape

Cause: Insufficient or overly thin compound was used under the tape; tape was not initially pressed into good contact with the compound; overly thick (dry) compound was used; or too much compound was forced from under tape by application of excessive tool pressure when embedding.

Correction: Open up blistered area by slitting tape. Fill cut under the tape with joint compound and press tape back in place with knife blade. When dry, smooth to level finish.

Prevention: Provide sufficient compound under entire tape.

3.2 Edge Cracking

Cause A: After joint treatment, straight narrow cracks along edges of tape result from: too rapid drying because of high temperature accompanied by low humidity or excessive drafts; improper application, such as over-dilution of joint compound; use of wrong compound (topping instead of taping); excessive joint compound under tape; failure to follow embedding with a thin coat over tape; or cold, wet application conditions, which also may cause poor bond.

This problem, difficult to see when it first occurs, may not be discovered until decoration begins. However, the cause can be attributed to some aspect of the taping operation.

Correction: Especially under hot, dry and/or drafty conditions, carefully examine all joints after taping applications have dried; repairs are more economical at this stage. Cut away any weakly bonded tape edges. Fill hairline cracks with joint compound; groove out larger cracks with sharp tool; coat with joint compound and allow drying, then refilling with joint compound to smooth; or cover cracks with complete joint treatment system including reinforcing tape; feather to surface level with plane of board.

Prevention: Use a setting-type joint compound, which imparts built-in resistance to cracks. Place shielding devices over room openings to prevent drafts. Do not apply joint treatment over hot surfaces. During cold weather, maintain air, product, and surfaces temperatures at min. 50-55°F on jobsite, and supply good ventilation. Avoid practices listed under "Cause" above. Refer to joint compound manufacturers recommendations for minimum conditions to install joint compounds.

Cause B: After joint treatment, cracks along edges of corner bead or trim can result from the same unsatisfactory conditions listed above for tape. Also can be caused by impact on the bead.

Correction: Remove applied joint compound. Securely fasten corner bead or trim to framing beneath panels. Refinish bead with joint compound.

Prevention: Use metal reinforced tape-on corner beads and trims, which eliminates edge cracking.

3.3 Center Cracking

Cause A: Abnormal stress buildup resulting from structural deflection or racking discussed previously.

Correction: Relieve stress. Provide adequate isolation and re-tape, feathering joint compound over broad area to disguise buildup.

Prevention: Provide proper isolation from structure to prevent stress buildup.



Cause B: Excessive stresses resulting from hygrometric and/or thermal expansion and contraction discussed previously.

Correction: Correct unsatisfactory environmental conditions. Provide sufficient relief; re-tape, feathering joint compound over broad area.

Prevention: Correct improper job conditions and install control joints for relief in long partition runs and large ceiling areas.

3.4 Angle Cracking

Cause A: Too much compound applied over tape at apex of angle. Abnormal stress buildup resulting from structural deflection or racking discussed previously.

Correction: After compound is completely dry, smooth out excess compound at apex. Fill only hairline cracks with compound. Do not apply additional compound, which will build up

Prevention: Keep excess compound from corner, leaving only a small amount or no compound in apex.

Cause B: Slitting or scoring reinforcing tape during application. May result from use of improper tool.

Correction: If crack extends through the tape, re-tape and finish.

Prevention: Use proper tool for corner treatment.

Cause C: Structural movement from two separate supports or framing members, which react independently to applied loads. Often occurs in wall-ceiling angles where wall is attached to top plate and ceiling is attached to floor or ceiling joists running parallel to top plate.

Correction: Remove fasteners closer than 6" from angle, re-tape and finish.

Prevention: Use "Floating Interior Angle" application.

Cause D: Structural or thermal movement resulting from two dissimilar materials or constructions.

Correction: Remove tape, provide relief, finish with appropriate trim and caulk as required.

Prevention: Use channel-type or angle edge trim over gypsum board where two dissimilar surfaces interface.

Cause E: Excessive paint thickness; application of paint under poor conditions.

Correction: Correct unsatisfactory job conditions. Scrape away cracked paint. Fill and feather with joint compound. Prime and paint.

Prevention: Provide proper job conditions. Apply recommended thickness of prime and finish coats of paint.

3.5 High Crowns

Cause: Excessive build-up of compound over joint; compound not feathered out beyond shoulders, improper bedding of tape; framing out of alignment or panel edges not tight against framing; improper adjustment of tools; misuse of or worn tools.

Correction: Sand joints to flush surface. Take care to avoid scuffing paper by over-sanding.



Prevention: Embed tape properly, using only enough compound to cover tape and fill taper depression or tape itself at butt joints; feather compound wide enough to conceal.

3.6 Excessive and/or Delayed Shrinkage

Cause: (1) Atmospheric conditions—slow drying and high humidity; (2) Insufficient drying time between coats of compound; (3) Excessive water added in mixing compound; (4) Heavy fills. When a second coat of joint compound is applied over compound that has not yet dried, the first coat will dry more slowly and shrinkage will occur later than is typical. This slow shrinkage is termed “Delayed Shrinkage.”

Correction: See “Starved Joint” below.

Prevention: Allow each coat of joint compound to dry thoroughly before applying succeeding coat, or use a low shrinkage setting-type joint compound.

3.7 Starved Joint

Cause: This is a form of delayed shrinkage caused chiefly by insufficient drying time between coats of compound. May also be caused by insufficient compound applied over tape to fill taper, over-thinning or over-smoothing of compound. Shrinkage usually progresses until drying is complete.

Correction: Use a fast setting-type joint compound (low shrinkage property) ; or reapply a fill coat application using undiluted joint compound over tape coat. Since fill coat is thickest build of wet compound in the application, most shrinkage will take place in this coat, making it easier to fill taper properly. Finish by standard procedure.

Prevention: Allow each coat of joint compound to dry thoroughly before applying succeeding coat, or use a low-shrinkage setting-type joint compound.

3.8 Ridging

Cause: All building materials grow or shrink in response to changes in temperature and humidity. When they are confined to a specific space, such as gypsum panels in a partition or ceiling, they are put under stress, either compression or tension, depending on the temperature or humidity conditions. These stresses are relieved when the panel bends outward in the region of the joint. Once this bending takes place, the system takes a set and never returns to normal. It becomes progressively worse with each change of temperature or humidity. This progressive deformation appears as a continuous ridge along the length of joint, with a uniform fine, ridge-like pattern at the center.

Correction: (1) Let ridge develop fully before undertaking repairs; usually six months is sufficient. Make repairs under average room conditions; (2) Smooth ridge down to reinforcing tape without cutting through tape. Fill concave areas on either side of ridge with light fill of compound. After this is dry, float very thin film of compound over entire area; (3) Examine area with strong side lighting to make certain that ridge has been concealed. If not, use additional feathering coats of compound. Redecorate. Ridging can recur, but is usually less severe. Continuous wetting of area will aggravate condition.

Prevention: Where available, use gypsum panels with a rounded edge designed to minimize ridging. Follow general recommendations for joint treatment and approved application procedure, which includes back-blocking and laminated double-layer application to minimize potential ridging



problems. Pay particular attention to temperature, ventilation, consistency of compound, prompt covering coat over tape, minimum width of fill, finish coats and required drying time between coats.

4. COMMENTS

Application - Industry experience demonstrates that an effective method for achieving a visually uniform surface for both the primer and topcoat is spray application immediately followed by back rolling or roller application using good roller techniques, such as finishing in one direction and using roller types and naps recommended by the paint manufacturer.

Environmental Conditions - Refer to Drywall Finishing Council recommendations in document titled, "Interior Job Condition Specifications for The Application of Drywall Joint Compounds, Drywall Textures, and Paint/Coatings".

Environmental Control - Temperature, humidity, and airflow should remain constant, and as close to occupancy conditions as possible. The potential for finishing and decorating problems is minimal when job environmental conditions match occupancy environmental conditions. Controlling and maintaining environmental conditions is key. Changes and/or fluctuations in temperature, humidity, and airflow can have a profound adverse effect.

Environmental Limitations / Considerations – All products shall be applied and maintained in accordance with manufacturers recommendations.

Gypsum-Board Preparation - To achieve the desired effect of texture finish over gypsum wallboard, the gypsum board substrate must be finished appropriately. Refer to Gypsum Association GA-214-07 titled "Recommended Levels of Gypsum Board Finish", NWCB "Recommended Levels For Finishing Of Gypsum Board", and/or equivalent.

Job Standard Specification - To improve communication, a job standard of the approved paint system shall be established to provide for a visual sample, constructed and finished in accordance with applicable project specifications. As a guideline, refer to PDCA P5-94 titled "Benchmark Sample Procedures for Paint and Other Coating Systems" for a detailed description.

Paint Selection - Manufacturers produce various paint grades and types. When the level of finish is selected, consult with the paint suppliers to determine the products that will produce the desired finish.

Project Standard Specification - A project standard of the approved wall and/or ceiling configurations shall be established to provide a visual sample constructed, finished, and decorated in accordance with applicable project specifications. As a guideline, refer to PDCA P5-94 titled, "Benchmark Sample Procedures For Paint and Other Coating Systems".

5. RESOURCES

ASTM. C11 Standard Terminology Relating to Gypsum and Related Building Materials and Systems, American Society for Testing and Materials, West Conshohocken PA

ASTM. C840 Standard Specifications for Application and Finishing of Gypsum Board. American Society for Testing and Materials, West Conshohocken, PA

DWFC. Interior Job Condition Specifications For The Application of Drywall Joint Compounds, Drywall Textures, and Paint/Coatings". Drywall Finishing Council, Incorporated. www.dwfc.org



DWFC. Method for Inspecting Joint Treated Gypsum Panel Surfaces, Drywall Finishing Council, Incorporated. www.dwfc.org

DWFC. Recommended Specification for Preparations of Gypsum Board Surfaces Prior To Texture Application, Drywall Finishing Council, Incorporated. www.dwfc.org

FSCT. Coatings Encyclopedic Dictionary. Federation of Societies for Coatings Technology, Blue Bell, PA

GA. GA-214, Recommended Levels of Gypsum Board Finish. Gypsum Association, Washington DC

GA. GA-216, Application and Finishing of Gypsum Panel Products. Gypsum Association, Washington DC

National Gypsum Company. ProForm Brand Drywall Finishing Products Construction Guide, National Gypsum Company, 2001 Rexford Road, Charlotte, NC, 28211, www.nationalgypsum.com

National Gypsum Company. National Gypsum Construction Guide, National Gypsum Company, 2001 Rexford Road, Charlotte, NC, 28211, www.nationalgypsum.com

PDCA. Glossary of Terms, Painting and Decorating Contractors of America, Fairfax VA

PDCA. Standard P4, Responsibilities for Inspection and Acceptance of Surface Prior to Painting and Decorating. Paint and Decorating Contractors of America.

PDCA. Standard P5. Benchmark Sample Procedures for Paint and Other Coating Systems. Painting and Decorating Contractors of America, Fairfax VA

USG. The Gypsum Construction Handbook H-17. USG Corporation, 550 West Adams Street, Chicago, IL, 60661, www.usg.com

USG. SA927 Gypsum Products – Panels and Accessories System Catalog, USG Corporation, 550 West Adams Street, Chicago, IL, 60661, www.usg.com

USG. USG SHEETROCK Brand Products - Installation and Application Guides, USG Corporation, 550 West Adams Street, Chicago, IL, 60661, www.usg.com

Members

Certaineed Gypsum • Freeman Products • Georgia Pacific Corporation • LaFarge North America • Magnum Products • National Gypsum Company • Panel Rey SA • Rapid Set Cement • Saint-Gobain, Inc • Sherwin-Williams Company • Solid Products, Inc. • Southern Wall Products • Trim-Tex, Inc. • United States Gypsum Company • Westpac Materials

Associates

Active Minerals International • Akzo Nobel • Allied Custom Gypsum • Ames Taping Tools Company • Aqualon – A Division of Ashland • Bayer Chemicals • Canadian Gypsum Company • Chemstar • Clinch-On Corner Bead • Celanese • Dow Chemical Company • Evans Adhesives • Forbo Adhesives LLC • J.M. Huber, Inc. • Nobel Materials, Inc. • Oglebay Norton • Tate & Lyle Ingredients Americas • Troy Chemical • Verichem, Inc. • Zemex Industrial Minerals

Honorary Members

Association of Wall and Ceiling Industries (AWCI) • Drywall Information Trust Fund (DITF) • Gypsum Association (GA) • Northwest Wall and Ceiling Bureau (NWCB) • Painting and Decorating Contractors of America (PDCA) • Technical Services Information Bureau (TSIB)

