Gypsum Wallboard:

Specifying Levels of Finish

Georgia-Pacific
Building Products

Specifying Levels of Finish for Gypsum Wallboard

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Description: A successful project depends on understanding the levels of finish and ensuring the specification for the level of finish is complete. This course provides an overview of gypsum wallboard manufacturing, a review of the Gypsum Association's recommended levels of finish, and examples of writing specifications for levels of finish.

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Learning Objectives

At the end of this program, participants should be able to:

- Define gypsum and explain how gypsum wallboard is manufactured.
- List and describe the recommended levels of gypsum board finish in terms of their appearance, application, and ability to achieve specific aesthetics.
- Identify different types of joint-treatment products to determine whether they are formulated for use in certain applications, such as bedding tape, skim coat, wall or ceiling texture, or in lower-temperatures areas.
- Compare and contrast the features of the various types of paint sheen and their effects on the final appearance of the installation.
- Write a complete specification for levels of gypsum board finish using the guidelines outlined in the Recommended Levels of Gypsum Board Finish document.
- Describe wall conditions needed for joint-compound applications and how dry times vary based on temperature and humidity.

Introduction to Gypsum

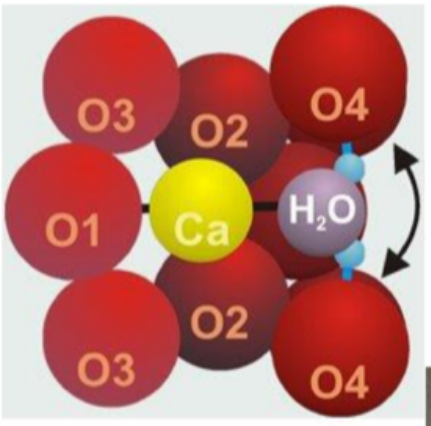
What Is Gypsum?

Gypsum is a widely distributed mineral used to make cements, plasters, and related products.

The composition of gypsum is $CaSO_4 * 2H_2o$. Water accounts for 20 percent of the combined weight of gypsum.

No gypsum deposits are 100 percent pure. They usually contain a combination of limestone, sand, shale, anhydrite, and sometimes rock salt.

To be commercially practical, the deposit content should be at least 75 percent gypsum.

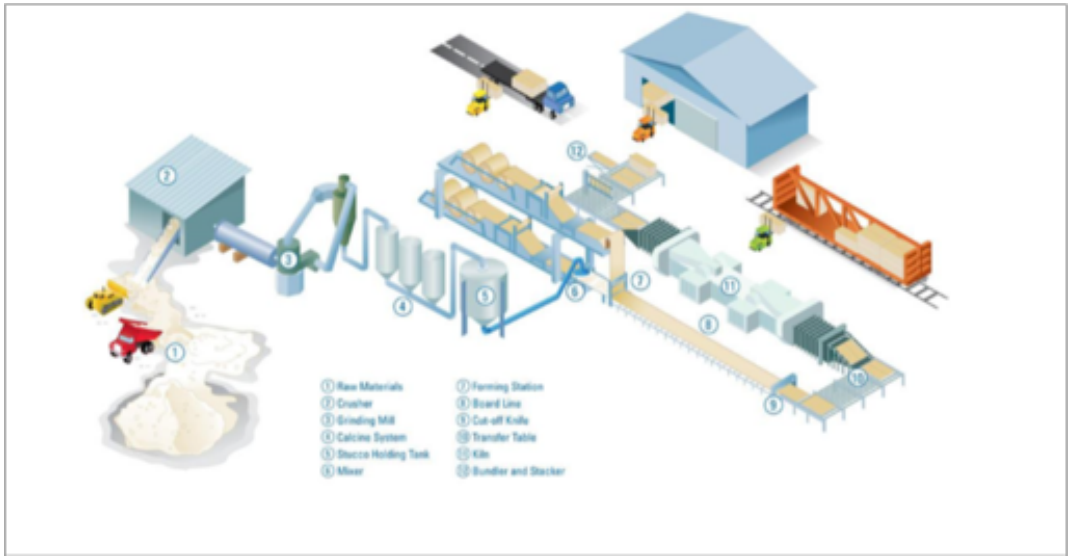


Composition of Gypsum

Manufacturing Gypsum Board

Introduction

In this section of the course, the manufacturing process of gypsum board will be discussed, beginning with the drying and calcination process.



Calcine System

To remove the free water in the material, wet gypsum cake is fed into the cage mill system.

The material is flash dried using a gas burner and then transported into storage bins via an air-veying system.

The dried gypsum is now ready for calcination.

Cage Mill

Calcine System

Gypsum contains two molecules of chemically combined water.

To produce wallboard, 1.5 of these molecules will be removed via a process known as kettle calcining. This process uses heat to remove the water resulting in a product known as stucco.

We are now ready to produce wallboard.

Kettle Calcining

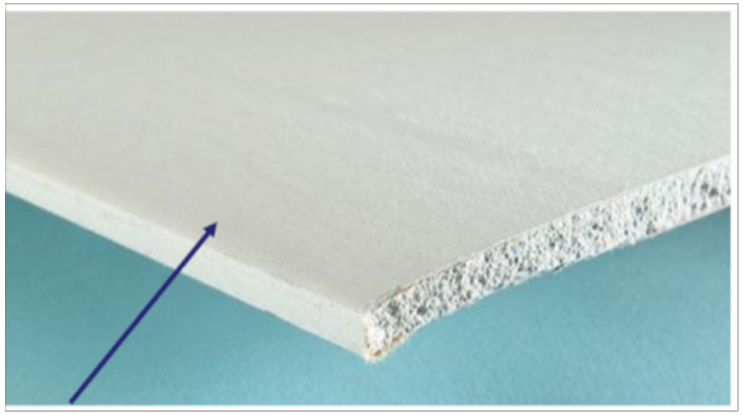
Wallboard Paper

Gypsum wallboard is available with paper facing (pictured on the following slide) or fiberglass mat.

Note that the paper/fiberglass mat is the single-largest cost factor in the manufacture of wallboard.

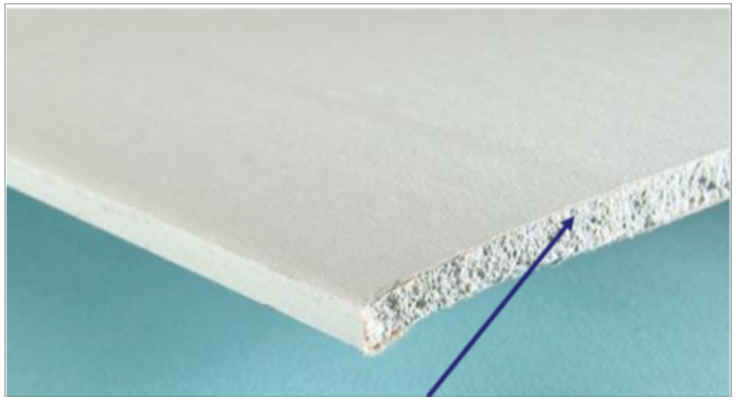
The paper used in wallboard manufacturing is commonly made from 100 percent recycled paper.

The Edge and End of a Gypsum Panel



Edge

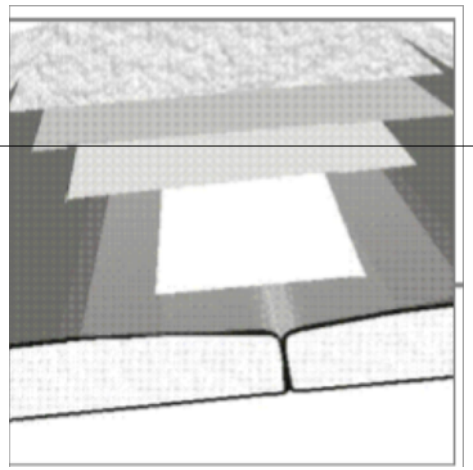
- The paper-bound edge of a gypsum panel product
- Interior wall board typically has tapered edges for receiving tape and joint compound.



End

- The mill or field-cut end that is perpendicular to the edge
- The gypsum core is exposed at cuts.

Levels of Gypsum Board Finish



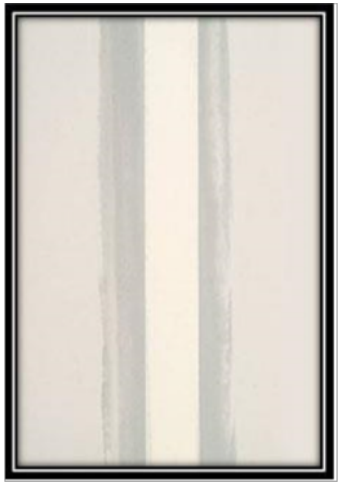
Introduction

The finishing of gypsum board requires:

- Concealing joints with joint compound and tape, and
- Concealing fastener heads and accessories with joint compounds.

Pictured on the following slide are examples of a treated joint and an untreated joint.

Treated Joint/Untreated Joint



Treated Joint

- A joint between gypsum panel products reinforced and concealed with tape and joint compound

Untreated Joint

- An exposed joint between gypsum panels

Reflectivity

Drywall, either paper or fiberglass mat faced, is a different material than the joint compound that covers the joints, butts, and fastener heads.

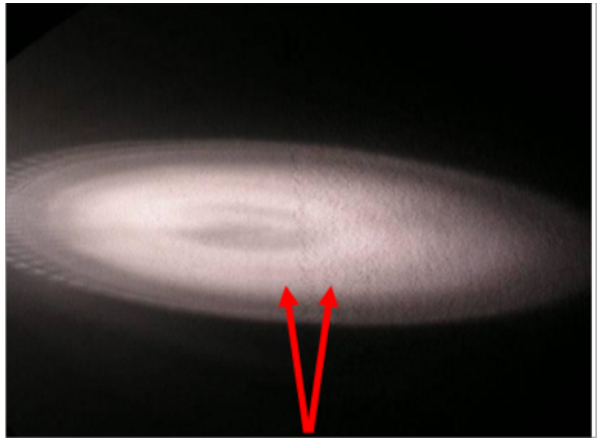
As a result, under hard lighting conditions, paint will “reflect” dissimilarly.

Paper Texture Shows Under Harsh Lighting

The Power of Reflectivity

Different reflectivity may result in several problems that can compromise the aesthetics of the wall, such as shadowing (left image), joint flashing, and an overall imperfect look to an otherwise perfectly smooth wall. Joint compound leaves an edge on top of paper or fiberglass mat, which must be sanded down. When sanding, a layer of paper is disturbed, creating dissimilar material surfaced (right image).

Example of Shadowing



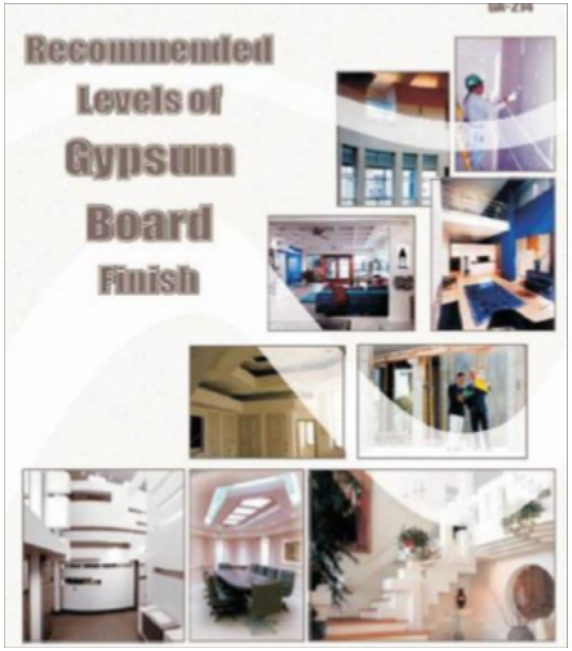
Example of Dissimilar Material Surface

Recommended Levels of Gypsum Board Finish

To overcome these common problems and assist the industry, the Recommended Levels of Gypsum Board Finish document (GA-214) was developed.

This document was created in 1988 by five major trade associations concerned with the manufacture, erection, finish, and decorating of gypsum board:

- Association of the Wall & Ceiling Industries (AWCI)
- Ceiling & Interior Systems Construction Association (CISCA)
- Gypsum Association (GA)
- Painting & Decorating Contractors of America (PDCA)
- Drywall Finishing Council (DWFC)



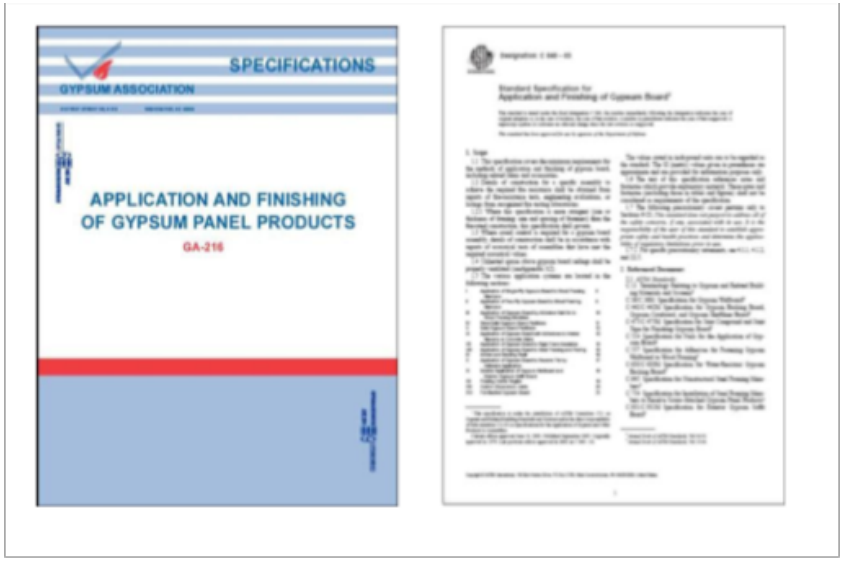
Recommended Levels of Gypsum Board Finish

The Recommended Levels of Gypsum Board Finish document was intended to assist specification writers, architects, contractors, and building owners in the following areas:

- To precisely describe the finish of walls and ceilings prior to the application of paints and other wall coverings
- To encourage competitive bidding of suitably finished surfaces
- To enhance the appearance of the final decorative treatment

Gypsum Association/GA-216 and ASTM C840

Specifications for the application and finishing of gypsum panel products can also be referenced in the document developed by the Gypsum Association, GA-216, and ASTM C840: Standard Specification for Application and Finishing of Gypsum Board.



Determining the Level Required

The recommended level of finish of gypsum wallboard is dependent on the combination of several factors.

- Whether the panel is paper-faced or fiberglass mat faced
- The location of the work to be done
- The type and angle of surface illumination (natural vs. artificial lighting)
- The orientation of the panels during installation
- The type of paint or wall covering to be used
- The quality of the framing

Terminology

The different levels of finish are explained beginning on the next slide. Some of the common industry terms found therein are defined below:

- **Critical lighting:** Refers to the strong side-lighting from windows or surface-mounted light fixtures. Critical lighting areas include long hallways; wall and ceiling areas abutting window millions or skylights; and atriums with a large surface area flooded with artificial and/or natural lighting
- **Joint photographing:** a term used to describe the shadowing of the finished joint areas through the surface decoration.
- **Spotting:** the covering of fastener heads with joint compound.
- **Texture:** a decorative treatment of gypsum board surfaces.
- **Skim coat**: a thin coat of joint compound (or a material manufactured especially for this purpose), applied over the entire surface to fill imperfections in the joint work, smooth the paper or fiberglass mat texture, and provide a uniform surface for decorating.

Level 0

The next sequence of slides explains each level of finish, beginning with level 0.

This level of finish can be useful in temporary construction or whenever the final decoration has not been determined.

Level 0 finish is typically used in plenum areas above ceilings, in attics, service corridors, or as base layers in multi-gypsum layered assemblies.

Example of Level 0 Finish

Description:

- Hung and finished

Level 1

Level 1 finish is often specified in areas where the assembly is concealed or not normally open to public view, such as plenum areas above ceilings, in attics, and in building service corridors.

Although tool marks and ridges are acceptable, the surface must be free of excess joint compound.

Example of Level 1 Finish

Description:

- Tape bedded in joint compound

Level 2

Level 2 finish is generally used in areas where surface appearance is not a primary concern (for example, garages and warehouse storage areas).

Description:

- Tape embedded in joint compound and wiped with a joint knife, leaving a thin coat of compound over the tape
- Fastener heads and accessories shall be covered with a coat of joint compound

Example of Level 2 Finish

Level 3

Typically, a level 3 finish is specified for areas that will be covered with a medium- or heavy-texture finishes before final painting or where heavy-grade wall coverings are to be applied.

This level of finish is not recommended for smooth-painted surfaces or where light-to-medium-weight wall coverings are utilized.

Description:

- Taped as in level 2, then covered with one additional coat of joint compound
- Fastener heads and accessories, as described in level 2, then covered with one additional coat of joint compound
- Prepared surface should be coated with primer prior to the application of final decoration.

Example of Level 3 Finish

Level 4

This level should be specified for areas where flat paints, light textures, or light-grade wall coverings are to be applied.

In critical-lighting areas, flat paints applied over light textures tend to reduce joint photographing.

Eggshell, satin, gloss, semi-gloss, enamel paints, and un-backed vinyl wall coverings are not recommended over this level of finish.

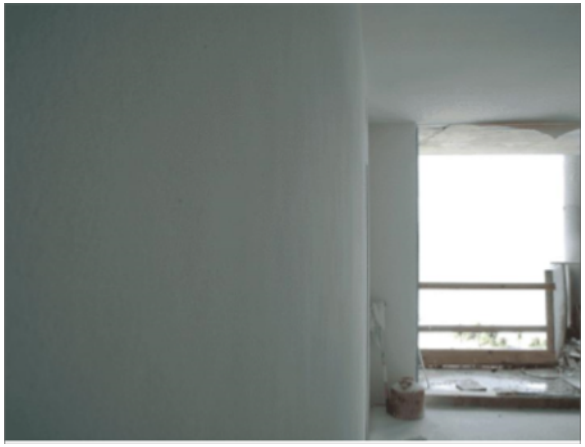
Description:

- Taped as in level 2, then covered with two additional coats of joint compound
- Fastener heads and accessories, as described in level 2, then covered with two additional coats of joint compound
- Prepared surface should be coated with primer prior to the application of the final decoration

Examples of Level 4 Finish

Level 5

A level 5 finish is highly recommended for areas exposed to severe lighting conditions or where gloss, semi-gloss enamel, or non-textured flat paints are specified.



Example of Level 5 Finish

Description:

- Taped as in level 4, plus skim coat the entire board surface with joint compound (or a material manufactured especially for this purpose) and applied in accordance with the manufacturers recommendations. Note: It is recommended that the prepared surfaced be coated with a primer prior to the application of finish paint.

Level 5

A level 5 finish generally provides the best aesthetics and is the most effective method to provide a uniform surface and minimize the possibility of joint photographing and fastener show-through.

This is important, since not all wallboards are created the same. The following factors can impact the final appearance of the decorated wallboard:

- Several different kinds of paper are present in the wallboard industry, some whiter than others (see image at right).
- Joint-compound absorption rates differ from the absorption rates on the panels themselves.
- Fiberglass mat gypsum panels have a different texture and absorption rate than paper-faced panels.
- The power of reflectivity.

Some Boards Are Whiter Than Others

Joint Treatment Products

Introduction

Joint-treatment products are covered under American Society for Testing and Materials ASTM C474 and C475/C475M: Standard Specifications for Joint Compound and Joint Tape for Finishing Gypsum Board.

These specifications cover all-purpose taping and finishing joint compounds, paper-joint tape, and glass-mesh joint tape. The joint materials used in these standards are designed to be used with gypsum board installed in accordance with Gypsum Association GA-216 and specification ASTM C840.

Reviewed in this section are some of the popular joint treatment products and their applications available in the market today, beginning with three types of joint compounds.

Joint Compounds

Joint compounds are available (pre-mixed and ready to use), in a variety of types, varying in weight and range of adhesion and shrinkage:

All-purpose joint compound

- Used for bedding tape, finishing joints, skim coating, and texturing
- Most widely used type of joint compound

Semi-light joint compound

- Used for the same purposes as all-purpose joint compound
- Mid-weight, easier to pull, and softer to sand
- Tends to have less shrinkage

Lightweight joint compound

- Not used for bedding tape
- Used for finishing joints
- Easier sanding
- Improved working properties
- Reduced shrinkage

Joint Finishing Products

Topping compounds

- Easy to sand and ready to use, topping compounds are utilized for finish (skim coat) applications only.

Regular setting compounds and sandable setting compounds

- Ideally suited for patch and repair tasks, setting compounds are commonly available in 20-, 45-, and 90-minute set times. The more popular sandable setting compounds can be recoated when set, not dry, allowing complete taping and finishing in one day. Setting compounds can be used in cold or harsh weather conditions at temperatures as low as 40 degrees Fahrenheit.

Paper and fiberglass tape

- Typically, paper joint tape is $2^{1}/_{16}$ inches wide and available in 250- and 500-foot rolls. It is designed for use with joint compound to reinforce drywall joints and corners. Paper tape is pre-creased for easy, accurate corner applications. To determine if fiberglass tape is appropriate for your application, refer to the tape manufacturer's recommendations.

Ceiling and Wall Texture

Pre-mixed ceiling texture

- This product, a non-aggregate texture, provides a hard, white textured surface. It is designed for roll-on applications to interior ceilings.

Polystyrene ceiling texture

- Used for gypsum board and concrete ceilings, this product is formulated for spray applications only and is designed for large-volume applications, requiring an economical, high-quality finish. The finished appearance depends on the size and type of aggregate used. It is not recommended for high-moisture areas, such as bathrooms.

Wall texture

- A non-aggregate compound formulated for either hand-tool or spray application. When applied by hand, a stipple, swirl, or brocade appearance can be fashioned. A spatter or orange peel effect is formed when applied by spray.

Applying Joint Treatment Products

Conditions Prior to the Application of Joint Treatment

Listed below are the conditions that should be considered prior to the application of joint treatments.

- Install framing members correctly for a monolithic-looking wall.
- Rest panels flat against framing and fasten them securely.
- Abut panels, but do not force them together.
- Keep panels clean and free of dirt, oil, and other containments.

Mixing and Applying Joint Treatment Materials

When mixing and applying joint treatment materials, it is important to:

- Keep the room temperature at a minimum of **50 degrees Fahrenheit for 48 hours** before mixing and applying, and
- Maintain temperature until the application is dry.

These instructions apply to situations where joint-treatment materials are used as laminating and texturing materials.

Finishing: Nails and Screws

Drive nails and screws so that the nail/screw heads are slightly below the panel surface.

It is important to avoid breaking the face paper or fiberglass mat facer, fracturing the core, or stripping the framing member.

Skim Coat

A skim coat is trowel applied over the entire surface to fill imperfections in the joint work.

Gypsum board paper or fiberglass mat facer may show through a skim coat. As well, treated joints, filled voids, and spotted fastener heads will likely be visible.

Photo courtesy of wiseGEEK

Dry Times for Joint Treatment

Relative Humidity	Temperature, °F (°C)							D = Day H = Hours
	32 (0)	40 (4)	50 (10)	60 (16)	70 (21)	80 (27)	90 (32)	100 (38)
98%	53D	38D	26D	18D	12D	9D	6D	4½D
97%	37D	26D	18D	12D	9D	6D	4½D	3¼D
96%	28D	21D	14D	10D	7D	5D	3½D	2½D
95%	25D	17D	12D	8D	6D	4D	2¾D	2D
94%	20D	14D	10D	7D	5D	3¼D	2¼D	41H
93%	18D	12½D	9D	6D	4D	2¾D	2D	36H
92%	15D	11D	8D	5D	3½D	2½D	44H	32H
91%	14D	10D	7D	4¾D	3¼D	2¼D	40H	29H
90%	13D	9D	6D	4½D	3D	49H	36H	26H
85%	10D	6D	4D	3D	2D	34H	25H	18H
80%	7D	4¾D	3¼D	2¼D	38H	27H	19H	14H
70%	4⅓D	3⅓D	2¼D	38H	26H	19H	14H	10H
60%	3⅓D	2⅓D	42H	29H	20H	14H	10H	8H
50%	3D	2D	36H	24H	17H	12H	9H	6H
40%	2½D	44H	29H	20H	14H	10H	7H	5H
30%	2¼D	38H	26H	18H	12H	9H	6H	4½H
20%	2D	34H	23H	16H	11H	8H	5½H	4H
10%	42H	30H	21H	14H	10H	7H	5H	3½H
0%	38H	28H	19H	13H	9H	6H	4½H	3H

DRYING TIME - JOINT COMPOUND UNDER TAPE*

This table indicates the dry times for joint treatment according to the Gypsum Association standards (excludes setting type joint compound).

Paint and Sheen Levels

Paint and Sheen Levels

Paint sheen can have a dramatic effect on the overall look of any interior room.

As well, the amount of gloss can have an enormous effect on both the appearance and performance.

Definition and Types of Paint Sheen

Flat paint
- Also called a matte finish
- Generally non-reflective and most forgiving
- Good choice for interior ceilings and walls

Eggshell or satin paint
- Both have slightly more sheen than flat
- Good choice for interior walls and high-traffic areas
- Used for exterior applications also, as it sheds water and resists effects of the sun better than flat paints

Semi-gloss paint
- Higher sheen than eggshell or satin paints
- More resistant to scuff and dirt marks; applications include kitchens, bathrooms, and window and door trim

Gloss paint
- Highly reflective, tough, and stain resistant
- Due to high-reflective nature, surface imperfections are more noticeable

Good, Better, Best Results

For the best results, use a high-solids primer and *never* water down the paint.

Good	Better	Best
1. Spray/roll on one coat, back roll 2. Spray/roll on first coat, back roll (primer color or finish color) 3. Finish coat	1. Spray/roll on one coat, back roll primer 2. Spray/roll on first coat, back roll (primer color or finish color) 3. Finish coat	1. Spray/roll on one coat, back roll high-solids primer 2. Spray/roll on first coat, back roll (primer color or finish color) 3. Finish coat

Architectural Specifications

Introduction

Although it's important to understand the levels of finish, it's crucial for a project's success that the specification for the level of finish is *complete.*

A complete specification provides detailed information on levels of finish relating to joints, interior angles, accessories, fasteners, and surfaces.

This section begins with a poorly written specification, followed by improved versions.

Also presented are the factors that can impact the final appearance of a decorated wallboard.

Poorly Written Specification

This example of a specification only identified two different levels of finish:

ACTIVE STANDARD: C840 Standard Specification for Application and Finishing of Gypsum Board Finish Panels to levels indicated below, according to ASTM C840, for locations indicated:

Level 1: Embed tape at joints in ceiling plenum areas, concealed areas, and where indicated, unless a higher level of finish is required for fire resistance, related assemblies, and sound related assemblies.

Level 4: Embed tape and apply and separate first, fill, and finish coats of joint compound to tape, fasteners, and trim flanges at panel surfaces that will be exposed to view, unless otherwise indicated.

Improved Written Specification

This example of an improved specification provides more information:

- Where level 1 gypsum board is indicated, apply single joint compound for embedding coat.
- Where level 2 gypsum board is indicated, apply joint compound specified for first coat in addition to embedding coat.
- Where level 3 gypsum board finish is indicated, apply joint compounds specified for the first and second coat in addition to embedding coat.
- For level 4 gypsum board finish, embed tape in joint compound and apply three separate coats of joint compound over joints, angles, fasteners, heads and accessories. Touch up and sand between coats and after one last coat as needed to produce a surface free of visual defects and ready for decoration.

Complete Specification

A complete specification includes considerations relating to *all* levels of finish.

Level 0: No taping, finishing, or accessories required.

Level 1: Joints and interior angels shall have tape embedded in joint compound. Surfaces shall be free of excess joint compound. Tool marks and ridges are acceptable. This finish level may be used in plenum area above ceilings, in attics and in areas where the assembly is concealed.

Level 2: Joints and interior angels shall have tape embedded in joint compound and 1 separate coat of joint compound applied over joints, angels, fastener heads, and accessories. Surface shall be free of excess joint compound. Tool marks and ridges are acceptable.

Complete Specification

Level 3: Joints and interior angles shall have tape embedded in joint compound and two separate coats of joint compound applied over joints, angles, fastener heads, and accessories. Joint compound shall be smooth and free of tool marks and ridges. This final level may be used in areas that are to receive heavy textured, thick ($^1/_8$ inch or greater) wall coverings.

Level 4: Joints and interior angles shall have tape embedded in joint compound and three separate coats of joint compound applied over joints, angles, fastener heads, and accessories. Joint compound shall be smooth and free of tool marks and ridges. Prepare surface to be coated with a primer/sealer prior to the application of final finishes. This finish level may be used where lights, textured finishes, and wall coverings are to be applied.

Level 5: Joints and interior angles shall have tape embedded in joint compound and two separate coats of joint compound applied over joints, angles, fastener heads, and accessories. Joint compound shall be smooth and free of tool marks and ridges. Prepare surface to be coated with a primer/sealer prior to the application of finish paint by applied monolithic coat of joint compound over entire surface.

Conclusion

In conclusion, providing a complete specification based on the Levels of Finish guidelines facilitates the success of the installation, including the appearance of the final decorative treatment and the satisfaction of the client.

Summary

Important Points

- Gypsum is a mineral used to make cements, plasters, and related products. The composition of gypsum is $CaSO_4 * 2H_2O$.
- The manufacturing process of gypsum board involves drying (cage mill) and calcining.
- The recommended level of finish of gypsum wallboard varies with the final decoration that is to be applied; as well, it is also dependent on the gypsum panel facers, the location in a structure, and the type of lighting striking the surface.
- The Recommended Levels of Gypsum Board Finish document GA-214 was developed to assist specification writers, architects, contractors and building owners in the following areas:
  - To precisely describe the finish of walls and ceilings prior to the application of paints and other wall coverings.
  - To encourage competitive bidding of suitability finished surfaces.
  - To enhance the appearance of the final decorative treatment.

Important Points

- Levels of finish range from 0 (hung and unfinished) to 5 (skim coated for areas exposed to severe lighting conditions, gloss, semi-gloss, or enamel paints).

- It's crucial for a project's success that the specification for the level of finish is complete, providing detailed information on levels of finish relating to joints, interior angles, accessories, fasteners, and surfaces.

- With the variety of joint finishing products available in the marketplace, it's important for the project's success to choose the products suited for the application. If in doubt, consult with the manufacturer or supplier for further information.

Additional Information

Other sources of information pertaining to levels of gypsum board finish include:

- American Society for Testing and Materials (ASTM): www.astm.org
- Gypsum Association: www.gypsum.org
- National Paint and Coating Association: www.paint.org
- Painting and Decorating Contractors of America: www.pdca.org
- Drywall Finishing Council: www.dwfc.org

Thank You

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