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**ABSTRACT:**

Gypsum board is manufactured to minimize joints telegraphing through applied finishes. The specified joint finish must account for the finish that will be applied to the gypsum board and the lighting conditions for the application. Lighting will drastically affect perception of the completed work.

**FILING:**

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**KEYWORDS:**

Gypsum board, joints, joint finishes, lighting

**REFERENCES:**

ASTM C754 - Standard Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products

ASTM C840 - Application and Finishing of Gypsum Board

ASTM C1396/C1396M - Standard Specification for Gypsum Board

## Poor Gypsum Board Installation?

By David Stutzman, AIA, CSI, CCS, SCIP, LEED AP

### Background

So what would you advise? Does the photo show an acceptable Level 4 joint finish installation, or not? The photo shows a wall perpendicular to a north facing multi-story curtain wall. The photo was taken without flash or other artificial lighting.

According to the architect, the specification for this project required all of the following:

- Steel stud framing spaced 16 inches on center installed per ASTM C754 and ASTM C840.
- 5/8-inch thick Regular/Type X gypsum board with tapered edges complying with ASTM C1396/C1396M.
- Paper tape and all-purpose type joint compound (setting type compound for prefilling).
- Parallel to framing application, unless required for fire resistance.
- ASTM C840 Level 4 Finish.
- The gypsum board was finished with a primer and eggshell paint

### The Investigation

At first glance, the intuitive answer is the installation is obviously flawed and unacceptable. Virtually every joint can be seen. However, before jumping to conclusions, let's review the conditions in more detail.

ASTM C840 requires joints between the boards to be prefilled with joint compound, then joint compound applied and the joint tape embedded. For Level 4 finish, the tape must be wiped with joint compound leaving a coating over the tape and then finished with two additional coats of joint compound.

ASTM C1396/C1396M requires tapered edges along the long sides of the boards to have an average dimension between 0.020 and 0.090 inch less than the board thickness. Tapered edges are designed so finished joints appear flush with the gypsum board faces. The most noticeable joints are the end joints along the short dimension of the boards. This is to be expected since gypsum boards edges are tapered and the ends are square cut. The tape and three coats of joint compound applied to the end joints are proud of the board surface. This creates the ridge that casts the shadow making the joints very visible. The spec required the boards to be parallel to the studs. That would have eliminated the butted end joints because the reveal trim is spaced about 6 feet on center. The horizontal installation chosen by the contractor probably produced less gypsum board waste because the cut-offs could be used, but introduced the end joints. The joints appear to be better closer to the glazing. This may be because the surface is more evenly lit - similar to a photographer's "fill" light used to ease harsh shadows. The shadow effect is what makes the joints so noticeable because one side of the



joint is in light and the other in shadow. None of the building lighting was operating when the photo was taken. So the lighting level within the building is entirely dependent on daylight from the curtain wall. The lighting contrast can be extreme. Daylight produces illumination levels of 1,000 - 2,000 footcandles (fc) compared to typical levels in occupied buildings of 10 to 100 fc. Lobby spaces show in the photo are usually in the 10 fc range. The surface brightness is significantly less and the contrast is greater as the distance from the curtain wall increases. This may be compounding the visual perception of the joints. If the space was lit to the design values, filling the dark side of the joints, the joints may be far less visible. The joints in shadow at the soffit and return walls at the vestibule framing are not noticeable in the photo.

## Conclusions

Determining acceptability of gypsum board joints is subjective. ASTM standards do not set dimensional tolerances for joint treatments, so there is no quantitative measure for guidance.

Visual perception is highly dependent upon lighting conditions when viewing the joints. Determining joint acceptability before the permanent building lighting is installed and operational may be nearly impossible, unless design lighting levels and lighting quality can be simulated with temporary measures.

Be careful of lighting conditions, especially daylight, wall washing light fixtures that illuminate the wall with glancing light nearly parallel to the wall surface. Such lighting can drastically affect the perception of the finished gypsum board by casting shadows from every imperfection. ASTM C840 Appendix cautions that Level 4 joint finishes should not be

used with gloss, semi-gloss and enamel paints. Paints, other than flat paints, will help highlight joints because the absorption rate of the joint compound is different than the face of the gypsum board. The different absorption will change the perceived paint sheen or gloss helping telegraph the joints.

For critical lighting conditions, ASTM C840 Appendix recommends using flat paints applied over a light texture when using Level 4 finishes. The alternative is to use a Level 5 finish with a skim coat of joint compound applied to the entire surface. The skim coat ensures that minor surface imperfections are concealed and the surface has consistent porosity for applied finishes. Consistent porosity helps ensure uniform visual perception of the final finish.

## Specifying Joint Finishes

ASTM C840 Finish Levels and typical uses:

**Level 0:** No joint treatment.

- Temporary construction.

**Level 1:** Tape embedded in joint compound.

- Concealed locations such as plenums above ceilings.

**Level 2:** Level 1 plus wipe coating of joint compound over the tape.

- Under ceramic tile finishes.
- Garages, storage, and utility spaces where appearance is not a concern.

**Level 3:** Level 2 plus one coat of joint compound.

- Under medium to heavy textured finishes.
- Under heavy wall coverings.

**Level 4:** Level 2 plus two coats of joint compound.

- Under light textured finishes.

- Under flat paint finishes and light wall coverings.

**Level 5:** Level 4 plus skim coat of joint compound over full surface.

- Under gloss or semi-gloss paint finishes.
- Critical lighting conditions (harsh light or light at a shallow angle)
- Large expanses of uninterrupted flat wall surface.

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