

### PROBLEMS IN PAINTING INTERIOR DRYWALL

#### Background:

The home building industry is noticing an increasing amount of complaints in applying latex paints to interior drywall surfaces. Several problems are occurring on mainly two kinds of drywall surfaces. These are normal orange-peel textured drywall and hi-profile, knockdown textured drywall. These problems can be summarized as follows:

1. Slight to noticeable yellowing of white or almost white interior latex paints.
2. Mild to severe cracking of heavy coats of latex paint over textured drywall.
3. Very poor washability of latex paint over textured drywall.

A fourth and somewhat different problem has also emerged, that of a grayish darkening of drywall mud joints and nail spots underneath paint and wallcovering that shows through in a sometimes extreme manner.

#### Discussion:

There have been sporadic, but increasing tendencies for white or just slightly off-white latex paints to develop a mild to moderate yellowing over some boards of drywall in new home construction. It can be noted that this yellowing does not show up over the tape joints and nail head mudded spots, but is quite apparent over the areas of texture and bare board. This problem can affect both highly pigmented, low end flats to higher quality, high resin content flats.

Research has developed the following explanations:

- A. For various economic and production process reasons, some drywall manufacturers have switched to a new kind of sizing compound that treats the surface of the cardboard facings. We are told that this new sizing, which evidently is easier to apply and offers some economies, is very highly alkaline, as opposed to the more acidic sizing previously used. This alkaline sizing can react with latex paint, causing a discoloration.
- B. The facing cardboard is manufactured from a variety of materials, which in the past used to be a high grade of recycled paper. Now it can contain a degree of wood pulp and other low grades of recyclable materials including wood by-products. These by-products can contain a high degree of tannic acid, known to be a water soluble staining agent which can discolor paints.
- C. Moisture seems to be a major factor in the degree of yellowing, especially considering that it appears to be a water soluble staining agent that is causing the yellowing. A higher degree of moisture both in the board and in the surrounding atmosphere at the construction site causes a higher degree of yellowing. The dryer the board, the less yellowing.

Problems of both the paint cracking over new textured drywall and paint having poor washability are related to the same issue. That is the fact that conventional drywall spray texture is extremely low quality in both adhesion and cohesion and is, in fact, a weak surface to put paint over. Most drywall spray texture manufacturers indicate on their labeling that there is a texture hardener in powder form already included in the mixture but, in fact, this material has proven to be of limited value.

Showing a recognition of the difficulties in painting over a variable grade of cardboard facing paper, the recommended specifications for the application and finishing of gypsum board #GA216-85 put out by the Gypsum Association in Evanston, Illinois and comprising of membership including such companies as Goldbond, US Gypsum and Georgia Pacific, among others, state in Section 19.2 that gypsum board surfaces to be decorated with paint, texture, wallpaper or vinyl covering should be primed or sealed prior to decoration and allowed to

completely dry. In Section 19.3 it states that gypsum board surfaces to be decorated with textures should be primed or sealed with specific primer or sealer recommended by paint or texture manufacturers for application over gypsum board. The implication of this specification is to prime drywall board before texturizing or decoration. While this priming would, in fact, aid the problem of yellowing or discoloration, we do not feel that it would help at all in the area of washability, durability, adhesion and cracking.

It has been more than adequately demonstrated that raw drywall texture, including those that contain the powdered texture hardener, in itself can be wiped off the cardboard facing with a rag dampened with just water in 2-3 wipes. The drywall texture itself, even with the powdered additives, has relatively little binding capability or adhesion whatsoever. The capability of this texture to be wiped off with water at times is advantageous for the drywall texture applicator who must then sponge off the wall in order to prep it for wallcovering. However, there is an inherent conflict in this ability which is, that the same qualities that make drywall texture removable also make it a difficult surface for the application of paint.

It is important to realize that the texture is, in itself, the first coat of paint on the drywall surface and will determine the future toughness and durability of any paint films to be applied.

The cohesive weakness and porosity of drywall texture brings us to the next problem, that of the cracking and separation of latex paint covered texture from the facing paper. This phenomenon has been especially noticed when higher quality latex flats are used and areas where thicker films of paint are built up, such as in corners and at ceiling lines or in any area where more than the usual thickness of paint could be inadvertently applied. During the drying process, the paint film can have its water content sucked into the excessively porous texture too quickly, causing the paint film to mud crack. This has occurred among several brands of paint, both nationally and regionally, when applied by experienced paint contractors over what appears to be consistent drywall. This problem appears sporadically and may appear in one or two homes, or may not appear at all. However, this problem is being seen more and more often, especially in more expensive homes where the higher grade latex flats are used for increased washability and durability, as opposed to the lower grade flats which do not contain enough resin to form a continuous, durable film. It has also been seen that these same paints that are cracking over textured drywall do not demonstrate the problem on untextured drywall. The problems of cracking and poor washability seem to be related directly to texture.

The next problem, which is somewhat unrelated, is that of the graying out of drywall mudded joints and nail heads. This problem is extremely sporadic, sometimes occurring in as few as 1 in 200 homes, but when it does occur it is usually a major disaster. Repriming the grayed areas with latex primer or most alkyd or oil based primers will only temporarily solve the problem, and it is usual that the problem bleeds back through within 30-90 days. Ultimately, some people have required the drywall mud be actually ground out of joints to try to affect repairs.

The reason for this darkening is one of two things. Either it is mildew or it is hydrogen sulfide staining. More and more this problem appears to be hydrogen sulfide staining. This phenomenon occurs especially in low lying watery areas near swamps, golf courses and water treatment plants and especially around areas where the automatic irrigation systems for lawns are fed from a ground water well. Since 1985, there appeared a rash of these problems, signifying some kind of change in the water table, and research by paint companies as to why this hydrogen sulfide reacts with any sort of phenyl mercuric acetate compound, commonly known as mercury, which is used in drywall mud and many paints as a can preservative and mildewcide.

Many paint manufacturers have dropped mercury from their latex paints, mainly because of the problem of hydrogen sulfide staining. Mercury is still legal in most latex paints, and as it is much less expensive than the non-mercurials, you can be assured that paint manufacturers would still use it if they absolutely didn't have to because of performance problems in the field.

The other problem with drywall mud is the occasional case of mildew. In times where thick coats of drywall mud in joints are applied and then textured and painted before thoroughly cured, the damp drywall mud inner layer can be a tremendous growth medium for mildew spores.

There appears to be several answers to these problems.

Solutions:

- A. The solution to the yellowing problem is complex and most likely can only be cured by the drywall board manufacturer. The board should be as dry as possible before painting, and it should be realized that high atmospheric humidity and waterfront locations especially can greatly retard the curing of the paint film. This will allow the water in the paint film to activate any water soluble staining agents, thereby causing yellowing. It is imperative that the drywall board manufacturers utilize raw materials that do not contain any form of water soluble agents or their sizing formulations must be modified to accommodate the realities of the construction work place, especially in the South. It is impossible to lower the humidity at the work site to achieve a dry board and then keep it sufficiently dry so that paint has a chance of curing without yellowing. Without the board cardboard facings being formulated themselves to resist yellowing, the only solutions left available are to prime all of the board areas with an oil based primer that is proven to hold back bleeding, or experiments should be done to avoid paint toxicity problems with various water base acrylic type primers to see which ones have the greatest success in holding back this yellowing.

The conclusion is that this problem is best solved at the source, which is in the formulation of the cardboard paper facing. It is manufactured in a factory atmosphere and is more controllable than in field, topical solutions.

- B. Drywall texture manufacturers should advise drywall texture sprayers to put into the texture mix a sufficient level of drywall texture binder or hardener in liquid form, preferably the same kind of generic vinyl acrylic emulsion at 55% weight solids that goes into most common latex paints today. The dry powder "hardeners" do not work! These liquid binders, which appear like white glue, will aid in hardening and binding together the drywall texture, which then will improve the adhesion of the texture to the cardboard facing and will reduce its porosity to make it more water resistant. The level recommended as a starting point is 5-7 gallons for 100 gallons of texture mix, depending on the formulation. This additive will also help provide a denser, tighter surface, which will absorb less of the coat of paint allowing it to develop a tighter, harder film for greater scrubability.
- C. Prime the textured surface. We have found that a properly formulated latex drywall sealer will have enough resin in it to be able to coat and seal the porous drywall texture to give the top coats of paint at least a chance of adhering properly without cracking or pinholing. In fact, the better the paint with more resin in it, the more priming can be of benefit.

Less expensive paints do not have enough resin to form a really tight, continuous film and therefore do not crack, but they also have no washability and can cause problems later.

The general problem of washability relates back to the problem of poor drywall texture integrity (cohesion). The quality of any paint job is dependent on the quality of the surface being painted and the ability of paint to stick to it. Painters and builders alike would never accept a paint primer that could be washed off a wall in just 2-3 wipes with just water, but that is exactly the surface that is being accepted on modern drywall. You can put the greatest scrubable paint on top of this weak, powdery drywall texture and it will not hold up through repeated washings, much less scrubbing, especially with the use of alkaline cleansers like Formula 409 or even just water with a cleanser. The cleaning water will penetrate the latex top coat and soften and dissolve the texture underneath. The priming has also been seen to reduce or eliminate the problem of yellowing.

- D. The solution to the problem of graying joint compounds is as follows: Drywall mud manufacturers must discontinue the use of mercury compounds as a package stabilizer and mildewcide in their muds. Suitable non-mercurials are available on the market, which while more expensive, are very effective against mildew and do not cause the side effect of hydrogen sulfide staining. If the graying occurs, only several coats of water based epoxy coating have been found to satisfactorily seal in the graying, but without guarantee.

This discussion of several difficult paint problems over drywall are solvable with research, investigation and education. It is most important to note that in all of these cases there is not a defect in the paint. Where yellowing, premature wear out or blackening occurs, the underlying culprit seems to be the drywall mud or texture. The evidence for this conclusion is that when boards yellow, the paint usually is the correct color over drywall mud which isolates the paint from the cardboard. On washability, where the paint washes off, it is evident that the paint sticks very well to any other surface except the texture. Where blackening occurs, it occurs on mud lines especially in the thicker areas, where if there was a defect in the paint, this problem would be consistent over the entire board.

We feel that with mercury free drywall muds, properly resin reinforced drywall textures and with proper priming techniques to provide a sound surface, drywall can be painted with consistently high quality results and without the back end warranty costs. People in modern homes have to live with the painted walls for many years and expect low maintenance costs. In today's litigious society, we sincerely urge that all painters, drywall persons and builders consider these problems together and solve them at minimal cost and maximum satisfaction of the customer who buys the home.

We welcome your input in our discussion of these problems, as we wish to provide you and your customers with successfully drywalled and painted homes.