



Compound adhesion mechanism to plasterboard

People in New Zealand mostly prefer monolithic walls - nice and smooth, finished with paint.

To achieve this smoothness, joint compound is applied on the joints, reinforcing them with tape. The choice of joint compounds that can be used are from either a setting type (plaster-based powder formulation) or air-drying type (limestone-based ready mixed paste from a pail/box). Ideally these joint compounds are applied in three coats.

01. Base coat or the taping coat in which the tape is incorporated.
02. Second coat to fill any hollows left by the earlier coat.
03. Topcoat to smooth out the joint and get an even finish.

Normally the first two coats used are from the setting type of compounds and the topcoat used is from the air-drying type of compounds. Sometimes some stoppers use air drying (ready mixed) compounds for all the three coats.

Here the opportunity is taken to describe the mechanism of how these two compound types (setting and air-drying) help adhere to the plasterboard and create that strong bond (base coat adhesion). Also detailed are the points we need to be aware of and consider when deciding choice of compound to be used.

Setting compounds

These are plaster based powdered compounds and are mixed on site with water before use. They come in pre-determined working times as indicated on the bags. For example, a 90 minute product is going to set in about 90+ minutes from the time the powder is added to water. So essentially, all mixed compound needs to be used up in 90 min. Mechanical tools if used need to be cleaned before the compound sets in them.

This plaster mixture is applied on the plasterboard and the tape reinforced in the joint. When this compound is spread on the plasterboard the compound starts losing moisture back into the board and some of the moisture will evaporate into the atmosphere depending on the environmental conditions. Simultaneously the plaster is converting to gypsum. This conversion (chemical reaction) exhibits itself as an exothermic reaction. Heat is generated as the gypsum crystals form and grow. The gypsum crystals grow within themselves and into the plasterboard paper surface. This growth creates the anchor points for the compound to adhere to the plasterboard. When this compound dries the gypsum gets it full strength realisation and presents itself as a strong joint.

Care needs to be taken to make sure that adequate compound is under the tape and the compound sets before it dries, especially in hot dry environments. Small amount of polymer binder is added to cater for the adhesion of the feathered edges to the plasterboard. Setting compounds dry relatively quicker and shrink less. The bulk of the shrinkage takes place within the setting time. The strength of the setting compound exhibits itself in the form of a product being hard to sand and therefore not recommended as a topcoat.

Air drying compounds

There are no time restrictions on use of air-drying compounds compared to the setting type compounds especially when used in machine tools. Most air-drying compounds can be used as a base coat. These compounds bring about the adhesion to the plasterboard by compacting itself (manifested as shrinkage) and

embedding into the coarse paper surface. The shrinkage helps pull the compound closer to the plasterboard surface making it denser and generating the adhesion. More polymer binder quantities are present in these formulations as compared to the setting compounds and thus exhibit good adhesion on the plasterboard when dry.

In using these compounds as base coat care needs to be taken to have enough compound under the tape to get good adhesion. These air-drying compounds shrink more

than the setting type of compounds. Air-drying compounds take more time to dry and rely more on the environmental conditions (temperature and humidity) to come to its stable state. Until the time the compound is completely dry, shrinkage continues to occur. Drying can take much longer in winter and has potential to result in delayed shrinkage issues if not taken care of while stopping. Once dry these compounds are comparatively easy to sand and create a smooth surface much more easily.

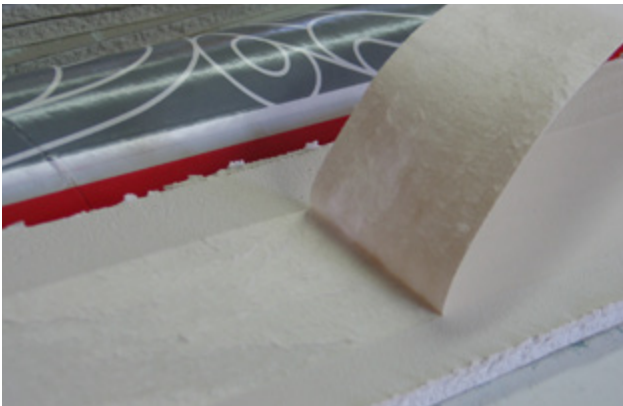


FIGURE 1: Setting compound strong joint adhesion through gypsum crystal formation.

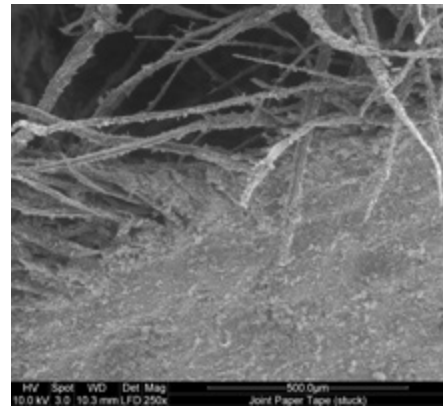


FIGURE 2: Gypsum integration with the paper fibres.

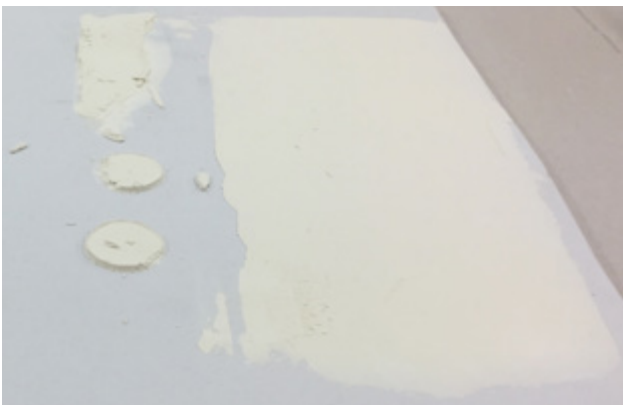


FIGURE 3: Air-drying compound strong mechanical adhesion on plasterboard.

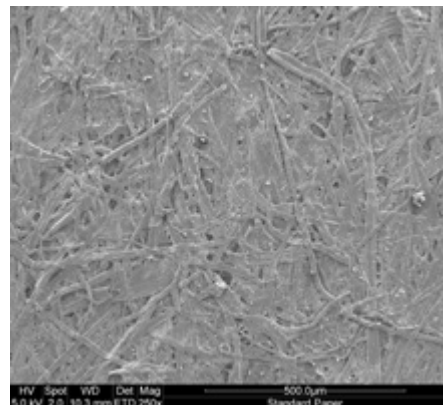


FIGURE 4: Paper surface enlarged to show keying sites.

Main points we can take away can be summarised as:

- Environmental conditions need to be kept in mind before making a compound choice. Use of appropriate heating and good ventilation to be ensured.
- Setting compounds are preferred to be used as base coats especially in winter.

- Air-drying compounds can be used as a base coat where there are very good drying conditions as in summer or provided it is completely dry before the second coat is applied.

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