STOPPING & PAINTING – FACTORS THAT INFLUENCE DRYING

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SCOPE OF USE

We get a steady flow of complaints about poor adhesion of paint over new plasterboard and jointing materials particularly during the winter months and suspect that there are many more that we never hear about. We believe that an understanding of Relative Humidity and just how difficult it is to remove water from interior walls and ceilings would eliminate most of the problems.

NOTE: A wet & dry bulb psychrometer is the best instrument to establish whether site conditions are conductive to drying (see above).

PRELIMINARIES

- Relative humidity is a measure of how much water vapour air is holding expressed as a percentage of the maximum amount of water it can hold at whatever the temperature is.
- At 100% RH, water cannot evaporate out of stopping compounds or coatings etc.
- Air has very poor water carrying power.
- At 15°C a cubic metre of air can only hold 12 grams of water.
- At 25°C a cubic metre of air can only hold 25 grams of water.
- Wet conditions outside will generally mean that air is at or close to 100% RH.

- Interior stopping, plastering or painting is often undertaken when it is raining outside during winter.
- Damp conditions will ensure that setting type plaster based compounds cure well (though they will be slow to through dry) but that air-drying type compounds will suffer from retarded drying and curing because the air is likely to be near or at saturation point.
- Water may be absorbed by the stopping and plasterboard rather than evaporate into the saturated or near saturated air.
- New plasterboard is usually installed in unoccupied buildings that tend to be closed up overnight with little or no ventilation. In these conditions air will soon reach saturation point and if temperature drops, there may also be some condensation when a dew point is reached.
- In summer conditions we reckon at least 40 changes of air in a room are needed to remove water from wallboards and compounds.
- In wet or winter conditions, ventilation plus heating will be needed.

WHATS THE DIFFERENCE BETWEEN DRYING COMPOUNDS, PAINT & *WASHING*?

Not much! Even when it's very cold, your washing will still dry, but it may dry so slowly that it really just isn't worth it. The reason washing dries is because water evaporates from it. If a wet surface is in contact with the air, some molecules of water will leave the surface and go into the air, but at the same time, molecules of water vapour from the air will be coming *into* the surface. Eventually, it will reach some kind of equilibrium where the amount of water leaving the surface is the same as the amount coming in. We then say that the air is saturated with water, and once the air is saturated, no more [net] evaporation can take place. Now, if we look at the basic physics underlying this, we find that the amount of water that air can hold when it's

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saturated depends very strongly on temperature, and the warmer the air is, the more water it can hold. So, evaporation tends to proceed much more quickly when it's warmer than when it's cold. But even when it's quite cold, as long as the air isn't saturated, your washing will dry outside, but it may dry very, very slowly (and it may rain before it gets dry)! In general, we don't hang washing out to dry in the Antarctic because it is so cold that things would take a long time to dry. Maybe on a really nice sunny day in the middle of summer, you might get the tea towels dry, or something like that.

What are the perfect conditions for drying?

To sum up, we've discovered that three things favour the evaporation of water from wet materials:

High temperatures—to increase the number of molecules that can turn from liquid to vapor.
Air movements—to carry water away and prevent the air near your materials from becoming saturated with vapour.
Low humidity—so evaporation will continue steadily and water molecules won't return to your materials from the air.

PROTECTION FROM WEATHER – THE BEST CHOICE

Prior to installation all GIB® products must be kept dry, preferably by being stored inside a building and under cover. Where it is necessary to store GIB® plasterboard outside, it must be stacked off the ground and be fully protected from the weather.

Fixing GIB® plasterboard to timber with moisture content in excess of 18% will increase the risk of surface defects such as peaking of joints and popped fasteners.

Installed GIB® plasterboard systems must not be exposed to liquid water or be installed in situations where extended exposure to humidity above 90% RH can reasonably be expected.

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RECOMMENDATIONS

- Given that weather proofing of multi-storey construction during winter is generally problematic, we would recommend that designers, their client, main contractors and specialist sub trades consider more extensive use of light gauge steel framing to mitigate moisture related issues commonly encountered with timber framing, particularly in areas with inherent poor ventilation such as lower floors or basements.
- It is extremely important that each coat of a multi-coat jointing system is allowed to adequately dry. This will reduce the likelihood of subsequent cracking and shrinking of the compound. The second coat of setting compound and any air drying compounds are ready to recoat once each coat is completely dry.

Approximate Drying Times for Air Drying Compounds

Relative Humidity	Temperature				
	10° C	16° C	21° C	27° C	32° C
98%	26 days	18 days	12 days	9 days	6 days
94%	10 days	7 days	5 days	3 days	2 days
90%	6 days	4 days	3 days	49 hrs	36 hrs
80%	3 days	2 days	38 hrs	27 hrs	19 hrs
60%	42 hrs	29 hrs	20 hrs	14 hrs	10 hrs
40%	29 hrs	20 hrs	14 hrs	10 hrs	7 hrs

Indicates common weather conditions in New Zealand. Based on 1.5 - 2mm thickness of wet compound.

- Approximate drying times for pre-mixed compounds are given in the above table. Water, air and mixed compound temperature should be kept above 10°C.
- During winter periods with cold damp conditions, drying rates are improved by use of more, but thinner coats of compound. For setting compounds, the use of shorter set/working times (20-45 minutes) can provide better performance during cold periods.