Primers, Sealers and Undercoats

Introduction

In this module we will discuss what makes sealers, primers and undercoats different from other paints. We will begin by defining the role each has to play and then discuss the needs of various substrates and the appropriate primer, sealer or undercoat for each. We will give the important features of each of the products.

Primers and sealers in particular are specialised paints and this module will show why it is so important to choose the correct one.

The painting of masonry and the issues of clear finishes and stains are covered in separate modules.

What is a primer?

A primer is a paint; a coat of paint that is applied directly to the bare substrate. The word 'primer' means 'first' and in this case it is the first coat to be applied to the timber, steel or other surface to be coated. The primer is the most important coat of paint a substrate receives. The final paint system is totally dependent on the primer during its job. The primer will only be able to perform well if the surface preparation has been done well.

- Primers are the anchors for the new paint system. There are big differences in the quality of primers on the market.
- A primer is wasted if surface preparation is not thorough.
- Take time to ensure all surfaces are thoroughly clean and free from contaminants.
- Remove sharp edges from timber and steel wherever possible.
- With new work most priming may need to be done before erection. Planning is needed.

The main functions of primers

Primers have varying roles on different substrates but the main functions are:

- To provide excellent adhesion to the substrate for the new paint system. Primers therefore need to have good adhesion to the substrate themselves and to provide a surface that subsequent coats of paints can easily adhere to.
- To provide protection to the substrate until it can be topcoated. This is why it is very important to have exterior wood primers in colours that block out U.V. light.
- To inhibit moisture reaching the substrate.
- To seal the surface and prevent subsequent coats of paint sinking into the substrate and losing gloss.
- To stop stains. Special primers can help to prevent stains and tannins from bleeding through into the topcoats and ruining the finished job. This particularly applies to staining timbers such as Cedar or Redwood.

- Some primers, particularly those for wood have built-in fungicides to help prevent mould growth.
- To prevent corrosion of nail heads higher quality wood primers contain anti-corrosive pigments.
- To provide adhesion to non-ferrous metals and to stop these metals from corroding.
- To prevent steel from rusting.

Primer composition

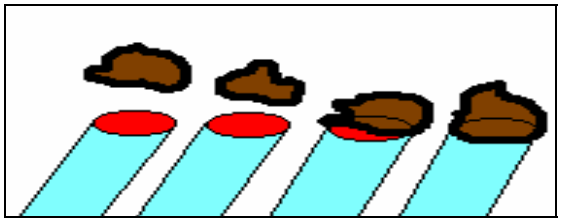
It is very important that primers are made using specialised binders that are compatible with the substrate and that have excellent adhesion to it. For example the alkyd binder used in Resene Wood Primer (see Data Sheet D40) is excellent over timber but will chemically decompose if used over zinc metal or fresh concrete. The resin binder actually turns to soap in these situations.

In the ideal world primers would be distinctively coloured to allow specifiers and painters to clearly recognise that a primer coat has been applied. A strongly coloured primer would also ensure that low quality painters could not escape with just a single finishing coat of paint in situations where 2-3 coats are needed for good durability. Timber primers also need to have a good loading of prime pigments to achieve good hiding power in order to block out damaging U.V. light from the timber surface.

Metal primers will contain substantial quantities of ant-corrosive pigments to chemically inhibit corrosion. Often they are cynically coloured to match the colour of rust.

Primers are usually pigmented and have a middle range PVC (pigment volume concentration) around 35-45% (see CPD module 'Volume Solids, PVC and Hiding Power' to learn more about this). This allows them to have spare binder resin (left over from pigment holding together duties) for adhesion to substrate purposes. A largish pigment content is needed to provide hiding power and to help seal off the substrate surface. This is very important on timber where the primer is also playing the role of sealer.

If you can imagine the surface of a piece of timber magnified 100 times it could be represented as the top surface of a can of drinking straws. As a primer dries the pigment particles slowly sink onto the opening of each straw and block it off.



Primers have an excess of pigment and this ensures they dry with a slightly roughened surface to aid the adhesion of subsequent coats.

What is a sealer?

A sealer is designed to be used prior to, or in place of a primer. Sealers are special primers designed to perform some of these functions:

- Provide good adhesion
- Recondition poor substrates such as crumbly old concrete tiles. Resene Sureseal (see Data Sheet D42) is ideal for this purpose.
- Seal off any surface porosity to prevent subsequent coats from sinking in, resulting in a non-uniform finish. The porous substrate needs to be 'filled' or 'sealed'. This 'sealing' of the porous surface evens out the porosity of the surface. Such a 'sealed' surface will allow the topcoats to appear more even, resulting in a more uniform gloss level over the finished surface.
- Block off stains.
- Seal waxes in the substrate.

Unfortunately the naming of sealers and primers is very loose and often products labelled as primers would be more appropriately called sealers and vice versa. For example, Resene Waterborne Smooth Surface Sealer (see Data Sheet D47a)could be described as an adhesion primer rather than a sealer.

Sealers are required to do quite special jobs that can be quite varied. Traditionally the key role of a sealer has been to bind up porous surfaces such as crumbly concrete or gypsum plaster. In these areas a PVC of about 20-30% allows for plenty of spare binder to bind up the surface of dodgy substrates and to provide a good anchor to those surfaces. Resene Sureseal is especially strong in this area and is formulated on a urethane alkyd resin with good alkali resistance so it can be used over concrete as well as interior plasters.

Other sealers are often referred to as sanding sealers and may be formulated more like undercoats with much higher PVC's. Talc is used in these products because it provides a lovely slipperiness that greatly aids sanding.

While the colour of a sealer may not be important, having some distinctive colour there does help to see where the sealer is being applied, so that complete coverage is achieved. Resene sealers are generally coloured to enable identification of them in the case of disputes.

Functions of sealers

Some sealer functions are very similar to that of primers. For example both need to:

- Provide excellent adhesion to the substrate.
- Seal off any surface porosity.

Sealers for interior paperfaced plasterboard and similar substrates are also required to:

- Block off water stains (existing), e.g. Resene Sureseal.
- Help seal off stains from fire damage, e.g. Resene Sureseal and Resene Quick Dry (see Data Sheet D45).

- Waterproof the substrate (to some extent), e.g. Resene Sureseal.
- Provide a good surface for easy sanding, e.g. Resene Broadwall Surface Prep & Seal (see Data Sheet D807). In this case the Resene Broadwall acts as an 'anti-sealer' and actually acts to make the entire surface more porous but evenly porous.

On exterior or interior concrete, sealers such as Resene Sureseal may be used to:
- Bind up crumbly surfaces of weathered concrete.
- Provide a barrier coat to allow the use of alkyd paints over concrete.

On composite wood products (e.g. particle board) sealers seal off the waxes from alkyd type paints. E.g. Resene Quick Dry and Resene Particle Board Sealer (see Data Sheet D43).

Products such as Resene Qristal Poly-Flat or Resene Poly-Satin (see Data Sheet D52) are used on timber as sealers for clear finishes.

What is an undercoat?

An undercoat is applied over a sealer or primer and is designed to do the following:
- Provide a good adhesion to primer or sealer.
- Provide a base that the topcoat will stick to.
- Provide film build for barrier properties to prevent moisture etc. getting to substrate, especially important for steel.
- Even out small imperfections in rough surfaces.

In these days of 100% acrylic paints, undercoats are almost obsolete on timber and galvanised steel. Instead of a special undercoat the first of the two normal finishing coats of acrylic gloss can be considered as the undercoat.

Undercoats generally have the role of filling up surface imperfections and acting as barrier coats against moisture. They are formulated at PVCs of about 45-55%. Undercoats for steel often utilise extender pigments such as micas and talcs, which have platelike shapes and are very efficient at preventing moisture passage. The high PVC of undercoats (and primers) means they will not weather well and should be topcoated as soon as possible.

Functions of undercoats

The functions of undercoats also vary according to their end use. Undercoats for timber are generally used to provide filling properties and provide a smooth even surface for the finishing coat, e.g. Resene Enamel Undercoat (see Data Sheet D44).

When acrylic paints are used the trend is to use the same acrylic as its own undercoat. This ensures good hiding power because the two coats are identical in colour. This also has the advantage of needing fewer different cans of paint.

The waterborne enamels Resene Enamacryl (see Data Sheet D309) and Resene Lustacryl (see Data Sheet D310) and the solventborne Resene Lusta-Glo (see Data Sheet D33) should be used as their own undercoat.

Undercoats for steel play a completely different role in that they provide the major means of blocking off water and salts from the steel. They achieve this by being there in bulk and are usually formulated on very impermeable epoxy binders, e.g. Resene Armourcote 510 (see Data Sheet RA40). Film builds are normally 4-6 times thicker than timber undercoats.

The Importance of surface preparation

Just like paints and other coatings, primers and sealers perform better when the substrate is properly prepared. Cracks, nail holes and other surface imperfections should be filled and sanded smooth. Rusty surfaces, in particular, need extensive work to prepare them adequately. Most important, the surface should be clean and free of all dust, dirt, grime, loose or flaking paint and other contaminants before primer is applied.

While it is always wise to use a primer in order to achieve the highest quality paint job, the following circumstances are most important for use of a primer:-

- When painting new wood, new plaster or paperfaced plasterboard, or another surface that has never been painted.
- When repainting a surface that is uneven or badly deteriorated.
- When painting a surface that has been stripped or is worn down to the original substrate.

Primers, sealers and undercoats for exterior timber

Timber is an especially difficult substrate for four main reasons.

- It has a natural tendency to rot and grow mould.
- When it gets wet it swells anywhere from 1-5%. This doesn't sound much but a 2% change over a board 20 centimetres wide is a movement in paint thickness terms of 4000 μms (4mm). *Remember that an average coat of paint is only 35 μms thick.* The end grain of timber is the major problem because water is absorbed through end grain about 50 times faster than through the face of the timber. It is extremely important to prime timber end grains.
- Timber is made up of fibres of cellulosic type material bound together by material called lignins. These fibres (like human skin) can be zapped or badly burnt by U.V. radiation from the sun. The surface of badly weathered timber can be likened to a bale of straw but with the binder twine cut. The surface fibres are just sitting there and if painted over, the new paint system would be expected to fail by blistering off in about 18 months time.
- Nail fasteners in timber will tend to rust in damp conditions.
- At Resene we have considered these problem areas and have a range of products carefully engineered and proven over time. We will cover these products one by one.

Resene TimberLock

Chemists from most other paint companies would say that sealers are not used or needed for exterior timber. At Resene, however, we have had extensive experience with trying to satisfactorily coat exterior Cedar and old, weathered timber. The big problem with both these substrates is that the timber surface fibres are poorly bound together as we have mentioned before. Resene have a unique sealer, called Resene TimberLock (see Data Sheet D48) to remedy Cedar and weathered timber surfaces. Resene TimberLock should not be relied upon as the only means of rejuvenating weathered timber and is best used in conjunction with thorough surface cleaning and sanding to remove grossly weathered fibres. Resene TimberLock is not needed if a Resene Woodsman stain is to be used

Resene TimberLock key features

- Specially developed as a sealer conditioner for new and weathered Cedar.
- Contains strong fungicides to hinder future mould growth. It will not kill existing mould.
- Will not magically transform rotten timber into usable timber.
- Penetrates into the timber surface and binds up loose wood fibres to rejuvenate the surface.
- Contains some U.V. blocking pigmentation.

Resene TimberLock, while ideal for rejuvenating old weathered timber, needs to be used in conjunction with proper surface preparation such as:

- Treatment of mould with Resene Moss & Mould Killer (see Data Sheet D80).
- Thorough scrubbing clean using Resene Roof Wash and Paint Cleaner (see Data Sheet D88).
- Thorough scraping out of cracks and split areas and removal of any rotten timber.
- Sanding to remove grossly weathered timber fibres.

Remember that Resene TimberLock is very high in VOC and therefore excellent ventilation is essential.

Resene Timber Surface Prep

Resene Timber Surface Prep (see Data Sheet D814) is a low VOC pigmented high build waterborne surfacer for solid timber. This can be used to upgrade and fill surface defects in solid timber substrates prior to application of waterborne finishing systems however it is not designed to fill major cracks or imperfections. Resene Timber Surface Prep is designed to be overcoated with Resene waterborne primers/finishes.

Resene primers for exterior timber

The Resene primers for exterior timber are Resene Wood Primer (see Data Sheet D40), Resene Decorator Alkyd, Resene Aluminium Wood Primer (see Data Sheet D46), Resene Quick Dry and Resene Decorator Acrylic Primer Undercoat. We have extensive performance data on Resene Wood Primer going back over 20 years. Our exposure panels show that this primer performs exceptionally well whether used under enamel or acrylic

paints. Resene Quick Dry Waterborne Primer Undercoat and the Resene Decorator Acrylic Primer Undercoat are specially designed to make them suitable for use under Resene waterborne enamels where excellent flow properties are so important. They can still be used wherever the old products were used.

The special features of these products are listed below with recommended special areas of use for each.

Resene Aluminium Wood Primer
This is something of a special primer in that its sole pigmentation is aluminium flake. Though slow drying, it is tolerant of less than perfect surface preparation. The aluminium flake in this primer forms a physical barrier to moisture. It therefore has better ability to stop staining and reduce gum bleeding. The aluminium flake also slows down its own dry by making it difficult for oxygen to reach the alkyd resin binder on the bottom.

RSR=12 DFT=38μms. Slow dry and difficult to recoat with acrylics. Recommended as best sealer over bleeding timbers and end grains. Best overcoated with Resene Enamel Undercoat for adhesion reasons.

Be realistic about what a primer such as Resene Aluminium Wood Primer can achieve. Note that with bad smoke damage the key to successful painting is in the preparation stage. Bad gum bleeding is a timber problem and can only be minimised by painting in pale rather than dark colours.

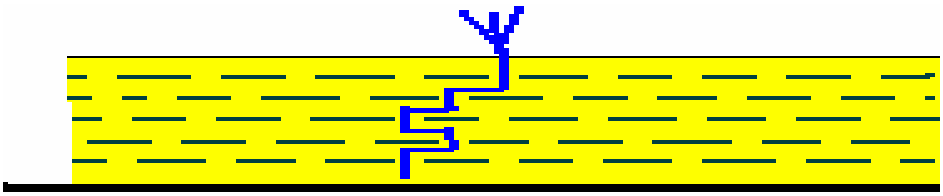


Diagram showing how difficult it is for water to pass through aluminium flakes in Resene Aluminium Wood Primer or Resene Alumastic.

Problems of cissing can occur when overcoating Resene Aluminium Wood Primer with a waterborne system. This can usually be overcome by allowing it to weather for a few days and by wiping over the surface with a turps soaked rag.

Resene Wood Primer
Resene Wood Primer is a solventborne primer with alkyd binder that contains anti fungal and anti corrosive pigment. RSR=12. DFT=46μms. Ideal for staining timbers such as Cedar, Redwood, and some Beeches. Better hold out for spot priming on repaint jobs.

Resene Decorator Alkyd Primer
Can be regarded as very similar to Resene Wood Primer.

Resene Quick Dry waterborne primer undercoat

Resene Quick Dry is a waterborne primer with acrylic binder. Contains anti fungal and anti corrosive pigment. RSR=12. DFT=38μms. Ideal for Matai and Totara (and for Interior particleboard type products). Interior/exterior primer for any non-staining timber. Ideal under Resene Enamacryl and Resene Lustacryl waterborne enamels. Best overall primer for non-staining timbers because of inherent durability and flexibility. Can be overcoated with Resene Uracryl.

Resene Decorator Acrylic Primer Undercoat
Can be regarded as very similar to Resene Quick Dry.

Resene Lumbersider
Resene Lumbersider is a self-priming waterborne with acrylic binder. RSR=12 DFT=35 Ideal for rough sawn timber. Apply at least 3 full coats. Won't stop stains.

Note:
RSR= recommended spreading rate.
DFT= dry film thickness when applied at RSR.

The colour of the primer
In the old days traditional wood primers were pink in colour, because they were based on red lead. The colour of wood primers is important because the pigments help screen out damaging U.V. light and protect the timber surface. There is an unfortunate modern tendency for painters to demand white coloured primers for exterior timber. This encourages overspreading of the topcoats because light coloured primers are easier to cover. Stronger coloured primers did ensure that at least two topcoats were applied over the primer. The great risk with white primers is that low quality painters will try and get away with only one topcoat or two thinly applied topcoats.

Whatever the colour of the timber primer is remember that it is coloured to prevent U.V. damage to the timber surface. Remember that primers need to be overcoated with a good solid paint system to be able to concentrate on their main job. They are not designed to be left uncoated or with minimal cover.

Oddball New Zealand timbers
Unfortunately in New Zealand, we have additional technical problems in priming timber because of oddball characteristics of our native timbers. Matai and Totara contain chemicals known as anti-oxidants. These act to slow down or stop the curing of alkyd resins and primers such as our Resene Wood Primer. We therefore recommend Resene Quick Dry to prime these timbers.

Other timbers such as Cedar, Redwood and some native Beeches contain water soluble extractives, which bleed or stain through acrylic primers, and we recommend the use of a solventborne primer such as Resene Wood Primer over them.

There are also many foreign timbers being imported into New Zealand, which are many and varied. Contact the Resene Technical Centre for advice on painting these.

The timber problems described below may or may not occur on all timber of these types. Timber from one tree may be better or worse than that from the next tree.

- **Totara and Matai:** Contain anti-oxidants that may prevent alkyd type paints such as Resene Wood Primer, Resene Sureseal, Resene Enamel Undercoat and even Resene Particle Board Sealer from drying. Lacquers, acrylics, moisture cured and two pack paints will not be affected by anti-oxidants. Therefore Resene Polythane (see Data Sheet D53), Resene Aquaclear (see Data Sheet D59) and Resene Quick Dry can all be used directly onto these timbers.
- **Redwood and Cedar:** These timbers contain water-soluble tannins that need to be blocked off by a full coat of Resene Wood Primer or Resene Aluminium Wood Primer. If dark colours or enamel topcoats are to be used there will be no need to take precautions against staining. Some other timbers such as our native Beeches are also known to stain.
- **Particle board and composite wood products:** These contain waxes that can inhibit the dry of solventborne paints. These waxes will not affect the drying of Resene Polythane, Resene Aquaclear, Resene Quick Dry, Resene Particle Board Sealer nor two pack products such as epoxies. Superflake Particle Board can contain small flakes of bleeding Cedar timber.

Timber identification

Cedar timber can be identified because it is very soft with a straight prominent grain. Other timbers on old houses can be difficult to identify and if in doubt a test patch can always be done. Technically the best approach, if in doubt, is to apply Resene Quick Dry and if any staining occurs switch to Resene Wood Primer and go over stained areas. Problems are only likely when bare timber is being primed.

Self-priming finishes

Another area to be considered under primers for timber, is the application of self-priming finishes direct to bare timber. The product to be used is, of course, Resene Lumbersider (see Data Sheet D34). Resene Lumbersider has been designed to be self-priming and a three coat system of Resene Lumbersider will perform almost as well as, say, Resene Quick Dry Waterborne Primer Undercoat and two coats of acrylic finish. The fungicidal and nail head corrosion features of our standard primers will be lost.

Weathered primers

We see many instances where factory primed weatherboards have been used or where a standard primer has been used and left to weather for some months. Factory primed weatherboards can be very problematical because the primer may be of dubious quality. Instructions on some LOSP treated timber instructs that the original factory primer should be first sanded to an even finish then primed with an alkyd primer followed by an acrylic primer. This is regardless of any weathering and is an indictment on the quality of the original primer (in our view).

The primer coat is not one that any risks should be taken with.

The primer will probably need treatment for mould and should certainly be thoroughly scrubbed down with Resene Roof Wash and Paint Cleaner. This should be followed by thorough sanding to remove surface chalk before repriming as if the old primer had not been applied. This sounds drastic but primers, especially alkyd types, are not made to weather and their high PVC will make them candidates for early chalking and film erosion.

Telltale signs that the existing primer needs attention are:

- A chalky surface.
- Mould growing on the primer.
- The timber grain texture showing.
- The primer appearing transparent in patches.
- Splits or cracks appearing in the timber.
- A Sellotape adhesion test fails.

If in doubt the old primer should be thoroughly sanded back to obtain a sound surface and a full coat of new primer applied

Tinting of primers

We are often asked why we can't tint Resene Quick Dry and Resene Wood Primer. The answer is that this would require extra water sensitive additives to be added to give good tinter acceptance and these additives along with the 'gunge' from the tinters themselves would add up to a serious compromise with the adhesion of the primer in wet conditions. The other aspect is to question why anyone would want to tint the primer. The probable reason is so they can get away with just one topcoat.

Dealing with fillers

This is not necessarily straightforward because some fillers require the timber to be primed first while with other fillers primers can compromise the fillers performance. If Resene Epox-O-Bond (see Data Sheet D808) is being used to fill gaps in timber the timber may be Resene TimberLock'ed first (this is an excellent treatment if rot has just been cut out) but not primed. Common fillers such as Selleys Permafill and Putty certainly require bare timber to be primed before use. Note that Permafill should be left 24 hours before painting over it even though it appears dry in a lot less time. Delamination may occur otherwise.

Dealing with putty on windows

Putty is made from linseed oil with limestone ground into it. It takes forever to dry properly and when hard dry it cracks and needs replacing. Painting over it can be problematical because of the drying time needed. Putty dries from the surface downwards and after 3-4 weeks of good weather new putty will have formed a hard skin on the surface about 200μms thick. At this stage it can be coated with either Resene

Enamel Undercoat or Resene Wood Primer. If painted too soon the uncured putty will cause these products to wrinkle. Resene Quick Dry is best avoided on new putty.

When painting over putty ensure that it is hard enough and clean and to take care to paint about 2-3 mm of the glass adjacent to the putty at the same time. This helps ensure that there is no gap to allow moisture to get between the putty and the glass.

Priming exterior timber doors and windows

These can present special problems because the top and bottom edges are very difficult to get access to once doors and windows have been hung. We strongly recommend that the top and bottom edges of doors in particular are double primed before fitting. When repainting doors, take them off their hinges wherever possible to enable proper attention to all faces that the weather can reach.

Failure to pay attention to properly priming doors and windows can result in swelling of the timber in wet weather and there will be problems opening and shutting them.

Undercoats for exterior timber

Undercoats for exterior timber are generally only needed for joinery with working faces which are to be finished in enamel paint. Resene Enamel Undercoat comes in a range of coloured bases and can be tinted to match the topcoat colour. This is really only necessary if a Resene Super Gloss (see Data Sheet D32) finish is to be used. There is some danger in using such traditional systems because if weathering results in the erosion of the topcoats then the exposed undercoat will chalk quite rapidly and be quite an eyesore.

When painting with acrylic systems it has become the accepted practice to use two full coats of acrylic over a primer. When this is done the first coat of acrylic is behaving as the undercoat.

Primers, sealers and undercoats for interior timbers

Some of the interior uses of timber can be almost as demanding as exterior situations. Kitchens and bathrooms can be subjected to steam, water, detergents and greases. Floors get severe abrasion from foot traffic and coatings on window joinery are subjected to sun and often water ponding.

Problems in old houses are often encountered because these potential hazards have not been recognised. For example:

- Mould and flaking paint on interior windows.
- Flaking paint on timber, around baths and laundry tubs.

As an example, new interior windowsill areas that are likely to suffer from ponding water as a result of moist air condensing on cold glass would be ideally first treated with Resene TimberLock, then given a full coat (on all sides) of Resene Quick Dry Waterborne Primer Undercoat before finishing in two full coats of Resene Uracryl 403. Resene Uracryl will

withstand the water ponding much better than standard enamels. A better recommendation is to double glaze.

It is important, therefore, to treat the timber in areas where water ponding may occur as if it were exterior. End grains and backs of boards should be well primed with a fungicide coating primer (ideally Resene Wood Primer) for best results. In other less harsh interior areas either water based or enamel undercoats may be used to prime timber.

Resene Timber Surface Prep is a low VOC pigmented high build waterborne surfacer for solid timber. This can also be used to upgrade and fill surface defects in solid timber substrates prior to application of waterborne finishing systems.

Sealing old varnish

Old varnishes get very hard as they age and it becomes very difficult to get a good key for adhesion. When re-varnishing the only satisfactory method is to thoroughly sand every square centimetre of the old varnish to provide a key for adhesion. When painting over varnish with coloured paints there is another option, which is to use an adhesion primer (or sealer).

Resene Waterborne Smooth Surface Sealer is ideal for this purpose but remember that:

- Thorough sanding is still strongly recommended as well.
- Waxes and or grease need to be removed first.
- Some surfaces may not need Resene Waterborne Smooth Surface Sealer at all (e.g. when wrinkling or frying of old varnish occurs).
- Vinyl imitation timber grain veneers may contain plasticisers which can migrate through coatings and cause drying problems.
- In cases where odd substrates are involved always recommend a test patch is done.

Composite wood products, such as Particle Board, Customwood and Medium Density Fibre (MDF) Board

Products, such as Particle Board, MDF Board, etc., contain waxes and solvent based systems may have problems with the waxes affecting the gloss level and even drying of these products. In all cases, Resene Quick Dry - waterborne primer undercoat should be used as a seal coat before applying any pigmented system, whether, waterborne acrylics or the solventborne enamels. Note that some composite wood products such as Triboard can be very rough grained and extra coats may be needed to fill in the rough surface texture.

For all interior clear finishes, such as Resene Qristal Clear and Resene Polythane, Resene Particle Board Sealer should be used as a seal coat before apply the clear finish. Resene Particle Board Sealer is a unique product designed for use under clear alkyd and polyurethane varnishes. It seals in all fibres and waxes used in the manufacture of particle, fibre, chip and strandboard.

Galvanised steel and Zincalume

Zincalume has recently replaced galvanised iron in the manufacture of corrugated iron roofing sheeting. The same rules for painting apply as did for the older product but care is needed when installing new material because of potential corrosion problems if different metal flashings are used etc. Zincalume is steel hot dip coated with a blend of 45%zinc metal and 55% aluminium metal as compared to 100% zinc metal on standard galvanised iron. The zinc and or aluminium save the steel from corrosion by sacrificial rusting.

Specialised primers are essential for the painting of galvanised steel or Zincalume. Alkyd binders will react with the zinc metal and turn to soap. There are many galvanised iron spoutings around the country that have enamel paint flaking off them for this reason. If acrylic paint is applied direct to these unprimed surfaces the result will be that the acrylic will allow moisture and salts to the surface and corrosion will actually be accelerated.

We strongly recommend that new galvanised iron or Zincalume is primed and painted as soon as possible. Never allow the roof to weather under the mistaken idea that this will remove the forming oils, etc. and that a little roughening of the surface, because some corrosion has taken place, is good for the adhesion.

New galvanised steel or Zincalume must be degreased before priming, by washing and scrubbing with Resene Roof Wash and Paint Cleaner Once the surface is clean apply either Resene Galvo One (see Data Sheet D41) solventborne primer or Resene Galvo-Prime (see Data Sheet D402) waterborne primer. We strongly recommend that these primer coats are applied by brush and worked well onto the surface. Both faces of any lap areas should be primed before roofing iron is put in place.

Weathering of galvanised iron primers

These primers have very specialised jobs to do and are not designed to be left without topcoats. Serious chalking and erosion can occur. Apply the topcoats as soon as practicable.

Galvanised steel and Zincalume in corrosive areas

Most cities in New Zealand are located beside the sea and are considered to be in either severe or very severe zones for corrosion. These zones are determined by measuring salt deposited from sea water around the country. Salt is one of the prime contributors to corrosion. All painters of metal substrates need to be aware that any work left overnight could have reasonable salt deposits on it the next morning, especially roofs. In these cases an extra wash down with copious quantities of fresh water is recommended at the start of each new day.

High corrosion zones in unexpected places

Areas close to the sea are not the only areas of severe corrosion. Areas sheltered from rain such as the undersides of canopies, walkways and spoutings accumulate windblown

salt that is not removed by rainwashing. These areas are considered to be 2-3 times as hostile as the surface of a roof because the salts on top of the roof are washed away each rainfall. We strongly recommend that these areas receive at least two full coats of primer carefully applied at the recommended spreading rates. If possible the use of Industrial products should be promoted for these areas

An excellent system for the underside of a canopy in downtown Wellington would be two full primer coats of Resene Armourcote 220 epoxy two pack primer (see Data Sheet RA34) (or two full coats of Resene Galvo-Prime) to be finished in Resene Uracryl (brush) or Resene Imperite I.F. 503 (spray) (see data Sheet RA81).

High corrosion zones are not always in locations next to the beach. Very localised zones of high corrosion exist when wind carried sea salt is deposited onto areas that are not washed by rain.

- This can be dependent on the prevailing wind in the region.
- Typical areas are: tops of garage doors, flashings sheltered by soffits, underside of gutters, underside of canopies or walkways.

Solutions:

- Prepare and paint these areas as soon as possible.
- Prime with at least two full coats of Resene Galvo One or Resene Galvo-Prime.
- Best solution: -Prime with two full coats Resene Galvo-Prime (or Resene Armourcote 220) then topcoat with at least two full coats of Resene Uracryl 403.

These zones are equally applicable to steel as they are to galvanised surfaces.

Weathered galvanised iron or Zincalume

If the surface is weathered galvanised steel or Zincalume, either because the roof was not painted initially, or because of bare, weathered areas that have lost their original coatings, and requires spot priming, then Resene Galvo One should be used and not Resene Galvo-Prime. Such a weathered surface is covered with white zinc corrosion products. These must be removed by scrubbing the zinc surface with a stiff bristle brush, using Resene Roof Wash and Paint Cleaner. During surface preparation as much corrosion should be removed as is practicable. Care is needed not to damage any remaining sound zinc coating.

Badly weathered roofing iron

An ideal way to paint old badly weathered unpainted roofing iron is by the use of Resene Alumastic (see Data Sheet RA402). This is a two pack product with an extremely high volume solids of 90%. When applied to a surface that has had all salt removed from it and been prepared as well as is practicable it does the job of primer, undercoat and finish coat all at once. Resene Alumastic contains special resins to wet well into rusty areas and the pigmentation of Aluminium flake provides excellent water barrier properties. We recommend that badly rusted areas are first spot primed (using Resene Alumastic) and then a full coat of Resene Alumastic is applied at 5 square metres per litre.

Resene Galvo One
As we mentioned earlier Resene Galvo One has an outstanding record as a galvanised iron primer in New Zealand going back over 20 years. For many years it was the only quality single pack primer available on the market suitable for collecting drinking water from roofs. Resene Galvo One is strongly recommended on all new roofs but is especially recommended for spot repairs of weathered areas. Over hand tool cleaned areas of red rust use two full primer coats of Resene Galvo One.

Resene Galvo-Prime
Resene Galvo-Prime is the result of extensive development work and it has achieved outstanding results.

Resene Galvo-Prime is not recommended over weathered Zincalume or galvanised iron. If the substrate is weathered we recommend the use of Resene Galvo One or one of the Engineered Coatings primers such as Resene Armourcote 220 or Resene Alumastic. Note that the performance of these primers is still dependent on good surface preparation to remove corrosion.

Resene Galvo-Prime is a waterborne galvanised iron primer ideal for use on new galvanised iron or Zincalume. It has been evaluated in salt fog cabinets and has superb corrosion prevention abilities. To be effective Resene Galvo-Prime needs to be applied evenly at the recommended spreading rate of 12 square metres per litre. If Resene Galvo-Prime is thinned then lower film builds will result which will compromise performance.

Resene Galvo-Prime is ideal for spot priming nail heads on fibrous cement sheeting. If these rust at a later date they result in very unsightly rust staining which is very difficult to repair.

Apply two full coats to garage doors and guttering for best longer term results. These areas often accumulate salts.

Resene Galvo-Prime can be overcoated with any of our exterior acrylic paints but Resene Hi-Glo will be the best of these for durability. Resene Uracryl 403 can be used over Resene Galvo-Prime when there is a requirement for extra durability.

Resene Alumastic is a specialised primer/undercoat/finishing coat all rolled into one. It should not be used as a primer for other products and must not be applied over old acrylic type paints.

Resene Vinyl Etch
Resene Vinyl Etch (see Data Sheet RA31) may be used over galvanised steel or Zincalume. While this is not the first choice, it is a useful addition to the range and may be used on these two metals in areas that are not rated as highly corrosive.

Other non-ferrous metals (Aluminium, Brass, Bronze, Copper, Zinc)

By definition a ferrous metal is one that contains iron, such as mild steel or cast iron. Hence, a non-ferrous metal is one that does not contain iron. In practise we would normally class the following metals and metal alloys as non-ferrous:- Aluminium; brass; bronze; copper; zinc

We have already dealt with zinc when discussing galvanised steel. Generally Resene Vinyl Etch is suitable for all the non-ferrous metals or alloys. Resene Galvo-Prime may be used on new aluminium. Aluminium tends to be covered in a layer of oxide and is often greasy. Degreasing with Resene Roof Wash and Paint Cleaner and wet sanding to remove the surface oxide layer will help adhesion of primers. Badly weathered aluminium will be covered in a coating of oxide and may be deeply pitted in bad cases. Thorough sanding is recommended to remove corrosion and pitted areas.

Brass, bronze and copper require a thorough sanding back to bright metal. This is particularly important with copper, where the oxides have to be removed. It is also important to achieve some sort of mechanical key through sanding. We recommend wet sanding with 400 grit wet and dry paper. When the surface is properly prepared Resene Vinyl Etch Primer adheres very well. If a clear finish is desired over these metals Resene Uracryl 403 Clear adheres very well to properly prepared surfaces.

Lead

One other non-ferrous metal that needs to be considered is lead. Lead is quite resistant to corrosion. But, the dull looking lead we are so familiar with does have an oxide layer on its surface. This must be removed by abrading to bright metal. Resene Vinyl Etch Primer then sticks quite well to this surface. Lead is normally painted for appearance purposes not necessarily to stop it corroding.

Stainless steel

Another metal that is occasionally painted for decorative purposes is stainless steel. Under normal circumstances, stainless steel does not corrode, and while it is generally best to leave stainless steel unpainted, Resene Vinyl Etch Primer does provide the key that is necessary for the adhesion of subsequent coats if a painted finish is desired. Always ensure it has been thoroughly degreased with Resene Roof Wash and Paint Cleaner before priming.

Resene Vinyl Etch Primer probably has the least ability to withstand weathering without a topcoat. Whenever it is used always try to apply the finishing coats as soon as possible.

Primers for mild steel

Mild steel is probably the easiest of substrates to paint, but can the most difficult if not properly prepared. Steel is chemically unstable. In the presence of moisture, oxygen and an electrolyte, such as salt, it very quickly rusts. The purpose of painting steel is to keep

these three elements of corrosion away from the steel surface. A paint system for steel must be able to keep salt, oxygen and water away from the bare metal surface.

Surface preparation of the steel surface is also important. All traces of salts must be removed, as must red rust and mill scale. There is little point in having a system that is trying to keep oxygen and water away from the surface, if there is salt there encouraging the water to come through the coating. Also there is little point in going to this trouble if there are areas of differing electrochemical potentials, caused by the presence of mill scale and other contaminants that will cause electrolytic cells being set up.

Degrees of surface preparation for steel

Unfortunately steel does not remain pure for very long and is usually in some stage of rusting. The type of primer to use on steel is very surface preparation dependent.

For more detail on the preparation of steel refer to the front pages of the Resene Engineered Coatings Manual.

Hand tool cleaned steel

For hand tool cleaned steel our Resene ArmourX Rust-Arrest (see Data Sheet RA30a) is ideal. Resene ArmourX Rust-Arrest is an oil modified alkyd primer made to conform to the Australian Standard specification for steel primers. The oil modification of the binder system slows the dry time considerably and allows for extra wetting out of the rusty surface. The primer is also loaded with Zinc chromate anti corrosive pigment. Remember though, that painting of steel that has not been abrasive blast cleaned back to bare, shiny metal is a compromise solution. The poorer the surface preparation, the lower the life expectancy of the system. Resene Alumastic can also be used for hand-tool cleaned steel.

Power tool cleaned steel

This method of preparation a considerable step up from hand tool cleaning and is generally only suited for professional applicators. Resene ArmourX Rust-Arrest can be used with better results than expected from hand tool cleaned steel. The Resene Engineered Coating Systems primers Resene Alumastic, Resene ArmourZinc 120 and Resene Armourcote 220 can also be used but it is best to consult a Resene Engineered Coating Systems representative prior to starting to ensure the optimum system is selected.

Abrasive blast cleaned steel

If your are going to the expense of abrasive blast cleaning steel then we would strongly recommend the use of an inorganic zinc primer such as our Resene Zincilate 10 (see Data Sheet RA20) and Resene Zincilate 11 (see Data Sheet RA21). These primers need to be spray applied by specialists and give a Rolls Royce priming system. They provide a finish very similar to that of galvanised steel. The major benefit is that if subsequent topcoats get damaged the Inorganic zinc prevents underfilm corrosion. Again we strongly recommend that it is best to consult a Resene Engineered Coating Systems representative prior to starting to ensure the optimum system is selected. Inorganic zinc primers require a blasted profile for adhesion purposes.

Resene ArmourX Rust-Arrest
Made to an old specification for the Ministry of Works that matched Australian Standard ASK211. This was heavily modified with linseed oil to help wet into rusty surfaces.

Resene ArmourX Rust-Arrest is very slow to hard dry. At least 48 hours are needed in good temperatures.

- If applied in heavy coats thicker than 50 μms the dry will take even longer.
- When using two pack products on top allow an extra day for hard drying.

Two full coats of Resene ArmourX Rust-Arrest are recommended over hand tool cleaned steel. Remember that as for other primers the subsequent performance will be highly dependent on the degree of surface preparation carried out.

Paperfaced plasterboard

Plasterboard and critical light

Ranchsliders, massive windows, super smooth finishes and monolithic walls are a headache for many causing critical light conditions and less than perfect finishes on walls as the glancing light shines a spotlight on any surface imperfections. Often the problem is only evident for a short period each day when the light is at a certain angle, but whether a one hour a day or all day problem, the issue is likely to be unacceptable to the owner.

The situation is made worse when the level of finish is insufficient, such as a Level 4 finish when a Level 5 finish is needed. To achieve a Level 5 finish the entire surface of the paperfaced plasterboard and stopping should be skimcoated. The Resene Broadwall range has undergone a leap in innovation to improve efficiencies in level 5 finishes.

This can now be achieved by brush or roller with Resene Broadwall Surface Prep & Seal or by specialist spray application with the more recently released Resene Broadwall 3 in 1 (see Data Sheet D810).

Resene Broadwall 3 in 1
Resene Broadwall 3 in 1 is aptly named providing three different use functions - a sealer (when thinned), a surfacer and a finish coat on ceilings tinted to a range of popular Resene off-white and neutral colours. It is designed for use over stopped and jointed wall systems in place of traditional surfacers and sealers. It equalises surface porosities; smoothes minor surface irregularities; minimises textural differences; and provides a perfect base for subsequent Resene finishes. If using this product to provide a high build basecoat it can also be used as a sealer on timer and reconstituted timber products (architraves). It is not designed to fill major cracks or imperfections or to block waterborne stains. It also must be sealed in wet areas prior to topcoating.

Resene Broadwall Surface Prep & Seal
Resene Broadwall Surface Prep & Seal is a high build basecoat designed for roller application over stopped and jointed wall systems providing a skim coat and sealing

system in one. It equalises surface porosities; smoothes minor surface irregularities; minimises textural differences; seals the surface and provides a perfect base for subsequent Resene finishes. If using this product to provide a high build basecoat it can also be used as a sealer on timer and reconstituted timber products (architraves). It is not designed to fill large gaps or cracks (use an appropriate stopping or finishing compound) and also not designed to block stains.

Painting over skim coats

Skim coats are not all born equal. Some are far superior in quality than others. Important features of a skim coat apart from the obvious one of equalising porosity are that it has:

- Excellent hiding power.
- Excellent sandability.
- Good cohesive strength when dry.
- Good cohesive strength when wet as may occur when overcoated.

Good cohesive strength means the coating is tough enough not to be pulled apart like the butter in a sandwich if you dismantle it.

Poor quality skim coats can be identified because the dry surface can easily be removed with light thumbnail pressure or by rubbing with a wet finger. These types of skim coats should only be sealed with Resene Sureseal and even then no guarantees given about the system performance. On new paperfaced plasterboard in wet areas such as bathrooms, laundries and kitchens, Resene Waterborne Smooth Surface Sealer or Resene Sureseal are recommended.

Paint is limited in being able to protect gypsum based wallboards from the rigours of steam and hot water. The basic problem is that gypsum will dissolve in water.

Where to use sealers

Resene Sureseal is strongly recommended for:

- Sealing wallboards in wet areas such as kitchens, bathrooms and laundries.
- Sealing surfaces containing water soluble stains (old yellowed paperfaced plasterboard.
- Over all wallboards if masking tape is to be used after or during painting.
- On crumbly concrete surfaces, especially old roofing tiles.
- To help bind up low quality skim coats.
- Sealing wallboards prior to hanging new wallpaper.

Resene Waterborne Smooth Surface Sealer is recommended for:

- An adhesion coat over old polyurethane type varnish that is to be painted in a solid colour.
- An adhesion coat over old two pack products
- An adhesion coat over old Resene Sidewalk type flooring paints.
- An adhesion coat over very smooth concrete.

- An adhesion coat over Formica, melamine, glass, ceramics, GRC panels and powder coated objects.
- Sealing new paperfaced plasterboard in wet areas such as kitchens, bathrooms and laundries. (If the paperfaced plasterboard is old or stained, use Resene Sureseal in place of Resene Waterborne Smooth Surface Sealer).

Note that Resene Vinyl Etch Primer can be used in place of Resene Waterborne Smooth Surface Sealer and is preferred for any metallic surfaces such as copper, brass etc.

Resene Broadwall Waterborne Wallboard Sealer is recommended for:
- For interior use only.
- For sealing wallboards in non wet areas.
- For sealing good quality skim coats in non wet areas.

Resene Broadwall Waterborne Wallboard Sealer is:
- Formulated on a unique blend of fortified 100% acrylic resins with special penetrants. This results in substantially better adhesion to plaster type surfaces than standard acrylic paints.
- Excellent sanding properties due to the special resin blend along with a high loading of talc pigment. The resin-pigment combination is designed to minimise porosity and textural differences.
- Easily applied by brush, roller or airless spray.
- Excellent hold-out of topcoats and very good opacity.
- Waterborne so brushes etc. clean up in water and has both Environmental Choice (NZ) and Good Environmental Choice (AUS) approval.
- Can be recoated in 2 hours.
- The solvent type and content has been kept as low and innocuous as possible while still maintaining good film formation and low temperature curing properties. The polymers chosen were selected to have the lowest possible odour and monomer level.
- Contains no VOC resulting in very little fibre raising of paper when applied over paperfaced plasterboard. Fibre raising is usually related to the solvent (or VOC) content of sealers.

Limitations
- Not a surface reconditioner for crumbly or excessively porous surfaces. Use Resene Sureseal.
- Will not stop water soluble stains. Use Resene Sureseal.
- Not for exterior use and is not recommended for wet areas such as showers, kitchens, bathrooms and laundries. Use Sureseal.
- Will not 'fix' poorly stopped plaster walls in areas of critical lighting. Use a skim coat or hang lining paper. Refer to AS/NZS standard 2589
- Not recommended for very powdery or porous surfaces. If, after dusting down, a suspect surface continues to come off (as chalk would from a blackboard) with a light finger rub, then Resene Sureseal is advised to bind up the substrate. Note, in some cases, even Resene Sureseal may struggle to produce a sound substrate.

- Do not apply at temperatures below 5°C nor in conditions of high humidity.

Wallpaper

Those familiar with painting over wallpaper will shudder at the mention of plasticiser. Painting directly over vinyl wallpaper can cause the plasticiser hidden in the vinyl wallpaper to migrate through to the topcoats affecting the cure of the coating and leaving a sticky surface. To alleviate this problem many simply removed the wallpaper, expending much time and energy in the process, before coating the surface in paint. While this resolves the sticky surface issue, it is a resource intensive option and not for the fainthearted.

Recognising the need for a quick and easy method of coating vinyl wallpaper, Resene have introduced new Resene Vinyl Wallpaper Sealer. Designed to be applied direct to the vinyl wallpaper, Resene Vinyl Wallpaper Sealer seals in the plasticiser leaving the surface ready for finishing with the desired topcoats. Those wishing to take advantage of the texture of the existing wallpaper can safely seal the vinyl wallpaper with Resene Vinyl Wallpaper Sealer and follow this in the desired topcoats leaving a freshly coated surface with the texture of the original wallpaper.

Primers and sealers for concrete and other cementitious surfaces

For more information refer to the 'A closer look at concrete' module.

Concrete is a very stable and generally an ideal substrate to paint. There are a few problems to be aware of such as:

- Concrete is very alkaline when fresh and will turn alkyd type paints to soap.
- Acrylic paints are highly alkali resistant and ideal for use over concrete.
- Concrete on floors need special surface treatment to roughen it up in order to provide the extra adhesion needed when it is subjected to traffic. Acid etching or captive shot blasting are common methods used to achieve this.
- Concrete needs to be kept damp for the first few days (longer if possible) after being poured to ensure it cures properly.
- Aged concrete can become crumbly and need sealing with Resene Sureseal. (especially old concrete roofing tiles).
- Concrete cancer or spalling problems (rusting of reinforcing steel).
- Efflorescence due to very porous concrete or concrete not adequately cured.
- Failure of sealants in expansion joints

Primers and sealers for other unusual substrates

Bituminous surfaces

These are notoriously difficult substrates to get any coatings to adhere to. They are usually black in colour and when touched with a turps wet rag immediately give a black stain. Resene Membrane Roofing Primer (see Data Sheet D49) has excellent adhesion to all sorts of bituminous surfaces and rubber sheeting, including Butyl Rubber Membrane

Sheeting (Butynol) used on roofs, Flintcote type waterproofing paints used on concrete buildings, Bituminous Substrates and Asphalt Tennis Courts.

Although Resene Membrane Roofing Primer has better adhesion to these types of surfaces than any other products we know of there are no guarantees it will be 100% satisfactory. This caution is needed because there are a thousand and one other oddball factors that we can never know about.

Use only waterborne paints over any bitumen substrate because black bleeding (staining) or plasticiser migration may occur. This applies whether or not Resene Membrane Roofing Primer has been used.

Miscellaneous smooth surfaces

Resene Waterborne Smooth Surface Sealer is basically an adhesion primer for smooth surfaces. It is not there to bind up crumbly substrates or seal off stains. Resene Vinyl Etch Primer can be used in place of Resene Waterborne Smooth Surface Sealer and is preferred for any metallic surfaces such as copper, brass etc.

It is worth noting that μPVC Gutters and Downpipes do not need an etch primer before overcoating with an exterior acrylic finish. In fact any coating rich in solvents may cause permanent damage to PVC by making it brittle. PVC may be covered in form oils that will require removing with Resene Roof Wash and Paint Cleaner and water. When painting acrylics directly onto PVC, adhesion can be improved slightly by sanding with P220 sandpaper. Acrylics also take about a week to develop full adhesion over PVC. Don't panic if an acrylic paint doesn't seem to have good adhesion on the first day.

Remember not to use dark colours over PVC. If it gets hot in the sun it may buckle and will not return to its original shape.

Standard weathered COLORSTEEL® will not require a special primer, provided that the surface is washed free of chalk, etc. This also assumes there is no corrosion. COLORSTEEL® VP has a coating similar to our Resene Polymeric AV8 (see Data Sheet RA63). Recoat with acrylics only. Apply directly after cleaning.

Coilcoat ZRX has a polyvinylidine flouride type coating. There are other substrates such as Lucobond and Aluclad that have similar factory applied coatings. We have found in the Lab that thorough sanding and cleaning provides a good base for Resene Vinyl Etch.

It always pays with suspect surfaces to recommend a test patch first and consult Resene if in doubt.