

Clear coatings for timber and cementitious surfaces including anti-graffiti

Introduction

A gloss clear coating is essentially a paint that contains no pigment - only binder and additives. As the name implies, the film it forms is transparent, permitting the substrate to be seen through the coating. Satin and other lower gloss level clears are pigmented using very special, very clean silicas and waxes. The silicas are usually made synthetically and are an art form in themselves. It is very difficult to achieve a true matt finish with a clear coating without it tending to go milky.

Waxes in clear satins give the coating slip and mar resistance. This means that rather than scratching or marring the surface a heavy object tends to slide off because of the slipperiness of the wax. Silicone additives can also be used to achieve this both in clear and pigmented paints.

As with paints the level of special pigments affects the performance of clears. As PVC (pigment volume concentration) increases, general durability decreases.

The special flattening pigments and waxes used in satin clears have almost zero ability to block out U.V. light. Clears can be made with special clear U.V. absorbing chemicals but levels need to be high and these additives are extremely expensive and do not last forever. Effective exterior clear coatings over timber need to be applied in about 5-10 coats and when they start to fail total stripping back to bare timber will be required. The usual mechanism for failure is that the timber underneath the coating is degraded by the few percent of U.V. rays that get through the coating. These rays act very much like lead poisoning in that their effect is cumulative. 1% getting through for 10 days has the same destructive force as 10% getting through in one day.

The performance of clear coatings both exterior and interior is very much dependent on the binder's features. Polyurethane alkyds for example have excellent water resistance and general toughness but have very poor resistance to U.V. light. The old issue of fitness for purpose arises. Polyurethane alkyds are great for indoor furniture but very poor in exterior situations.

Resene do not recommend clear coatings for exterior timber.

Timber

Timber is one of the most inherently beautiful building materials known to us. It is only natural that people desire a coating for timber that preserves the infinite variety of grains and colour. Indeed these needs are met perfectly for timber used in an interior environment; the problems arise when timber is on the exterior.

In order to understand the reasons for this, one must first consider the surface chemistry of timber.

Most timber is made up of cellulose fibres arranged in long, slender, hollow tubes or cells. The cellulose fibres are bound together with lignins, hemicellulose, and a wide variety of compounds lumped together under the term 'extractives'. The thickness of the cell walls and the ratio of cellulose to lignins varies with seasonal growth so that the surface of any piece of timber is, by nature, a non-uniform substrate.

Timber is in general a very stable material retaining its mechanical and chemical properties over long periods of time. It will however, undergo cyclical changes of expansion and contraction with heat and cold: and swelling and shrinking with the ingress and egress of moisture. This dimensional instability with moisture varies from species to species and has been correlated with the 'paintability' of individual species.

The chemical stability of the timber surface is poor under the influence of U.V. light. Under such circumstances wood loses methoxy groups and lignin, with a corresponding increase in acidity and the evolution of formaldehyde and methanol. Loss of these elements creates voids in the timber which results in enlargement of the cell orifices and cracking of the cell walls. Areas of high lignin content are more prone to U.V. damage than areas of low lignin content. These chemical changes are accompanied by a colour change towards grey and the exposure of loosely bound cellulose fibres on the surface of the timber.

The prime considerations for a coating for timber, therefore, must be:

1. Moisture impermeability.
2. Ability to resist U.V. degradation of itself and to screen the timber from U.V.
3. Flexibility.
4. Heat reflection.

Clear coatings do not easily match the requirements of a coating for timber because:

1. They cannot reflect heat, as any heat reflecting pigments will reduce or eliminate the clarity of the coating.
2. The path through the film for moisture is very short and unimpeded due to the absence of pigments.

3. A clear coating designed to allow the unrestricted passage of visible light cannot entirely stop the passage of closely related (and damaging) U.V. light.

Clear films however, can be designed to have excellent resistance to U.V. light in themselves and this, in general, was the tack that manufacturers took. Results are generally disappointing as U.V. resistant films failed in a classic pattern.

1. Cracks developed in the coating/timber system due to moisture penetration and swelling of the timber.
2. Rapid attack by U.V. and moisture at the site of the crack.
3. Colonisation by mould at the timber interface and further sideways attack.
4. Loss of adhesion around cracks resulting in 'peel-back' and discolouration of the timber.
5. Simple clear oil treatments are not subject to this 'peel-back' problem but they erode so rapidly that constant maintenance is required.

The route to achieving a satisfactory clear finish for timber must take into account the twin enemies of water and U.V. light. Experience shows that it is unlikely that a suitable coating polymer will ever achieve vapour barrier properties so one must accept that water will get to the timber and the timber will subsequently move. The aim must then be to achieve a film flexible enough to move with the timber and thus resist cracking. This tends to bar most thermosetting polymers.

The second objective is to design a binder system that not only is U.V. resistant in itself but has the ability to screen the timber from the damaging rays by absorbing them. This technology is not new and for years suntan lotions have been using organic U.V. absorbers. Such materials have been adapted for coatings and improvements can be shown. Unlike the suntan lotion, however, the clear finish ideally should last for some years and it is in the area of long term cost/performance that there is serious doubt about organic U.V. absorbers.

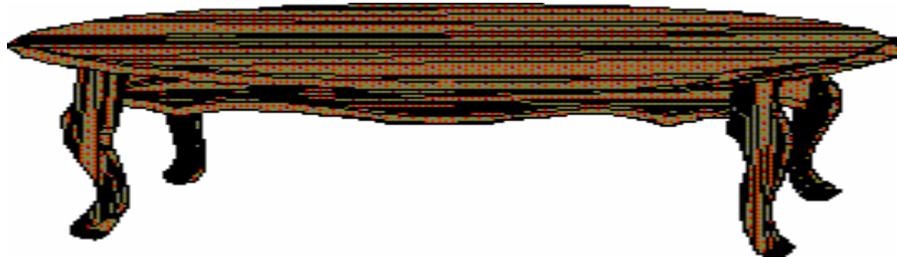
Recent years have seen the availability of some synthetic iron oxides pigments in so fine a form that they become transparent in vehicles. More recent work has shown that even though transparent to visible light, they remain very effective U.V. absorbers. They also have the advantage of being virtually permanent. The disadvantage is that they are coloured but at the use level the colouring is slight, so slight that it is virtually unnoticeable over timbers such as cedar and redwood. These pigments are utilised in timber stains such as Resene Waterborne Woodsman ([See Data Sheet D57](#)) to improve their U.V. resistance.

Interior clear coatings for timber

Clear coatings designed for interior use are employed mainly on bare or stained wood surfaces. Examples include wood furniture, doors, windows, and trim, floors and bar-

tops. For environmental reasons always try and use products with lower VOCs such as Resene Aquaclear ([See Data Sheet D59](#)).

Clear coatings can be formulated with a variety of binders, such as polyurethanes, acrylics, alkyds, and phenolics. Most interior clear coatings are referred to as 'varnishes', which are thinned with either mineral turps or water.



In the old days a table such as this one may have been finished by a process called French polishing. This involved an insect shell derived lacquer called shellac, which was dissolved in meths. The lacquer was applied in dozens of applications by polishing it onto the surface with special cloths.

Many wood furniture producers still use fast drying nitro-cellulose based clear 'lacquers' because they dry so fast and allow early handling. Resene do not supply this market, which is very specialised and for spray application only.

All clear coatings should be stirred carefully before application to avoid foam entrapment that can result in 'craters' in the finished job. Satin or matt finish clear coatings contain flattening pigments and should be stirred from time to time during the course of longer jobs to ensure even sheen levels.

If small craters or specks do develop in solventborne clear coatings, they can be removed by gently rubbing the surface with extra-fine steel wool between coats.

When using waterborne clear coatings, it is best to gently sand the surface between coats with very fine sandpaper (P400). (Steel wool should not be used with waterborne clear coatings, since small particles of steel left on the surface can rust when the next coat is applied.)

Special attention should be paid to creating a dust free area in which to apply clear finishes. A thorough dust and vacuum should help greatly. Be careful not to use old brushes or rollers with dried out paint embedded in the bristles. Sometimes these bits come loose or the strong solvents in the clear coating may redissolve old acrylic paints. It is almost impossible to achieve a perfect bit free finish with clears. Don't be too critical.

Tips for using Interior clear finishes

- Avoid shaking clear finishes as this may entrain air.
- Stir gently with a broad knife or clean stick.
- Ensure satin and matt finishes have no settling.

To remove small air bubbles in applied clear:

- For solventborne clears use fine steel wool.
- For waterborne clears use zinc stearate P400 sandpaper. Wipe clean with a turps damp cloth before recoating. Otherwise next coat may ciss!

Sand with zinc stearate P400 sandpaper before the final coat of clear to remove small nibs etc. Wipe clean with a turps damp cloth before recoating.

As a final surface preparation step wipe down bare timber or old varnish with a tack-rag. It is extremely difficult to achieve a smooth bit free finish with clears. Contamination from airborne dust and bits of old paint and gunge embedded in brushes and rollers are hard to prevent.

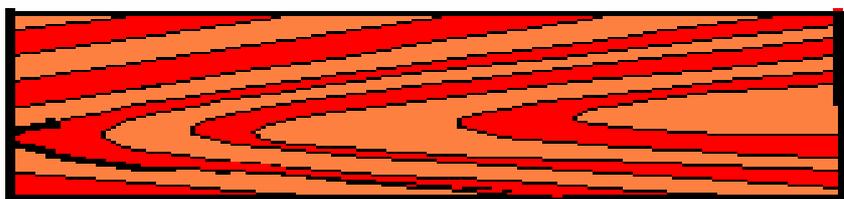
Recoat within 24 hours or thorough sanding will be needed to get adhesion. Old varnishes will be very difficult to get adhesion to. Very thorough sanding is required. Solventborne clears will tend to darken the timber whereas waterborne clears will not. Do a trial on an off cut of timber if not sure of colour.

1. Natural oil finishes

Solventborne oil finishes are made with drying oils, usually either linseed oil or tung oil (also called chinawood oil). They actually penetrate the wood to which they are applied and are suitable for most applications to bare or stained wood.

Oil finishes, such as Danish or tung oil, are generally applied just like wiping stains - by brush or rag, then allowed to dry for a short period before the excess is removed with a clean cloth. Application of two or more coats will produce a rich, satiny appearance on the wood.

These products will perform disastrously in exposed, exterior situations.



Resene Danska Teak Oil can be used to 'bring out the grain' of timber. This type of product is very slow to dry however and can create serious problems if topcoats of polyurethane varnishes are required. We recommend the use of a thinned coat of Resene Cristal Poly-Gloss.

Generally speaking, oil finishes should be allowed to dry for at least 48 hours between coats. Here, again, be sure your customers follow the manufacturer's recommendations for dry time. Resene Danska Teak Oil is the Resene offer in this area.

Disposal of rags used for oiling timber or cleaning up spills of varnishes

Rags or papers soaked with oil-based paints or varnishes can catch fire through spontaneous combustion. After use dispose of such rags by submerging them in a pail of water. This also applies to rags that may be used for applying Resene Scumbling Glaze ([See Data Sheet D308](#)) or Resene Waterborne Colorwood ([See Data Sheet D50a](#)) type stains. Yes! Resene Waterborne Colorwood included!

2. Solventborne alkyd and urethane-alkyd (polyurethane) varnishes

These types of varnishes have broad utility, and are often used on floors, steps and trim, as well as on furniture. They are best applied with a good quality natural bristle or polyester brush. When applying alkyd and urethane-alkyd varnishes, such as the Resene Qristal range of products ([See Data Sheet D52](#)), care should be taken to avoid forming bubbles that may not break as the coating dries.

The coating should be stirred using only a gentle motion and never shaken; brushing should be done slowly and carefully.

Drying of polyurethanes

Allowing the proper dry time is very important when using urethane-alkyd varnishes. If the dry time is too short (typically, less than a few hours), the second coat can attack the first coat, and cause wrinkling or blistering. On the other hand, if the dry time is too long, the second coat may have inadequate adhesion to the first coat. If the first coat has been allowed to dry for more than 24 hours, light sanding will help the second coat adhere properly. We always recommend lightly sanding the penultimate coat of polyurethane to help achieve a fine bit free finish.

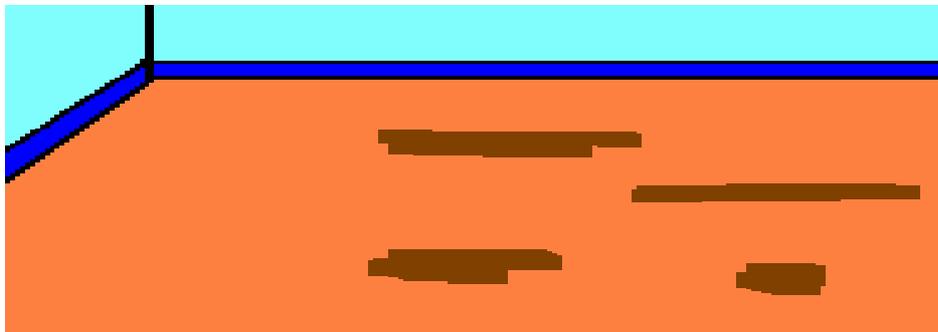
See the Resene Putting your safety first brochure for polyurethane safety issues.

Resene clear finishes for interior timber

The Resene Qristal range of polyurethanes is designed for interior timber joinery and furniture. With interior varnishes rather than have a specialised sealer or primer, it is normal to use either the standard Resene Qristal Poly-Satin or the Resene Qristal Poly-Flat as the sealer coat over bare timber. The flattening pigments in these products act to seal off the timber. Finishing coats of the desired gloss level can then be applied. Unfortunately the situation can be complicated if different timber types are being used.

- For Matai or Totara timber the anti-oxidants in the timber may prevent Resene Qristal products from drying. We recommend that these be sealed by using Resene Aquaclear.
- Note that timber to be coated in Resene Polythane ([See Data Sheet D53](#)) does not need a special sealer. Resene Polythane will not be affected by anti-oxidants.

- Resene Particle Board Sealer ([See Data Sheet D43](#)) and Resene Waterborne Colorwood are based on a water-soluble alkyd resin and can be effected by the anti-oxidants in Matai and Totara.
- If customwood or other composite wood products are being coated the waxes may also retard the dry of Resene Qristal Polyurethanes. We recommend that these be sealed by using untinted Resene Waterborne Colorwood.
- Resene Polythane can be applied directly to particle board floors and has the effect of darkening the timber quite dramatically. This can enhance the appearance in some eyes.
- When Resene Particle Board Sealer is used on particle board floors the colour of the timber remains almost unchanged in colour. If Resene Particle Board Sealer is used under Resene Polythane on floors extreme care is needed to ensure there are no holidays in the sealer layer. When the Resene Polythane is applied any holidays will appear as dark patches that can only be removed by sanding all the varnish off.



Holidays in Resene Particle Board Sealer are well highlighted by the first coat of Resene Polythane.

- The use of Resene Particle Board Sealer will save 2-3 coats of Polythane because Polythane is very thin and low on solids content. 2-3 coats can be applied over particle board before the surface of the timber is covered in varnish.
- Staining can be a problem over Totara and Matai and composite wood products because the Resene Waterborne Colorwood is based on an alkyd binder and may not dry. At present our best recommendation is to not stain these timbers at all.

3. Applying stains to interior timber

Resene Waterborne Colorwood ([See Data Sheet D50a](#)) is a slow drying waterborne, alkyd based penetrating stain. Resene Waterborne Colorwood is best wiped on using a good quality lint free cloth. Before they attack their favourite book shelf advise customers to practice on a timber off-cut to ensure the depth of colour is to their liking. Resene Waterborne Colorwood does take some time to fully soak into timber and it is possible to vary the depth of colour by how much is wiped off in the first few minutes.

Timber staining tips

- The untinted Resene Waterborne Colorwood Tint Base can be used to lighten the depth of colour of a stain.

- Resene Waterborne Colorwood on floors needs to be applied perfectly and be thoroughly dry before painting over.
- For blonding mix 5-20% of Resene Quick Dry ([See Data Sheet D45](#)) waterborne primer undercoat white into Resene Waterborne Colorwood tint base.
- Do not recommend any of the Resene Woodsman range indoors. The solvents are very strong and adhesion of polyurethanes to it is suspect.
- Apply Resene Waterborne Colorwood with a good quality lint free cloth wiping with the grain. When satisfied with the depth of colour wipe off as much excess stain as is practicable.
- Stir up Resene Waterborne Colorwood well before and during use to ensure uniformity of colour

Colour issues when staining

Remember that Resene Waterborne Colorwood Tint Base can be used as a reducing base if the stain is too dark. Non standard colours can be achieved by blending different colours together but this can be a risky exercise as producing the same colour twice will be very difficult. Always make sure there is enough to complete the job.

Different batches of Resene Waterborne Colorwood should be assumed to be slightly different in tone and boxed together if they are going to be used on the same piece of joinery of furniture.

The colour you get from using Resene Waterborne Colorwood is dependent on the colour of the timber used. Because Resene Waterborne Colorwood is semi-transparent the actual colour obtained is the 'reaction' between the timber and the stain. Different timbers will stain quite differently from the same can of Resene Waterborne Colorwood. Even the same timber type can vary in colour depending on how it is cut or the history of the tree it came from. Resene Waterborne Colorwood sample chips should be taken as a guide only.

A final but crucial piece of advice on Resene Waterborne Colorwood is to thoroughly wipe off any excess stain with a dry cloth about five minutes after it has been applied. This should not affect the depth of colour.

4. Resene Polythane moisture cured polyurethane.

Resene Polythane is arguably our toughest clear product for use on timber flooring. It is ideal for Gymnasium floors and is very popular in this area. Resene Polythane can be a difficult product to understand and customers need to be given clear instructions. We strongly recommend that Resene Polythane is only used by experienced tradespeople with appropriate safety gear.

- Resene Polythane is moisture cured which means it reacts with water in the air to cure. Extreme care is needed not to contaminate opened cans with water from

brushes or rollers. If only small areas are being coated it pays to pour enough Polythane out of the main can into a smaller one and then tightly replace the lid on the main can. Do not pour any remnants back into the main can. Contamination of cans of Resene Polythane by moisture will result in them gelling or thickening up.

- Resene Polythane should not be thinned. It is naturally very low in viscosity and any thickening is an indication that it has been contaminated with water. We advise disposal of such material.
- Use Resene Polythane Brush Cleaner to clean brushes. This actually reacts with spare Resene Polythane on the brush and neutralises it. If standard solvents are used your brushes may be like concrete the next morning. Roller sleeves would be best left to dry overnight then thrown away. The volume of solvent needed to clean them properly is probably worth more than the sleeve.
- Ensure there are no traces of Resene Polythane Brush Cleaner left in brushes when starting work again.
- Resene Polythane contains less than 0.7% free isocyanate but this is only a hazard if it is sprayed. Do not spray Resene Polythane.
- Resene Polythane is very low in volume solids (about 33%) and contains powerful aromatic solvent. Large areas are best done by roller (which is fast) with as much ventilation as possible provided. Rotate painters if possible to minimise solvent exposure.
- After 24 hours dry Resene Polythane will have dried very hard and will need to be thoroughly sanded to provide a good key for adhesion. If jobs are carefully planned two-three coats of Resene Polythane can be applied in a day and this potential problem avoided.
- Lines on Gymnasium floors are best done by applying Resene Uracryl 403 ([See Data Sheet RA56](#)) Colour to the bare timber and then applying Resene Polythane after 48 hours dry time. The application of five coats of Resene Polythane over the lines allows the floor to be machine sanded later without disturbing the expensive to apply line markings.

5. Waterborne varnishes

The technology for waterborne varnishes has advanced significantly in recent years. Currently, waterborne varnishes are available with a variety of binder types: acrylic, modified acrylic, urethane acrylic and water-dispersed urethane. Waterborne varnishes offer the benefits of easy soap and water cleanup and low odour compared to solvent-based varnishes, but in general, they do not completely have the resistance properties and very high gloss potential that solvent clears offer.

Resene Aquaclear

Resene Aquaclear ([See Data Sheet D59](#)) is based on a binder that combines acrylic and polyurethane polymers. The binder behaves the same as the acrylic binders we use for products such as Resene Hi-Glo ([See Data Sheet D31](#)) but is much tougher in the dry film stage and also has excellent block resistance. Like standard acrylic binders the Resene Aquaclear binder is a colloid containing discrete particles of binder suspended in water. This gives the product a whitish appearance in the can but be assured Resene Aquaclear dries to a clear finish. Resene Aquaclear needs to be applied at temperatures above 10°C as it also dries by the process of coalescing.

After application to wood, Resene Aquaclear will actually be more clear and colourless than solventborne varnishes. The latter tend to provide more 'warmth' and 'depth' to wood for several reasons: their amber or yellowish tone, their greater tendency to penetrate the wood fibres which accentuates the grain, and their higher gloss when viewed head-on.

When applying a waterborne varnish, it is possible that the water in the coating can 'raise the grain' of the wood, resulting in some degree of roughness. This is especially so with certain hardwood species such as oak and walnut.

To avoid this roughening effect, you may want to suggest that customers pre-dampen the wood surface with a wet rag and allow it to dry for a half-hour. They can then carefully sand the surface in the direction of the wood grain with fine-grit sandpaper to remove any wood 'whiskers' that may appear. As with other jobs, it is important to dust off the surface before applying the coating.

Interior clear timber finishes main features

Resene Danska Teak Oil

- Used to bring out the grain in timber.
- Takes days to dry properly.
- Is very difficult to varnish over at any stage.
- Poor durability and mould resistance.

Resene Oristal Polyurethanes

- Good water resistance and good all round durability
- Ideal for furniture, joinery and panelling in wet areas.
- Resene HD Poly-Satin is much tougher than Resene Oristal Poly-Gloss, Resene Poly-Satin and Resene Poly-Flat and can be used on floors.
- Resene Oristal HD Poly-Satin is very slippery on floors.

Resene Polythane

- This should really be used only on floors.
- Extremely tough gloss finish.
- Low volume solids and therefore very high VOC content of strong aromatic solvent.
- Use only if excellent ventilation can be provided.
- Sensitive to moisture contamination (will gel).
- It may yellow over time.

Resene Aquaclear

- A low VOC alternative to the above products.
- Not as tough as Resene Polythane on floors but much, much more user friendly.
- Will not darken timber as much as other products.
- Should be used as a sealer for Resene Cristal products over Totara and Matai. (Not for Resene Polythane).

Exterior clear coatings for timber

Resene recognise the near impossibility of providing clear finishes for exterior timber based on current technology because of concepts covered in the timber introduction. We therefore do not recommend these finishes outside unless they have full protection from U.V. light. Such areas may be the undersides of soffits. In these situations, priming of end grains and backs of boards is strongly recommended using a satin polyurethane. Resene TimberLock ([See Data Sheet D48](#)) would also be ideal as a pre-treatment.

The most likely problem in these types of areas is from underfilm staining caused by water entering end grains or the back surfaces of panelling. A complete sealer coat followed by three to four good coats is also mandatory to ensure the timber is waterproof.

Exterior applications are very demanding for clear coatings, especially applications over wood. Without the protection of pigmentation, clear coatings are relatively transparent to ultraviolet radiation from sunshine. When this radiation reaches the wood substrate, it tends to break down the wood fibres, which can ultimately cause the coating's adhesion to the substrate to fail. Another factor in the equation is that polyurethane and alkyd type varnishes have very poor resistance to U.V. light themselves and break down early.

Note that if standard polyurethane varnishes are used on exterior timber failure is by a combination of both the timber and the varnish breaking down in the U.V. light. To be effective over bare exterior timber clear finishes need to be loaded with specialised U.V. absorbers. These specialised U.V. absorbers are extremely expensive and only so much can be added to a litre of paint. Consequently, with these types of clears, 5-8 coats are needed to give full protection. Resene do not have such a product. Using standard unmodified clear coatings on exterior timber is akin to using coconut oil as a sunblock on bare skin.

The problems outlined above and the huge maintenance costs of a fully varnished timber system like you would see in a super yacht are the reasons that Resene do not recommend the use of clear finishes over timber.

Cementitious substrates - Including concrete and concrete blocks

Increasingly, Resene is being asked by architects and specifiers for clear systems for both interior and exterior cementitious surfaces, particularly high grade exterior concrete panels and decorative concrete blocks. Equally there are increasing requests for interior clear systems.

Unfortunately the area is fraught with technical difficulties and unless addressed carefully can leave the specifier (and others!) exposed if the system isn't applied correctly.

While concrete can have a certain rugged beauty when first poured, generally, it rarely ages well. In our temperate humid climate a combination of surface erosion, laitance, dirt and mould result eventually in less than pristine surfaces. Less natural pollution, coming out of an aerosol can and representing the artistic energy of a rising generation, can also leave its indelible mark.

There is often a desire to preserve the appearance of new concrete especially when the aesthetic of a building has been designed around it. Clear coatings are often assessed as a potential means of achieving this, often with great success.

One class of materials, solventborne acrylics, have had a long history in the area. Although currently being phased out by waterborne analogues, solution acrylics' most stunning successes have been as the factory-applied clear coats over concrete roofing tiles. In closely controlled environments these products are able to be applied over the wet, uncured tile to provide a glossy durable surface. In fact the high water content of the 'green' tiles is a benefit in preventing the absorption of these solventborne acrylics and leaving the beneficial film, fully cured right on top of the tile where it will do the most good.

We highlight this because, over dry concrete, the normal tendency for these products is to absorb into the somewhat porous surface. This again is useful in that they can consolidate weak, porous surfaces and enhance the colour of a surface, providing a 'wet look'. This is especially useful for re-vitalising pressed concrete paving.

A drawback to penetrative clear coatings over concrete is that this ability can also emphasise any variations in porosity of a concrete surface. Invariably this is aesthetically unpleasant. In aesthetically-challenged environments, such as industrial floors, these penetrating polymers can provide very useful anti-dusting coatings. Small amounts of colourant can be added which, over uniformly porous surfaces, can provide a pleasant appearance.

Clear two-component systems, usually based on polyester or solventborne acrylic/isocyanate blends are an extremely useful defence against graffiti. These tightly cross-linked urethane systems resist the penetration of graffiti media and allow for easy cleaning. They are only of real value over smooth, pore-free concrete as graffiti lodged in pores will always be difficult to remove. The challenge with these systems is to achieve a finish that is flat enough to be in harmony with the original concrete concept whilst giving a surface smooth enough to make for easy cleaning.

Waterborne products, particularly acrylics, are known for their excellent performance over concrete and for their durability. The vast majority of this genre do not penetrate porous surfaces at all so they tend to produce more uniform surfaces over variably porous substrates. While this leads to better appearance, it does demand a sound substrate, as lack of penetration means there is absolutely no consolidation of weak friable substrates. These materials can be flatted so that a very 'sympathetic' coating can be designed to replicate, but protect, the new concrete surface.

Application of waterborne acrylics over porous surfaces can generate microfoam if not applied very carefully. Microfoam appears as a 'milky' within the clear coating, which permanently detracts from the overall appearance.

There has, over the past year or two, been a request from the market for high-build, elastomeric, flat and clear waterproof coatings for use over concrete, especially masonry. Such technology is available but, in common with all the above coatings, they can be completely ruined by efflorescence. We know that if there is water around concrete, efflorescence will not be far behind.

If efflorescence appears on uncoated concrete, it will eventually weather off. If it occurs on clear-coated concrete it will deposit under the film and be a salutary reminder for the life of the clear coat - which could be a very long time.

The best defence against efflorescence is, as stated before, a deeply penetrating oligomeric siloxane and this should be used before any suggestion of clear coating is contemplated. In fact, in the opinion of your humble scribe, the masonry water-repellent treatment, in itself, is the ideal clear treatment for architectural masonry surfaces.

Useful products in the Resene range for clear coating concrete are:

Resene Concrete Conserver ([See Data Sheet D58](#)) , Resene Concrete Stain - coloured solventborne acrylic ([See Data Sheet D58](#)), Resene Multishield+ - waterborne acrylic ([See Data Sheet D54a](#)), Resene Uracryl 403 ([See Data Sheet RA56](#)) , Resene Uracryl 402 ([See Data Sheet RA55](#)) or Resene Uracryl 404 ([See Data Sheet RA59](#)) - anti-graffiti coatings and Resene Aquapel - siloxane ([See Data Sheet D65](#)).

Recent advances in acrylic resin technology have seen the arrival of new generation waterborne acrylics with substantially better blanch resistance, and much improved dirt pick up resistance. Such a resin has been used in Resene Multishield+ ([See Data Sheet D54a](#)).

Resene Multishield+ gloss

Resene Multishield+ gloss is a 100% acrylic waterborne glaze primarily designed for use over Resene X-200 ([See Data Sheet D62](#)) and Resene Resitex ([See Data Sheet D70](#)) to improve general durability and lessen dirt pick up. Resene Multishield+ gloss is also suitable for exterior and interior masonry as long as the surfaces are not crumbly in nature and do not require waterproofing. The function of waterproofing should be left for Resene X-200, which has substantially better film build. Crumbly surfaces are best sealed by use of Resene Concrete Conserver or by thinning the first coat of Resene Multishield+ gloss about 30-50% with water.

Resene Multishield+ gloss is not recommended for any paving situations except as a dustcoat for new interior concrete.

Resene Multishield+ gloss (and, incidentally all our other clear finishes, including Resene Uracryl 403) should not be used as a clear finish for bare exterior timber. The clear acrylic itself will not be degraded by U.V. light but will not protect the underlying timber from U.V. light. The underlying timber will be chemically attacked by U.V. light and broken down. In exposed situations we would expect the clear finish to fail due to lack of adhesion in about 6-12 months. The clear coating will not have failed but the timber it was adhering too will have been 'nuked' by the U.V. light.

Satin and flat versions are available but the performance of these will be less than the gloss because of their higher PVC. Care is needed with the flat not to apply it too heavily or it will appear milky. The Flat will lighten the colour slightly when applied over strong colours.

Warning:

If applying Resene Multishield+ flat or satin over a very porous bare substrate such as old unglazed wall bricks apply a sealer coat of gloss first. If this is not done the binder tends to dive into the surface leaving the flattening pigments behind. The result is a very milky appearance.

Resene Uracryl 403 gloss and Resene Uracryl 402 satin clear

Resene Uracryl clear, when applied over Resene Uracryl colours gives the system a boost in anti-graffiti properties. Resene Uracryl clear can be used indoors for clear finishing of timber but remember that it is based on very strong smelling solvents that can be unpleasant in poorly ventilated areas. On floors Resene Uracryl will not be as tough as Resene Polythane and needs 3-4 days of good temperatures to fully harden up.

Resene Uracryl Clear (and Resene Polythane) must not be used over products such as Resene Lumbersider on floors.

Interior clears

Increasingly walls, columns and blockwork are being left 'natural' and the effect can be striking, however they do need a coating on to stop them 'dusting' and also so they can be more easily cleaned.

It is rare for a wet look to be requested, mainly because this look will highlight imperfections, although this can be the objective of the specifier - especially if blocks or bricks have been sandblasted for example.

Another potential issue is efflorescence coming through from the cementitious surface and 'staining' or discolouring the clear finish. While we cannot guarantee this will not occur the use of Resene Aquapel) will significantly reduce if not eliminate this possibility.

System for concrete, concrete blocks and plaster:

1. Apply a saturation coat of Resene Aquapel to prevent efflorescence (*optional*).
2. Apply a coat of Resene Cemseal.

Notes:

For a wet look apply a coat of Resene Concrete Conserver in place of Resene Cemseal ([See Data Sheet D504](#))

Interior concrete floors

Floors are prone to a wide range of contamination, so surface preparation is the critical factor in achieving a long lasting paint system. New concrete floor slabs must be allowed to cure for a minimum of 28 days prior to painting. Diamond grinding is the preferred surface preparation (refer below). Some new floors may have had a curing membrane applied or may contain additives that harden the surface. These treatments result in a surface that is usually resistant to dilute acids and that requires alternative preparation by mechanical abrasion or captive shot blasting. All concrete floors must be checked for excess moisture before coating. In the case of new concrete the test must be carried out after the minimum recommended curing period.

System:

1. Apply a full sealer coat of Resene Uracryl 403 clear thinned 10% with Resene Thinner No.8 at 12m² per litre. Allow 24 hours dry.
2. Apply a build coat of Resene Uracryl (optional gloss level) at 10m² per litre.
3. Apply a finishing coat of Resene Uracryl (optional gloss level) at 10m² per litre.

Notes:

Resene Cemseal can be used as a dust coat for concrete floors. Resene Cemseal is a non-decorative clear coating for use on industrial and domestic concrete floors where a low cost, easily applied and maintained method of controlling concrete dusting is required.

Diamond grind or captive shot blast should be used to achieve a slightly roughened, toothy finish to the concrete to provide a good key for adhesion. The floor should resemble P180 grit sandpaper in texture. Ensure that floors are thoroughly clean, dry and dust free before painting.

Ensure surfaces are thoroughly dry before painting. Test method ASTM D4263 is recommended. Tape a 45cm square plastic sheet to concrete and leave for 16 hours. Observe underside for presence or absence of moisture.

Exterior clears

Generally customers are seeking a protective system for their exterior concrete or blockwork that isn't a paint or coloured coating.

Often they will also want graffiti resistance and/or water-proofing.

There are a number of new design styles in evidence on the New Zealand (and Australian) markets that feature the area of exposed materials - concrete and block in particular but increasing timber and zincalume. Below are detailed a description of what the customer is looking for and the systems we would recommend.

1. Raw natural look clear coatings

To achieve a natural look on cementitious surfaces you need to use either solventborne Resene Aquapel or Resene Waterborne Aquapel.

Resene Aquapel needs to saturate the surface and obviously the more porous the surface the more Resene Aquapel per square metre will be needed.

For example Resene would recommend Resene Waterborne Aquapel is applied to concrete blocks at approximately 2.5m² per litre, while on smooth concrete we recommend Resene Solventborne Aquapel (as it soaks into the concrete easier than the Resene Waterborne Aquapel) is applied at 8-10 m² per litre.

Resene Aquapel doesn't change the appearance of the concrete (block or plaster) surface when initially applied, however as it sheds water (and dirt) and to a large degree denies mould - the moisture it needs to flourish over time, it will retain its original look rather than discolour with mould, dirt and other contaminants.

Concrete blocks

System:

1. Saturate the surface with **Resene Waterborne Aquapel** at 2.5m² per litre, a garden knapsack sprayer is more than adequate for this purpose.

Notes:

This is best described as weatherproofing rather than waterproofing (Resene would recommend three coats of Resene X-200 for that!). The system when applied as a saturation coat will resist water in most situations but will not stop water ingress in heavy wind driven rain or after long periods of wet weather.

If this is an issue, the designer will either have to reconsider and go for a waterproofing paint or coating (Resene X-200) or construct the cladding with a cavity at the back (so any water that does get through will get out without getting inside).

There are similar products and systems on the market to Resene Aquapel and they all face the same inherent problem, they do a good job of keeping moisture off and away from the cementitious surface but will not waterproof it.

Resene Aquapel will last a long time but will need reapplication every 7-8 years or alternatively it can be painted over.

Concrete

System:

1. Saturate the surface with **Solventborne Aquapel**, again easily applied with a knapsack or airless spray unit (apply at approximately 7-10m² per litre (depending on porosity)).

Notes:

Seven inches (or more) of concrete is unlikely to leak unless there are cracks and voids in it to allow moisture ingress, so waterproofing is less of an issue than with blockwork.

Resene Solventborne Aquapel is more easily absorbed into dense concrete than Resene Waterborne Aquapel so is preferred so as to avoid unsightly shiny areas on very dense, smooth concrete.

Plaster

System:

1. Apply Resene Waterborne Aquapel at 6-8m² per litre depending on porosity (Resene Solventborne Aquapel can also be used).

Notes:

Raw plaster is an increasingly popular look and provided waterproofing is not an issue, waterborne Resene Aquapel is ideal (Resene Aquapel won't bridge or fill cracks in plaster which is where water ingress typically occurs - that's what Resene X-200 is for!)

2. Standard clear coatings

Many specifiers are looking for a clear coating that will enhance and protect the cementitious surface, in much the same way they would use a varnish on (interior) timber. There is an expectation that the clear finish or coating will be protective and waterproofing as well.

Unfortunately there is no easy answer available - particularly if the customer wants a waterproofing system as well.

Further there are 2 quite different appearances available - these are commonly referred to as a '*wet look*' and the '*non wet look*' (well at least it's highly descriptive!). The wet look mimics the how the surface would look if it were wet and had a layer of surface water on it while the non wet look is less obvious and more subtle. The more a clear penetrates into the substrate the *more* it appears wet - typically solventborne products penetrate more deeply (due to their smaller resin size) than waterborne clears (like Resene Multishield+).

To achieve the best protection and reduce the likelihood of any issues the systems are costly due to the multiple coats needed and different products required to reduce water ingress and provide the level of protection needed - especially if there is a requirement for anti-graffiti. Having said that the costs of the decorative panels when used, and the inherent difficulties in removing graffiti make protecting them a sensible and practical choice.

Concrete blocks

System:

1. Saturate the surface with Resene Waterborne Aquapel at 2.5m² per litre.
2. Apply first coat of Resene Multishield+ gloss.
3. Apply second coat of Resene Multishield+ gloss, satin or flat.

Notes:

This isn't a waterproofing system. The coating is too thin to bridge and fill the cracks and voids in concrete blocks - you need three coats of Resene X-200 to do this!

Any moisture, water that does get into or was retained in the blocks will be drawn out as it dries and will appear as a milky film in the Resene Multishield+ layers!

This is unsightly but will dissipate as the moisture (vapour) evaporates through the film (just as it does through a paint film except you can't see it).

If there is too much it can cause the clear layer to bubble and ultimately flake off. However, saturating the surface with Resene Aquapel will significantly or completely prevent this but because of the porosity and amount of voids in concrete blocks; this simply can not be guaranteed.

Applying Resene Multishield+, especially by roller over a rough surface like concrete block can lead to significant fine foaming problems. If the film dries out without 'releasing' this foam, permanent milkiness will result. Brushing or laying off with a brush is recommended or spray application.

Resene does not recommend coating honed blocks, slurry left in pores of blocks during manufacture can dry once coated and fall away leaving a hole in the system.

Concrete and plaster

Wet look system:

1. Apply a saturation coat of Solventborne Aquapel at between 8 and 10 m² per litre.
2. Apply a coat of Resene Concrete Conserver.
3. Apply a second coat of Resene Concrete Conserver.

Non-wet look system

4. Apply a saturation coat of Resene Solventborne Aquapel at between 8-10m² per litre.
5. Apply a coat of Resene Multishield+ gloss.
6. Apply a second coat of Resene Multishield+ gloss or alternatively Resene Multishield+ satin or flat.

Notes:

Most specifiers are looking for a non wet look as it is more subdued and uniform. Achieving the 'wet look' with penetrating resins will also highlight differences within the concrete surface.

The same issues apply here as with concrete blocks, any moisture that gets behind the clear coating will cause the Resene Multishield+ to become milky until the moisture passes through the film (as moisture vapour).

3. Anti-graffiti clear coatings

From the original terse messages scratched on the walls of the urinal in Taihape to the dynamic outpourings on the walls of the Wellington bus terminal, the 'art' of graffiti grows more intrusive every day. Whatever one's reaction to it is, and some of it can be very witty, it cannot be denied that it defaces buildings and results in spiralling removal costs.

The two major factors to be considered in graffiti damage are the kind of vehicle used for the graffiti and the type of surface to which it is applied. Modern technology has supplied the graffiti artist with a formidable array of raw materials with which to pursue their craft, in the vanguard of which is the versatile spray bomb. Based on high polymer technology and durable pigments, these materials are not easily shifted.

It is stating the obvious when saying that the smoother the surface the more easily cleaned it is, but it should always be borne in mind in the war against graffiti. Unsealed porous surfaces such as brick, concrete and concrete masonry, unpolished stone etc can accept the graffiti medium within the pores of the surface and even complete removal of the graffiti on the surface still leaves behind its indelible message. Only removal of the surface layer by sandblasting or the like can completely remove deeply penetrated graffiti. There is no way of guaranteeing 100% graffiti resistance.

Coatings have a role to play in combating graffiti by providing smooth sealed surfaces, which prevent penetration.

As the coating then becomes the layer which receives the graffiti, it in itself must be able to resist the cleaning agents and strong solvents used to remove the offending messages. This necessitates the use of very hard, densely cross-linked coatings such as specially formulated two-pot epoxies or polyurethanes with solvent resistance as their chief parameter.

Solvents used to clean off graffiti need to be strong enough to remove the graffiti without affecting the underlying coating. They also require an evaporation rate that is not too fast otherwise the graffiti becomes smeared over the surface and re-dries as the solvent evaporates. The ideal cleaning solvent will remain wet long enough for the surface to be wiped clean.

The Resene coatings most useful in this area are Resene Uracryl, which combines superb exterior durability with graffiti resistance, and Resene Aquapoxy ([See Data Sheet RA42](#)), a completely odour-free coating suitable for areas not affected by U.V. light. Although many existing coated surfaces can have their graffiti resistance improved by overcoating with the above products, best resistance is achieved when the system is designed for uncoated substrates.

Concrete blocks

Wet look system:

Saturate the surface with Resene Solventborne Aquapel at 2.5m² per litre.

1. For a wet (more intense look) apply a first coat of Resene Uracryl 403 (gloss).
2. Apply 2 further coats of extra Resene Uracryl 403 or alternatively Resene Uracryl 402 or Resene Uracryl 404.

Notes:

A wet look is deeper and more intense and similar to how the substrate would look if it were wet.

Resene Uracryl 403 needs to be used as the first coat under both itself, Resene Uracryl 402 and 404 to seal the surface and prevent any of the flattening agents used in Resene Uracryl 402 or Resene Uracryl 404 (semi-gloss and satin) from remaining on the surface of the substrate as too porous. This appears as a milky residue (similar in terms of appearance to moisture vapour behind the clear film!).

Resene Solventborne Aquapel as opposed to Resene Waterborne Aquapel **must** be used under the Resene Uracryl system as there are compatibility issues with the Resene Waterborne Aquapel.

This is not a waterproofing system and should not be seen as such.

The use of Resene Aquapel will help prevent any moisture vapour discolouring the clear film as well as improving the water resistance of the substrate and system.

Non-wet look system:

To achieve a non-wet look, which will appear more subdued and closer to its natural state, a coat of Resene Multishield+ gloss can be recommended **after** applying the Resene Solventborne Aquapel and **before** applying the three coats of Resene Uracryl.

Sufficient film build of the Resene Uracryl system is needed for the removal of graffiti. However it is unlikely that graffiti will be successfully removed from deep pores and cracks. The smoother the surface the better when it comes to successfully removing graffiti

Concrete and plaster

Wet look system:

1. Apply a saturation coat of Resene Solventborne Aquapel at between 8-10m² per litre.
2. Apply a first coat of Resene Uracryl 403.
3. Apply a second and third coat of Resene Uracryl 403 or alternatively Resene Uracryl 402 (semi gloss) or Resene Uracryl 404 (low sheen).

Non-wet look system:

1. Apply a saturation coat of Resene Solventborne Aquapel at between 8-10m² per litre.
2. Apply a first coat of Resene Multishield+ gloss.
3. Apply a coat of Resene Uracryl 403.
4. Apply a second and third coat of Resene Uracryl 403 or alternatively Resene Uracryl 402 (semi-gloss) or Resene Uracryl 404 (low sheen).

Notes:

Graffiti is more easily removed from the high gloss Resene Uracryl 403 than the low sheen Resene Uracryl 404.

Graffiti removal from an anti-graffiti paint:

Resene Graffiti Cleaner ([See Data Sheet RA101](#)) is a low evaporating, low odour solvent system that will facilitate the removal of most graffiti.

Graffiti should be removed as soon as possible. Some spray cans do contain good quality paints that may adhere well given time to fully harden. The Resene product for removal of graffiti is Resene Graffiti Cleaner. This is based on an extremely strong, slow evaporating solvent that is often used in paint removers.

Procedure for graffiti removal

- Scrub surface with a stiff, nylon brush wet with Resene Graffiti Cleaner. If graffiti is not immediately removed leave a layer of Resene Graffiti Cleaner on the surface and try again in 10-20 minutes.
- Avoid splashing Resene Graffiti Cleaner on surrounding areas of acrylic paint or on flower beds and the like.
- Removed graffiti will be sticky and gooey and capable of making a real mess in another area. Take care to carefully contain removed material. Clean out brush in a bucket of fresh water.
- Wear strong rubber gloves and safety glasses and avoid skin contact with Resene Graffiti Cleaner.

Finally, for the most efficient obliteration of graffiti damage, which cannot be removed, the super-hiding Resene Contractor is unsurpassed.