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FINISHES FOR EXTERIOR TIMBER SURFACES

While interior timber surfaces are able to be readily and satisfactorily coated with a wide variety of paints, stains and oils, the performance of exterior finishes, particularly on timber surfaces exposed to the elements of ultraviolet light, heat, cold, water and airborne contaminants, is entirely another matter.

Unfinished and unprotected timber will weather slowly, losing approximately 6 mm of surface depth per one hundred years. Weathering though should not be confused with the effects of deterioration caused by fungal decay which is usually the result of the use of incorrect timber species, a lack of adequate detailing and of poor building practices generally.

The purpose of exterior timber finishes is usually twofold. Firstly, to provide a protective sacrificial covering for the timber, which in turn will inhibit moisture changes,



thereby reducing the amount of movement and stresses occurring constantly in wood and, secondly, to improve the structure's overall aesthetic appeal.

The correct selection and application of finishing products is critical to the successful completion of any job but the performance of exterior finishes may be expected to vary depending on any number of factors such as season, local climate, type of timber used and even the time of day. There are far too many variables to enable specific recommendations to be made for all situations. Therefore, it is suggested specific advice be sought from your local paint specialist or manufacturer.

FACTORS AFFECTING THE PERFORMANCE OF FINISHES

The performance or service life of the chosen finish will obviously have a significant effect on the ongoing maintenance costs of a structure and care taken during the planning and preparation stages can be expected to



pay dividends in the long term. Factors worth considering include:

- Substrate (the timber base) and its condition, seasoned, dressed etc.
- Environment - dry, wet, humid, hot, cold and airborne contaminants.
- Structure design - verandahs, wide eave overhangs, aspect, adjacent vegetation and detailing generally.
- Finish used - the use of heavily pigmented light coloured paints or stains containing UV absorbents will tend to reflect a great deal of the sun's heat, thereby placing less stress on both the protective coating and its timber substrate. In general, lighter colours would be expected to provide superior performance to darker ones.

SUBSTRATES

The properties of different timber species and products can be expected to vary considerably. In the case of natural timber, not only its degree of dryness but its density and surface finish will be factors for consideration, while manufactured products will differ for any number of reasons.

Care should be taken with some species as discoloration or blistering of the finish can be caused by naturally occurring water soluble extractives of the heartwood such as gum or resin. This phenomenon tends to be exacerbated by heat and will normally occur on the side of the building receiving the most sunlight. Thorough seasoning will normally cause these extractives to cure, thereby minimising or resolving the problem. Where it is impractical to use seasoned timber, the cleaning of the surface with a solvent sometimes offers a solution. Other timber characteristics affecting paint performance are knots, bark, gum pockets and insect damage. In most cases, knots will tend to absorb more of the finish than the side grain and also have a greater potential to check and exude resin or gum. Species such as tallowwood and turpentine contain other extractives such as tannins which are water soluble and will react with alkaline surfaces, such as cement, causing unsightly brown stains.

Where plywoods or other manufactured timber products are used, exterior grades should be specified and finished as for timber.

In the case of hardboards and similar materials, because of the diversity of uses and finishes, the manufacturers' recommendations for finishing should be followed.

STRUCTURAL CONSIDERATIONS

Other than the substrate, the two factors most affecting the performance of protective finishes are sunlight and moisture. Any measures limiting the materials' exposure to these two conditions will pay dividends.

Measures worth consideration include:

- Wide eaves, verandas, or shading material such as polycarbonate sheeting.
- Use of vertical rather than horizontal cladding.
- Profiles with rounded rather than sharp edges.
- Dripcaps above timber windows and doors.
- Minimisation or elimination of joins in horizontal cladding.
- Where timber is exposed to the elements, sacrificial drip edges should be provided, where possible, below sills and at the bottom of horizontal cladding.

PREPARATION

The correct preparation of the timber surface will ensure it accepts and maintains the applied finish. The timber's physical characteristics such as porosity and profile will also be a major factor in the adhesion and ultimate durability of the chosen coating.

All surface contaminants such as sawdust, grease, dirt or indeed anything that might be expected to affect the paint's adhesion should be completely removed.

Surfaces will usually be either a sawn (or textured) finish, or a smooth (planed or sanded) one.

Rough surfaces (providing they are thoroughly cleaned) will provide a more positive mechanical key for surface coatings but where conventional paint systems are used will not provide an even covering film. They do, however, tend to accept proprietary timber stains far more readily than smooth surfaces.

When painting in areas where airborne contamination might reasonably be expected, that is near the coast or in heavily polluted industrial areas, the surfaces should be washed and dried immediately before the application of each coat.

Where raw timber has been exposed to the weather for a considerable amount of time and has suffered some deterioration of its surface, it should be thoroughly sanded or planed back to a fresh surface before priming.

As an alternative, a thorough brushing down with a fine wire brush to remove any loose material, followed by the application of a penetrating stain, will usually provide a satisfactory result. Damaged or decayed timbers should be cut out and replaced. Where decay has been detected, the source or cause must be identified and remedied.

The thorough sealing of end grain cannot be over-emphasised because, in many cases, there will only be one opportunity to do so.

When preparing a previously painted surface, the amount of work required will largely depend upon the condition of the existing paintwork. If the surface is blistering, cracking or flaking, it will normally be necessary to completely remove the damaged layers or at least enough to provide a sound base for the new surface.

Where chalking or mould is apparent, manufacturers' directions for its removal should be carefully followed. Where water-based sealing systems are being used, this is particularly important.

FINISHES

There are a wide variety of finishes available and selection is usually determined by the level of protection and appearance required.

The intent of any of these systems is principally to form a coating on the surface and, to a certain extent, to fill voids in the surface structure of the wood.

The principal difference between film and penetrating finishes is in the thickness or 'build' of the surface layer. Film finishes provide a distinct layering effect whereas penetrating finishes do exactly as their name suggests, filling the microscopic surface pores of the timber and following the surface contours.

Because of the greater thickness of the film (or paint) finishes, they are generally far more resistant to wear but do not as easily deal with the differential movement of the timber substrate caused by moisture variations.

While both systems have their place, some advantages of the penetrating stains or finishes are:

- Natural appearance.
- They do not peel or blister.
- Suited to sawn-textured surfaces.
- Do not trap moisture in timber.
- Are easily applied and renewed.

RECOMMENDED FINISHING SYSTEMS

Ultimately the system chosen will depend on the intended use of the timber, its finish, the level of protection and appearance required, and the amount of effort prepared to be expended during preparation, application, and longer term maintenance.

The following is intended purely as a guide and specific recommendations should be obtained from paint manufacturers.

- *Hardwood or softwood cladding, decking and exterior joinery.*
Primer + undercoat + minimum of two coats of solvent or water borne paint, or
primer + minimum of two coats of solvent or water borne opaque penetrating stain.
- *Softwood cladding, decking and exterior joinery.*
Water repellent preservative + two coats of solvent borne stain.
- *Hardwood or softwood cladding only.*
Minimum two coats of solvent or water borne opaque or semi-transparent stain.
- *Hardwood or softwood cladding and external joinery.*
Minimum three coats of clear exterior finish (clear finishes are not highly recommended as generally the higher the level of pigmentation the greater the protection afforded).

PERMEABILITY

While most coatings are impervious to water, paint or film finishes will eventually develop minute cracks which may allow the ingress of moisture. Penetrating finishes may, in certain instances, be more effective.

When painting or staining, the coating should be applied to all surfaces of the timber or timber article to ensure differential moisture changes do not cause distortion.

TYPES OF FINISHES

As noted earlier, finishes fall into two principal categories:

- Solvent borne
- Water borne.

Most pigmented finishing systems consist of a three stage process:

- Primer
- Undercoat
- Finishing coats.

Wood primers

Primers are designed to provide adhesion to the timber and act as a base for good inter-coat adhesion of subsequent coats.

They may be solvent borne, composed of drying oils and/or synthetic alkyd resins and may incorporate zinc oxide or other fungicidal pigments. Alternatively, the more recently developed water borne primers, containing acrylic emulsions as the principal binder, offer excellent adhesion to timber and improved flexibility, particularly as they age. The problem of staining when water borne primers are applied to timbers containing natural, water soluble tannins has been largely resolved by including fixative pigments and special emulsions.

Modern wood primers are lead free and are generally tinted to a pink colour to provide greater opacity and a contrasting colour to the next coat applied. This assists in the uniform application of the second coat.

Undercoats

As with the primers, these may be solvent or water borne. The solvent borne undercoats usually provide superior adhesion when applied to slightly chalky or powdery surfaces and may be formulated to provide superior sanding properties. The water borne undercoats are faster drying, have better colour and non-yellowing qualities. They may generally be overcoated with either water or solvent borne coatings subject to the manufacturers' recommendations.

Undercoats are the bridge between the primer or previously painted surface and the finishing coats. They are specifically designed to provide good bridging properties across cracks, easier brushability and better sanding properties.

In addition, they are intended to enhance the durability of the overall system and provide better opacity that is capable of substantially obscuring background colours.

Finishing coats

It is generally accepted that water borne paints provide substantial benefits such as ease of cleaning of equipment and faster drying and re-coating times. A major restriction, however, is that they must not be applied or

allowed to dry at temperatures below 10°C, as film formation may not occur and the paint could become powdery.

Gloss

With the use of tinting systems, solvent and water borne gloss paints are available in a wide range of colours. While most solvent based gloss enamels can be used for interior as well as exterior uses, the available colour ranges may be restricted because of the poorer light fastness of certain colours.

Water-based gloss exterior finishes are now more widely used. While having slightly lower gloss levels than the solvent borne enamels, their long-term gloss retention is usually greater. When applied according to manufacturers' recommendations, they frequently have a useful life double that of the solvent systems. If a water borne paint is to be used to cover old alkyd or oil based finishes, it should be appreciated that those surfaces will continue to embattle with time and will eventually fail beneath the re-painted top coat.

Semi-gloss/satin

Available in both solvent and water based formulations they are usually quite suitable for exterior uses and do not tend to highlight minor imperfections in the timber's surface.

Flat/matte and low sheen

In exterior situations, water borne acrylic emulsions have captured almost 100% of their market. Where minor imperfections in the timber surface exist, the low sheen paints will satisfactorily mask them while still providing a reasonably washable surface.

Natural finishes

The build or film thickness of these finishes vary from product to product. Semi-transparent and opaque or solid stains are marketed to provide a natural timber look and to minimise on-going maintenance. These stains vary from those that penetrate the timber leaving little or no film on the surface, to others with relatively high pigmentation that resemble top paint coats.

The natural finishes are normally a one or two coat system and, unlike conventional paint systems, there is little chance of breakdown by cracking or flaking. While stain finishes will eventually weather, a simple brush and washdown is normally all that is required before a new coat is applied.

Stains will usually perform at their best on vertical surfaces but if required to be used on horizontal surfaces an extra coat is recommended.

Semi-transparent or grain enhancing stains

Usually solvent borne, they are normally available in common timber colours with relatively low levels of pigmentation to show the grain and texture of the timber. The intent of these coatings is to keep the timber surface looking as natural as possible and usually contain fungicides to prevent mould growth.

Solvent borne opaque stains

The advantage of these fairly heavily pigmented low viscosity, low solid, flat paints is that they provide a longer service life compared with the semi-transparent stains and, while obscuring the timber's grain pattern, the texture is normally still visible. Surface preparation and re-painting is considerably easier than with conventional paint systems.

Water borne opaque stains

Also referred to as acrylic stains they often utilise other polymeric emulsion binders. Because of their ease of application and cleanup compared with oil based solid stains, they are extremely popular, particularly over knotty timbers.

Clear exterior finishes

Clear finishes are not generally recommended in fully exposed situations and while these finishes have come a long way in terms of stability, they have not yet provided satisfactory long-term service life under Australian conditions.

However, water borne emulsions based on specific pure/ acrylic emulsions are showing some promise of extended durability provided regular maintenance is carried out.

If clear finishes must be used, care should be taken to avoid lap marks in large areas as the water borne clear finishes dry more rapidly than solvent borne formulations and the application of double coats at the lap will leave bands of deeper colour.

APPLICATION OF COATINGS

The most common method of applying exterior finishes is by brush which, although labour intensive, is particularly recommended for the application of initial priming coats because it provides a more thorough

wetting of the surface and penetration into grain, joints and corners. Other methods, such as rollers and airless sprays, may be used successfully for subsequent coats, particularly over large areas.

At all times manufacturers' recommendations relating to surface preparation, thinning, the number and sequence of coats, spreading rates, the time interval between coats, and weather conditions at the time of application should be strictly adhered to.

While manufacturers recommend a minimum time between coats, it is advisable that no longer than two weeks should be allowed between them without re-cleaning the surface to remove any build-up of surface contamination. Obviously, local conditions will influence this. As mentioned earlier, if the site is subject to unusual atmospheric contamination, for example salt spray, the surface should be thoroughly rinsed and dried before re-coating. All cladding, joinery, and other timber that will eventually require painting or staining should be primed on all surfaces as soon as practicable. Subsequently, careful attention should be paid to the re-sealing of exposed end grain or other areas that may be cut on site.

Finally, painting should never be undertaken during extremely hot weather or when temperatures are, or may fall, below 10°C as this will cause the paint to cure too quickly. Foggy, misty, or dusty weather should also be avoided and work for the day should stop early enough to allow the surface film to dry sufficiently before adverse conditions develop.

MAINTENANCE

Because of the infinite number of variables that can apply with any painted surface, it is virtually impossible to predict an accurate service life for any paint system before complete re-coating is necessary. These days though, with modern paint formulations and systems, a period of five to ten years between major maintenance may realistically be expected. However, it is likely that certain areas, such as those unprotected from the weather and particularly those facing due north, may need more frequent attention. Naturally, exactly the reverse will apply to areas that are well protected such as under verandas or wide eaves etc. In these situations, painted surfaces may possibly have a service life considerably exceeding the five to ten year period referred to previously.

The existence of mould and mildew will require treatment with specially formulated fungicidal washes, rinsing and

drying before new coats are applied. If this is not attended to correctly, the mould can spread between the coats of paint resulting in a lifting of the film and staining.

A number of paint manufacturers market various coatings specially formulated to inhibit the growth and spread of mould and mildew.

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Paint type	Comments
Conventional opaque systems - water and solvent borne	Suitable on dry and dressed timber. Wide range of colours. Durability good.
Natural timber finishes - semi-transparent and opaque	Best employed on durable sawn or textured timbers. More frequent but considerably simpler maintenance.
Water-repellent preservatives	Used as a pre-treatment to minimise soiling and deterioration during construction. Limited life if not overcoated.
Wood primers	Brush application is recommended. Solvent borne - better penetration but slower drying. Water borne - better long term flexibility, quicker overcoating and easier clean up.
Undercoats	Good opacity and bridging properties. Increased system film build and durability. Solvent borne - best over chalky surfaces. Water borne - faster drying, improved colour qualities and easier clean up.
Finishing coats - gloss	Solvent borne formulations have sharper gloss, good flow characteristics, opacity and durability. Water borne have a somewhat lower gloss initially, improved gloss retention, poorer flow but better film flexibility after ageing. Water borne formulations applied to primed timber will usually prove superior to solvent borne systems.
Finishing coats - semi-gloss	Comments as for gloss but lower gloss level. Slight reduction in durability but will minimise the appearance of surface imperfections.
Finishing coats - flat and low sheen	Solvent borne - rarely used for exterior. Water borne - good durability and colour.
Natural finishes - opaque or solid stain	Generally solvent borne. Enhances both timber grain and texture and will help maintain timber colour. Care is required during application to avoid lap joint colour differences.
Natural finishes - semi-transparent stains	Obscures grain but enhances texture. Has better durability than semi-transparent stains. Water borne 'acrylic' solid stains generally provide superior performance to solvent borne finishes, particularly over knotty timbers.
Natural finishes - clear	Enhances timber appearance but requires a commitment to regular maintenance with frequent inspections. The performance of solvent borne clears has improved with the use of UV absorbers specific to resin types used. Water borne clears, or slightly tinted formulations, are demonstrating considerable promise of durability almost equivalent to the opaque systems. Water borne clears are more flexible and thermoplastic.

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