

GUIDE TO THE SELECTION, APPLICATION AND TESTING OF END GRAIN SEALANTS FOR TIMBER WINDOWS

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INTRODUCTION

This Guide discusses the use and criteria for the selection of an end grain sealant (this is often referred to as a sealer particularly in trade literature) which can be used to seal the end grain of timber. This Guide also proposes a simple test, which can be used to identify suitable materials, both proprietary and general products. The test will also confirm whether a full decorative coating system is suitable to seal end grain timber.

Coating failure or localised coating breakdown can be linked to moisture movement particularly if moisture is trapped. The most susceptible places for moisture movement are certain areas of end grain that are visible after the machining of components whether or not the end grain is still fully exposed after a frame is assembled. A significant improvement in moisture control and hence reduction in moisture movement within the timber can be achieved by end-grain sealing those areas that are most exposed to the elements.

As well as significantly reducing the chance of coating failure, end-grain sealing will:

- increase the long-term performance of exterior-quality paints or decorative stains,
- improve the appearance of the whole window, and
- further simplify and reduce the need for maintenance during the life of a window.

Extensive research testing by BWF members and the Building Research Establishment at Garston has demonstrated how moisture can enter end grain within typical joinery joints and how to minimise this ingress. The following guidance is given on the basis of the results of this testing. In providing this guidance, BWF has assumed that good building practice will be followed when fixing timber windows on site e.g. with the provision of damp-proof courses.

This note describes methods of sealing end grain to a significant extent and includes advice on:

- the positions where sealing is most advantageous, and
- an appropriate test to judge the efficiency of a particular sealing method.

WHERE END GRAIN NEEDS TO BE SEALED

The preparation of a joint between two pieces of timber will inevitably create a number of end grain surfaces. Once the joint is assembled some of these surfaces will be concealed by other timber pieces and others will remain exposed. The exposed surfaces will eventually be covered by a surface coating.

The positions in a window where end grain sealing is most likely to be most advantageous are in:

- joints that are at the lower corners of a casement, sash or main frame
- at the bottom end of a mullion or vertical glazing bar
- at the ends of transoms or horizontal glazing bars
- at the ends of sills or sub-sills
- at the bottom end of vertical glazing beads
- any mitred joint of glazing beads
- to end grain created by mortices.

APPLICATION OF END GRAIN SEALANT

Any material used as an end grain sealant must be applied in accordance with the manufacturer's instructions, particularly if a proprietary end grain sealant product is to be used.

- Where the end grain is concealed within a joint the sealant will need to be applied before the joint is assembled. In these instances suitable adhesives which have also been shown by test to act as an end grain sealant may be the preferred solution.
- Where end grain is still exposed after assembly of the joint, it may be preferable to apply the sealant after a base or priming coat has been applied. There is some evidence to show that not only will an exposed end grain sealant perform better when applied after the base or priming coat, but also that subsequent decorative coats adhere better with this sequence. The advice of suppliers of proprietary end grain sealants must be followed.

TYPES OF SUITABLE MATERIALS

At present, there are a number of proprietary end-grain sealant products on the market produced specifically by coating manufacturers for end grain sealing.

In addition to these, timber window manufacturers have used a number of other products, such as adhesives and mastics, with varying degrees of success.

Before using any product (even a proprietary sealant product) as an end-grain sealant it is advisable to test the product on timber samples as indicated below under "Test Method".

In tests by BWF Members, a number of products have been found to provide a good response to the test. These have included:-

- Proprietary sealant products
- PVAc adhesives meeting the D3 requirements of BS EN 204.
- Fully factory applied decorative coatings

BWF TEST REQUIREMENT

A product or system will be accepted as providing sufficient resistance to moisture uptake and therefore suitable as an end grain sealant if, after being evaluated by the test given below, the sample does not increase in weight by more than **20%** of the increase attained by the untreated control sample.

This is also subject to the 5% control requirement referred to under “Analysis of Results”.

TEST METHOD FOR END GRAIN SEALANTS

The test method described below has been used with success by BWF members in evaluating the efficiency of various methods of sealing end grain by factory-finishes, certain adhesives, and proprietary end-grain sealant.

In order to provide an appropriate method of selecting and controlling the quality of end-grain sealants the following test procedure shall be followed:-

Equipment:

- Tray of suitable size to take the required quantity of timber samples.

The tray material must not react with the water and timber samples to cause staining or deterioration.

The tray should have an internally ridged base which shall allow maximum water contact to the base surface of the timber samples.

Alternatively the internal base shall be lined with a mat of wickable material which will also allow maximum water contact to the base of the samples.

- Equipment to apply sealant material as dictated by 'sealing product' manufacturer.
- Balance to weigh samples (within an accuracy of ± 1 gramme).
- Aluminium primer or full gloss paint system to seal samples prior to cross-cutting to produce the test samples.
- Kitchen or other absorbent paper to dry samples.

Preparing the samples

From a typical production run, of either European Redwood (*Pinus Sylvestris*) window material or another suitable species used for window production, select random samples of knot free timber with a cross section area sufficient to be able to produce a section 45mm x 45mm. Each piece should be

capable of producing two or more test pieces 150mm long.

Check the moisture content and ensure that it is within the range $16\% \pm 3\%$

Ensuring the section sample will contain at least 50% sapwood, machine the sample to 45mm x 45mm with the arrises rounded to a radius of 3mm.

Decorate the machined sample with three coats of aluminium primer or the full gloss paint system in accordance with the manufacturer's instructions on all faces and both ends – Allow at least 48 hrs for the final coat to dry.

Cut the selected pieces into 150mm long test pieces, discarding the pieces with decorated ends. Dust off the end grain to remove any loose sawdust.

Using adjacent pairs from each original machined section, decorate one end of one test sample with the end grain sealing material to be tested, keeping the pieces from each machined section together. Mark an end of each piece for identification such that when the samples are placed in the tank the grain direction of all of the samples from the same machined section will be the same. Place all samples in a clean cupboard and leave for 24 hrs for the end grain sealant to cure.

If a proprietary end grain sealant is being used follow the manufacturer's instructions.

Note: Each length of timber must have at least one test piece used as a control. A test piece from one length cannot be used as a control for samples from a different length.

Testing Samples

At the time of preparing the samples, prepare the test tray. If appropriate, place the wickable matting in the tank ensuring a smooth surface. Prepare sufficient water to fill the tank so as to ensure the samples will be covered up to 10mm from the immersed bottom end of the samples.

Leave for 24 hrs to ensure the water reaches room temperature. (For observation purposes a colouring agent may be added to the water.)

24 hrs after preparing samples and before placing in the tank, weigh all the test pieces and record the results.

Stand all the test pieces in the water with the end grain sealed end and the common end of the control samples in the water ensuring that the water covers the immersed ends by 10mm. Ensure samples are at least 15mm apart.

Leave the samples in the tray in contact with the water for 3 days (72 hours) ensuring that the water does not drop below 10mm from the lower end of the samples.

Examination

At the end of the test period remove the test pieces and blot the wet surfaces with kitchen paper to remove any free water.

Weigh all the samples and record the results. Weighing must take place within 1 hour of removal from the water.

Analysis of the Results

Calculate the increase in weight of each sample.

Calculate the percentage increase of the end grain sealed samples relative to the increase in weight of the control sample.

If the control samples have **NOT** increased in weight by more than **5%**, the results on the treated samples are to be ignored (this could indicate that the timber for the samples is already significantly resistant to moisture uptake).