

National Centre for Timber Durability and Design Life



Natural Durability of Plantation Blue Gum (*Eucalyptus globulus*) Timber

Professor Tripti Singh¹ and Professor Jeffrey J. Morrell²

¹Director, The National Centre for Timber Durability and Design Life
University of the Sunshine Coast, Brisbane, QLD

²Director, *Forestry Centre of Excellence*
University of South Australia, Mt Gambier, SA 5290

Executive Summary

Durability Concerns: Blue gum timber, particularly the rapidly grown plantation material, is unlikely to perform well in exterior exposures due to its susceptibility to fungal and termite attack. Untreated blue gum is classified as Durability Class 2 for above-ground exposures and Durability Class 3 for in-ground contact, making it less resistant to decay compared to other timbers.

Preservative Treatment: To enhance the durability of blue gum timber, it is essential to treat it with preservatives as outlined in Standard AS1604. This involves complete treatment of the sapwood and a minimum of 5 mm penetration in the heartwood. However, blue gum heartwood is highly resistant to fluid movement, requiring additional processing such as incising to achieve effective treatment.

Interior Applications: Given the challenges associated with treating blue gum timber for exterior use, the most practical application for glued laminated timber (GLT) blue gum would be interior settings where the timber will not be subjected to wetting.

Overview

Southern blue gum (*Eucalyptus globulus*) is native to southeastern Australia, but has been widely planted globally. It is characterised by rapid growth under a variety of conditions. More recently, it has been extensively planted in southern Australia to produce chips for the pulp and paper industry.

Changing markets have encouraged exploration of other products for blue gum including glued laminated timbers (GLT). This effort was supported by the Agricultural Trade and Market Access Cooperation (ATMAC) program and resulted in successful manufacturing of GLT beams. A secondary objective of this program was to evaluate

the durability of blue gum GLT in exterior exposures. This treatise will briefly summarise the reasons why that portion of the project may not be useful.

Australian Standard AS5604 characterises durability for both above ground and in-ground contact applications on a scale from 1 (very resistant to decay) to 4 (highly susceptible to decay) (Table 1). The standard categorises blue gum as Durability Class 2 in above ground exposures and Durability Class 3 in soil contact. It also lists this species as having lycid (powderpost) beetle susceptible sapwood as well as being prone to termite attack. It is important to note that these ratings are based upon native growth timber, not the more rapidly grown plantation material being considered for GLT manufacturing. As a result, untreated blue gum is unlikely to perform well in exterior exposures.

Class	Probable in-ground life (Years)	Probable above ground (Years)
1	>25	>40
2	15 to 25	15-40
3	5 to 15	7 to 15
4	0-5	0 to 7

In lieu of any natural resistance to fungal and termite attack, blue gum would need to be supplementally treated with preservatives to enhance its durability. The processes for treatment are described under Standard AS1604, which outlines the chemicals that can be used for this process as well as the requirements for successful treatment. The Standards require a that a minimum amount of preservative (or retention) be delivered to a minimum depth into the wood (penetration). The Standards require that all sapwood in a given piece of timber be treated as well as a certain amount of the heartwood. For background, sapwood is the living part of the tree, and its depth varies with species. Blue gum has a relatively shallow sapwood so most of the wood in a GLT beam would be heartwood. Heartwood is the internal core of the tree that is not alive at the time of cutting. Sapwood is relatively easily treated with preservatives while the heartwood of most species, including blue gum, is extremely resistant to fluid movement. The result is a shallow layer of preservative surrounding an untreated heartwood core.

AS1604 requires complete treatment of the sapwood and a minimum of 5 mm of penetration in the heartwood of timbers. While this might seem easily achieved, blue gum heartwood is highly resistant to treatment and would require some additional processing to be treated. The most common additional step to improve treatment is incising, which involves driving fine metal teeth into the wood surface to increase exposure of more permeable end-grain. However, this process mars the wood surface

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and many architects object to its use, resulting in improperly treated beams that perform poorly in outdoor exposures. Treatment of the lamina before gluing can also be used, but the material must be planed prior to gluing, removing much of the treatment. These characteristics would make using treated blue gum GLT problematic, although not impossible.

At present, the most practical uses for GLT blue gum would be interior applications where the timber will not be subjected to wetting.

Background of the Authors: Professor, Tripti Singh is the current Director of the Centre for Timber Durability and Design Life at the University of the Sunshine Coast. Prior to that she led the timber durability research program at Scion in Rotorua, New Zealand and have over 2 decades of professional experience in timber durability.

Professor Jeffrey Morrell was the previous Director of the of the Centre for Timber Durability and Design Life and currently is the founding director of the *Forestry Centre of Excellence, University of South Australia*. Professor Morrell is an authority in Timber Durability around the world with over 40 years of experience both in the USA and Australia. Under his leadership, as the chair of TM-12 committee, which includes Standards for preservative treatment and natural durability and recently led the efforts to revise Standards AS5604, which provides durability ratings for native and imported timbers, including blue gum, as well as AS/NZS1604, which covers preservative treatment.

Literature

Boland, D.J., M.J.H. Booker, G.M. Chippendale, N. Hall, B.P.M. Hyland, R.D. Johnston, D.A. Kleinig, M.W. McDonald, and J.D. Turner. 2006. *Forest trees of Australia*. Fifth Edition. CSIRO Publishing, Clayton South, Victoria.

Bootle, K.R. 1983. *Wood in Australia*. McGraw-Hill, Australia North Ryde, NSW.

Standards Australia. 2018. AS1604-2021. *Preservative treated wood-based products*. Standards Australia, Sydney, NSW. Standards Australia. 2022. AS5604-2022. *Timber-Natural Durability Ratings*. Standards Australia, Sydney, NSW.