

## Information Paper

## British-grown Douglas fir

## Growth rate and density relating to visual grading and strength class attribution

## Ed Suttie

This Information Paper describes research carried out on visual methods to assess the strength of Douglas fir. Current standards for visual grading use the growth rate (ie width of growth rings) to draw conclusions for wood density, but testing the wood density of samples grown in various parts of the UK found that these standards underestimate the mean density. This often results in capable structural timber being downgraded and used for lower value applications. Using the ratio of earlywood to latewood in the growth rings can be used successfully to assess the wood density, and this alternative method would lead to less wastage of serviceable structural timber. The use of Douglas fir in structural applications is also briefly considered.

This Information Paper is aimed at timber processors and users of timber products, as well as designers and architects considering using UK-grown Douglas fir for their projects. After reading this they should be inspired to use a material that supports part of the UK's sustainable rural economy and have the confidence to specify Douglas fir in structural applications.

## Introduction

Douglas fir (*Pseudotsuga menziesii*), like many timber species grown in the UK, is a native of the North American continent and originates in the area of California through the west coast mountain ranges up into Canada. In the US it is called 'Oregon pine' rather than 'Douglas fir'. The UK name comes from David Douglas, who first sent seed back to Britain in 1827, and the 'menziesii' part of the botanical name derives from Archibald Menzies, who sent botanical samples back to Kew whilst exploring the US with George Vancouver in 1793.

Douglas fir is a relatively minor timber species in the UK, like larch, with each species accounting for about 5% of the structural timber produced. In the US and Canada it was traditionally used



**Figure 1:** This collage shows the general appearance of the tree, logs and timber. The sapwood is the thin, pale, almost white outer band of the logs, whereas the majority of the timber, the heartwood, is a mild orange that will darken on ageing and exposure to air

for railroad construction and general construction work, due to the size of the trees and the durability of the timber in that environment. The natural durability of the material, as classified by BS EN 350-2:1994<sup>[1]</sup>, varies based on origin, with the North American supply classified as moderately durable in resistance to fungi, whilst European-grown material is classed as moderately to slightly durable. The heartwood has a warm, slightly orange hue whilst the sapwood is pale, almost white. Figure 1 (right-hand image) indicates the general appearance of the timber when planed.

For its strength Douglas fir is stiff, with a high modulus of elasticity. This is an important factor for structural timber design as serviceability criteria, governed by stiffness, are generally the design-limiting factor, rather than strength. Douglas fir is finding increasing application on localised bespoke projects as structural framing (Figure 2). It is also available in large, relatively clear baulks suitable for timber engineering applications.

One of the current difficulties encountered when using this species is that the strength attributions for the visual grades in BS 4978:2007<sup>[2]</sup> are low: the general structural (GS) grade is C14 and the special structural (SS) grade is C18. Typical strength grades used for structural timber in construction are C16 or C24, so whilst we have to rely on visual grading, this has the risk of precluding Douglas fir from these valuable applications.