Durability
Timber has been used in construction for millennia and timber structures can survive for centuries. The oldest surviving wooden building, Horyuji temple in Japan was built in 670. Different timbers (species) have different durability, and the Australian Standard AS5604 (Timber - Natural durability ratings) defines the durability ratings for timbers in different environments. The selection of fit for purpose timber is important for the longevity of the structure. Timber that has been correctly chosen for its application and installed and maintained correctly can last well in excess of 50 years (see Table 1).

<table>
<thead>
<tr>
<th>Natural durability class</th>
<th>Probable heartwood life expectancy (years) (1)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Fully protected from the weather and termites</td>
</tr>
<tr>
<td>Class 1 Highly Durable</td>
<td>50+</td>
</tr>
<tr>
<td>Class 2 Durable</td>
<td>50+</td>
</tr>
<tr>
<td>Class 3 Moderately Durable</td>
<td>50+</td>
</tr>
<tr>
<td>Class 4 Non-durable</td>
<td>50+</td>
</tr>
</tbody>
</table>

1. The rating system used in AS 5604 is based on the average life (range in years) of test specimens of sound, untreated heartwood (35 mm, 35 mm for the above-ground tests and 50 mm for the in-ground trials). In construction, commercial timber member dimensions would normally exceed the section sizes of specimens used in trials and the construction timber should provide life expectancy in excess of the above values.
Good building design increase the life of timber, as timber is susceptible to decay and attack from insects like termites. Decay occurs with fungal infection and requires four different factors to take hold; a timber moisture content of between 20 to 60 percent, exposure to oxygen, temperatures between five and 40 degrees Celsius and nutrients present within the wood. The best ways to prevent decay are to protect the timber from moisture or to treat the timber to remove the nutrients necessary for decay to establish.

It is necessary to manage for the impacts of moisture across the entire life of the building. Moisture can be introduced to timber by rain during the construction phase as well as during building use through condensation, humidity and ground moisture. This is the case for both structural timber and engineered timber products like cross laminated timber (Wood Solutions, 2013).

**Strength**

Timber has a high strength for its weight and strength generally increases with density. The strength of timber can be increased further with engineered products like Laminated Veneer Lumber (LVL), Glulam and Cross Laminated Timber (CLT), plywood and LVL. CLT is layers of timber glued with their grains opposing which increases the strength of the timber significantly; a panel of CLT has a similar strength to a panel of concrete but with less weight (Wood Solutions, 2017). Timber is being successfully used to create mid-rise buildings, with the tallest timber office building in Australia to be completed in Brisbane in mid-2018, which is 45 metres tall.

**Further Reading**


**Case Study — International House**

International House at Barangaroo is a seven-storey office building and initially was Australia’s first and largest commercial engineered timber building. CLT and glulam have been used for the floors, columns, walls, roof, lift shaft and stairs, supplemented with recycled Australian hardwood. The first floor has a traditional concrete structure to remove the timber from the hazards of moisture and termites from the ground. The strength of timber is uniquely displayed through the design of the building and the use of glulam and CLT for the structural loads and bracing.

Figure 1 International House, Barangaroo, Sydney. Image courtesy of Lendlease.