EXPLAINED INSIDE:
NEW UNTREATED DOUGLAS-FIR SOLUTIONS APPROVED BY DBH

DOUGLAS-FIR

up close

Douglas-fir is a highly regarded timber, preferred for its superior strength, toughness, durability and decay resistance.

Nature prefers Douglas-fir

In today's world with the threats posed by climate change and the impact of our carbon footprint, creating a sustainable future is an essential factor in the decisions and choices we make both as individuals and as a country.

Designing and building with wood is one easy way to make a significant difference. Douglas-fir, in particular, offers premium advantages – from environmental benefits through to superior structural characteristics, it is a smart choice for creating natural, healthy, environmentally sound buildings of the future.

Using sustainably grown timber benefits the planet, by taking advantage of what is commonly known as 'the Carbon Cycle'. Basically, growing trees absorb CO2 from the atmosphere by using photosynthesis, effectively removing it and, in turn, releasing the oxygen that we all breathe.

Our Douglas-fir and other planted forests will effectively cancel out the growth in New Zealand's emissions from the cars we drive in Kyoto's first Commitment Period (CP1). So, by choosing wood, you can do your bit for a better world, in New Zealand and globally.

In 1991 New Zealand forest growers and environmental, conservation and outdoor groups signed the New Zealand Forest Accord promoting plantation forests as a sustainable source of timber while removing the harvest pressure off our precious native forests. By choosing plantation grown Douglas-fir timber you encourage the creation and cultivation of more plantation forests to supply for such demand. You also take the pressure off our remaining native and tropical forests. Harvesting our forests, and using the timber they contain, creates carbon stores while replanting these forests repeats the cycle. Remember that wood is the only building material that is truly renewable.

The Carbon Cycle is one of the major factors affecting our environment. Wood has a huge role to play in helping to combat climate change and contributing in a positive way to our world. Because wood is effectively 'manufactured by the sun' it also uses less energy to produce than other comparable building materials.

New Zealand's Douglas-fir forest plantations are managed sustainably, producing renewable supplies of excellent quality building materials, while encouraging biological diversity, providing recreational opportunities and delivering clean water.

350 billion tonnes of carbon are locked within forests above ground, with another 800 billion below ground (in roots and humus layers) worldwide.

Manufactured by the sun

A growing tree is called a "sink" because it absorbs carbon dioxide from the atmosphere. Much of the CO2 absorbed through the leaves of the tree is converted into wood. Young vigorous growing trees absorb more CO2 than older trees, but all retain the carbon within their wood until they are burned or otherwise disposed of. That means old wooden antiques still contain the carbon from hundreds of years ago. This also means that recycled wood products maintain the carbon stored in the timber used.

The "pool" of stored carbon in existing buildings in New Zealand is substantial. But when these existing buildings are demolished and the wood burnt or left to decay, this carbon returns to the atmosphere. If new wood is used in the construction that replaces these structures it results in a continuation of the status quo.

If a different building material is chosen then the loss of the stored carbon can negatively impact upon the atmosphere. What's more, additional fossil fuels will have been used in the production of that other building material which cumulatively adds to the concern of global climate change.

Let's talk footprints in the forest

Material	*Carbon (CO_2) emitted*
ALUMINIUM (virgin)	**21600kg per m³**
STEEL (virgin)	**9749kg per m³**
CONCRETE (17.5 MPa)	**268kg per m³**
WOOD (kiln dried dressed)	**-690kg per m³**

The carbon footprint is calculated by employing Life Cycle Assessment (LCA) principles and current methodologies applied to the production and manufacture of the building materials and components of building designs (often referred to as 'cradle to gate' assessment).

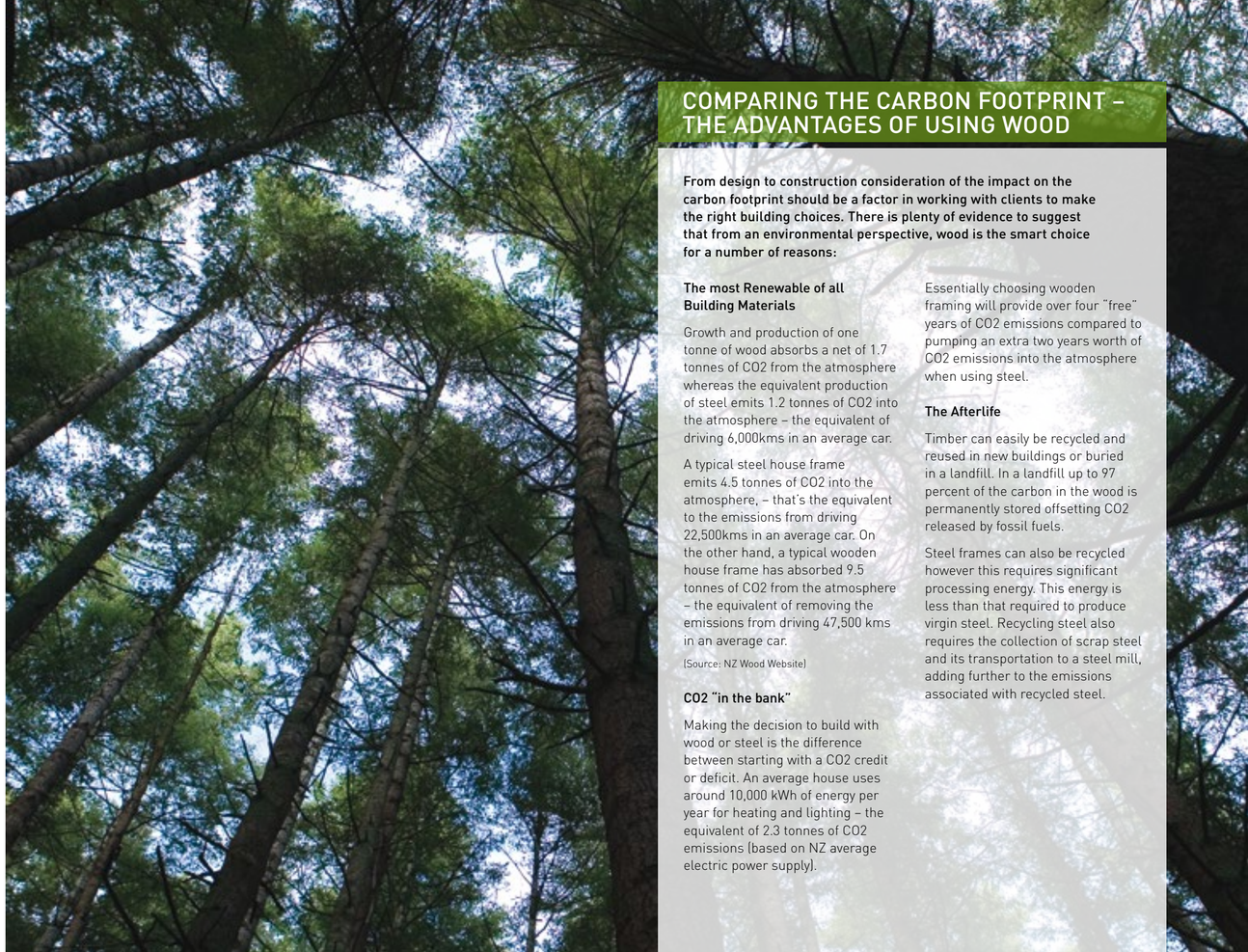
The principal source of CO2 associated with the production of building materials is the combustion of fossil fuels used, at all stages, to make those materials, together with the release of any CO2 from the source materials (often referred to as 'embodied CO2').

Applying known CO2 emission rates for various fuels and processes provides embodied CO2 coefficients (g CO2 /kg) for building materials. These details are contained in a NZ-specific study authored by Andrew Alcorn of Victoria University[1].

Under this methodology, when a tonne (1000 kg) of processed, finished timber leaves the sawmill, it is calculated to have removed a net total of around 1644 kg CO2 from the atmosphere[2]. This is net of all CO2 related to its growth, harvesting and production.

[1] Alcorn, A., 2003 :. Embodied Energy and CO2 coefficients for NZ building materials. Centre for Building Performance Research, Victoria University of Wellington.

[2] Based on the amount of carbon stored in the timber – making an allowance for all the energy used and CO_2 produced, in its growth, harvesting and processing.



COMPARING THE CARBON FOOTPRINT – THE ADVANTAGES OF USING WOOD

From design to construction consideration of the impact on the carbon footprint should be a factor in working with clients to make the right building choices. There is plenty of evidence to suggest that from an environmental perspective, wood is the smart choice for a number of reasons:

The most Renewable of all Building Materials

Growth and production of one tonne of wood absorbs a net of 1.7 tonnes of CO2 from the atmosphere whereas the equivalent production of steel emits 1.2 tonnes of CO2 into the atmosphere – the equivalent of driving 6,000kms in an average car.

A typical steel house frame emits 4.5 tonnes of CO2 into the atmosphere, – that's the equivalent to the emissions from driving 22,500kms in an average car. On the other hand, a typical wooden house frame has absorbed 9.5 tonnes of CO2 from the atmosphere – the equivalent of removing the emissions from driving 47,500 kms in an average car.

(Source: NZ Wood Website)

CO2 "in the bank"

Making the decision to build with wood or steel is the difference between starting with a CO2 credit or deficit. An average house uses around 10,000 kWh of energy per year for heating and lighting – the equivalent of 2.3 tonnes of CO2 emissions (based on NZ average electric power supply).

Essentially choosing wooden framing will provide over four "free" years of CO2 emissions compared to pumping an extra two years worth of CO2 emissions into the atmosphere when using steel.

The Afterlife

Timber can easily be recycled and reused in new buildings or buried in a landfill. In a landfill up to 97 percent of the carbon in the wood is permanently stored offsetting CO2 released by fossil fuels.

Steel frames can also be recycled however this requires significant processing energy. This energy is less than that required to produce virgin steel. Recycling steel also requires the collection of scrap steel and its transportation to a steel mill, adding further to the emissions associated with recycled steel.

Keeping it local

With Douglas-fir plantations and saw milling operations spread throughout the South Island, timber supplies can be sourced locally. Not only is this great for local business and the local economy, but also with less distance to travel it provides the perfect building option for those conscious of reducing their carbon footprint.

The South Island's mountainous landscape, mountain fed streams and rivers, climate and clean atmosphere, provides an ideal growing environment for Douglas-fir. Over 75 percent of New Zealand's 112,000 hectares of Douglas-fir plantations can be found in the South Island and the potential exists to expand on this. Enjoying the cooler climate of the South and with a tolerance of winter conditions Douglas-fir tend to experience good growth in this part of the country.

Many plantation forests have been established on steep land previously in pasture but where soil loss as a result of storms has triggered erosion and made farming unsustainable. Planting forests in these areas has helped to reduce soil erosion, improve water quality, increase biodiversity and reduce greenhouse gas emissions into the atmosphere.

In 1991 New Zealand forest growers along with environmental, conservation and outdoor groups signed the New Zealand Forest Accord promoting plantation forests as a sustainable source of timber while removing the harvest pressure off our precious native forests.

By choosing plantation grown timber for building design and construction it encourages the creation and cultivation of more forests to supply for such demand. It also takes the pressure off our remaining native and tropical forests alike and provides a natural, sustainable building material.

"Apart from the superior strength and durability… it's also a local product which fits another Ecotect policy: every project must include locally sourced materials … It's a simple choice."

Mark Fielding, ECOTECT

"A truly superior building material, one of natures best."

Why Douglas-fir

The benefits of natural products in general and wood in particular, are often taken as a given however the astute engineer, architect and builder understands the variables in performance and application that exist across the many timber options available.

Given New Zealand's harsh and often extreme climatic conditions, architects and builders need to be sure that their buildings have been designed and built to resist anything that the elements deliver. Choosing to build with wood and in particular Douglas-fir provides superior solutions for the majority of building and construction requirements.

Good architects and builders know about Douglas-fir and its superior qualities as a building material. By making Douglas-fir your building product of choice you are creating forward thinking buildings, fit for tomorrows world.

When you build with Douglas-fir, you can be sure you are choosing a popular material with inherent natural advantages that come from a sustainable plantation programme with environmental benefits offering real flexibility and opportunity in construction terms.

Douglas-fir is an excellent quality framing timber that can be used for roof trusses and framing, internal panelling, and glue laminated beams.

Popular for light timber framing, the larger dimensional stock has become increasingly popular for exposed interior beams due to its stability and freedom from twist.

Timber framing allows for flexibility and modification during construction and in comparison to other products is relatively easy and quick to erect. There are also advantages when it comes to building consents, as timber is an acceptable solution under the Building Code.

Timber from New Zealand Douglas-fir plantations has been used and trusted in construction since the 1930s. It is a specialist structural timber renowned for its strength, stability, stiffness and natural moisture resistance.

A truly superior building material, one of natures best.

For shape that lasts

For stability against the extremes of New Zealand's environment, Douglas-fir stands out as a top performer. By choosing Douglas-fir as a structural timber builders benefit because their timber frames are much more stable.

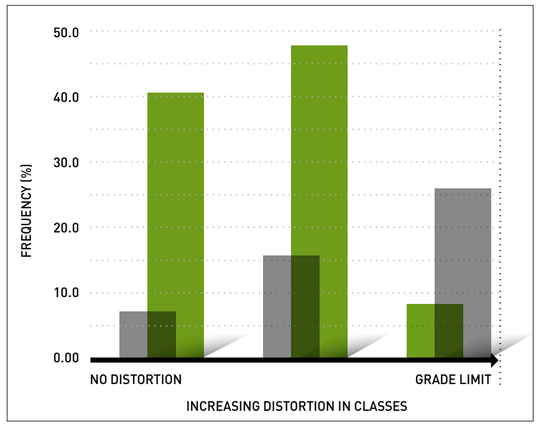
Douglas-fir is highly regarded for its stability, meaning that it stays straight. There are very few issues with 'longitudinal shrinkage near the pith, spiral grain and compression wood' and as a result its shape is retained when dry. Its steady nature and strong character help prevent movement in building structure and ensures a cleaner finish for interior linings.

Douglas-fir has high natural resistance to moisture and decay which means it can be left untreated in many low risk building situations – an ideal choice for people seeking the natural benefits of a wood solution.

There is a low incidence of spiral grain and compression wood around the pith, which allows the timber to retain the shape.

(Source: Douglas-fir Stability Comparison with Radiata Pine)

Distribution of Distortion in Douglas-Fir and Pinus Radiata



While all timber is specially selected to meet grading limits so that it is fit for purpose Douglas-fir timber is renowned as the best of the best for timber stability.

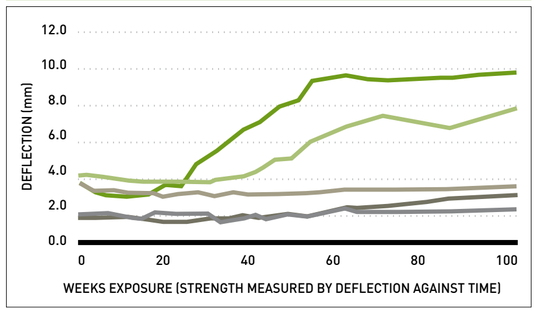
Durability you can trust

Douglas-fir is highly respected in the building trade for its ability to withstand the elements. This is because it's a refractory species, which means, the wood resists wetting, lowering the risk of damage during construction. It also has a natural ability to withstand decay for longer.

Furthermore it reduces the risk of movement due to expansion/ shrinkage that is caused by wetting and drying – making it an ideal choice for frames and trusses.

Even after 70 weeks accelerated decay trials untreated Douglas-fir performs as well as H1.2 LOSP radiata with no sign of strength loss.

Outstanding Resistance To Decay (D4-Durability)



Build well.
Build strong.

Strength is a vital characteristic of superior construction timber. It's all based on branch diameter or knot size. Douglas-fir is well known among builders for its strength and reliability, making it a first choice for structural beams and framing.

Douglas-fir does not have the juvenile pith and growth rate issues of pine. Its strength is a result of its tough fibre and dense grain structure. The forests are grown with more trees per hectare than pine varieties, thereby producing smaller branches (usually, less than 40mm). The branches are not produced as a whorl (or ring around the stem of the tree) so knots are not just generally smaller but also scattered around the trunk, which results in greater timber strength.

Its reputation for reliability and strength is best in class among readily available New Zealand framing timbers.

Natural stiffness.
Tough build.

Douglas-fir trees are generally left to grow for 40 — 50 years. This slower, stronger growth gives Douglas-fir a substantially higher stiffness and stability when compared to the common pine species.

Stiff timber reduces deflection and movement under loading, making it a preferred option for beams and joists. Its superior stiffness and strength means Douglas-fir is readily available in large end section sizes in MSG 8 and 10. Plus wider spans in MSG 10 mean less timber is required, reducing the cost of the building.

Its stiffness and strength coupled with its high natural resistance to moisture and decay mean it can be left untreated in many low risk building situations – an ideal choice for people seeking the natural benefits of a wood solution.

Builders Benefit.

The benefits of natural products in general and wood in particular, are often taken as a given, however the astute engineer, architect and builder understands the variables in performance and application that exist across the many timber options available.

CHEMICAL FREE

Offering Customers a chemical free choice:

- Customers considered it is important to be able to choose a chemical free alternative.

No personal or employee health and safety issues with treatment chemicals to manage: Natural Douglas-fir does not contain treatment chemicals. Working with Natural Douglas-fir does not pose the health and safety issues that working with treated timber has.

Benefits to builders and employers include:

- You can burn off-cuts without health risks associated with burning treated timber.
- Do NOT require gloves, goggles to avoid contact with treatment chemicals.
- Do NOT need to dispose of waste in approved landfill.
- Do NOT have to wash clothes separately from children's or other clothes.
- Do NOT have special precautions to avoid treatment chemicals when eating or working in unventilated spaces.
- Do NOT have risk of working with damp solvent impregnated timber.

STABILITY

When builders were asked about the stability of Douglas-fir they had this to say:

- "saves you replacing studs and gives you reliability."
- "With Pine we may have to replace anywhere up to 20 to 25 studs which costs time and money..."
- "Douglas-fir stops Gib board popping which saves us time."

MOISTURE RESISTANCE

When asked about moisture resistance builders said:

- "less hold ups in the winter months" (using Douglas-fir).
- We use it (Douglas-fir) where we can. It doesn't soak up water like a sponge and it will dry on site in two weeks."

STRENGTH AND STIFFNESS

- Douglas-fir has superior strength and stiffness to Pine.

Builders comments: "Douglas-fir is well suited for structural beams, trusses and roof framing."

DECAY RESISTANCE

- High resistance to decay when used in wall framing (but not suited for in-ground or exterior situations).

Builders comments: "We have first hand experience of moisture getting into a home we built, but the Douglas-fir stood up to it." "It gives me the peace of mind that it will stand up."

LESS WASTE

- Stays straight and you can burn off-cuts without health risks associated with burning treated timber.

Commercial and Industrial applications

Because of natural high stiffness Douglas-fir can produce large dimension solid wood and engineered components for many commercial, industrial and residential buildings without the need for chemical treatment.

Natural ingredients. No additives.

The Department of Building and Housing (DBH) have endorsed untreated Douglas-fir as approved for use in low risk buildings providing a building solution that is regarded as offering a weather-tight and 'chemical free' design option. Its natural resilience against a number of environmental elements means that untreated or natural Douglas-fir may be used across a range of applications.*

With its high natural resistance to moisture and decay, Douglas-fir can be used in many building applications without being chemically treated. This means much of the wood inside the home can remain 'natural' and free from man-made additives or chemical treatments.

Not only does untreated timber provide a chemical free and healthier option for clients, but also for builders – no contact with treatment chemicals; no need to wash clothes separately; no special precautions to avoid treatment chemicals when eating or working in unventilated spaces; and, no risk of working with damp solvent impregnated timber.

Furthermore, New Zealand's Douglas-fir trees are grown in sustainably managed forests which encourage biological diversity as well as providing recreational areas and delivering clean water. Simply put, untreated Douglas-fir is the ideal choice for those looking for an eco-friendly more natural living environment – inside and out.

Untreated Douglas-fir offers an added environmental benefit in that the off cuts and shavings can be safely burned or may be used to create a natural industrial boiler fuel.

* Refer to DBH Compliance Document B2/AS1. www.dbh.govt.nz

Treated and untreated solutions

Building solutions that specify where Douglas-fir can be used.

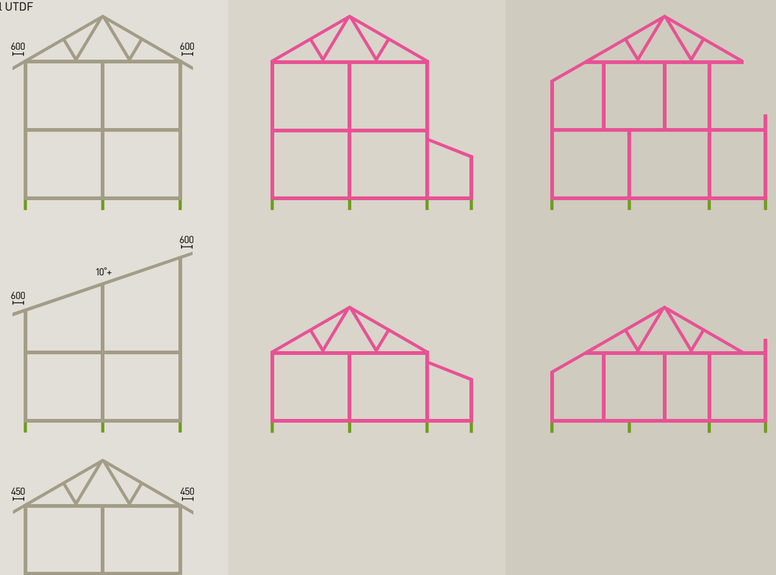
Treated Douglas-fir timber is available to H1.2 standard for use in building elements where there is a higher risk of moisture entering the building structure. Coupled with its natural ability to resist moisture and decay, treated Douglas-fir provides extra resistance for these areas.

Where the Building Code does require treatment, Douglas-fir treated with Boron, a naturally occurring earth element, can often satisfy Code requirements.

Full details of our building solution assessment criteria, as well as other useful technical guides, are available on our website: www.douglasfir.co.nz.

Acceptable and alternate solutions for the use of untreated Douglas-Fir in buildings with low to high risk matrix scores

LOW RISK 0-6	MEDIUM RISK 7-12	HIGH RISK 13-20
Using acceptable solutions B2/AS1 for all external and internal framing and roof framing Acceptable solution B2/AS1 2011 Para 3.2.2.2 all UTDF	Acceptable solution B2/AS1 2011 Para 3.2.2.2 All framing H1.2	Acceptable solution B2/AS1 2011 Para 3.2.2.2 All framing H1.2



- UNTREATED DOUGLAS FIR
- H1.2 TREATED DOUGLAS FIR
- H5 TREATED

Clever design means that your home can be chemical-free using wood. There are places where you can confidently use untreated Douglas-fir for your home and designs that eliminate or minimise the requirement for treated timber.

Building with wood means you're making a worthwhile contribution to improving the overall environmental performance of the building. Choosing wood reduces the use of energy and "resource greedy" materials and processes, and reduces environmental impact helping to redress global climate change. Douglas-fir has natural resistance to moisture and decay that means it can be used in many areas of your home without being chemically treated allowing you to enjoy a more natural home for you and your family.

People will tell you how they love the feel of a home with a strong wood presence. But way beyond that perception of instant comfort is a whole host of practical reasons for choosing a timber such as Douglas-fir. It's not only the wood on show, in a ceiling beam or beautiful floor, that makes the difference, but the wood used in the framing and construction as well.

WOODEN HOMES TEND TO BE MUCH MORE ENERGY EFFICIENT

Wood has a naturally good insulating value compared to other materials. And these days, a home that is warmer and more welcoming – one that needs less power to create a comfortable interior environment – is just what everyone is looking for.

THE POPULAR CHOICE WITH ARCHITECTS AND BUILDERS DUE TO ITS FLEXIBILITY, STRENGTH AND INHERENT CHARACTERISTICS

Douglas-fir offers proven construction benefits along with its warm, natural beauty. Part of this appeal is that Douglas-fir can offer higher stiffness grades, like MSG10, which provides long span capacity, the nice visual appearance of exposed beams, more aesthetic flooring options and so much more... that means there's greater opportunity to show design flair and create the distinctive and innovative buildings that others envy.

CLEVER DESIGN MEANS THAT YOUR HOME CAN BE CHEMICAL-FREE USING WOOD

There are places where you can confidently use untreated Douglas-fir for your home by choosing designs that eliminate or minimise the requirement for treated timber. Should the Building Code specify treated wood, Douglas-fir treated with Boron provides a great alternative to other treated timber products.

In the quest to make your home or building more natural and more environmentally sustainable, these are huge benefits. They're also the type of characteristics people will start to look for when buying houses in the future. If you're building now, things such as the environmental footprint, inherent insulation characteristics and chemical content are all becoming key factors to consider.

A decision you will be proud of for years to come...

WOOD LASTS

Wood takes us right back to the origins of our building heritage – our early history was built with wood. But on an international time line, our buildings are all incredibly recent. There are much older examples. Across the world, wood has been chosen for important and significant buildings, as well as people's homes, for centuries. There are temples in Japan and buildings around Europe still standing after a thousand years!

Those historic wooden buildings around the globe, many dating back to the 16th century or beyond, still store the carbon from back when the trees were growing. Talk about durability. It's no wonder that wood remains such a highly valued building material.

CASE STUDY 01

Alpine Retreat

Nestled under a mountain vista in Queenstown

When Amanda and Brent Elliott built their dream home, they had recently purchased the Signature Homes Southern Lakes franchise, and needed their new house to act as their showhome. So, for an agonising seven months, they continued to rent, showing prospective clients through and dreaming of the day they could move in. Brent built the house himself, and it is this dedication to producing quality houses, as well as his passion to help others into affordable homes, that makes their franchise so successful.

Located just five minutes from the heart of Queenstown at Arthurs Point, the Elliots home is tucked beneath Mount Bowan, and looks up to the Moonlight track, which takes serious walkers straight to Moke Lake. The house is positioned just above a picturesque canyon, famous for being the place where the Shotover Jet operates. Amanda and Brent simply adore the setting where they live, and are particularly blessed with their new neighbourhood. The mountain is spectacular in the middle of winter, disappearing altogether when a storm is brewing, and the family can be at the top of Coronet Peak in only fifteen minutes. They are surrounded by other young families, and have a reserve just across the road, which is great for their two boisterous boys.

Prior to building commencing, the couple spent hours pouring over design ideas. Magazines were a constant source of inspiration, with Brent's practical experience making the process very detail orientated. To ensure the design existed at one with the environment, the Elliots favoured a pitched roof, with wide windows at each end of the house incorporated to capture the view. The building itself was constructed to face the mountain, and its North West position also allows the family to enjoy complete privacy. To maintain the 'alpine' theme, interior fittings were also studiously considered. "We introduced natural timber into the house to create a sense of warmth, and to steer clear of the sterile look," comments Amanda. The living spaces all work well, with the striking high ceilings enhancing the spacious dimensions of the home...

(Story & photos courtesy of Homestyle magazine, Issue 21, 2007)

Opposite:
The cathedral-style ceiling features Douglas-fir beams, a perfect contrast to the Karen Walker Milk White on the ceilings.

CASE STUDY 02

Smith and Smith Glass Building

The application of large section and engineered Douglas-fir for industrial and commercial buildings has created new opportunities for environmental responsibility. Douglas-fir presents an easy and cost-effective way to reduce the carbon footprint of your building whilst maintaining integrity and functionality.

Nelson Douglas-fir supplier, Waimea Sawmillers, worked closely with the Smith and Smith Glass building owners and designers to maximise the use of chemical free Douglas-fir glulam portals to replace energy intensive steel. The result was a healthier and more carbon friendly building that instils pride in the owners.

"Knowing we could use a local product that was good for the environment and meet all our building needs, Douglas-fir became the obvious choice"

Justin Fletcher, Redbox Architects

Durable, natural and aesthetically pleasing, wood is the most sustainable, infinitely renewable raw material on earth. Unlike oil, gas, coal or minerals that, once used, can never be replaced, wood can be regenerated indefinitely when grown and processed sustainably.