THINK WOOD.

ENERGY AND THE ENVIROMENT.

The challenge facing specifiers and builders today is daunting but critical…to create and construct buildings that contribute towards solving the complex environmental and energy related problems facing the planet.

It is ironic that, at a time when the need for energy efficient and environmentally benign materials has never been greater, timber and wood products are criticized and sometimes avoided because of concern over deforestation.

It's a process, which ignores the facts. The fact that in most of the world's forested countries trees are being replanted in their millions, putting back more than is harvested.

The fact that wood is natural, organic, renewable, non-toxic, re-cyclable and biodegradable. The most important fact of all is that by opting for alternative materials you are contributing to the growing threat of global warning.

GLOBAL WARMING AND THE GREENHOUSE EFFECT.

Energy from the sun heats the earth's surface which radiates energy back into space but gases in the atmosphere – carbon dioxide, methane, nitrous oxide and CFCs – absorb some of this energy and return additional heat to earth – "the greenhouse effect".

Without action, the best estimates suggest that the average temperature of the world may increase by 0.3 degrees centigrade every ten years and sea levels could rise by 6cm a decade over the next century.

It may not sound much but it's a rate of warming faster than for the last 10,000 years, threatening to change weather patterns, food production, patterns of disease and to flood low lying land and turn fresh water to salt water.

According to the Government. "These changes and the migration of people they could cause, could affect peace and international security."

That's why Britain has set itself the target of reversing the growth in carbon dioxide emissions and returning them to their 1990 level by 2005 because carbon dioxide is the main greenhouse gas.

ENERGY EFFICIENCY AND GREENHOUSE GASES.

To achieve this demanding target the Government has launched a major campaign to improve because carbon dioxide comes mainly from burning coal, oil and gas to generate electricity, run factories and heat buildings.

In fact, according to the Building Research Establishment, energy use in buildings is responsible for around 50% of total UK emissions of carbon dioxide at present, virtually as much as industry and transport combined.

So architects, specifiers and builders in both the public and private sectors, are in the frontline, creating new energy efficient buildings and finding ways to improve the efficiency of existing properties.

They bear the responsibility for selecting building components and materials, which use the least energy in their production because industrial manufacture and processing also uses energy and relates carbon dioxide.

Which, to put it in a nutshell, means…Think Wood!

GROWING TREES ABORBS CO 2.

A growing tree is a very effective 'carbon stink'. During its growth carbohydrate is accumulated by photosynthesis faster than it is metabolished by respiration. This natural process means a growing tree is a gas exchanger, carbon dioxide is absorbed, the carbon "locked" in the wood structure, while oxygen is released into the environment. It is one reason why some world authorities are calling for more trees to be planted, to absorb existing **CO2.**

In addition, growing trees act as a 'wick', drawing up ground moisture and evaporating it into the atmosphere, humidifying and calling the climate.

However, in a mature tree, as growth slows, this process levels off and little **CO2** is removed; while fallen, decaying trees in old growth forest actually release **CO2** into the air.

The logic is inescapable – trees can help to reduce **CO2** and through carefully controlled forest management we can harvest mature trees and replace them with young, faster growing trees and improve the rate of **CO2** absorption.

BURNING THE FORREST.

What about the rain Forrest fires which release huge amounts of **CO2** into the atmosphere? Burning forests account for upto **25%** of the worlds **CO2** emissions.

But, these fires are not ignited by foresters or the timber industry. Forests are burnt when the land is wanted for the other uses – agriculture, a power station or an ore mine complex – perhaps to provide the energy and materials to produce steel or aluminum building products as alternatives to wood!

It's also important to remember that burning wood is "**CO2** neutral". The carbon dioxide released is equivalent to that absorbed by the tree in its growth. In some developed countries burning wood as a fuel is being carefully considered. The US Office of Technology Assessment has suggested that US forests could meet **10-20%** of the country's energy needs. The UK Government is also considering this process with funds for research and demonstration projects. Unlike non-renewable fossil fuels, wood may prove a fast growing source of potential heat and energy.

ACID RAIN.

Even closer to home the generation of power is helping to destroy trees. Acid rain is produced mainly by sulphur dioxide and oxides of nitrogen (NOx) from power stations and other plants burning coal, oil or gas.

European Sulphur emissions are putting at risk 60% of the coniferous forest reserves of Czechoslovakia, Russia, Sweden and Finland and 50% of the deciduous forest of Germany and France.

So what is the alternative?

THE TRUE COST OF ALTERNATIVE MATERIALS

Today the responsible specifier can no longer afford – for all our sakes – to compare building materials without - thoroughly taking into account the energy efficiency – and hence the **CO2** efficiency – of the available options.

That assessment must look at the environmental consequences 'from cradle to the grave'.
The production and processing of wood products require very low energy inputs. A tree grows on 'natural' energy. Its extraction requires far less energy than the coal, oil, bauxite, iron ore and limestone needed to produce alternative materials.

If you are concerned at the environmental impact of forestry, remember the effects of opencast mining and quarrying, the problems of oil spillage and the risks inherent in nuclear power. Don't forget, trees can grow in the space of a lifetime. How many centuries do we need to replace our stocks of oil, fossil and minerals?

Equally, converting logs into finished, high grade building components requires low levels of energy compared with the alternatives.

You can not ignore the facts.

SO WHAT ARE THE FACTS?

Research in Europe, North America and Australia shows time and again that it takes less energy to produce timber products than alternative materials and consequently less **CO2**.

ENERGY TO PRODUCE ONE TONNE OF BUILDING MATERIAL.

Timber	**435 kilowatt hrs**
Steel	**3780 Kilowatt hrs**
Aluminum	**20169 Kilowatt hrs**

For example converting, kiln drying and treating rough sawn timber consumes 5.3mj/Kg and aluminum 145 mj/kg, which means that a light gauge cold rolled steel purlin, takes 19 times more energy compared with a 300 x 50mm rough sawn joist of the same stiffness.

A 305x165mm steel I-beam will perform only as well as a 550x135mm glulam softwood beam but has 6 times the energy cost. A comparable 400x250mm reinforced concreter beam has 5 times the energy cost of the wood product. A solid mesh reinforced concrete ground floor for a typical domestic house, with moisture barrier and support walls and footings consumes almost twice the energy of using particleboard on timber joists or timber bearers on concrete walls and footings. But, are these just isolated, carefully chosen examples? What about the total building energy cost? Again, studies in the USA and Canada demonstrate that a structure using timber components requires less material and construction energy requirements than alternatives. A study in the USA compared the energy needed to manufacture and build a straightforward commercial warehouse, looking at four alternative methods.

It showed that using pre-fabricated steel was twice as energy expensive as timber and adding aluminum cladding to a steel structure was over three times as energy expensive.

ENERGY NEEDED TO MANUFACTURE AND BUILD A 2200 SQ METRE WAREHOUSE.

		(SCALE)
Timber throughout	**1480GJ**	**1.0**
Concrete block, timber roof	**2550GL**	**1.7**
Prefabricated steel throughput	**3150GJ**	**2.1**
Concrete tilt up walls, timber roof	**4030GJ**	**2.7**
Prefabricated steel, aluminum cladding	**4830GJ**	**3.3**

Another study, based on the Forintek Western Laboratory in Vancouver, a new 11,000 square meter building, showed similar results.

By directly comparing steel building materials with wood it showed that steel results in the use of over three times as much energy nearly 17,500 GJ compared to just over 5000GJ for wood. Translate that into carbon dioxide emissions and the result is startling, with the wood structure emitting 400,000 Kg of CO2 and the steel building creating nearly three times as much – 1,200,000Kg of CO2.

Look at sulphur dioxide emissions and steel accounts for almost five times the levels of timber for the same structure.

A frequently forgotten concern, the steel building would consume 16 times the amount of water during manufacture and construction.

Residential buildings show a similar result. Another Canadian study looked at building a two-storey 215 sq meter residential house with full basement in four different ways: All timber: concrete foundation walls, wood frame and brick: concrete, wood frame, aluminum cladding and roofing: concrete block foundations and exterior wall.

Again, the results were inescapable. The wood structure took structure took less energy and emitted less CO2 – virtually half the CO2 emission of the brick structure and two thirds the emissions of the concrete building.

ENERGY EFFECIENLY AND INSULATION.

Understandably perhaps, these facts have received less attention than the benefits of reducing CO2 emissions by improving energy efficiency, especially insulation, in building design. Again, timber proves its worth. The cellular structure of wood provides good thermal insulation. The equivalent thickness of wood is 15 times better as an insulator than concrete, 400 times better than steel and 1770 times better than aluminum. For example a 2.5 cm board has better resistance to the loss of heat than a 11.4cm brick wall.

In window frames, the 'U' valve of comparative material shows the benefit of wood.

'U ' VALUE FOR GLAZED WINDOWS.

Yet it is the opportunities for timber-framed buildings where the potential for energy saving through wood is considered greatest.

The voids in the timber frame superstructure ensure there is space to install high levels of thermal insulation within the standard constructional element.

In fact, all the homes built in Britain since 1945 had been to modern timber frame standards, we would have saved over 300 million tones of CO2 emissions.

Timber framed houses are now recognized for their superiority in energy efficiency with considerable data to demonstrate the potential saving.

ARE YOU CONVINCED!

Hard, factual evidence based on scientific research demonstrates that specifying wood will save energy and reduce CO2 emissions.

Of course the 'energy input' cost is only one factor a specifier has to take into account. Although, we would respectfully suggest that, when the future of the planet is at stake, it should weigh heavily in the balance.

A range of other environmental and technical performance criteria also need to be met. Does wood stand up?

WOOD IS RENEWABLE.

In the developed countries of North America and Europe many timber companies are harvesting today trees planted a generation ago – and replanting much more than your extract. In British Columbia for example – one province of Canada – seedlings are planted at the rate of nearly 300 million a year. A billion trees in just four planting seasons – and a similar story can be found in many other countries.

Thanks to sustained pressure and support from the UK Government and timber trade, progress made on the tropical rainforest. Forest management and logging practices are being improved, re-planting and re-generation schemes are taking place: all working towards the International Tropical Timber Organization's target of substantial forest worldwide by the year 2000. Science is playing its part too with improved genetic techniques, which together with advances in forest management are creating new 'high yield' forests. Just how renewable are the alternative materials?

WOOD IS WASTE EFFICIENT.

Virtually all parts of the tree can be utilized. Waste material can be converted into quality products like particleboard and chipboard. Even the sawdust and shavings can be used in a variety of applications. Quite evidently wood is re-cyclable. It can be re-worked into different shapes and sizes, put to new uses. Remember the UK Government is committed to "encouraging companies to recycle more building materials.

Wood can be disposed of safely as it is biodegradable, unlike PVC_U for example, which has been banned in parts of Germany for its carcinogenic properties when burned.

TECHNICAL PERFORMANCE.

Put aside the pure environmental concerns and consider wood on its technical performance. Timber is available in a wide variety of density, colour, strength and size – all well researched and documented.

The technical performance of timber is covered by many British Standards and readily available technical data ensures that specifying timber causes 'no surprises'.

Timber has a high strength-to-weight ratio, which allows structures to be designed extremely efficiently. It can be re-engineered and manufactured to meet precise requirements, for example, glued laminated (glulam) members of extra high strength. Recent developments in laminated veneer timber (LVL) offer new solutions for curved portals, domes, bridges, long span floor beams and purlins.

Timber has excellent acoustic properties for sound insulation. Plus, with modern treatments, many timber wallboards and panel products now meet the BS476 Class 1 or Class 0 performance requirements for surface spread of flame.

Wood is resistant to corrosion: That is why it's used in marine applications, or areas with aggressive chemicals.

Wood lasts: Many hardwoods are normally long lasting and durable and all timbers can be effectively treated for protection against fungal decay and insect attack. The range of proven preservatives, paints, varnishes and stains to extensive.

Wood is available: Throughout the country all types of hardwoods, softwoods and panel products can be obtained quickly and conveniently with no disruption or delay to site work.

HELP SAVE OUR ENVIROMENT

THINK WOOD!