

## ONWARDS & UPWARDS? A TIMBER FRAME UPDATE

David Scott, Technical Director, Timber and Brick Consortium

The timber frame market is today experiencing a level of growth not seen since the early 1980's. A survey carried out by Timber & Brick, the trade body for timber frame manufacturers in England and Wales, earlier this year showed that there had been a 25% increase in output during 1998 with a further increase in excess of 30% forecast for 1999.

This growth is largely taking place in England and Wales and is predominantly in the private housing sector. The level of 'commercial' work such as hotels, nursing homes, schools and churches also remains high, at about 35% of total output.

From one standpoint this resurgence is of course to be welcomed and justifies the massive effort and expense put in over the last 15 years by the Timber industry and other associated industries such as gypsum and insulation manufacturers in funding the Timber & Brick Information Council's campaign to promote timber framed construction to consumers, specifiers and builders as a proven and durable method of construction with impeccable environmental credentials. The message that timber frame is 'Simply a Much Better Way to Build' to quote the campaign slogan, has now taken root in the hearts and minds of builders and consumers alike.



Internal and external timber stud framing in a platform frame construction

Without wishing to overstate the case, the writer believes that despite wet trade shortages, the return to the timber frame fold of a number of volume housebuilders would not have occurred had they still detected any consumer resistance among their housebuying customers. That this resistance has now been removed is almost entirely due to the good news stories read by consumers, not to mention positive T.V. and radio coverage about 'Timber & Brick' as the product is marketed to the public.

It can therefore now be said that timber frame is back on the map and is being considered on merit by all construction professionals as a viable alternative to other methods of construction.

The benefits of speed of construction, excellent thermal insulation qualities, high standards of finish and competitive cost are now being discovered by more and more builders, architects and engineers with major R&D initiatives such as the BRE/TRADA Technology Ltd (TTL) TF 2000 project at Cardington playing a major role in getting the message across on a technical level. The recommendations of Egan and before him Latham with the emphasis on construction efficiency and off-site fabrication are further reasons why the resurgence of timber frame is now a reality.

This growth benefits the whole wood chain and all the other associated industries, and is of course more than welcome. Notwithstanding this, there is a potential downside and this is that the industry may not be able to sustain the level of quality required in order to not only consolidate its increased market share, but to enjoy sustained growth.

***In the writer's view this will only be achieved if the industry invests heavily, not only in plant and premises, but equally importantly, in training at all levels.***

In his report 'Rethinking Construction', Sir John Egan said "training is inextricably linked to quality" and the timber frame industry in England and Wales via the Timber & Brick Consortium, and in Scotland with SCOTFI, have put in hand a number of important initiatives to address this need.

Specific Timber and Brick initiatives include:

### N.V.Q. FOR ERECTORS

The development, in partnership with Dudley & Cornwall Colleges of an N.V.Q. qualification for timber frame erectors which has been accepted by C.I.T.B., and is programmed to commence in the Autumn term of 2000. It will cover levels 1 & 2 and lead to a stand-alone N.V.Q. for the new trade of timber frame erector.

In addition, the designation will be available to existing experienced operatives who will undergo 'on the job' assessment. There will also be 'bolt on' N.V.Q. timber frame modules for

bricklayers, plumbers and electricians which are being developed by C.I.T.B., also to be available, it is hoped by Autumn 2000.



A timber frame, brick clad, house nearing completion of the external walls and roof

### QUALITY ASSURANCE

The Timber & Brick Q Mark is a third party accreditation scheme for timber frame manufacturers. The scheme, unlike ISO 9002, majors on product conformity; that is to say it ensures the end product is of the right quality, not just that there is a good management system in place which only ensures efficient production of indeterminate or uncontrolled quality. The scheme, which because of the group registration arrangements with BM TRADA is relatively inexpensive, is nonetheless wide ranging.

It covers structural, constructional and production design in Part 1 and actual manufacture in Part 2. Part 3 is under development with the assistance of a PII award from DETR and will cover the on-site erection of timber structures, a crucial area. Part 3 when complete in late Spring 2000 will provide the means of registering erection companies against industry approved and developed criteria as Quality Assured contractors.

As can be seen this project dovetails very conveniently with the N.V.Q. initiative, given that one of the criteria to be met before firms achieve accreditation will undoubtedly include a means of demonstrating that the operatives employed are properly trained and qualified to carry out their job, and clearly an N.V.Q. qualification will be one of the means of so doing.

### CONTRACTOR TRAINING

One of the major causes of the problems experienced in the 1980's was the lack of timber frame experience among housebuilder's staff, both sales and technical.



This time around, many firms are asking for training before they embark upon timber frame for the first time, and this the industry has welcomed. The response is in the form of two structured training days for sales and construction personnel. The courses have been prepared by the writer and to date over 250 construction and over 200 sales staff have been through the course. For construction staff a question paper has to be completed with these being marked and certificates awarded to those who pass.

Timber & Brick's intention is to transfer the current 35mm and overhead slide show into electronic format which can then be disseminated more widely to those who wish to carry out such training, or to offer this service to their customers. Timber & Brick's role in this will be to set up one or two day courses to 'train the trainers' and by this means ensure that the message is spread as widely as possible.

In addition to the specific activities described above, Timber & Brick continues to adapt to the needs of its members and to this end have put in place a new structure which includes technical committees, manufacturers groups, a marketing committee and building industry liaison groups.

Membership of Timber & Brick is now open to designers and engineers and a modest scale of subscription based on fee turnover has been introduced for each category of membership. Should readers wish to find out more on this topic they may contact the Timber & Brick office on:-

e-mail: [info@timberandbrick.co.uk](mailto:info@timberandbrick.co.uk)  
 Fax: 01923 836964  
 Tel: 01923 827660  
 or at Gable House, 40 High Street,  
 Rickmansworth, Herts WD3 1ES

#### BIOGRAPHICAL DETAILS

*David Scott is a founder member of the Timber & Brick Consortium, and has been its Technical Director since 1984. He is a member of the Council of the Timber Industry Alliance and sits on various D.E.T.R. and B.S.I. committees. Sometimes described as 'the voice' of timber frame, he also runs an architectural practice, based in Rickmansworth, Herts. which unsurprisingly specifies a good deal of timber frame construction.*

#### Editorial Comment

The reference to the training programmes developed by David Scott of the Timber and Brick Consortium is a very encouraging initiative. It does however have implications for those within the timber industry who may already be, or are planning to, deal with the timber frame sector (either fabricators or builders). I am confident that David Scott would welcome a dialogue with any timber company or group that might wish to explore opportunities for training in timber frame principles and practice, especially in regards to Sales Staff.

## The TRADA Technical Consultant

Richard White AIWSc

### What does a TRADA Technical Consultant do?

TRADA's Technical Consultants provide a specialist information and problem-solving service in the performance and technical specification of timber. This service is provided to a spectrum of parties, including members of the public, construction companies, architects, engineers and the wider timber trade, including merchants, joinery manufacturers, sawmillers, and paint and stain manufacturers. TRADA's Technical Consultants also frequently advise Insurance Companies, Loss Adjusters and Trading Standard Offices, as well as lawyers and other parties involved in legal disputes.

The Consultants are backed up by experienced TRADA architects, engineers and research scientists, and by extensive test facilities and scientific laboratories. They also have the support of TRADA's Timber Information Centre which provides a very wide range of technical publications.

In addition, TRADA's Technical Consultants maintain the unique "TRADA Helpline" a free telephone enquiry service, which responds to more than 10,000 calls every year, providing technical help and answers to allcomers.

### What Qualifications and Experience are needed?

In the first instance, new recruits usually hold an Institute of Wood Science qualification, and are of diploma or graduate status in a timber or construction related discipline, or they may come with experience in the timber trade or in forestry. Whatever their background, they come to TRADA to pursue a specialist career in timber, its technical specification and use.

TRADA's Technical Consultants, as with all groups under the TRADA umbrella, enjoy a robust culture of knowledge-sharing and of mutual help and support. Newly appointed consultants are given full training and support in the technical and practical aspects of timber in its various end uses. Training is also given in the sourcing of technical information and in the preparation of reports to TRADA standards. This training and support is given by experienced Consultants, who themselves came through the same learning curve and so understand the pressures involved in providing this professional service.

### What does the Work involve?

Some of the work, it has to be said, is dusty and dirty. However, this is counterbalanced by work that is very interesting and diverse. For example, in recent times TRADA's Technical Consultants have been involved with advising on the condition and strength of structural timbers at the Tower of London, Edinburgh Playhouse, listed timber bridges in Caerphilly, London Palladium, Newcastle High Level Bridge, Royal Naval

College, and Chatham and Portsmouth Dockyards. TRADA's Technical Consultants have also advised recently on high-specification joinery and other key architectural timber features for the Royal Opera House, Tate Gallery, British Library, the Houses of Parliament and the Millennium Dome. Our investigations also regularly involve items ranging from cooling towers to furniture, fence posts to doors and windows, tool handles to floors, and scaffold boards and ladders to pergolas and decks. Overseas work also features in the Consultant's duties, most recently in India, Burma and the Middle-East, and currently in the Philippines.

### New Recruits!

Study in wood science to AIWSc or BSc level is often under-utilised in the timber and associated trades and professions. However, it may be emphasised that TRADA's Technical Consultants both use and continually develop their knowledge across the ranges of wood science and timber technology, whilst also developing other skills for example through inspection and technical report writing and through the provision of expert witness services. To maintain and build upon the high standards of work and experience of TRADA's Technical Consultants we need new recruits. For further information on current openings please telephone or write to Richard White, TRADA Technology Ltd, Stocking Lane, Hughenden Valley, High Wycombe, Buckinghamshire HP14 4ND. Tel: 01494 563091. Email: [rwhite@trada.co.uk](mailto:rwhite@trada.co.uk)

## The Web

<http://www.iwsc.org.uk>

The Institute's Web pages have been revised and expanded and now contain:

- More detailed pages on Membership and Education including Membership application form and listing of the Institute's course providers
- Review of the 1999 National Conference
- Pre-view of the 2000 National Conference with interactive booking form
- Listings of Papers published in Volume 15 of the Institute's Journal
- Listings of the principal technical articles in Wood Focus issues 1 and 2
- Branch and regional contracts

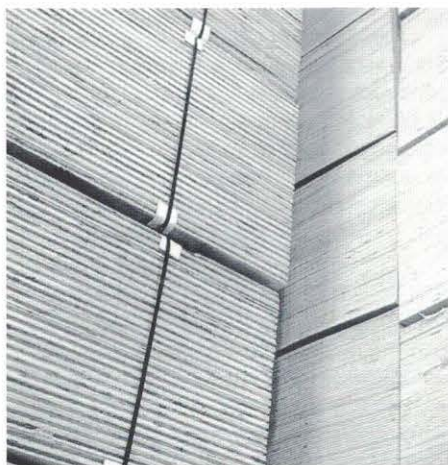
Visit the Site and make sure that your colleagues do too -

**ESPECIALLY IF THEY ARE NOT MEMBERS**



# Risks From Unregulated Plywood

Duncan King, Director AIWSc APA - The Engineered Wood Association for UK and Ireland discusses the risks of using sub-standard plywood



Concern is mounting about the

## SANDED



### A-C GROUP 1

EXTERIOR

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PS 1-95

## FLOOR



RATED STURD-I-FLOOR

24 OC 23/32 INCH

SIZED FOR SPACING

T&G NET WIDTH 47-1/2

EXPOSURE 1

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PS 1-95 UNDERLAYMENT

PRP-108

## SHEATHING



RATED SHEATHING

32/16 15/32 INCH

SIZED FOR SPACING

EXPOSURE 1

000

PS 1-95 C-D

PRP-108

## SIDING



RATED SIDING

303-18 S/W

24 OC GROUP 1

SIZED FOR SPACING

EXTERIOR

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PS 1-95 FMA-UM-84

PRP-108

increasing volume of plywood appearing on construction sites for use in load-bearing applications, which does not conform to British or European Standards. Safety can be at risk, both to the workforce during construction and the possibility of collapse if the plywood being used is not suitable for load bearing applications. For professionals such as architects this can have serious financial implications, as indemnity insurance is compromised. British Standard BS 5268-2 recognises Grade Stresses for American, Canadian, Finnish and Swedish panels and clearly stipulates each country's organisation responsible for the quality auditing procedures of the structural plywood entering the UK.

There are

- 2 American associations (APA and TECO)
- 1 Canadian (COFI)
- 1 Finnish (VTT)
- 1 Swedish (Statens Provingsanstalt)

Plywood from other countries outside those listed, or panels subject to

quality control procedures of organisations not named, are not recognised by the British Standards Institute for use in load-bearing applications. Yet in spite of this well established code of practice, inappropriate panels are still being used on site.

Specifying plywood with the right engineering values for the job in hand and being able to identify its grade marks to check that it has indeed been used correctly, requires a clear understanding of product markings. But this is being made more difficult by the Plywood coming into the UK from countries, of which Korea, Brazil, Latvia, other parts of the far East and also Russia are just a few.

Some non-American overseas plywood is entering the UK with the marking CDX. To most in the building industry, CDX is traditionally recognised as a mark of approved North American Structural Plywood notable for its consistency in production and thus suitability for load bearing applications as defined in the American Plywood Grades brochure. So the use of this coding could be taken as a guarantee of the same US quality. Of course it is not American CDX at all and does not have BSI approval for use in the UK for structural applications. So a clear understanding of how to read the marks is essential.

APA - The Engineered Wood Association is a leading authority on structural wood panels. Its technical brochure 'American Plywood Grades' explains exactly how to read and evaluate American trademarked plywood and is available free of charge from our technical office on 01202 201007 or you can download a copy from our website [www.apauk-ireland.org](http://www.apauk-ireland.org). Every APA panel has a trademark stamp, usually on the back, on which full details of that panel will be found, covering such information as:

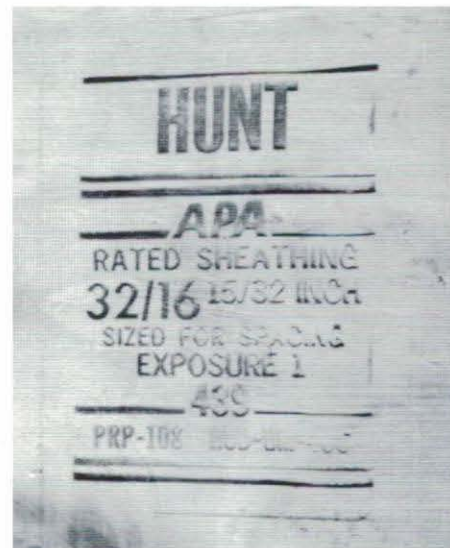
- grading
- span rating (maximum separation of supports)
- thickness
- exposure durability
- classification
- regulations controlling manufacture
- mill number (manufacturer)

Another important area on a construction site is the provision of falsework e.g. concrete formwork, staging or other support systems. These have to carry loads, but for a temporary period only. However, with the increase in scale, frequency and complexity of falsework application, the need for authoritative guidance has grown accordingly. This has led to the publication of BS 5975: 1996 - Code of Practice of falsework. The new edition of this code

brings it into line with BS 5268 Part 2. As to the design, erection and use of concrete formwork, the authoritative publication issued by the Concrete Society 'Formwork - A guide to good practice' is the bible.

At a less regulated level of activity, plywood is often used as temporary cover to trenches or drains over which workers need walk. Although there are no legal requirements to use structural plywood it makes sense to use plywood for which structural adequacy can be proven i.e. structural plywood. Failure to follow such common sense criteria could result in the Health and Safety Executive asking questions about the suitability of product and whether proof of structural adequacy can be provided.

Quality auditing procedures established by APA - The Engineered Wood Association are some of the most stringent in the world. Each plywood mill has a minimum of three audit visits a month, when production procedures are checked and finished panels sampled. APA trademark stamps remain the property of APA not



the mill so the threat of withdrawal of trademark stamps can be used by APA against a member mill if, occasionally a mill fails to correct faults. The immediate adverse impact on sales means it is in the mill's best interest to keep quality in place.

APA member mills produce approximately 70% of the structural panel products and over half the glued laminated beams manufactured in the US. It also represents a significant number of Canadian OSB producers. One of APA's most important functions is quality inspection and testing. It maintains seven quality testing laboratories in key production regions and a 3,400 square metre research centre at its US headquarters in Tacoma, Washington State.



# USA TIMBER-BRIDGE CONSTRUCTION

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## (Part 2)

### Railroad bridges in the USA,

Historically in the USA, the predominant material used in railroad bridges was timber, specifically the timber-trestle bridge. At the turn of the 19th Century, the development of steel focused attention on longer spans and the use of timber trestles diminished in subsequent construction.

However, the railroads have many timber bridges that have been in place for 75 years or more. Maintenance was good and they are in various states of condition, but still in use. In recent decades, train-car loads have increased significantly. Presently, the typical design axle load is 66 kips (66,000 pounds), but the requirement is to be increased to 78 kips soon.

Consequently, the railroad industry has developed interest in field-testing existing timber-trestle bridges to determine capacity, field-testing bridges strengthened with sleeper members, and controlled laboratory testing of full-scale bridges. As the availability of large timbers has diminished or been controlled, interest in strengthening methods or new construction methods relying on smaller timber exist, too.

With the Association of American Railroads, CSU initiated a comprehensive load-testing program. In 1995, exhaustive field tests were conducted on three, carefully selected, open deck, timber-trestle bridges in Colorado.

in three directions statically, by ramp or dynamically. Controlled vertical ramp loads and sinusoidal dynamic tests were conducted. In addition, the three-car train unit (total weight over 880,000 pounds or 3,916 kN) was used statically in more than 100 load positions. Finally, a set of moving-train tests was done at various speeds. The objectives were to study existing load path under static and dynamic loading. In 1996, the 3-span bridge was strengthened and later retested for comparison. A full size 3-span bridge was built in the laboratory and will be tested at each stage of construction to examine various construction and retrofit options.

### Trends, future of timber bridges

Development of timber resources for even long-span bridges is technically achievable, and many case studies exist in the USA and western Europe to attest to this reality. The greater challenge is to foster a broad-based desire and engineering capability to achieve such bridges, and to solve the "real" and "perceived" constraints of wise use of the tree resource.

In countries where modern timber-bridge technology would be a new initiative, many misconceptions may be in place or encountered. A certain bias against wood as a material exists everywhere. Some engineers consider wood a plain, ordinary material for which the technological

These misconceptions occur despite the reality that wood is our most complex construction material, and the state of wood science and technology is markedly advanced. Modern materials have overcome these limitations of the past. Wood products are in a high "tech." arena and provide significant advantages.

With proper engineering, the upper limit of application of wood in bridge construction is considerably higher than typically thought by society, or by architects and engineers either unfamiliar with its real potential or lacking full technical understanding of the material.

Inefficiencies in behaviour and cost primarily occur from the use of improper or unwise framing configurations for wood. Detailing that overlooks the special aspects of wood or are left unprotected from moisture will result in poor performance of a timber bridge.

Some inexperienced engineers adapt steel- or concrete-bridge concepts to timber systems. This can lead to some poorly conceived or implemented projects and resulting bad image. Thus, the availability of special education focused on modern timber construction is prerequisite for architects and engineers interested in using timber as a bridge-construction material.

Quality control is vital in producing any material. For wood, it is necessary to effectively control the manufacturing process for strength graded lumber and laminate materials. For economy, such sorting is critical before assembly or into composite materials (e.g., laminated beams) or reconstitution (e.g., laminated veneer lumber).

It is advantageous to place stronger or stiffer materials where they are most needed. For example, laminated beams should have the strongest material as its outermost laminations and weaker ones in the interior. The jointing methods for achieving large member size (length and depth) need proper control too.

Failure in bending is likely to occur at a finger joint or a knot close to one. Unless joint strength is achieved, some low-strength laminated members will be present in supply. Proof loading (loading the joint beyond the tensile or bending design level) finger joints is used in production, but is cumbersome and time consuming.

Rigorous studies of finger joints were evident in recent years, and they are much better understood. Automated, nondestructive methods to monitor joints and identify defective ones in laminating stock assembly of members are possible and would help.

Machine stress grading via production-line "flexural" tests (based on correlating modules of elasticity to strength) has existed for two decades. However, this



Field testing 31-span bridge for deflection, strain, accelerations, etc.

One was a 3-span right bridge, one was a 4-span skewed bridge and one was a 31-span right bridge. Each was extensively instrumented for deflection, strain, accelerations etc. A special track-loading vehicle (travelling laboratory) was used provide the controlled loading.

The load axle can apply simultaneously

development was minimal.

Specifically, for some, wood is considered a low-technology material whose performance is perceived from a track record of many years ago. Wood is mistakenly thought of as having low strength, requiring massive sizes, being subject to rapid decay and sustaining fire.



can be expensive and not readily affordable in developing plants. More advanced technologies for examining wood exist.

Sonics, ultrasonics, acousto-ultrasonics, acoustic emissions, tomography, X-ray imaging, thermography and nuclear techniques, among others, are being used. Primarily, these were for condition assessment such as examining moisture content, density, detecting deterioration and decay, evaluating stiffness, monitoring surface roughness, locating defects and other physical characteristics.

However, ultrasonic methods exist to accurately determine solid member strength so that better sorting can be done after production. Currently, such methods are being used to allow acceptance checks of delivered material, and to determine some properties of in-place material.

Tests have shown that the strength is higher and variability less for natural logs than for large pieces (lumber) cut from them. In essence, nature generally produces a better product than humanity. Cutting and assembly introduces synthetic complications that weaken the material.

Thus, round poles have an inherent advantage over sawn lumber and timber. Applications in which they can be employed would be more economical. Some needs in nondestructive evaluation of wood are apparent. The abilities to determine strength of laminated beams and deteriorated materials are paramount.

The former is being done, compounded by the related issue of detecting finger-joint resistance. The second requires the ability to detect location and extent of deterioration, and relate it to a quantified indicator of the consequence to member strength. Success in the latter can help in assessing capacity of existing timber bridges more dependably than by analytical rating methods. A more advanced need is to detect degradation and approaching brittle failure during load tests of in-place material.

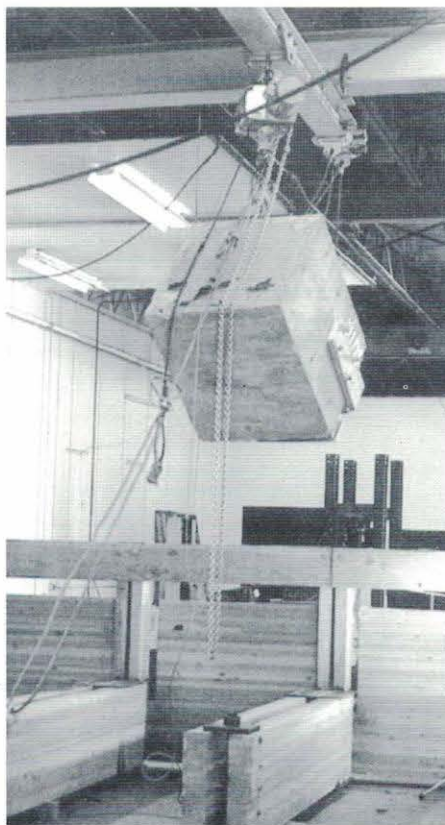
Species, genetics, climate, exposure harvesting, milling, grading procedures and joining and assembly into products are key factors affecting mechanical properties of wood and its products. In total population, wood and wood products are extremely variable in their physical properties. Traditionally, design stiffness and strength values for wood and timber were, and still are, established by consideration of sampling complete populations, be it by species, grade or other artificial separations.

Two major directions in statistical codification of wood-design properties are "in-grade testing programs" and "load and resistance factor design" (LRFD). Each reflects a striving to statistically characterize a complete sub-population of wood products, and offset the lower tail-end values as a mathematical point of

demarcation between unacceptable and acceptable resistance. In effect, the larger proportion of the medium and high resistance material is penalized by the acceptance of the probability of having low resistance occur.

Whether by the past use of lower 95-percent exclusion limit (5-percent fractile) of strength, or by emerging use of a safety index in LRFD for setting the base resistance for codification of measured resistance into allowable stresses, the implication is weakest members in a sub-population control the permissible stresses.

This is in contrast to steel, wherein the industry has developed a wide range of material grades with modest variation about the mean. Thus, designers can dependably "select" steels from a range of "resistances" (types and grades) to match the strength and exposure requirements.



*Dynamic impact testing of a guardrail system*

In contrast, wood is penalized by conservative lower-limit strengths. The pre-eminent challenge in timber-bridge construction is to identify, with high dependability, the specific properties of individual pieces.

### **Environmental considerations**

The environmental and ecological aspects of accessing forests for resources are of increasing importance. Attention to and debate about the wise and sustainable use of wood fibre, and protection of the forest and ecosystem, are universal.

Much more is known about the science and silviculture of forest growth. Extensive research on the control of

damage due to infectious insects is also ongoing. Computer tools provide better means to monitor and manage forest growth (or depletion).

Clear-cutting of trees, contested as both visually imposing and ecologically damaging to the forest and ecosystem, is being more closely examined and debated. Managed harvesting of trees is imperative to re-growth of the forest, and approaches to this are improving.

Virtually every fibre of the tree can now be used. Reconstituted products use veneer peeled from even low-grade logs. Materials otherwise wasted, such as peelings and sawdust, are used in panel products such as particle board. Logs with many defects can be reconstituted into laminated veneer lumber (in population, stronger and less variable than solid, sawn dimension lumber), wafer board, oriented strand board and other "high-tech" products. "Waste" is also usable in methanol production for developing efficient fuels.

In contrast to other materials, energy of wood-related production and construction is low since steel-producing furnaces, welding, flame cutting, production of cement and other energy-demanding processes are avoided. The deleterious environmental effects of producing alternate products are of concern, particularly when plant modernization, efficiency and containment of pollutants are lacking.

Standing trees with older wood hinder new growth and are susceptible to biological attack, which can spread throughout a forest. *In reality, expansion of the use of timber construction fosters forest conservation and new plantings needed to ensure regeneration and life of the forest.*

Ability to selectively identify the stiffness and strength of individual wood members is progressing. Achieving this would allow designers to use them "selectively," putting strongest pieces where most needed. The beneficial outcome would be dramatic since a) less of the "better" material would be wasted, b) marketing less production of "better" material at value-added premium prices could result, and c) demand for older growth trees would be reduced or more controllable without consequence to industry. Similar rationale applies to the assessment of standing trees for harvesting and production planning.

There is a compelling need to identify physical characteristics of standing trees. This capability would foster harvesting for assigned (graded) use in different end products. It would also provide a means to nondestructively monitor the consequences of different forest-management approaches. This implies the need to develop practical means to use such high technology.



# COMPANY PROFILE – George Walker Ltd

In 1814 George Walker started a haulage business in the village of Syston near Leicester. At a date that is not clearly recorded, the Walker's haulage business began to handle round timber. In those days this was a fairly predictable extension of the operations.



*The Entrance to the Syston premises and the offices*

Still managed as a family concern, on the sudden death of the senior Walker in 1914 his son, Harry, then aged 21, found himself in charge of the business, together with a substantial stock of logs.



*Completing a large oak gate, one of a pair, in the Syston Joiners Shop*

Progress from this date was substantial as a further predictable extension of the business was made, the business started sawmilling, which went on to become the dominant activity. In 1952 the business was incorporated as a Limited Company, and in 1978



relocated from the village centre site it had occupied since 1814 to a new site on the edge of the village, a village that was expanding rapidly to become a town. Harry managed the firm until his death in 1973.

Through the 1980's the operation stagnated due to the lack of a clear strategy, and under investment. This resulted in a conservative management style, increasingly out-moded operations and a failure to position the company in markets that were anticipating the changing patterns of the time.

In 1989 Rob Toon, a wood science graduate of the University of Wales, Bangor, returned from forest management work in southern Africa to become Managing Director, and take over the business from the existing directors who had been with the firm since the end of World War 11, and who were due to retire, one of whom was Rob's father.



*The Sawmill and part of the log yard at Thurlaston*

This initiated a decade of radical change. It was clear that a small privately owned sawmill could not compete in the bulk production markets, and that such mills, solely concentrating

on the general sawmilling of home grown timbers, had a very finite future. To secure the future of this business Rob and his team firstly identified the target markets they wanted to compete in. The company withdrew from high volume work, and simultaneously diversified and specialized to take advantage of opportunities to add value. The added value came from exploiting



*Timber pre-treatment at Syston*

the professionalism and expertise of the workforce at all levels to lever up the margin on the work it performed. The company was moving from being production led to service led, a situation that generally defines a lot of successful

businesses in the Britain of the 90's. It's not what you can produce, it's what you can sell at what margin that counts.

In the late 1990's and now at the start of the new century, the results of these decisions are paying off. The acquisition, in 1995, of a substantial sawmill and log yard at Thurlaston, near Hinckley, enabled the company to stop all primary processing activity at the Syston site concentrating it at Thurlaston. This has been a defining opportunity in that it allowed the Syston premises and operations to further concentrate on sales and margin issues. Substantial new offices have been erected and the whole site laid out to stock items and generally made customer friendly. The company produces in the region of 40% by value of what it sells, compared to over 90% when Rob first took over.



*Haulage of logs in the 1930's*



The Syston premises have many advantages, not the least being its location within about 6 miles of Leicester City center and half a mile from the A46, providing fast links to the M1 and other major roads.



*Selecting and measuring individual larch logs for heavy construction beams*

The stock range is in response to customer demand, and the facilities to add value through further working is a feature that is very obvious when one sees the items for sale. A predominant theme is the utilization of timber products in garden and landscape design. On site at Syston is a carpenters' workshop that can produce bespoke items in wood, and a fully equipped saw-doctoring workshop, an unusual service these days, but one which is well used at Syston. To meet the fast developing demand for timber decking as a garden feature, Walkers have contracted with a Scandinavian mill to import Baltic redwood, kiln dried and machined to the traditional decking ribbed profile which is pressure impregnated at Syston in their CCA preservation plant.

At the Thurlaston sawmill, with its large capacity head-rig, specialist conversion can be carried out, and logs of up to



*One of the larch logs from previous picture set on the head-rig ready for conversion*

1.2m diameter and 8m length can be cut. This mill concentrates on specialist cutting of homegrown roundwood, and is able to offer Spruce, Pine, Larch, Douglas Fir and oak.

In addition to these activities at Syston and Thurlaston, the business includes George Walker (Tree Care) Ltd, a wholly owned subsidiary company, which, under the direction of a professional arborist, undertakes a full range of arboricultural work, tree planting and maintenance for a wide range of clients. These include local authorities, private land owners, building developers, landscapers and house owners. Tree surgery and felling in urban locations is the core business here.

Rob Toon, with his Bangor University background and later studies at Buckingham Chilterns University College on their MSc course, is well aware of the value to both the company and the individual of training. In 1994, Richard Toon (not a direct relation of Rob, Toon being a local Leicestershire name) became the first fully *Distance Learning* student in recent times to take the IWSc Certificate course with regular tutorials provided by David Woodbridge. Richard passed the examination with a Credit. Another staff member is about to embark on this course under David's guidance.



*Selected British grown pine drying for the production of gates*

In 1998, to meet the demand for strength-graded heavy constructional softwoods (especially large section Larch and Douglas fir), three members of the company were trained and examined to meet the registration and certification requirements for strength-grading timber in the UK.

They pride themselves in being a *knowledge-based company* and are



*Shaped gate posts laid out to measure and CCA treated pine gates at Syston*

resolved to do all that they can to help overcome the frequent misconceptions and lack of understanding about timber and how to use it. They realize that such advice, which comes free from George Walker Ltd, does not always materialise in an order. However, they have found that a substantial proportion of their recent business success is as a result of customer confidence in the company's ability to both give the correct advice and to supply a product that is fit for the purpose intended. One of the opening questions asked in any enquiry is, "What are you using it for?" As Rob says, if they cannot produce a suitable timber or specification they will recommend other suppliers who may be able to help.

So what of the future for George Walker Ltd? "The business must continue to grow and increase its ability to deliver higher sustainable profits", says Robert Toon. One way in which this could happen would be to find suitable premises where they could replicate the success of the Syston formula in a new geographical location.

Specialist markets have always featured in the company's activities and it is interesting to note that Walkers employed, until he retired in the 1970's, the last known full-time oak cleaver. One of his last jobs before retirement was the full set of hand cut oak shingles for the renovated roof of Anne Hathaway's cottage.

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# Spruce in North America. A review of *Picea* Species, the regions in which they grow and their individual characteristics and attributes

by Alan Brooks, Editor of World of Wood

## Editorial Commentary

To some extent this article can be seen as a sequel to that on British Grown Spruce which appeared in the previous issue of Wood Focus. When all said and done both articles are about spruce. However, whereas Dr John Brazier's article was primarily concerned with the growing of spruce, especially Sitka, as a softwood timber resource for the UK markets, Alan Brook's article, printed here, has much more to do with the spruce species growing naturally (rather than plantation grown) in North America. It is an article that focuses, for the most part, on the trees, their habitat and their characteristics rather than the uses for the sawn timber converted from the logs.

For those in the UK who have not had the opportunity to visit the forest areas of North America the notion of spruce imported from this continent will probably be that of Canadian Spruce-Pine-Fir (S-P-F). This commercial grouping, based on similarities in strength, is listed in BS5268 part 2 and the spruces shown within the group are:

<i>Picea mariana</i>	Black spruce
<i>Picea engelmannii</i>	Engelmann spruce
<i>Picea rubens</i>	Red spruce
<i>Picea glauca</i>	White spruce

David Woodbridge, Editor

For many years, I had cultivated an interest in, and collected information on, several North American forests and their ecosystems. This quest included identifying trees and wood, although it excluded the gathering of wood samples and herbarium specimens except for short-term projects.

Residing near the eastern USA's mixed forests, my interests focused on the spruces (*Picea* spp.), pines (*Pinus* spp.) and other northern conifers mingling with the broad-leaved American beech (*Fagus grandifolia*), maples (*Acer* spp.), oaks (*Quercus* spp.) and other deciduous trees.

After moving to the fringes of the Rocky Mountain forests and pinyon-juniper woodlands, I began to learn about western wild plants, both woody and herbaceous.

Among them are the coniferous evergreens called spruces. Although associated by many people with the cooler, moist, temperate forests of the Northern Hemisphere, some spruces have permeated south, generally along mountain slopes.

Spruces are at home in cool, wet environments because their needles cannot control water loss, and the trees have shallow roots and no taproot. Typically tall, straight and conical shaped at lower elevations, variations in soil and climate may alter their forms in other ecosystems.

Most species of *Picea* that grow in Asia, Europe and North America share similar characteristics. As a rule, the trees are shaped like steeples and bear short, sharply pointed, four-sided needles. A notable exception is Sitka spruce (*P. sitchensis*), whose needles are flattened.

When crushed, the needles emit a



Red spruce



White spruce

pungent aroma. The peg-like sterigmata or base of each needle remains on the twig after the needle falls, making the twig feel rough to the touch. Years ago, I had heard the bare twigs called "sardines' spine."

The mature cones of spruce hang from the branches, in contrast to the erect cones of true fir (*Abies* spp.). Each thin, papery scale comprising the spruce cone contains two seeds readily eaten by squirrels, birds and other small animals.

## Diverse ecology, growth patterns

Some differences in growth habits, range, appearance and other dendrological characteristics may offer help in identifying the following North American species:

The short growing season in Alaska and northern Canada stunts black spruce (*Picea mariana*) and white spruce (*Picea glauca*); specimens more than 100 years old may reach only 10 feet high. But they tolerate permafrost (permanently frozen soil) better than most woody species.

White spruce in Alaskan river valleys, perhaps sheltered from harsh storms, often grows more slender and spire-like than specimens found elsewhere in North America. However, it does not command the forest ecosystem as much as black spruce.

Woodlands in cooler regions dominated by black and white spruces follow a natural succession that includes alder (*Alnus* spp.) roots adding atmospheric nitrogen to the soil, and aspen, poplar (*Populus* spp.) and willow (*Salix* spp.) leaves adding humus to enrich the soil even further.

South of these permafrosted timberlands, the fog-shrouded temperate rain forests of Canada and the USA flourish along the northwestern edge of North America, from southeastern Alaska to northwestern California.

No wider than about 100 miles, this strip of coniferous forest boasts some of the world's taller firs, Douglas-firs (*Pseudotsuga menziesii*), hemlocks (*Tsuga* spp.), redwoods (*Sequoia sempervirens*), western red cedar (*Thuja plicata*) — and spruces.

In these Pacific coastal forests, their sizable arboreal inhabitants grow not as isolated behemoths but as large assemblages whose canopies may tower

almost 250 feet above an eternally damp ground. Among them is Sitka spruce, which may reach up to 225 feet and six feet in diameter. But its thick, buttressed trunk does not approach the enormity of bole flanges seen in the tropical rain forests.

This species is found along the Pacific coast of Alaska, British Columbia and the northwest USA. It is the dominant conifer in southeast Alaska's maritime forests, growing from sea level to about 1,500 feet in elevation. A prolific seed producer, it is the only coniferous species that grows on Alaska's Afognak and Kodiak islands.

Sitka spruce and other trees in the wettest temperate rain forests often can be found growing in straight lines. This linearity among rainforest species in North America stems from the "nurse" logs, or fallen trees that decay more slowly than their counterparts in the warmer tropics.



From moss mats covering the nurse logs, the young spruces and other species tend to grow in single file, aligning with the log that nurtures them. Find an older, half-rotted log and you may see adolescent trees standing in perfect columns!

You also may see a young spruce that germinated atop a rotting, upright snag. Its roots, growing down the already dead host tree in search of soil, resemble the Florida strangler fig (*Ficus aurea*) entwining its more tropical and live victims.

But, in the higher and drier slopes of the central and southern Rocky Mountains and surrounding plateaus in western USA, you will not find nurse logs or the arboreal linearity of the Pacific coastal rain forests.

In these subalpine forests, you likely will