

ISS Institute / DEST Fellowship Report

Building Conservation and Craftsmanship Of Traditional Timber Structures



Nigel Bryce Lewis

2006



A special thanks to Rachel Bower of The Society for the Protection of Ancient Buildings. United Kingdom. Tracy Holmes, of The York Minster England, Goran Andersson of Goteborgs Universitet Sweden.

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1. Acknowledgements

Awarding Body

International Specialised Skills Institute

Since 1990, ISS Institute, an independent, national, innovative organisation, has provided opportunities for Australian industry and commerce, learning institutions and public authorities to gain best-in-the-world skills and experience in traditional and leading-edge technology, design, innovation and management.

ISS Institute offers a broad array of services to upgrade Australia's capabilities in areas that lead to commercial and industrial capacity and, in turn, return direct benefits to Australia's metropolitan, rural and regional businesses and communities.

Our core service lines are identifying capabilities (knowledge, skills and insights) to fill skill gaps (skill deficiencies), which are not available in accredited university or TAFE courses; acquiring those capabilities from overseas (Overseas Skills Acquisition Plan - Fellowship Program); then placing those capabilities into firms, industry and commerce, learning institutions and public authorities through the ISS Research Institute.

Skill Deficiency

This is where a demand for labour has not been recognised and where accredited courses are not available through Australian higher education institutions. This demand is met where skills and knowledge are acquired on-the-job, gleaned from published material, or from working and/or study overseas. This is the key area targeted by ISS Institute.

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Importantly, fellows must pass on what they have learnt through a report and ISS Institute education and training activities and events such as workshops, lectures, seminars, forums, demonstrations, showcases and conferences. The activities place these capabilities, plus insights (attitudinal change), into the minds and hands of those that use them - trades and professional people alike - the multiplier effect.

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At ISS Institute we have significant human capital resources. We draw upon our staff, industry partners, specialists in their field and Fellows, here and around the world.

Based on our experience and acute insights gained over the past fifteen years, we

have demonstrated our capabilities in identifying and filling skill deficiencies and delivering practical solutions.

Our holistic approach takes us to working across occupations and industry sectors and building bridges along the way:

- Filling skill deficiencies and skill shortages,
- Valuing the trades as equal, but different to professional disciplines,
- Using 'design' as a critical factor in all aspects of work.
- Working in collaboration and enhancing communication (trades and professional),
- Learning from the past and other contemporary cultures, then transposing those skills, knowledge and insights, where appropriate, into today's businesses.

The result has been highly effective in the creation of new business, the development of existing business and the return of lost skills and knowledge to our workforce, thus creating jobs.

We have no vested interest other than to see Australian talent flourish and, in turn, business succeed in local and global markets.

Carolynne Bourne AM, ISS Institute's CEO formula is "skills + knowledge + good design + innovation + collaboration = competitive edge • good business".

Individuals gain; industry and business gain; the Australian community gains economically, educationally and culturally.

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Fellowship Sponsor

DEST - Department of Education Science and Training

DEST provides national leadership and works in collaboration with the States and Territories, industry, other agencies and the community in support of the Government's objectives. We develop and implement policies to ensure the continuing relevance of education, science and training to contemporary needs and the growing requirement for lifelong learning. We also ensure high quality and value for money in delivering Government funded programs.

Fellowship Contacts and supporters

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| Nigel & Joyce Gervis | Ty-Mawr lime. Wales |
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| Laurie Smith | Historical Researcher Wales |
| Doug Joiner | Heavy Horses Herefordshire |
| Alan & Jo Waters | Coppicing West Dean |
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About the Fellow

Nigel Bryce Lewis

Industry Bridge and Wharf Carpenter - Building * Construction * Heritage

Skill gaps Traditional timber building conservation techniques * Scribing techniques in traditional carpentry * Laying of timber (the heartwood) * Use of traditional tools in sawing and hewing * The recording of historical buildings

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My journey started at a young age, I wanted to follow in my grandfathers' footsteps as he was a journeyman carpenter in Wales with an interest in my forbearer's lives and their travels from Wales and Scotland to Australia. This set me on my own path, like so many other Australians, I wanted to find out where I came from and where my ancestry lay.

I grew up in a country town and attended Technical School in Portland Victoria, I was fortunate to gain employment as a commercial diver in Geelong and Melbourne with a very diverse workload. This then led to bridge and wharf reconstruction and repair throughout Australia over the next ten years.

After returning home I set my sights on the restoration of a Victorian cottage. I needed to further my carpentry skills and knowledge of past building traditions. As this form of education was limited in Australia, I decided to travel overseas to work with craftsmen who specialised in these fields, after being awarded the International Specialised Skills Institute/DEST Fellowship. This fellowship enables me to, travel to Wales and England to start my training. Arriving in England I met with The Society for the Protection of Ancient Buildings, with their support I was placed with building conservation companies and also attended their short courses in conservation.

After returning from United Kingdom there was still a need to further develop my knowledge and skills in the traditional crafts, and by returning to York in England and with help from friends of the York Minster, I was employed by a building conservation company working throughout Yorkshire, enrolling on various short course and study trips this enabled me to travel onto Scotland, Sweden, France and Italy to further my education and practical skills.

It is now my plan to return to Europe and start my craftsman training so I will be able to become a Master Craftsman, with work and training courses already set up in France, Romania, Sweden and other European countries, this will require at least another five years for this outcome.

2. The Fellowship Program

Aim of the Fellowship

The aim of the fellowship was to undertake an overseas study program to gain a comprehensive understanding in the restoration techniques used to conserve traditional timber buildings. Including conservation and crafts, traditional carpentry practises and principles, and aspects of scribing techniques, along with as the use of traditional tools and the recording of buildings for conservation and conservation techniques.

The Skills/Knowledge Gaps

The reasons for the skill shortages or skill deficiency are various. The deficiencies may result from economic or demographic change or where there is no training available. They can also result from the emerging demands of new technology and materials.

Skill Deficiency

This is where a demand for labour has not been recognised and where accredited courses are not available through Australian higher education institutions.

This is the current situation in Australia today, where the loss of accumulated knowledge and skills in the traditional crafts is a fundamental problem; we have a situation where it is extremely difficult or nearly impossible to find craftsmen in the true sense, 36 (a craftsman being a person who practices a handicraft using the original tools and techniques).

Tradesmen today are trained to use up to date technology and power tools for economy and efficiency. Few tradesmen are skilled in the traditional practices and principles (a tradesperson being a person who is skilled in the modern trade).

Traditional crafts skills that in the past have been handed down are now threatened because, as the old craftsmen have died, so have their specialised skills. The most important skills, in danger of being lost, are arguably those of our own craftsmen, as without these we would be unable to repair and care for the historic past. 36 There is a need to ensure that the decline in these crafts is halted and is reversed by reinstating craftsmen and the craft skills through training and the hands on experience gained on site visits when travelling.

Specific specialist skills and knowledge to be investigated include the following;

Shingle roofs
Earthen infill, - wattle and daub
Timber - sawmilling timber and sawpits
Mortise and tenon traditional practise and application
Traditional Thatching
Pegging
Wood and Timber qualities and application

And the use of Traditional Tools such as;
Adze, carpenters axe, broadaxe, mortising axe, froe and crook and spud

Australian Apprentices System

New Apprenticeships were introduced in 1998 to establish a single, national, integrated system of training and employment incorporating the previously separate apprenticeship and traineeship systems. Registered training providers deliver the national accredited training programs; this program is funded by the government and is accessible through work place placement providers.

In Australia, apprentice carpenters are trained en masse, to build structures where the quickest and cheapest way possible is applicable.

In the past apprenticeships carpenters had a one-to-one relationship with the master, which promoted a more personal learning relationship. Apprentices were taught to use the natural properties of the timber and how to transform it into craftwork, hopefully lasting for generations and leaving a legacy of their ability and skill.

Current Education in Australia

The introduction of training packages under the Australian National Training Authority developed a module based certificate system.

However the current educational environment does not provide a basic grounding or an intensive understanding in the traditional crafts (handicrafts).

Currently there is limited training of this trade (Traditional Carpentry with modern tools - BCG30203: Certificate III in Carpentry) in Technical or Tertiary Institutes and the highest formal training in Australia is (BCCTB2001B) Maintain timber Bridges). Alternatively there is Heritage Carpentry; this is only available when the carpentry apprenticeship is completed post trade.

There is a need for all traditional crafts to be reintroduced for the ongoing support of conservation and restoration. More emphasis should be placed on continuous professional education and short courses with work placement. This training should be made available to any one with a passion and dedication for built heritage.

There is a need for all traditional crafts to be reintroduced for the ongoing support of conservation and restoration. More emphasis should be placed on continuous professional education and short courses with work placement. This training should be made available to any one with a passion and dedication for built heritage.

3.The Australian Context

The importance of conserving historic buildings and structures is slowly being recognised in Australia; virtually all the early buildings used timber in its construction. From the first settlements, timber structures were built with hand tools. However with the increase in availability of milled timbers, other materials and processes, the traditional practices and methods have become less common

Portland is the site of Victorias' first permanent European settlement with the first settlers coming across from Tasmania. Later settlers and following immigrants were skilled craftsmen, masons, blacksmiths, and carpenters. Many of these people came from Scotland, Ireland, England, Germany and a number of other countries. 6 The immigrants brought with them knowledge and craftsmanship from their own lands, and applied them in their new country. This enabled Australia to open up new areas for settlement.

Our forbearers' left us with a legacy of different construction techniques that need to be preserved for future generations. Sometimes it is easy to forget about the real purpose of preserving the buildings that the earlier generations constructed. It isn't just the bricks and mortar, or the need to enhance them, it is to assist to retain with the least interference, any historic building to preserve all aspects of their historical significance. The principle of minimum intervention should be adhered to, whether it is repair, replacement or restoration, to enable the building to continue its beneficial use.

The following is an overview of the Australian context as it relates to this historic district of Portland and its preserves. The content and context of the skills relate to numerous buildings and their surrounds. Studying these closely helps to identify the specific skills in carpentry that are required and those that are now on the verge of being lost forever. In this context, comparisons are also made, with current UK or European practices that must be acquired here in Australia if these lost skills are to be reinstated. This training should be made available to any one with a passion and dedication for built heritage.

The implications of this to historic structures can be seen in the conservation activities at present.³⁶ there are many examples of inappropriate works that have the potential to compromise the significance of the historic structure.

Conserving Glenelg Shire's Significant Heritage



Since its formation in 1976, the Historic Buildings Restoration Committee has encouraged retaining the heritage of Victoria's First Settlement and its surrounds, which reflect indigenous, archaeological, maritime, pastoral, settlement, industrial and architectural history.

As this is the area where Fellow lives, the following are examples of why there is a need to use traditional timbers, tools and methods of conservation. The various sites that are identified help to place in context the traditional methods and methodology acquired while studying in the UK and Europe.

There have been many losses, but policy gains were made by Portland City Council through the Portland Urban Conservation Study in 1981. Following this study they designated an Area of Special Significance (the area of earliest European settlement) in Portland. During the 1990's the Portland City Council developed a Heritage Overlay for its town centre, based on the Urban Conservation Study recommendations. However, in 1994 the City of Portland was amalgamated with two neighbouring rural Shires to form the Glenelg Shire.

The new Shire's Planning Scheme 1998 did not incorporate the Portland Urban Conservation Study (1981), instead recommending that new Shire-wide Heritage Studies should be carried out within 12 months to assist heritage conservation with up-to-date information; a good aim, but one which is as yet, unrealised. So far only Stage One of a 5 stage necessary Heritage Study has been carried out; it is hoped that Heritage Victoria will soon fund Stage 2, and that the Study when incorporated into the Glenelg planning scheme will once again afford proper protection for all of the Shire's indigenous places of significance, pre-gold rush and Colonial buildings, and sites of human endeavour.

The Shire has recently moved to improve conservation provisions and to restore balance to planning administration. It is to be hoped that in future, protection of both the environment and the built heritage will improve. In this area, rich in heritage, there is dire need for funding and skills to support the repair of buildings and for ongoing research into early architecture and engineering. 1

The Steam Packet Inn Portland

This Inn was built prior to 1842; the Steam Packet Inn's original weatherboards were of split timbers with a bead moulding. There are several different types of lining boards used on the walls and ceilings, these boards are fastened with cut nails, these cut nails can be clearly seen, on the inns frontage where they are preserved due to protection from the veranda.¹⁰



Photo A



Photo B

In Photo A and B the design characteristic of early buildings in Portland Victoria reflected the influence of the Tasmanian settlers. The Steam Packet Inn is one of the few remaining buildings in Portland that has shingles. These shingles were replaced in 1980.



Photo C



Photo B

Photo C showing timber shingled roof of the Steam Packet Inn and Photo D showing a 'close-up' of shingles. Because of available timber resources from the earliest settlement days, many of the buildings were constructed of wood. Wooden shingles were cleaved out of suitable timber, one method of creating timber shingles was to follow the meddullary

rays (ray- this being the vertical bands of transverse cells that radiate between pith and bark of the tree structure). When split into equal halves these are called a billet. Usually hand split shingles, are made with a froe and mallet. The wedge -shape shingles are then feathered with a draw knife.



Illustration A

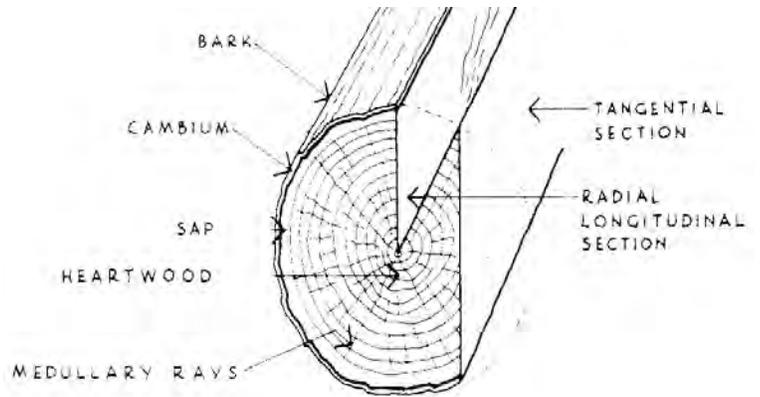
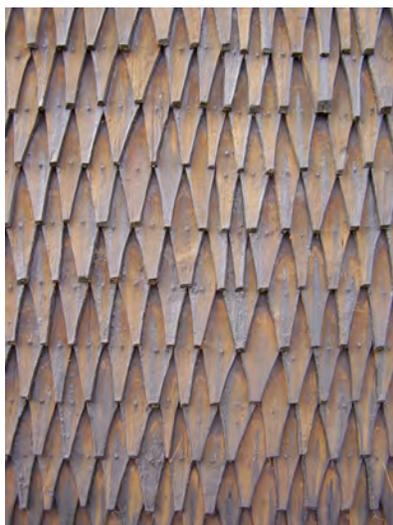


Illustration B

Illustration A showing the use of froe and mallet following the medullary ray; the rule of thumb when working with timber is that it should be green when worked, then allowed to season over time before the placement of the shingles onto the structure. And illustration B showing structure of a tree with the medullary rays and growth rings.

While there are replacement shingles available, prior to any restoration or conservation project, careful research into a historic - buildings' past is needed. Without this, the wrong shingles can often be selected.⁹

Historic shingles, regardless of whether they were the earliest hand split (cleaved) or the later machine-sawn type are known as shingles. The term shake is a relatively recent; it is currently used by industry to distinguish the sawn products from split products.



Samples of timber shingles at Goteborgs universitet

Many modern roofing practices should be avoided when re-roofing a historic building, there is a practice to lay impregnated roofing felts under new wooden shingle roofs. These practices interfere with the proper drying of the shingles and could accelerate deterioration.⁹

The longest lasting shingle roofs are generally the ones with the best roof ventilation. Shingles should be replaced before there is deterioration of other wooden components of the building.

The German Immigrants

Many German migrants arrived in Australia during its early settlement, a number of these families set up in South Australia and then moved to Western Victorian around today's Hamilton, these settlers established German-speaking settlements, such as Gnadental ("Valley of Grace"), near Peshurst (1853). Hochkirch (now Tarrington). The two cottages in the photos below were built in 1853. There is speculation that one of the buildings was used as a stable, the cottage appearance takes on characteristic of the traditional European open-timbered /half timber frame, with the timber frame and braces visible externally.



Burger cottage, near Peshurst Cottage 1



Burger cottage, near Peshurst Cottage 1

The original cottage comprises two rooms, it is single story, has a gabled roof with an attic this is accessed by a hatch in the south gable and an I- shaped skillion extension, the gables are covered with weatherboards⁴ This cottage includes traditional joining such as the halved scarf. The timbers in these cottages have been sawn, cleaved or hewn.



Burger cottage, near Peshurst Cottage 2 Burger cottage, near Peshurst Cottage 2

Repair work has been carried out on this cottage, instead of using the same materials and techniques; cement mortar has been used on the left hand side, bottom panel in the above left photo. Repairs with any cement content should not be used as they are not vapour permeate, and inevitably trap moisture within the structure, this can lead to failure of the infill. the repair should always match the original as closely as possible.



Photos A & B & C; Burger cottage, near Peshurst 2

Close up photos of internal walls of Burger cottage. The area of the internal timber framing (staves) has lost their cover. The infill panels of the cottages are made from timber that have been cleaved and hewn with the spaces between the timbers (staves) filled with a clay and organic mixture. A layer of clay, straw mixture would have been placed onto wooden staves. The staves are roughly split and hewn timbers about a metre long, and 60 to 80 mm wide, with tapered ends that protrude from the end of the clay and straw. The overall diameter is about 100 mm. The finished staves are placed between the main structural timber with tapered ends resting in slot or holes4 this then formed a row, makes up a panel to complete a wall. As shown in illustration D below.



Photo C
Burger cottages, near Penshurst Cottage 1

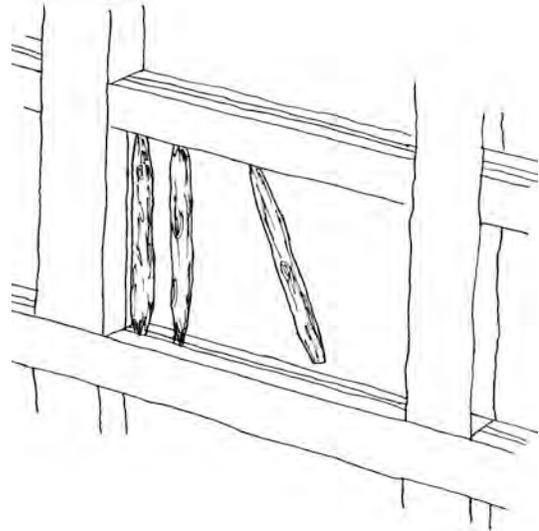


Illustration D

The above Photo C is the traditional German technique called lehmwickel (Loam Wind). There are a number of different techniques and variations for earthen infill, one of the older is known as wattle and daub, this is a common form of non-load-bearing earth construction, which has been widely used for infill panels in framed or half timber buildings, the spaces between the structured timbers are placed with wooden staves and split branches, branches are woven through the wooden staves, once a panel is completed it will be daubed from both sides with a mixture of clay, dung, straw. 8, 15, The 'daub' is made of a clay mixture with animal dung and organic fibre. In this case the earth mixture is supported by an interwoven lattice of sticks and laths (the 'wattle').



Photo A



Photo B

Photos above are of A Compressed Straw and B Clay Infill with earthen render.



Above: Brick infill panels with earthen mortar and render. Goteborgs Universitet

There are numerous variations and hybrids from region to region and in different country, the names can vary in each technique that achieve a very similar purpose.

Historic Trestle Bridges

Victoria has a number of important trestle bridges throughout the state, one of these is the Camperdown to Timboon line of bridges, this line was open on the five of April 1892 after 3 years of construction; this line was built to serve pioneers of the Heytesbury forest, it was originally constructed with 34 timber bridges and 84 culverts' 2, 3

There is a need for the conservation of these historic timber trestle bridges. As these bridges will become apart of a rail trail. The main obstacle to be overcome is the halting of further deterioration. Six other bridges are one third or less length of the Curdie's River Bridge. These would all benefit from conservation works, as the bridges have been classified unsafe. Sourcing of qualified traditional bridge carpenters is also another area that needs attention.2, 3



Photo A
The Curdie's River Bridge (Photo A) is listed with Heritage Victoria



Photo B

There is an abundance of vegetation on this trestle bridge (Photo B). This is contributing to the problems associated with this structure, when restoration/conservation works are carried out for these structures the traditional practices could be used to keep the knowledge and skill of craftsmen alive.



Photo C

Photo C showing Dennington Trestle bridge.

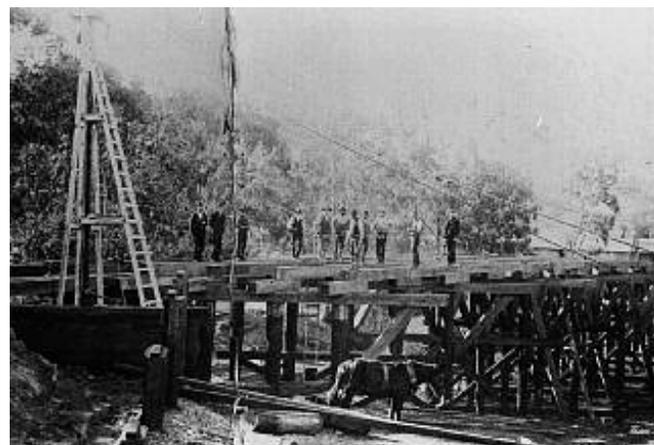


Photo D

Photo D showing bridge being built.



Photo A of a driven pile of Dennington Bridge.

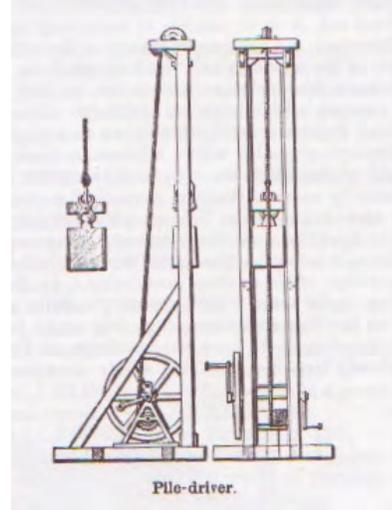


Illustration B

Illustration B pile driver, or pile engine - an engine for driving down piles. It consists of a large ram or block of iron termed the 'monkey, also known as a drop hammer which slides between two guide-posts. The hammer is drawn up to the top, and then let fall from a considerable height which then comes down on the head of the pile. The pile driver may be worked by men, horses, or a steam engine. 29

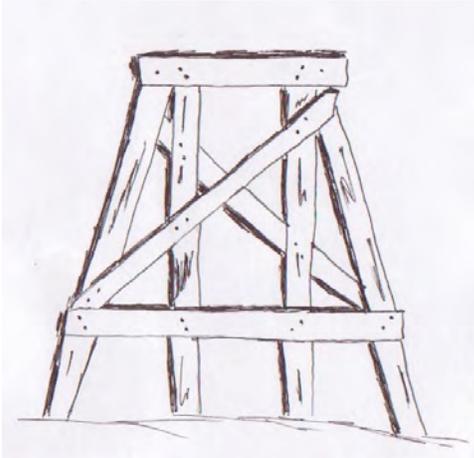
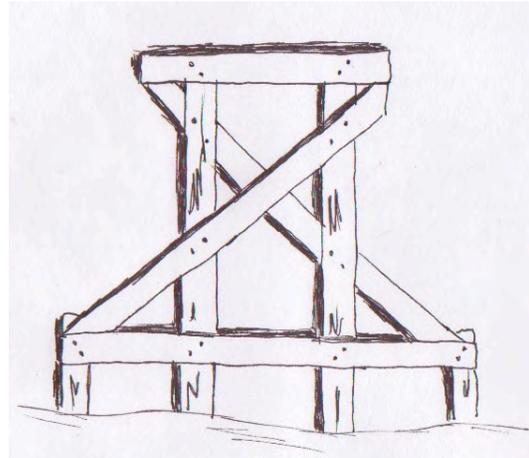


Illustration of trestles - NB Lewis



Trees have an area known as heartwood, as trees mature the sapwood is converted into heartwood this is distinguished by the colour. The rule of thumb in bridge-wharf and rail construction is that the heart always faces down when sawing or hewing is finished and made into a structure. There are exceptions to this rule for different species of timber.



Photo A



Drawing B

The Hopkins Bridge in Warrnambool (2004), this historic bridge was demolished in 2000. The new decking in Photo A has been placed with the heart of the timbers facing upwards. Drawing B shows the correct positioning of timber (that is the heart facing down)

Forestry around Portland far South West Victoria

The forest industry has always played an important part in the development of Portland; the ingenuity and traditional way of our forebears working in these forests have disappeared very rapidly in comparison to many areas in Europe where the application these traditional ways are now increasing.



Photo A



Photo B

Photo A showing (Mount Clay sawpit) Portland Victoria

Photo B showing Horse logging in England, Hill Farm, Stanley Hill, Bosbury, Ledbury, Herefordshire. Horses are still used to extract a full range of timber produced in Europe.



Photo A

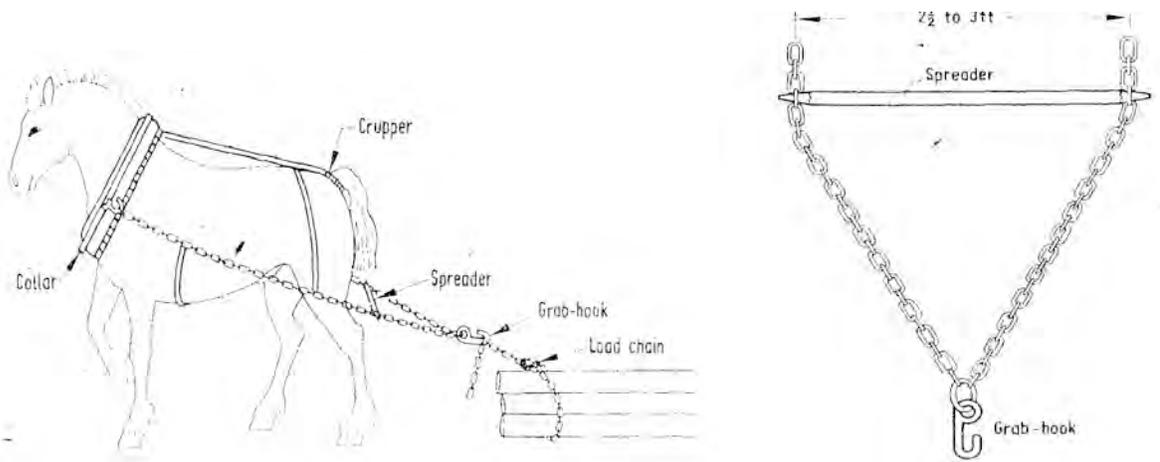
Photo A showing Eric Storer with his bullock team at Drumborg 1955



Photo B

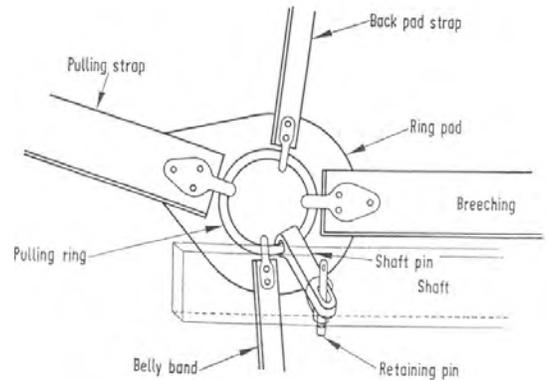
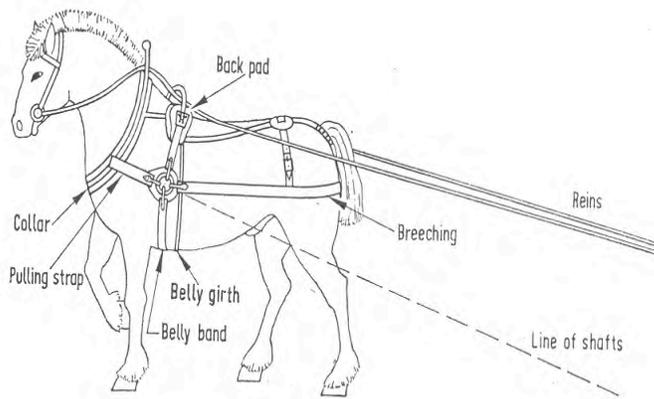
Photo B showing a twenty-horse team pulling red gum

When logs were to be carted, the bullock and horse teams would then play their part, the larger mills could employ up to five or six teams. This would ensure an adequate supply of logs for the mill to keep it operating over the wetter months, because at this time logs could not be hauled from the forest'. 11 The bullock had a slow and steady pace and had no equal for the long continues hard work, the horse was more agile and faster, these qualities played an important part, but had a disadvantage as they would tire more easily.



The above illustrations are of one type of harness used for logging in Europe.

The British horse loggers are a group of professional contractors and enthusiasts who help to keep alive the tradition of horse logging and there skills. Horse logging is the extraction of timber using horses with traditional and modern implements, these loggers are currently employed throughout Britain and many other places in Europe working in state forests, woodlands and private lands, horse logging has considerable benefits over other extraction systems with low or negligible impact on the environment. 34



Horse loggers often work on dangerous terrain and over long distance for the extraction of timber. Horse logging in many areas is not an outdated relic of the previous age, it's a continued tradition using the best of the past.

The Saw Pit Mt Clay Portland

From the early settlement days timber had been cut by the means of using a sawpit. The master sawyer would stand above; (illustration B) - he guides and lifts the saw along the marked line (which was snapped with a string line using chalk, charcoal or colour paste) while another man (known as the under man or pitman) would stand in the pit, he does most of the heavy work. Both men would work in harmony to saw the timber. This pit was dug allowing sufficient depth for a person to stand in. Small logs were placed at intervals across the pit to support larger logs for sawing. To enable the log to stay in place before sawing commenced timber hooks or as there known 'dogs' would be positioned 11. (illustration)



Photo B
Portland Victoria (Mount Clay sawpit)

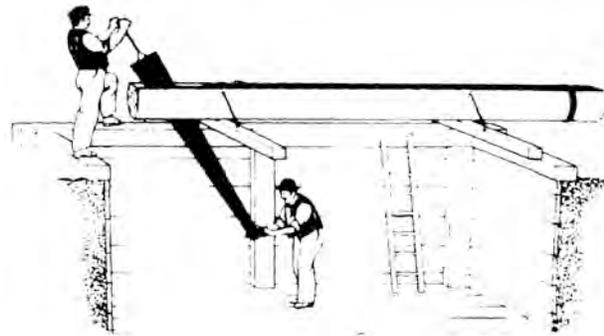
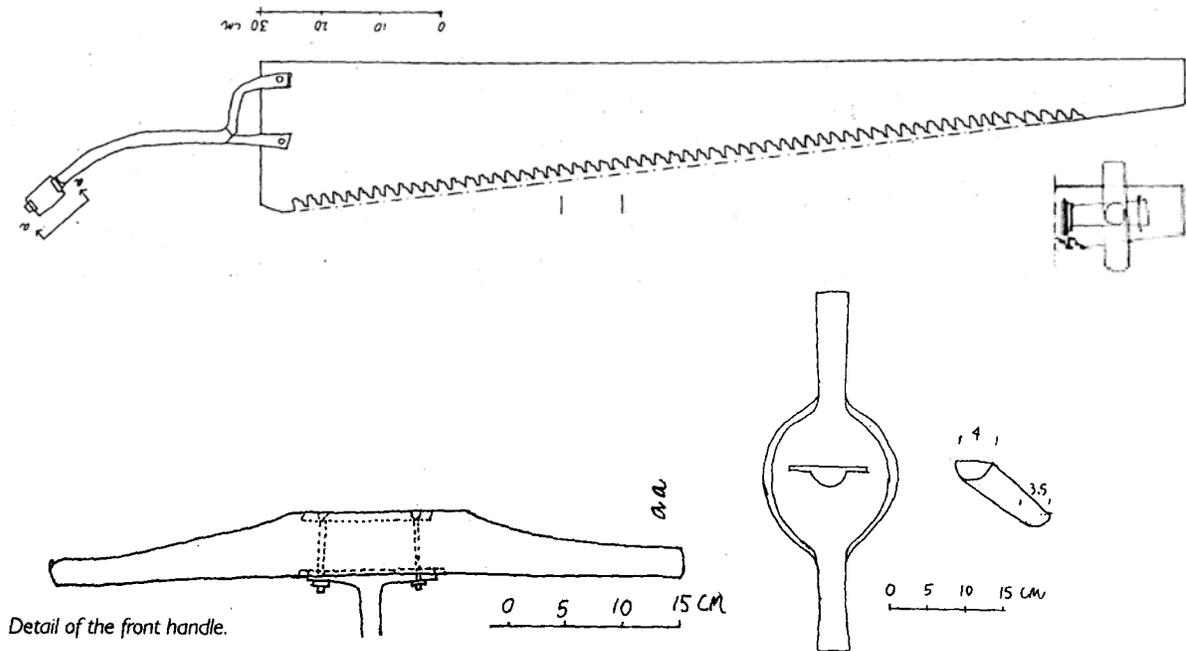


Illustration B
Weald and Downland Open Air Museum

Sealers and whalers first settled Portland as early as 1828, sawpits were soon established to provide suitably timber for houses and other building associated with whaling. The remains of old saw pits were once common through out the forest, but

time and development have diminished most of these sites. A site worked by Patterson and Hoggan at Mount Clay in the 1850s has been restored. This site is now known as the Sawpit Picnic area.¹¹

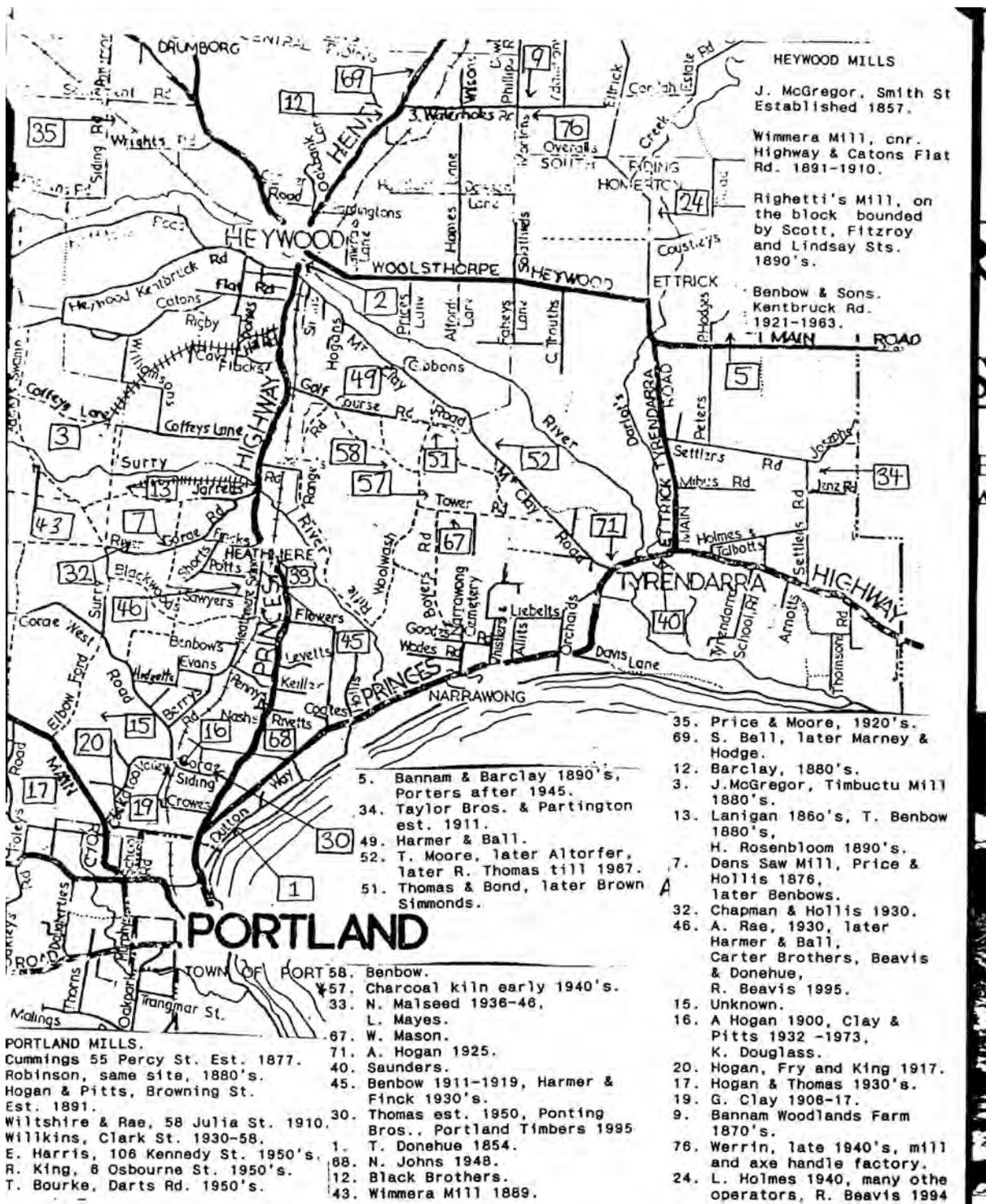


Illustrations from the Ttakkila pitsaw wooden cultures of Europe workshop Finland

Garry Kerr, *Of Sawyers & Sawmills a history of the timber industry in Victoria far Southwest*
 Photo above Portland and surrounding area map of timber industry.¹¹

The First Saw Mill - Portland

This archaeological site is situated near Malseed Street ,Dutton way Portland (Number 1 on map) this was firstly used as a whaling station, then a boiling down works, in 1853 it was the site of a saw mill ,this mill is believed to be the first saw mill operating in the district 6.



In the surrounding area of Portland there were also a number of splitters, they would split timbers for variety of uses. These timbers were far less expensive to produce than sawn timbers. Splitting logs could be processed where they were felled. Unlike the felled trees for sawing which would have to be drawn by bullocks or horses to a sawpit' 11



Photos above - Sleeper cutting with a broadaxe

The broadaxe usually has one entirely flat side, while the other side is bevelled to a cutting edge. The conversion of timber by broadaxe or pitsaw has disappeared very rapidly in Australia due to the introduction of sawmills with steam power and mechanical saws. This mechanisation replaced the traditional hand operated sawpits.¹¹ Therefore the basics elements of the conversion using traditional tools and methods (sawing, hewing) and the converting of round timber to the required size have disappeared. Where in contrast in Europe, the practices of hewing timber by broadaxe and the use of pitsaws, can still be seen.



Photo A

Photo A of Aitkens mill Lyons c 1914, Photo B showing the remains of McGregor's water wheel sawmill around 1900, the sawmill was erected in Heywood in 1857 McGregor family Photo.



Photo B

Repair of Heritage Structures, Substitute Materials, Second-hand materials.

In the early pioneering days to the late 1900s the use of second hand timbers and saplings (sapwood small size timbers) was not uncommon.



Photo A



Photo B

The timber in Photo A has come from the workings of a ship and was reused in the building. In Photo B the mortise and tenon are of different sizes suggesting that one or both timbers came from another structure, or the mortise was made larger on purpose to allow the tenon to slip in more easily, in the back upper left corner there is also some round timber. To ensure the preservation process is authentic to the historic fabric, the carpenter needs a clear understanding of the history, technology, materials and techniques of the craft, in order to implement the correct choice.



Photo C



Photo D

Above - The Argyle house stable conservation works was supported by the H.B.R.C, Arts Company Portland, community volunteers and work for the dole and funded by the Commonwealth Government. If replacement is necessary, the new material should match the existing material of the structure. This new material should take on the same

composition, design, colour, texture, and any other visual properties associated with the building. 'All preservation options should be explored thoroughly before substitute materials are used. The purpose of repairing damaged fabrics and replacing lost or irreparably timbers is to rematch what was originally there and to cause no further deterioration or change of appearance, to the remaining historic fabric. With proper planning the use of substitute materials can be used successfully. The understanding of how a building has changed over time is also necessary and anything that pertains to the building should be saved, a common mistake is to presume to know the value of artefacts or features at the beginning of a project. Evidence from all periods should be protected and documented for future reference'. 19



Photo A



Photo B

Photo B illustrates the use of galvanised steel straps for support and concrete stumps. These materials are being more widely used. The butt joint is the simplest way of joining two pieces of timber together; it is also one of the weakest, despite the presence of more sophisticated joinery techniques. This joint has excelled due to its inherent simplicity and ease of implement, this joining technique enables the modern carpenter to produce a structure very quickly and requires the carpenter to have minimum skill or craftsmanship ability to execute this procedure efficiently. Many modern builders, and tradesmen are more concerned with completing the task quickly with little regard to craftsmanship. In using modern processes, the traditional carpentry techniques and skills are being lost. The product enhancements of modern technology and new developments in materials can also have a detrimental affect on our building heritage.

Strength grading historic timbers

The strength of timber, whether new or historic, depends on its species and the effects of certain growth characteristics. In particular, knots and shakes as these can weaken the timber (splits along the grain which occur as the timber dries) – the ideal timber should have straight grain with no knots or drying shakes. Strength grading involves assessing the effect of these features. For structural purposes new timber is supplied in 'strength classes' this determines the allowable working stresses. 13

There are a number of old methods for the seasoning of timber they are still available and the means employed to increase its their durability. One of the old traditional methods for drying timber was the use of quicklime, this would produce heat for the evaporation of moisture; sand was also used for the process. Another method of drying which is still used today, is leaving timber stack underneath trees for free air movement for around five years or so. It was also thought that charring the timber ends before burying them into the earth would increase its hardness and durability. These methods have been used for hundreds of years and are still practiced in some areas of Europe.

Peak Organisations, which have impact on the industry

Australian Heritage Organisations

'**ICOMOS** is an international non-governmental organization of professionals, dedicated to the conservation of the world's historic monuments and sites. ICOMOS provides a forum for professional dialogue and a vehicle for the collection, evaluation, and dissemination of information on conservation principles, techniques, and policies'.

The Burra Charter is the nationally accepted standard for heritage conservation practice in Australia and provides guidance for conservation and management

'In accordance with the Burra Charter, the study of a place should make use of all relevant disciplines. It cannot be assumed that any one practitioner will have the full range of skills required to develop a conservation policy and prepare the appropriate report. It may be necessary to consult with other practitioners and organisations. The purpose of the conservation policy is to state how the conservation of the place may best be achieved both in the long and short term'.⁴⁰

National Trust of Australia

'The National Trust of Australia was established in New South Wales in 1945. The Trust is a community-based, non-government organisation that works to promote and conserve Australia's indigenous, natural and historic heritage through its advocacy work and its custodianship of heritage places and objects" In Victoria, the National Trust works with both local communities and decision makers towards conserving important aspects of Victoria's historic built and natural environment'.⁴⁰

The Royal Historical Society of Victoria (RHSV)

'The Royal Historical Society of Victoria (RHSV) was formed in 1909 and is a community organisation committed to collecting, researching and sharing an understanding of the history of Victoria. The Society publishes a monthly newsletter, a reviewed journal and books of historical interest. The RHSV collection is used primarily by local history and family researchers, post-graduate students, authors and commercial enterprises." The Royal Historical Society of Victoria is a member of the Federation of Australian Historical Societies'.⁴⁰

Engineering Heritage Victoria

'Engineering Heritage Victoria recognises the importance of recording and protecting significant engineering works in Australia, and in recording and recognising the Engineers, Contractors and Technicians who created these works'

'They also aim to promote a greater understanding of the role and importance of engineers and engineering to our society and promote the importance of good heritage practices both within the profession and within the wider community'.⁴⁰

Heritage Victoria

'Heritage Victoria administers the Heritage Act 1995 and maintains the Victorian Heritage Register. Heritage Victoria supports the work of the Heritage Council Victoria, although the two are separate. Heritage Victoria is a Victorian State Government agency, where as the Heritage Council is an independent statutory authority established under the Heritage Act'.
40

'Heritage Victoria assists in identifying, protecting and interpreting Victoria's most significant cultural heritage resources. It advises private owners, local and State government, industry and the general community on heritage matters. Heritage Victoria's aim is to make heritage identification, protection and management accessible and easily understood'. 40

Heritage Council Victoria

'Heritage Council Victoria provides the highest level of legal protection for heritage places and objects identified as being of significance to the State of Victoria. As an independent statutory authority, the Heritage Council Victoria is the State's main decision-making body on heritage issues. Its members are appointed by the Governor-in-Council upon the recommendation of the Minister for Planning. It operates in accordance with the Victorian Heritage Act.'

The Heritage Council Victoria receives professional advice and administrative support from Heritage Victoria'. 40

'The functions of the Heritage Council Victoria are to; act as the primary source of advice to the Minister of Planning and Local Government on heritage issues, determine which heritage places and objects are added to the Victorian Heritage Register, hear appeals on permit applications determined by Heritage Victoria, approve or reject recommendations for loans and grants from the Heritage Fund for registered heritage places and to promote public understanding of Victoria's cultural heritage and to conduct community education and information programs'. 40

Australian Heritage Council

'The Australian Heritage Council is the principal adviser to the Australian Government on heritage matters. The Council assesses nominations for the National Heritage List and the Commonwealth Heritage List and compiles the Register of the National Estate. This Council was appointed on 19 February, 2004'. 40

Other Organisations that can impact on the industry.

- Local builders/commercial companies
- Restoration committees/societies
- Volunteering organisations
- Municipalities
- Timber harvesters

4. The International Program

Training background, the European Model - a history.

During the fellows time in Europe the exploration of the numerous guilds and related organisations was key focus of the journey. Apprenticeships go back at least as far as the Guilds of the early Middle Ages. – These came to be supervised by Guilds and Town Governments. The Master was entitled to employ young people as a form of labour in exchange for providing training in the craft. Some forms of these apprenticeships have developed in modern times into formal training schemes.

Apprentice - Journeyman - Master.

The guild was made up by experienced and confirmed experts in their field of handicraft. They were called master craftsmen. Before a new employee could rise to the level of mastery, he had to go through a schooling period during which he was first called an apprentice. After this period he could rise to the level of journeymen. Apprentices would typically not learn more than the most basic techniques until they were trusted by their peers to keep the guild's or company's secrets.

After being employed by a master for several years, and after producing a qualifying piece of work, the apprentice attained the rank of journeyman and was given a letter which entitled him to travel to other towns and countries to learn the art from other masters. These journeys could span large parts of Europe and were an unofficial way of communicating new methods and techniques.

After this journey and several years of experience, a journeyman could be elected to become a master craftsman. This would require the approval of all masters of a guild, a donation of money and other goods, and in many practical handicrafts the production of a so-called masterpiece, which would illustrate the abilities of the aspiring master craftsman.⁶⁰

These organisations continue in various guises both in the UK and in Europe.

Council of Europe, English Heritage, Cadw, Fondazione Romualdo Delbianco, Wooden Culture, SPAB and numerous other organisations and Government agencies have all recognized that the crafts and craftsmanship is dying out in nearly all of the old and traditional crafts and that this decline cannot be curbed without the total cooperation of European countries and their people.

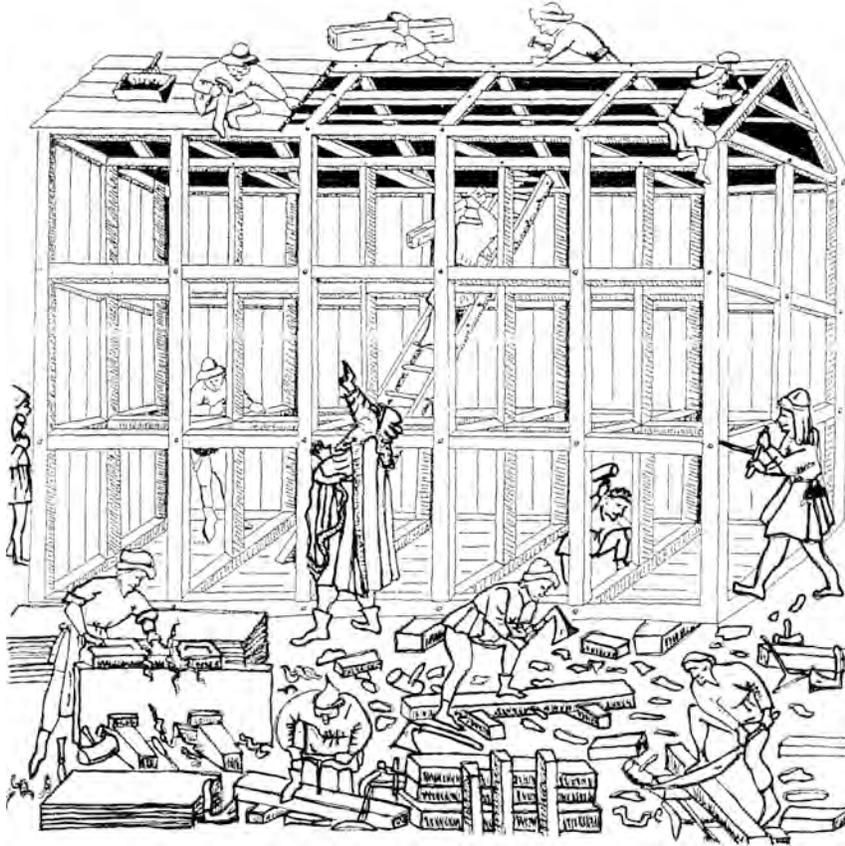
A range of different government bodies and private organisations are funding mechanisms for the protection of these crafts and with the development of inventories, annual workshop programs, craftsmen training, crafts fellowships, scholarships, continuous professional development, summer school in the crafts and conservation activities throughout Europe. Saying this some traditional crafts are expanding at a steady rate in Europe due to the accessibility of the Internet.

Groups such as The Society for the Protection of Ancient Buildings, Carpenters Fellowship and other dedicated organisations contribute to ensure that these skills and the original craftsmanship continue. William Morris founded the Society for the Protection of Ancient

Buildings in 1877 to counteract the destructive 'restoration' of medieval buildings being practiced by many Victorian architects. This society is still active in this field and is involved in all aspects of the survival of ancient buildings. 41

The Leonardo Di Vinci project - 'Training in Contemporary Applications of Traditional European Crafts' (TICATEC) provides training opportunities for UK Initial Vocational Training students to learn a variety of traditional techniques and crafts across Europe. 43

The Carpenters Fellowship was formed at Avon Croft Museum of Historic Buildings in August 2000, The Fellowship's aim is to increase communication, training and sharing of knowledge amongst those interested in historic and new timber framed structures. 42



*Sketch from Duke of Bedford's Book of Hours 1405
This shows the methods employed in the construction of
a timber framed structure.*

Destinations: All of the Courses undertaken and work experience gained during the fellows travels were very interrelated and as such are of necessity similar in many aspects and courses overlap in content and context. Therefore some of the images and illustrations are not necessarily in the sequence of the destinations but related to the specific technique that was observed and studies.

Destination:
Weald and Downland Open Air Museum



The Weald and Downland Open Air Museum is established as a provider of specialist education and training in building conservation and historic building techniques. It has worked with the University in delivering high calibre conservation programmes since 1990. The historic buildings, many of them timber framed, provide an unrivalled teaching resource in this specialized area. Set in 50 acres in Sussex countryside there is a collection of nearly 50 historic buildings dating from the 13th to the 19th century. 45

Courses undertaken and key headings;

Construction and Repair of Timber Framed Buildings

Key areas

- * Overview of traditional systems of timber framed building construction
- * Structural problems in timber framed buildings
- * Appropriate and sympathetic repair methods
- * Regional traditions in timber framed buildings

Repair of timber framed buildings

Key areas

- * Overview of timber framed building repair principles and methods
- * Conversion methods, patterns of decay and basic methods of repair

Timber decay and its treatment

Key areas

- * Timber science biology of hardwood and softwood timbers and their decay
- * Effects of modern forestry
- * Current research in treatment methods
- * Monitoring the building environment to maintain healthy timber
- * Consequences of fire damage and dereliction
- * Examination of restored and stabilised timbers

The following photos were taken at the Weald Downland Open Air Museum in England and relate to

- * Timber science biology of hardwood and softwood timbers and their decay
- * Effects of modern forestry
- * Current research in treatment methods



Photo A

Photo B

Photo A Sample shows the tool marks resulting from pit sawing. Photo B these marks were made by a band saw a machine driver saw in which the blade is a continuous belt.

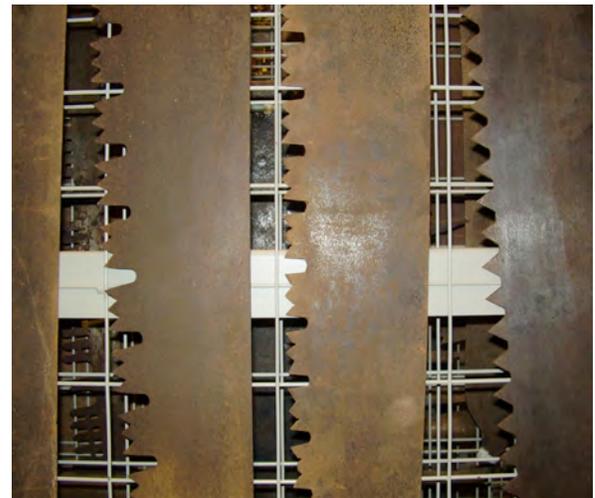
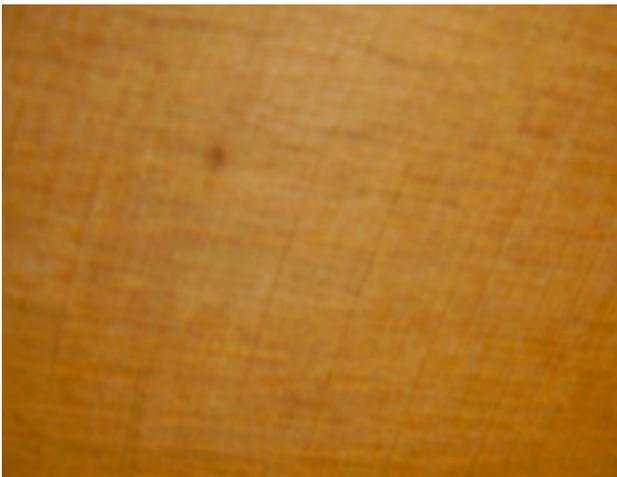


Photo C

Photo D

Photo C showing the curvature marks of the circular saw which came into wide spread use in the late 19 century. Photo D showing different gauges of saw teeth of pitsaws (Weald Downland Open Air Museum).

Destination:

Oak Wrights in Hereford England.

Milled or naturally curved pieces of timber can be joined using the English, French or Swedish scribe methods. These traditional methods are useful for incorporating out of square, curved or oddly shaped pieces of timber into a timber frame.



Photo A



Photo B

Timber dragg (Scribe) for log building Dragg in use for the scribing of timbers

The scarf and mortise and tenon are commonly used in traditional joinery the modern carpenters use the butt joint to save time and to cut down on expenses, therefore the skills of craftsmanship forged over time have disappeared. Portland being the first settlement in Victoria had an outstanding collection of historic buildings. These timber and stone structures displayed traditional timber joinery; regrettably many of these early settlement buildings have been neglected, redeveloped or pulled down.



Photo A



Photo B

Photo A Completion of a through tenon. Photo B An implement to mark the offset hole position to be drilled for the tenon, the pegs to be inserted are tapered at one end this allows the peg to pass through the offset tenon hole.



Photo C



Photo D

Main truss Frame near completion ready for the insertion of timber wedges and pegs. This work was completed at Oak Wrights in Hereford England.

These following photos and illustrations are of the assembly and pre fabrication of timber framed building

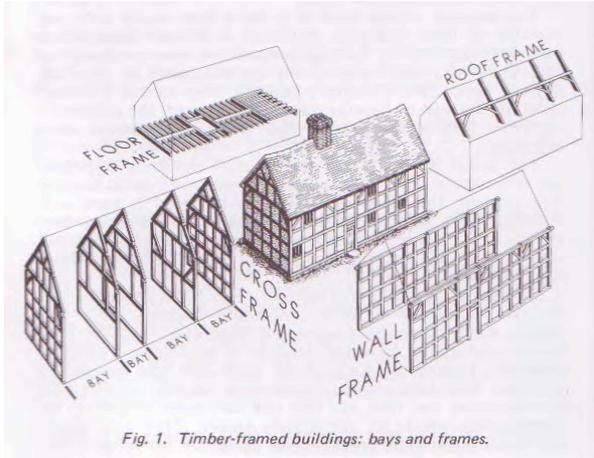


Fig. 1. Timber-framed buildings: bays and frames.

Illustration A



Photo B

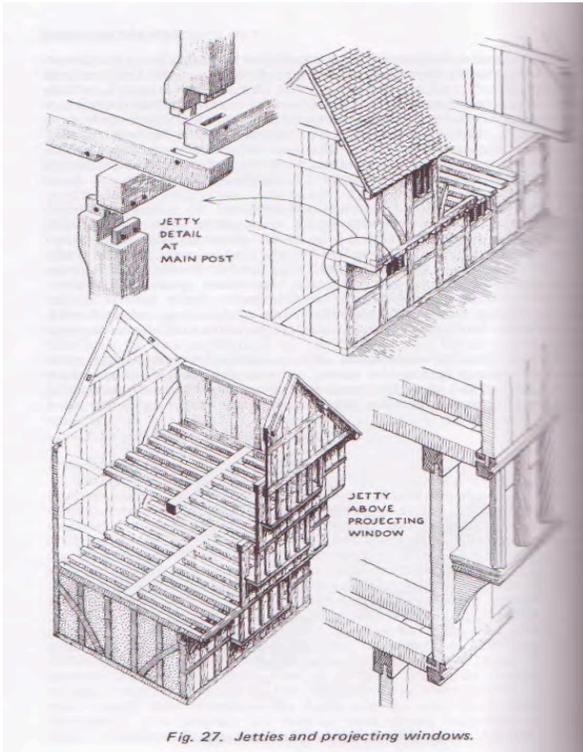


Fig. 27. Jetties and projecting windows.

Illustration A

Photo B

Illustration A of jetties and projecting windows 62
Photo B of the construction of a jetty at Oak Wrights



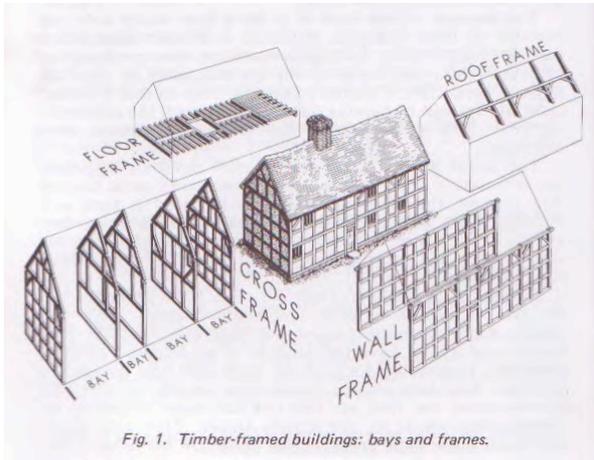


Fig. 1. Timber-framed buildings: bays and frames.



After the pre fabrication in the yard of the frames with joints cut, fitted and the frame marked with a numbering system. the frames are then dismantled and stack. These frames will then be transported to the site where it will be resembled. The work above was completed by Nigel Lewis and other members of Oak Wrights in Hereford England.

Scribing of timber

A traditional method of timber framing, probably developed and used in France since the 13th century. This comprised of a series of technical drawings. The ground plan is created and used to determine timber length/size, angle cuts, and location of connections. French Scribing is plotted by hand; this is only one of many forms of scribing available.

The principle of geometry underlies the construction of many timber structures; this comprises working out geometric design in small scale on paper, and then transferred to a full scale tracing floor of framing ground.

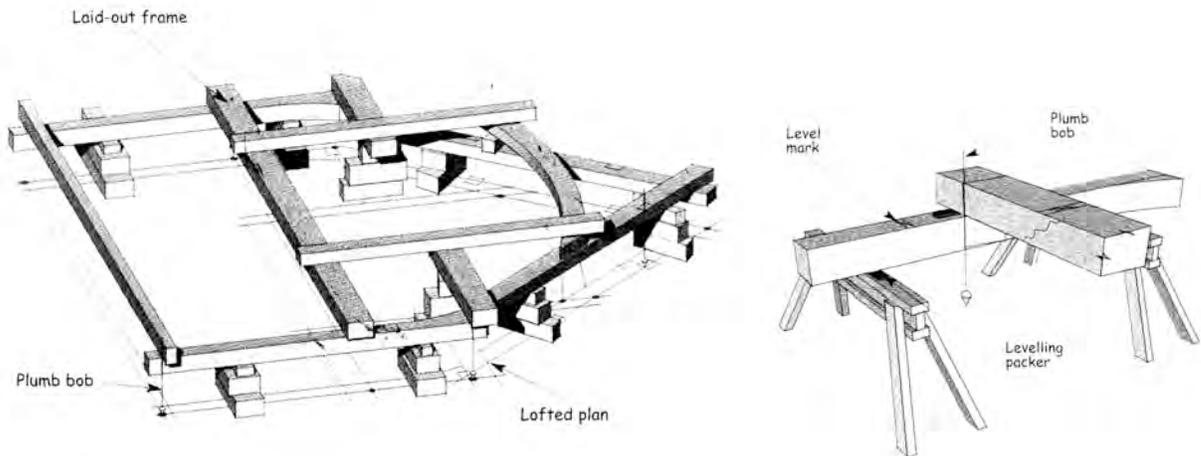


Illustration of set out for timbers-oak framing⁴⁴



Photo A

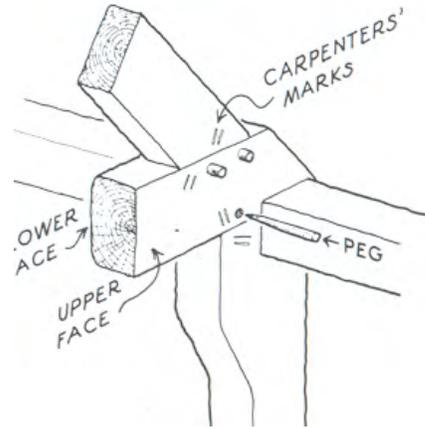


Illustration B 62

Photo A (above 'carpenter's mark' these carpentry marks are used to identify where one piece of timber is to match another timber for the continuing stage of construction. These marks are usually created by a chisel).

Illustration B62 shows where the carpenter's marks are situated these marks identify each piece of timber in the frame so the framer will know where each section and every piece will be placed in the erection of the building.

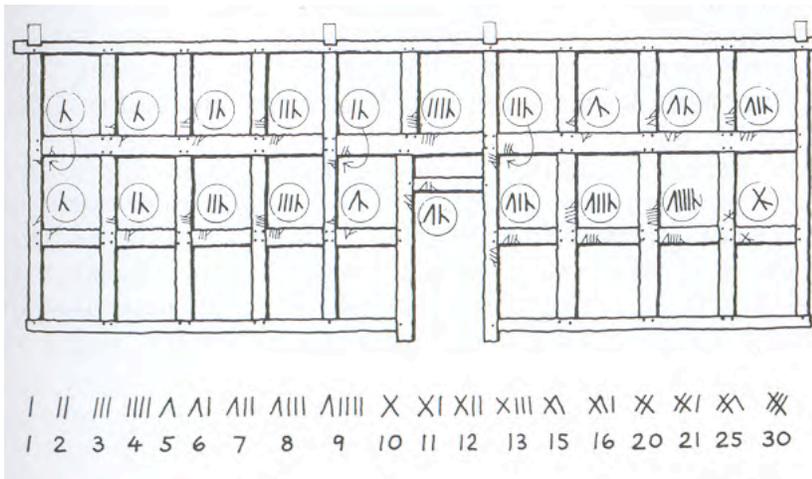


Illustration A of frame ... please explain context of why inserted 62

Illustration A & B below are based on the Roman numeral system that is used for the construction of timber framed buildings.

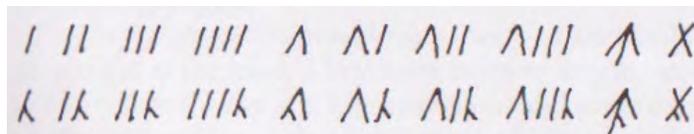


Illustration of roman numerals 62

In history geometry has underlined many buildings if not all, these geometric principles can be seen in churches and cathedrals thought out the world, geometry is a branch of

mathematics that is concerned with the properties of configurations of geometric objects - *points*, (straight) *lines*, and *circles* being the most basic of these.

Three tools are used a compass, scribe and a straight edge. these are the basic equipment that is needed for geometrical drawing, the design leads to three related drawings, the plan, section and elevation from which the structural building work can proceed.²⁶



Photo A

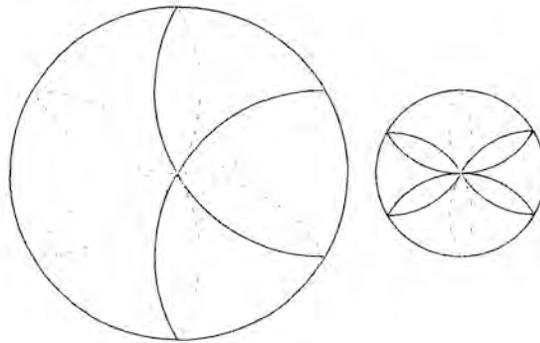


Illustration B

Photo A (geometry symbol) etched into the timbers with a scribing knife. (race knife).

Illustration B (above) shows example of a daisy wheel (geometry). There is debate regarding whether these symbols are connected with geometrical building principles or are examples of ritual marks, the use of circle, triangle, square, pentagram, hexagon, or octagon, were used in the set out and development of structures.



Photo A showing proportion layout on York Minster tracing floor.

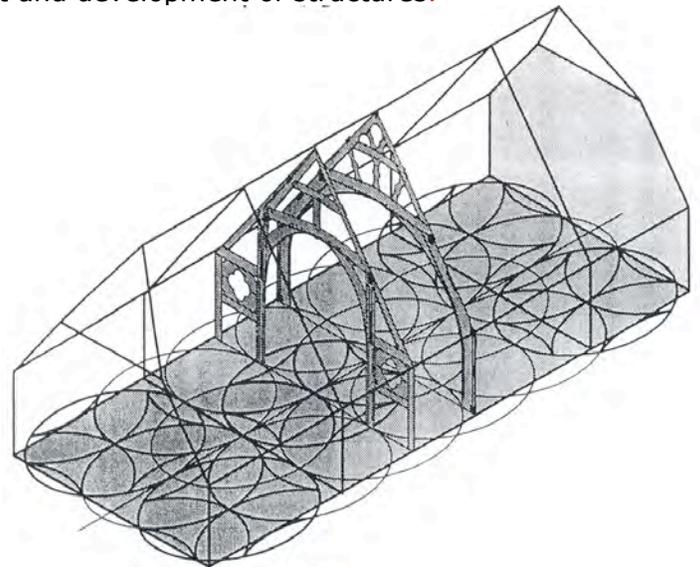
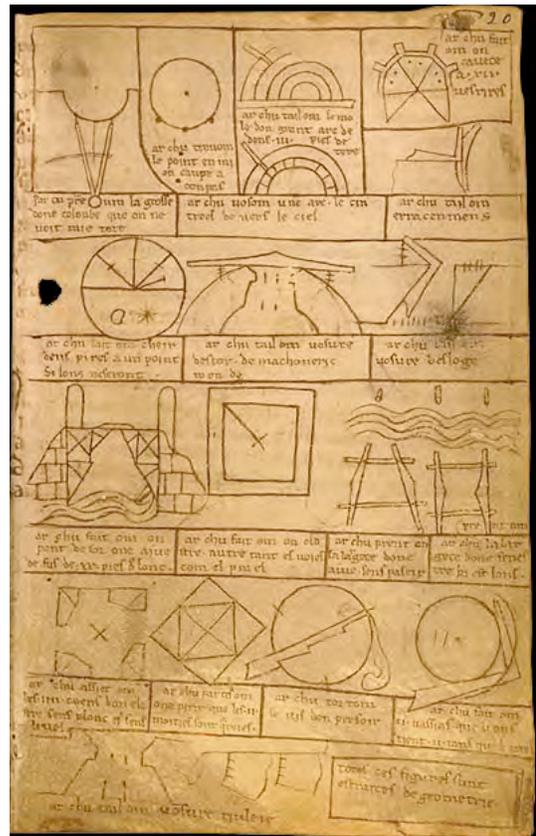
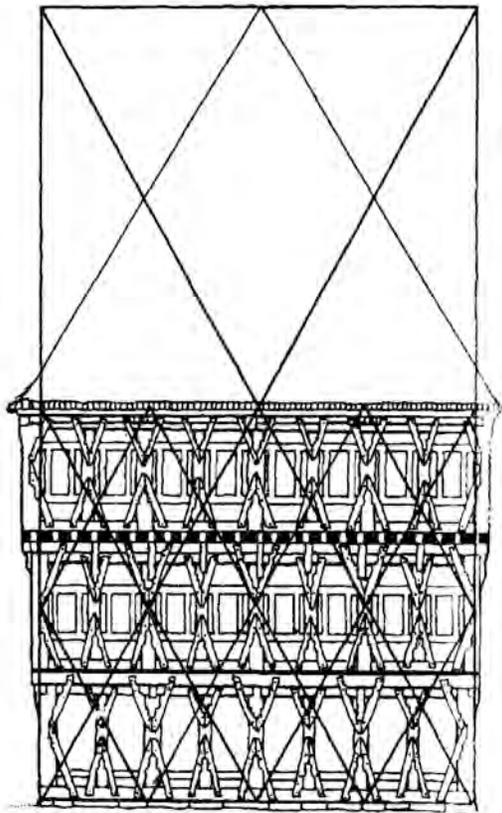


Illustration B of geometrical building set out at Ty-Mawr ²⁶

There are many of books on the subject of geometric building. Research into this area of geometric symbols has found examples in a church in Goth land Sweden and in barn houses in the United Kingdom. These symbols continue to be rediscovered when restoration or conservation work are carried out.

Many geometric principles of design were known to be at work in buildings (above and below) it is likely that the persons that set out and built these structures had a set of geometrical procedures that they would follow to produce a complete design for the building. The knowledge of early geometric designs in many area is now been re-discovered due to interest in the subject, with research and practical work been carried out. we will be able to get amore in-depth picture of these practises.



*Drawing A of geometric design is based on equilateral triangles
Relates to a town hall in Germany 1450, 27*

Illustration B is of Geometrical studies and layouts. This shows various useful processes for the manufacturers and the engineers, who need to use concepts of geometry.

Destination

University of York



All courses are housed in historic King's Manor.

The University of York was founded in 1963 and has over 30 academic departments and research centres. The Aim of the Short Courses at York is to update professional skills, particularly in the areas of conservation and heritage management. The Department's enviable team of specialists provides the training.

Courses and topics covered included;

HB4 the Study and Conservation of Timber

Key areas

- * Understanding wood and timber structures
- * Understanding types of timber-framed buildings
- * Conserving timber-framed buildings
- * Carpentry and joinery in the eighteenth century
- * Hands on study day of practical techniques, measuring and marking timbers for use
- conversion of round timber by broad axe, carpenters axe.
- * Making laths, pegs and shingles
- * Contractual matters relating to timber conservation, including costing

Timber joinery

There are dozens of ways to join timber together and if not hundreds of variations of timber joinery, the mortise and tenon is among one of the oldest.



Photo A



Photo B

Photo A showing the basic mortise and tenon comprises of a tenon (male) cut into one piece of timber and a mortise (female) this can be cut all the way through the other piece of timber. Photo B showing a pegged tenon Hereford England.



Mortise and Tenon Photo C



Photo D

Photo C and D (above) are a pegged tenon (male); the tenon protrudes through the mortise (female) this enables a peg to be placed to secure the joint. These historic joining techniques have been saved and stored undercover by Gordon stock of Portland Victoria. There were many opportunities to compare contrast and learn from similar and related techniques observed in Portland and district then discussed and identified during the time spent in Europe and the UK. The tusk tenon is a variation of the pegged tenon, but has a more complex carpentry joinery and also uses a peg to secure the joint. There are many

variations, combinations and alternatives of the scarf. The main being halved, splayed, and bridled. Listed below are the three basic scarf joints.

Halved scarfs has the lapped surface parallel with the timber

Splayed scarf has the lapping surface sloping

Bridled scarf takes the form of a tongue and fork or open mortise and tenon

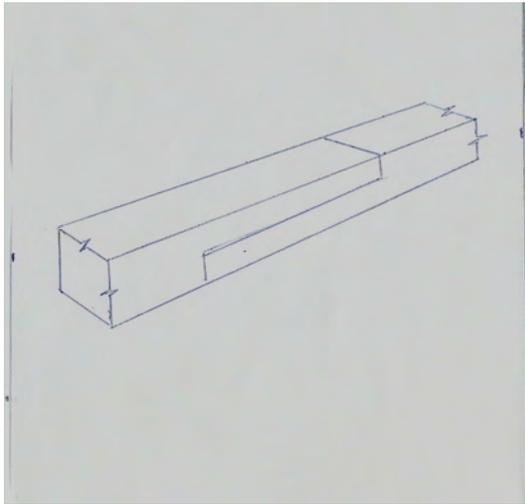


Illustration A
A Halved scarfs

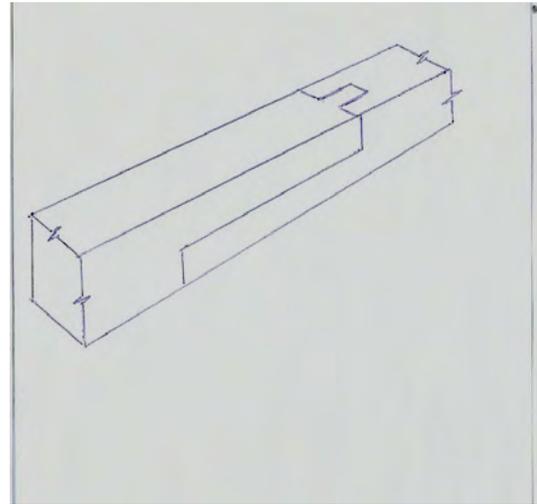


Illustration B
B Bridled scarf

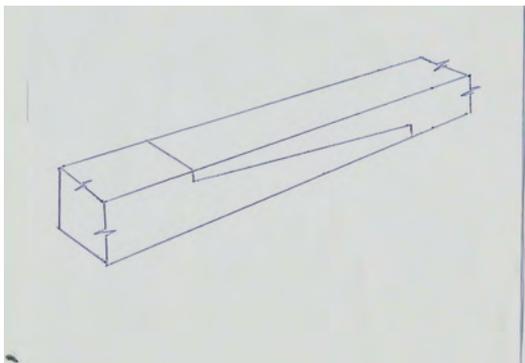


Illustration C
C Splayed scarf



Illustration D
D Splayed scarf being position into place England

Holy Trinity Church

The photos following are of some repair work that Nigel Bryce Lewis and Steve Turner carried out over time while in United Kingdom working for 'Williams Anelay Restoration and Building Company' The repairs show some examples of joints that were used. This conservation work was under English Heritage the government body that controls the of conservation on heritage buildings. The work was carried out in "Newcastle under Lyme" on the Holy Trinity Church.



Photo A



Photo B

Photo A traditional pegging being placed into position, the main original truss (painted), with the new lighter coloured timber (Douglas Fir) which has been scarfed into position. Photo B the pegging system finished and completion of the splayed scarf joint. These pegs are put under stress as they are knocked in with a mallet, they also must hold the joints structurally for years to come.



Photo C



Photo D

Photo C showing a peg being placed into position to hold the spline. Photo D is of a scarf joint completed. These pegs should be firmly tapped in position and then again on completion of the structure the use of second-hand pegs is not recommended.



Both Photos A & B showing the decade timber corbel (dark timber painted) and the new corbel (Oak) which was traced of the existing timber



Photo A

Photo B

Photo A showing the position of the new timber corbel and leg with mortise(s)
Photo B showing completed leg sitting on stone corbel



Photo C

Photo D

Photo C showing the process of making a shoulder tenon
Photo D showing the near completion of the shoulder tenon

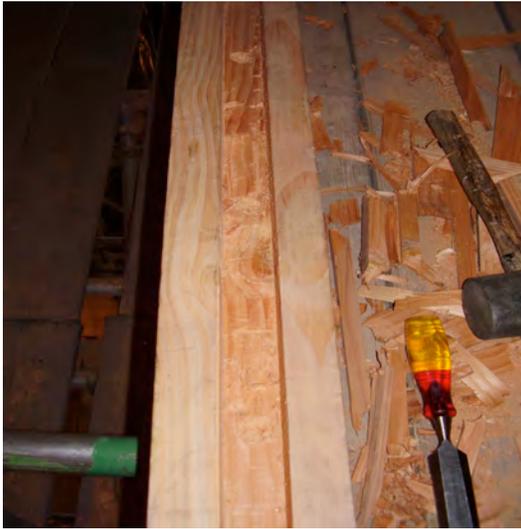


Photo E



Photo F

Photo E showing the complement of a mortise for a spline to be inserted and pegged.
Photo B showing the complement of a mortise hole for a slip tenon.

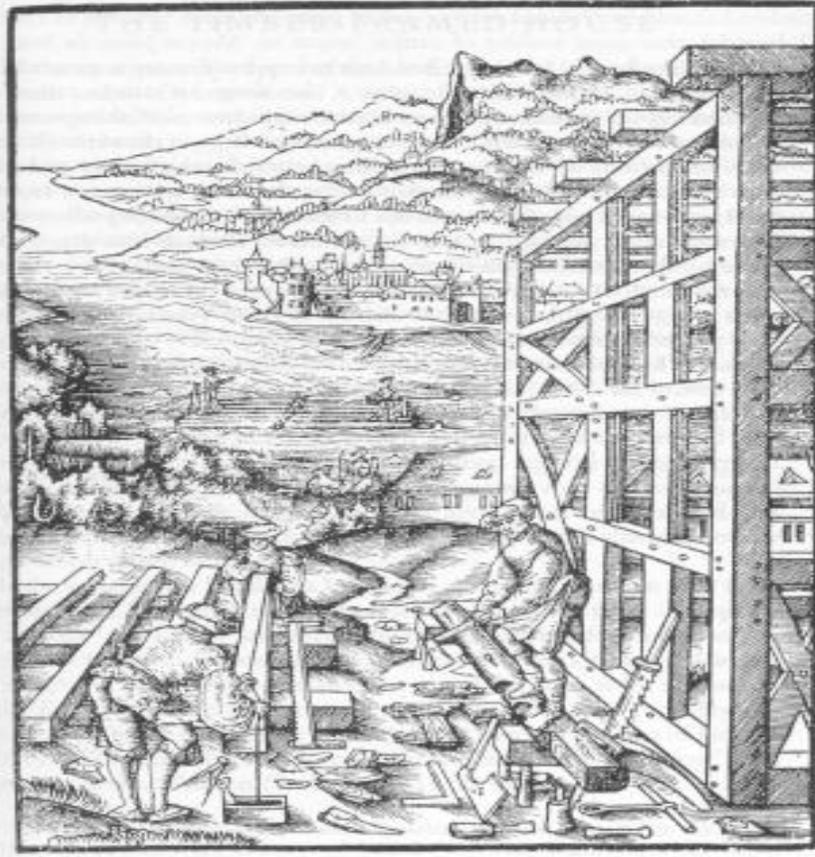
The use of Traditional Tools

Adze, carpenters axe, broadaxe, mortising axe, froe and crook are some of the more unusual names of the traditional carpenters tools

The use of traditional tools is in itself an art form; generally most people cannot use these tools efficiently because they do not have the training or the experience. When craftsmen become proficient in the use of these tools they can achieve a high standard of finished workmanship. To achieve this standard with both the broad-axe and adze it requires years of practise and the drive to be devoted to acquire these skills and techniques.

The two primary tools for hewing timbers to size are the broadaxe and adze. There are other axes and adze and associate tools available for use. Axes generally fall into two types; felling axes and broad axes.

The broadaxe or side axe was used to hew larger timbers to the required size. Guidelines were first struck onto the length of the log, and guide wedges (v grooves) cut between the lines down to the intended face of the finished timber. The log was then positioned so that the face to be cut was vertical. Standing beside the timber, the axeman then use his broadaxe to hew off unwanted material. After hewing one side the timber is turned, and the process is repeated until the timber is close to the required size.



Duke of Bedford's book of hours. This illustration of craftsmen working on a timber framed house. On the right of the illustration above, a craftsman cutting Guide wedges (V-grooves) out of the log before he continues the conversion of the timber to the required size, the craftsman on the left is snapping a string line.



Photo A



Photo B

Photos above showing some of the variations of axes .The axe second from the right Photo B is a broad axe called goose-wing type.20

Destination:

Chiltern Open Air Museum Buckinghamshire England

The Carpenters Fellowship was formed at Avon Croft Museum of Historic Buildings in August 2000, The Fellowship's aim is to increase communication, training and sharing of knowledge amongst those interested in historic and new timber framed structures. 42



Photo A



Photo B

Photo A German Carpenter (Journeyman) converting of log to required timber size (Hewing off timber) and converting this to the rough profile for the plane. Photo B showing the Completed work showing profile of the hewn and planed timber.



Photo A



Photo B

Photos B & C of the hewn timber being planed to the desired shape.



Photos above of a tenon in the stage of being completed with a carpenter's axe

Destination:

Hereford Caps & Caps

Post and rail fence

The techniques and knowledge of making a post and rail fence in the traditional way has virtually been lost, this method of fence building required a large degree of skill and patience. Many of these fences have disappeared through fire, age or development. Once proficient a log can be converted much faster than sawing. This timber procedure is preferred as the cells are not cut through.



Photo A, B (Caps & Caps Hereford) this fence is for an estate commissioned from the National Trust. Timber is split by placing wedges or froe in the end of the log first;

this opens up the timber and starts the splitting process. Secondary wedges are placed in the required position as above and hammered in occasionally. The splitting process doesn't split the entire length of the timber, so a carpenter's axe is used to finish the process. One another tool that is used for the construction of these post and rail fences is the mortise axe it's used for making of mortises in timber to allow another piece of timber (tenon) to be fitted.

Traditional Thatching School in England.

These next photos are from the Traditional Thatching School in England. These processes are called *riving and cleaving* persons performing these tasks usually use a froe and club, maul or a mallet (made of timber) and crook.



Photo A

Photo A shows a process called riving this process of splitting timber with a crook to the required size



Photo B

Photo B The froe had a couple of dozen other names as well, including "riving axe". It is used to start the splitting process of timber. This tool is L-shaped; the blade is usually from 6 to 24 inches in length and 2 inches in width.

Destination:

The Society for the Protection of Ancient Buildings (SPAB)



William Morris founded the Society for the Protection of Ancient Buildings in 1877 to counteract the destructive 'restoration' of medieval buildings being practiced by many Victorian architects. This society is still active in this field. It is involved in all aspects of the survival of ancient buildings. 41

The 'Repair of old Buildings' Course

Key areas covered in the course were

- * Philosophy of conservative repair
- * Damp
- * Lime the material and its use in repair
- * Traditional masonry, masonry decay and conservative repair
- * Development of building structures and principles of repair
- * Roofs
- * Plasters and renders, ironwork, services in historic buildings
- * Timber- its nature, decay mechanisms and remedial treatment
- * Timber frame construction and repair, costing historic building work
- * Surfaces and finishes

Destination:

Oxwich Castle Wales

Oxwich Castle is situated in Wales on the Gower Peninsula. This is actually a grand Tudor manor house built in a courtyard style in the 16th Century. The conservation work was carried out by Caps and Caps under CADW. CADW is the Welsh Assembly Government's historic environment division. Its aim is to promote the conservation and appreciation of Wales's historic environment. CADW was created in 1984.



Photo A Oxwich Castle Wales.



Photo B above shows truss with purlins being completed and the positioning of rafters.

The choice of timber to be used in the repair or replacement should have been felled for about three years and be of straight grain free from sapwood and wane edges and any major shakes. It is now generally accepted that green timber can be also used.



Photo A and Photo B show the Main truss of roof, splicing of a half scarf and a half scarf clamped together with, pegs inserted

The length of the scarf joint should be three times the width or depth of the timber, whichever is of the greater; the length will also alter depending on the species of timber.

Traditional pegging

Pegs or as they're known 'tree nails' are used for the joining of timbers together in frames. The timber selected to make pegs needs to be very straight -grained. And made of oak or other suitable timber, which is as dry as possible so that they will not shrink.



Photo A

Photo A showing of a peg blank on a draw horse also known as a shaving horse.



Photo B

Photo B the completed timber pegs

Photo C The first stage is to cut a suitable log to the finished length that is required; the timber is then split into equal sections, then into blanks. these blanks are slightly larger diameter than the proposed finished peg, the next stage is to shape the blank this can be done using a drawknife by tapering it into a roughly octagonal shape, then continue turning the blank and shaping it to the required size .



Photo C



Photo D

Photo C showing peg blanks with a drawknife and D completed pegs.

Destination:

Herefordshire England Caps and Caps



*Photos above Caps and Caps sawmill, Herefordshire, England
Photo's of converting round timber into slabs with bandsaw.*



*Photos A and B showing the removal of bark before milling commences the
Main tool for bark removal is the spud.*

Destination:

Goteborgs Universitet Sweden

Goteborgs Universitet runs a craft course that is called The Bachelor of Handicrafts - (traditional carpentry). –the course runs for three years.



Photo A Sawmill at Goteborgs Universitet. Photo B Building Restoration/Conservation Dept



Photo C Swedish sawmill 1800,s

Photo B inside mill cradle for log

The earliest mills were situated in or near the forest being felled, and always close to permanent water, which was used by the steam boiler or water wheels. Many of these mills were only established temporarily in order to cut out the available timber in the surrounding area. In the later years mills became established nearer to towns¹¹.



Photo A



Photo B

Photo A; Shows Traditional peg making by carpenters axe. Photo B, C, D and E; A Scaled mode of a church to represent the carpentry techniques before a full-scale church is rebuilt; the church to be rebuilt was extensively damage by fire. This model will sit at the entrance of the church to show visitors the carpentry joinery.



Photo C



PhotoD



Photo E
The use of carpenters axe and the finished joint



Photo F

Destination:

West Dean College



West Dean offers a series of courses for professionals in Building Conservation Master Classes. These courses offer a mix of basic training in materials conservation and more specialist courses, such as the conservation and repair of timber. West Dean also offers a programme of courses in continuing professional development for the practising conservator, including its Building Conservation Master classes. In addition, it provides year-round short courses in the crafts. The programme is collaboration in specialist training between West Dean College, English Heritage and the Weald & Downland Open Air Museum, and is supported by The Redcliffe Trust. English Heritage advises the government on the protection of the historic environment, its primary aim being the conservation of England's historic sites, monuments, buildings and areas. 47

Master Class Conservation and Repair of Timber

Key areas

- * Fungal decay and insect attack
- * Treatment of rot and insect attack
- * Timber in historic structures
- * Historic methods of timber framing
- * Laying out and marking a simple frame
- * Introduction to repair techniques
- * Repairs using timber
- * Repair demonstrations
- * Fixing and finishing repairs

The above was attended and the focus was on the use of timber in historic structures. The course has participants from many different locations and sharing this knowledge was a strong component of the experience. The discussion of the qualities wood and the skills required in identifying, selecting and preparing the appropriate timbers was present in most of the activities attended. What follows is a compilation of findings on this subject.

Wood

This is the tough, fibrous cellular substance that makes up most of the stems, branches of trees beneath the bark.

Tree rings

The annual ring represents one year's growth. A good year for growth will be recorded by a wider ring in all trees affected, whatever their age. The outermost ring records the year that the tree was felled, also called growth rings.



*Photo above shows new timber on the left and historic timber on the right
Cross section of Oak that clearly shows the tree rings in both the heartwood (darker coloured wood in the centre) and sapwood (lighter coloured wood towards the outside).*

Heartwood: The wood making up the centre part of the tree, beneath the sapwood. Cells of heartwood no longer participate in the life processes of the tree. Heartwood may contain phenolic compounds, gums, resins, and other materials that usually make it darker and more durable than the surrounding sapwood also called duramen.

Sapwood: The outer layers of wood in a growing tree, contain living cells and reserve materials such as starch. Under most conditions, the sapwood is paler in colour and more susceptible to decay than heartwood. Situated between the cambium and heartwood also called the laburnum.

Springwood is the softer, more porous than an annual ring, this develops early in the growing season also called early wood.

Summerwood the harder, darker, less porous portion of an annual ring that develops later in the growing season also called late wood.

Cell structure When timber is split (cleaved), the cells are wrenched apart. In timber being sawn the cells walls are severed, this enables the timber to decay more quickly.

Dendrochronology

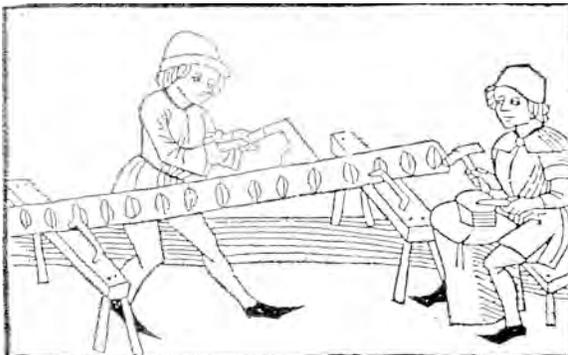
'Dendrochronology, or 'tree ring dating' as it is often known, can provide an invaluable insight into the history of a building by revealing the year in which timbers used in its construction were felled'

The way dendrochronology works is as the tree grows, it puts on a new growth or tree-ring every year, just under the bark. A trees growth will be at different rates according to environmental factors in any given year: a wider ring indicates a productive year and a narrower ring indicates a less-productive year. Over a long period of time (80 years or more) there will be a corresponding sequence of tree-rings; this will give a pattern of wider and narrower rings. These represent the span of years during which a tree has lived. 12

Samples are prepared by the dendrochronology either from cores drilled out of the timber or, if the timber is to be replaced, by taking complete slices through the whole timber. Slices are far more destructive but give the clearest picture of tree ring sequences. Generally a minimum of 50 rings should be present in each sample and that eight to ten timbers should be sampled per building, with no more than two core samples taken from the same timber to avoid unnecessary damage. 12

Sapwood is highly susceptible to decay particularly by termites. As a result all sapwood may have been removed from the accessible surfaces of timbers during building repairs and conservation work, making it impossible to determine when the timber was felled. 12 Where trees were felled at a relatively young age there may not be enough rings to cross-match accurately. Other reasons such as the use of timber from other area or unusual growth conditions in the timbers will affect the out come.

Timber Measurement

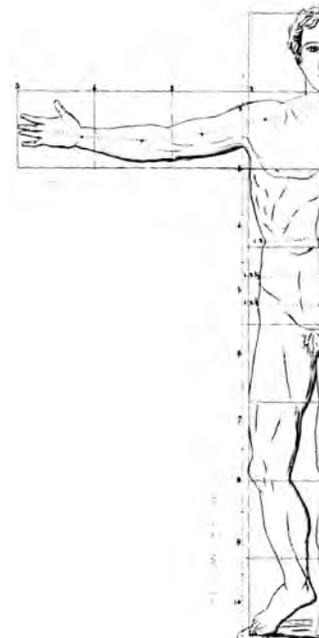
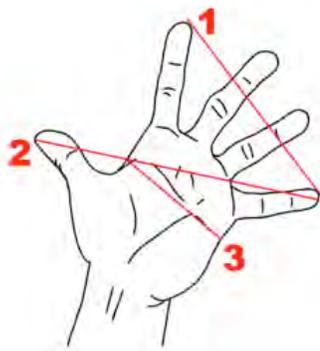


Germany 1486 manuscript of the process of timber conversion (hewing)

The felling axe or belte were used to fell trees and to cut logs into lengths as well as notch the sides of the log in preparation for hewing them into square timbers.

Our history for measuring timber was in imperial super foot, which is equal to a board 12 inches wide, 12 inches long, by one inch thick. Timber is now measured by the cubic meter, which contains 423.47 super feet.¹¹ The hoppus feet system of measuring came in to use around 1763 this system enables the measuring of a log with the bark still on. it is still being used in the timber industry.

'The human body parts were used for measurement .The common cubit was the length of the forearm from the elbow to the tip of the middle finger. It was divided into the span of the hand (one-half cubit), the palm or width of the hand (one sixth), and the digit or width of a finger (one twenty-fourth). The Royal or Sacred Cubit, which was 7 palms or 28 digits long, was used in constructing buildings, monuments and in surveying'.⁶⁰



Three archaic hand units of measurement

1 Hand= 4 inches, 2 Span= 9 inches, 3 Palm=3 inches

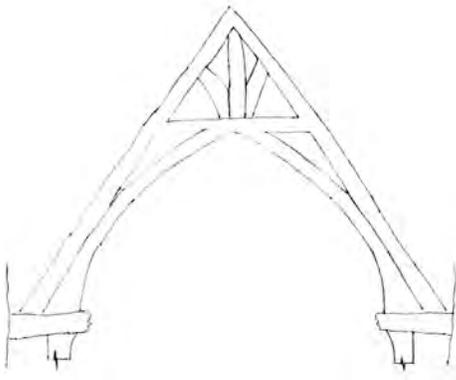
illustration B

'The Cubit is the name for any one of many units of measure, used by various ancient peoples.(illustration A, B previous page) The *natural cubit* is based on the distance between thumb and another finger to the elbow on an average person. This natural cubit measures 24 digits or 6 palms or 1½ foot. This is about 45 cm or 18 inches'.⁶⁰

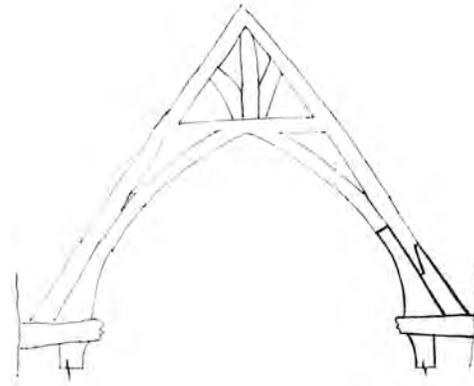
Lack of knowledge in drawing and sketching of buildings

One of the best ways to study and understand timber-framed buildings is to draw them.

In this area there is a need to improve the accuracy of rapid sketches, by using a grid to record complex patterns. Tracing and photography are also beneficial. The use of drawing individual timbers and rubbing surface features would help in the recording of these historical fabrics. In doing this a greater understanding in the structure can be achieved.



Drawing A



Drawing B

Church truss completed with the removal of defect area, the scarf timbers placed in drawing B.



Illustration A

National Library of France, Department of the manuscripts, French 19093
 Illustration A the first two farms illustrated on this page are with elevated tie-beams. The third sketch of frame represents a lean-to building, covering a side. In bottom of the board a deaf lamp or monastic lamp appears 48
 Illustration B is a cross section of a traditional timber framed building 30

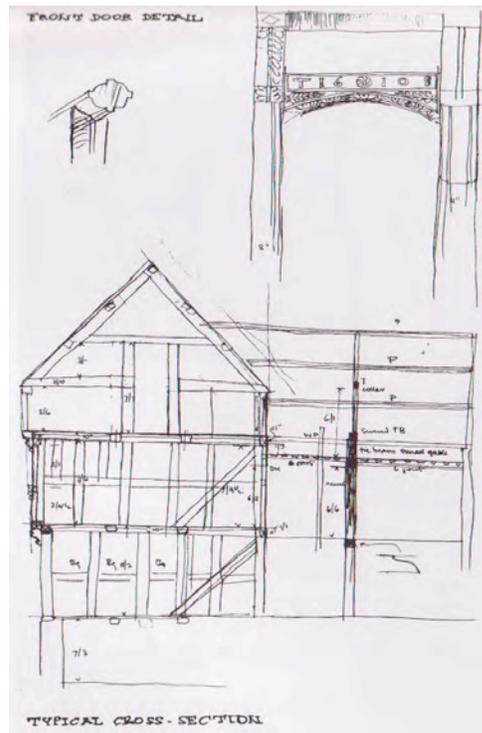


illustration B

Fungi decay and its treatment

This was another course topic covered while at West Dean.

The aim of remedial works is to control timber decay, prevent further deterioration and to correct any significant building defects. It is important to reduce sub-surface moisture content of all timber to below 20 per cent. This material should be isolated from damp masonry by air space and free air movement around the timbers.



Photo A Bluestone and timber work Portland Victoria Photo B Concrete stumps on a listed building - Portland's Steam Packet Inn

'Dry rot' is the decay of wood caused by fungi; however, all wood-rotting fungi require both food (wood or other cellulose material) and water, The process of wood decay itself produces water; its ability to produce moisture in this manner can be negated by ventilation. Decay should cease if the moisture content of the wood is reduced to below about 20 per cent.

Because of the total dependency of dry rot on moisture, the primary control strategy must be based on environmental considerations aiming to restore and maintain dry conditions. However, in many cases drying will take a long time, often measured in years. It is necessary to determine how far the dry rot has spread. All timber in the vicinity of any outbreaks should be inspected carefully to assess the extent of decay and the current moisture content. 14



Photo A spread of dryrot at Church at NEWCASTLE-UNDER-LYME, a borough, market-town, in the parish of Staffordshire

The conservation work was completed under the guidance of English Heritage the Government conservation body on heritage buildings The work took place in "Newcastle-Under-Lyme" on the Holy Trinity Church. My co-worker was Steve Turner and the work was for William Ansley.

5. Findings

Key issues

It appears that getting through the work without regard to quality and craftsmanship, is paramount at present in Australia. In this area of learning today its driven home with lessons in classrooms with insistence on using volumes of textbooks.³³

However the first principle of learning any craft is by learning under a Master. Only these Masters, who are fully skilled and trained in the processes that are being taught, can pass on the artistry associated with this level of skills in a 'hands on' workshop.

There are hundreds of matters (tricks of the trades) which belong to the workshop. These cannot be fully grasped just by the reading of books. They have to be shown by a Master. Skills demonstrated and then applied are learnt more quickly than if the subject is only read.

There is a need to insist on the value and necessity of the daily and hourly lessons that come from the constant presence of handling and using all tools and materials. There is a need to exchange ideas among those who are working together in these areas. ³³ A 'Master Craftsman level isn't gained in a university of theory, it's earned through years of dedication and attention to detail, the hallmark of perfect craftsmanship.

6. Recommendations

Government: Federal, State and Local

The area of South West Victoria is rich in heritage. There's a need to support the repair of buildings and for ongoing research into early architecture and engineering.

There is also a dire need for funding to support the acquisition of the skills required to achieve these outcomes effectively and in a timely way. Establishment of logging in rural areas with a view to access selected logging using traditional techniques would also be of benefit to keep the knowledge alive.

There a need for a Government body or agency for heritage crafts training to develop overseas connections, and provide funding support for tradespersons wanting to become craftsmen and support craftsmen to travel overseas to further develop their knowledge and skills.

The development of a single craftsmen training collage for Australian would also be beneficial to the future of craftsmen and tradesmen.

Communication and collaboration between Federal, State and Local Governments about the above issues would assist in recognising the most appropriate craftsmen for the job and to help develop a cohesive Australia wide strategy for heritage restoration matters. This would help to ensure that any restoration and conservation work would obtain good outcomes.

Industries

Heritage education for industry bodies, company staff and management on restoration and conservation practices and principles

Recognition of journeyman, craftsmen with appropriate pay structure as reward and recognition of these skills.

Provision of a structured and recognised career path for would be craftsmen to expand their skills and knowledge, as they require it, in a flexible and hands on environment.

Firms and Specialised Organizations and Professional Associations

Often the use of modern tradespeople is detrimental to the conservation of the historic buildings; without craftsmen with specialist expertise we cannot achieve high standards and authentic results. Architects must establish a liaison with craftsmen before restoration and conservation activities commence so the correct joinery and processes are used.

It would be worthwhile establishing an individual specialist organisation in the crafts and networking already existing bodies such as Australia's ICOMOS National Trust, Historical Societies and Engineering Heritage Victoria, to help foster the awareness of the need for, and for understanding the use of, traditional materials and the application of the processes that go into the conservation of heritage structures.

Without consultation between craftsmen and professionals during the development of a conservation plan, the wrong decisions are liable to be made, at a time when the knowledge of authentic and traditional methods used for the conservation of these rare buildings is key.

Training Providers and Universities

At present the educational environment provides neither a basic grounding nor an intensive understanding in the traditional crafts skills (handicraft) and associated knowledge. There is limited training in the trades for restoration and heritage work.

For the delivery of training, the contribution of craftsmen/journeymen, to implement their specialist skills for the units for heritage courses would be beneficial.

In response to the positive outcomes experienced in Europe, the establishment of a travelling scheme based on the guilds would help to ensure that the quality and pride of skilled workmanship is retained and fostered. A second language integrated in to this training would be of great assistance when travelling overseas.

If requirements of craftsmen training are not implemented the enthusiasm shown for the traditional crafts in Europe, we will continue to lose the already decreasing number of craftsmen to overseas.

Community

If there is an expectation that our built heritage is to remain in the original crafted condition, we need to educate tradespeople and the general public of the ancient skills and building techniques of the traditional crafts for these buildings.

There's an issue of raising the awareness to the general community of the importance of preserving the past through conservation, this could be initiated in connection with historical associations, schools and farmers field days.

What Can International Specialised Skills Institute do to help with the change?

ISS institute could assist by providing mentoring and networking opportunities such as Forums, Seminars, and Workshops also further lobbying Government agencies to bring forward travelling craftsmen training. The set up of a register for craft persons would also be beneficial

ISS Institute could assist with the furthering of networking opportunities with overseas originations such as REMPARTS, CHAM, SPAB, and CAWD by doing this it would enable future placements of Australians craftsmen.

There's a need to record and document the heritage of our living treasures including the skilled crafts people. There is also a need for one central reference point (online) to deal with Australian historical past, conservation and restoration matters

This could incorporate such things as:

- A database of craftsmen and restoration groups with links to there websites
- A current list of up coming courses from Government Departments and Educational Institutes and Private Providers related to conservation and traditional crafts (both International and Local).
- A list of material and tool resources
- A discussion forum for questions and answers.
- A central Government and private contacts list.
- A Volunteer registry.
- Scholarships, fellowships and philanthropic trust support database.

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