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Re-using timber

Using non-destructive methods to justify the retention and strength of existing timber in refurbishment projects

John Williams
Senior Technical Consultant
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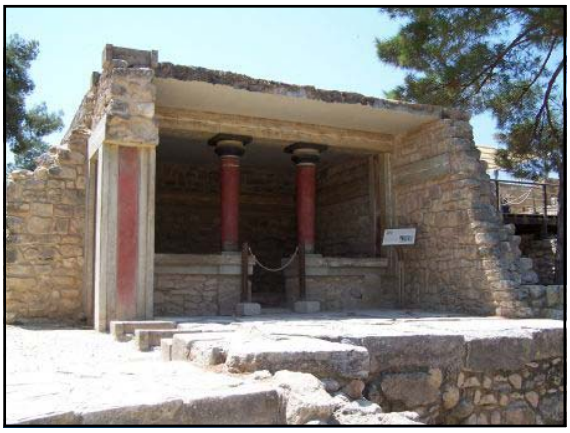

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UK's leading consultancy providing timber expertise (not just research!!!!)

Multi-disciplined organisation employing materials scientists and timber engineers

Provide a 'one stop shop' service for site investigations

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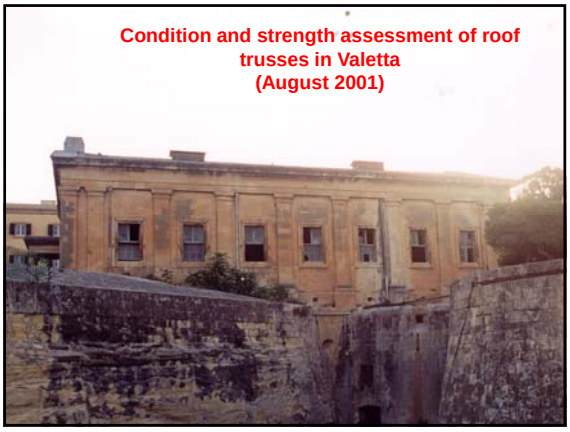
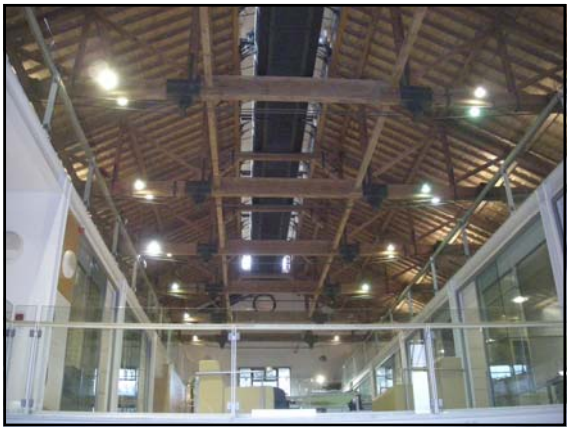
I am here


Condition and strength assessment of roof trusses in Valetta
(August 2001)

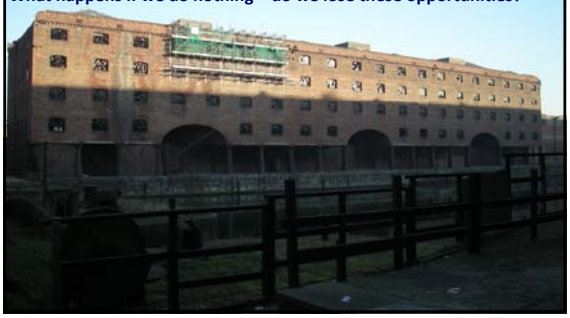

February 2009



Why restore and refurbish historic buildings?

Heritage reasons or environmental responsibility?

What happens if we do nothing – do we lose these opportunities?



What are the main timber challenges faced when converting or changing the use of buildings or restoring structures?

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Inspection and Evaluation

Define the objectives

Are you after a quote,
risk assessment or
or detailed survey

Contractors need
information

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Quote

(comparatively small building).....

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Inspection and Evaluation

Good information allows you to minimise exposure to risk pricing and to identify obstacles before they become a problem

....Get it wrong?

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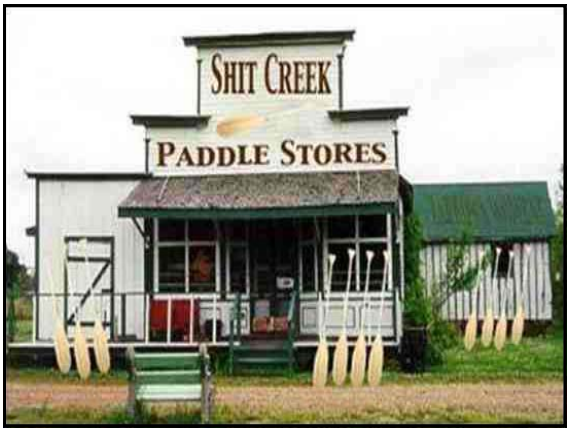

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Historic buildings are challenging!

Let's look at some budget planning

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The Developer's vision!

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The architect's interpretation of the developer's vision!

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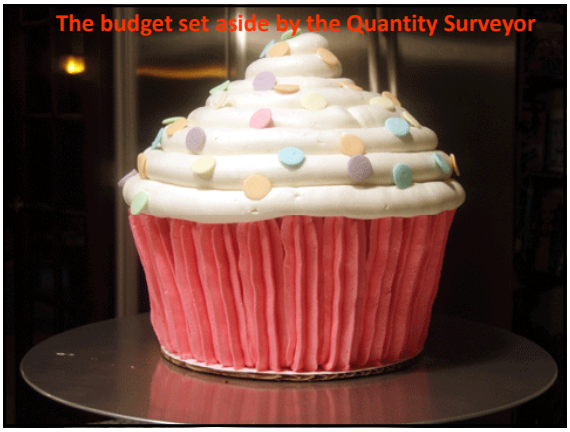
The structural engineer's solution

The budget set aside by the Quantity Surveyor



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Along come the Targeted Specialist Investigations!

(not just timber)

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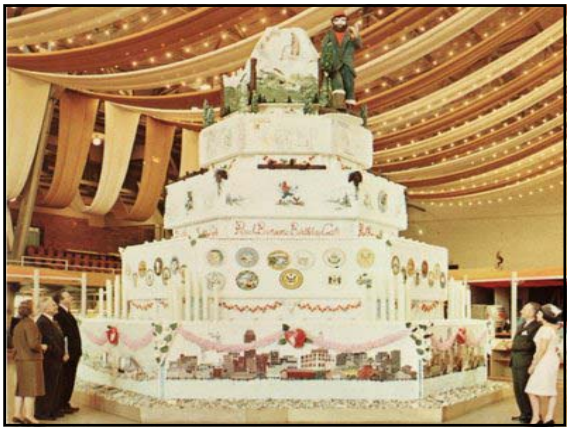
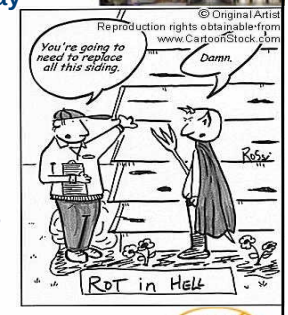


What should we look for?

Fungal Decay

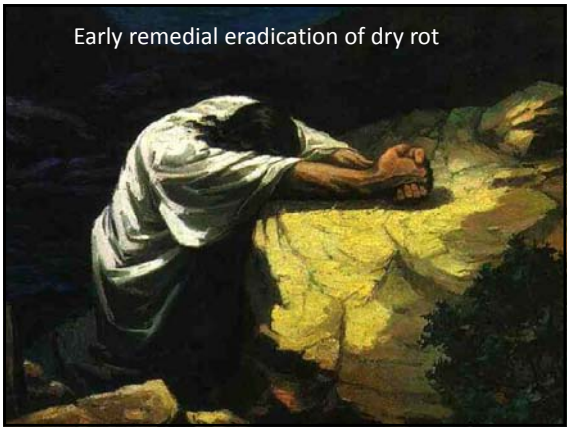
- Fungi are living organisms
- Require food and 'warmth'
- Also need MOISTURE!!!!
- Fungi will only cause decay if the moisture content of timber exceeds and remains above 20% for prolonged periods.
- What about dry/wet rot and mould?



Origins of dry rot

- Book of Leviticus: Chapter 14 verses 32 – 46
- Dry rot described as *'the plague of leprosy in a house'*
- The PWPDA recommended calling in a priest and if prayer did not work the contractors were urged to ...

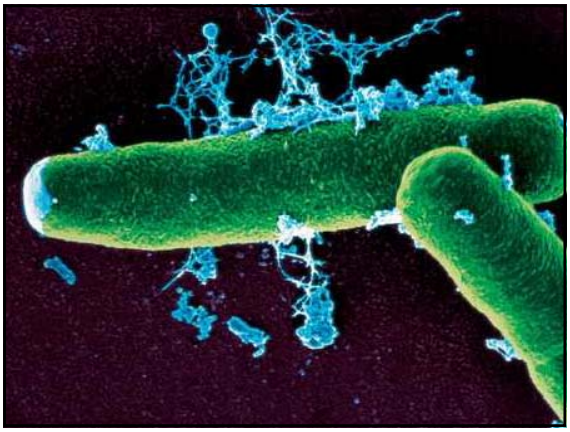
''break down the house, and stones of it, and the timber thereof, and all the mortar of the house; and he shall carry them forth out of the city into an unclean place'




What about wood destroying insects?


Identify the wood destroying insect


Nasty case of dart board beetle



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Inspection and Evaluation

- Non destructive methods
- 'TAMO
- Decay detection drilling
- Moisture content readings
- What probes do we use?
- Where do we insert probes?
- What is the decay threshold?
- What species is the timber?
- How strong is the timber?

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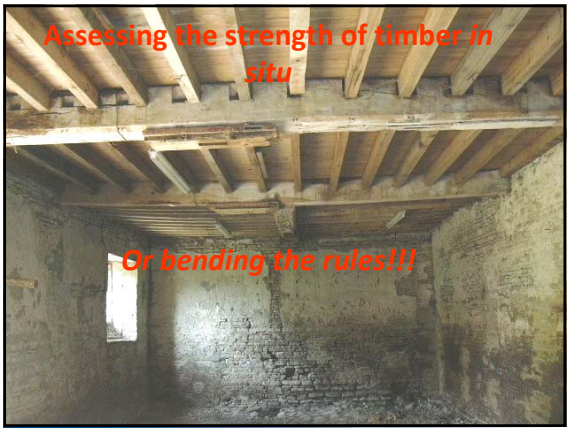

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- The strength of a structural timber is defined by the size and location of strength reducing characteristics.
- Examples are rate of growth, slope of grain and knot size (decay and insect attack!!!)
- The code of practice for the structural use of timber was first published in 1952
- CP112 defined strength reducing characteristics and grade stresses for structurally important species. We now have BS 4978 and BS 5756
- Did we grade timber before 1952?

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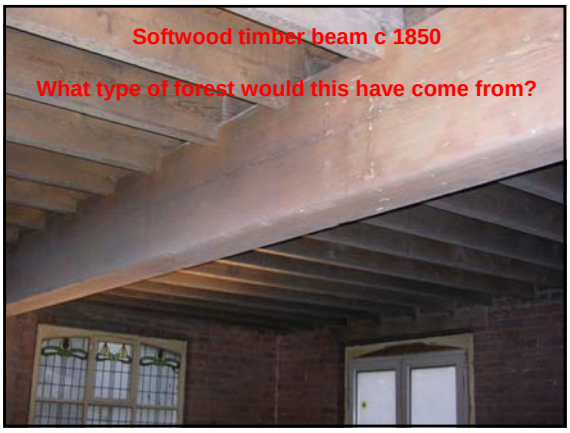
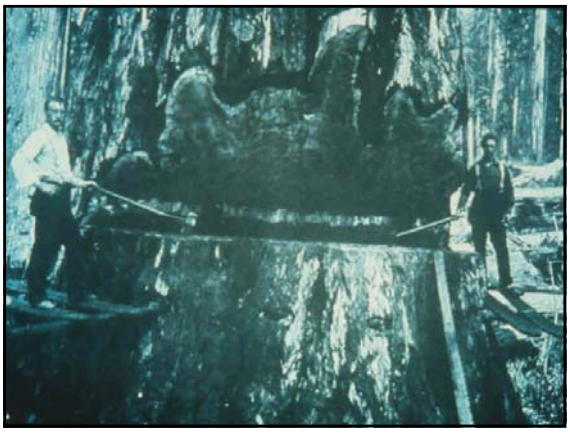

Softwood timber beam c 1850
What type of forest would this have come from?




Modern rules for modern timber !!!

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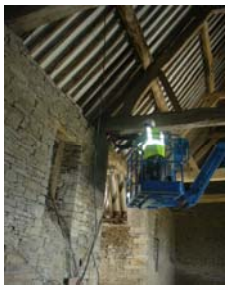
Assessing strength of timber *in situ*

- We need to understand the effects of moisture. As timber dries it becomes stronger.
- BS 5268 permissible stresses are based upon 16% to 20%
- Timber in older buildings (provided they are dry) are around 10% to 12%.



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Assess the timber *in situ* - understand what function it is serving and judge the effects of strength reducing characteristics. Bespoke rules and strength data are bespoke!

Consider the effects of moisture and density. Consider destructive laboratory testing – obvious disadvantages!!!

When is it worthwhile undergoing *in situ* load tests and when should we decide to strengthen?

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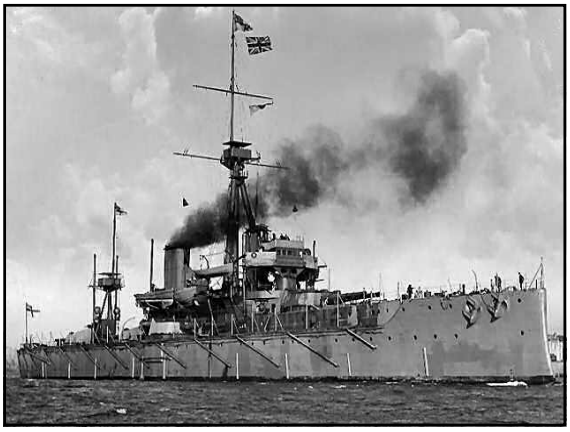
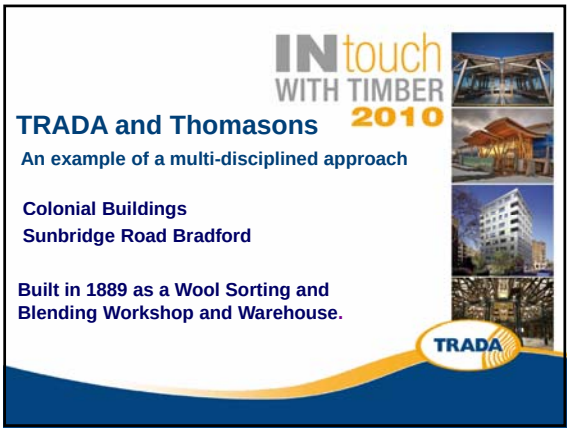
C 35!!!




<C16 !!!!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TRADA and Thomasons
An example of a multi-disciplined approach
Colonial Buildings
Sunbridge Road Bradford
Built in 1889 as a Wool Sorting and
Blending Workshop and Warehouse.
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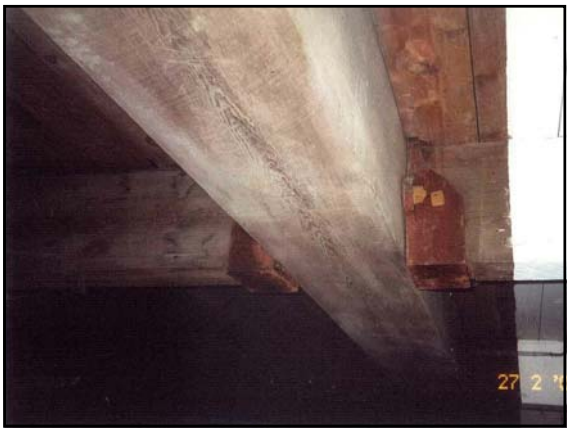
Two rows of circular, hollow cast iron columns supported primary and secondary timber beams. 75mm thick timber planks spanned between the secondary beams at 2.3m centres
22 9 '00



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So what was the problem? The initial appraisal concluded that when using C24 permissible stresses, the primary and secondary beams were inadequate in bending when a future office loading was considered.

Steelwork strengthening would have cost approximately £154,000, excluding fire protection, in 2001 or £300,000 in 2007.

The total cost in 2001 in consultancy fees (TRADA + Thomasons) was less than 10% of strengthening works

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Some conclusions

An increasing amount of resources are being set aside for the repair and rehabilitation of existing structures for heritage or commercial reasons.

Should there be an increase in the emphasis placed on the *in situ* assessment of existing structural timbers? Use NDT?

When assessing strength, in some cases, the existing standards do not go far enough to justify the retention of the original timber elements - but we can bend the rules!

Always resistance to consultants fees, but.....

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