Sustainable Timber Recreation Structures

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NAPIER UNIVERSITY
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Forestry Civil Engineering

Today

- Mountain Bike Specialist Structures
- Playground Structures
- Bridges

History - the very beginning - 1919

We are now devolved into 3 countries

General GB Forest Policy

- To protect and expand Britain's forests and woodlands and increase their value to society and the environment.

Today This Includes

- Encouraging Leisure Activities in the Forest
- This is Government Policy and the FC Utilises its Estate to help
- Urban Policy – Sustainable Communities are the ODPM Cornerstone Policies
- Remit is to Deliver Clean Green Spaces

Where does the Money come from?

- Funds from the Office of Deputy Prime Minister
- The Capital Modernisation Fund was set up as part of the Comprehensive Spending Review in 1998 to support government departments' capital investment projects to improve key public services or public infrastructure. – Now empty
- There are now other Fund Sources from ODPM
- Also Local Enterprise Funds, European Grants, Private Companies etc.

FCE Involvement

- FC do what funds allow and ask FCE to design and Build the Facilities
- FC apply for ODPM and European Grants and ask FCE to Design and Build
- Local Authorities, Community Groups, Private Companies ask FCE to Design and Build

FCE's Unique Contribution

- Structural Design with a Specialism in Timber
- Management of Rural Contracts
- Low Cost Engineering
- Rural Contracting
- 50 years of Experience

Napier Involvement

- Centre for Timber Engineering (CTE)
- Finance by the Forestry Cluster, FC and some Industry Partners (James Jones)
- Research into Timber Engineering
- Teaching Timber Engineering
- Producing a Generation of Engineers trained to use more than Steel & Concrete

What are Clean Green Spaces

- Outdoor Places to Walk, Run, Ride
- Places for Children to Play
- Places for Adults to Play
- Places Designed for All Abilities
- Learning Facilities for Children
- Challenges for All
- Well Designed Sustainable Facilities

Rural Timber Structures

- Bridges
- Viewing Platforms
- Towers
- Walkways
- Signs
- Playgrounds
- Crash Barriers
- Telephone Boxes
- Fencing
- Mountain Bike Obstacles
- Roads
- Tracks
- Coastal Protection
- Buildings
- Benches

Benefits of using Timber in Structures

- the original sustainable material,
- it is easy to work and fix to
- it does not require special tools or special skills to work it
- new design codes (Eurocode 5) are making it easier for engineers
- it is a renewable resource
- it has very good strength to weight properties

Benefits of using Timber in Structures

- when used with other materials the composite is very strong
- stress lamination solves the problem of short timber lengths
- stress lamination solves many of the awkward jointing problems
- stress lamination permits preservative to be applied throughout the section
- The public like the look and feel of timber

Timber Mountain-bike Structures – recent History

- Exponential Growth over 5 years
- Fits with ODPM Policies for Access
- Attracts 30 Some-things
- Causes Ground Erosion
- Need to Emulate USA
- Will be big Business

Where we are Today

- Many Trails throughout the UK
- They were not Designed
- Legislation does Apply
- 2 Fatal Accidents Recently
- Safety is part of ODPM Policy
- Encourage Growth and Apply Safety
- Control Ground Erosion

Recent FC Action on Control

- A duty of care exists because the bikers have been invited onto the land
- The Health and Safety at Work Act applies therefore risk assessments must be carried out on the entire operation of the trail
- The riders must be informed of all risks and how to use the equipment
- Dangers must be visible and not hidden
- Great care is required when designing and constructing structures

Recent FC Action on Control

- Access for ambulance and emergency personnel must be possible and informed
- Moving structures must have failsafe mechanisms
- A regime of inspection and maintenance must be set up
- All literature concerning the trail must be stored for 5 years in case there is a claim as a result of an accident.

Special New Obstacles
Mountain-Bike Fairground

- Skinny
- Berm
- See Saw
- Human Hamster Wheel
- Vortex
- Rib Tickler
- Special Handrail

On Site Production

John Ireland at Glen Urquhart

Video

- Note the Robustness of Structures
- We are introducing Stress Lamination
- This will minimise Maintenance
- Everything is AT YOUR OWN RISK
- This is not allowed in UK
- We will make ride Exciting and Safe

Children's Play Structures

- European Standard EN 1176
- Manufactured Play Items
- Combined Facility built In Situ
- Must be safe in more than one Way
  ie structurally and to play on
- Distinction between <36 Months>

When planning it is important to:-

- Hire a designer who is experienced, competent and qualified to accept the responsibility
- Hire a contractor who is experienced and has the capacity.
- Ensure regular supervision is built into the contract
- Ensure budget is adequate
- Allow enough time to gain Planning permission etc
- Ensure enough time is allowed for construction to avoid rushed finish

Royal Society for the Prevention of Accidents (RoSPA)

- A level of Risk in necessary to provide a Challenge for Learning
- RoSPA will carry out Risk Assessments
- Provide a Certificate to the Operator
- Trapping of Fingers, Heads, Hands
- Sharp Edges, Falls
- Must Inspect Regularly

Grizdale

Consider Design Carefully

- Ensure well Braced
- Ensure Joints are Designed
- Consider Dynamic Loads
- Design for Rot
- Design for Bearing

- Fix minor Structural parts
- Design Handrails
- Ensure Robustness
- Nails or Screws
- Stress Lamination helps to produce a Robust Structure

Conclusion – Play Equipment

- Excellent use of Timber
- Remember EN
- Hire a Competent Designer
- Remember the 36 month Age Limit
- Make Activities Challenging
- Make Facility Safe
- Use RoSPA Check

Timber Recreation Bridges

- A Bridge is a Focal Point of a Walk
- It needs to look good and fit with the Surroundings
- Timber makes Sustainable Structures
- They provide Interest for Children
- They provide Excitement for Cyclists
- They provide Designers with Opportunity

Types of Timber Footbridges

- Log
- Sawn Timber
- Glentrool
- Truss
- Aerial Mast
- Stress Laminated
- SLT Arches

Short Span Standard Footbridge

- Upto 9m
- Log
- Sawn
- Glentrool
- Footbridges in the Countryside
- Keep it Simple
- Get it Certified

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Sawn Timber Bridge

Aerial Mast Bridges

Log Bridges

Aerial Mast Glen Feshie

French Innovation

French Disaster

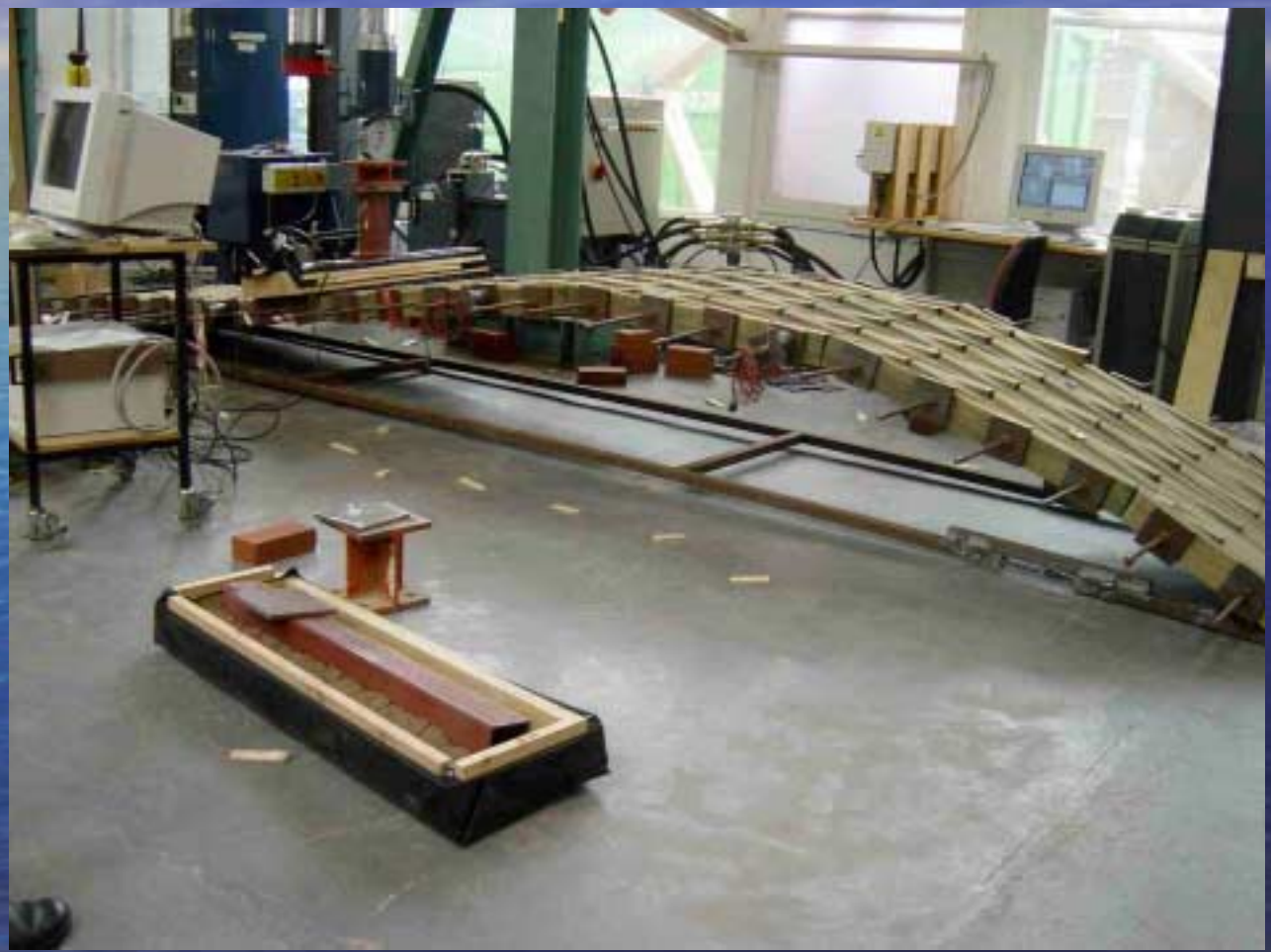
Oak Arch from Bent Tree

Recent Construction
May 2004

This is Stress Lamination

3 Years ago I designed this for a competition

Delay so we built this



Results of 6m Span Test

- The Design Load was 20kN as UDL
- Crowd Loading in countryside
- 50kN - as 4central point loads was taken with ease
- 30kN line load at 1/3 Span caused partial failure
- Structural performance suggests dominant arching action

New Home in Cheshire

Next we Tried Different Arch Shapes and Tested with different Tensions

Completed May 25th and topping compacted with 15tonne roller

Very attractive from below

This is How Good it can Look

Biggest Span of All 20m

The Future for Vehicles

Conclusions

- This technique is very useful and low cost
- Lateral tensions and moisture contents are of vital importance to structural safety
- Limitations of span will be stability not strength
- SLT Arches act very differently to SLT flat decks
- Shorter laminates can be used
- Foundations can be expensive – trails needed
- There will be many developments
- Structures are sustainable and well fitted to the countryside

Overall Conclusion

- Timber is an excellent material for Recreational Structures
- It is Sustanainable
- It is easily worked
- It is Plentiful
- It is Low Cost
- It belongs in the Countryside