Maximising the potential of Scots Pine falling boards

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Wood processing dissemination meeting

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Alternative uses for board material

- Falling board material often goes to the lower value markets
  - Pallet production
  - Fencing
- When in fact, this material is some of the better quality material in the log, being stronger, stiffer & clearer than most centre material

Scottish Sitka spruce

- Results from laminating C18 falling board material (visually graded)

	Strength (N/mm^2)	**Stiffness (N/mm^2)**	**Density (kg/m^3)**
Actual	23.97	10177	410.7
C24 Strength class (EN 338)	24	11000	420

Four main work tasks

- Define the resource
- Identify two test products and manufacture
- Evaluate demonstration products
- Review results on improving the measured performance

Material requirements

- 168 logs (from 7 locations)
- 200 - 250 mm max top-diameter under bark
- Log length approx 3600 mm

- Board dimensions (19/22 mm x 75/100/125/150 mm)
- 75 mm boards not used

Defining the resource

- Material will be appearance graded according to BS EN 1611-1:2000, Sawn timber - Appearance grading of softwoods – Part 1: European spruces, firs, pines, Douglas fir and larches

- Material graded above will also be compared to BS 4978 (visual strength grading standard)

BS EN 1611-1:2000 grading rules

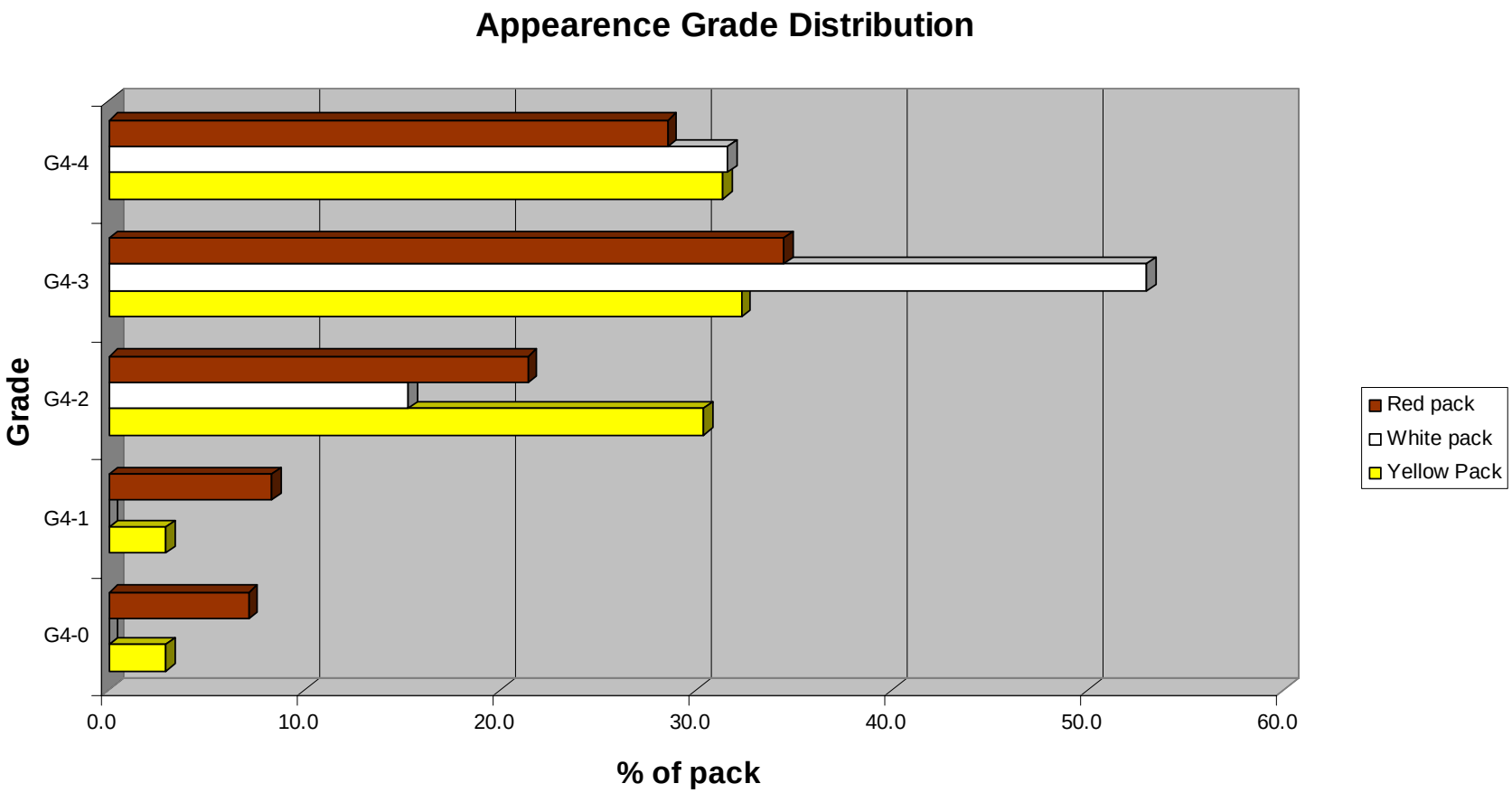
- Five grades
  - G4-0
  - G4-1
  - G4-2
  - G4-3
  - G4-4
- Grade G4-0 being the highest grade (clearer material)
- Grade G4-4 being the lower grade (larger more frequent knots)


G4 - 0
G4 - 1
G4 - 2
G4 - 3
G4 - 4

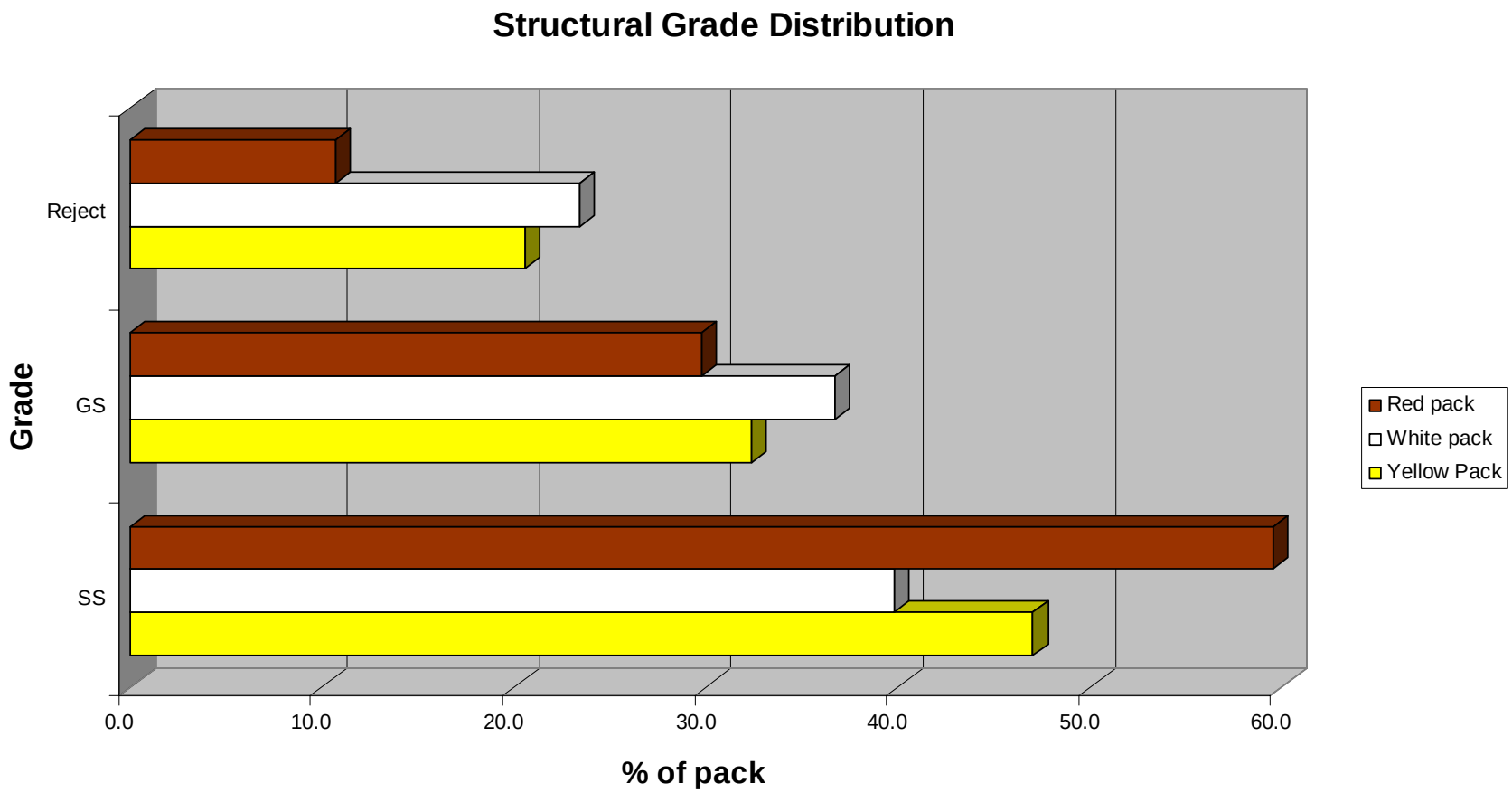
BS 4978: 1996 grading rules

- Two visual strength grades
  - GS (general structural grade)
  - SS (special structural grade)
- These grades equate to a structural grade of:
  - GS – C14
  - SS – C22

Board grades – BS EN 1611-1:2000



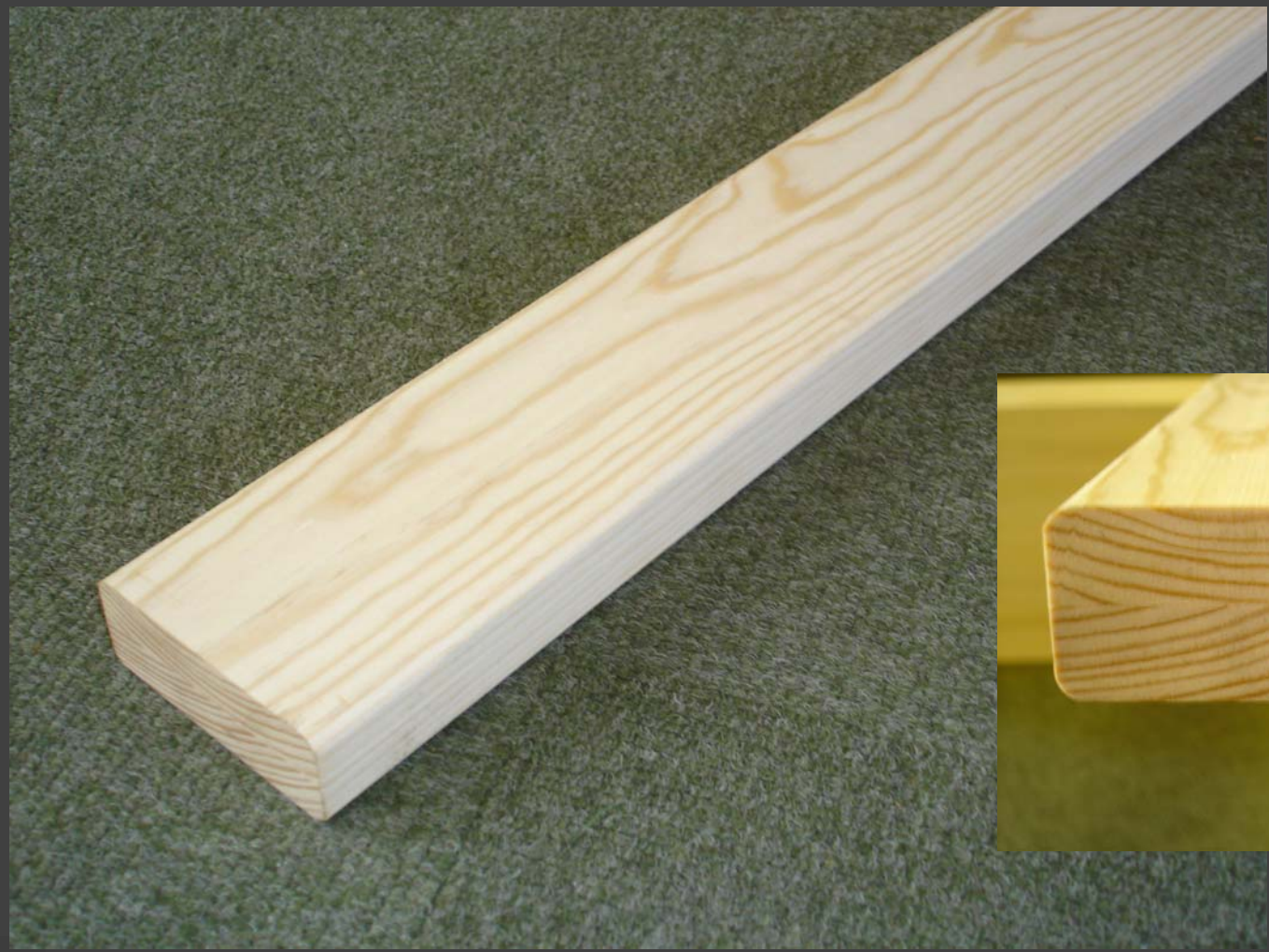
Board grades – BS 4978: 1996



Identify two test product

- Two products
  - A twin laminate re-engineered structural member (C24, TR26, C30 or better)
  - A traditional glulam style beam (100 mm x 200 mm x 4000 mm)

Laminated product examples

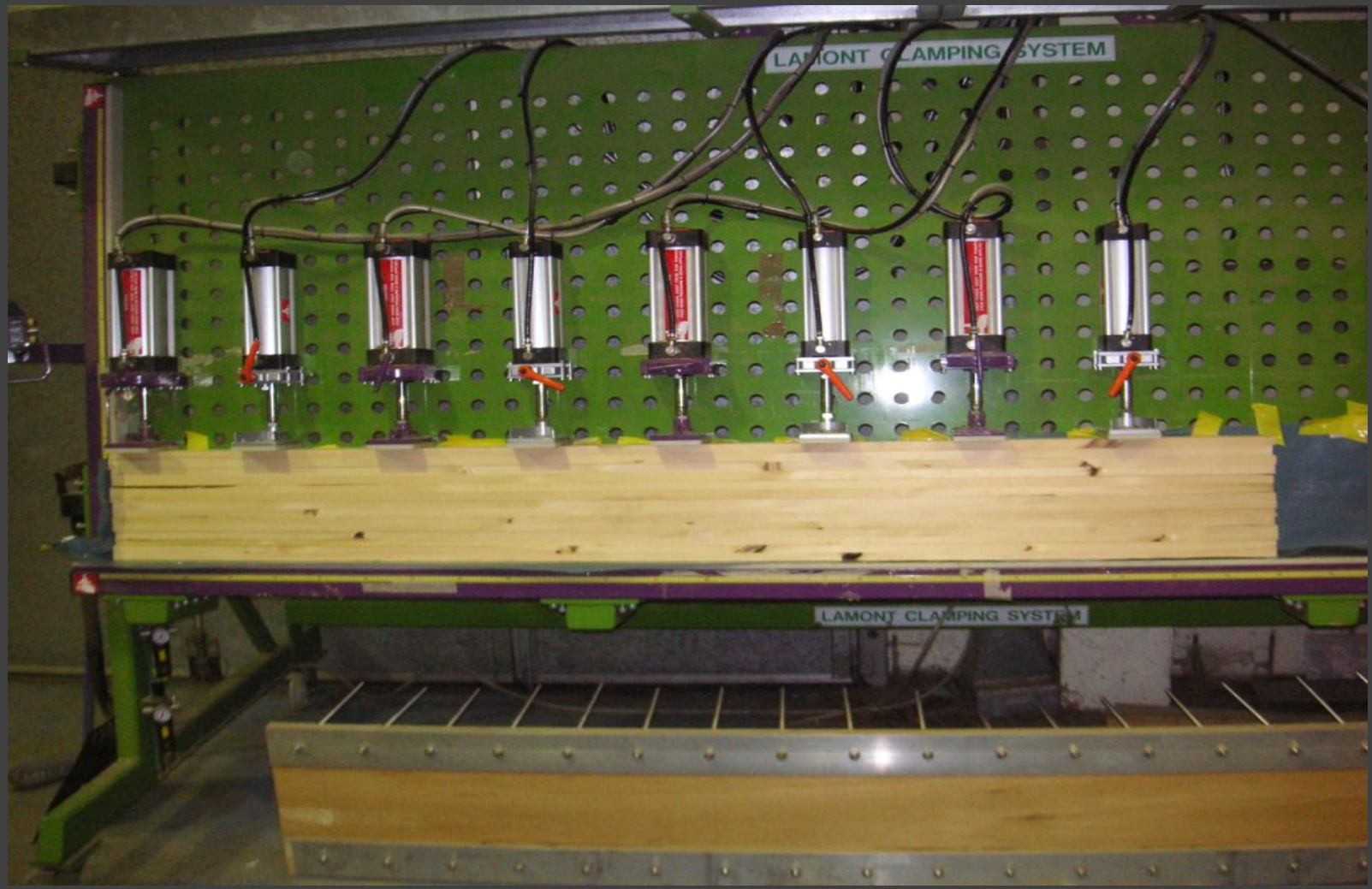


Laminated product examples

Manufacture of test product

- Appearance and structural grades combined
- Boards cut to 2.4 m length
- Some 150/125 boards used
- 1 face planed flat
- Paired boards bonded with Polyurethane adhesive
- Boards installed in press and allowed to cure
- Laminated boards machined to give straight edge

Laminating rig



Evaluation of demonstration products

- Both products will undergo testing according to EN 408 to establish
  - Bending strength
  - Stiffness
  - Density
- Products will be compared to strength classes in EN 338 to demonstrate compliance with the prediction of performance (Glulam product, compared to design methods BS 5268, EN 1194 & Eurocode 5)

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4-point bend test rig

Initial findings

		Strength (N/mm^2)	Stiffness (N/mm^2)	Density (kg/m^3)
GS	C14	14	7000	350
SS	C22	22	10000	410
GS				
SS				

Initial findings

		Strength (N/mm^2)	Stiffness (N/mm^2)	Density (kg/m^3)
GS	C14	14	7000	350
SS	C22	22	10000	410
GS		32.2	11767	511.5
SS		48.2	13963	562.1

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Initial findings

		Strength (N/mm^2)	Stiffness (N/mm^2)	Density (kg/m^3)
GS	C14	14	7000	350
SS	C22	22	10000	410
GS	C24/ TR26	32.2	11767	511.5
SS	C40	48.2	13963	562.1

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Remaining tasks

- Continue testing of twin laminate members
- Characterisation of single boards
- Manufacture and testing of traditional glulam style beams
- Review of results