


Timber floor systems

An overview of the construction and finishing options


Greg Nolan

*Centre for Sustainable Architecture with Wood,
School of Architecture and Design,
University of Tasmania*


Learning Objectives




- Participants completing this activity will be able to:
 - Understand how configurations of timber floors can meet specific performance criteria.
 - Identify systems appropriate for particular applications.
- For architects - AACA Competencies:
 - Design
 - Documentation



This presentation




- Surface material selection
 - Sheet material
 - Conventional strip flooring
 - Parquetry and other systems
- Structural substrate
- Flooring insulation
- Flooring heating
- Flooring acoustic control
- Advanced systems





Williamstown High School

Timber flooring options



Floors are now complex timber elements.

Solid timber makes a beautiful floor

Appearance layer

Structural / substrate layer


Heating layer

Insulation layer

Acoustic separation layer

Timber floor systems options

Material selection



The species and appearance grade are key selections for every project.


Use quality boards & products



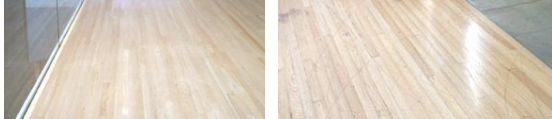
- AS 2796 - Timber Hardwood Sawn and Milled Products sets out the main requirements.
- Moisture content anywhere in a piece must generally be between 9-14%
 - Boards are generally manufactured to about 10-12%.

Timber floor systems options


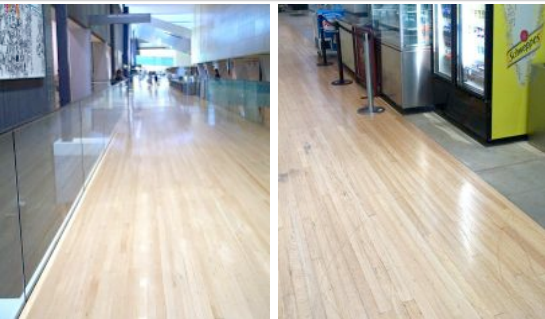
The relationship of use to hardness



Traffic level	Persons/day	Preferred average density	Acceptable average density
Heavy	> 2000	700 kg/m ³	650 kg/m ³
Normal	< 2000	650 kg/m ³	560 kg/m ³
Light	Residential	560 kg/m ³	Not less than 450 kg/m ³




Timber floor systems options



Timber floor systems options

Readily available species



Species	Colour	Density kg/m ³	Hardness
Spotted gum	Brown, dark brown, light sapwood	950	Very hard
Brushbox	Mid brown even colour	900	Hard
Blackbutt	Pale straw to light brown	900	Hard
Mixed Qld. species	A mix of the above or selected reds / whites	800-1000	Moderately to very hard
Jarrah	Dark red brown	820	Hard
Tas. Oak - Vic. Ash	Pale straw to light brown, pink	780-650	Moderately hard
Cypress	Pale straw sapwood, dark brown heartwood	680	Moderately hard
Hoop pine	White to straw	530	Soft
Pinus	Straw	500	Soft - firm

Timber floor systems options


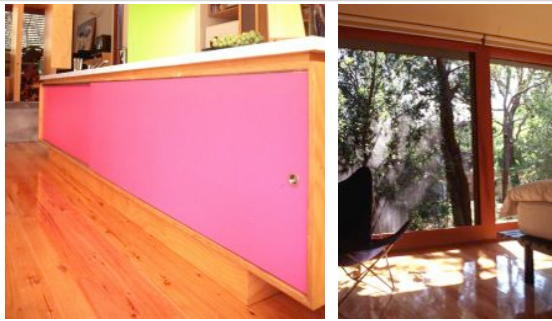



Grade description


- **Select:** Straight & even grain with uniform texture
- **Medium Feature - Standard:** Increased feature providing a surface with distinct natural appeal
- **High Feature:** Most distinct with a rich, lively & vibrant surface

Timber floor systems options

Using feature to advantage





Timber floor systems options

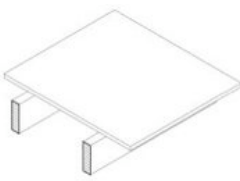
 Wood Solutions
design and build
woodsolutions.com.au

System options – sheet boards

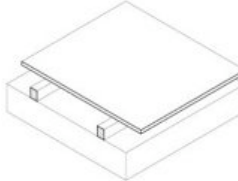
Plywood and particle boards floors
and substrate

 Wood Solutions
design and build
woodsolutions.com.au

Board as the finished surface.




Board on joists




Board on battens


Timber floor systems options

 Wood Solutions
design and build
woodsolutions.com.au

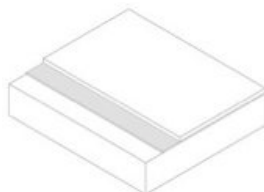
Board on joists



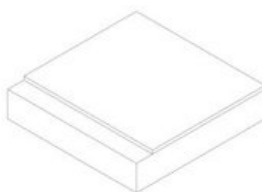
Timber floor systems options

 Wood Solutions
design and build
woodsolutions.com.au

Board




Board on acoustic underlay




Board direct stick or nail to concrete

Timber floor systems options

 Wood Solutions
design and build
woodsolutions.com.au


Plywood & battens



Commercial multi-layer plywood substrate on resilient mat


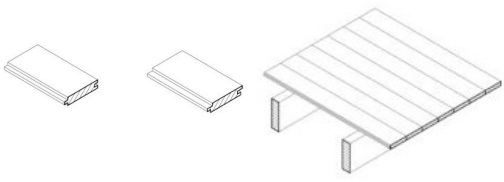
- Plywood should be laid in a brick bond pattern, glued and fixed to EWPA instructions.
- Battens are not structural members and should be continuously supported
- Minimum batten size is 65 x 19 mm glued continuously and have fixings at 600 mm centres.

Timber floor systems options

 Wood Solutions
design and build
woodsolutions.com.au

System options – strip

Conventional strip flooring


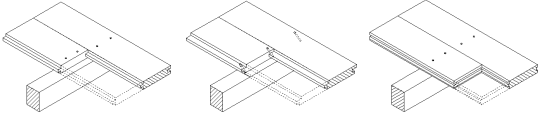



Standard and secret nail profiles

Strip flooring on joists

Timber floor systems options

Conventional strip flooring


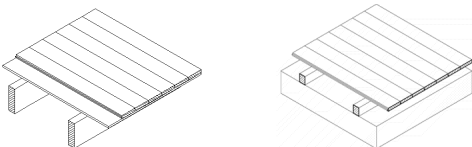



Surface or face nailing Secret nailing End matched

- Generally 19 mm deep board laid over joists or battens
- The boards are tongue and groove, profiled for surface nailing, secret nailing, end matching
- As they form a structural component, their installation is controlled in AS 1684

Timber floor systems options

Overlay tongue & groove flooring

Direct fix to ply or chipboard


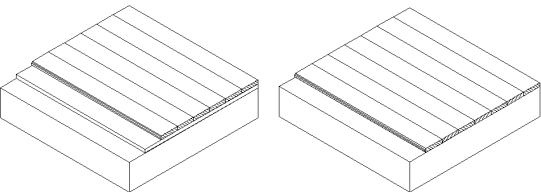
Battens on concrete

12, 15 or 19 mm thick board:

- Nail & glued to chipboard or plywood;
- Nail & glued to plywood underlay over concrete;
- Nail & glued to battens over concrete; or
- Glued to concrete.

Timber floor systems options

Overlay tongue & groove floors






Fixed to ply on concrete

Direct fixed to concrete


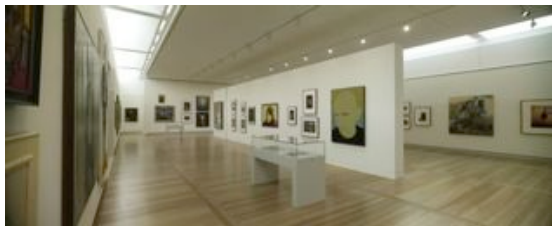
Timber floor systems options

National portrait gallery

Timber floor systems options

National portrait gallery

Timber floor systems options

Wood Solutions
design and build
woodsolutions.com.au

Floating overlay on resilient mat Sports floor with battens and resilient mounts

Timber floor systems options

Wood Solutions
design and build
woodsolutions.com.au

Resilient mounts

Labels in diagram:
- 20mm Polystyrene WATERPOOF MEMBRANE
- 40mm x 20mm TRG CRIP FLOORING
- 20mm x 20mm Transmission Hardwood BATTENS on site
- 40mm x 40mm x 12mm (min) BRICK PEGS

Timber floor systems options

Wood Solutions
design and build
woodsolutions.com.au

Sprung floors

Sprung sports or dance floor

Timber floor systems options

Wood Solutions
design and build
woodsolutions.com.au

System options – parquetry & other options

Wood Solutions
design and build
woodsolutions.com.au

Parquetry on a substrate

Block parquetry Finger parquetry

Timber floor systems options

Wood Solutions
design and build
woodsolutions.com.au

Herringbone block parquetry


Timber floor systems options

Herringbone block parquetry




Timber floor systems options


Structural substrate




Range of systems in Seminar 2





Systems - insulation




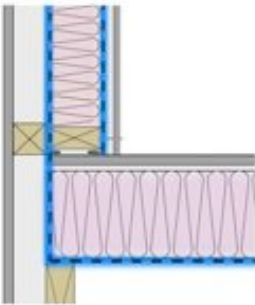
Insulating the floor



- Floor insulation is required in all climate zones.
 - System R2.75 in Climate Zone 7.
- Insulation products include:
 - Bulk insulation
 - EPS
 - Foil systems
 - Combination systems



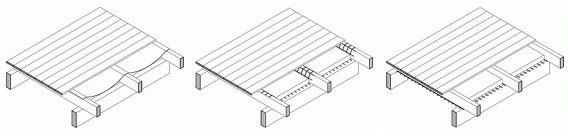

Insulation and infiltration control

Thorough design for thermal performance needs:

- Infiltration control systems to seals the subfloor space.
- Complete insulation cover.

Insulation as part of the system



Moisture permeable foil

Bulk insulation on mesh

Different approaches are needed for:

- Cut-in strip flooring
- Sheet flooring

Timber floor systems options

Insulation in the support structure



Timber floor systems options

Bulk insulation in a renovation





Timber floor systems options

Spray-in foam insulation



Timber floor systems options

Foil system between battens



Timber floor systems options

Foil system between battens



Timber floor systems options

Wood Solutions™
design and build
woodsolutions.com.au

Systems - heating

Wood Solutions™
design and build
woodsolutions.com.au

Floor heating - hydronic



Timber floor systems options

Wood Solutions™
design and build
woodsolutions.com.au

Floor heating - radiant



Timber floor systems options

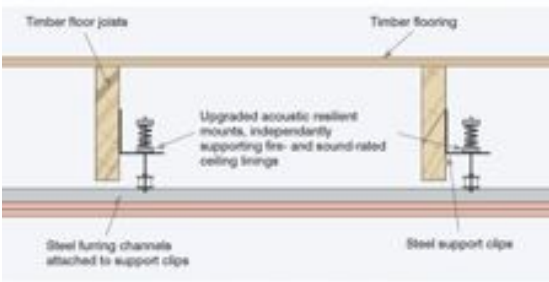
Wood Solutions™
design and build
woodsolutions.com.au

Systems - acoustic

Combinations of vibration control and added mass.

Wood Solutions™
design and build
woodsolutions.com.au

Wood solution guide



Upgraded sound-resilient ceiling mounts - elevation view.

Timber floor systems options

Wood Solutions™
design and build
woodsolutions.com.au

Wood solution guide

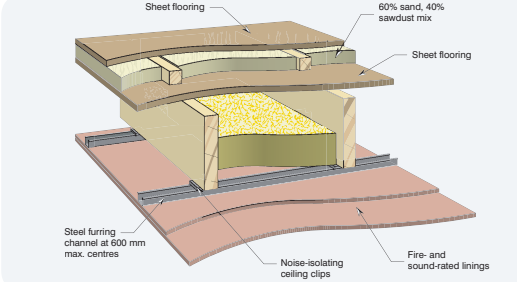


Figure 23: Adding mass to floor system through the use of sand top layer.

Wood solution guide

Figure 24: Acoustic isolating pad to reduce flanking noise.

Timber floor systems options

Wood solution guide

Figure 25: Adding mass to floor system through the use of additional floor sheets.

Timber floor systems options

Advanced timber floor arrangements

Component	Thickness	Weight
1 Particleboard, 120 kg/m ³	25 mm	kg/m ²
2 2 Nap impact sound insulation fleece	6 mm	kg
3 Timber sheathing	21 mm	kg/m ²
4 Timber joists	140x200 mm	kg/m ²
5 Mineral fibreboard, 30-70 kg/m ³	80 mm	kg/m ²
6 Battens fixed with spring clips	30 mm	kg/m ²
7 Particleboard	18 mm	kg/m ²

dB reduction 56

Component	Thickness	Weight
1 Cement screed, 120 kg/m ³	30, 40 mm	kg/m ²
2 Damp-proof membrane	-	kg/m ²
3 Mineral fibreboard, 80-110 kg/m ³	15 mm	kg/m ²
4 Timber sheathing	21 mm	kg/m ²
5 Timber joists	140x200 mm	kg/m ²
6 Mineral fibreboard, 30-70 kg/m ³	80 mm	kg/m ²
7 Battens fixed with spring clips	30 mm	kg/m ²
8 Particleboard	18 mm	kg/m ²

dB reduction 60

Timber floor systems options

Advanced timber floor arrangements

Component	Thickness	Weight
1 Particleboard, 120 kg/m ³	25 mm	kg/m ²
2 Mineral fibreboard, 80-110 kg/m ³	15 mm	kg/m ²
3 Concrete flags, 120 kg/m ³ , 500 x 500 mm	50 mm	kg/m ²
4 Impact sound insulation fleece	3 mm	kg/m ²
5 Timber sheathing	21 mm	kg/m ²
6 Timber joists	140x200 mm	kg/m ²
7 Mineral fibreboard, 30-70 kg/m ³	80 mm	kg/m ²
8 Battens fixed with spring clips	30 mm	kg/m ²
9 18 kg gypsum fibreboard	12 mm	kg/m ²

dB reduction 64

Component	Thickness	Weight
1 Particleboard, 120 kg/m ³	25 mm	kg/m ²
2 Mineral fibreboard, 80-110 kg/m ³	15 mm	kg/m ²
3 Concrete flags, 120 kg/m ³ , 500 x 500 mm	50 mm	kg/m ²
4 Impact sound insulation fleece	3 mm	kg/m ²
5 Timber sheathing	21 mm	kg/m ²
6 Timber joists	140x200 mm	kg/m ²
7 Mineral fibreboard, 30-70 kg/m ³	80 mm	kg/m ²
8 Battens fixed with spring clips	30 mm	kg/m ²
9 Dried laminated fibreboard	12 mm	kg/m ²

dB reduction 62


Timber floor systems options

Concrete composites

Timber floor systems options

Timber floor systems options

Summary



- There are various options for the surface, structure and inclusion in a timber floor systems.
- Informed material selection is critical for performance over time.
- Solid timber surface options can be installed structurally or as an overlay.
- Configurations of timber floors are available to meet specific performance criteria.
- Requirements for insulation, heating and sound separation are increasing the complexity of floor systems.
- Advance options do exist and can be used.

Timber floor systems options

More Information






02

Timber-framed Construction for Multi-residential Buildings Class 2, 3 & 9c
 Design and construction guide for BCA compliant sound and fire-rated construction

Questions?



Greg Nolan

*Centre for Sustainable Architecture with Wood,
 School of Architecture and Design,
 University of Tasmania*

