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

Timber flooring options

Floors are now complex timber elements.

Solid timber makes a beautiful floor

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%.

The relationship of use to hardness

<table>
<thead>
<tr>
<th>Traffic level</th>
<th>Persons/day</th>
<th>Preferred average density</th>
<th>Acceptable average density</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heavy</td>
<td>&gt; 2000</td>
<td>700 kg/m³</td>
<td>650 kg/m³</td>
</tr>
<tr>
<td>Normal</td>
<td>&lt; 2000</td>
<td>650 kg/m³</td>
<td>560 kg/m³</td>
</tr>
<tr>
<td>Light</td>
<td>Residential</td>
<td>560 kg/m³</td>
<td>Not less than 450 kg/m³</td>
</tr>
</tbody>
</table>

Readily available species

<table>
<thead>
<tr>
<th>Species</th>
<th>Colour</th>
<th>Density kg/m³</th>
<th>Hardness</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spotted gum</td>
<td>Brown, dark brown, light sapwood</td>
<td>950</td>
<td>Very hard</td>
</tr>
<tr>
<td>Brushbox</td>
<td>Mid brown even colour</td>
<td>900</td>
<td>Hard</td>
</tr>
<tr>
<td>Blackbutt</td>
<td>Pale straw to light brown</td>
<td>900</td>
<td>Hard</td>
</tr>
<tr>
<td>Mixed Old species</td>
<td>A mix of the above or selected reds / whites</td>
<td>800-1000</td>
<td>Moderately to very hard</td>
</tr>
<tr>
<td>Jarrah</td>
<td>Dark red brown</td>
<td>820</td>
<td>Hard</td>
</tr>
<tr>
<td>Tas. Oak - Vic. Ash</td>
<td>Pale straw to light brown, pink</td>
<td>780-850</td>
<td>Moderately hard</td>
</tr>
<tr>
<td>Cypress</td>
<td>Pale straw sapwood, dark brown heartwood</td>
<td>680</td>
<td>Moderately hard</td>
</tr>
<tr>
<td>Hoop pine</td>
<td>White to straw</td>
<td>530</td>
<td>Soft</td>
</tr>
<tr>
<td>Pines</td>
<td>Straw</td>
<td>500</td>
<td>Soft - firm</td>
</tr>
</tbody>
</table>

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

Using feature to advantage
System options – sheet boards

Plywood and particle boards floors and substrate

Board on joists

Board on battens

Board

Board on acoustic underlay

Board direct stick or nail to concrete

Plywood & battens

- Plywood should be laid in a brick bond pattern, glued and fixed to EWPAQ 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.

System options – strip
Conventional strip flooring

- Standard and secret nail profiles
- Strip flooring on joists

Overlay tongue & groove flooring

- Direct fix to ply or chipboard
- Batts 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.

National portrait gallery

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:

- Resilient mounts

- Sprung floors

- Parquetry on a substrate

- Herringbone block parquetry

- Floating overlay on resilient mat

- Sports floor with battens and resilient mounts

- Sprung sports or dance floor

- System options – parquetry & other options

- Block parquetry

- Finger parquetry
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 seal the subfloor space.
- Complete insulation cover.
Different approaches are needed for:

- Cut-in strip flooring
- Sheet flooring
Concrete topping. This increases the sound performance of the floor system, and typically can be achieved with a 35 to 45 mm thick layer of concrete placed over an isolating acoustic mat. Care is required to turn-up the isolating acoustic mat at the perimeter of the topping adjacent to the wall, otherwise the effect of the topping is negated (Figure 24).

Figure 24: Adding mass to floor system through the use of concrete topping.

Few SOU residents would suspect sand in their timber floors.
Extra sheet flooring. This method utilises standard sheet flooring on an isolating mat. This system does not perform as well as the higher mass products, sand or concrete (Figure 25).

Acoustic-isolating mat
2 x 20 mm layers of sheet flooring
Sheet flooring
Noise-isolating ceiling clip
Steel furring channel at 600 mm max. centres
Fire- and sound-rated linings

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

Separate floor and ceiling frame.
By having two sets of joists (separate floor and ceiling joists) which are nested between but not touching each other, it is possible to isolate the two structures, thereby minimising the transference of impact sound through the structure. Even so, care must be taken with this approach to prevent flanking noise running along the floor joists and into the walls below. This can be improved by sitting the ceiling joists onto strips of isolating mat (Figure 26).

Fire- and sound-rated linings
Sound-rated insulation
Timber floor joists
Independently supported timber ceiling joists

Figure 26: Separate ceiling and floor joist structures.

Isolated support for stairs.
Impact sound from stair usage typically vibrates its way into walls dividing SOUs, thus creating a greater likelihood of sound passing across the walls and into adjacent SOUs. The best way to prevent this is by isolating the support for the stair structure. Options include:
• Using the stringers to support the stairs (top and bottom) rather than the wall between dwellings (Figure 27).
• Using newell posts to support the stair structure rather than the wall between dwellings.

Stringers are an elegant way to isolate stairs from dividing walls (see next page).

Advanced timber floor arrangements

dB reduction 56
dB reduction 60

Advanced timber floor arrangements

dB reduction 64
dB reduction 62

Concrete composites

Timber Floor systems options

Concrete 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.

More Information

Questions?

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