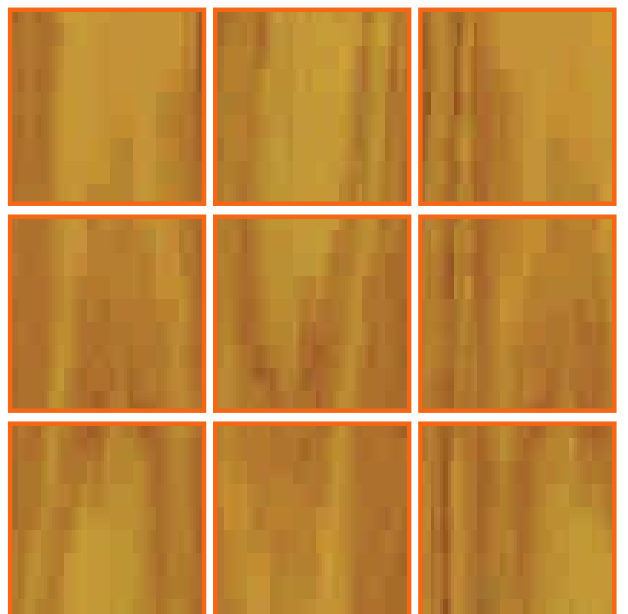


Timber Flooring

GOOD INDUSTRY PRACTICES



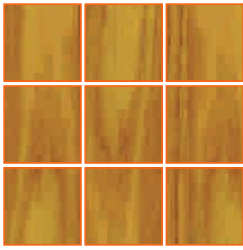
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Foreword

The Building and Construction Authority (BCA) has been promoting the use of Construction Quality Assessment System or CONQUAS 21 as the de facto national yardstick for measuring the workmanship quality of building projects. To meet the rising expectation of the homeowners, the Quality Mark (QM) Scheme was launched in July 2002 to promote a higher consistency in workmanship standards for residential developments.

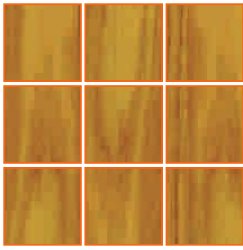
Besides setting standards and assessing the level of workmanship through CONQUAS 21 and QM Schemes, BCA is developing a series of publications called the CONQUAS 21 Good Industry Practices Guides to share with the industry good work practices adopted by practitioners and contractors who consistently deliver high quality work.

This “Good Industry Practices – Timber Flooring” is part of the CONQUAS 21 Enhancement Series on Good Industry Practices. Timber flooring is widely used in building work. This guide provides simple and practical tips to users on how good quality timber flooring can be achieved on site. Common complaints associated with timber flooring and their causes are highlighted. Charts, photographs, graphical representations and tables are used extensively in the guide to provide easy reference and better illustration of the practices.

It should, however, be pointed out that this guide is not meant to dictate how timber flooring must be designed and installed. It only serves to illustrate some of the good practices designers and contractors have adopted while designing and installing timber flooring. We gratefully acknowledge the contributions of these practitioners and trust that the industry will find this publication useful in its pursuit of quality excellence.

Lam Siew Wah
Deputy Chief Executive Officer
Industry Development
Building and Construction Authority





Acknowledgement

“Good Industry Practices – Timber Flooring” was developed with inputs from architects, main contractors, timber flooring suppliers/installers and members from the various professional associations.

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Singapore Contractors Association Ltd
V + Sim Consultants
Cheap & Beauty Teak Parquet Pte Ltd
Mapei Far East Pte Ltd

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1. Introduction

Timber flooring is popular for its warm sense of touch and variety of styles and patterns. It is important to note that timber flooring is a system which comprises the substrate, plywood sub-base (if applicable), timber strips/parquets/blocks, adhesive (and/or nails) and expansion gaps. All components are equally important and closely related to one another. Adequate compatibility must exist among these components as they could only function collectively. The system could only be as strong as the weakest component, if not worse.

Therefore, design, material selection, preparatory works, installation, protection and maintenance must take into consideration the performance characteristics of each individual component as well as the in-situ environmental conditions that prevail during the installation process. This guide adopts the quality standards set out in CONQUAS 21 and includes the CONQUAS quality assessments criteria in the recommended inspection checklists.

Due to volume constraint, this guide focuses on the installation of timber strips and parquet flooring for residential projects.

2. Design

There is a wide range of timber flooring, adhesives and finishing coats available in the market. This guide book focuses only on those commonly used systems and products.

2.1. COMMON TYPES OF TIMBER FLOORING SYSTEMS

There are various timber flooring systems available in the market, including timber strip flooring, parquet flooring and wood block flooring. Table 2.1 shows the various types of timber flooring systems and installation methods commonly used in residential projects.

Table 2.1 Types of Timber Flooring Systems and Installation Methods

1. **Types of Timber Flooring Systems**
 - 1.1. **Parquet Flooring**
 - Parquet flooring is made up of strips of proprietary products, in varying lengths depending on the layout design, for direct installation on the floor screed.
 - Appendix A shows the common types of design and layout patterns for parquet flooring.
 - 1.2. **Timber Strip Flooring**
 - Timber strips usually come with tongue-and-groove joints. The dimensions of these strips vary, depending on the type of timber used and the manufacturer's specifications.
 - Timber strips are usually laid on plywood sub-base with adhesive and secret nails.

introduction/ design

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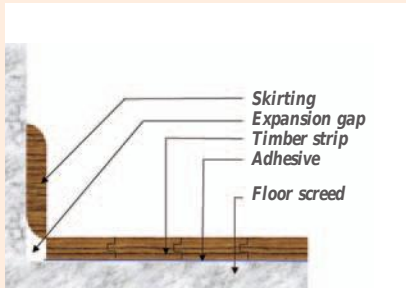
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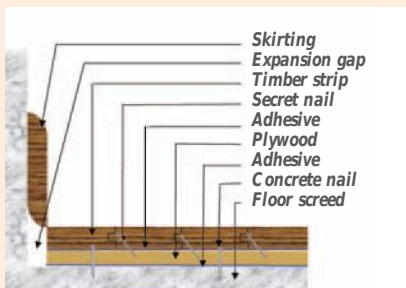
2. Methods of Installation

2.1. Direct Installation Method



- For direct installation method, it is important that the floor screed is relatively flat to give an even bedding surface for the adhesive to ensure evenness of the timber finishes. The floor screed should be laid within the tolerance of $\pm 3\text{mm}$ per 2m length.
- If the evenness of the floor screed is not within the required tolerance, a self leveling screed could be applied to the surface to achieve the required levelness.

2.2. Plywood Sub-base Method



- Plywood is used as sub-base over floor screed to accommodate slight unevenness of the screed and provide a smooth surface to receive the timber flooring. However, this should not be used as the solution to correct the levelness of the floor screed. Proper supervision and good workmanship are critical and should be employed to achieve the required levelness of the floor screed.
- It is advisable to use WBP Preservative treated plywood.
- The plywood should be adhered to the floor screed using a suitable adhesive and nailed down to the screed using concrete nails. Care should be taken not to damage any embedded M&E services where applicable. It is not advisable to nail the plywood without using adhesive. The adhesive helps to hold the plywood in-place and minimise hollow sound resulted from uneven floor screed and voids left between the plywood and screed.

2.2. APPLICATION OF DAMP PROOF MEMBRANE

To keep the timber flooring within acceptable moisture content limit, timber flooring installed on concrete floors which are in contact with the ground should

be provided with a damp proof membrane. It is important to note that the adhesive used for the installation of timber flooring is not meant to serve as a damp proof membrane. Its sole function is to bond the timber flooring to the concrete base.

2.3. TIMBER

Timber is generally produced from two classes of trees, namely the softwoods and the hardwoods. The classification of softwoods and hardwoods is botanical and may be misleading as some of the softwoods may exceed most hardwoods in hardness.

Timber species can generally be identified by their trade names. The timber species commonly used for timber flooring are shown in Appendix A.

When selecting timber flooring, besides considering the styles and colour options, the designer should ensure that the selected timber species are able to meet the project specifications. Table 2.2 provides some guidance on the selection of timber species for flooring.

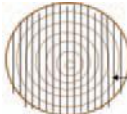
Table 2.2 Selection of Timber Species

Selection Criteria	Properties / Characteristics Requirements
1. Timber Appearance	As a natural material, timber is expected to have variations in grain and colour. If more uniform tonality is required, prior agreement between the designer and supplier should be arranged. 
2. Moisture Content and Dimensional Stability	- It is important to know the behaviour of timber species in relation to moisture. - Timber absorbs moisture from the atmosphere. Changes in relative humidity of the atmosphere, for example, due to intermittent air-conditioning in building, can cause dimensional changes in timber flooring. Sufficient provision at the perimeters should be made to accommodate expansion of the flooring. - Different timber species exhibit different moisture stability but they generally shrink and swell more in the direction of the annual growth rings (tangentially) and only slightly along the grain (longitudinally). Hence, plain-sawn timber tends to shrink and swell more in width than quarter-sawn timber*. - Timber should be kiln dried and the moisture content requirements should comply with the requirements specified in SS CP1. - Unless otherwise specified, dimension variation of the timber shall comply with the SS CP1. The permissible variation should be as follows: - Width : $\pm 0.75\text{mm}$ - Thickness : $\pm 0.40\text{mm}$
3. Wear Resistance	- Wear resistance depends on the species of timber. Janka hardness is commonly used to indicate the resistance of timber to wear, denting and marring. Appendix A shows the hardness rating of the commonly used timber species. - The pattern of sawing can also affect the wear resistance. Quarter-sawn flooring has better wear resistance than plain-sawn flooring. - Application of suitable surface finishing, especially those based on polyurethanes, can help to slow down the rate of wear of timber flooring.
4. Slip Resistance	- Slip resistance of timber flooring is generally acceptable when the surface is dry. The coefficients of friction are: - dry surface : > 0.5 - wet surface : $0.2 - 0.4$ - Slip resistance of timber flooring can be poor if the surface is wax polished. - On stair treads, a slip resistant nosing should be used.



Selection Criteria	Properties / Characteristics Requirements
5. Sanding	Some timber species are highly resinous and tend to clog sandpaper. When working on such species, it may be necessary to use sandpaper of a coarser grit.
6. Finishing	- The correct finishing should protect the timber flooring from wear, dirt and moisture while give the timber an attractive colour and sheen. - Some timber species contain oil and chemical compounds that may adversely react with certain types of finishes to inhibit drying and/or dramatically change the colour of the timber.

* Types of Saw Cut

Plain-sawn	Plain-sawn is the most common type of saw cut for timber. The strips contain more variations than those produced using the other two cutting methods below because grain patterns resulted from the growth rings are more obvious.	
Quarter-sawn	Quarter-sawn produces less strips per log than plain-sawn and is therefore more expensive. Quarter-sawn wood tend to twist and cup less and wear more evenly.	
Rift-sawn	Rift-sawn is similar to quarter-sawn, except the cut is made at a slightly different angle.	

2.4. ADHESIVES

There are many types of adhesives available in the market. Common types of adhesives used in timber flooring are based on polyvinyl acetate (PVA), polyurethane (PU), epoxy, acrylic, etc. It is important

to note that the performance of products belonging to the same types of adhesives could defer significantly. If in doubt, manufacturer's advice should be sought.

Table 2.3 provides some guidance on the selection of adhesives.

Table 2.3 Selection of Adhesives

Selection Criteria	Requirements
1. Type of Timber Species	- The adhesives must be compatible with the timber species used. - To verify suitability of adhesives with the manufacturer.
2. Type of Substrate	- The types and characteristics of substrate can affect the adhesives selection. - To verify suitability of adhesives with the manufacturer.
3. Application Properties of Adhesives	To refer to manufacturers' recommendations on any requirements on open time (maximum time interval after application during which timber strips can be embedded in the applied adhesive and achieve the specified adhesion strength), pot life and time before sanding of adhesives.
4. Final Properties of Adhesives	Elasticity and adhesive strength of the adhesives should be considered to allow the flooring to resist moisture movement of timber and thermal expansion of substrates.

2.5. FINISHING COATS

The finishing coat provides a protective layer and a colour (if desired) to the timber flooring. It seals the timber flooring against moisture and foreign materials such as dirt. Table 2.4 shows the four main types of finishing coats for timber flooring.

Table 2.4 Types of Finishing Coats for Timber Flooring

Types of Finishing Coats	Descriptions
1. Oil-Modified Urethane	– This is a solvent-based polyurethane that dries in about eight hours. – It is durable, with moisture resistance and easy to apply. – It tends to amber with age
2. Moisture-Cured Urethane	– This is a solvent-based polyurethane that is harder and has higher moisture resistance than other coatings. – It is very difficult to apply and has a strong odor.
3. Water-Based Urethane	– This is a water-based urethane that dries through water evaporation. It dries in about two to three hours. – It gives a clear and non-yellowing finishing. – It has a milder odor than oil-modified coating.
4. Conversion Varnish / Acid-Cured Urethane	– It dries and gives a clear to slight amber colour. – It is very difficult to apply and has a strong odor.

2.6. PROVISION FOR MOVEMENT

Timber flooring is subjected to dimensional movement as its moisture content changes. Provision should be made to accommodate this movement without disrupting the flooring (see Figure 2.1).

For parquet and timber strip flooring, movement can be accommodated by providing an unfilled expansion gap of 6-8mm width at the perimeters of room. This expansion gap should be kept clear of debris and should be covered with skirting boards. For plywood sub-base, the joints between the sheets of plywood should be staggered.



Expansion gap at the perimeter of room



Layout of plywood sub-base in a staggered manner

Figure 2.1 Provision for accommodation of movement

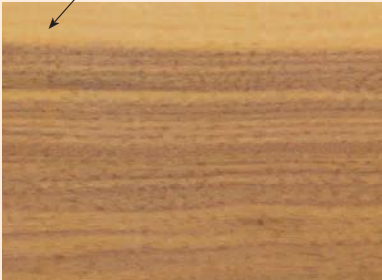


3. Delivery, Handling And Storage

3.1. TIMBER

Table 3.1 lists the good practices in delivery, handling and storage of timber on site. Site supervisory personnel and installers should adopt these practices to ensure that the timber is in good condition before installation.

Table 3.1 Good Practices in Delivery, Handling and Storage of Timber

Items	Good Practices
1. Delivery	- Quality of timber delivered should be similar to that of the approved sample. - To confirm the country of origin of the timber delivered by verifying the shipping documents furnished by the supplier. - Timber delivered should have a moisture content of 10-14% for use in an air-conditioned building and 14-15% for a non air-conditioned building. The moisture content of timber could be measured with, for example, Protimeter. - Dimensional variations of timber should be within the following permissible variations: - Width : $\pm 0.75\text{mm}$ - Thickness : $\pm 0.40\text{mm}$  - Visible surfaces of timber should be free from sap (unless otherwise specified by designer), shakes, waney edges, unsound knots, spongy or brittle heart and any other defects.  Timber with Sap  Timber with Knots - For plywood, type and thickness of plywood should be verified. 

delivery, handling and storage

Items	Good Practices
2. Handling	– Timber should be unloaded in good weather. Never transport or unload timber flooring in the rain. – Where possible, the timber should be delivered directly to the rooms where it will be installed. 
3. Storage	– Timber should be stored in an enclosed building space that is well ventilated. – Storage area should be clean and dry. – Timber should be stacked on pallet to maintain its flatness. There should be adequate room space for good air circulation around stacks of timber. – For kiln dried timber, packaging of timber should only be removed before installation. For air dried timber, if site condition allows, remove the packaging of timber in the environment where it will be installed to allow for proper acclimation of the timber for at least two weeks. 

3.2. ADHESIVES AND FINISHING COATS

Table 3.2 lists the good practices in the delivery and storage of adhesives and finishing coats.

Table 3.2 Good Practices in Delivery and Storage of Adhesives and Finishing Coats

Items	Good Practices
1. Delivery	Adhesives and finishing coats should be delivered in original containers. Seals and labels should be kept intact until time of use. 
2. Storage	- The storage area should be clean and dry to maintain the temperature range within appropriate levels recommended by the manufacturers. - Adhesives and finishing coats should be prevented from damage or contamination by water, moisture, excessive heat or foreign materials. 

4. Preparatory Works

To achieve quality timber flooring, the following preparatory works should be carried out before laying the flooring. Supervisory personnel must ensure that these steps are properly carried out.

Preparatory Works	Remarks
1. Preparation of Concrete Slab	
1.1. Concrete substrate should be cured for at least 28 days.	– This time duration is necessary for the concrete to cure and realise most of its shrinkage
1.2. The substrate should be sound and stable, and free from any loose substances (e.g. dust, debris or loosely bonded topping) and deleterious substances (e.g. oil and grease).	– These imperfections of substrate may reduce the adhesion of the screed.
	
1.3. The surface of the concrete substrate should have a roughened texture	– The roughened texture forms mechanical key to enhance adhesion of the screed.
	
1.4. Check the alignment and evenness of wall and slab. Any misalignment and unevenness should be rectified before laying of screed.	– Misalignment and unevenness of the wall and slab will, in turn, cause misalignment in timber strips and/or skirting which may be costly to rectify.
1.5. Clean the concrete surface with a broom and wash it using water jet.	
	

2.1. Establish common reference line (usually marked on the wall at 1m) to determine the correct level for the flooring to be laid.



- This is to prevent any mismatch in levels, for example between timber flooring in bedrooms and ceramic /marble/granite flooring in living room.
- The finished level of floor screed for timber flooring should be controlled so that the timber strip could be laid at least 1-2mm higher than the divider strip.

-

- These pegs help to control the thickness and level of the floor screed.

-

- Floor screed should be applied before the slurry coat loses its tackiness.
- To achieve a good and consistent mortar mix, pre-packed mortar is preferred over the conventional cement and sand mortar mix.

-

- The screed mortar is preferred to be polymer latex fortified.
- For floor screed of thickness more than 50mm, a non-oxidising metal-mesh should be placed in the middle as reinforcement.
- Steel trowel float is recommended to achieve the required smoothness of the floor screed.



Preparatory Works	Remarks
2.5. Screed to be air-cured for at least 14 days.	- Spraying of water mist with a hand pump during the first 3 days of curing is a good quality-enhancing practice.
2.6. Check the soundness of the screed using a metal rod. 	- Cracks and hollowness, if any, should be properly rectified.
2.7. Check the levelness of floor screed. The levelness of the screed should be within the tolerance of $\pm 3\text{mm}$ per 2m length. 	- Gaps may be seen at the base of skirting if the timber flooring is laid on screed surface that exceeds the allowable tolerance. - If evenness of the screed is not within the required tolerance, a self leveling mortar should be used. Prime the screed with a suitable primer, then follow the manufacturer's instruction to apply the mortar.
2.8. Check level of finished floor screed by using sample piece of timber strip installed in accordance with the selected flooring system. 	- This is to prevent any mismatch in level between adjoining areas such as living room and bedroom. For timber flooring with plywood sub-base system, it is important to ensure the finished floor level take into consideration the thickness of both the plywood and timber strip.

Preparatory Works		Remarks
2.9.	Check moisture content of the screed.	- The moisture content should be within the tolerance specified by timber manufacturer. Moisture content should be measured using meter (e.g. concrete encounter meter) designed for measuring moisture content of floor screed. - High moisture content of floor screed can cause defects in the timber flooring.
		
3. Sorting of Timber Strip Flooring		
3.1.	For timber species with large colour variation, it is advisable to sort the timber strips into different colour categories before installation. Timber strips with obvious tonality difference should not be used.	- Timber strips within a unit should be selected from the same category to minimise colour variation.
		
4. Conditions that must be fulfilled before laying Timber Flooring		
4.1.	The building envelop should be enclosed and weather-tight, with all the external windows and doors installed. The window glazing should be installed and kept closed at all times.	- It is a bad practice to use only plastic sheets to seal up window openings as these are ineffective in preventing ingress of rain water.
		
4.2.	All wet trades at the surrounding areas, including masonry, plastering, tiling, etc should be completed and thoroughly dry before laying of timber flooring.	- It is important to note that construction dampness is hazardous to timber flooring.

5. Installation

5.1. LAYING TIMBER FLOORING

Adequate lighting should be provided when laying timber flooring. Timber strips that are slightly out of alignment may show up distinctly when lighting

falls on them, helping the installers to spot any misalignment of the timber strips.

Table 5.1 summaries the good practices in laying different types of timber flooring systems.

Table 5.1 Installation of Timber Flooring

Preparing and Laying Timber Flooring	Remarks
1.1 Preparatory works for laying over plywood (for plywood sub-base method)	
1.1.1 Remove any dirt and dust on the screed.	– When spreading the adhesive, only apply sufficient amount of adhesive that the plywood can belaid on within the open-time of the particular adhesive. – Stagger the plywood joints. – Provide 2-5mm gap between plywoods and 6-8mm gap between plywoods and perimeter walls. – Ensure the plywood is firm and stable with no movement when walking on it.
	
1.1.2. Apply adhesive according to manufacturer’s instructions.	
	
1.1.3. Lay plywood and fasten the plywood with concrete nails at 300mm centre-to-centre space interval.	
	
1.1.4. Allow the adhesive to fully cure before proceeding to install timber flooring.	
1.1.5. Clean away any dirt and dust on the plywood before installation.	



Preparing and Laying Timber Flooring

Remarks

1.2 Preparatory works for laying of timber flooring (for direct installation method)

1.2.1. Remove any dirt and dust on the screed.



- It is a good practice to vacuum the screed surface as any presence of granular particles trapped between the timber strips may cause inconsistent joints.

2. Laying timber flooring

2.1. Apply adhesive according to manufacturer's instructions.



- When spreading the adhesive, only apply sufficient amount of adhesive that the timber flooring can be laid on within the open-time of the particular adhesive

2.2. Lay timber flooring. Where possible, use a floor nailing machine after the second or third run is in place.

- Laying directly over screed using adhesive; or



- Where appropriate, maintain full width of timber strip at the door entrance or as per approved shop drawings.



- Laying over plywood with tongue and groove



- The use of nailing machine is preferred as it drives nails mechanically or pneumatically through the tongue of the flooring at proper angle
- Avoid nailing into the plywood joints. Position the floor strips so that they do not meet at the plywood joints.
- To minimise inconsistent joint, timber strips should be "pressed-in" to enhance bonding and close up the gap between the strips.
- Wedges should be provided at the perimeters of the room to prevent any movement during the curing process.

Preparing and Laying Timber Flooring

Remarks

- Leave expansion gap of 6-8mm at the perimeters of the room.



- All wood products expand and contract with humidity changes. The expansion gap provided will allow for such dimensional changes.

- 2.3. Allow the floor to cure for a minimum of 3 weeks (or period specified by manufacturer). Restrict access to the area during the curing period.



- For proper curing, flooring should not be covered during the curing period. Do not allow anything to spill on the timber flooring as this may contaminate the final finishes.

- 2.4. Remove perimeter wedges and check for loose timber strips.



- Rectify any loose timber strips according to manufacturer's instructions.

5.2. SANDING

The timber floor should be sanded before applying the finishing coat to give a smooth and level surface.

The number of sanding operations depends on the type of timber flooring and the level of unevenness of the floor. Manufacturer's advice should be consulted on the number of sanding operations required. Normally, 3 to 4 sanding operations are required. The 1st sanding should produce a level and completely

sanded surface. Subsequent sanding operations would then serve to remove the sanding scratches produced by the 1st sanding. Table 5.2 shows the commonly used floor sanding grits defined by NOFMA*: The Wood Flooring Manufacturers Association and Table 5.3 shows good work practices to be adopted when sanding timber flooring. Unless otherwise specified by the manufacturer, the sanding sequence shown in Figure 5.1 should be followed.

Table 5.2 Commonly used Floor Sanding Grits

Classifications	Sanding Grits
Coarse	36,40
Medium	60,80
Fine	80,100,120
Very Fine	120,150

Source: NOFMA

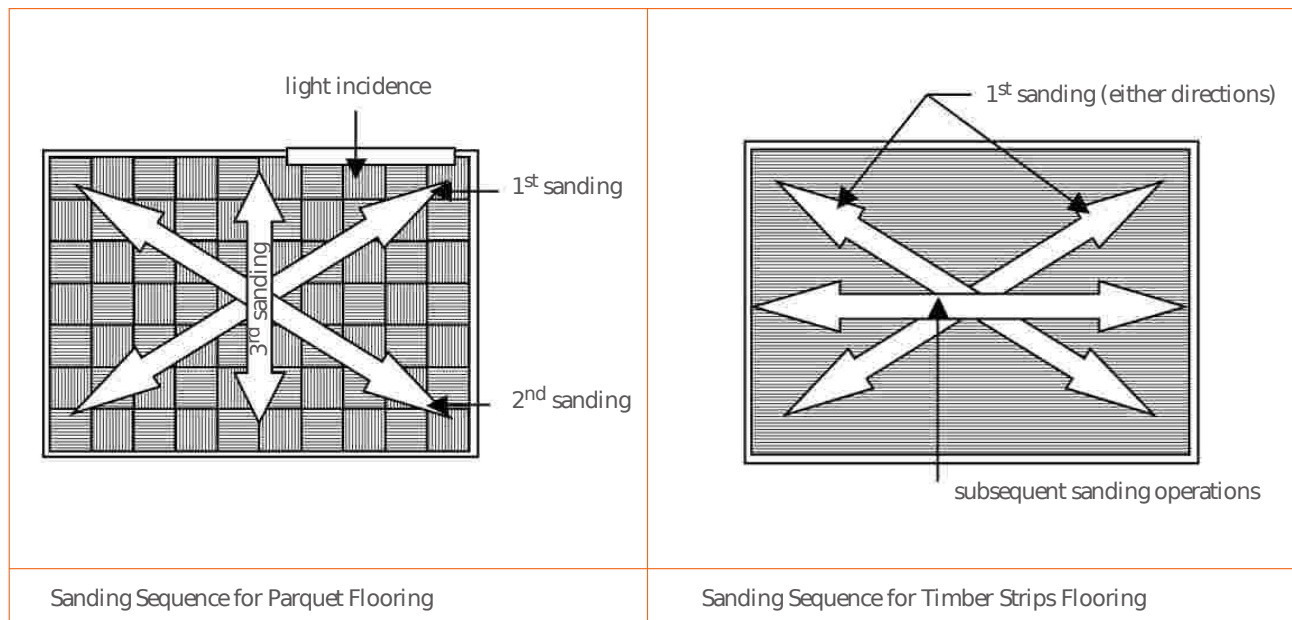


Figure 5.1 Sanding Sequence for Timber Flooring

*NOFMA - National Oak Flooring Manufacturers Association

Table 5.3 Sanding Timber Floor

Sanding Timber Floor	Remarks
1. Before commencement of sanding, check for any protruding nail heads and remove them. 2. Clean the floor with a vacuum cleaner. 	- Sanding on exposed nails may produce sparks and cause a fire in the sander dust bag.
3. Start the sanding operations. Clean the surface with a vacuum cleaner following each sanding operation. 	- It is important that the correct type of sand papers are used for the various rounds of sanding. - Sand paper should be changed when necessary. Some timber species are highly resinous and tend to clog sandpaper. When working on such species, change the sandpaper more often. - At areas such as corners or edges of walls where the sanding machine cannot be reached, edge sander should be used. 
4. Where applicable, apply a coat of wood filler to patch up nail holes and gaps, prior to the last sanding operation. 	- The wood filler could be prepared by mixing the sanding dust of the last sanding operation and a gap filling adhesive solution. This filler should has a shade as close to that of the wood surface as possible

Immediately after sanding is completed, the finishing coat should be applied. This will protect the exposed timber from getting dirty and absorbing excessive moisture. Finishing coat provides a uniformly enhanced

surface and seals the timber flooring against moisture and foreign materials. Manufacturer's instructions and recommendations should be followed when applying the finishing coat. Table 5.4 shows the steps required to achieve good timber flooring when applying the finishing coat.

Table 5.4 Applying Finishing Coat

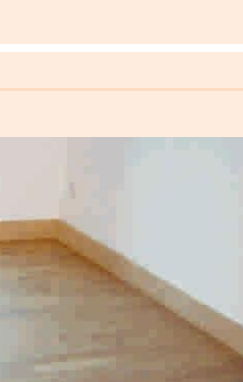
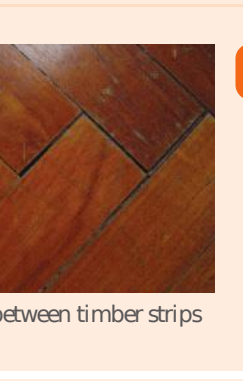
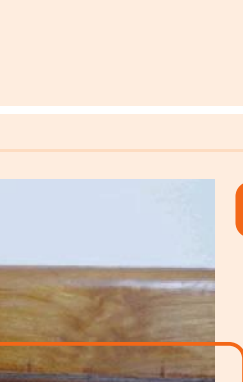
Applying Finishing Coat		Remarks
1. Sweep and vacuum the floor. Wipe and remove all dust on windows, doors, door frames, expansion gaps etc. 	- If surface is not properly cleaned, sand or dust may get stuck on the finishing coat and result in roughness of the finished surface.	
2. Apply the finishing coat evenly with a surface brush or a roller. - applying finishing coat with a surface brush  - applying finishing coat with a roller 	- The manufacturer's guide on coverage should be strictly followed. - Start on the side of the light incidence and work away from the light. This allows better observation of the finished surface to spot and rectify any possible imperfections. - When applying finishing coat, avoid direct sun radiation on the surface as radiation may lead to the generation of blisters in the finishing coat.	
3. Allow the finishing coat to dry according to manufacturer's instructions.		



Close supervision should be provided for both in-process and finished works. In order to achieve high workmanship quality, it is important that quality control should be driven by the site management.

Table 5.5 Checklist for Final Inspection of Timber Flooring

The finished works should be inspected to ensure they meet the client's requirements and standards. Table 5.5 shows a recommended checklist for final inspection of timber flooring. The inspection criteria in the checklist are in accordance with the CONQUAS 21 quality assessment standards.

Inspection Checklist		
1.	CONQUAS 21 Assessment – Jointing	
1.1.	No visible gap between timber strips	
	 	 
1.2.	Edges of the flooring to be properly sealed	
	 	
1.3.	No visible gap between skirting and wall/ timber flooring	
	 	 

installation

[illegible]

9



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7



20

protection

Upon completion of the timber flooring, the flooring should be allowed to cure for 7 days before covering the finished surface. No traffic on the timber flooring is permitted for 1 day after installation. After the curing period, protect the flooring by mopping away all dust and dirt and covering the floor finishes with clean

Proper co-ordination among various construction trades is critical in preventing damages to the timber flooring. Exact time-windows for the various trade contractors to carry out their works in the rooms completed with timber flooring should be scheduled so that access to the site is restricted and work conflicts are prevented. By doing so, the party that is responsible for any damage of the timber flooring at any location could also be identified.



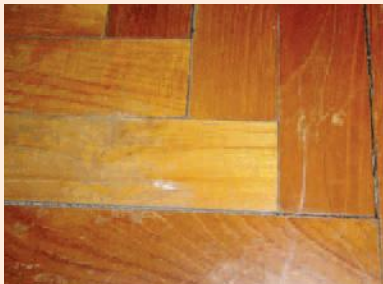
22

maintenance/ common complaints

- Liquid spills can stain wood permanently when they are absorbed into the wood finishes. Spills should, hence, be cleaned immediately;
- Avoid walking on the timber flooring with cleats, safety boots and other footwear that may damage the flooring;
- When moving heavy furniture or equipment, do not slide it on timber flooring. It is a good practice to lift and carry the furniture or equipment to protect the timber flooring; and
- Avoid leaving stagnant water on the timber floor.

8. Common Complaints

To achieve quality timber flooring, contractors should understand the common complaints and how to avoid them. The following are common complaints from owners.

Common Complaints	Possible Causes	Recommendations
1. Jointing		
1.1. Visible gaps between timber strips/ parquet 	a) Timber shrinkage due to prolonged exposure to dry environment b) Moisture content of timber exceeds the acceptable limits during installation c) Dimensional defects of timber	• Avoid extreme environmental changes • Check moisture content of timber before installation • Use timber with closer dimensional control during fabrication • Check dimensional defects when receiving the timber
1.2. Gaps between timber floor and skirting 	a) Uneven floor screed b) Insufficient levelling of timber strips c) Timber skirting warps	• Ensure proper surface preparation • Ensure timber strips are even and level during laying • Use suitable adhesive • Check straightness of timber skirting

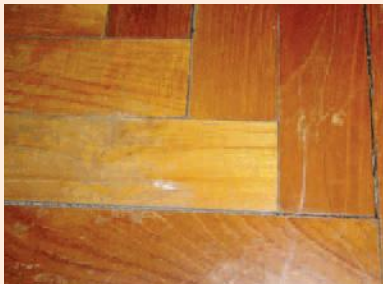


maintenance/ common complaints

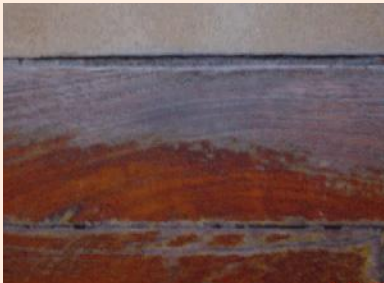
- Liquid spills can stain wood permanently when they are absorbed into the wood finishes. Spills should, hence, be cleaned immediately;
- Avoid walking on the timber flooring with cleats, safety boots and other footwear that may damage the flooring;
- When moving heavy furniture or equipment, do not slide it on timber flooring. It is a good practice to lift and carry the furniture or equipment to protect the timber flooring; and
- Avoid leaving stagnant water on the timber floor.

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Common Complaints	Possible Causes	Recommendations
2. Finishing		
2.1. Staining 	a) Staining by other trades after laying b) Spillage of chemicals	• Proper protection after installation • Avoid spillage
2.2. Localised discolouration 	a) Prolonged exposure to water b) Prolonged exposure to direct sunlight	• Use proper waterproofing or stop the source of water inflow • Minimise exposure to sunlight by providing window shade
2.3. Dull areas in varnished surface 	a) Spillage b) Use wrong cleaning solution such as ammonia-based cleaner c) Prolonged exposure to direct sunlight	• Avoid spillage and ensure fast cleaning of spillage • Use suitable cleaning solution • Minimise exposure to sunlight by providing window shade
2.4. Strong contrast of tone 	a) Choice of materials with excessive colour variations	• Select suitable timber with smaller colour variations

Common Complaints	Possible Causes	Recommendations
3. Alignment & Evenness		
3.1. Uneven surface 	a) Uneven screed b) Insufficient levelling of timber strips c) Dimensional defects of timber d) Premature loading on newly completed timber flooring e) Poor control of sanding on a single spot could cause undulation	• Ensure proper surface preparation • Ensure timber strips are even and level during laying • Use timber with closer dimensional control during fabrication • Check dimensional defects when receiving the timber • Ensure proper protection of flooring • Strict control of sanding operations and proper maintenance of sanding machine
4. Cracks & Damages		
4.1. Cracks 	a) Inadequate expansion gaps b) Timber flooring laid directly over structural/screed crack c) Excessive moisture changes in timber	• Allow sufficient expansion gaps • Check floor screed to ensure no crack before laying timber flooring • Minimise moisture content changes in timber
4.2. Dents 	a) Direct impact b) Damage by other trade after laying c) Poor cutting and handling	• Proper protection • Proper protection after installation • Use proper tools

appendix A

	1.1. American Walnut	<table border="1"> <tr> <td>Source</td> <td>USA</td> </tr> <tr> <td>Hardness</td> <td>1,010</td> </tr> <tr> <td>Colour</td> <td>Rich brown to purplish-black</td> </tr> <tr> <td>Description</td> <td>It has a fine, even texture with a rather coarse grain. The heartwood varies in colour from rich brown to purplish-black. The sapwood is in pale brown colour. Difference between heartwood and sapwood is great</td> </tr> </table>	Source	USA	Hardness	1,010	Colour	Rich brown to purplish-black	Description	It has a fine, even texture with a rather coarse grain. The heartwood varies in colour from rich brown to purplish-black. The sapwood is in pale brown colour. Difference between heartwood and sapwood is great
Source	USA									
Hardness	1,010									
Colour	Rich brown to purplish-black									
Description	It has a fine, even texture with a rather coarse grain. The heartwood varies in colour from rich brown to purplish-black. The sapwood is in pale brown colour. Difference between heartwood and sapwood is great									
	1.2. Beech	<table border="1"> <tr> <td>Source</td> <td>Europe, Canada</td> </tr> <tr> <td>Hardness</td> <td>1,300</td> </tr> <tr> <td>Colour</td> <td>Pale pink</td> </tr> <tr> <td>Description</td> <td>It has a straight grained with a fine, even texture. No clear distinction between heartwood and sapwood by colour</td> </tr> </table>	Source	Europe, Canada	Hardness	1,300	Colour	Pale pink	Description	It has a straight grained with a fine, even texture. No clear distinction between heartwood and sapwood by colour
Source	Europe, Canada									
Hardness	1,300									
Colour	Pale pink									
Description	It has a straight grained with a fine, even texture. No clear distinction between heartwood and sapwood by colour									
	1.3. Brazilian Cherry	<table border="1"> <tr> <td>Source</td> <td>South America</td> </tr> <tr> <td>Hardness</td> <td>2,350</td> </tr> <tr> <td>Colour</td> <td>Reddish brown to rich red</td> </tr> <tr> <td>Description</td> <td>It has an interlocking grain with medium to rather coarse texture</td> </tr> </table>	Source	South America	Hardness	2,350	Colour	Reddish brown to rich red	Description	It has an interlocking grain with medium to rather coarse texture
Source	South America									
Hardness	2,350									
Colour	Reddish brown to rich red									
Description	It has an interlocking grain with medium to rather coarse texture									

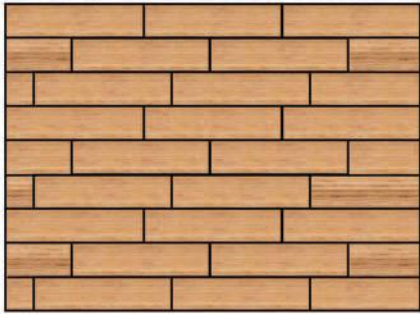
The hardness rating is based on Janka hardness test. The Janka hardness test measures the force required to embed a 0.444-inch steel ball to half its diameter in the timber.

	1.4. Brazilian Teak <table> <tr> <td>Source</td><td>South America</td></tr> <tr> <td>Hardness</td><td>1,457</td></tr> <tr> <td>Colour</td><td>Golden brown to reddish brown</td></tr> <tr> <td>Description</td><td>It has an interlocking grain with fine texture</td></tr> </table>	Source	South America	Hardness	1,457	Colour	Golden brown to reddish brown	Description	It has an interlocking grain with fine texture
Source	South America								
Hardness	1,457								
Colour	Golden brown to reddish brown								
Description	It has an interlocking grain with fine texture								
	1.5. Cherry <table> <tr> <td>Source</td><td>Canada</td></tr> <tr> <td>Hardness</td><td>950</td></tr> <tr> <td>Colour</td><td>Reddish brown to rich red</td></tr> <tr> <td>Description</td><td>It has a fine, straight and close grain</td></tr> </table>	Source	Canada	Hardness	950	Colour	Reddish brown to rich red	Description	It has a fine, straight and close grain
Source	Canada								
Hardness	950								
Colour	Reddish brown to rich red								
Description	It has a fine, straight and close grain								
	1.6. Ivorywood <table> <tr> <td>Source</td><td>South America</td></tr> <tr> <td>Hardness</td><td>1,457</td></tr> <tr> <td>Colour</td><td>Yellowish-white</td></tr> <tr> <td>Description</td><td>It has a straight grain and a fine texture</td></tr> </table>	Source	South America	Hardness	1,457	Colour	Yellowish-white	Description	It has a straight grain and a fine texture
Source	South America								
Hardness	1,457								
Colour	Yellowish-white								
Description	It has a straight grain and a fine texture								
	1.7. Jarrah <table> <tr> <td>Source</td><td>Australia</td></tr> <tr> <td>Hardness</td><td>1,910</td></tr> <tr> <td>Colour</td><td>Pink to dark red brown</td></tr> <tr> <td>Description</td><td>It has a straight or interlocked grain with an even medium coarse texture</td></tr> </table>	Source	Australia	Hardness	1,910	Colour	Pink to dark red brown	Description	It has a straight or interlocked grain with an even medium coarse texture
Source	Australia								
Hardness	1,910								
Colour	Pink to dark red brown								
Description	It has a straight or interlocked grain with an even medium coarse texture								



	1.8. Maple <table> <tr> <td>Source</td><td>USA and Canada</td></tr> <tr> <td>Hardness</td><td>1,450</td></tr> <tr> <td>Colour</td><td>Pale cream with fine red/drown markings</td></tr> <tr> <td>Description</td><td>It has a straight grain with a fine texture</td></tr> </table>	Source	USA and Canada	Hardness	1,450	Colour	Pale cream with fine red/drown markings	Description	It has a straight grain with a fine texture
Source	USA and Canada								
Hardness	1,450								
Colour	Pale cream with fine red/drown markings								
Description	It has a straight grain with a fine texture								
	1.9. Patagonian Walnut <table> <tr> <td>Source</td><td>South America</td></tr> <tr> <td>Hardness</td><td>2,491</td></tr> <tr> <td>Colour</td><td>Golden to medium brown</td></tr> <tr> <td>Description</td><td>It has a range of straight to very irregular grain, with fine to medium texture</td></tr> </table>	Source	South America	Hardness	2,491	Colour	Golden to medium brown	Description	It has a range of straight to very irregular grain, with fine to medium texture
Source	South America								
Hardness	2,491								
Colour	Golden to medium brown								
Description	It has a range of straight to very irregular grain, with fine to medium texture								
	1.10. Teak <table> <tr> <td>Source</td><td>Indonesia & Burma</td></tr> <tr> <td>Hardness</td><td>1,000</td></tr> <tr> <td>Colour</td><td>Yellow brown to dark golden brown</td></tr> <tr> <td>Description</td><td>It has a straight grain, with coarse and uneven texture</td></tr> </table>	Source	Indonesia & Burma	Hardness	1,000	Colour	Yellow brown to dark golden brown	Description	It has a straight grain, with coarse and uneven texture
Source	Indonesia & Burma								
Hardness	1,000								
Colour	Yellow brown to dark golden brown								
Description	It has a straight grain, with coarse and uneven texture								
	1.11. White Oak <table> <tr> <td>Source</td><td>USA and Europe</td></tr> <tr> <td>Hardness</td><td>1,360</td></tr> <tr> <td>Colour</td><td>Pale yellowish-brown to mid-brown (sometimes with pinkish tint)</td></tr> <tr> <td>Description</td><td>Its grain is generally straight and the texture varies from coarse to medium coarse</td></tr> </table>	Source	USA and Europe	Hardness	1,360	Colour	Pale yellowish-brown to mid-brown (sometimes with pinkish tint)	Description	Its grain is generally straight and the texture varies from coarse to medium coarse
Source	USA and Europe								
Hardness	1,360								
Colour	Pale yellowish-brown to mid-brown (sometimes with pinkish tint)								
Description	Its grain is generally straight and the texture varies from coarse to medium coarse								

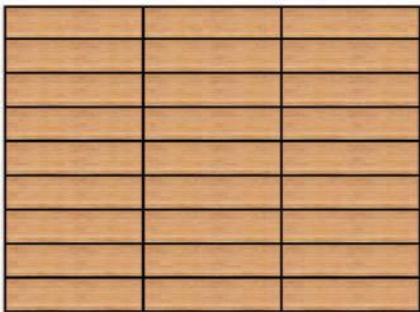
2. Commonly Design and Pattern for Parquet Flooring



Pattern 1



Pattern 2



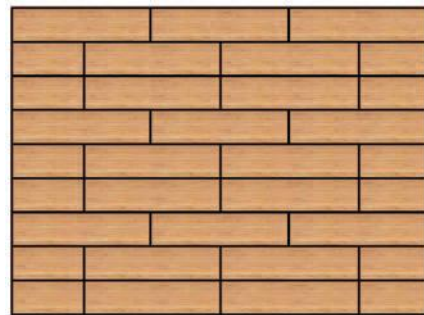
Pattern 3



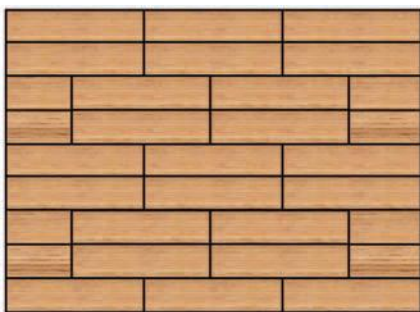
Pattern 4



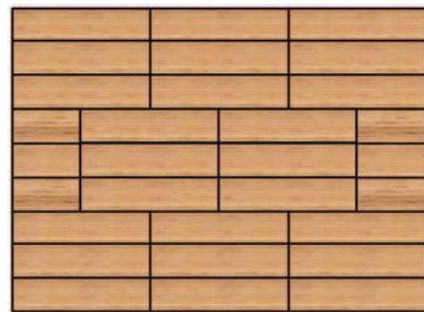
Pattern 5



Pattern 6

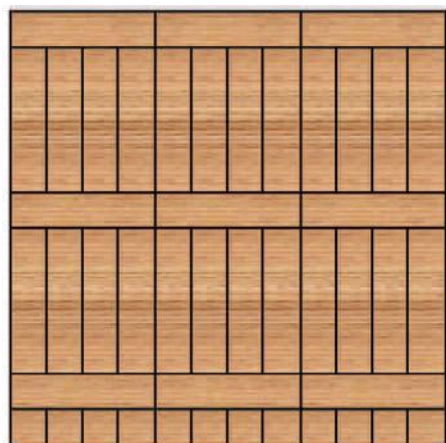


Pattern 7

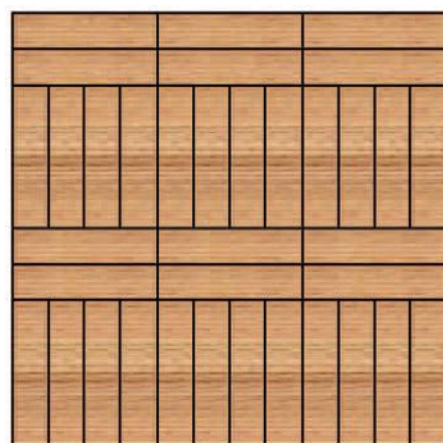


Pattern 8

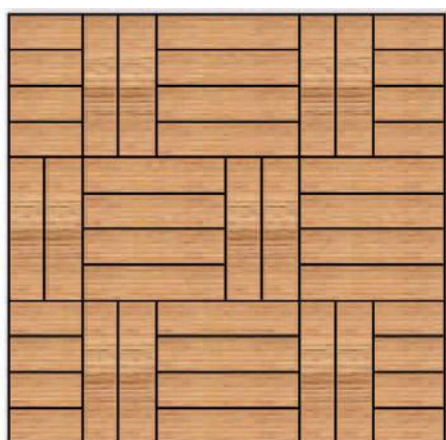




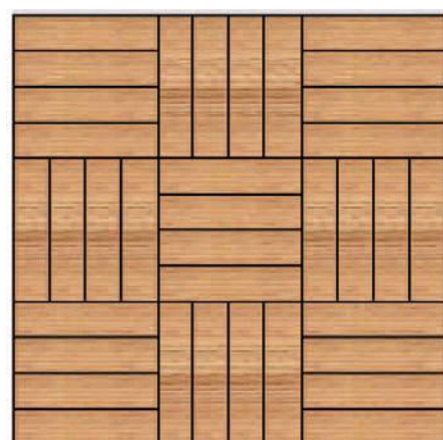
Pattern 9



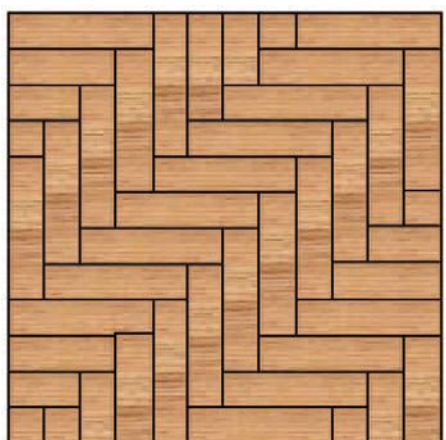
Pattern 10



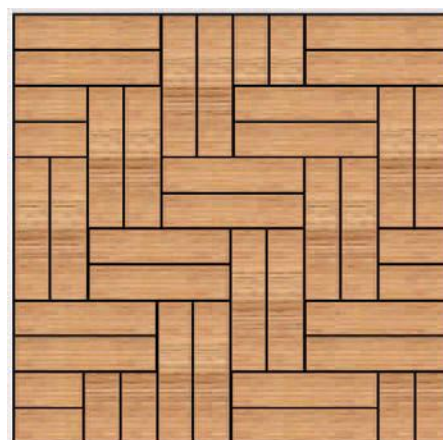
Pattern 11



Pattern 12



Pattern 13



Pattern 14

Sample of Inspection and Test Plan (ITP)

Project:

Scope of Work: Timber Flooring

Appendix B

S/No	Activity	Responsibility	Inspection Method	Requirement Reference	Acceptance Criteria	Frequency	Records
1 SUBMISSION							
1.1	Shop drawings	MC/ADO	Review	–	Approved	Initial stage	Approved submissions
1.2	Timber flooring and sub-base samples	MC/ADO	Review	Section 2.1/2.2	Conform to specifications	Initial stage	Approved submissions
1.3	Samples for securing components (such as adhesives and nails) and finishing coat	MC/ADO	Review	Section 2.3/2.4	Conform to specifications	Initial stage	Approved submissions
1.4	Test reports	MC/ADO	Review	–	Conform to specifications	Initial stage	Approved submissions
1.5	Technical data	MC/ADO	Review	–	Conform to specifications	Initial stage	Approved submissions
2 INCOMING MATERIALS INSPECTION							
2.1	Timber flooring	MC/ADO	Visual/ measurement	Section 3.1	As per approved samples	Each delivery	Delivery document
2.2	Sub-base (for sub-base system)	MC/ADO	Visual	–	Conform to specifications	Each delivery	Delivery document
2.3	Adhesives	MC/ADO	Visual	Section 3.2	Conform to specifications	Each delivery	Delivery document
2.4	Nails	MC/ADO	Visual	–	Conform to specifications	Each delivery	Delivery document
2.5	Finishing coats	MC/ADO	Visual	Section 3.2	Conform to specifications	Each delivery	Delivery document
Prepared by _____ Date _____		Verified by _____ Date _____		Approved by _____ Date _____			

LEGEND

MC – Main contractor/ Installer

ADO – Architect/ Designer/ Owner

Sample of Inspection and Test Plan (cont'd)

Appendix B

Project:

Scope of Work: Timber Flooring

S/No	Activity	Responsibility	Inspection Method	Requirement Reference	Acceptance Criteria	Frequency	Records
3 IN-PROCESS INSPECTION							
3.1	Check substrate	MC/ADO	Visual/ measurement	Section 4.1	Surface flat, solid, clean and free of foreign materials	Before laying screed	Checklist @ Appendix C
3.2	Laying of cement/ sand screed	MC/ADO	Visual/ measurement	Section 4.2	Screed level ($\pm 3\text{mm}/2\text{m}$) and moisture content of screed within acceptable limit	Before laying timber flooring	Checklist @ Appendix C
3.3	Install plywood (for sub-base system)	MC/ADO	Visual	Section 5.1	Sub-base is firm and stable with no movement	100% work done	Checklist @ Appendix C
3.4	Laying timber flooring	MC/ADO	Visual	Section 5.1	Lay timber neatly and to true level	100% work done	Checklist @ Appendix C
3.5	Check timber flooring surface	MC/ADO	Visual/ measurement	Section 5.5	Within 3mm tolerance per 1.2m and no loose timber	100% work done	Checklist @ Appendix C
3.6	Check floor joints	MC/ADO	Visual/ measurement	Section 5.5	No obvious gaps between timber strips	100% work done	Checklist @ Appendix C
4 SANDING							
4.1	Cleaning	MC/ADO	Visual	Section 5.2	Surface is clean	100% work done	Checklist @ Appendix C
4.2	Sanding operations	MC/ADO	Visual	Section 5.2	Follow manufacturer's instructions on no. of sanding operations required	100% work done	Checklist @ Appendix C
4.3	Apply wood filler (if applicable)	MC/ADO	Visual	Section 5.2	All gaps are properly patched	100% work done	Checklist @ Appendix C
Prepared by _____ Date _____		Verified by _____ Date _____		Approved by _____ Date _____			

LEGEND

MC – Main contractor/ Installer

ADO – Architect/ Designer/ Owner

Sample of Inspection and Test Plan (cont'd)

Appendix B

Project:

Scope of Work: Timber Flooring

S/No	Activity	Responsibility	Inspection Method	Requirement Reference	Acceptance Criteria	Frequency	Records
5 APPLY FINISHING COAT							
5.1	Cleaning	MC/ADO	Visual	-	Surface is clean	100% work done	Checklist @ Appendix C
5.2	Apply first coat	MC/ADO	Visual	Section 5.3	Follow manufacturer's instruction	100% work done	Checklist @ Appendix C
5.3	Sanding with fine grit sander (if necessary)	MC/ADO	Visual	Section 5.3	Surface is smooth	100% work done	Checklist @ Appendix C
5.4	Apply final coat	MC/ADO	Visual	Section 5.3	Follow manufacturer's instruction	100% work done	Checklist @ Appendix C
6 INSTALL SKIRTING							
6.1	Install skirting	MC/ADO	Visual	Section 5.4	Skirting is properly secured	100% work done	Checklist @ Appendix C
6.2	Patch nail holes	MC/ADO	Visual	Section 5.4	All nail holes properly patched	100% work done	Checklist @ Appendix C
Prepared by _____ Date _____				Verified by _____ Date _____			
Approved by _____ Date _____							

LEGEND

MC – Main contractor/ Installer ADO – Architect/ Designer/ Owner

Sample of Inspection and Test Plan (cont'd)

Appendix B

Project:

Scope of Work: Timber Flooring

S/No	Activity	Responsibility	Inspection Method	Requirement Reference	Acceptance Criteria	Frequency	Records
7 FINAL INSPECTION							
7.1	Cleaning	MC/ADO	Visual	-	Surface is clean	At completion	
7.2	Protection	MC/ADO	Visual	Section 6	Protect finish work	At completion	
7.3	Work acceptance	MC/ADO	Visual	Section 5.5	As per specifications	At completion	Inspection records
8 WORK HAND-OVER							
8.1	Rectification works	MC/ADO	Visual	-	-	At hand-over	
8.2	Inspection by owner	MC/ADO	-	-	As per specifications	At hand-over	
Prepared by _____ Date _____				Verified by _____ Date _____			
Approved by _____ Date _____							

LEGEND

MC – Main contractor/ Installer

ADO – Architect/ Designer/ Owner

appendix C

(with plywood sub-base)

Location:

37[illegible]

Checklist	Acceptance Criteria/ Requirement Reference	Date of Inspection	Remarks
LAYING TIMBER FLOORING			
16. Lay timber strips	Refer to Section 5.1		
17. Allow timber flooring to cure	Timber flooring cured for at least 3 weeks (or period specified by manufacturer)		
18. Check for loose timber strips	No loose timber strip		
SANDING			
19. Check for any protruding nail heads	No protruding nail head		
20. Clean the flooring with vacuum cleaner	Surface is clean		
21. Start sanding operations and clean the surface after each sanding operation	Follow manufacturer's instruction		
22. Apply wood filler (where applicable)	Refer to Section 5.2		
APPLYING FINISHING COATS			
23. Sweep and clean the flooring	Surface is clean		
24. Apply finishing coat	Follow manufacturer's instructions		
25. Allow finishing coat to dry	Follow manufacturer's instructions		
26. Cut back with sanding	Surface is smooth		
27. Clean the flooring	Surface is clean		
28. Apply the second finishing coat	According to the same procedure of applying the first coat		
29. Allow flooring to cure	Flooring cured for at least 7 days		
INSTALLING TIMBER SKIRTING			
30. Install timber skirting	Skirting is properly secured		
31. Patch nail holes	All nail holes properly patched		
PROTECTION			
32. Protect completed flooring	No traffic is permitted on the flooring for 1 days after completion.		

(laid directly over screed)

Project:

Location:

Checklist	Acceptance Criteria/ Requirement Reference	Date of Inspection	Remarks
SURFACE PREPARATION			
1. Check curing of concrete substrate	Concrete cured for 28 days		
2. Check substrate condition	Surface flat, solid, clean and free of foreign materials		
3. Check alignment of wall and slab	Wall and slab are properly aligned		
PREPARATION AND LAYING OF SCREED			
4. Establish common reference line	Reference lines are normally marked at the wall at 1m		
5. Set out level pegs at regular interval	–		
6. Wet concrete surface prior to laying screed	Surface is in a saturated-surface-dry condition		
7. Apply bonding agent	Follow manufacturer's instructions		
8. Lay cement/sand screed	Refer to Section 4		
9. Damp cured screed	Screed cured for at least 14 days		
10. Check screed surface	Screed is level (within tolerance of 3mm in 2m) and no hollowness		
11. Check moisture content of screed	Follow manufacturer's instructions		
LAYING TIMBER FLOORING			
12. Vacuum the screed surface	Surface is clean		
13. Lay timber strips	Refer to Section 5.1		
14. Allow timber flooring to cure	Timber flooring cured for at least 3 weeks (or period specified by manufacturer)		
15. Check for loose timber strips	No loose timber strip		

Checklist	Acceptance Criteria/ Requirement Reference	Date of Inspection	Remarks
SANDING			
16. Check for any protruding nail heads	No protruding nail heads		
17. Clean the flooring with vacuum cleaner	Surface is clean		
18. Start sanding operations and clean the surface after each sanding operation	Follow manufacturer's instruction		
19. Apply wood filler (where applicable)	Refer to Section 5.2		
APPLYING FINISHING COATS			
20. Sweep and clean the flooring	Surface is clean		
21. Apply finishing coat	Follow manufacturer's instructions		
22. Allow finishing coat to dry	Follow manufacturer's instructions		
23. Cut back with sanding	Surface is smooth		
24. Clean the flooring	Surface is clean		
25. Apply the second finishing coat	According to the same procedure of applying the first coat		
26. Allow floor to cure	Flooring cured for at least 7 days		
INSTALLING TIMBER SKIRTING			
27. Install timber skirting	Skirting is properly secured		
28. Patch nail holes	All nail holes properly patched		
PROTECTION			
29. Protect completed flooring	No traffic is permitted on the flooring for 1 days after completion.		

References

1. BRE Building Elements
Floors and flooring, PW Pye and HW Harrison
2. BS 8201 : 1987
Code of practice for flooring of timber, timber products and wood based panel products
3. LÄGLER Technical Paper
Valuable hints for correct sanding and sealing of wooden floors
4. National Wood Flooring Association
Hardwood flooring installation guidelines
5. National Wood Flooring Association, Technical Publication No. A100
Water and wood
6. National Wood Flooring Association, Technical Publication No. A200
Wood species used in wood flooring
7. NOFMA: The Wood Flooring Manufacturers Association
Finishing hardwood flooring
8. SSCP 1
Code of practice for the use of timber in buildings
9. Singapore NPQSA4-30
Specification for floor screeds and hardeners
10. Singapore NPQSA4-50
Specification for timber flooring

