

Havwoods Installation Guide: Bonded Floors

These guidelines are designed to complement the current British Standard BS8201 or the relevant standards in the country of installation.

Safety must be paramount on every installation. All electrical equipment must be PAT tested and labelled and all cutting tools such as jigsaws, circular and bench saws must have guards fitted and cutting must be carried out on a suitable bench. You must also wear suitable work wear and remove or make safe any loose items such as jewellery. Safety is your responsibility.

The installer must be suitably trained and knowledgeable with wood flooring installations. Engineered wood flooring can be installed as a floating floor, fully bonded, or nailed. This document covers fully bonded installation. The following topics are covered by this document, for further information or for advice on any subject not covered here, please contact Havwoods:

- Environmental Conditions
- Subfloor Preparation
- Installation
- Underfloor Heating
- HVAC heating/climate control
- Floor Protection
- Care & Maintenance

Please Note: Any fixing through floors to the substrate must allow for expansion around the fixing point. Over-drill fixings by 20mm and either leave an unfilled expansion gap or use a compressible soft gasket to allow for movement in the timber flooring.

The final responsibility for the installation lies with the installer. It is the duty of the installer to inspect materials prior to installation and notify Havwoods of any potential material defects prior to installation. Installed materials are deemed to have been accepted.



ENVIRONMENTAL CONDITIONS

The building must be watertight with all windows and doors fitted and all wet trades complete before taking delivery of materials and before any wood flooring installation can take place.

Always check the ambient room temperature and humidity, which should be maintained at a constant level between 18°C (64°F) and 22°C (72°F) with a relative humidity between 45% – 65%RH prior to, during and for the whole life of the wood flooring. Try to avoid extremes of low or high temperatures as this will negatively affect the stability of the wood flooring.

Acclimatise the wood flooring in the room where the wood is to be fitted for at least 72 hours prior to the installation. The timber material should be maintained in their original packaging in this period. Only remove the materials from their packaging just before installation. The wood should be stored out of direct sunlight, away from walls and radiators and on battens fully supporting the wood to prevent a build of heat on the bottom boards.

Acclimatising is used to balance the wood flooring with the environment in the installation area.

If the temperature of the wood is at an equilibrium balance (the same as the room) and the moisture level of the wood is 8%(±2%) then you can assume that the timber does not require any further acclimatisation.

Keep the room temperature constant by using the heating set at minimum 15°C (59°F) or if there are problems with the permanent heating other forms of heating such as convector heaters can be used.

Do not use gas-type heaters as these will generate extra moisture in the air.

Infra-red type heaters do not generally warm the fabric of the room or the wood, they tend to only warm the person or item close to the heater.

Low humidity can cause the wood to shrink and high levels can cause expansion. Common causes of low humidity are using the heating at too high temperature, open fires and wood burners. High humidity is commonly caused by poor ventilation.

We recommend using a digital gauge to monitor the humidity and temperature level. Humidity can be adjusted by either placing moisture in the room (plants that are watered regularly or receptacles of water) or ventilating the room to reduce high levels of humidity. A humidifier/de-humidifier can also be used to control the atmosphere.

As a general rule, rooms/areas should be adequately ventilated to prevent a build of moisture in the environment. Care must also be given to rooms that are only heated when in use and with the heating switched fully off at other times. This can cause a build-up of humidity if the room is closed and not ventilated immediately after usage. The build of humidity / moisture will generally increase the moisture level of the wood flooring. The next time the room is used, the heating can dry out the moisture in the surface of the wood, causing cupping.

Wood will naturally change in size during seasonal variations in temperature and humidity.



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Wood that Works.

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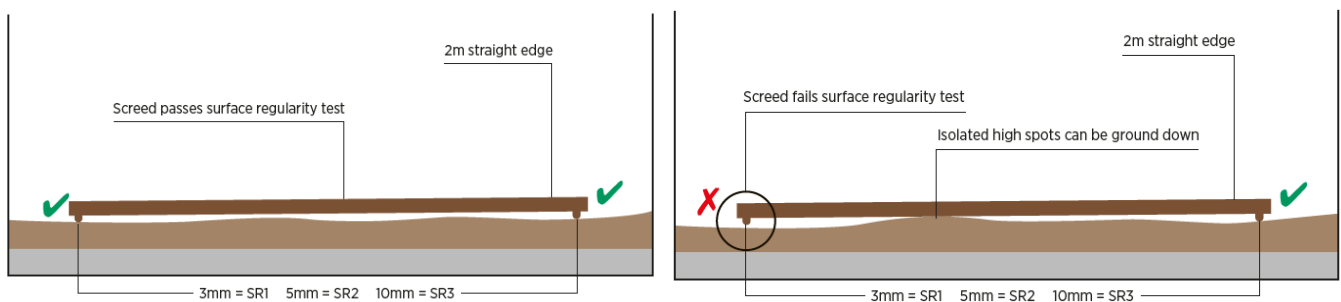


During summer the humidity is generally at its highest level, hence the wood joins should be reasonably tight together. During the winter, when heating is commonly used, the humidity levels are generally lower and will produce small gaps between the joins. This occurrence is not a manufacturing or installation fault.

SUBFLOOR PREPARATION

The subfloor must be sound, dry, free from contamination and flat to British Standard SR1 tolerance: maximum 3mm of level variance under a 2m long straight edge, at any point across the subfloor. The subfloor must have a tensile strength of at least 1.5Mpa for fully bonded timber flooring application.

Where a wooden floor is to be installed using a glued down method, a structural substrate of adequate density must always be in place beneath the floor finishes. Please consult Havwoods if there is any question relating to substrate suitability.



Screeded Substrates

Cementitious (sand and cement) / Calcium Sulphate (Anhydrite):

The subfloor must be sound with no friable areas, free of laitance and dry. The moisture content of solid sub-floors must be checked in accordance with British Standards Annex A.

Moisture Testing is carried out using a Hygrometer set on top of the screed or by inserting a sleeve into the screed, (the sleeve method is not recommended with underfloor heating to avoid the risk of damage to the pipes).

For screed substrates, the moisture reading must be less than 65% Relative Humidity (RH) or 2.0%CM / 1.8%CM for heated substrates for glued down installations. For Calcium Sulphate screeds, this is 0.6%CM or 0.5%CM for heated substrates.

Where there is a cementitious substrate, if the reading is above 75% RH and below 95% RH, we recommend using the **Marldon MXS 140** two-part epoxy damp proof membrane (DPM). The DPM must be applied in accordance with the manufacturer's instructions. Marldon MXS 140 DPM (or any other epoxy DPM) can be used on anhydrite-type screeds where the relative humidity is below 87% and there is no UFH.

A poured or pumped screed rarely achieves the required SR1 levels and it is recommended that a self-levelling compound be used prior to timber flooring installation. Self-levelling compounds also provide a more uniform surface for the best level of adhesion to the flooring.



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If bonding directly to a screed, first prime the subfloor with an acrylic or polyurethane floor primer to ensure maximum bond strength and eliminate uneven drying of the adhesive due to varying substrate porosity. Havwoods recommend Marldon Universal Primer MXS120 for existing screeds and Marldon MXS150 for any new screed. Priming the screed with a liquid DPM, i.e. Marldon MXS140 or MXS150, is a requirement for any new screed containing embedded UFH.

N.B. Do not prime a levelling compound before bonding timber flooring.

Structural movement joints in the concrete must be mirrored in the finished timber floor using a suitable flexible expansion detail.

Note: For advice on the installation of Havwoods products over screeds with embedded or overlaid Underfloor Heating, please also see section on Underfloor Heating.

Timber Substrates

The timber sub-floor must be sound, tested for vertical movement (which should be less than 5mm) and tested using a spike-type meter to ensure that they are dry. The moisture content of the subfloor should be less than 14% and within $\pm 2\%$ of the wood floor being installed.

All suspended wood floors must have suitable through ventilation normally delivered by air bricks in the outside walls.

Any wood sub-floor that has a higher moisture level than 14% should be investigated. They must also be free of infestations such as wood-rotting fungi and wood boring insects.

Solid timber floors bonded to a timber subfloor require a substrate of plywood in an equivalent or greater thickness than the solid flooring which is to be installed.

Suitable timber substrates for engineered floors are flooring-grade plywood and P5 flooring-grade particleboard. Timber substrates can be bonded to directly with a suitable MS Polymer adhesive (Havwoods recommend Hav:Bond or Marldon MXA200 adhesive), provided that they are sound, level to SR1 level requirements and free from contamination.

For existing suspended timber floors (where planks are securely fixed to joists/bearers), these can be over-boarded with flooring-grade plywood of a minimum 6mm thickness, fixed at 300mm centres, in a direction perpendicular to the run of the existing planks. Any loose sections of the existing planks must first be secured and any repairs to the existing bearers completed before over-plying may be considered.

Kingley bitumen paper can be sandwiched between the plywood and the wood sub-floor to reduce/prevent residual moisture affecting the wood flooring or adhesive.

Note: For advice on the installation of Havwoods products over timber substrates with incorporated Underfloor Heating Pipes, please also see section on Underfloor Heating.

Dry Screed Panels

Structural or overlay dry screed flooring panels are generally suitable substrates for Havwoods timber flooring. All dry screed flooring panels should be bonded to directly with Hav:Bond / Marldon MXA200 adhesive.



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Raised Access Floors

Havwoods Floors may be bonded to new steel-encapsulated raised access floor panels using Hav:Bond / Marldon MXA200 adhesive. This is provided that any contaminants, such as oil residues from the manufacture of the panels, are removed prior to installation.

All access floors must have pedestals adjusted to remove any rocking action and be levelled, with pedestals locked in position, to best avoid the potential for deflection in the finished flooring. Access panels should be fixed to pedestals.

Existing raised access panels must be thoroughly cleaned and degreased with appropriate cleaning agents to remove any adhesive residues and other contaminants prior to direct installation of Havwoods timber flooring. If all existing contaminants can't be removed, then the access panels may be over-boarded with flooring-grade plywood of a minimum 6mm thickness, suitably fixed at centres of no wider than 300mm.

INSTALLATION

The wood should be fully bonded to the prepared sub-floor using a suitable flexible adhesive. Havwoods recommend Hav:Bond / Marldon MXA200 MS polymer flexible adhesive.

This should be applied using a notched trowel (please see adhesive manufacturer's instructions for trowel notch size). Always lift an occasional board to see if there is at least complete coverage to the back of the board, if not then increase the notch size.

Be sure to install into wet adhesive and break the installation down into workable areas which can be installed within the open working time of the adhesive. If the adhesive is allowed to skin-over, then it must be scraped from the subfloor and fresh adhesive laid.

Avoid standing or kneeling on elements which are sitting on wet adhesive as they may shift and result in gaps within the finished floor.

Note: Do not use adhesive to level a sub-floor.

In order to achieve a harmonious blend of tones throughout the floor, material should be taken from several packs and mixed during the installation. Working from 3-4 packs at a time creates a blend of tones from the variation in the raw material. Colour variety is inherent to all wooden floors and is a key feature in the choice of real wood material for any interior scheme.

It is also important to keep the atmosphere constant during and for at least 24 hours after the installation (particularly overnight) when temperatures can drop causing variations in the atmosphere and may not allow the glue to cure effectively in glued T&G installations. Always keep the temperature above 15°C.

Always create an unfilled perimeter expansion gap of a minimum 10mm and allow at least 1mm of perimeter expansion gap per 1m width span of the flooring.



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Place spacers between the boards and the wall to keep the expansion gap whilst the adhesive is curing.

If the installation is over more than one day, strap or wedge the last row to prevent movement overnight. Weight (you will have packs of boards at this stage) down the last few rows to prevent them from lifting off the adhesive. If the boards do not close easily, you may need to use a knocking block or lever bar to assist in the placement. If you are installing a click system board fully bonded, locate the header joint first at an angle and then lower the long joint so that the short joint is over the groove (longer protrusion). Once laid, use a knocking block or lever bar to knock the joint into place.

Areas in excess of 10 linear meters x 8m width of the boards may require extra expansion between the boards and intermediate expansion in the length. Check with Havwoods for larger installations because different products have specific allowances. Expansion gaps can be covered using a skirting board or beading/scotia.

Bonded floors may have a suitable compressible detail installed at visible threshold locations to other flooring types, perimeter details etc. using a low-density foam strip (low density meaning it can easily be crushed between your fingers) leaving it approximately 2mm below the height of the wood floor and then use a flexible acrylic mastic-type filler, or similar, to bridge over the foam.

All thresholds must allow for the required expansion and contraction. Door frames and architraves can be undercut to allow the wood to slide underneath, still allowing for the expansion.

Note: Never undercut newel posts as these are structural sections of the stairs.

Specific to Plank Format Installations

Plank format flooring is designed to be installed in a randomly staggered pattern where the off-cut from the end of the previous row is used to start the following row. If another pattern is required for the project, then Havwoods must be consulted prior to order of the materials.

When planning the area, try to balance the board width against the two most prominent walls, considering focal points such as fireplaces. You must always try to have at least half a board at each opposing wall because smaller width boards are difficult to fit and may not give the adequate level of finish, particularly if the wall is not straight. We recommend dry laying the first two or three rows and adjusting the first row to the wall contours and adjusting for the width you have planned. Make sure you have at least a 300mm distance between header joints, ideally 500mm. Once done, mark a glue line on the sub-floor and move the boards whilst applying the adhesive. Immediately place the boards into the adhesive, which must be prior to the adhesive skinning over.



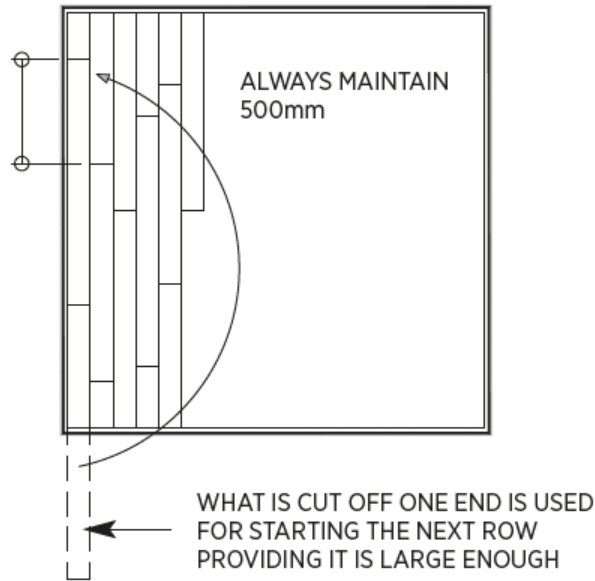
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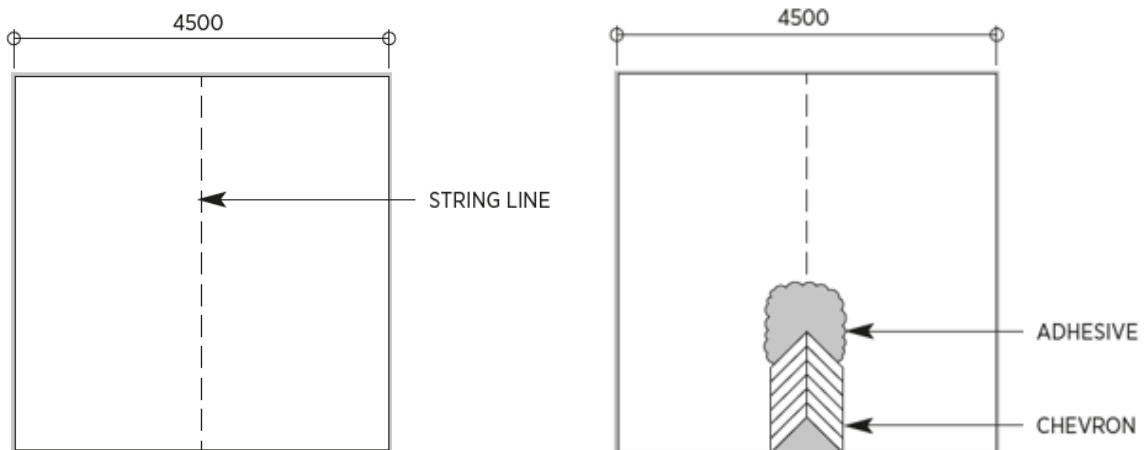


Specific to Patterned Installations

Patterned floors (such as herringbone and chevron formats) should be set out using a line of one run of left-hand and one run of right-hand blocks either side of a determined line from the centre of the room/area using a string or laser along the desired centre point of the installation. This is referred to as a crown line or row.

Herringbone patterned floors require that a section of left and right blocks is dry-laid prior to installation in order to establish the alignment of the blocks for the left- and right-hand elements. A working line is then drawn either side of the centre in order to keep the alignment of the herringbone pattern.

Crown rows must be left until the adhesive is fully cured before the remainder of the flooring installation may be completed.



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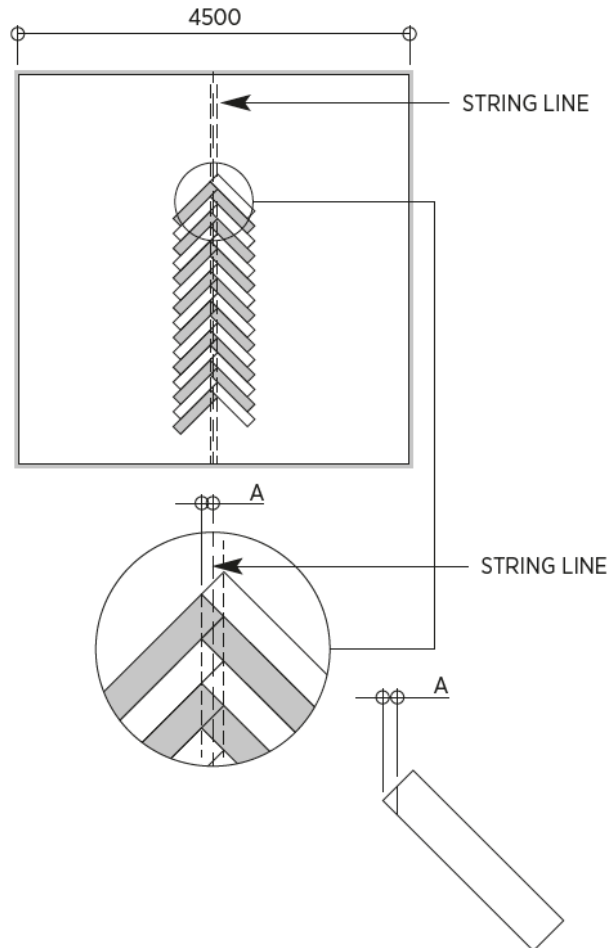
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Herringbone Working Lines:



Where a border is to be installed to the perimeter of the pattern, draw the junction line of the pattern and border onto the subfloor. Glue up to but not over this line and continue the pattern installation over the line to the nearest full block. Once the adhesive is fully cured, use a plunge saw with a guide rail to cut along the junction line between pattern and border. Either route a complementary groove into the cut side of the pattern around the perimeter to receive the tongue of the border elements or use biscuit joints to form a join between the patterned field and the border.



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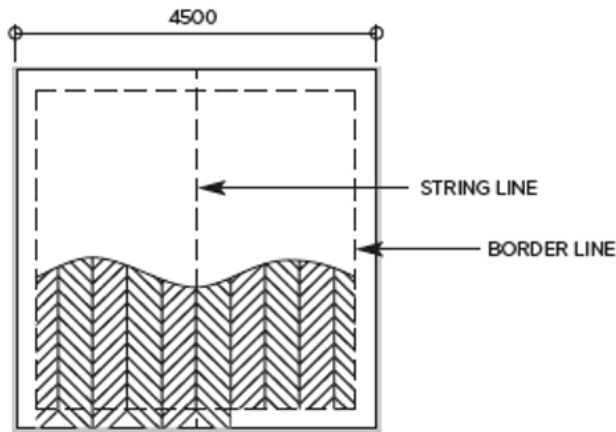
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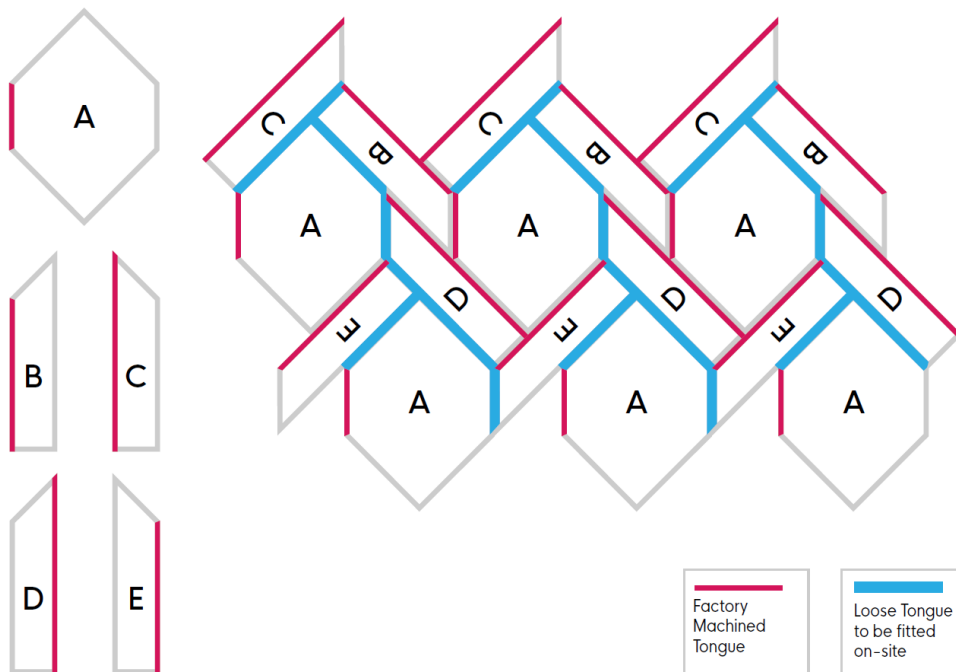
Border Installation:



Versailles panel installations (and installations of other repeating elements) should be planned to ensure even cuts are present to all perimeter walls. Once the layout of the floor is established, either a crown row may be installed as above, or the installation can be brought outwards from a defined square corner. This does not need to be in the centre of the room and temporary battens may be fixed to the subfloor to allow the elements to remain aligned during installation if preferred.

Patterns which use elements of differing size and shape, such as mansion weave, should be dry laid to define a central repeating line to be used as a crown row.

Mansion Weave Installation with loose tongues:



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Underlays

Where additional sound-dampening is required, bonded installations of wood flooring can be carried out over a high-density double-stuck underlay. Havwoods recommend the use of Strata rubber resilient acoustic mat 3mm, 5mm, 10mm as the preferred method of incorporating a sound-reducing resilient layer. This underlay is bonded to the substrate with Hav:Bond / Marldon MXA200 adhesive, which must be allowed to fully cure prior to timber flooring installation. The timber flooring is then bonded to the Stratabase layer with the same Hav:Bond / Marldon MXA200 adhesive.

Gun-applied flexible adhesives (Such as Marldon MXA200 600ml sausages) may be used with slatted underlays to install in a glue batten method. The pre-cut reservoirs in the underlay are filled with adhesive at the manufacturer's designated coverage before floor placement. This installation method is only appropriate for plank formats and is not suitable for patterned parquet installations.

Neither of the above underlay types offer a moisture vapour barrier or DPM. Where substrate moisture is measured at above 65%RH (approx. 2.0%CM), an appropriate moisture-suppressant primer or surface DPM must be installed prior to underlay or flooring installation.

UNDERFLOOR HEATING (UFH)

We advise using a water pipe UFH systems that is set into a screed or electric type set into a smoothing compound under wood flooring.

Electric cable systems must have a minimum of 8mm coverage above the cables using a reinforced smoothing compound.

Heating elements (pipes or cables) should not be in direct contact with the reverse of the plank or the underlay. This is to avoid over-drying of the timber materials through direct transfer of heat into the wood. Electric mats or water pipes that are placed on top of screeds in routed panels must have a distribution board fitted above them to ensure an even heat distribution to the underside of the engineered board. This is typically a layer of plywood, particleboard or dry-screed panel. Aluminium spreader plates sit below pipes and do not offer separation of heating elements from the underside of the flooring.

Note: Some systems can create hot spots (when rugs or other items not on feet are placed directly onto the wood floor) which will negatively affect the stability of the wood flooring.

To ensure the surface of the wood flooring does not exceed 27°C (81°F), we recommend temperature probe(s) be installed within the subfloor build up to regulate the surface temperature. These should be located in each room / zone.

Havwoods' engineered floors which are stated as being suitable for use over UFH systems can be installed on electric or water-fed underfloor heating systems BUT the construction and joint profile of the product will dictate suitable installation methods.



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Underfloor Heating systems must not generate temperatures above 27°C in the timber floor surface.

Plank and herringbone format floors with a click joint may be installed over UFH in a floating installation or fully bonded to the substrate.

Tongue and groove profile floors in all formats must be installed fully bonded to the substrate with a suitable flexible adhesive where UFH is present.

Chevron, Versailles panels and other parquet patterns must be bonded to the substrate, regardless of joint type, unless advised by Havwoods on a project-specific basis.

Havwoods solid timber floors are not suitable for installation over UFH.

There are 5 main types of UFH systems which are discussed below:

- Hot water pipe systems embedded in a screed
- Hot water pipe systems in overlay panels
- Hot water pipe systems beneath a suspended/structural deck
- Electric foil or carbon mat systems
- Electric loose cable or sticky mat systems

N.B: The final responsibility for the installation lies with the installer. If there is any doubt about product suitability, it is the duty of the installer to check with Havwoods staff before installing any Havwoods timber floor on an underfloor heating system.

Below recommended flow temperatures are general recommendations only and a Heating Engineer should be consulted regarding the R-value/TOG of the substrate construction and chosen floor covering when determining the exact flow or operating temperature of the UFH system.

FLOW TEMPERATURES OF >45°C ARE NORMALLY NOT APPROPRIATE WHERE TIMBER FLOORS ARE TO BE INSTALLED

HOT WATER PIPE SYSTEMS

The most common issues experienced with water pipe UFH systems are due to moisture ingress into the timber floor from the substrate or from excessive heat generated from the heating system. Generally, the flow temperature at the manifold for a water pipe UFH system should not be above 40°C for an embedded system or 35°C for an overlay panel or suspended timber deck system.

Havwoods recommend that surface temperature probes are installed to provide a cut-off when the surface exceeds 27°C.



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WATER PIPES EMBEDDED IN A SCREED: recommended flow temperature of c.40°C

Tongue and Groove profiled timber floors must be fully bonded with a suitable flexible timber floor adhesive (Hav:Bond / Marldon MXA200) when installed over UFH. This is because the effect of UFH on the D3 type adhesive normally used for floating installations of T&G floors can result in gapping between planks over time. Click System profiled plank format floors may be floated on an underlay or fully bonded to the substrate over embedded UFH. Click system herringbone pattern floors must be bonded to the substrate unless otherwise agreed with Havwoods.

Subfloor Moisture and Commissioning of UFH: it is a requirement that underfloor heating systems be commissioned prior to the installation of floor coverings. This is detailed in BS8201 and BS8204 national requirements. Failure to commission the UFH system by bringing the system up to temperature over several days, leaving to run for 5 days and then cooling down over several days means that deep-lying moisture may remain in the screed which will be released when the heating system is turned on. The release of this moisture can cause damage and floor failure. Always record substrate moisture levels prior to flooring installation.

Any substrate above 65%RH / 2.0%CM for bonded installations or above 75% RH/2.5%CM for floated installations requires a surface applied DPM prior to timber floor installation. Anhydrite screeds with UFH should not be above 0.3%CM.

It is Havwoods recommendation that an Epoxy (Marldon MXS140) or Polyurethane liquid DPM (Marldon MXS150) be applied to the screed surface prior to timber flooring installations over embedded UFH systems. Where a floating installation of a click plank is to be carried out, a 250 micron polythene layer that's overlapped by 150mm at joints and taped with vapour tape can be used in place of a liquid DPM if preferred before the underlay and flooring are installed.

WATER PIPES IN OVERLAY PANELS: recommended flow temperature of c.35°C

Tongue and Groove profiled timber floors must be fully bonded with a suitable flexible timber floor adhesive (Hav:Bond / Marldon MXA200) to an intermediate heat distribution layer when installed on overlay panel UFH. The proximity of the pipes to the back of the timber floor in this type of system can lead to hot spots on the floor surface and cause localised over-drying, shrinkage and cracking.

By introducing an intermediate heat distribution layer of min. 6mm thickness between the tops of panels/pipes and the timber floor, the heat will be more evenly spread, and these issues can be avoided. Suitable intermediate layers are; a fibre-reinforced flexible levelling compound, dry screed board, fibre-cement panels, plywood and P5 chipboard. A cementitious material (levelling compound or screed or fibre cement board) will provide lower thermal resistance and is preferable.

Click system profiled floors should also be installed onto an intermediate layer (as above), whether being floated on an underlay or fully bonded on overlay panel UFH systems.

N.B Any intermediate layer (other than a levelling compound) should be fixed with a suitable adhesive or screw-fixed at close centres of no more than 300mm to the overlay panel. An aggregated primer may be necessary prior to any levelling compound application in order to provide a physical key over panels.



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WATER PIPES BENEATH A SUSPENDED/STRUCTURAL DECK: *recommended flow temperature of c.40°C where a void is present between pipes and deck / recommended flow temperature of c.35°C where pipes are in contact with the underside of the deck.*

18mm+ thickness Tongue and Groove planks can form a structural deck by being nail or screw-fixed through the T&G as a hidden fixing directly to bearers/joists, provided that either a void is present between heating pipes and the underside of the deck or the pipes between bearers are encased in a cementitious compound. If pipes will be in contact with the underside of the deck, then a structural layer of min.18mm thickness T&G screed board, Plywood or P5 chipboard should first be installed.

Any T&G plank which is <18mm in thickness or is in a format other than a plank (i.e., a patterned floor) must be fully bonded with a suitable flexible timber floor adhesive (Hav:Bond / Marldon MXA200) onto a structural layer of min.18mm thickness T&G screed board, Plywood or P5 chipboard.

Click system profiled plank format floors should also be installed onto a structural layer (as above), whether being floated on an underlay or fully bonded on this type of UFH system. Click system herringbone pattern floors must be bonded to the substrate unless otherwise agreed with Havwoods.

ELECTRIC UNDERFLOOR HEATING SYSTEMS

The most common issues experienced with electric UFH is the wrong type of joint profile or floor format being chosen to suit the type of UFH system or excessive temperatures being generated from a system with too high output for timber flooring.

Always choose an Electric System that has an incorporated cut-off to prevent surface temperatures of 27°C being exceeded.

FOIL MATS & CARBON FILMS: recommended output of <150w

Click System profiled plank format floors may be floated on an underlay over electric foil mats or carbon film UFH.

Tongue and Groove profiled timber floors are not normally appropriate with this type of system. The effect of UFH on the D3 type adhesive normally used for floating installations of T&G floors can result in gapping between planks over time. Patterned floors must be fully bonded to the substrate and that is not possible here unless 12mm Jumpax CP is installed over the foil mat to provide a floated substrate for bonded installations.

LOOSE CABLE & STICKY MAT SYSTEMS: recommended output of <200w

All products listed by Havwoods as appropriate for installation over UFH are suitable for installation over these types of system. Cables should be installed to the subfloor and then covered with a fibre-reinforced levelling compound to a suitable depth so that a minimum of 6mm depth of levelling compound is present between cables and the underside of the timber floor. The timber floor can then be installed to this substrate.

Tongue and Groove profiled timber floors must be fully bonded with a suitable flexible timber floor adhesive (Hav:Bond/ Marldon MXA200) when installed over UFH.

Click System profiled plank format floors may be floated on an underlay or fully bonded to the substrate this type of UFH. Click system herringbone pattern floors must be bonded to the substrate unless otherwise agreed with Havwoods.



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Note: Wall mounted, or free-standing thermostats placed >500 mm off the floor surface can allow higher temperatures at floor level.

The care manual handed to the end user should highlight the requirement for heating systems to be increased gradually when moving into the colder months.

Information on the thermal conductivity/resistance of Havwoods products is available from Havwoods.

Any information on the function of underfloor heating systems or exact calculations relating to thermal resistance or conductivity of the flooring build-up as a whole must be provided by the supplier of the heating system or the heating engineer.

We recommend using alternative heat sources to the UFH during the installation period and that UFH systems should remain off for the installation period and for at least 48 hours after the installation. When bringing the UFH back into operation, increase the temperature by a maximum of 2°C (3.5°F) each 24-hour period until the normal room temperature is reached.

Note: This also applies when using the UFH after periods of not being used. We would also recommend a cool down period using the same formula 2°C (3.5°F) each 24-hour period until switched off. Always set the heating to a frost temperature of minimum 12°C (54°F) when not in full usage.

COMMISSIONING & USAGE of HEATING, VENTILATION and AIR CONDITIONING (HVAC) SYSTEMS

This relates specifically to the transition from construction-phase environmental conditions to normal operating conditions where Havwoods timber floors are to be installed.

The concern relating to this project type is detailed in the expected Equilibrium Moisture Content (EMC) in the timber material as dictated by its environment:

Construction-Phase Environment Example

Temperature: 15°C

Ambient Relative Humidity (RH): 60%

EMC: 11.14%

Operational Environment Example

Temperature: 21°C

Ambient RH: 35%

EMC: 6.95%

Under the example transition above, the timber flooring will lose over 4% of moisture content once the environmental control system is brought into operation. This equates to ~1% of dimensional contraction (typical 0.22% dimensional change per 1% change in EMC). If this transition is made too quickly, the timber will be subjected to a high level of stress and this can result in surface cracking, gaps between timber elements, distortion of timber elements and other undesired actions.



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Because of this, there is a requirement to bring the heating/ac system into operation slowly in order to allow staged adaptation of the timber to the environment. This should be done as follows:

- Environmental conditions measured and recorded, and the temperature of the system set to that which is present in the environment at that time.
- The system should be allowed to operate at this temperature for at least 24 hours. RH should be monitored and recorded in the environment in this time.
- No more than 2°C increase in the system per 24-hour period with recordings to be made of RH.
- System brought up to operating temperature with each stage recorded and documented over several days with RH to also be recorded.
- An environmental measure should be in place (such as a LogTag temperature and humidity device) to monitor RH and provide an alert when RH levels fall below 35% so that plants or other moisture sources may be introduced.

The optimum performance of the timber flooring will remain between 40–60% RH and between 18–22°C due to the 8% ($\pm 2\%$) moisture content at the time of manufacture. The above process is designed to prevent failure of the timber flooring under sudden exposure to altered environmental conditions. BS8201:2011 states that acceptable seasonal gapping can be expected.

Requirements for temporary heating (during the installation at construction phase) in colder months to be operational 24 hours a day remain. All efforts should be made to achieve temperatures of 18°C at the time of timber flooring installation and until the project completion. If RH levels are found to be above 65% at the time of installation, works should be postponed until ventilation and/or dehumidifiers have been introduced in order to provide suitable installation conditions.

FLOOR PROTECTION

When Havwoods floors are installed in a construction environment, they should be adequately protected in order to prevent damage from any following trades.

Havwoods recommend that a layer of building paper or another suitable breathable membrane is first installed prior to an impact protection layer. The building paper should be installed over the whole floor area and overlapped at joins before being taped on the surface, ensuring not to tape the protection to the wood floor surface. An impact protection layer of fire-retardant hardboard can then be installed over the building paper, leaving the hardboard 50–100mm short of the perimeter to allow ventilation of moisture.

Caution should be taken if using corrugated plastic floor protection (i.e. Corex) because this is non-permeable to moisture and can cause construction moisture to be trapped in the timber, leading to excessive expansion or telegraphing of the floor surface. If this type of protection must be used, always install a layer of overlapped building paper (or another suitable breathable layer) first and ensure Corex is not left on the floor for any extended period.



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Any floor protection should be lifted regularly, ideally every 2-3 weeks, to allow ventilation to the floor on projects with elongated periods between flooring installation and project completion.

Never tape flooring protection directly to the flooring surface because tape adhesive can cause irreparable damage to the floor finish. Overlap paper layer and tape sheets to one another and/or walls and tape impact protection to the paper layer.

Never run underfloor heating systems while floor protection is in place because the protection layers can trap moisture or generate elevated surface temperatures, potentially leading to problems such as excessive expansion or over-drying and shrinkage of the wood material respectively.

CARE & MAINTENANCE

Havwoods timber floors are designed to withstand the wear and tear of day-to-day life. Because wood is a natural material, it will react to the environment it is installed in. Dry environments will cause a floor to lose moisture, and this can lead to issues such as gapping between planks or cracks between growth rings. Humid environments will cause moisture to be gained and this can result in expansion of the floor. Using the correct cleaning products helps a wooden floor to adapt to its surroundings while still looking and performing as required.

Havwoods flooring produced in a range of finishes. Each finish has a specific range of products designed to clean and maintain the surface and optimise performance. Here is a list of finishes and the relative cleaners and maintainers we recommend:

- LACQUER FINISHES

- Cleaner: MARLDON MULTICLEANER (alternatively Bona Cleaner)
- Maintainer: Bona Polish Matt/Gloss (depending on desired sheen level)

- UV OIL/HARD-WAX OIL FINISHES

- Cleaner: MARLDON CLEANCARE (alternatively Osmo Wash & Care)
- Maintainer: MARLDON LIQUID WAX CARE Clear/White (alternatively Osmo Liquid Wax Cleaner)
- OR Maintainer: Waterborne maintenance oil where oil-based liquid wax care is not desired e.g. Junckers Maintenance Oil or Bona Oil Refresher.

- NATURAL OIL FINISHES

- Initial treatment is required after installation with MAINTENANCE OIL or HARD-WAX OIL
- Cleaner: MARLDON CLEANCARE (alternatively Osmo Wash & Care)
- Maintainer: MARLDON LIQUID WAX CARE Clear/White (alternatively Osmo Liquid Wax Cleaner)
- OR Maintainer: Waterborne maintenance oil where oil-based liquid wax care is not desired e.g. Junckers Maintenance Oil or Bona Oil Refresher.

- UNFINISHED PRODUCTS

- Supplied as raw wood and require sanding, filling and finishing after installation
- Finish: LACQUER, HARD-WAX OIL OR OIL – TO BE APPLIED BY CONTRACTOR



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- Cleaner: AS APPROPRIATE TO CHOSEN FINISH
- Maintainer: AS APPROPRIATE TO CHOSEN FINISH

PREVENTATIVE MAINTENANCE

Abrasive particles of dirt and grit trafficked on to a wooden floor can be very abrasive and seriously shorten the lifespan of any treatment. The floor's surface will quickly become dull due to scratches and the wood may be affected by the ingress of moisture and stains. Matting placed at external entrances is essential in prolonging the appearance and life of the floor, whilst reducing the frequency of refurbishment. It is important that matting is of a type which can remove grit and absorb moisture. Barrier matting should be regularly cleaned, and additional matting may be required during periods of snow or heavy rain.

It is also very important to ensure that the floor is protected from moveable furniture, such as tables and chairs, and a simple solution to this is to protect the floor by applying felt furniture feet to underside of the furniture legs. Regularly check and clean the felt feet to avoid / reduce embedded grit or particles from scratching the wood surface.

Stiletto heels can indent timber flooring due to the very high point loading this type of footwear applies to the timber surface, especially if the metal pin within the heel becomes exposed.

Spillages on wooden floors should always be removed as quickly as possible.

REGULAR / DAY-TO-DAY CLEANING

An effective maintenance programme will keep the floor clean and looking as good as possible. The following information is designed to provide a starting point for such a programme and is appropriate for residential and commercial installations. In commercial installations with high usage, regular maintenance will be combined with routine specialist commercial maintenance from a flooring contractor.

- Regularly vacuum the floor to remove dust, lint and animal hair.
- Fill the SPRAY MOP reservoir with the correct dilution of cleaning solution for the floor finish type.
- There will need to be multiple mop heads so that these can be washed and changed regularly, ensuring contamination is being removed from flooring during the cleaning process.
- Spray mops ensure that there isn't standing water on the floor surface for any prolonged period, it is important to avoid this wherever possible.



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MAINTENANCE APPLICATION (RESIDENTIAL)

Apply a surface maintainer periodically (typically every 6-12 months) to saturate the floor surface to prevent staining and limit visibility of superficial marks and scratches. Marldon Liquid Wax Care can also be used on oiled floors and Bona Refresher on Lacquered floors as a spot cleaner for finishes to remove scuffs and residues from the floor surface. In high usage areas such as kitchens and entrance hallways, maintenance application may be required more regularly.

- Apply a small amount of product to the floor and spread evenly with a new flat microfibre mop head.
- Work across the floor in the direction of the planks where possible until the whole floor is evenly covered.
- Work around furniture other than chairs and rugs, which should be moved.
- Avoid foot traffic until the floor surface is dry, normally 30-60 minutes.

MECHANICAL CLEAN AND REFRESH

Periodic Mechanical Cleaning is necessary in high traffic environments and often in construction projects to remove contamination from the grained texture of the wood and ensure that contamination that builds under heavy usage is lifted from the floor before a maintenance coat is applied to refresh the floor finish.

- Use a scrubber-drier machine with rotating pads or brushes such as an iMop, Bona Power Scrubber, Pallmann Turbo Scrubber to clean both across the grain of the wood and in line with the grain of the wood. These machines dispense cleaning solution, and this cleaner is formulated for machine application. Suitable low-foaming cleaners for this application are Marldon MXC710 & MXC735 as well as Bona Deep Clean Solution and Osmo Wash & Care. Dispense the cleaner onto the floor, scrub with the rotating brushes and then use the machine suction to lift the fluid from the surface. Use a flat mop to the edges of the room where standing water may be left to absorb this. Work in areas of 10-20m² at a time so that standing water isn't present on the flooring for prolonged periods and the cleaning solution doesn't dry out before the scrubbing process is complete. Repeat if necessary.
- Allow the floor to fully dry before applying any maintenance materials.
- Once fully dry, use a flat applicator mop to apply either Marldon Liquid Wax Care (oil-based product) or Junckers Maintenance Oil (water-based product) for oiled floors OR Bona Refresher for lacquered floors in line with the grain of the planks at a consumption of 80-100m² per litre for Liquid Wax Care or 30-50m² per litre for Junckers Maintenance Oil & Bona Refresher (if the floor is more porous consumption may be lower). Pour the maintenance product down in small amounts directly onto the floor and immediately spread out until the surface has a saturated sheen. Once dry (30-40 mins under normal conditions) the sheen will reduce and retain the original sheen of the floor.
- UV OIL & OIL FINISHES ONLY - If there are areas where the Oak colour can be seen through an oil finish, the correct colour of Osmo or Saicos Hard-Wax Oil (or equivalent) may be used to top up the floor finish to add a greater level of pigment and a higher level of surface build. This is best applied by brushing on to the surface and buffing the floor with a white floor pad and oiling cloth either manually for small, localised



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areas or using a low-speed rotary scrubbing/polishing machine for larger areas. Always do a test patch to approve colour and ensure adhesion before applying a hard-wax oil finish to the wider floor area.



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