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Welcome to the 2022 Guide to Contract Flooring

QUALITY BY ASSOCIATION

The *CFA Guide to Contract Flooring* is a unique document for anyone involved in our industry. Written as a plain English guide, it sits somewhere between the British Standard and manufacturers' recommendations, covering the installation of all the most commonly used materials in one volume.

It naturally refers to British Standards as best practice, but also discusses some of the background to provide a real-world insight into how to successfully complete a quality installation of a floor covering.

As you might expect, this latest version contains significant innovation in a number of areas, giving the reader the latest information and best practice for the installation of the core product groups within "soft" floor coverings.

Its appeal is widespread, with flooring contractors, architects and designers alike using it as a reference document and common understanding. It works both as a whole document and also individual data sheets and is available in printed as well as digital format from our website **www.cfa.org.uk**

Written with the help and cooperation of CFA manufacturers' technical experts as well as input from CFA contractor members and specialists in areas such as sustainability and waste management, it represents an otherwise difficult to access knowledge base.

To those involved in its production, too numerous to mention individually, I would like to take this opportunity to offer sincere thanks. Not only on behalf of the CFA, as this forms one of the most important documents in our library, but also on behalf of all those who will use it to improve the quality of installation.

The support and expertise captured in the *CFA Guide to Contract Flooring* gives another insight into why it is important to use a CFA member to supply and install your floor.

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All members have passed the CFA membership vetting process and are all established quality companies offering high standards of installation. Through the CFA, they all have access to up-to-date Technical, Environmental and Quality Standards and all adhere to the Contractors Code of Conduct.

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THE CFA: WHO ARE WE?

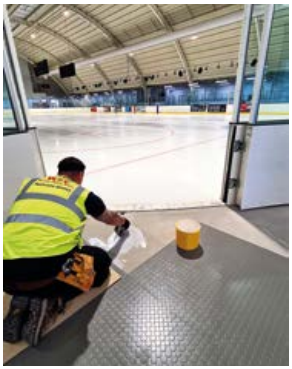
The Contract Flooring Association is the leading independent professional voice of the Contract Flooring Industry. The CFA provides members and their clients with a wealth of advice to assist with installation including:

- **British Standards Codes of Practice**
- **Employment law**
- **Health and safety**
- **Insurance**
- **Technical support**
- **Training**
- **CFA Guide to Contract Flooring**

With such a high level of commitment from so many companies and individuals, the CFA has a wealth of resources at its fingertips. It is this breadth and depth of information that makes it so much more than just a trade association.

PDF

Search for a CFA Member in your area and download our "Why Choose a CFA Member?" PDF leaflet. See the Downloads section at www.cfa.org.uk



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THE CFA: OUR OBJECTIVES

The CFA aims to support its members in developing sustainable, highly productive businesses that supply and install commercial floor coverings. Recognised as the voice of the industry, we achieve this by providing essential business services and expert information that promote industry standards, professionalism, quality, safety, and training.

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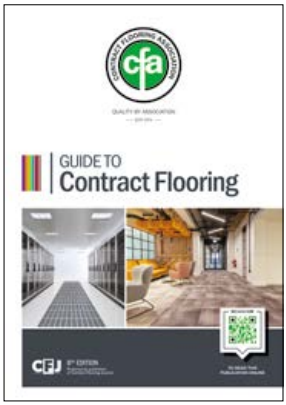

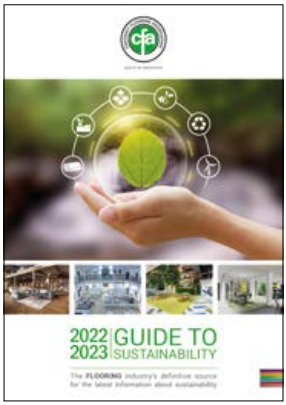

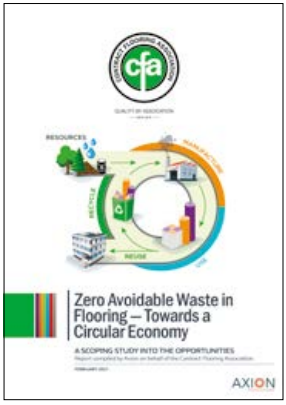

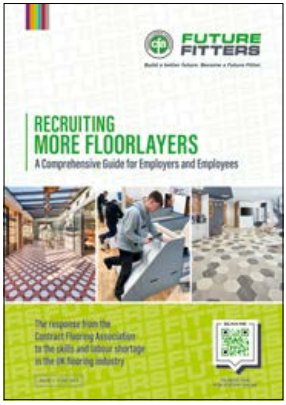

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1 | Site Requirements

The appearance and performance of floor coverings are determined to a large extent by the quality of the prepared base or screed on which they are laid. Those responsible for the design and construction of the subfloor must ensure that it meets the requirements for hardness, soundness, levels and surface regularities, dryness and other design parameters before flooring covering installation is commenced.

The quality of the installation also depends on attention being given to those other building related products, and work processes as well as the general conditions provided during installation which may directly affect, the finished flooring. Any incompatibility with other trades or unsuitable conditions of work can restrict the ability of the floor layer to provide a neat, well adhered or installed, satisfactory and lasting floor finish.

Clear contractual arrangements at the beginning and effective communications throughout the contract between all parties will minimise contention and maximise customer satisfaction.

Whilst the need to provide the right conditions through specification is obviously of first importance, only by careful consideration being given to on-site quality control of these and other works, will the expected advantages be realised.

ELIMINATING CONSTRUCTION MOISTURE

Before flooring coverings are laid it is necessary not only to ensure that the subfloor is constructed to prevent moisture reaching them from the ground but also to ensure that enough excess water within the subfloor, used in or during the construction process, is given time to evaporate — the time for this must be taken into account at the planning stage. Estimated drying times are only very approximate, but research has shown that (under ideal conditions) screeds up to 50mm thick will take approximately 1 day per mm to dry under good drying conditions (a warm, well-ventilated room) i.e. 20°C and <65% RH. For screeds or concrete of greater thicknesses and particularly power floated finishes, this timescale increases significantly and can extend into many years.

A British Standard hood test box with built-in digital hygrometer is being used to determine if the concrete solid base is sufficiently dry

Often project schedules do not allow for lengthy drying times and consideration needs to be given at the design stage to the use of surface DPMs.

Before the application of the floor finish a solid (cementitious or similar) base must be sufficiently dry to show a hygrometer reading not greater than 75% Relative Humidity when tested in accordance with the British Standard Code of Practice.

Equally, timber bases should be at equilibrium moisture content so that the state of dryness it attains in normal service conditions are in place at the time it is covered.

SUBFLOOR SURFACES

Floor screeds and all other in-situ floor bases need to have a surface regularity which complies with the requirements of **BS 5325, BS 8203, BS 8204, BS 8201 and BS 8425** or other relevant Standards.

Directly finished concrete bases frequently do not comply with the required surface regularity or the smoothness needed to receive a floor finish. In addition, power floated finishes may

Mechanical surface preparatory work may often be required to create a suitable subfloor surface

provide a surface too dense to allow the flooring adhesive to dry and make a satisfactory bond.

Mechanical surface preparatory work may often be required to create a suitable subfloor surface. This will ensure that the finished floor covering adheres properly, realises its final properties and is durable enough to minimise the potential risk of failure.

Typical subfloor problems include uneven joints, high spots, contaminants, worn coatings, sticky residues, existing flooring, and friable substrates. Some new solid subfloors (such as concrete or anhydrite) may have a surface laitance which needs to be removed.

Methods such as Shotblasting, Scarifying, Grinding and Multi-stripping **(see Section 4)** may need to be carried out to deliver a clean area with the required surface regularity suitable for the application of the new flooring material.

Those responsible for the design and construction of the subfloor may need to consider and specify preparatory work to the subfloor surface before instructing the flooring contractors to commence work.

PROTECTION OF FLOOR SURFACES (see section 18)

Floor screeds and bases are not wearing surfaces and as soon as possible after laying should be protected against damage to the surface and contamination by other trades. Foot traffic from all trades can cause considerable surface abrasion and contamination. The effects on the flooring application are numerous, including:

- **Wear of the screed surface weakening aggregate fixation and affecting adhesive spread**
- **Concrete and brickwork contractors working on the subfloor and failing to clean off residues**
- **Plaster and paint being dropped onto the subfloor contaminating the surface**
- **Use solvent-based products for removing paint, oil, or other contaminants.**

Any areas of the screed surface damaged due to lack of protection or any other reason MUST be repaired before the flooring contractor commences work, although this cannot be accepted as an equal alternative to screed protection.

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FITTINGS IN FLOOR SURFACE

These are fittings placed within the floor screed which can considerably affect the quality of the flooring installation. They include:

- **Construction joints**
- **Service ducts and duct trays or covers**
- **Drainage outlets**
- **Matwells**

It is important that where surface fittings are placed within the flooring base, or where construction arrangements affect the continuity of the flooring, consideration needs to be given to the selection of the most appropriate type of fitting to suit the flooring being installed. It is also necessary to ensure that the installation of such fittings is carried out in such a manner which will allow neat and efficient placing of the flooring, for example, by selecting duct or drainage fittings in sizes to match a tiling module.

CONSTRUCTION JOINTS

It is sometimes wrongly supposed that a construction joint can be taken to the surface of the floor screed, a smoothing underlayment spread over the top to mask the joint and then the flooring laid across that. There is no doubt that if this procedure is carried out, the flooring will fail. Treatment of a construction joint must allow for a metal upstand on each side of the joint, or similar propriety system which needs to be accurately fitted to finish sufficiently above the screed surface to allow for the thickness of the flooring, so that fitting can be carried out neatly and tightly.

SERVICE DUCTS

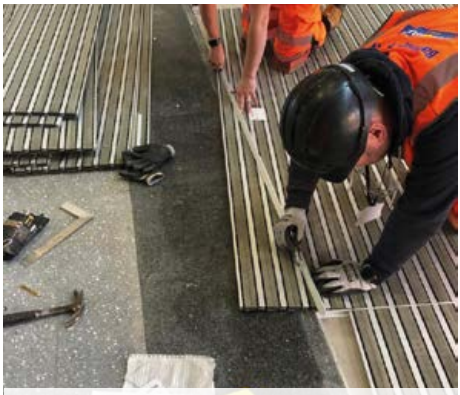
Access covers, either individually or in continuous duct format, used in conjunction with flexible flooring must be installed in the screed allowing sufficient upstand for the thickness of flooring. The cut edge of the flooring is vulnerable to traffic and the effects of water seeping into the underfloor. Steps should be taken to anchor it securely. Screeding can rarely be carried out with sufficient precision to allow the edge to be left uniformly proud when the underfloor has cured. It is preferable to use a cover and frame modified to accept the flooring material. This can have a clamping edge or an accurate upstand formed at the periphery of the frame giving a precise level for the screed. The flooring is fed over a clamping edge prior to being secured mechanically. Alternatively, an upstand, incorporating a vinyl insert to which the flooring is welded may be used to form a completely flat, watertight joint.

DRAINAGE OUTLETS

Some floor areas, for example in commercial kitchens, hospitals, leisure facilities, production areas or laundries are subject to wetting, far in excess of that produced by normal cleaning. To clear this surface water efficiently, gratings are fitted in the subfloor, over channels, or point-drains. Non-corroding materials should be used. To prevent water penetrating the screed at the vulnerable edge between the flooring and the outlet, the flooring should be clamped in place with a separate flange or cover strip. Alternatively, a grating with a PVC frame may be used to which the flooring can be seam welded.

MATWELLS

Matwell frames are recessed into the subfloor to accommodate an entrance flooring system. The matwell frame should be positioned to ensure a smooth transition from the entrance flooring system, across the matwell frame and then onto the adjacent interior floor finishes in accordance with **BS 3000-2.**



Matwell frames shown recessed into the subfloor to accommodate the entrance flooring system

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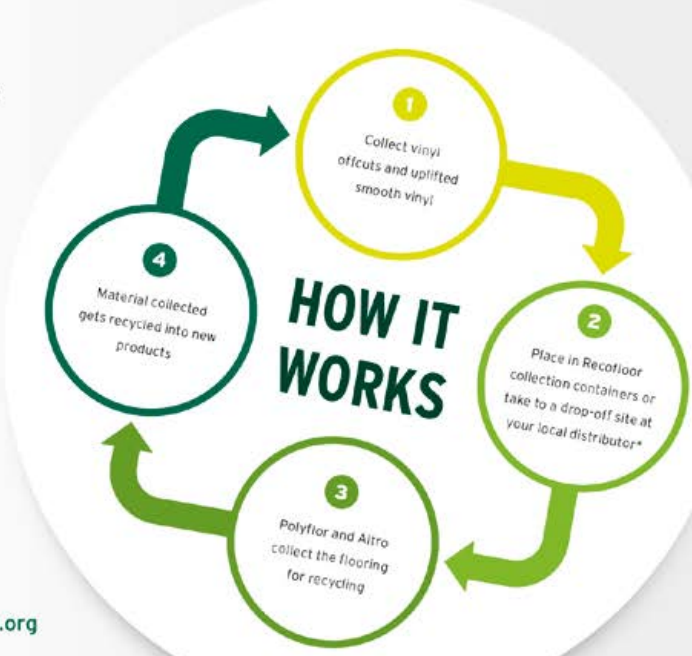

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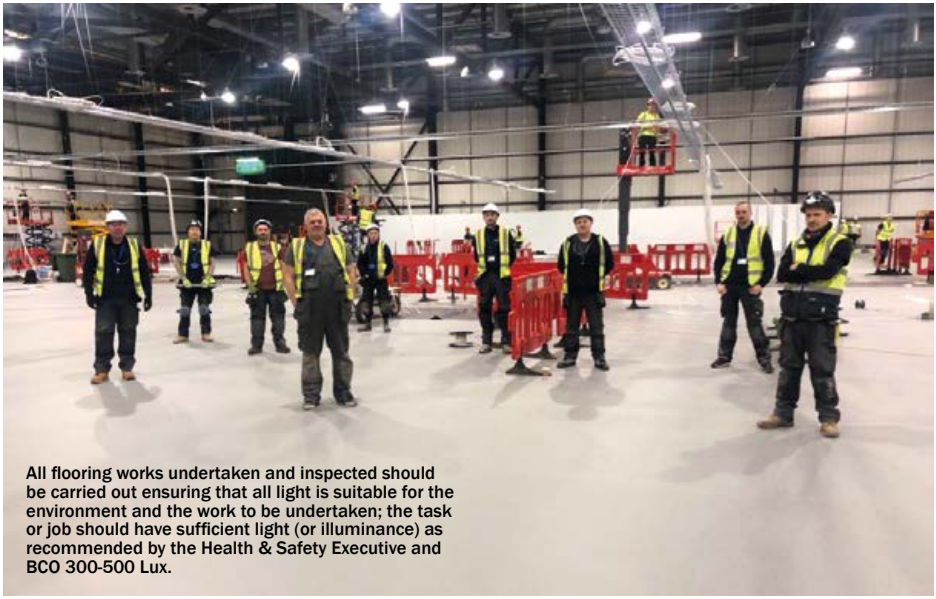

All flooring works undertaken and inspected should be carried out ensuring that all light is suitable for the environment and the work to be undertaken; the task or job should have sufficient light (or illuminance) as recommended by the Health & Safety Executive and BCO 300-500 Lux.

REQUIRED ATTENDANCES

Access and hoisting facilities for the safe unloading and distribution of flooring and accessory materials. Such provision to be made available on multi-storey work for all appropriate floor levels as the work proceeds. This should include any special storage for flammable adhesives and any other volatile substances as required.

Provision of dry, clean, ventilated, waterproof, warm, weatherproof and secure storage area(s). Floorcoverings and associated materials such as plywood, chipboard and subfloor materials to be unloaded with care and stored according to manufacturers' instructions.

Good standard of electric lighting to work areas when required. Electric power, generally at 110V but often at 230V floor sanding machines, to be made available for using power tools.

Provision of ventilation throughout and after installation of flooring. If required, the use of de-humidifiers should be considered to remove excess moisture.

Any conflicting overhead work and preliminary work, such as the fixing of floor sockets for service plugs, should be completed prior to flooring installation commencing in any area of work.

ROOM TEMPERATURE, HUMIDITY AND LIGHTING

BS 5325, BS 8203, BS 8204 and BS 8425 advise that for the installation of most floorings, a steady work area temperature of between 18 °C to 27 °C should be maintained throughout the period of the installation of the flooring.

For solid wood flooring **(BS 8201)** the temperature and humidity must be as close to the working temperature and humidity in which the floor will be used.

They also advise that this temperature should be attained 48 hours prior to the installation,

so that floorings can be kept in the room and brought to room temperature (acclimatised) before installation. It is equally important to maintain those temperatures for 24 hours after installation or until the adhesive has cured.

With fully flexible vinyls and linoleums flexibility is important for a good and safe installation. At low temperatures these floorings will harden up making them difficult to apply and with rolls of floorings, difficult to unroll (without cracking) and achieve a satisfactory lay-flat condition.

In all cases, the minimum subfloor surface temperature should be no less than 10°C.

It is essential with most floor coverings that they are laid in the same humidity conditions as would be expected to be prevalent in use. Temporary heating equipment which may be used to warm buildings to achieve the required temperature can also increase the humidity to a markedly higher level than would normally be expected. Also, turning off heaters at night in cold weather will lead to condensation as the air cools, causing water pooling on the surface of the floor.

The fitting of floor coverings in a new building prior to the running of heating and/or humidification systems is a major cause of eventual dimensional stability problems and must therefore be avoided.

Materials such as levelling compounds and liquid DPMs are also susceptible to low temperatures, which can extend drying times, causing programming issues and possible product failure.

All flooring works undertaken and inspected should be carried out ensuring that all light is suitable for the environment and the work to be undertaken; the task or job should have sufficient light (or illuminance) as recommended by the Health & Safety Executive and BCO 300-500 Lux.

CLEAR AND CLEAN WORK AREA

Each work area should be clear of all other trades and their materials to allow unhindered access for the floor layer. Any floor area to be fitted must be clear of rubbish with any surface contamination removed as directed by the manufacturers of the next product to be applied. This includes plaster, filler, paint, and firestop with these areas initially scraped to loosen adhered surface contamination before vacuuming prior to any flooring fitting work taking place.

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3 | Health and Safety

GENERAL

There are many pieces of legislation aimed at ensuring the health and safety of people at work in the flooring industry but probably the main ones are: The Health and Safety at Work Act 1974 (HASAWA) primary legislation in the UK, the Control of Substances Hazardous to Health Regulations 2002 (COSHH) and the Construction (Design and Management) Regulations 2015(CDM). These regulations and their many amendments have implications for all people at work but especially for those involved in manufacturing, importing or supplying any substance for use at work that are also subject to Registration Evaluation Authorisation of Chemicals (REACH).

From the Flooring Industry's point of view, they are relevant when using any products but particularly smoothing underlayments, cleaning materials, detergents, adhesives, polishes, seals, etc., and even tools.

It is not possible in this guide to cover all the information included in legislation, but it is essential that all involved in specification, supply and installation of floor coverings understand what is required or have expert guidance. The following is offered as a brief introduction to the scope of the various requirements and as a warning of some of the major pitfalls awaiting those who do not make themselves aware of their responsibilities. Further information on all UK requirements can be found at the Health and Safety Executive (HSE) website: www.hse.gov.uk

THE HEALTH AND SAFETY AT WORK ACT 1974 (HASAWA)

HASAWA 1974 is the Act that governs all health and safety aspects for activities at work, including the use of any substances/tools that may involve a risk to the health or safety not only of employees but also anyone else in an area where people are working. This Act is very far reaching; it places responsibilities on employers and employees to ensure the safety of everyone who may be affected by their acts or omissions at work by providing safe equipment, safe working practices, etc., and adequate information on any substances that may constitute a risk to health or safety.

It is in this last area that the chemical regulations REACH and COSHH makes a significant impact, requiring the supplier of any substance or mixture should provide the necessary information. In effect this means that anybody who is supplied with a substance or mixture for use at work must be provided with the necessary information by the person or company who supplied it to them. It is not enough to have the information available; the law requires that it be given to people who are supplied with the product. This also means that if there is a significant change in the substance or the relevant information, updated information must be provided to all those who have been supplied the product or request it.

This information is initially provided by the manufacturers through their Safety Data Sheets and, to comply with the law, must be supplied to their customers directly. The responsibility for the onward transmission of this information passes to whoever is next in the supply chain, e.g., the flooring distributor. Most manufacturers are very happy for their health and safety information to be copied and used for this purpose but neither can they take on the responsibility of supplying the information further down the chain, nor would it remove the direct supplier's own responsibility if they did so.

Other legislation ensures that all dangerous substances supplied for people to use or transport around the country are packaged and labelled in a way that protects them and warns them of their potential hazards. The regulations provide a standard means of classifying dangerous materials as required e.g., Highly Flammable, Corrosive, Harmful, etc., and stipulates the requirements for their packaging and the minimum information that

must be provided on any labels. Pictogram labels provide a very useful warning of the potential hazards presented by a substance; one or more pictograms might appear on the labelling of a single chemical along with a brief summary of the hazards and precautions. These pictograms have recently changed to align with the Global Harmonised System (GHS) under the EU Classification Labelling and Supply Regulations (see Appendix)

These labels are not intended to provide full details of the safety information on a product but must be read in conjunction with the relevant Safety Data Sheet. One important aspect that is often overlooked is that if any dangerous goods are transferred from the original containers for ease of use, each new container used must be labelled in accordance with the regulations.

The COSHH regulations should be used to ensure that all substances hazardous to health are not used until the risks of doing so have been adequately assessed and the necessary precautions taken.

NOTE: It should be noted that under COSHH, the word substance has a very broad meaning — including mixtures, micro-organisms or natural materials, such as flour, stone or wood dust.

Again, these are complex regulations but basically they require that before an operation is carried out, a full assessment is made of the hazards presented by the materials to be used and the risks involved in using them to carry out the operation in question. Having identified the problems, the operation must be planned, and both equipment and facilities provided to ensure that anyone in the area is protected against the health hazards presented by the materials to be used.

The Safety Data Sheets supplied by manufacturers provide the basic information on the substances to be used, from which the COSHH assessment is made. The assessment must take into account the location in which the work is to be done, ventilation, quantities of materials to be used, etc., as well as the skill and knowledge of the operatives. The assessment must relate to each specific job and getting this right, properly recorded and the work properly controlled forms an increasingly important part of any contract. It is clear, therefore, that a generalised assessment cannot be made.

CDM 2015

Regulation 8 sets out a number of requirements on anyone working on a project with certain responsibilities. They relate to appointing designers and contractors, the need for cooperation between duty holders, reporting anything likely to endanger health and safety and ensuring information and instruction is understandable.

CDM 2015 regulations impose various duties on contractors as follows:

Principal contractors — contractors appointed by the client to coordinate the construction phase of a project where it involves more than one contractor.

- **Plan, manage, monitor and coordinate health and safety in the construction phase of a project. THIS INCLUDES:**
- **Liaising with the client and principal designer**
- **Preparing the construction phase plan PDF**
- **Organising cooperation between contractors and coordinating their work**

MAKE SURE:

- **Suitable site inductions are provided**
- **Reasonable steps are taken to prevent unauthorised access**
- **Workers are consulted and engaged in securing their health and safety**
- **Welfare facilities are provided to comply with CDM 2015 Schedule 2**

Contractors — those who carry out the actual construction work. Contractors can be an individual or a company.

- **Plan, manage and monitor construction work under their control so it is carried out without risks to health and safety**
- **For projects involving more than one contractor, coordinate their activities with others in the project team — in particular, comply with directions given to them by the**

principal designer or principal contractor

- For single contractor projects, prepare a construction phase plan PDF

Further information on the duties of other parties and detailed explanation of the regulations see: **www.hse.gov.uk/construction/cdm/2015/summary.htm**

REACH

REACH is a European Union regulation concerning the Registration, Evaluation, Authorisation and restriction of Chemicals. It came into force on 1st June 2007. Following the transition period of the UK withdrawal from the EU, the EU REACH Regulation was brought into UK law under the European Union (Withdrawal) Act 2018. REACH, and related legislation, has been replicated in the UK with the necessary changes to make it operable in a domestic context. The key principles of the EU REACH Regulation have been retained. The domestic regime operating in the UK from 1 January 2021, is known as UK REACH.

As of 1st January 2021, the UK REACH and the EU REACH regulations operate independently from each other. Companies that supply and purchase substances, mixtures or articles to and from the EU/EEA/Northern Ireland and Great Britain (England, Scotland and Wales) will need to ensure that the relevant duties are met under both pieces of legislation.

Under the Northern Ireland Protocol, the EU REACH Regulation continues to apply to Northern Ireland, while UK REACH will regulate the access of substances to the GB market.

Further information on UK REACH can be found on the HSE website **www.hse.gov.uk/reach**

Other regulations affect the flooring industry, but the following are particularly relevant to flooring contractors:

- **Control of Noise at Work Regulations 2005 (Noise Regulations 2005)**
- **Manual Handling Operations Regulations 1992**
- **The Work at Height Regulations 2005**
- **The Personal Protective Equipment at Work Regulations 1992 and the Personal Protective. Equipment (Enforcement) Regulations 2018 give the main requirements**
- **The Control of Vibration at Work Regulations 2005 (the Vibration Regulations)**
- **Provision and Use of Work Equipment Regulations 1998 (PUWER)**
- **The Electricity at Work Regulations 1989**
- **Health and Safety (Consultation with Employees) Regulations 1996**
- **Reporting of Injuries, Diseases and Dangerous Occurrences Regulations 1995 (RIDDOR)**
- **Waste Management Regulations**
- **Hazardous Waste Regulations**
- **The Carriage of Dangerous Goods and Use of Transportable Pressure Equipment Regulations 2009 ("CDG 2009")**
- **The Dangerous Substances and Explosive Atmospheres Regulations 2002**

The Regulatory Reform (Fire Safety) Order 2005 covers fire safety requirements, including prevention, precautions, detection, alarm, firefighting equipment, emergency procedures, etc., which place responsibilities on everyone involved in a construction project, including employees. Fire Risk Assessments should identify potential fire hazards and determine measures to ensure the safety of people in a building in the event of a fire.

The Control of Asbestos Regulations 2012 is especially relevant to anyone who has control of, or obligations under a contract or tenancy for the maintenance/repair/refurbishment, etc., of non-domestic premises. Owners, occupiers and those with responsibility for non-domestic premises which may contain asbestos have a legal duty to manage the risk from this material and/or a duty to cooperate with whoever manages that risk.

The duty holder shall ensure that a suitable risk assessment is carried out to enable him or her to manage the risk from asbestos.

It only remains to emphasise once again these notes only scratch the surface of all the requirements and implications of the various pieces of legislation covering this aspect of a contract. There is no substitute for personal knowledge

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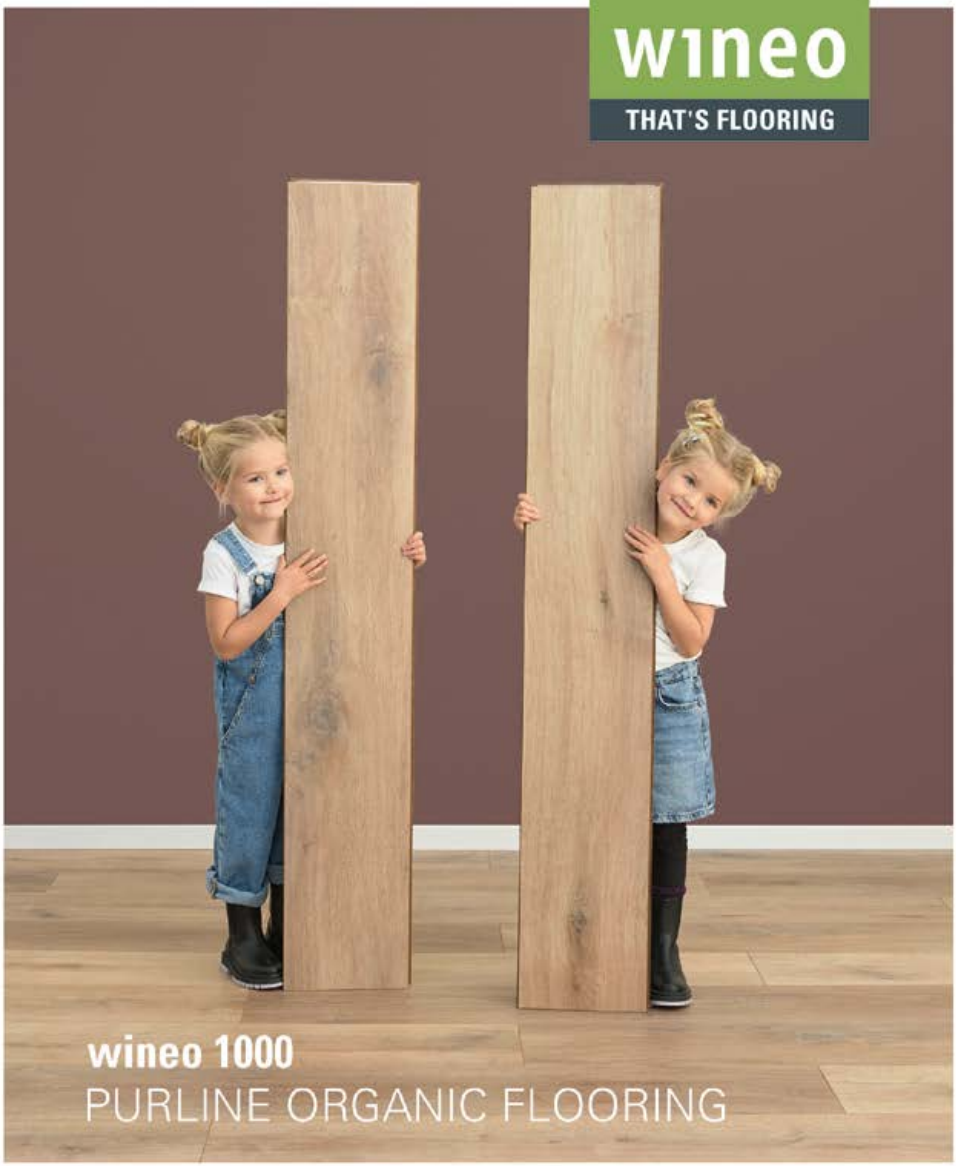

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and it is essential that anyone involved in the installation of floor coverings ensure they are fully conversant with and comply with, all the necessary legislation as it applies to them, or have competent advice.

Further information can be obtained from local offices of the Health and Safety Executive, see **www.hse.gov.uk/guidance/index.htm**

SITE CONDITIONS

ESSENTIAL REQUIREMENTS

Facilities for the safe unloading and distribution of flooring and accessory materials must be made available on site.

Provision of dry, clean, ventilated, waterproof, warm and secure storage area must be made available. Floorcoverings and associated materials such as chipboard must be unloaded with care and stored according to manufacturers' instructions. On multi-storey work, suitable storage facilities must be made available on each floor as the work proceeds. Special storage facilities must be made available for highly flammable adhesives.

Safe lifting facilities on all floor levels must be made available.

A good standard of electric lighting to all work areas must be available. Electric power, generally at 110V but often at 240V for floor sanding machines, should be made available when using power tools.

NOTE: All portable electrical appliances should have been electrically tested to ensure they are safe to use and must be retested as appropriate. (Portable Appliance Testing).

PROVISION AND USE OF WORK EQUIPMENT REGULATIONS 1998 (PUWER)

These Regulations, often abbreviated to PUWER, place duties on people and companies who own, operate or have control over work equipment. PUWER also places responsibilities on businesses and/organisations whose employees use work equipment, whether owned by them or not.

PUWER requires that equipment provided for use at work is:

- **Suitable for the intended use**
- **Safe for use, maintained in a safe condition and inspected to ensure it is correctly installed and does not subsequently deteriorate**
- **Used only by people who have received adequate information, instruction and training**
- **Accompanied by suitable health and safety measures, such as protective devices and controls. These will normally include emergency stop devices, adequate means of isolation from sources of energy, clearly visible markings, and warning devices**
- **Used in accordance with specific requirements, for mobile work equipment and power presses**

Each work area must be clear of all other trades and their materials. Floors must be cleared of all rubbish and initially swept clean or, preferably, industrial vacuumed. All surface contamination must be removed in accordance with the relevant manufacturers' instructions, ready to receive the next product to be applied.

WORK AT HEIGHT

Falls from height are one of the biggest causes of workplace fatalities and major injuries. Common causes are falls from ladders and through fragile roofs. The purpose of WAHR is to prevent death and injury from a fall from height. Work at height means work in any place where, if there were no precautions in place, a person could fall a distance liable to cause personal injury. For example, you are working at height if you:

- **Are working on a ladder or raised platform**
- **Could fall through a fragile surface**
- **Could fall into an opening in a floor or a hole in the ground**

Take a sensible approach when considering precautions for work at height. There may be some low-risk situations where common sense tells you no particular precautions are necessary, and the law recognises this.

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The purpose of The Work at Height Regulations 2005 is to prevent death and injury caused by a fall from height. If you are an employer or control work at height (for example facilities managers or building owners who may contract others to work at height) the Regulations apply to you.

Employers and those in control of any work at height activity must make sure work is properly planned, supervised and carried out by competent people. This includes using the right type of equipment for working at height. Low-risk, relatively straightforward tasks will require less effort when it comes to planning.

SAFE HANDLING OF PRODUCTS

Details of hazard information relating to specific materials are supplied by the manufacturer in the form of safety data sheets (SDS) and should be passed on down the line of supply. Under existing Health and Safety legislation, it is the responsibility of the supplier to ensure that there is adequate information made available to enable the user to apply the material safely. Equally, the user also has responsibilities including asking the supplier, when necessary, for specific information. This is of particular importance when novel or out-of-the-ordinary applications are involved.

As a generalisation, read the manufacturers' instructions thoroughly before any product is used.

STORAGE

Products will be labelled in accordance with the current UK or EU legislation. Some products will be labelled as "Highly Flammable/Flammable" and these must be stored in accordance with UK legislation and guidance.

HYGIENE

- **Do not eat, drink or smoke in areas where hazardous products are stored or used**
- **Care must be taken to avoid contact of products with skin, mouth, and eyes. Use protective gloves and protective barrier creams and, where splashing is a danger, protective goggles or glasses as specified in the SDS. Always wash hands prior to eating or drinking, using soap and water or skin cleansers as appropriate. DO NOT USE SOLVENTS e.g., white spirit, paraffin, etc.**
- **Avoid inhalation of powders, dusts and solvent vapours. Use suitable respirators where necessary as specified in the SDS.**

SPILLAGE

Any accidental spillages must be contained immediately by barriers of earth or sand (not sawdust). The spillage must be soaked up and disposed of in accordance with both local and national regulations. See SDS for more detailed information.

WASTE DISPOSAL

The Environmental Protection Act, the Waste Management Licensing Regulations and legislation arising from these Acts, relate particularly to: Duty of Care, Controlled Waste, Licensing Requirements and Special Wastes.

These require waste materials to be classified, separated by type, contained, stored, handled, transported, treated, and disposed of according to strict requirements by licensed agents, carriers, and treatment operatives. Supportive confirmatory documentation relating to proper disposal of waste should be kept as proof of "duty of care". Additional checks on procedures and methods employed are recommended including proof of the receiver of the waste being legitimate.

Always refer to section 13 of the supplier's health and safety data sheet for disposal recommendations of hazardous materials and their containers.

VAPOURS FROM SOLVENTS

The vapours from solvent-borne products are generally harmful when inhaled, which may lead to nausea, headaches, dizziness, and unconsciousness in the short term and, in some cases, may lead to more serious long-term effects. A risk assessment should be conducted to determine the most appropriate method in order to reduce the exposure to vapours, this may include but not limited to such actions as ensuring windows and doors are open and a through draught is blowing.

If this condition cannot be achieved use either a flameproof extractor fan (for factory applications) or an approved respirator, such as a fresh air fed mask, fed with clean air or a suitable organic vapour mask as specified by the SDS.

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- **Ensure that there are no pilot lights, naked flames, sparks, heating elements, or other means of ignition in the vicinity of the work area. Particular care must be taken on building sites where other tradesmen may be using electric drills, blow lamps, etc. Smoking must be prohibited when using solvent-borne products, including non-flammable types. "No Smoking" signs should be displayed.**
- **Solvent vapours are usually heavier than air and the vapours may gravitate to lower levels or travel some distance to a means of ignition and cause fire and/or explosion by "flash-back" to the vapour source.**
- **Remember that a through draught will be carrying hazardous solvent vapour a considerable distance although it will be progressively diluted with air. Care must therefore be taken to ensure the solvent laden air is not blowing towards other workers.**
- **In controlling the emission of solvent, it should be noted that the Health & Safety at Work Act places a duty on contractors to carry out their operations in such a way as not to cause a risk to the public**
- **Avoid contact with skin as this causes defatting and, eventually, dermatitis is a possibility**
- **Replace lids immediately after use**
- **The above precautions apply whether or not the solvent present is flammable**

WATER-BASED PRODUCTS

Most water-based products have a low degree of hazard but in some cases small amounts of solvent will be present and the above precautions must be taken if so labelled. Take the precautions given in the SDS and use good practice.

HOT-MELT ADHESIVES

The major hazards associated with the use of hot melt products are burns either from molten adhesive or the applicator tip, or if a melt comes into contact with water when it will spit violently.

- **Use protective clothing, goggles and gloves**
- **Do not overheat, as hazardous fumes may be produced**
- **Take care when pouring**
- **Avoid contact with water**

If burns do occur, immerse the affected area in clean cold water immediately. Do not attempt to remove the cold adhesive from the skin. Cover the affected area with a wet compress and obtain medical advice immediately.

RESIN-BASED PRODUCTS

Liquid products such as epoxy resin, polishes, seals, lacquers, polyurethane, surface membranes and formaldehyde condensation products, present no particular fire or explosion hazards unless they contain highly flammable or flammable solvents, in which case containers will be so marked. Under such circumstances, the precautions outlined for solvents should be observed. Take the precautions given in the SDS and use good practice.

Ensure adequate ventilation. Some components may be hazardous, and precautions will be stated on the label. Where components are powders, it is obligatory to use dust masks. Strict attention must be paid to the manufacturers' instructions.

DUST

Dust from products, such as cement, and from floor preparation operations such as sanding wooden floors is a potential irritant and exposure to such risk should be controlled by care in handling, the wearing of personal protective equipment such as dust masks or respirators, eye protectors, gloves, etc., and the use of barrier creams. See **www.hse.gov.uk**

Hardwood dust can cause cancer, both hardwood and softwood dusts have a Workplace Exposure Limit (WEL) which must not be exceeded. For further details and advice go to:
www.hse.gov.uk/woodworking/wooddust.htm

Spontaneous ignition can occur with sanding dust, collection bags and oily rags. These should not be left unattended even for a short time and must be disposed of safely.

METHOD STATEMENTS

A work method statement, sometimes referred to as a safe work method statement or a safe work

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procedure, is a part of a workplace safety plan. It is predominately used in construction to describe a document that gives specific instructions on how to safely perform a work related task, or operate a piece of plant or equipment.

RISK ASSESSMENTS

A risk assessment is a careful examination of what in the workplace, could cause harm to people, in order to assess whether enough precautions have been taken. The aim is to make sure that no one is subject to injury or infection. Accidents and ill health can ruin lives, and affect business if output is lost, machinery is damaged, insurance costs increase, or results in litigation. Under Management of Health & Safety at Work Regulations there is a requirement for every employer to make a suitable and sufficient risk assessment. It is also a requirement of several other regulations (COSHH, PUWER, LOLER, etc.) for specialist individual risk assessments to be carried out.

It is the responsibility of the Employers and those in control to conduct risk assessments. The first step being to record workplace activities carried out and to identify which activities involve or may involve, potential hazards e.g., fire, cuts to hands, poisoning, etc.

Employees have general legal duties to take reasonable care of themselves and others who may be affected by their actions, and to cooperate with their employer to enable their health and safety duties and requirements to be complied with.

HAZARDS

Look only for the hazards which could reasonably expect to result in significant harm under the conditions in your workplace. Use the following examples as a guide:

- **Slips and trip hazards**
- **Manual handling**
- **Fire**
- **Noise**
- **Chemicals**
- **Poor lighting**
- **Moving parts of machinery**
- **Low temperature**
- **Working at heights**
- **Dust**
- **Pressure systems**
- **Fumes**
- **Ejection of material**
- **Electricity**
- **Vehicles (e.g., lift trucks)**

WHO MIGHT BE HARMED?

There is no need to list individuals by name — list groups of people involved in similar work or who might be affected, for example:

- **Office staff**
- **Operators**
- **Maintenance personnel**
- **Cleaners**
- **Contractors**
- **Visitors**
- **Lone workers**
- **Inexperienced staff**

IS THE RISK ADEQUATELY CONTROLLED?

Have precautions been taken against the risk from the hazards listed? e.g., provision of:

- **Adequate information, instruction or training?**
- **Adequate systems or procedures?**

DO THE PRECAUTIONS

- **Meet the standards set by legal requirements?**
- **Comply with a recognised industry standard?**
- **Represent good practice?**
- **Reduce risk as far as reasonably practicable? If so, then the risk is adequately controlled but it is necessary to indicate the precautions in place. Refer to procedures, manuals, company rules, etc.**

RISK FACTOR

This is to be based on the following equation:

LIKELIHOOD OF OCCURRENCE × **HAZARD SEVERITY** = **RISK**

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The likelihood of occurrence is to be assessed on a scale of five:

5. VERY LIKELY
   If the work continues as it is, there is almost a 100% certainty that an accident will happen (e.g., broken stair or broken rung on a ladder, bare exposed electrical conductor, high unstable stack of heavy articles).

4. VERY LIKELY
   The effects of vibration, wind or human carelessness could precipitate an accident, which is unlikely to happen without this additional factor (e.g., ladder not secured to scaffolding, pile of tubes with temporary or makeshift wedge, temporary electrical hook-up to live supply, puddle of slippery or oily waste on walkway).

3. QUITE POSSIBLE
   The accident may happen if additional factors precipitate it, but it is unlikely to happen without them. The additional factor is more than a casual slip or nudge and would require an additional action or event to trigger it (e.g., leaving a vehicle with the engine running, obstructing an aisle, leaving a welding torch alight on the bench, failing to replace a defective light in a storage area used at night).

2. POSSIBLE
   If other factors were present, an incident or injury might occur, but the probability is low and the risk minimal (e.g., storing heavy items above shoulder level, cracked or chipped electrical plug or frayed cable, cracked glass window, worn steps).

1. NOT LIKELY
   There is really no risk present. Only under freak conditions could there be any possibility of an accident or injury. All reasonable precautions have been taken so far as is reasonably practicable. This should be the normal state of the workplace.

Hazard severity is to be assessed on a scale of five:

1. VERY HIGH
   Causing multiple deaths and widespread destruction.

2. HIGH
   Causing death or serious injury to an individual.

3. MODERATE
   Causing injury or disease capable of keeping an individual off work for 3 days or more and reportable under RIDDOR.

4. SLIGHT
   Causing minor injury, which would allow the individual to continue work after first aid treatment on site or at a local surgery. The duration of stoppage/treatment is such that the normal flow of work is not seriously interrupted.

5. NIL
   No risk of injury or disease.

Using the equation above, a risk factor can be determined ranging from 1 (no severity and unlikely to happen) to 25 (just waiting to happen with disastrous, widespread results, possibly with one or more fatalities). This qualitative information can be used to determine the urgency of action.

What further action is necessary to control risk?

What more could reasonably be done to address those risks which were found not to be adequately controlled?

Apply the principles below when taking further action, if possible in the following order:

- Remove the risk completely
- Try a less risky option
- Prevent access to the hazard, (e.g., by guarding)
- Organise work to reduce exposure to hazard
- Issue personnel protective equipment
- Provide welfare facilities (e.g., washing facilities for removal of contamination and first aid)

REVIEW OF RISK ASSESSMENTS

Sooner or later new machines, substances and procedures which could lead to new hazards may be introduced. If there is any significant change it should be added to the assessment in order to take account of the new hazard.

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SAFETY INDUCTIONS

In any relationship between a business — known as the client — and a contractor, both parties will have duties under health and safety law. Similarly, if the contractor uses sub-contractors to carry out some or all of the work, all parties will have some health and safety responsibilities.

To ensure contractors' or sub-contractors' health and safety it is necessary to:

- **Identify the requirements of the job and assess the risks involved**
- **Decide what information and training is required**
- **As the client, select an appropriate contractor and ascertain their health and safety policies and procedures**
- **As the contractor, find out about sub-contractors' competence**
- **Review the way work is carried out (risk assessment)**

Ensure there is cooperation and coordination at all times between all concerned parties and the contractors/sub-contractors. In particular:

- **Provide all parties with information, instruction and training on anything that may affect health and safety**
- **Make the contractors/sub-contractors aware of health and safety procedures and policies**
- **Provide management and supervision to ensure the safety of contractors/sub-contractors**
- **Ensure a contractor's/sub-contractor's competence**
- **Supervise a contractor/sub-contractor**
- **Take steps to prevent contact with live equipment**
- **Provide information about the existence of asbestos**
- **Ensure safe operation of vehicles**
- **Ensure safe loading to or unloading from delivery vehicles**
- **Assess risks to health from regular exposure to high vibration levels**
- **Exercise a duty of care towards a contractor/sub-contractor**
- **Provide a formal site induction, risk assessment or method statement**

USE OF SAFETY KNIVES TO INSTALL FLOORING MATERIALS

The CFA are periodically approached to comment on the use of safety knives with retractable blades for the installation of floor coverings. This is often from an initiative driven by the client or Main Contractor to improve site safety. As such it is important to immediately stress that the CFA wholeheartedly support all initiatives that add to safety on site. However, it is of course important that these initiatives are appropriate and achieve that end.

For commercial and professional applications, a fixed blade knife is generally accepted as the best piece of equipment, where the blade is securely held in position by the handle of the knife. Blades are changed by unscrewing the body of the knife to release them. As a very general statement, knives with retractable blades would usually be classed as hobby, craft or DIY products. If ever used in a "professional" setting they are generally only employed in warehousing or similar situations for removing packaging. This is also generally felt to be the limitation of their safe use.

As previously mentioned, the flooring industry and specifically fitters generally prefer to use a fixed blade knife. As many of the materials that are frequently installed require quite a lot of force to cut them, the fixed blade type of knife is used because it allows the control and pressure required and is also ergonomically designed to fit in to the installers hand. It is felt by many that knives with retractable blades and without this ergonomic design are in fact more likely to lead to injury if used for a flooring application.

As a general comment, experience has shown that the retracting mechanisms can be unpredictable when used with the type of pressure required to cut flooring materials. Of course, the professional products also have a "holster" and good practice would always suggest that the knife should be returned to the holster when not in use.

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This leads to the subject of training. This is of course where CFA flooring contractors excel with the support available. It is of course important that all operatives using any sort of equipment are trained and can demonstrate that they have received training in order to carry out the work they are employed for. Alongside experience, evidence could include CSCS cards (which includes a H&S test and an NVQ level 2), the FITA QA card, as well as attendance of FITA training courses. On site, this would also be underpinned by a method statement, risk assessment appropriate contract supervision.

In summary, the CFA would not generally recommend the use of "safety knives" for flooring applications and would again stress that in our opinion they can add to hazard if used for a flooring application.

As a CFA member, contractors are able to access the CFA's health and safety benefit helpline to ensure they remain up to date and fully compliant.

USE OF GLOVES WHEN HANDLING AND INSTALLING FLOORING MATERIALS

The CFA are periodically approached to comment on the use of gloves whilst installing floor coverings. This is often from an initiative driven by the client or Main Contractor to improve site safety. As such it is important to immediately stress that CFA wholeheartedly support all initiatives that add to safety on site. However, it is of course vital that these initiatives are appropriate and achieve that end.

PPE is equipment that will protect the user against health or safety risks at work. It can include items such as safety helmets, gloves, eye protection, high-visibility clothing, safety footwear and safety harnesses. PPE is governed by the Personal Protective Equipment at Work Regulations 1992.

The PPE regulations (regulation 4) require the provision of PPE to every employee exposed to a risk where the risk cannot be adequately controlled in other ways. Amongst the requirements of regulation 4, PPE is required to be appropriate for the risk involved, the conditions at the place where exposure to the risk may occur and the period for which it is worn. So far as is practicable, it should be effective to prevent or adequately control the risk or risks involved without increasing overall risk.

A full copy of the HSE Guidance relating to the Personal Protective Equipment at Work Regulations 1992 can be found at: **www.hse.gov.uk/pubns/books/l25.htm**

The selection and use of PPE, including gloves, should, therefore, be based on a risk assessment.

"If PPE is still needed after implementing other controls (and there will be circumstances when it is, e.g., head protection on most construction sites), you must provide this for your employees free of charge." This can be viewed at: **www.hse.gov.uk/toolbox/ppe.htm**

"Personal Protective Equipment (PPE) At Work — A Brief Guide, describes what you, as an employer, may need to do to protect your employees from the risk of injury in the workplace. It will also be useful to employees and their representatives. Employers have duties concerning the provision and use of personal protective equipment (PPE) at work and the leaflet explains what you need to do to meet the requirements of the Personal Protective Equipment at Work Regulations 1992 (as amended)." This can be viewed at: **www.hse.gov.uk/pubns/books/l25.htm**

IMPORTANT NOTE: Proposed changes to The Personal Protective Equipment at Work 1992 Regulations (PPER)

A partial extract of proposed changes to the PPER is as follows:

"In November 2020, a court judgment found that the UK had failed to adequately transpose aspects of two EU Directives into domestic law– Article 8(4) and 8(5) of EU Directive 89/391/EEC ("the Health and Safety Framework Directive") and Article 3 of EU Directive 89/656/EEC ("the PPE Directive"). The UK implementation of these provisions only applied to ***employees*** *and the court found that the UK's implementation should*

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*extend to **limb (b) workers.** The government transposed the PPE Directive through the Personal Protective Equipment at Work Regulations 1992.* This can be viewed at:
www.legislation.gov.uk/uksi/1992/2966/regulation/7/made

The "Related section" at the bottom of this page has further background information and the definition of a **limb (b) worker.**

WHAT IS A LIMB (B) WORKER?

There are two main employment statuses for employment rights: "employee" and "worker". Employees are defined as limb (a) and workers are defined as limb (b) in the Employment Rights Act 1996 s.230. This can be viewed at:
www.legislation.gov.uk/ukpga/1996/18/section/230

*"... an individual who has entered into or works under — **(a)** a contract of employment; or **(b)** any other contract, whether express or implied and (if it is express) whether oral or in writing, whereby the individual undertakes to do or perform personally any work or services for another party to the contract whose status is not by virtue of the contract that of a client or customer or any profession or business undertaking carried on by the individual."*

At the time of writing this guide, the proposed changes to the PPER are subject to public consultation but are likely to be in place by the time the guide is published. More information and updates on the status of these changes can be found at:
www.consultations.hse.gov.uk/hse/cd289-amends-ppe-work-regs-1992/

NOTE: The references and content related to the regulations discussed in this guide are correct at the time of writing. However, as has been highlighted with PPER above, changes are possible during the life of this document. We would strongly advise that readers of this section refer to latest version of the regulations including the proposed changes to the PPER to ensure compliance.

APPENDIX

The following symbols are from the HSE website:
www.hse.gov.uk/chemical-classification/legal/clp-regulation.htm

EXPLOSIVE
(exploding bomb)

FLAMMABLE
(flame)

OXIDISING
(flame over circle)

CORROSIVE
(corrosion)

ACUTE TOXICITY
(skull and crossbones)

HAZARDOUS TO ENVIRONMENT
(environment)

HEALTH HAZARD/ HAZARDOUS TO OZONE LAYER
(exclamation mark)

SERIOUS HEALTH HAZARD
(health hazard)

GAS UNDER PRESSURE
(gas cylinder)

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SUBFLOORS

SOLID SCREEDS AND CONCRETE SUBFLOORS

These fall broadly into four categories:

1. **Concretes, either hand/or power float finished**
2. **Traditional hand/or power trowelled cement: sand screeds**
3. **Calcium sulphate pumpable self-smoothing screeds**
4. **Pumpable self-smoothing screeds based on Portland cement**

GENERAL

The quality of the finished floor will only be as good as the subfloor over which it has been laid. All flooring finishes require a clean, sound, level surface that is sufficiently strong and capable of supporting any applied subfloor preparation materials and the chosen floor finish. Suitable preparation of the subfloor will ensure the longevity of the installation.

All screeds and concrete require a degree of mechanical preparation in order to remove surface contamination likely to affect adhesion of subsequent coverings. This contamination could include surface treatments such as hardeners or curing agents, or construction debris such as mud, plasterboard adhesive, mortar, etc. It is also important that the subfloor surface is sufficiently absorbent to allow the penetration of primers and adhesives to ensure good adhesion. Mechanical preparation methods can include lightly sanding, grinding or enclosed shot blasting and the appropriate method selected will depend on the hardness of the subfloor surface and the nature and level of contamination present.

Subfloors at ground floor level should be protected against rising moisture and moisture vapour from the ground to the upper surface of the floor. Various methods and materials for damp proofing solid floors are described in British Standards **BS 8204** Screeds bases and in-situ flooring and **BS 8102:** Code of Practice

for protection of below ground structures against water from the ground. This aspect is also dealt with in new build structures by UK Building Regulations.

Sufficient time should be allowed in the build program to allow the subfloor to properly dry prior to the application of floor coverings. The amount of time required can vary greatly based on screed type as well as in response to a number of external factors including not only the amount of water used in the mix design but also the site conditions at the time of laying, the post installation site conditions and the depth of the material. Where sufficient time cannot be allocated moisture management systems such as liquid DPMs and over lay systems can be considered in order to mitigate the risk that remaining moisture does not affect the final performance of the finished floor coverings. It should be borne in mind that the laying of concrete externally where it is directly affected by atmospheric conditions is common practice in the UK.

The British Standard Code of Practice states in the section for eliminating construction moisture "In practice it has been found that even under good drying conditions concrete bases 150mm thick often take more than one year to dry from one face only. Moderate and heavy use of power-float/power-trowel finishing methods further delays drying". For cement: sand screeds a drying period of approximately 1mm per day is considered necessary for screed thicknesses up to 50mm under optimum drying conditions i.e., 20°C and <65% RH. Drying times will be considerably longer when dealing with thicker screeds or in cold, damp conditions. Where the DPM is placed beneath the concrete slab rather than between the slab and the levelling screed then the combined thicknesses must be considered.

The methods of testing for moisture in subfloors are given in the relevant British Standards Codes of Practice.

Methods of testing screeds for in-situ crushing resistance and surface tensile strength are detailed in the relevant British Standards. However, these tests are largely obsolete due to the introduction of standardised manufacturing and installation methods involving statistical process control.

Application of primer promotes good adhesion of smoothing underlayments and prevents premature drying

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CONCRETE BASE SLABS FOR THE DIRECT APPLICATION OF FLOOR COVERING

Concrete base slabs which are to receive floor coverings or levelling screeds direct to their surface should typically offer a minimum compressive strength of C25/30. **BS 8204: parts 1-7** gives guidance on the installation of concrete bases to receive resilient, wood and textile floor coverings, in-situ floorings such as synthetic resin floorings, in-situ terrazzo, etc. Some may require a concrete base slab having a characteristic concrete strength class of C28/35.

The power trowelling of a concrete floor slab has a large influence on the choice of adhesive used for fixing floor coverings. Care needs to be exercised in ensuring that the flooring material and the concrete surface will give adequate absorption and allow the dissipation of any free water or solvent vapours thus enabling sufficient adhesion to both surfaces. The final finish of the power floated surface will also influence adhesion, a mirror finish may look good but it may prove difficult to achieve an adequate bond of a waterproof surface membrane, adhesive or floor smoothing underlayment to the surface. The dense surface finish will also considerably extend the drying time of the concrete slab.

NOTE: Externally applied curing agents should be removed seven days after installation from the surface of the concrete base slabs to allow unrestricted drying of the concrete.

HAND/OR POWER TROWELLED CEMENT: SAND LEVELLING SCREEDS

These screeds have been employed for many years in the UK and continue to be widely used. Liquid pumpable and self-smoothing screeds are also now in common use.

Cement sand screeds are generally manufactured using a mixture of Portland cement, blended bagged cements, general purpose sharp sands or concrete sands, water and special additives where required. They can be manufactured by some ready-mix screed suppliers but are commonly hand mixed on site. They are usually hand placed and compacted and then hand trowelled

Application of smoothing compound before installation of decorative floor covering to ensure smooth surface and correct adhesion properties

ACOUSTIC

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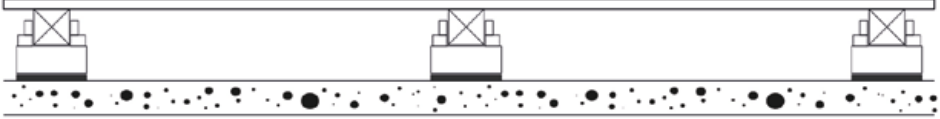
SOUND REDUCTION	LIGHTWEIGHT SYSTEM	FLOOR HEIGHT RANGE	CRADLE SPACINGS	BATTENS CENTRES	LOAD CAPACITY	SUSTAINABILITY
27db minimum	IDEAL FOR HIGH RISE APARTMENT BLOCKS WHERE INTERNAL WEIGHT LOADINGS MAY BE AN ISSUE	74mm - 419mm	**450mm** along a 36mm batten **600mm** along a 48mm batten	400mm	**500kg** spread load **350kg** point load	recycled plastic cradles



although for larger areas power trowels and pumps can be used. They can be employed where screeds to falls are required.

BONDED LEVELLING SCREEDS

Cement and sand levelling screeds can be bonded to a concrete base providing the base has been suitably prepared, thickness nominally 40mm, minimum 25mm.

UN-BONDED LEVELLING SCREEDS

Cement and sand screeds or fine concrete levelling screeds can be laid unbonded normally over a separating layer and should not be less than 50mm thick. **BS 8204** considers that a screed laid directly to an unprepared sub-base to be unbonded. They should be reinforced using either steel mesh reinforcement or polypropylene fibres.

FLOATING LEVELLING SCREEDS

These are laid over separating membranes on thermal or acoustic insulation and should be not less than 75mm thick, or 65mm in domestic situations. Some proprietary screeds may be laid in thinner sections, seek manufacturers' advice.

CURING AND SETTING

Cement Sand screeds should be cured for a minimum of 7 days following installation by covering with polythene. It is less common to see spray on curing membranes used although these are available. The screed should be placed into a weather tight environment and not be subjected to severe draughts, direct sunlight or heating for the first 72 hours. Foot traffic should be restricted for at least 7 days to prevent damage to the screed surface. They should generally not be loaded for a minimum of 28 days.

DRYING

Drying times will vary according to the product used and manufacturers guidance should be sought on appropriate drying times. Poor site condition and deeper screed sections will extend drying times so it important to ensure that site conditions are well controlled.

Cement sand screeds should not be force dried and commissioning of any UFH should be avoided for a minimum of 21 days.

TESTING RESIDUAL MOISTURE CONTENT

Before floor finishes are laid, the moisture content of the screed should be checked. The British Standard for testing a base to receive a floor covering is to use a surface or probe hygrometer. This provides a non-destructive test and when tested strictly to the method defined will give reliable results on calcium sulphate screeds for RH up to 75% (the required limit for floor finishes).

The installation code of practice for some product groups also accept the hygrometer sleeve method. If this method is being considered it is important to check the code of practice that applies to the product type being installed.

Cement sand screeds, once fully dried, are generally very absorbent. Therefore, the screed must be primed with a suitable primer to prevent premature drying of smoothing underlayments:

- **Where moisture levels exceed 75%RH (65%RH for some timber flooring installations) consult manufacturers to ascertain if there is an option for a surface DPM or application to be made. Where surface DPMs are not suitable then the subfloor must be allowed to further dry. Drying can be encouraged by providing good airflow, dehumidification and ambient temperature conditions. Use of any UFH, where present, may also be considered. Specifiers need to be aware manufacturers differ in regard to their recommendations, and it is essential that clear directions are given to installers.**

CALCIUM SULPHATE SUBFLOORS

These are alternatives to sand and cement levelling screeds based on calcium sulphate instead of Portland cement. They are usually supplied with the calcium sulphate being either based on anhydrite or on alpha hemihydrate. The calcium sulphate binders are usually manufactured to **BS 13454** using by-products of other processes such as flue gas desulphurisation or acid production. These binders are mixed with sand and water and additives where appropriate to **BS 13813**. The finished screed mortars may be supplied ready mixed in agitator trucks or mixers, mixed on site by volumetric mixers or can be mixed from pre blended bagged ingredients. They are generally pump applied.

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BONDED LEVELLING SCREEDS

Calcium sulphate levelling screeds can be bonded to concrete bases providing the base has been suitably prepared, thickness minimum 12mm.

UN-BONDED LEVELLING SCREEDS

Calcium sulphate levelling screeds can be laid unbonded normally over a separating layer, typically, not less than 30mm, for thinner sections manufactures guidance should be sought.

FLOATING LEVELLING SCREEDS

Floating levelling screeds are laid over separating membranes on thermal or acoustic insulation boards or quilts and should typically be no less than 40mm thick or 35mm in domestic situations. For thinner depths manufacturers guidance should be sought.

Some manufacturers offer proprietary screed mix designs which can be thinner.

CURING

Calcium sulphate-based screeds are self-curing and need no external curing agents or membranes. The screed should be placed into a weather tight environment and not be subjected to severe draughts, direct sunlight or heating for the first 72 hours. Foot traffic should be restricted for at least 24 (preferably 48) hours to prevent damage to the screed surface.

Several types of calcium sulphate screed are currently available. Some produce a friable flaky laitance on the surface where others do not. Friable Laitance will usually be sanded off the screed at an early stage, whilst non-friable Laitance will usually be prepared during the process of mechanical abrasion carried out on all screeds to provide a surface key and remove surface contamination.

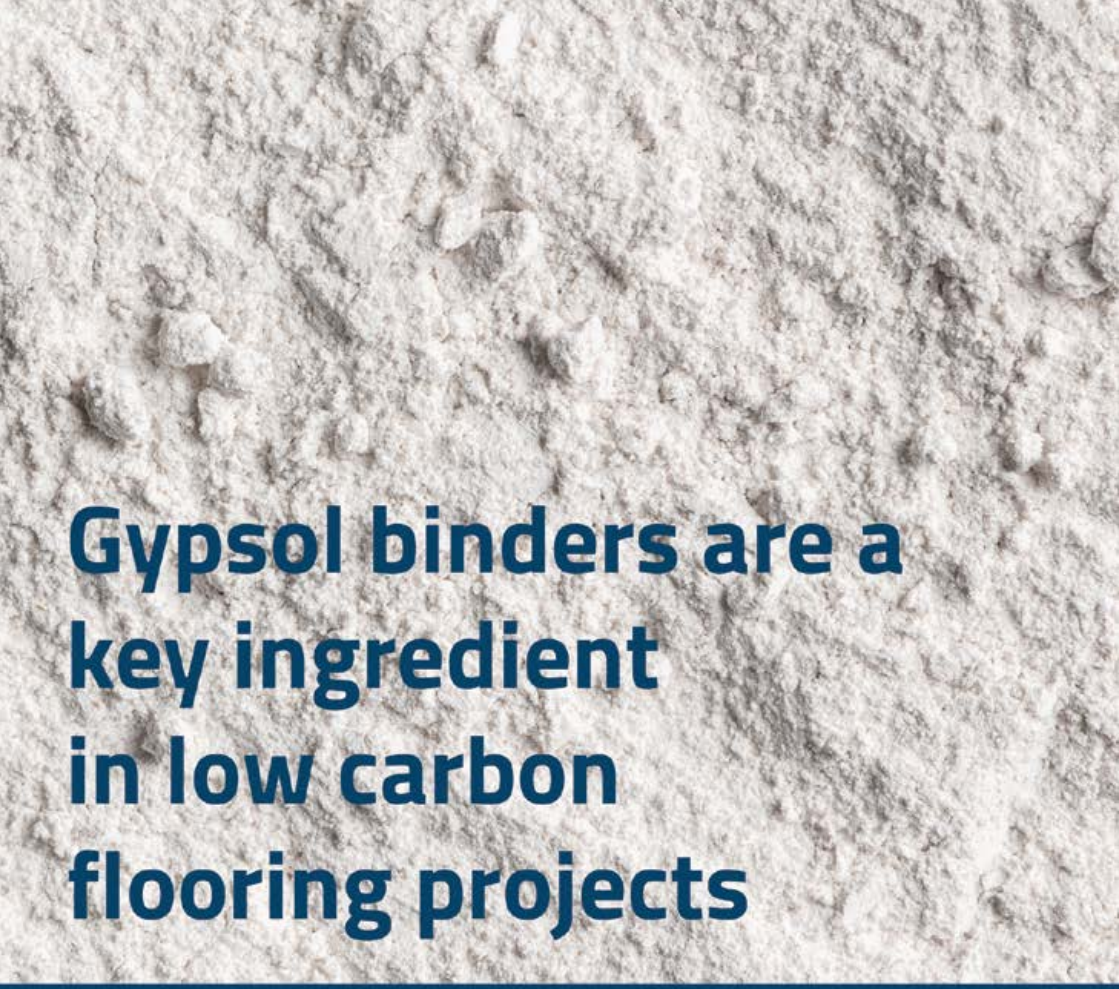
Typically, calcium sulphate screeds can be loaded after seven days following installation.

DRYING

Drying times will vary according to the product used and manufacturer's guidance should always be sought on the appropriate drying times. Drying times are usually based on 40 to 50mm depth in warm and well-ventilated drying conditions, typically <65%RH at 20ºC. Poor site condition and deeper screed sections will extend drying times so it is very important to ensure site conditions are well controlled.

Good ventilation or the use of dehumidifiers can assist in reducing the ambient humidity. Forced drying of these screeds is possible if required. After 3 days dehumidifiers maybe employed, and after 7 days the UFH may be commissioned and slowly brought up to temperature to force dry the screed reducing drying times significantly.

Smoothing underlayments can be applied over different substrates, including ceramic tiles



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TESTING RESIDUAL MOISTURE CONTENT

Before floor finishes are laid, the moisture content of the screed should be checked. The British Standard for testing a base to receive a floor covering is to use a surface or probe hygrometer. This provides a non-destructive test and when tested strictly to the method defined will give reliable results on calcium sulphate screeds for RH up to 75% (the required limit for floor finishes).

The installation code of practice for some product groups also accepts the hygrometer sleeve method. If this method is being considered it is important to check the code of practice that applies to the product type being installed.

The moisture content of calcium sulphate screeds is sometimes checked using the CM Test/oven drying Method **(BS 8204 Part 7).** This method is a destructive test and if used the moisture content should be less than 0.5% at 75% RH.

In the presence of excess moisture, cement-based smoothing compounds and calcium sulphate can react to form Ettringite, which is an expansive crystal that damages the bond between the smoothing compounds and calcium sulphate screeds which may result in subsequent failure of the floor covering installation.

Therefore, the screed must be primed with a suitable primer as recommended by the manufacturer of the product. An alternative method of mitigating the risk of Ettringite failure is to use a calcium sulphate-based smoothing compound.

PUMPABLE SELF SMOOTHING SCREEDS BASED ON PORTLAND CEMENT

BONDED LEVELLING SCREEDS

Liquid cement-based levelling screeds can be bonded to concrete bases providing the base has been suitably prepared, with a minimum thickness of 20mm.

UN-BONDED LEVELLING SCREEDS

Liquid cement-based levelling screeds can be laid unbonded normally over a separating layer, typically no less than 30mm thick. For thinner depths, seek manufacturers guidance.

FLOATING LEVELLING SCREEDS

These are laid over separating membranes on thermal or acoustic insulation boards or quilts and should typically be no less than 40mm thick.

Some manufacturers offer proprietary screed mix designs which can be thinner.

CURING

Some liquid cement-based screeds are self-curing and need no external curing agents or membranes. Others require an externally, usually spray, applied curing membrane. Spray on curing membranes are designed to entrap the water within the screed preventing premature drying and associated issues this can cause. These membranes should be removed by sanding after 7 days in order to prevent extended drying times. The screed should be placed into a weather tight environment and not be subjected to severe draughts, direct sunlight or heating for the first 72 hours. Foot traffic should be restricted for at least 24 (preferably 48) hours to prevent damage to the screed surface.

There are different types of liquid cement-based screeds presently available. Some produce a dense shiny surface with bonded laitance where others do not. Laitance will usually be prepared during the process of mechanical abrasion carried out on all screeds to provide a surface key and remove surface contamination.

Typically, liquid cement-based screeds can be loaded after 7 days following installation.

DRYING

Drying times will vary according to the product used and manufacturers guidance should be sought on appropriate drying times. Drying times are usually based on 40 to 50mm depth in warm and well-ventilated drying conditions, typically <65%RH at 20°C. Poor site condition and deeper screed sections will extend drying times so it important to ensure that site conditions are well controlled.

Good ventilation or the use of dehumidifiers can assist in reducing the ambient humidity. Forced drying of these screeds is sometimes possible if required. Seek manufacturer guidance if assisted drying is required.

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TESTING RESIDUAL MOISTURE CONTENT

Before floor finishes are laid, the moisture content of the screed should be checked. The British Standard for testing a base to receive a floor covering is to use a surface or probe hygrometer. This provides a non-destructive test and when tested strictly to the method defined will give reliable results on Portland cement for RH up to 75% (the required limit for floor finishes).

The installation code of practice for some product groups also accept the hygrometer sleeve method. If this method is being considered it is important to check the code of practice that applies to the product type being installed.

The prepared surface of the screed is likely to be absorbent and should generally be primed using a suitable primer to prevent.

FURTHER GENERAL CONSIDERATIONS FOR ALL SCREEDS

- **All traffic, including pedestrians, should be kept off the screed until it has hardened sufficiently in accordance with the manufacturer's recommendations. The screed should be protected from contamination and damage by other trades and should be protected until the floor covering is applied.**
- **See BS 5325, 8201, 8203 and 8425 Codes for Practice for Installation of Textile Floorcoverings, Timber and Timber-based products, Resilient Floorcoverings and Laminate Floorcoverings.**
- **To ensure the smooth installation of floor screeds and subsequent floor coverings it is advisable that all parties have a clear understanding of the requirements and programming required. To ensure that this is achieved it is suggested that all parties involved in the project consult at an early stage in the contract.**
- **The area where a screed is to be installed should be protected against ingress of rain or water leaks. Once the area has been screeded further water should be avoided as this can cause damage and can considerably extend its drying time.**
- **One of the main reasons for floor covering installation failure is excess subfloor moisture. It is essential that all those involved in the installation understand that application of the surface finishes before drying out has been completed may lead to failure unless suitable moisture mitigation/surface DPM systems are utilised.**
- **If UFH is utilised, this must have been put through a full commissioning cycle and the floor must be suitably dry or an approved surface DPM considered before installation of finishes — see section 8 for further information on UFH. Different British Standards offer conflicting advice on commissioning procedures for UFH so manufacturer guidance is recommended.**
- **Avoid water ingress to completed screeds. If ingress occurs consult the manufacturer/installer of the screed to check its integrity.**
- **It is the responsibility of the Main Contractor to ensure that surface damage/cracks, etc., are repaired prior to the floor covering installation as follows:**

  — SURFACE DAMAGE: Use an appropriate levelling material for the thickness required. Prime with a primer recommended by the manufacturer of the compound.

  — CRACKS: It is very important that the reason for the crack formation is identified; repair to a crack caused by thermal movement may be insufficient to stop it recurring. Where UFH is employed movement joints should be visible at all door thresholds, and between individual heating zones. Where repairs can be undertaken rake out any loose spalled edges from the sides of the crack and vacuum to remove dust.

  Fill the crack with a suitable material. The crack may require priming depending on what product is to be used to fill the crack; consult the manufacturer. Suitable crack filling materials may include low viscosity epoxy, compatible repair mortar. Should cracks not be suitable for repair then considerations may be made for decoupling/uncoupling membranes provided the finished floor coverings is suitable for use in such applications.

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NOTE: It is the Main Contractor's responsibility to ensure that bases or screeds meet the specified standards for level, smoothness, dryness and soundness before any subsequent or finishing trades are called to commence work.

- **The Flooring Contractor retains a duty of care to the client for the correct installation of the floor finish, and if the substrate is not in a suitable condition to proceed then this should be rectified by agreement between the Flooring Contractor and the Main Contractor**
- **Where the contract does not have a Main Contractor, then the responsibility for assessing, repairing and preparing the substrate falls to the Flooring Contractor**
- **During surface preparation (and subsequent floor covering installation) the area should be kept clear of all trades to avoid any contamination (or damage to the floor covering)**
- **The surface of the screed should have been mechanically prepared if necessary to provide a good surface key and remove site traffic**
- **The surface of the screed should be dust free/vacuumed prior to the application of primers or adhesives**
- **The surface must be primed with a recommended primer/sealer in accordance with the product manufacturers instructions**
- **Where moisture levels exceed 75%RH (65%RH for some timber flooring installations) consult manufacturers to ascertain if there is an option for a surface DPM application to be made. Where surface DPMs are not suitable, then the subfloor must be allowed to further dry. This can be done effectively utilising UFH were present along with good airflow, good ambient temperature and dehumidification.**

MOVEMENT JOINTS IN SCREEDS

The formation of joints in screeds is essential to mitigate the risk of uncontrolled cracking. The frequency and placement of joints will depend in the screed type, the construction method and the presence or absence of UFH. Manufacturer guidance is therefore essential. Movement joints should typically be left open or filled with a suitable compressible material. They should be between 5mm and 12mm in width and in general should be a minimum of 1/3 (one third) the depth of the screed although where preformed joint systems are used they may be the full depth of the screed. Heated screeds will generally require more movement joints due to the increased level of thermal expansion and contraction likely to be experienced.

Movement joints should be carried through to the surface of the floor covering and all applied layers terminated either side. Most common locations would be at door thresholds, UFH zones, etc.

MASTIC ASPHALT

Flooring grades of asphalt are used as a waterproof surface membrane where some existing floors do not contain an integral DPM. Asphalt can be a naturally occurring or man-made mixture of bitumen, a waterproof non-crystalline and semi-solid or viscous mixture of hydrocarbons, and an inert mineral aggregate, e.g., limestone. Mastic asphalt is the term used for the material as used in the construction industry. The British Standard for the installation of flooring grade asphalts is **BS 8204 part 5.**

Flooring grade asphalt is composed of a suitably graded mineral matter and asphaltic cement in such proportions as to form a cohesive, void-less, non-permeable mass, solid or semi-solid under normal temperature conditions, but remain sufficiently fluid when heated so it can be spread by means of a hand float without compaction. They should be in good condition, sound, strong, having not suffered rutting or any sign of softening and must be free from any form of contamination. The surface should be cleaned and degreased then rinsed with clean potable water and allowed to dry. The surface may then be primed with a suitable primer and allowed to dry followed by the application of a suitable smoothing underlayment, taking care not to apply too thick a layer as this will cause excessive stress at the asphalt and smoothing underlayment interface and may cause curling of the subfloor.

WOOD-BASED PANEL PRODUCTS

All boards used for contract flooring shall preferably be moisture resistant. In accordance with **BS 8203** all wood-based panel bases should be covered with a suitable fabricated underlay and/or a flexible smoothing compound. Boards coated with wax, polyurethane or any other impervious seal should not be used for floors which are to be covered with a bonded floor covering.

Where boards incorporating special treatments, e.g., for fire resistance, are to be used, the compatibility with both the adhesive and the floor covering should be checked by consultation with the manufacturers prior to installation.

ORIENTED STRAND BOARD (OSB)

OSB should conform to **BS EN300,** Type OSB/2 (dry), Type OSB/3 (humid) or type OSB4 (heavy duty humid) and be covered with a suitable fabricated underlay.

PARTICLEBOARD (CHIPBOARD)

Particleboards used for subfloors in structural floor decking and floating floors are graded as follows, in accordance with **BS EN312** Particleboards Specifications, and should be tongued and grooved on all edges:

- **P4: load-bearing boards for use in dry conditions**
- **P5: load-bearing boards for use in humid conditions**
- **P6: heavy duty load-bearing boards for use in dry conditions**
- **P7: heavy duty load-bearing boards for use in humid conditions**

The most prevalent grade used in new construction will most likely be P5. P4 is generally being phased out of production but historical use may still be encountered, such as in refurbishment works. Either P6 or an enhanced P5 are used for mezzanine flooring applications. Boards are also available for use in construction products that give enhanced performance against the elements, usually with a protective film or coating. These may not be suitable for direct applications of adhesive or smoothing underlayment's so always check with the manufacturer.

Further preparation is likely to be needed before enabling floor coverings to be bonded.

STORAGE AND CONDITIONING

In most cases, particleboard will be installed by others prior to the flooring works. However, the following information is very useful both if the flooring contractor is carrying out the installation of the particleboards or for reference, when the particleboards are poorly installed by others. Like other wood-based panel products, particleboard is hygroscopic and its dimensions change in response to a change in humidity levels. A 1% change in moisture content typically increase or decreases the length, width and thickness of the different grades of particleboard by the amount set out in the table below:

TABLE A2.1
Dimensional change for 1% change in particleboard moisture content (DD CEN/TS 12872)

Grade	Dimensional change at 1% change in panel moisture content		
	Length %	**Width %**	**Thickness %**
P4 and P6	0.05	0.05	0.7
P5 and P7	0.03	0.04	0.5

The above table highlights the importance of correct storage and conditioning of particleboards before the installation of the chosen floor covering can be undertaken.

When delivered to site, particleboard should be stored in dry conditions on a flat level surface, clear of the floor to avoid distortion. If delivered in polythene wrapping, the packs should not be opened until boards are required for conditioning.

Boards should be conditioned to bring them into equilibrium with the "in service environment" where direct adhesion is being considered — see further guidance below regarding the installation of floor coverings. This is usually achieved by loose stacking the panels in the room where they will be used prior to fixing. The time required for the particleboard to achieve equilibrium moisture content (EMC) will vary depending upon the temperature and relative humidity in the building; this could be in the region of 3 to 10 days.

The moisture content of the particleboard should be measured using an electrical capacitance/resistance meter and checks performed to ensure it is in equilibrium with its "in service environment". Particleboard should not be installed if moisture readings are above 15% or below 7% moisture content. It is therefore important to understand and know what the "in service conditions" of the environment will be when the particleboards and flooring are installed to achieve equilibrium. The following table gives guidance on acceptable moisture content of the particleboard for typical "in use conditions"

TABLE A2.3
Likely equilibrium moisture content of particleboards in various conditions Panel Guide (V4) Annex 2A

In a building with continuous heating	7–9%
In a building with intermittent heating	9–12%
In an unheated building	Up to 15%

NOTE: Typically, particleboard has an ex-works moisture content of between 5% and 11%. When it is installed into a building the moisture content can increase to around 16% in a building under construction during winter months (WIPF Panel Guide Annex 3).

Failure to comply with moisture content recommendations and site conditions requirements may result in shrinkage or expansion of the boards which will in turn distort the floor covering.

Since the installation of particleboard bases is carried out by others prior to the installation of floor finishes, attention is drawn to Clause 4.9 Testing of **BS 8203** which states in respect of testing that:

For any conformity testing of the base, screed, floor covering, etc., details should be provided, and responsibilities defined.

The responsibility for ensuring that bases or screeds meet the specified standards for level, smoothness, dryness and soundness (impact crushing resistance) should be defined before any subsequent or finishing trades are called to commence work. This should be responsibility of the Main Contractor unless otherwise specified.

LAYING (BOARDS)

T&G boards should be laid across the joists with both short edges supported on a joist or other edge support. Readers should note that further materials may be required to meet other requirements e.g., acoustics, thermal, reaction to fire.

Square edged boards should be continuously supported along all edges, preferably by placing them with long edges along the joists and short edges supported by noggins. They can be laid with short edges butted at joists and long edges supported by noggins, but this method requires a greater number of noggins.

All perimeter and cut edges on both T&G and square edge boards need to be supported on joists or noggins. Boards should have a minimum bearing of 18mm on joists and noggins.

Boards of both edge types should be laid to break joint i.e., with staggered short edge joints to avoid lining them up.

FIXING

The method of fixing and installation can be critical to the satisfactory performance of wood-based panels in service. Panels can be fixed with nails, screws, staples, bolts, and other proprietary connectors or adhesives (sometimes in combination with fixings). It is important to consult manufacturer's literature in this respect and ensure that the fixing method is adequate for the end use. Note that there are also boards with acoustic design which are not intended for mechanical fix to the subfloor. Consult manufacturers when such boards are present.

Fixing centres for nails and other mechanical fasteners vary for each panel type and its intended use. In general, fixing centres are closer around panel edges than on intermediate framing. For all panels, nails and other mechanical fasteners should not be inserted close to the panel edges as this can lead to "tear out". Typical minimum edge distances are shown in the WPIF Panel Guide section 4, Table 4.7, but the panel manufacturer's recommendations should be followed if these are available.

Minimum fixing length should be 50mm or 2.5 times the panel thickness, whichever is greater. Where engineering design requires a certain fastener type and spacing this must be adhered to.

All T&G joints should be glued so that both the top and bottom surfaces of the T&G have enough glue to form a good bond. This is normally achieved by running a bead of glue along the top of the tongue and the bottom of the groove before the boards are joined together.

Further information on the installation and fixing of wood panel subfloors can be found in the Panel Guide V4:
https://wpif.org.uk/panelguide

It should be noted that the laying of square edged OSB and plywood is different to particleboard (chipboard) in that square edged OSB, and plywood is laid with its long edge supported by noggins across the joists with the short edges resting on the joist, whereas square edge particleboard has the long edges resting on the joists and the short edges supported by noggins.

T&G panels are always laid across the joists with the short edges resting on the joists. All T&G joints should be glued using an adhesive conforming to class D3 of **BS EN204** or better. For T&G boards, noggins are not necessary unless there are unsupported (i.e., no T&G joint) edges.

EXPANSION GAPS

A gap should be provided around the perimeter of a floor, to upstands or abutting construction or intermediate expansion gaps in larger floors, to allow for possible expansion of the decking. This should be a minimum of 10mm at each stage or 2mm per metre run of panel. The gap should be left open and covered by a skirting panel or filled with a compressible strip such as cork or other suitable material. A 3mm gap should also be left between each square edged panel. For T&G panels or panels which by design are tightly butted, special attention must be given to fixing down to avoid buckling.

NOTE: If square edged panels are used they should be overlaid with a fabricated underlay prior to installation of the floor covering.

FLOATING FLOORS

A floating floor is a floor that has an upper particle board or OSB surface that is "floating" i.e., not physically attached to the subfloor below. A floating floor does not carry the load but transfers the load to a subfloor that lies beneath. All T&G joints in a floating floor must be glued and all expansion provisions followed.

For further information, **WPIF Industry Standard 3/2014 Annex 3** should be referred to.

ACCESS TRAPS

Traps formed for services shall be close fitting and supported on all four edges to finish flush with the adjoining floor. It is recommended that they are fixed with brass countersunk screws in ring cups, unless otherwise detailed.

UNDERFLOOR SUPPORT

Support for the flooring panels shall be provided in one of the following ways:

- **TIMBER JOISTS/METAL SECTION BEAMS: — having a flange width not less than 50mm to allow for adjacent flooring boards, forming a butt joint, to be individually fixed to the support.**
- **Their depth shall be appropriate to the span. Their spacing shall be appropriate to the thickness of the boards, having regard to the imposed loading. (See Structural Considerations).**
- **WOOD BATTENS — having a minimum section 36mm deep and 50mm wide fixed to a level rigid base or resting on an insulating quilt, with full support along their length, to provide a floating floor.**
- **SEMI-RIGID INSULATING UNDERLAY — having a minimum thickness of 19mm, fully supported on a level rigid base to provide a floating floor. Suitable materials are expanded polystyrene ISD or SD/N grades to BS 3837 or insulating board (softboard) to BS 1142.**
- **Ensure that there is adequate ventilation underneath**

VAPOUR BARRIER

In ground floors, an effective DPM shall be incorporated in the construction. In addition, a vapour barrier shall be provided to the underside of the board (1000-gauge polythene sheet or other approved vapour barrier) lapped 150mm at the joints and taped, then upturned 38mm around the perimeter of the floor.

INSTALLATION OF FLOOR COVERINGS

Floorcoverings should be laid in conditions approximating to those likely to be encountered in service. The moisture content of the board, measured by an electrical resistance moisture meter, should be in accordance with table A2.3 (above) before floor coverings are laid.

The installer of the board should ensure that:

- **The surfaces are clean and free from contamination**
- **There is no movement at the joints and that jointed surfaces are flush**
- **All T&G joints are secured with suitable adhesive**
- **No fastenings are projecting above the surface of the boards**

It is often asked: “Can I install a floor covering directly to a particleboard subfloor?” In essence, the answer to the question is technically, yes. However, grin-through (telegraphing) of panel joints is one of the most common problems

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encountered with directly adhered (or loose laid) resilient or textile floor coverings.

The potential for grin-through of panel joints is referred to in the **Panel Guide 2014 (V4) section 2.4 Carpet and sheet floorings:**

"Sheet flooring can be loose laid or bonded directly to the panel surface. Thin sheet flooring or thin carpet may allow the panel joints beneath to show through, particularly after trafficking, and may require the use of an underlay to remove this effect."

Grin-though of panel joints can lead to complaints from dissatisfied end users and, in some cases, premature failure of the installed floor covering. It is recommended that, in order to prevent this, where resilient or thin textile floor coverings are to be installed over a chipboard subfloor (either floating or fixed) that a fabricated underlay or a suitable specified smoothing underlayment system should be used.

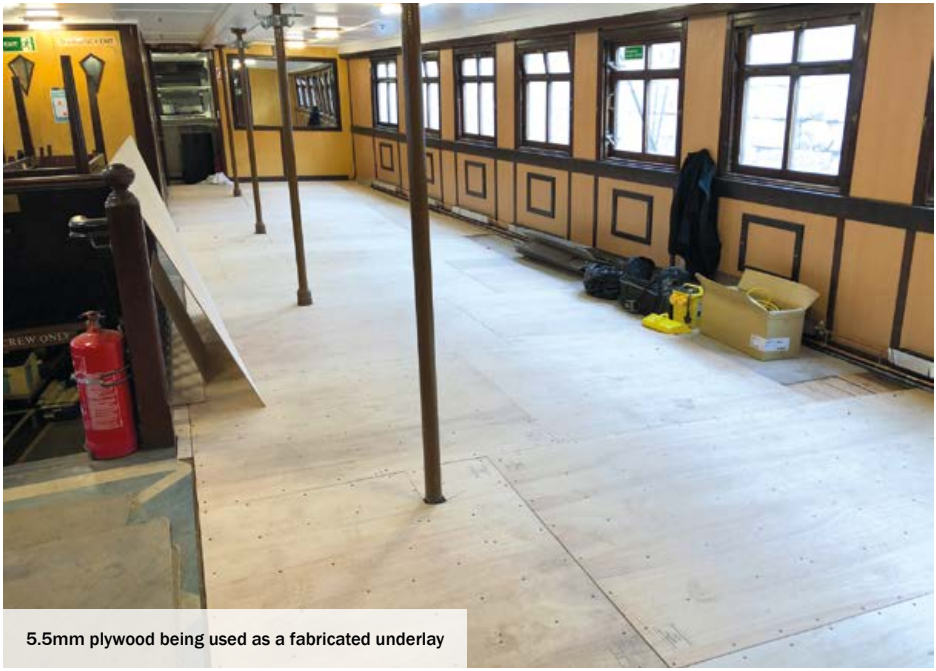
Some underlayment manufacturers may offer smoothing compounds as an alternative to the use of a fabricated underlay. The selection and application of appropriate primers and smoothing compounds is important and will be manufacturer dependant. It is therefore essential that if this option is to be adopted, that a full specification is obtained from the underlayment manufacturer and followed.

NOTE: Patching compounds are generally very thin, and should the panel expand/contract from ambient changes cracking and delamination of the thin patching compound can be expected. Patching compounds are therefore not recommended for the treatment of gaps or ridges in particleboard panel joints.

PLYWOOD

Plywood shall be of a suitable flooring grade and may also be used as a fabricated underlay to an existing timber floor (see "Fabricated Underlays" further on in this section):

1. **Boards are preferably T&G along long edges size 2400 × 600mm, minimum thickness nominally 15mm.**



5.5mm plywood being used as a fabricated underlay

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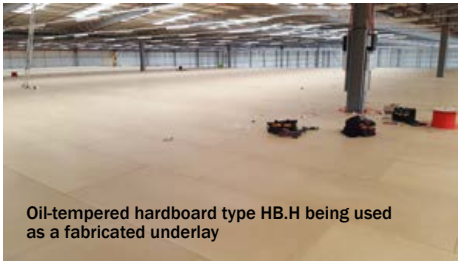
5.5mm plywood being used as a fabricated underlay



Oil-tempered hardboard type HB.H being used as a fabricated underlay

FABRICATED UNDERLAYS FOR OVERLAYING SUSPENDED FLOORS

The purpose of an underlay is to smooth out any irregularities of a subfloor before laying a floor covering which will telegraph these imperfections through to the floor surface (for example fully bonded thin vinyl on a particleboard subfloor may telegraph the joint lines).

FABRICATED UNDERLAY MATERIALS

The following types of panel product are suitable as underlay materials in dry conditions:

- **Plywood conforming to EN314-2 Class 3 (Exterior Conditions) for the Glue Bond and to EN636-2 for the Glue Bond and Resistance to Decay and should be constructed with hardwood veneers (see note below).**
- **Hardboard Type HB.H (oil tempered) conforming to BS EN622-2 Fibreboards. Hardboard should be checked for suitability when used in high traffic commercial and light industrial areas.**

Plywoods and hardboards should conform to **BS EN13986** and be clean and free from any additional surface sealants, residues or coatings.

NOTE: Plywood Specification Standards (a full specification can be found in **BS 8203: Annex A**

- **GENERAL — inner veneers should be laid up with the direction of grain in adjacent veneers at right angles to each other. The lay-up should be balanced (this will result in an odd number of total veneers around a central veneer e.g., 3 layers in total)**
- **GLUE BOND — EN314-2 Plywood–Bonding Class 3 (exterior) [plywood classified as EN636-3 will meet both the glue bond requirement and that of resistance to decay]**
- **RESISTANCE TO DECAY — there is no requirement for resistance to decay as such therefore plywood classified as EN636-2 (but with an exterior glue bond) or better, e.g., EN636-3, will meet this requirement (see glue bond requirement).**
- **OUTER VENEERS — should meet class I of EN635-2:1995 Plywood–Classification by surface appearance–Part 2: Hardwood. The outer veneers should be tropical hardwood, having a density of not less than 500Kg/m3 and a minimum thickness of 0.75mm after sanding. Face and back grain direction should be parallel to one another.**
- **PANEL EDGES — there should be no voids and no filler in the panel edges**
- **INTERNAL VENEERS — should meet class I of EN635-2:1995 Plywood — Classification by surface appearance — Part 2: Hardwood. Repairs to core veneers to achieve this class are permitted, within the limits set for Class I in Table 2 of EN635-2. Open joints, overlaps or other defects which may be telegraphed through to the surface veneers are not permitted.**
- **DENSITY — veneers should be made with species having a published average density of not less than 500 kg/m3 and a heartwood natural durability class between classes 1 and 4 (i.e., excluding class 5 species) in accordance with BS EN350-1.**
- **THICKNESS — minimum 5.5mm nominal (+/- 0.2mm) which is 6mm prior to finishing**
- **Formaldehyde emission class should not exceed E1, as defined in BS EN13986, Annex B.**

2. **Lay boards with long edges at right angles to joists, short edges must have solid bearing on joists.**
3. **Fixing is to be carried out using suitable mechanical fixings at 300mm centres along all joists.**
4. **For joist centres up to 600mm, use 24mm boards. For 500mm spacing, use 18mm board.**
5. **Since wood-based products change dimension with changes in ambient humidity the boards should be placed in position and allowed to condition prior to final fixing. All joints should be butted together.**
6. **With suspended timber at ground floor level, it is of vital importance that adequate ventilation is provided underneath the floor.**

NARROW T&G BOARDS ("FLOORBOARDS")

Even in new installations using traditional T&G floorboards, it is unlikely that the surface finish will be suitable to receive thinner floor coverings, such as sheet vinyl. These surfaces should be overlaid with a suitable fabricated underlay before laying the floor covering (see below).

Where this type of boarding is to be covered with a soft floor covering, e.g., carpet on an underlay, then the boards should be free of bumps and projecting nail-heads etc. Any gaps or depressions should be filled with a suitable filler.

SPECIAL TREATMENTS

It should be noted that certain treatments, either those applied on-site or by the board manufacturer, may interfere with subsequent adhesive bonding, such treatments would include moisture-proofing, wood preservatives and fire retardants. Where feasible, isolate the coatings by overlaying the boards with a suitable fabricated underlay (see specification below).

EXISTING TIMBER BASES (SUSPENDED)

All existing floor coverings and underlays should be removed, and the original board floors brought up to a continuous even and smooth surface by overlaying with a suitable fabricated underlay (see specification below).

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FABRICATED UNDERLAY APPLICATION

It is recommended the underlay should ideally be a minimum nominal thickness of 4.8mm (hardboard) or 5.5mm (plywood), depending on the level of rigidity required, and panels as large as possible used to minimise the number of joints. (It is assumed that underlays will be used on top of an existing structural deck such as particleboard or floorboards).

All wood-based panels used as fabricated underlays should be loosely stacked in the room where they are to be laid in order to condition as close to in-use conditions as possible before laying. The panels should be loosely stacked for at least 48 hours, and preferably one week, before fixing to allow for conditioning.

Hardboard should be either conditioned by sponging/brushing with water on the mesh side. This should be using approximately one litre per panel (1220 × 2440mm) or a pre-conditioned oil tempered hardboard should be used. Hardboards conditioned on site should be installed and fixed whilst slightly expanded but allowed to fully dry after fixing to avoid the risk of buckling after the floor covering is applied.

Where possible, hollows in the subfloor should be brought level by sanding, planing or patch-filling with a suitable underlayment. The underlay panels should be laid across the line of the panels in the subfloor. Conditioning and fixing recommendations for fabricated underlays is given in **BS 8203** or reference should be made to the carpet or resilient floor covering manufacturer's recommendations.

In order to obtain the best results, the underlay should be laid so that there are no gaps between the joints of the panels, nor any step between each panel. A gap should be provided around the perimeter of a floor to upstands or abutting construction and at door thresholds to allow for possible expansion of the underlay. This should be a minimum of 10mm at each stage or 2mm per metre run of panel. The gap should be left open and covered by a skirting panel or filled with a compressible strip such as cork. Joint lines should be staggered and joints in the panel and the timber base should not coincide.

The boards should be fixed using screw nails, ring shank nails or screws* which should be finished flush with the surface. Each panel should be fixed at 100mm centres around the perimeter of the panel and at 150mm centres elsewhere ensuring they do not protrude above the surface. The length of the fixings should be at least 2.5 times the thickness of the fabricated underlay, but no longer than would allow the fixing to protrude below the timber or wood-based panel base.

***An appropriate, secure, mechanical fixing method compatible with the wood-based panel should always be chosen.**

5.5mm plywood fixed as per recommended guidelines

Ring shank nails securing 4.8mm hardboard type HB.H oil-tempered

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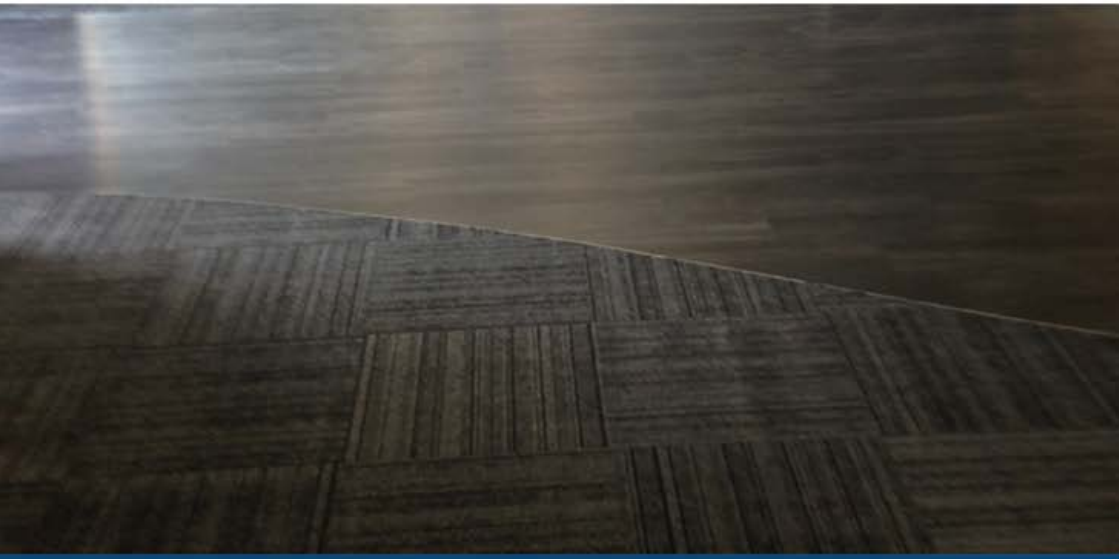

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RAISED ACCESS FLOORS

A raised access flooring system installed as a bare panel will normally be either a wood (particleboard) finish or galvanised steel, other finishes may be encountered but all metal surfaces must have an anti-corrosion finish.

It is rarely the responsibility of the flooring contractor to install the panels, but the following information is of value in ascertaining it has been installed correctly and is fit for purpose.

Alternatively, the floor panels may have a factory bonded finish e.g., a resilient floor covering such as PVC (vinyl), rubber, etc, needle punch, carpet, laminate or may be engineered to accept a textile finish that incorporates a location system. Sheet or broadloom materials should be avoided since this system is designed to give easy access to underfloor services.

PROTECTION

Where raised access metal clad panels are supplied with adequate corrosion protection which requires all parts of the platform floor system to be installed free of rust, corrosion, rot or any form of deterioration: they should be suitably finished to prevent such deterioration in normal use and oxidation, or rusting should not occur.

Raised access floors are often installed before other trades have completed their work, therefore adequate protection should be provided to ensure there is no damage to the surface which is essential to ensure satisfactory installation. Where metal clad panels are supplied with inadequate corrosion protection, they may rust whether or not floor coverings are installed. However, trapping moisture under floor finishes which is unable to evaporate and allow the panel to dry, appears to accelerate the corrosion process.

WATER TIGHTNESS

Unfortunately many raised access panel floors are installed too early in the construction programme due to inadequacies in the planning or progress and sometimes before the building is watertight. Those supervising the construction process should ensure that this does not occur and ensure that the flooring contractor does not have to resolve the problem.

RESIDUAL CONSTRUCTION MOISTURE

Installing floor coverings onto raised panel floors does not, in itself, require hygrometer readings to be taken. Retention of moisture in the structural slab and in the space underneath the raised panel floor deck that allows air circulation is often a primary source of moisture which can cause problems and must be avoided.

WET EXTRACTION AND SPILLAGE

It is almost inevitable that during the life of a floor covering, on raised panel floors, that wet spillage and wet extraction cleaning will occur. Where panels are adequately protected from corrosion, problems should not occur.

However, it should be noted that wetting of the floor covering may be deemed to be a contributory factor to any subsequent problems.

ADHESIVES

Tackifier adhesives used for the installation of carpet tiles should be carefully applied from a tray using a roller and the penetration of the tackifier between the edges of the panels must be avoided to prevent adjacent panels bonding together.

The film of tackifier should then be allowed to dry before the floor finish is installed. This will ensure that excess moisture is not trapped beneath the floor finish and will also avoid the possibility of a permanent bond being obtained. Under no circumstances should the tackifier adhesive be poured directly onto the floor.

Pressure sensitive adhesives are used for the installation of PVC (vinyl) floor coverings. The preparation should be as above.

High temperature adhesives should be considered where higher surface temperatures may be expected, for example, conservatories, glass atriums, etc.

SUMMARY

Where adequate corrosion protection is given to metal clad panel floors corrosion is not generally a problem. The solution therefore rests with the specifiers who, when specifying performance criteria, must insist that raised access panel floors have adequate protection.

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DRY SCREED PANELS/ SCREEDBOARDS

Dry screed panels/screedboards differ from particle boards and plywood described earlier in this document in that they are not manufactured from timber. A guidance note on acoustic and dry screed panels has been produced by the CFA. It is not expected that flooring contractors will be the installers of the dry screed panels and the guidance is relevant only to installing onto dry screed panels and is based on the board being installed onto a suitably dry substrate.

Dry screed panels can be used in both new and refurbishment projects. Due to the diverse nature and installation methods for dry screed panels it is important that prior to carrying out any flooring installation it is essential that the manufacturers guidelines are referenced an, understood and explicitly followed.

Dry screed panels can be summarised as consisting of any one of the following constructions.

- **Cement fibre board**
- **Crush backed boards**
- **Cement particle board**
- **Calcium sulphate board**
- **Cement faced polystyrene board**

On inspection, boards should be laid as a flat smooth regular base with no rocking. A minimum SR2 surface regularity in accordance with **BS 8204 Part 1** should be achieved. All wet trades in the immediate vicinity must be finished.

UNBONDED; CEMENT PARTICLE/FIBRE CRUSH AND CALCIUM SULPHATE PANELS

On such systems joints should be completely free from deflection/movement. The joints must be created in accordance with manufacturer's guidelines. These systems may include UFH systems.

In certain circumstances the finished surface of the board will be suitable to receive some types of flooring directly i.e., carpet/underlay, wood, ceramic or resilient. Advice must be sought from the relevant flooring manufacturers on this.

Where smoothing is required, prime and apply floor joint finishing compound/smoothing underlayment as detailed by subfloor preparation manufacturer's guidance.

BONDED PANELS

Ensure the cement fibre/particle/calcium sulphate/cement faced polystyrene panels are well secured in accordance with manufacturer's guidelines.

Where smoothing is required prime and place floor joint finishing compound/floor smoothing underlayment as detailed by supplier's instructions. In certain circumstances the finished surface of the board will be suitable to receive some types of flooring directly i.e., carpet/underlay, wood, ceramic or resilient. Advice must be sought from the relevant flooring manufacturers on this.

Where electric wire heating systems are present these must be securely located without the use of plastic faced tapes. Often, floor smoothing underlayment will be required to encapsulate the wire heating system to create a smooth surface ready for the decorative floor covering.

Micro-bore water fed heating systems can be located within screed board panels, in principle these can be covered with deep fill floor smoothing underlayment, due to the complexity of the systems the specifics need to be confirmed with the relevant manufactures.

Specific advice from subfloor/dry screed panels/ priming/floor jointing compounds and smoothing underlayment manufacturers should be sought for individual projects.

EXISTING FLOOR FINISHES

Whilst it may be possible to install new floor coverings over certain existing floor finishes or subfloors such as existing terrazzo/ceramic tiles, seamless resin floors, cement and sand screeds, concrete, etc., the manufacturers of the products to be applied should be consulted. This is to ensure that their products are compatible and that the correct subfloor preparation is carried out to ensure the longevity of the installation.

Note that new floor coverings should not be installed over existing resilient floor finishes such as vinyl and linoleum sheet and tile floorings, see clause 3.7 of **BS 8203**.

These floorings should be removed, and the subfloor suitably prepared before installing the

new flooring. All subfloors must be sound, clean and free from dust, any floor coverings that are to be covered must be well bonded to a concrete base that is protected from rising damp and is sufficiently dry to receive the new floor covering. If there is any doubt, they must all be removed to expose a good sound concrete base.

Where the floor does not contain a functional DPM that is incorporated into the subfloor or contains excess construction moisture then provision must be made for the use of a proprietary surface DPM. This is to protect new decorative floor coverings adhesive and floor preparation products.

MECHANICAL PREPARATION

Mechanical preparation has been referred to in various places within this section, generally for preparation of hard surfaces, removal of surface coatings, adhesive residues and, in some cases, existing floor finishes.

Hand grinding may be used in small areas to remove adhesive residues, and sanding may be employed for timber, calcium/cement flowing screed and, as a light application on asphalt. However, in all other situations requiring mechanical preparation then appropriate powered techniques should be employed.

The main mechanical subfloor preparation methods are:

- **Shotblasting**
- **Planing/Scarifying**
- **Grinding**
- **Multi-stripping**

SHOTBLASTING

Shotblasting is the most economical method for removing glaze/laitance from power floated concrete, texturing and cleaning concrete or tiled surfaces and for removing paints and sealants. Surfaces suitable for shotblasting include any hard composition that does not exhibit multiple layers of materials or contaminants i.e., concrete, terrazzo or stone.

Shotblasting will not effectively remove soft composition screeds, sticky/bituminous materials or materials in excess of 500µm thickness.

ABOVE: Shotblasting is the most economical method for removing glaze/laitance from power floated concrete, texturing and cleaning concrete or tiled surfaces and for removing paints and sealants

PLANING

Is often specified for the removal of high build coatings, thermoplastic compositions, thick surface contaminants, and latex and polymer screeds. This method removes materials in excess of 1mm in thickness including multiple layers of old coatings. Planing will also reduce tamped surfaces and levels and create a textured surface. It tends to create a rippled effect and dependent on the finished floor covering, it may be necessary to follow with another preparation method.

GRINDING

Grinding is the method for removing paint and coatings, thin adhesives, latex and screeds, levelling compounds and elastomeric systems. It will also clean, smooth, and polish concrete, stone and terrazzo.

It is important to note that grinding an uneven surface will skim across the high spots (peaks) and not touch the lower ones (troughs) unless the surface has been reduced to the lowest composition first.

MULTI-STRIPPING

Is often selected when there is no other suitable method. A wide range of existing floor coverings can be removed with minimal effort including self-levellers, ceramic and stone tiles, vinyl, carpets and laminate flooring, latex, screeds and epoxy resin, thermoplastic lines, adhesive and bituminous materials. Multi-stripping often needs to be followed by another method, in order to achieve a suitable profile for application of the final floor covering.

The size and scope of the project, the composition of the surface being treated and material being applied should always be considered when selecting equipment and accessories. A particular concern is where flooring products incorporating asbestos fibres may be present. These can include old thermoplastic tiles and bituminous-based adhesives. It is important to get expert advice.

Most modern machines are designed to be used with dust extraction. In all cases, vacuum removal of dust and debris should be used both during and after preparation to ensure no contamination is left.

Once prepared, substrates should be protected from access or contamination prior to installation of subsequent materials and finishes. It is good practice to minimize the delay between preparation and application of subsequent materials to avoid accidental traffic.

Grinding is ideal for removing paint and coatings, thin adhesives, latex and screeds, levelling compounds and elastomeric systems

Multi-stripping a vinyl surface can be done with minimal effort and often needs to be followed by another method, in order to achieve a suitable profile for application of the final floorcovering

TRAMEX

CONCRETE MOISTURE ENCOUNTER

CME5 CMEX5

QUANTITATIVE MOISTURE CONTENT & RH READINGS FOR CONCRETE FLOORS AND SLABS

BLUETOOTH FOR USE WITH TRAMEX APP
EXTENSION HANDLE REDUCES NEED TO BEND DOWN (optional)

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5 | Moisture Testing in Concrete Floors and Screeds

All cement and sand screeds, calcium sulphate screeds and concrete bases are produced by mixing a reactive binder (e.g., cement, anhydrite, hemihydrate, etc), fillers and sand/aggregate with water. Some of this moisture is used up in the hydration of the cement binder whilst most of the remaining moisture must be allowed to evaporate so that the screed is sufficiently dry to receive the final floor coverings. The base is deemed to be sufficiently dry to receive most floor coverings when the equilibrium relative humidity (ERH), as measured by a surface mounted flooring hygrometer box or an in-situ hygrometer probe is 75% RH or less.

For the use of a flooring hygrometer box reference should be made to Annex A (normative)–Dampness testing in **BS 8201; BS 8203; BS 5325 and BS 8425.**

For the use of an in-situ hygrometer probe reference should be made to Annex A (normative) in **BS 8201; BS 8203 and BS 5325.**

To ensure the surface has optimal drying conditions and before any moisture testing is carried out, the surface of the screed should be free from any contaminates or surface fines, laitance, surface finishes, etc.

For a traditional cement and sand screed utilising Portland cement the "rule of thumb" is to allow one day per mm drying out time, under ideal drying conditions of 20°C and <65% relative humidity. However, the actual rate of drying out will depend on the temperature and relative humidity on site, mix design and amount of water used in the mix, as well as the overall thickness of the screed and any underlying concrete subfloors (if not isolated from the screed). It is important to note that the above guidance is only applicable for cementitious levelling screeds up to 50mm thick. Thicker screeds and concrete slabs may take as long as 12 to 24 months to dry, whilst the power floating of concrete will greatly extend this period. For further information see **BS 8204-1:2003 +A1:2009 section 6.11.**

A British Standard hood test box with built-in digital hygrometer

When consideration is given to calcium sulphate screeds, the drying rate is similar to a sand and cement screed up to 40mm, i.e., 1mm per day. After this, however, the drying rate is 0.5mm per day. Therefore a screed of 50mm will take 60 days under ideal drying conditions. Faster drying options are also available where drying rates are uniform throughout the screed depth.

With regards to both cementitious and calcium sulphate-based screeds, ideal drying conditions are referenced. The conditions referenced include both the ambient conditions in the building (a temperature of 20°C and a relative humidity of <65%) as well as referring to a building that is weathertight, preventing any further moisture ingress into the building, and adequately ventilated. This ensures that optimum drying conditions are attained. **Drying times will be greatly increased under conditions of low temperature and/or high humidity.**

In all circumstances, the screed drying rate requires for the residual moisture to be able to evaporate from the subfloor surface. Storage of materials, damp air humidity, poor airflow, cold

temperatures, water spillages from other trades and water ingress into the property, will all adversely affect the drying rates.

Force drying with the aid of UFH or dehumidifiers can help reduce drying times significantly. However, early introduction, with a very immature or green screed, can cause damage to the screed by removing water that the cement may require to hydrate correctly and resultant cracking can occur. Follow guidance of the relevant section **BS 8204** or consultation with the screed supplier.

Where relative humidity readings of 75% or greater are recorded on a new concrete slab, cement/sand screed or calcium sulphate screed, this can normally be attributed to the retention of construction moisture, which will eventually dry out.

Where relative humidity readings of 75% or greater are recorded on an existing concrete slab, cement/sand screed or calcium sulphate screed, this can be attributed to passage of moisture from an external source. The source may be from leaking pipes, passage of moisture from above e.g., flooding, or from below ground where there is no DPM or the membrane has been breached. In all of the above cases the need for a surface DPM to control the excess moisture in the subfloor is required. In the case of calcium sulphate screeds this is not recommended and the source of ingress must be identified and corrected. Where the cause is flooding the source must be ascertained and adequate remedial measures undertaken to ensure that the floor is no longer subject to ingress of moisture.

NOTE 1: Floor slabs which are pre-1965 are not likely to have been installed with a physical DPM or, if they were, then it is likely they are no longer effective. Floor slabs which have no effective DPM can give low moisture readings, below 75%RH if they:

1. **Have been installed with a permeable floor covering, such as carpet or VCT.**
2. **Have been left uncovered for some time.**
3. **Are tested in a period of fine weather, where groundwater is low.**

A British Standard Hood test in use with plug-in hygrometer probe

PROTIMETER INSTRUMENTS FOR FLOORING

PROTIMETER

- Concrete floors
- Non-invasive testing through floor covering
- Wood moisture measurement of sub-floors and floor finishes
- Ambient Relative Humidity, temperature and Dew point measurement
- Non-contact surface temperature measurement and surface dew point detection

Visit www.protimeter.com for contact details, distributors, product information and videos.

In these cases, potential for groundwater problems may not arise until an impermeable floor covering is installed. If any doubt exists then a surface DPM should be applied to avoid such problems.

NOTE 2: When carrying out moisture testing, in all cases, identifying the correct location for the hygrometer is essential in determining the underlying moisture levels. A surface survey of moisture levels using an Electrical Impedance meter should be carried out to identify the most suitable test locations.

HYGROMETER BOX METHOD

In the UK, the most commonly approved method of testing the dryness of the base prior to the installation of floor coverings, is with the surface hygrometer box. Full details of the instrument and method of operation are given in **BS 5325, BS 8203, BS 8201 and BS 8425.** Briefly, the hygrometer measures the equilibrium relative humidity of a pocket of air trapped above the slab/screed for the duration of the test using an insulated impermeable box, which can be sealed to the floor surface to create an enclosed pocket of air which is isolated from the humidity and fluctuations in temperature of the outside air.

It is essential that this is sealed to the floor using a preformed butyl sealant tape and that readings can be taken while the apparatus is in position on the floor without breaking the seal and releasing the trapped pocket of air.

Other forms of apparatus might be suitable which conform to specifications in accordance with the British Standards referenced in this document.

A base is deemed to be dry when a figure of 75% RH or less is recorded in general, although a value of 65% may be required for overlaying of some timber products on UFH.

While the hygrometer, as recommended by BRE (Building Research Establishment), has been in use for many years, there are a number of factors that must be considered for it to be fully effective.

The hygrometer must be calibrated (at 75%RH +/- 3%), in accordance with manufacturers' instruc-

Taking instant readings with an electronic moisture meter

tions and BS Guidelines, to ensure accuracy of any obtained reading. The method for calibration is included in **Annex A of the British Standards.**

The building must be fully watertight and should, ideally, have good ventilation and heating where appropriate to encourage drying of the base. It should be pointed out that if the prevailing conditions are cold and damp, with associated high ambient humidity, the base will only establish equilibrium with the environment and no further drying will occur.

If UFH or other artificial drying aids are present in the base, these should be switched off 96 hours prior to any hygrometer test being carried out.

The surface hygrometer should be installed over an area of the base found to be wettest when checked with an electrical impedance moisture meter, or considered likely to be the wettest i.e., those with poor ventilation, corners of rooms, etc., and out of direct sunlight to minimise temperature differential. The surface hygrometer should also be installed over a clean and prepared base, this will not only aid the adhesion of the hygrometer itself but could also lead to faster establishment of moisture vapour equilibrium.

The hygrometer must remain in position until full equilibrium has been established. This is generally considered to be 72 hours but could be longer over sections of 200mm or more, and considerably longer on power floated concrete.

For unbonded screed, where the DPM is placed between the base and screed, allow a period of no less than 4 hours before taking the first reading. Equilibrium may be assumed when 2 consecutive readings taken at 4 hour intervals show no change.

The hygrometer must be removed once equilibrium has been established. If further readings be required in order to measure progress in drying, a fresh hygrometer test should be installed.

We would recommend that the following points should be followed to ensure that testing is accurately carried out in line with the current industry standards:

1. **Ensure the hygrometer testing equipment to be used is calibrated to within the manufacturers, and BS guidelines. Uncalibrated or wrongly calibrated equipment could result in inaccurate results and possible failure of floor finishes. Therefore, the device should be checked for calibration regularly.**

2. **Determine if the conditions within the building envelope are suitable for testing, a high ambient RH may result in a falsely high moisture content being established. The building should be weather-tight and have good ventilation.**

3. **If UFH is present within the floor screed, it must be switched off prior to carrying out site testing to allow the screed to cool fully (BS 8203; BS 8201 and BS 5325 stipulate the minimum elapsed time is 96 hours) and be left switched off throughout the length of test. Moisture testing on warm screeds may not give an accurate reading.**

4. **The hygrometer should be placed in a position on the floor where the moisture levels have been established to be at their highest level as it is here that the floor is at most risk of failure. To establish this point it is recommended that a hand-held moisture meter is used to determine the aforementioned locations; it is likely the wettest areas will be those with poor ventilation or, in winter, those directly adjacent to doorways. Due consideration must be given when placing the device to areas that may be subject to high thermal gain as this can produce erroneous results.**

5. **The equipment must be placed onto a clean, contaminant free surface, it is important to note that an abraded surface will ensure a good bond for the hygrometer box, but also will allow a faster passage of moisture and therefore potentially faster attainment of equilibrium.**

6. **The equipment must be adhered to the surface with a suitable moisture resistant adhesive or butyl tape, if this is not done moisture can pass around the box and readings could be reduced. (N.B. Silicone sealants, which can produce erroneous readings, should not be used)**

7. **Once the hygrometer has been placed, BS 8201; BS 8203 and BS 5325 state:**

Understanding Moisture Measurement Technology

RF DETECTORS

- Indicative test only
- Provides quick assessment of the relative moisture condition from the surface to a nominal depth
- You obtain an understanding of whether the subfloor is “Dry” or “At Risk” or “Wet”
- Doesn’t provide actual % readings

IMPEDANCE METERS

- Indicative test only
- Provides quick assessment of the relative moisture condition from the surface to a nominal depth
- Provides indication of actual moisture content % value in concrete and floor screeds

PIN METERS

- Provide quick and precise moisture measurement at specific points
- Surface measurements or sub-surface measurements
- Provides actual % moisture content value in wood and wood moisture equivalent (WME) value in other materials

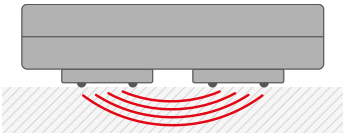
HYGROMETERS

- The definitive method for assessing the moisture condition of subfloor
- Measures RH of an air pocket in equilibrium within the floor
- Recognised in British Standards

Generic Moisture Testing

SUB-SURFACE DETECTION USING RADIO FREQUENCY (RF)

Reads up to a nominal depth of +/− 20mm (from the surface) dependent upon material



SUB-SURFACE DETECTION USING ELECTRICAL IMPEDANCE

Reads up to a nominal depth of +/− 25mm (from the surface) dependent upon material

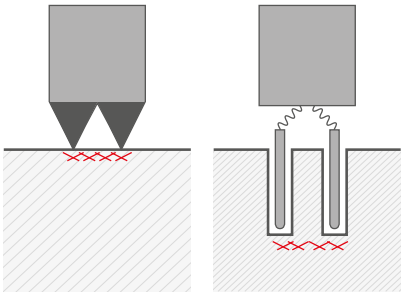
Indicative tests ONLY. Will not read at depths greater than indicated above. Dry readings do NOT guarantee a substrate is dry throughout.

Both systems will give false readings if positioned over metal objects or pipework (e.g., wet or dry UFH systems) fitted close to the surface within subfloors.

Equally, both systems will NOT give false readings if positioned over metal objects or pipework which are correctly fitted below 30mm from surface.

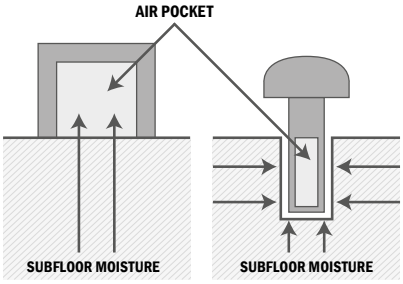
Generic Moisture Testing

PIN METERS



Surface measurement only	Sub-surface measurement at depth of drilled hole
Uses electrical impedance	Uses electrical impedance
Limited and restricted to measuring the distance between pins	Can obtain measurement to specified depth
Can give false readings, e.g., if conductivity of moisture is effected by salts	Also subject to false readings if additional factors effect conductivity

HYGROMETERS — Conform to BS



Equilibrium RH measurement	Sub-surface equivalent
Records relative humidity (RH)	Follows same principle as the Box hygrometer
Measures moisture content of trapped air pocket thus reflecting moisture content of the slab	Done by drilling hole in sub-floor and inserting a capped sleeve to chosen depth
Can be difficult to ensure boxes are not disturbed on-site	Readings **do not** directly correlate to surface hygrometer method

Interpreting Readings

Instrument Type	Reading	Probable Interpretation	Advisory Comments / Remarks
RF & Impedance Detection (indicative test only — Search Mode +/- 20mm to 25mm from surface)	Low	Dry	Must be confident that higher levels of moisture are not contained deeper in slab or measuring air pocket: Consider using hygrometer or sleeve test
	High	Wet	Conductive material or not: Must use hygrometer or sleeve for accurate measurement
Pin Meter (Measure Mode)	Low	Dry	Floor Dry (at surface and between the pins)
	High	Wet	Conductive material? Must use hygrometer or sleeve if subfloor is new and measurement taken early in day, test in "RF" Search Mode to rule out condensation.
Hygrometer or sleeve test (in accordance with BS)	<75% RH	Dry	Floor is DRY
	>75% RH	Wet	Floor is WET

a) *"For an unbonded screed, where the DPM is placed between the base and screed as described in **BS 8204-1** allow a period of not less than 4 hours before taking the first reading.*
NOTE: Equilibrium may be assumed when two consecutive readings taken at 4 hour intervals show no change."

b) *"For very thick constructions, i.e., direct finished base slabs or bonded screeds (where the DPM is placed below the base slab as described in **BS 8204-1**) allow a period of at least 72 hours to elapse before taking the first reading.*
NOTE: Equilibrium may be assumed when two consecutive readings taken at 24 hour intervals show no change."

c) *"Constructions with thickness greater than 200mm can take considerably longer than one week before moisture equilibrium is established."*

4. **The hygrometer box MUST be removed after the required time (section 7 above) has elapsed as readings cannot be taken over an extended period in the same position. To repeat the test a new suitable position should be found**

HYGROMETER SLEEVE METHOD

The hygrometer sleeve method was introduced in the UK in 2011 with the revision of **BS 8201 and also included in the 2017 revision of BS 8203 and the 2021 revision of BS 5325.**

The hygrometer sleeve method (also called the in-situ method) involves inserting a relative humidity probe directly into the slab/screed and allowing the sensor to equilibrate with a small pocket of trapped air to achieve an equilibrium relative humidity reading.

The main advantage over the humidity box test is that because the airspace is situated inside the slab, this can act as a better insulator against temperature change, thus producing more stable results.

The main disadvantage is the destructive nature of the test, and in particular, the problem of not being able to drill into screeds where UFH is installed, without an exact knowledge of where pipes are situated.

It is important to note that British Standards recommend that after drilling, the hole must be allowed to cool for a period of no less than 72 hours with the proprietary sleeve in place before inserting the probe as readings taken in a warm hole may not give an accurate reading. Please refer to probe manufacturer's guidelines for further clarification.

Relative humidity probes should not be exposed to high levels of humidity (>93%) for extended periods (i.e. > 24 hours) as this may cause the readings to drift.

Therefore, upon inserting the probe into the sleeve, as soon as the reading has climbed above the required reading (i.e. 75% or other reading specified by the manufacturer for the product), the probe can be removed and it may be recorded that the slab or screed is too wet and further drying or a surface DPM is required.

The method is performed as follows:

1. **Before drilling into the concrete, check that there are no services within the base.**
2. **Drill the correct size diameter hole into the concrete to a depth of 40% of the concrete subfloors overall thickness.**
3. **Using a small brush, clean the inside of the hole free from dust and vacuum away any loose debris from within the hole.**
4. **Place the proprietary sleeve into the hole ensuring it is firmly fixed and finishes flush with the concrete surface and the cap is firmly in place.**
5. **After a minimum of 72 hours, remove the cap and immediately insert a proprietary relative humidity probe into the sleeve.**
6. **After a minimum of 30 minutes, a reading can be taken and recorded. The probe is then removed and the cap firmly replaced.**
7. **After a further minimum 24 hour period, repeat the procedure at a minimum of 24 hour intervals until two consecutive readings are identical to each other. At this point the trapped air is in equilibrium.**

OTHER COMMONLY USED TEST METHODS

Whilst **BS 5325, BS 8201 and BS 8203** references the hygrometer box method as the correct test, there are other tests are available which support these in the right circumstances, e.g., Carbide Bomb (CM) test and the Gravimetric oven dried sample test, both of which are acceptable under the screeding Standard **BS 8204:7.**

These are generally not carried out by flooring contractors, but may be used by the screed installers/manufacturers or when carrying out diagnostic testing.

Bear in mind that each test method measures a slightly different aspect of the screed moisture, so comparisons between methods can be difficult if not impossible to appraise. However performing two or more different test methods can be helpful in identifying false positives or negatives, as, if all tests correspond, then the likelihood is greater that the readings are accurate.

Several electrical impedance devices are also available which can be used in a non-destructive "search" mode to provide a quick indication of moisture content. Such instruments offer indicative readings only and can be effectively used to detect the best location to install an in-situ sleeve or surface hygrometer box.

CARBIDE BOMB (CM) TEST

The CM test is a European Norm and is a national standard in many European states as the sign off. However, it is quite widely used in the UK by professional floor testers and is, in some cases, the preferred test recommended with certain types of floor screeds. In these circumstances the responsibility for testing the floor does not lie with the flooring contractor. Always consult the manufacturer's specifications.

The CM test involves removing a sample of the slab/screed with a hammer and chisel and then crushing using a mortar and pestle. The required amount is then weighed and placed into an airtight chamber together with Calcium Carbide which, when in contact with moisture, produces acetylene gas.

The higher the concentration of moisture the more gas is produced, which is read as pressure from the devices gauge.

Because Calcium Carbide reacts with free moisture only, the CM test will not measure chemically bound moisture within the sample. The test is ideal for certain fast-drying screeds, which act by chemically binding the majority of construction moisture and therefore cannot be tested with relative humidity or electrical impedance devices, which will give high results.

Performing a British Standard drill-in hygrometer probe test

Typical measurements which are specified/ achieved with the CM test and at the same time specified in RH%:

CONCRETE/SAND CEMENT/PUMPABLE CEMENTITIOUS SLABS/SCREEDS:

- **2.5%CM without UFH installed — normally specified at 75% RH**
- **1.5%CM with UFH installed — normally specified at 65% RH**

ANHYDRITE/HEMI-HYDRATE SCREEDS:

- **0.5% CM without UFH installed**
- **0.3% CM with UFH installed**

The main disadvantages of the test are the destructive nature and high potential for tester error.

GRAVIMETRIC OVEN TEST

This test involves removing a sample of the floor/ screed carefully to ensure minimum loss of moisture, then, usually by sending to a lab, weighing the sample before and after drying in an oven to calculate the moisture content by weight (MC) which was present.

Gravimetric oven testing of concrete is usually performed at 105°C which removes chemically bound as well as free moisture.

Typical measurements which are specified/ achieved with this type of test are:

CONCRETE/SAND CEMENT SLABS/SCREEDS:

- **4%MC without UFH installed — normally specified at 75% RH**
- **3.5%MC with UFH installed — normally specified at 65% RH**

ANHYDRITE/HEMI-HYDRATE SCREEDS

- **0.5%MC — normally specified at 75% RH**
- **0.3%MC — normally specified at 65% RH (at 40°C instead of 105°C)**

This test is seldom used and also has a high potential for error due to sample contamination.

NOTE: This testing method has no correlation to the above CM Test with regards to Cementitious materials due to the higher drying temperature typically used.

ELECTRICAL IMPEDANCE AND RF DEVICES

Many electrical impedance and RF (radio frequency) devices are available which provide instant, non-destructive moisture readings from the surface of concrete floors and screeds, some providing relative (0-100) readings and some calibrated to give an indication of Gravimetric oven or Carbide Method tests.

Such devices are useful indicators of high/low moisture levels and should be used as the best method to identify highest moisture concentrations, which should be the most suitable location for in-situ sleeve or humidity box tests.

Impedance and RF devices read from the surface and thus can give spurious readings in certain conditions, which care should be taken to identify:

- **When ambient relative humidity conditions within the building are extremely high, condensation can form on the floor surface providing false positives. This should not occur when proper site conditions are maintained and monitored (as above).**

Force drying with dehumidifiers can remove moisture from the surface first, providing artificially low readings, thus all drying aids should be shut down before for a minimum period of 48 hours before meaningful results should be taken.

The accuracy of impedance devices can be affected by the screed surface, therefore to improve accuracy these meters should only be used with flowing Cementitious/Calcium Sulphate screeds when the surface has been fully sanded/abraded.

NOTE: Some surface reading moisture meters can read deep into the surface and therefore potentially pick up moisture within UFH systems. It is important to know the depth of reading of the device used.

The Ultimate Solutions for Subfloor Moisture

Stopgap F77
Isolates residual construction moisture and rising damp up to 98% RH in a single coat. Apply direct over underfloor heating screeds where RH readings are up to 90%.

Stopgap F78
Impedes the passage of construction moisture up to 95% RH in a one component, ready to use system.

Stopgap Isolator Membrane
Loose lay, impervious sheet designed to provide a fast and easy solution for damp subfloors.

F. Ball Digital Hygrometer
For accurate measurement of relative humidity levels in accordance with British Standards.

F. Ball offer a complete range of solutions for the control of subfloor moisture.
Guaranteed to provide the ultimate protection.

A great finish starts with F. Ball

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6 | DPM (Damp Proof Membranes)

Many failures which occur with floor covering installations that are adhered directly to a solid subfloor can be attributed to moisture related issues. It is essential therefore, that the floor coverings are protected from the passage of moisture from below. Some of the main causes of moisture related failures are as follows:

- **No construction DPM in the subfloor build-up allowing moisture to rise from the ground**
- **Inefficient or damaged DPM**
- **The incorrect specification of moisture control products**
- **In fast-track building, where the construction techniques used, or the project program does not allow sufficient time for the construction moisture in the subfloors to reach acceptable levels**
- **For installations below ground floor level, there may not be a suitable tanking system installed**
- **Flooding**
- **On the outside of the building, soil or similar is above the damp proof course in a brick/block wall**

The specifier must therefore ensure that adequate protection from moisture ingress be provided, and that the products are suitable for the intended purpose, they are applied in accordance with the manufacturers' recommendations and that in the case of construction DPMs they are linked with the damp-proof course in the walls.

Power floating/power trowelling of concrete can result in a non-absorbent dense surface being achieved. The additional use of integral water-proofers in the concrete, the application of smoothing compounds and the use of bituminous adhesives do not provide adequate effective protection against moisture in the subfloor causing damage to the floor covering installation.

One-part waterproof surface membrane being applied with a pre-coated roller. No mixing required. Always follow manufacturer's recommendations.

In building construction, there are three basic methods of incorporating a DPM:

- **BASE MEMBRANES — these membranes are laid underneath the concrete base slab.**
- **SANDWICH MEMBRANES — laid onto the base slab and topped with a cement and sand levelling screed of at least 50mm thick.**
- **SURFACE MEMBRANES — as the name implies, are applied directly to the surface of the subfloor/smoothing compound.**

NOTE: It is essential that any pre-smoothing of the subfloor, before the application of a moisture control system, is performed using a moisture tolerant product.

BASE MEMBRANES

Building Regulations stipulate that base membranes are used on all construction sites. Normal methods for such construction are either:

a) To apply a concrete blinding to compacted hardcore and lay a self-adhesive rubber bitumen membrane on polyethylene film

b) To apply a layer of sand over the hardcore followed by 1200-gauge polyethylene sheets

Concrete is then pumped/poured onto the base membrane to the specified thickness, usually between 150mm and 200mm. The surface of the concrete can frequently be power floated/trowelled leaving a very dense surface which can significantly contribute to extending drying times.

NOTE: There is a risk that the membrane could be punctured during work on site.

The problem with deep slab construction is that a considerable amount of water is retained in the concrete following curing completion. This moisture in practice, even in good drying conditions, can take over 12 months to dry from one face only. The use of curing membranes also increases the drying time.

The build-up of moisture underneath a resilient floor covering can cause a build-up of moisture vapour which may result in failure of the floor covering such as blistering, loss of adhesion, etc., and the period between installation and failure can vary considerably.

SANDWICH MEMBRANES

These are used where the base concrete slab is cast to a level below the designed finished floor level. The membrane is then applied to this surface followed by an unbonded cement and sand levelling screed, minimum thickness of 50mm. Sandwich membranes come in three forms: hot applied; cold applied; and pre-formed sheet.

NOTE: In all cases it is essential that a construction membrane is carried up the wall to the damp-proof course in the wall structure, thus providing a tanked system for the levelling screed.

SURFACE DPMs

GENERAL

Surface applied DPMs include reactive resins such as two-component epoxies; one-component polyurethanes; separators and silane-based products; and one component water-based systems are also available. These water-based systems are commonly referred to as Moisture Vapour Suppressants although some two- and one-component systems only have moisture vapour suppressant capabilities.

There is a distinct difference between DPMs and Moisture Vapour Suppressants. Generally, Moisture Vapour Suppressants should only

Moisture suppressant are rapid drying, easy to use and ready mixed. A second coat is applied before application of a smoothing compound. Always follow the manufacturer's recommendations.

RAPID DAMP-PROOFING SURFACE MEMBRANE MAPEPROOF PRIMER, FROM MAPEI

Mapeproof Primer is a one component, **rapid drying** PVDC based dispersion primer for **suppressing residual moisture** up to 4.5 CM-% (95% R.H.). Once dried it provides a **waterproof surface membrane** impeding the passage of residual construction moisture from affecting subsequent floorcovering installations, therefore allowing early installation of floorcoverings.

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be used where it is known that an effective construction DPM is present and fully functioning, and therefore only has to control the passage of residual construction moisture and not ground bearing moisture.

Surface applied DPMs that can facilitate the controlled passage of both ground bearing and residual construction moisture should be considered for use when it is known that either no construction DPM is present or that its effectiveness cannot be guaranteed.

Generally, this is in building construction that pre-date the 1970s. It is therefore essential that the specifier identifies which moisture control product is required. Performing moisture readings in accordance with the guidance given in Section 5 of the *CFA Guide to Contract Flooring* will assist with the decision process.

There are also loose-laid sheet membranes available that may be used in certain circumstances and should be installed following the manufacturers' instructions. Surface applied DPMs are not designed to resist hydrostatic pressure, and where used, the manufacturers' recommendations should be followed.

Surface DPMs are generally reactive resin systems that penetrate and seal the surface of a subfloor and chemically cure in-situ to form a film which restricts the passage of moisture and allows the controlled passage of water vapour. Any subfloor that membranes are to be applied to should be clean, sound with a micro-textured finish which can be achieved by using mechanised equipment to remove any surface laitance, curing agents, surface hardeners or any applied layers, adhesive residues, or surface contamination and ensure that the prepared surface is capable of supporting the chosen finish.

Providing that the moisture control product is applied to form a continuous film at the required thickness and is free from pinholes, it will act as a surface DPM, or moisture vapour suppressant which will allow moisture sensitive floor coverings and adhesives to be installed on subfloors normally considered unsuitable for such materials.

POINTS REQUIRING ATTENTION

When specifying the use of surface DPMs, the following principles should be considered:

1. **The product can only be effective if the surface has been properly prepared and a sufficiently thick, continuous pinhole free coating is applied.**
2. **Selection of a surface DPM/moisture vapour suppressant and smoothing underlayment should be made after due consideration of individual manufacturers' literature which details the suitability and limitations of the products for the substrates to be covered.**
3. **Some adhesives allow direct installation to the surface membrane. However, a 3mm thick coat of floor smoothing underlayment is considered good practice, not only to protect the membrane but provide an absorbent surface for water-based adhesives to be applied.**
4. **Methods of use vary, and it is essential that the manufacturers' recommendations are obtained and followed carefully if an effective DPM is to be obtained.**
5. **With regards to the use of DPMs or moisture vapour suppressants on cement and calcium sulphate screeds containing commissioned heating systems, guidance should be sought from the screed manufacturer and membrane supplier to ensure complete compatibility.**

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A GUIDE TO SELECTION AND USE

The purpose of this guide is to advise on the selection and use of cement and calcium sulphate-based smoothing compounds and underlayments, along with other proprietary systems for the preparation of various bases to receive floor coverings.

There are many smoothing compounds supplied into the industry which are classed as “finished wear surface products”. The following guidance is relevant, but always consult the manufacturer for any specific needs when you are applying such products. The correct selection and use of the underlayment system to suit all the circumstances particular to the installation, is essential if the combined underlayment and chosen floor finish are to perform in a satisfactory manner over a long-term period.

Within the scope of this guide, a smoothing underlayment may be defined as a mixture of binder, polymers, powder, aggregate and various resins with water, forming a mortar of “wet flow” consistency which will support itself when applied at the minimum and maximum thickness recommended by the manufacturers of the underlayment and floor covering. Generally, the minimum application thicknesses is around 3mm and is considered the norm. In certain circumstances application thickness, may be required above 3mm depending on the surface regularity of the base. The underlayment, when set and dry, should provide a dense, absorbent, smooth base for the application of a floor covering.

The purpose of smoothing underlayments is to repair surface damage and surface irregularities to otherwise suitable new and existing bases in internal and external locations, and to provide a smooth surface to bases which have an open texture or other slight surface irregularity and to prepare old bases to receive new floor coverings. A correctly applied smoothing compound benefits the contractor by giving a controlled absorbent surface to a subfloor, enabling any adhesives to perform consistently across the floor and enable installation of the desired floor coverings to be carried out successfully. Smoothing underlayments are not designed to

be used in an attempt to improve or rectify any defective workmanship or materials within the base. This particularly applies to bases which are structurally weak or have a friable surface.

NOTE: To choose an underlayment for external applications always consult the manufacturer to ensure the product is suitable for use.

Each surface condition, type, construction of the base and end use of the floor can influence the selection of the smoothing underlayment best suited to the purpose and requirement of the contract and the preparation procedure to be used. The importance of careful consideration and correct assessment of the circumstances concerned cannot be over-stressed if good results are to be achieved.

All substrates will require a degree of cleaning or preparation using mechanised preparation equipment. Visual inspection or manual sweeping alone is not adequate under any circumstances as surface preparation. The appropriate method of preparation may range from vacuum cleaning to stripping, grinding, planing, or contained shot-blasting, depending on the condition of the subfloor and the presence of contaminants or old adhesive residues. Primers may or may not be required according to the product and substrate, but the use of primers alone is no substitute for adequate preparation. The advice of the underlayment manufacturer should be sought. However, the responsibility for providing an adequate level of preparation for each individual installation remains the responsibility of the flooring contractor.

This guide considers the use of floor smoothing underlayments in thin sections only. An underlayment will normally only provide a "smoothing" performance since it will normally follow the overall contours of the floor. Underlayments used in this way should be referred to as smoothing underlayments and never as levelling underlayments or levelling compounds. The selection and use of underlayments when bulked out with larger aggregate to provide thicker sections, whilst available, are not included within this guide. Where this information is required, then reference can be made to the underlayment manufacturer.

It is important to appreciate that thin section underlayments will only provide satisfactory

Ensure smoothing underlayments have adequate strength with a scratch tester

Smoothing underlayment flow test

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performance when firmly adhered to a sound base which is able to withstand tensile forces from drying. Consideration to the preparation and suitability of the base to obtain optimum performance of the smoothing underlayment cannot be over-stressed.

When an underlayment needs to be applied over or under a surface DPM, reference must be made to the underlayment manufacturer for advice on selection, suitability and use, as well as any primer required, to ensure good adhesion and performance of both the underlayment and surface DPM.

NOTE: Some underlayments can now be applied directly to surface DPMs/moisture vapour suppressants without the application of a primer within a specified time frame after the application of the moisture control product and also products to cover wire/narrow bore water containing heating systems on tile backer boards and preformed dry screed panels. Always consult the manufacturer for advice on the above.

Certain underlayments may be indicated by the manufacturer as having advantages where trowel or other application lines will flow out during application. An underlayment of this type may be referred to as “self-smoothing”, but never as “self-levelling, unless it can be applied at the thickness required to achieve self-levelling and eliminate any undulations in the subfloor.

NOTE: Level subfloors after the preparation of the base and application of an underlayment, are very difficult to achieve in practice, and the expectation of a client should be managed early on, right at the beginning of a contract. There are very distinct differences between smooth, flat and level. A full survey of the existing subfloor has to be performed using a laser and survey equipment in order to ascertain exactly what volume of underlayment will be required in varying areas in order to achieve as near as practicably possible a level subfloor, where generally this level of survey is not required for flat and/or smooth.

A floorlayer carefully moves smoothing underlayment with a trowel to the floor edges to ensure complete coverage

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Different types of trowel are available for the application of smoothing underlayments. Seen here is a larger format trowel being employed.

GENERAL COMMENTS ON THE USE OF UNDERLAYMENTS

It can be generally accepted that where the provision of a smooth surface may be achieved by the use of a smoothing underlayment, then the flooring contractor will, in most cases, have available sufficient expertise to affect satisfactory preparation. Where unsatisfactory levels exist that are localised or are more general, which need to be corrected by a thicker application of screed, this work will in most cases require the expertise of a screeding contractor. There are some exceptions to this rule where underlayments are available at thicker sections generally up to 30mm but may need bulking out with a fine or coarse aggregate to achieve the thicker sections.

There are also proprietary deep base materials suitable for application for up to 50mm in thickness that can provide a combined levelling and smoothing performance. These generally have the advantage of being quick drying and provide good structural hardness and are available from some manufacturers of floor smoothing underlayments.

NOTE: Depending on chosen floor finish, these thicker deep-base materials after application and hardening can take longer to dry and in some cases, may also require an additional application of a thin section smoothing compound if there is a presence of larger aggregate within them that may not give the desired smoothness for adhering thin resilient floor coverings.

It is preferable that a good standard of trowelled finish is attained, and a smooth and flat surface is achieved during application. This can also be aided by the use of a spiked roller to aerate the compound. Trowelling is not the only application technique available.

Some underlayments can be pumped, especially in large areas, or applied using gauging and smoothing blades and rakes which can control application thickness and eliminate trowel marks. Where this is not the case, it may be necessary to remove imperfections from the applied underlayment before the installation of the floor covering. This should be done using suitable mechanised preparation equipment to remove

A spiked roller being used to dispel any trapped air in smoothing underlayment. The fitter wears spiked shoes to allow him to walk on the underlayment.

trowel line ridges or other irregularities left on the surface of the subfloor, and/or repaired using suitable repair mortars.

It can't be assumed that self-smoothing underlayments will not require this treatment, but, some water-based products with high flow rates and extended wet-edge times can alleviate this problem.

It is important to note that some underlayments provide a very hard dense surface and stoning down by hand may be difficult unless carried out before the underlayment has fully hardened.

Smoothing underlayments do not offer any damp proofing properties whatsoever and cannot restrict the passage of moisture from below. There are moisture tolerant underlayments available that can be applied to a prepared subfloor that contain high levels of residual construction, or ground bearing moisture.

Where there is residual construction moisture or ground bearing moisture vapour where a surface applied DPM is required, pre-smoothing is considered good practice to maximise coverage of the DPM.

NOTE: Some calcium sulphate, anhydrite and cementitious-based flowing screeds may require alternate preparation techniques to remove laitance and control residual construction moisture. Consult the screed manufacturer or section 4 of this guide for further advice.

It should be appreciated that assessment of a particular subfloor condition, and any decision on the necessary procedure to be undertaken in providing a satisfactory standard of finish for the application of the floor covering, may require the opinion of the flooring manufacturer and underlayment manufacturer, but ultimately remains the responsibility of the flooring contractor. If any uncertainty exists on the suitability of the base over which an underlayment is to be applied, this must be resolved by the flooring contractor before application is carried out.

WATER-BASED SMOOTHING COMPOUND

These products provide a highly satisfactory smoothing underlayment for use over a variety of subfloors with good hardness and a high degree of resistance to indentation under point loads. Walk-on hardness is normally achieved within a few hours following application. The time taken for the underlayment to reach a satisfactory state of dryness for the installation of a floor covering will be influenced by the application thickness, air temperature and air humidity within the room space, ventilation and the absorbent nature of the base. Subject to the existence of good drying conditions, it can generally be accepted that an underlayment up to 5mm thickness will be sufficiently dry after 24 hours. There are of course, high performance products available that can dramatically reduce the setting, hardening and drying times for use in sensitive environments where there may be time constraints.

Correct surface preparation is essential when applying water-based products, and generally priming is required on all subfloors. Application can be carried out over non-absorbent bases, e.g., DPMs, granolithic or terrazzo bases, providing the surface is prepared and primed as recommended by the underlayment manufacturer if required.

Where preparation is being carried out over old adhesive residues then the recommendation of the smoothing underlayment manufacturer should be obtained.

The basic ingredients of this type of product are pre-blended binders mixed with fine aggregates and various polymers. This dry powder mix is combined with water according to the manufacturer's mixing instructions and gives a mortar of creamy consistency which is easily spread. The mix usually embodies self-smoothing properties which cause spreading lines to flow out leaving a smooth surface. On no account should extra water be added to the mix in excess of that which is specified by the manufacturer to improve flow or extend working time as this will adversely affect the overall performance of the underlayment.

NOTE: Always use cold clean water and measure accurately. Mix in a clean bucket and avoid mixing in the same bucket that has mortar on the sides that is starting to dry or gel. This can have an adverse effect on the fresh mortar; regularly clean the bucket between mixes.

TWO COMPONENT POWDER/LIQUID SMOOTHING UNDERLAYMENT (LATEX)

The term "Latex" is generally used to describe any bag and bottle system. This term is used for historical reasons, but it should be noted that no modern smoothing compound underlayment contains latex. Powder and Liquid systems offer good general performance and can be used over a wide range of subfloor conditions. Many of these smoothing underlayments may be used on both absorbent and non-absorbent bases including non-water softenable adhesive residues. Powder/liquid systems generally combine good general hardness with a degree of resilience, ensuring adequate resistance to indentation from the effects of point loading or wheeled traffic experienced within most contract situations. Where heavy floor trafficking/loading may be envisaged, then special consideration must be given to the use of a stronger, tougher smoothing underlayment.

These smoothing underlayments are supplied as two separate components, dry powder and liquid polymer and should be mixed as a complete unit according to the manufacturer's instructions. On no account should any water or additional liquid be added to the mix as this will adversely affect the overall performance of the underlayment.

As with water mix smoothing compounds adequate walk-on hardness can be achieved within a few hours following the application of thin layers and under good conditions, floor coverings may typically be applied the next day, or on the same day with some product types.

NOTE 1: Mix in a clean bucket and avoid mixing in the same bucket that has mortar on the sides that is starting to dry or gel. This can have an adverse effect on the mortar; regularly clean the bucket between mixes.

NOTE 2: With both water-mix and bag and bottle products, it is vital to ensure correct storage of the product. Although bags are designed to minimise moisture ingress, products stored on damp floors can harden in the bag and can slow down in reactivity/curing. Similarly, products stored in warm areas prior to use will accelerate the reaction time and reduce workability.

PROCEDURE AND PROVISIONS IN THE USE OF UNDERLAYMENTS

Prior to application of a smoothing underlayment, it is important that the subfloor is adequately prepared and should be carried out using suitable mechanised preparation equipment.

1. **All plaster and paint contamination should be completely removed along with any irregular residues including any barriers to adhesion, builders' debris, some adhesive residues and any applied layers that may not be compatible with the new floor smoothing underlayment. Areas contaminated with oil or grease may be treated with degreasing agents. However, if they have penetrated the surface the screed/concrete must be cut back to good material, or the use of an oil resistant primer maybe suitable, consult the manufacturer for further guidance.**


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2. Any deep holes from removal of partitions or walls may need to be filled first taking into account there may be an issue if not protected from ground bearing moisture, or using a moisture tolerant repair mortar should be considered. Adequate damp proofing may need to be included in the preparation. See sections 5-6 of this guide.

3. Use of mechanised surface preparation equipment, which is effective in removing adhesive residues/construction surface contamination (if necessary) from concrete or screed surfaces. Techniques include mechanical stripping, planning, grinding and contained shot blasting.

4. The choice of underlayment or any floor preparation product should take into account the type of floor finish, type of subfloor and its condition (presence of existing floor smoothing underlayments adhesive residues, etc.) as well as its intended use and the working environment. Typical products are water mixes (powder polymer), two-component products (bag and bottle) and mortars. Manufacturer's guidance should be sought for specification and correct application methods.

5. The strength required of an underlayment will be a key factor. Where there will be heavy point-loading or hard wheel trolleys, then a stronger material is required. In large areas of concrete there may be movement joints or crack inducement cuts in the base. Under no circumstances should floor smoothing underlayments be applied over these movement joints. The joints should be filled using suitable compressible filler and a proprietary joint should be inserted and the smoothing underlayment, floor covering or any applied layer terminated either side of the joint. Some joints such as crack-inducement or saw-cuts, day joints, along with other cracks that are considered by a structural engineer to no longer be subject to movement or shrinkage, may be cleaned out and stitched or filled using a suitable mortar or epoxy resin and covered over with an underlayment and floor covering.

6. Asphalt should be flooring grade and comply with the requirements of **BS 8204** and be correct grade for its service condition. Providing the flooring grade asphalt is in good condition, continuous, free from cracks, sound, strong, has not suffered rutting or any sign of softening, and is free from any form of contamination, the surface should be degreased with an appropriate cleaner and rinsed with clean water and allowed to completely dry. The surface, where required, should be primed prior to the application of the floor smoothing underlayment and generally, any thicknesses above 6mm should be avoided, unless advised by the underlayment manufacturer.

7. Wood and composite block floors (Granwood), when installed on a ground bearing subfloor can suffer extensive dimensional change if covered over with a resilient or impermeable floor covering. Under no circumstances should any cementitious smoothing underlayment be applied, as it will eventually break up. It is considered best practise to remove composite block floors, however some manufacturers may give recommendations to apply underlayments on non-ground bearing subfloors. The application of a plywood overlay on composite block floors, while providing a smooth even surface, can additionally result in the blocks being affected by dry rot, and/or delamination of the blocks by the forces exerted from fixing and is not considered good practise. In most cases, removal of the wood and composite block flooring is advised, and the exposed subfloor should be suitably prepared for the new flooring. Pitch adhesive residues if sound and non-water softenable, can be overlaid with a compatible smoothing compound. Consult the underlayment manufacturer for further guidance.

8. All wooden floors must be structurally sound and able to support the imposed loads, level, smooth, dry and clean. Adequate ventilation should be provided to suspended timber floors at ground level to ensure that the moisture content of the wood is maintained at equilibrium. Worn or uneven floorboards should either be replaced or levelled by sanding, planing or by patch filling with a suitable floor smoothing underlayment or

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repair mortar before finally covering with a minimum 6mm flooring grade plywood. Sheets should be positioned, with joints staggered and secured at 100-150mm centres (see **BS 8203** for details). Fibre reinforced water-based smoothing compounds, some bag and bottle products and feather finish type materials are available which can be applied to wood and wood-based panels after preparation as above, ensuring that any holes or gaps are filled to avoid the mortar leaking away. These products should be compatible with the background that they are being applied to and have sufficient deformability to cope with any anticipated movement of wood and timber-based panels. Priming before their application is normally recommended. Always consult the underlayment manufacturer for advice and recommendations.

9. When existing floor coverings have been previously removed and a cementitious underlayment had been used under the original adhesive, then ideally the old underlayment should be removed as well as the floor covering. In this situation, a build-up of adhesive and underlayment layers can result in poor levels being achieved, the soundness of the base would be questionable and there will be a potential for indentation from point loading.

NOTE: Having removed an existing floor covering, if it is found that adhesive contamination is not present, then the application of additional layers of underlayment is possible. However, priming will, in all eventuality, be required to avoid pinholing and suction. That said, it is very important to understand what the existing underlayment is and what its hardness or compressive strength value is. It is generally considered not good practise to apply a fresh layer of new underlayment to an existing material that has a higher compressive strength value than the underlayment which is currently in-situ. There could also be chemical incompatibility issues. If doubt exist, or the existing underlayment cannot be identified, it should be fully removed using mechanised surface preparation equipment.

Freshly laid smoothing underlayment will be allowed to dry before application of floor covering

10. On ground floor bases, when removing old floor coverings and replacing with a floor smoothing underlayment and new floor covering, consideration must be given to the moisture content of the base, especially where there is a change of the type of floor covering to be installed. Old flooring and adhesives may have exhibited a higher tolerance to ground bearing moisture than the new flooring and preparation products.
11. Steel surfaces should be prepared using contained shot blasting to SA2½ or rotary disc/wire brushed to ST2 as described in ISO 8501-1 and generally primed, however some bag and bottle products can be applied to the prepared steel without the need to prime. Consult the underlayment manufacturer for further guidance.
12. All subfloors should be dry i.e., ≤75% RH on a surface hygrometer, prior to installing either resilient or textile floor coverings. Where hygrometer readings >75% RH are obtained, a suitable surface applied DPM, or moisture vapour suppressant may be utilised subject to manufacturers recommendations. **See sections 5 and 6.**

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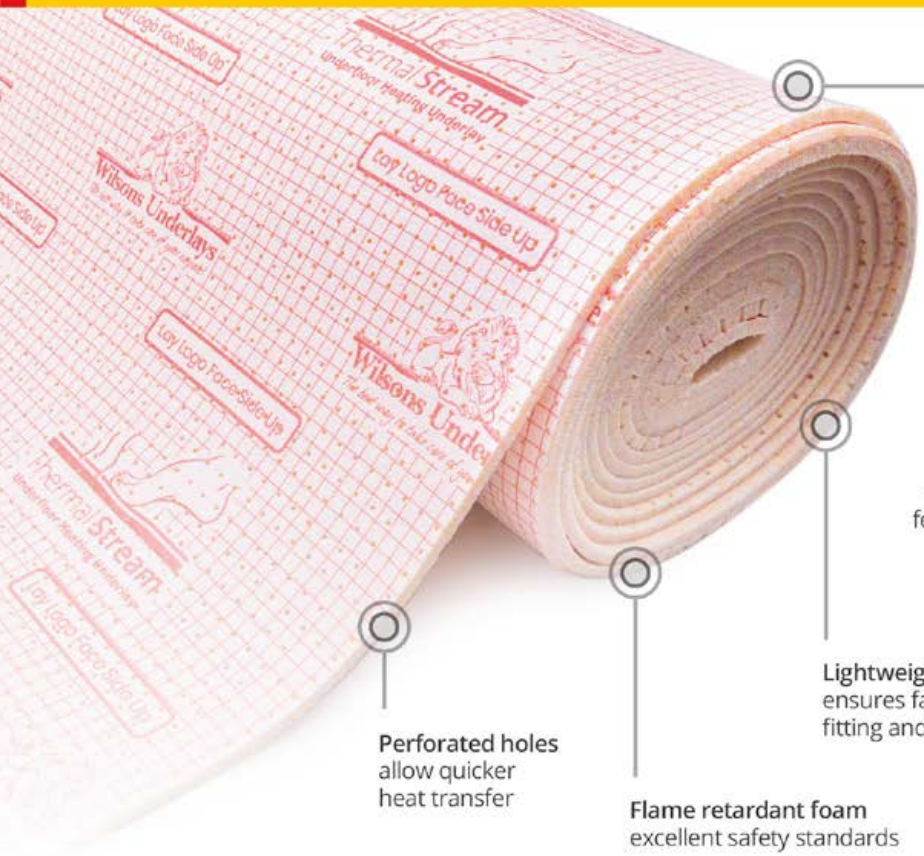

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8 | Underfloor Heating (UFH)

OVERVIEW

Underfloor heating (UFH) is now a hugely popular, appealing and potentially cost-effective source of heating, hence its increased desirability within the UK market.

The type of floor covering installation needs to be taken into consideration when designing the UFH. Insulation factors of floor coverings will obviously affect the performance of the UFH whilst some flooring installations may be affected by high subfloor temperatures and also by large fluctuations in subfloor temperatures. Subsequently, those in charge of operating the UFH should be aware that sudden large changes in subfloor temperatures must be avoided at all costs. The following information is intended to assist the specifier to select the appropriate combination of UFH and flooring installation.

TYPES

UFH can be broadly categorised into two types: water systems and electrical systems. The majority of modern UFH systems in new build projects are warm water systems.

Most systems integrate high tech plastic pipe within the floor — warm water at temperatures of 30-55 °C (in general) is circulated through this pipe and this warms the floor surface to a temperature of 23-29 °C (in general).

Electrical systems require the installation of a flexible heating element beneath the floor covering or underlayment which come in the form of cables, mats or film and can be installed within a standard screed or over the floor within a tile adhesive or levelling compound, (minimum depth to be manufacturer recommended). These are normally a retrofit when refurbishing an existing property but are becoming more popular on new builds.

DESIGN CONSIDERATIONS

Most floor coverings can be used over UFH, however this should not be taken for granted. The important principle to bear in mind is that UFH relies

Water-based UFH system, prior to the application of smoothing underlayment and floor covering

on the upper surface of the floor covering being warmed to a temperature of 23-29 °C, which will result in an adhesive bond-line temperature that should not exceed a nominal 29 °C. However, some manufacturers within the contract flooring industry prefer to recommend a maximum adhesive bond-line temperature of 27 °C. Floor coverings and adhesives should therefore be specified and used by considering: heat output required; floor covering and resultant floor temperatures; and manufacturers' recommendations for all the specific products under consideration.

FLOOR TEMPERATURE INTERPRETATION

The UFH industry designs to **BS EN1264: Water-based surface embedded heating and cooling systems/BS EN50559:** Electric room heating, UFH, characteristic of performance, which contains parameters for allowable floor surface temperatures.

These Standards allow for maximum floor surface temperatures of design air temperature plus 9 °C in occupied areas and plus 15 °C for peripheral areas, whilst some thicker floor coverings, especially those with foamed backing layers, have a

higher thermal resistance and this can result in higher interface temperatures.

In areas where UFH is used, it is recommended that agreement from the adhesive and flooring manufacturers should be obtained on the type of adhesive utilised for installation.

British Standards contain differing and conflicting information, for example:

BS 8204-1 Screeds, Bases & In-Situ Flooring, states: *"... the usual operating surface temperature of a heated levelling screed is about 27ºC; however, some locations operate at higher temperatures, e.g., 35ºC".*

BS 8203 Code of Practice for the Installation of Resilient Floor coverings states: *"When used with many flooring materials UFH can cause problems if the temperature at the interface between the subfloor and flooring exceeds 27 °C or is subject to rapid fluctuations in temperature. In the majority of installations this temperature will not need to be exceeded if the building insulation meets the requirements of Part L of the Building Regulations."*

BS 8425 Code of Practice for Installation of Laminate Floor coverings and the Code of Practice issued by the Association of European Producers of Laminate Flooring states that the surface temperature should not exceed 28 °C.

Whilst there are minor differences in actual temperature level recommendations, specifiers should be aware of the point. It is essential therefore, when installing floors over UFH, to consult the flooring manufacturer and adhesive suppliers for advice.

Opinions differ between the floor covering and UFH industries as to where temperatures should be measured. The 27 °C "interface" limit restricts the choice of floor coverings that could be used over UFH. Improvements in product performance and system understanding allow the successful pairing of floor coverings with UFH. For example, some hardwood floor finishes are installed with a maximum floor surface temperature of 27 °C.

FLOOR SCREEDS

Floor screeds that incorporate warm water UFH systems are commonly referred to as heated screeds and are usually installed as floating screeds and installed at an appropriate thickness on a slip membrane over thermal insulation.

The slip membrane does not act as DPM for the screed and there should always be an operational DPM between screed and the sub-base. Typically, this will be a simple 1200-gauge polythene placed on top of the concrete sub-base before any insulation is laid.

Although most types of screeds may be used with UFH, it is vital their selection and design is matched. The most commonly known problems of curling, stress cracking and shrinkage cracking can be exacerbated by early forced drying of a screed. This is commonly seen in traditional cementitious-based screed systems, whereas calcium sulphate, screeds generate far less dimensional stress.

Calcium sulphate screeds react in a different manner to cementitious-based materials, therefore these systems can be force dried from as early as 7 days after install without any detrimental impact on the final screed performance. Some proprietary cementitious flowing screeds claim that early drying is possible outside of the minimum 21 days usually associated with cement-based materials. ALWAYS consult the manufacturer.

Heated screeds expand and contract with temperature changes, recommendations in British Standards are that movement joints should be placed within the screeds at door thresholds, between independently controlled heating zones and at the perimeter of the rooms where heated subfloors abut walls/upstands and where design criteria dictate. Additional joints should be considered at points of high thermal gain and between heated and unheated screed areas. For detailed information on the general requirements for movement joints the screed manufacturer and heating designer should be consulted.

NOTE: Under no circumstances should movement joints be covered, they should be carried through the subfloor to the floor finish and all applied layers terminated either side of the joint. The joint should be filled with a suitable flexible filler and a proprietary cover strip applied to cover the joint.

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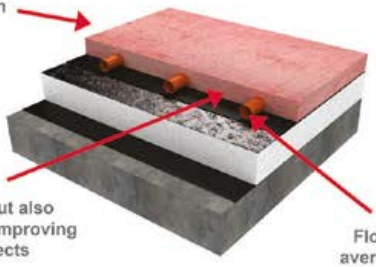

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Explanation.

Diffusivity (D): The measure of how quickly a material transmits a temperature increase. The higher the better.

Thermal emission coefficient (Ek): capacity of the heating system to emit the heat circulating through the pipes

Thermal conductivity: Higher thermal conductivity results in quicker passing of heat through the material

Thermio+ screed by Anhydritec-Gyvlon is the first screed designed for use with underfloor heating in the UK.

Thermio+ is made from selected admixtures to enhance its thermal conductivity, this means the UFH system can be operated at lower temperatures, thus saving money on fuel bills.

As well as being more conductive, Thermio+ is compressively and flexurally stronger than traditional screeds which have to be installed much thicker. In todays demanding construction market, floors which can offer savings in reduced weight/thickness Thermio+ ticks the right boxes.

Gyvlon Thermio+ is a fluid screed offering fast installation (up to 1,000m2 per day), due to its fluid nature the screed fully encapsulates the heating pipes.

Thermio+ can be installed up to a maximum bay size of 300m2.

As with all Gyvlon products, the Thermio+ screed offers a typical recycled element of approx. 36%

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Accreditation Thermio+ has been given BBA Agrement certification in the UK and is tested by CSTB in France

Application of smoothing compound over electrical underfloor heating system

TIMBER SUBFLOORS/ACOUSTIC/ FLOATING FLOORS — DRY CONSTRUCTION

Common issues with floor screeds are usually avoided in dry constructions. Dependent on construction and thermal transfer properties of the materials, lightweight timber subfloors can provide benefits in lower flow temperatures. Generally, this type of construction provides a more responsive system.

WIRE HEATING SYSTEMS

It is extremely important to ensure that there is an adequate amount of underlayment to cover the wires as there may be a tendency for the underlayment to crack directly over the wires themselves, and to reduce the risk of damage to the wires, from any point loads. (Minimum smoothing compound thickness to be obtained via compound manufacturer).

Due to the properties of the heating element wire, heat is generated as current which is passed through it. These elements come in the form of cables, mats or film/foils (consult the manufacturer of the film/foil systems for installation instructions) and are more commonly found in domestic and DIY installations. They are deemed to be particularly suitable for use with hard ceramic or natural stone tiling but may be used with textile, resilient and timber floor coverings. Detailing of movement joints should be carried out as mentioned above and must be in accordance with the UFH manufacturers' recommendations.

NOTE 1: Sometimes these systems are applied over an insulating mat/tile backer board or plywood, and it is important to ensure that the insulation mat/board is capable of supporting the chosen floor finish. It must be securely fixed to the substrate and may require priming before an underlayment is applied.

NOTE 2: The wire elements or heating mat are sometimes fixed to the insulation board with self-adhesive tape, excess use of the tape will reduce the potential contact area of the floor smoothing underlayment and may cause failure of the floor covering.

SCREED START UP/DRYING OUT

It is essential that before any floor covering is installed the screed is preheated as prescribed in **BS EN1264 -4, BS 8204 -1, and BS 8204-7.**

NOTE: Some surface moisture control systems are available however they should only be considered when approved by the relevant manufacturer.

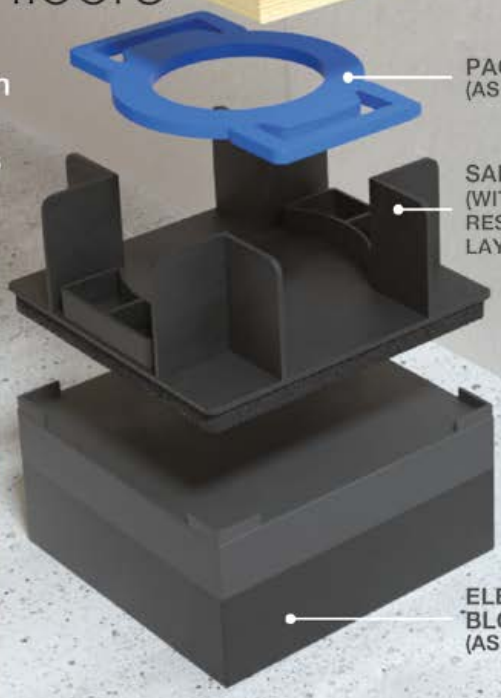
In all instances UFH systems must be run through a full drying/commissioning cycle of heating up and cooling down before any subfloor preparation or installation of decorative floor coverings are installed. This period of commissioning is usually around 21 days. After a full cycle has been carried out, perform moisture tests, and if necessary, repeat the process until a definitive moisture reading of ≤65-75% RH has been achieved if moisture control systems are not being applied (depending on surface finish to be applied).

At the time of publishing this document there is further work being undertaken to review and update guidance in relation to the use of Underfloor Heating combined with textile, resilient and timber products (and the adhesives and smoothing compounds used to install) which is the focus of this Guide. Therefore, further guidance may be issued by the CFA between this and the next publication of the *CFA Guide to Contract Flooring,* next scheduled for 2027.

Saddle Systems

Sound reduction and levelling for separating floors

- Cost effective, lightweight solution
- Eliminates delays caused by screeds
- Creates a void for services or underfloor heating
- Suitable for both new build and refurbishment



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9 | Selection of Flooring Materials

With many new and traditional types of floor coverings available, each providing varying levels of aesthetics and performance, it is important that the correct and most robust selection criteria are considered to ensure product suitability and fitness for purpose, including reference to the manufacturer's recommendations and product specification.

Aside from cost, performance and aesthetics, care should be taken to ensure a product's physical characteristic together with environmental properties meet the requirements relative to the intended use. This will ensure that the products selected meet the customers or contract requirements and are suitable for the intended purpose and longevity.

With a clear specification and defined scope, specialist flooring contractors can carry out the due diligence to check fitness for purpose on performance, aesthetics and longevity. Once this is agreed with the specifier or product selector, this will enable them to give an accurate costing and lead time to complete the work to the required standard.

These factors provide an overview of the type of criteria to consider:

PRODUCT SPECIFICATION

- **Type of product (e.g., vinyl, rubber, LVT, linoleum, carpet tile, broadloom carpet, timber and matting)**
- **Definition of intended area of use and required performance classification (e.g., resilient flooring in accordance with EN-ISO 10874 and textile flooring in accordance with EN1307)**
- **Installation methodology and layout of flooring along with expected performance for the anticipated life of the product**

SPECIAL FINISHES

- **Wet rooms (e.g., barefoot and shod)**
- **Skirting (e.g., preformed, sit on, set in, coved)**
- **Entrance matting (to protect the flooring from soiling, premature wear and to reducing moisture ingress into the building minimising slippage)**
- **Details of any testing required of installed flooring**
- **Colour, pattern, and contrast to assist the visually impaired (Dementia Friendly Design)**

PRODUCT PERFORMANCE

- **Contract Suitability (e.g., Heavy Contract, Medium Contract, Heavy Domestic, Light Domestic)**
- **Area use classification matches product specification**
- **Fire rating**
- **Thermal Conductivity**
- **Sustainable slip-resistance (Pendulum Test Value) if required**
- **Impact sound reduction and airborne sound**
- **Appropriate Light Reflectance Values (LRV)**
- **Chemical resistance**
- **Electrical behaviour — static control (if required)**
- **Infection control — welded seams and skirting type**
- **Residual indentation (actual)**
- **Suitability for wheeled traffic**
- **Light fastness**
- **Dimensional stability**

SUBSTRATE

- **Subfloor type and suitability to install the specified flooring**
- **Condition of subfloor and required preparation prior to installation to achieve the tolerances as set out in the manufacturer's recommendations under BS 8203:2017**
- **Provision for fabricated underlayment**

if required (e.g., flooring grade plywood, chipboard, screed board, underlays)

- Moisture testing on subfloor (e.g., hygrometer or carbide bomb test)
- Underfloor heating details, type (electric or water) testing, commissioning (if applicable)
- Site conditions (e.g., watertight building, adequate lighting, Relative Humidity (RH) heating and ventilation

INSTALLATION METHOD

- Tiles and planks (e.g., broadloom, quarter turn, brick, ashlar, random, etc.)
- Resilient (fully bonded, release adhesive or floating)
- Adhesive type (low VOC) and adhesive-free options
- Carpet fixing (i.e., gripper, adhered, underlay type)
- Static control measures (conductive adhesive, copper tape, etc.)

MAINTENANCE

- Provision of Temporary Floor Protection **(see section 18)**
- Builders clean, prior to customer handover, in accordance with manufacturers cleaning recommendations
- Appearance retention can be enhanced and maintained with the correct maintenance programme
- Equipment, accessories, and products required to maintain floor covering (e.g., upright vacuum cleaner with rotating head, cleaning machinery)
- Type of cleaning solution (pH level) recommended by the manufacturer

ENVIRONMENTAL

- BREEAM rating
- LEED
- SKA M12 rating
- Removal, safe disposal and recycling of waste
- Ability to be reused or recycled

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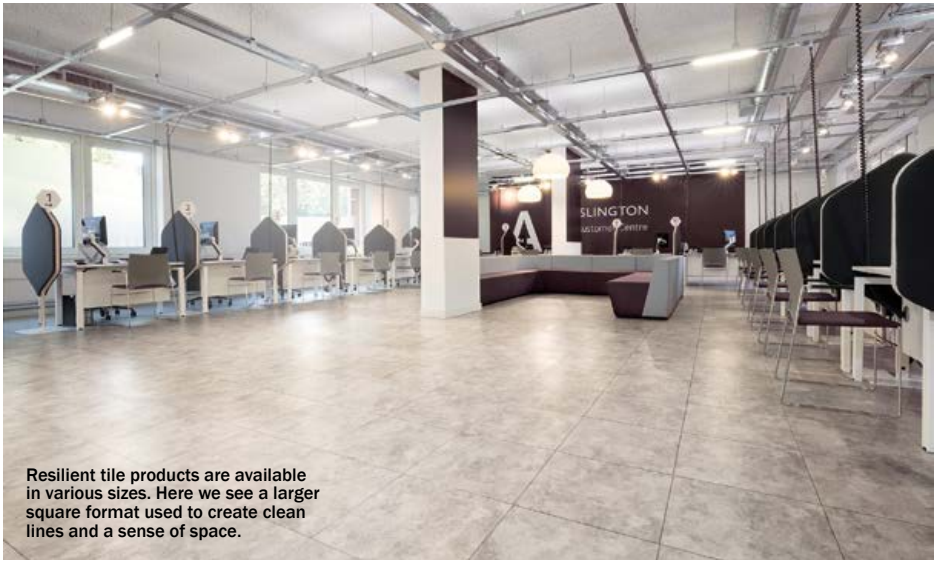

Resilient tile products are available in various sizes. Here we see a larger square format used to create clean lines and a sense of space.

GENERAL

DETAILED INSTALLATION GUIDANCE

This can be obtained from the floor covering manufacturers and for all products identified in this section is detailed in **BS 8203**–Installation of resilient floor coverings–Code of Practice. Much of the guidance is either replicated within this section or referred to elsewhere in this guide. If any doubt exists the floor covering manufacturers' guidance and **BS 8203** should be consulted.

SUBFLOOR MOISTURE

Unless otherwise stated, the floor coverings detailed in this section must not be applied over direct-to-ground subfloors which do not incorporate an effective DPM due to their impermeability and consequent detrimental effect of rising moisture vapour. Subfloors must be sufficiently dry to show an acceptable level of moisture when tested in accordance with the methods specified in the section on moisture testing **(section 5).** Surface applied DPMs are available to control residual or ground bearing moisture **(see section 6.**

LIGHTING

When required, lighting must be always be provided to enable works to be completed in a safe manner. The lighting provided should also be consistent to the expected ongoing level of lighting in the finished building to ensure the resilient floor finish can be fitted to the required standards.

UNDERFLOOR HEATING

The floor coverings detailed in this section can be applied over subfloors incorporating UFH. When used with UFH systems, the temperature at the surface of the subfloor must not exceed 27 °C. Guidance on installation of floor coverings over underfloor heated subfloors is in **section 8.**

Product specific considerations are given in this section by product type where applicable.

CLEANING AND MAINTENANCE

Correct and effective cleaning and maintenance is essential if a floor covering is to provide optimum performance and appearance. The products in this section can be cleaned and maintained

using most current, cost-effective cleaning methods, materials and equipment. However, there will be some differences between product types and indeed, product ranges within each product type.

All resilient floor coverings should be cleaned and maintained in accordance with the product manufacturer or supplier recommendations.

Section 20 in this guide provides a comprehensive overview of cleaning and maintenance for floor coverings. A regular and periodic cleaning and maintenance regime should be in place to ensure the resilient floor covering retains it optimum appearance retention and life expectancy.

It is important to consider the use of cleaning methods, cleaning machines and cleaning chemicals appropriate for the resilient floor covering installed.

Section 18 in this guide highlights the need to protect newly installed flooring to avoid damage or soiling.

Many new floors are damaged in their early life because the builder, client or end user was not in possession of the relevant cleaning and maintenance information. Problems of this nature can be avoided by passing on the manufacturers' cleaning and maintenance recommendations on completion of the installation.

Cleaning and maintenance information is usually readily available in product brochures, manufacturers' websites or on request.

PRODUCT SUITABILITY

The manufacturers' advice as to the suitability of a product for a specific area of use and recommended installation method for that area, bearing in mind type of use and location, should always be sought.

As with any floor covering, the specification of a contract resilient sheet or tile that is fit for purpose involves a consideration of both aesthetics and performance. Flooring is the most used and certainly the most abused, surface area within commercial premises, and as the largest space, any degradation in appearance through lack of maintenance or poor specification will be highly noticeable.

Resilient sheet and tiles offer many benefits within commercial interiors including hard wearing surfaces, sound absorption, ease of cleaning and improved slip-resistance. The large variety of colours, designs and formats also gives specifiers plenty of scope to design practical and attractive interior schemes.

RESILIENT FLOORING TYPES

There are four generic resilient floor covering construction types:

- **Vinyl**
- **Rubber**
- **Linoleum**
- **Cork**

These are available in a variety of formats:

- **Sheet (fully adhered and loose lay)**
- **Tile (fully adhered, tackified and loose lay)**

And constructions, including:

- **Acoustic backed (sheet and tile)**
- **Static control (tile and sheet)**
- **Slip-resistant (sheet and tile)**

In addition, a variety of purpose made underlay systems are available to enhance acoustic or moisture resistant performance.

The next sections explain the characteristics of these floor coverings in more detail.

VINYL SHEET AND TILES

Vinyl floor coverings are made up of a combination of PVC, fillers and plasticisers to enhance the product performance characteristics. Vinyl floorings are attractive, cost effective and have excellent in-use performance and durability. Sheet and tiles are generally manufactured using one of the following constructions:

- **HOMOGENEOUS — these products are made up of one or more layers of material of the same composition, colour and pattern throughout their thickness. They are usually made up of a mixture of PVC and mineral fillers. They are manufactured to ensure a consistent, dense and smooth or embossed wear surface.**
- **HETEROGENEOUS — these products are made up of a wear layer and other compact layers which differ in composition and/or design. This construction is**

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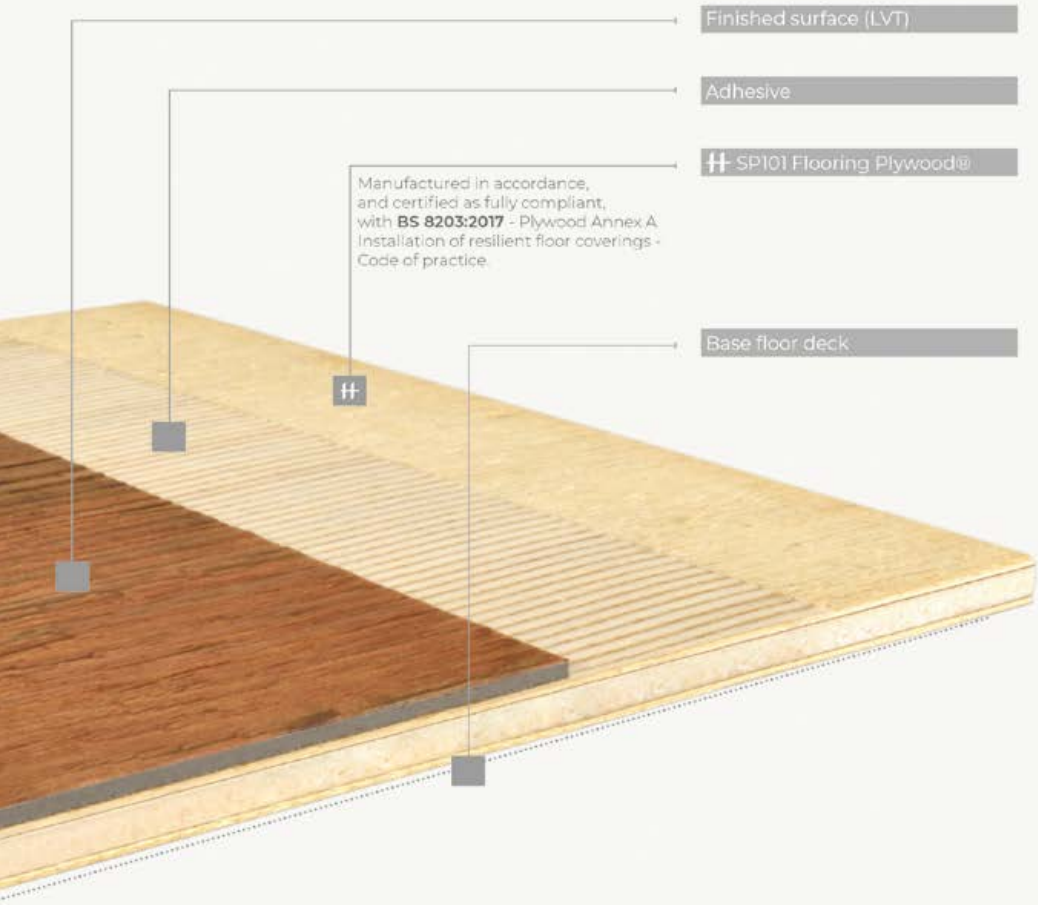

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common in sheet and tiles with printed designs which are sandwiched between a hard-wearing unfilled PVC wear layer and supported by a filled PVC backing layer. This construction is also used for products with a solid colour wear layer. Heterogeneous vinyl products usually incorporate a glass fleece in the backing layer for additional dimensional stability.

FLEXIBLE PVC TO BS EN ISO 10851 (HOMOGENOUS) OR BS EN ISO 10582 (HETEROGENEOUS)

These floor coverings have good resilience, the ability to stand up well to heavy point loading and excellent recovery from indentation. They have good resistance to dilute acids, alkalis and most common chemicals. Hard-wearing performance with many ranges now enhanced with factory surface coatings to provide ease of cleaning and good appearance retention.

For areas which demand frequent wet maintenance and/or high standards for hygiene, sheet products can be welded at seam joints with colour matched weld cable and fitted with a site formed cove or to vinyl skirtings, to provide a watertight floor finish.

These products are fully flexible and are available in sheet or tiles.

FULLY ADHERED OPTIONS

Both homogeneous and heterogeneous construction products are available in a variety of thicknesses, although 2mm is the thickness used in most contract sheet installations.

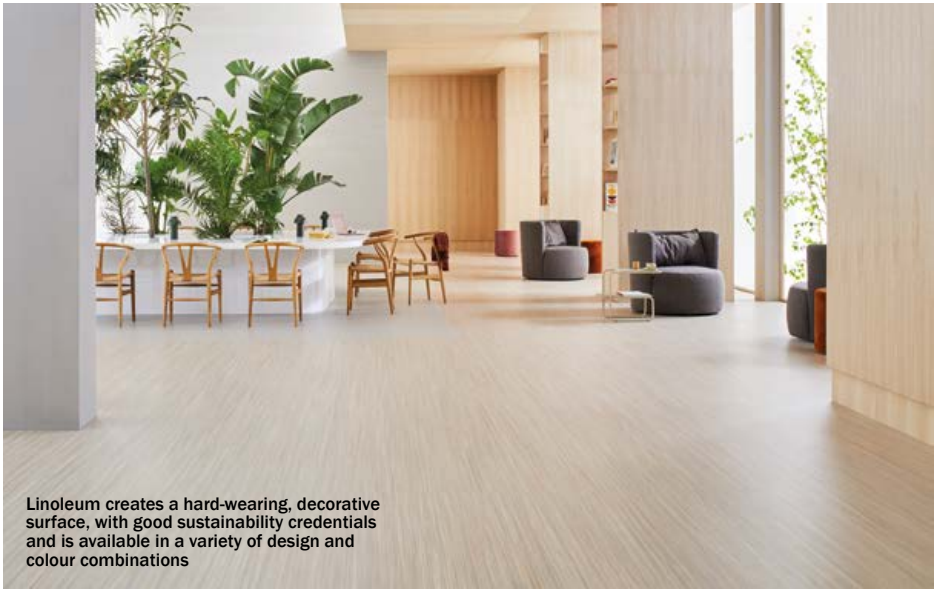
Tile sizes and sheet widths vary according to the manufacture with 2m being the most common in contract installations.

Standard installation with SBR (synthetic rubber) or acrylic emulsion type adhesives as recommended by the flooring manufacturer.

LOOSE LAY SHEET OPTIONS

A new generation of loose lay sheet products are available which can be fitted to a prepared subfloor or directly over other suitable existing floor fitments. These products offer quicker installation times and the advantage of ease or removal at end of their life.

There are also sheet options with an integral moisture control backing format to provide a simple installation option for damp subfloors up to 97% RH.



Linoleum creates a hard-wearing, decorative surface, with good sustainability credentials and is available in a variety of design and colour combinations

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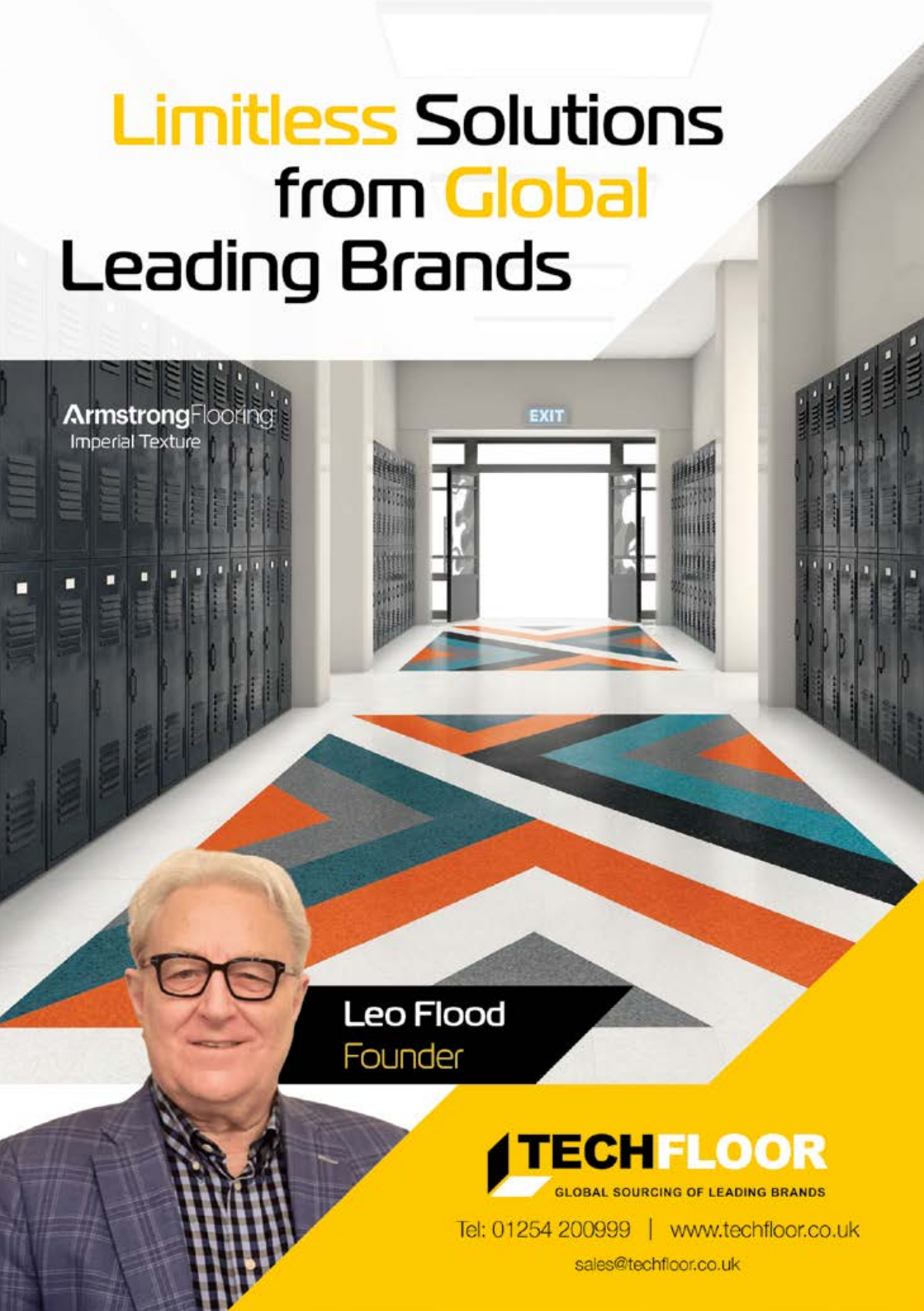

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LUXURY VINYL TILES (LVT) TO BS EN ISO 10582

Used to describe vinyl tiles that simulate either natural or man-made products such as wood, natural stone, granite, ceramic and bespoke designer patterns/colours. Normally produced in Heterogeneous construction, consisting of a backing layer, print film, reinforcement, and clear or coloured PVC wear layer for durability. They can be of calendared (roll) or pressed (slab) sheet construction from which the tiles are cut to the finished size. The thickness of the wear layer determines the durability and type of use area. LVTs are available in a range of gauges with a wide choice of sizes, configurations (e.g., plank and tile) and qualities for both domestic and commercial situations.

Other options include LVTs with enhanced slip-resistance **(to BS EN ISO 13845)** and with approval for use in maritime environments.

FOAM BACKED SHEET AND TILE TO BS EN651/BS EN ISO 11638

This type of product generally comprises homogeneous or heterogeneous sheet vinyl flooring which is backed by a high-density PVC foam. The wear surface affords all the advantages of unbacked sheet vinyls to **BS EN10581 and BS EN10582** in application, use and appearance. The inclusion of a foam backing affords excellent resilience and quietness and increased acoustic performance in terms of insulation against impact sound.

Application is normally carried out using adhesives of either the synthetic rubber or acrylic emulsion types. Seam joints in sheet must be welded to provide a jointless, watertight finish.

This type of flooring was designed to provide a highly resilient and hard-wearing flooring to suit increased need for impact sound reduction in multi-use residential, hospitals, shops and office buildings, to meet the requirements of Building Regulations. Impact sound reduction performance for these products is typically within the 14dB to 19dB range.

SLIP-RESISTANT (SAFETY) FLOORINGS TO BS EN13845

These may be of either homogeneous or heterogeneous construction. Classification is based on their enhanced sustainable slip-resistance performance in wet or contaminated conditions. The level and type of contamination must be considered when selecting slip-resistant floor coverings and emphasis placed on the requirement for correct maintenance to retain slip-resistance.

LVT in a hexagonal wood-effect design format create an engaging space that makes use of natural light

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PVC floor coverings with particle-enhanced slip-resistance (safety flooring) must comply with **BS EN13845.** Enhanced slip-resistance for these products is achieved through the addition of particles within the wear layer of the product. These particles ensure that the slip-resistant properties of the floor covering will be retained for the useful life of the product.

For further information on the classification, selection and application of slip-resistant floor coverings (**see section 14)**

Products which provide slip-resistance through surface coatings, surface embossing or a combination of these, are also available but at present there is no British or European Standard to which these products must conform with regard to their slip-resistance.

STATIC CONTROL FLOORCOVERINGS

These types of floor covering are used to control, within specified limits, Electrostatic Discharges (ESD) in usage areas where even very low levels of static charge may cause electronic component or systems failure, fire or explosions.

Available in fully bonded sheet and tile and loose lay click systems, there is now a wide choice of designs/colours to suit all types of environment.

These floor coverings should not be confused with floor coverings offering anti- static properties only and which are primarily used to provide personal comfort to the individual by offering protection against shocks from static electricity.

Static control floor coverings will either be classified as Static Dissipative or Electrostatic Conductive. The electrical performance of ESD floors is covered by various European and International Standards. The selection and performance requirements of ESD floor coverings is normally application-specific, so it is imperative that the products offered meets the end user's application performance requirements.

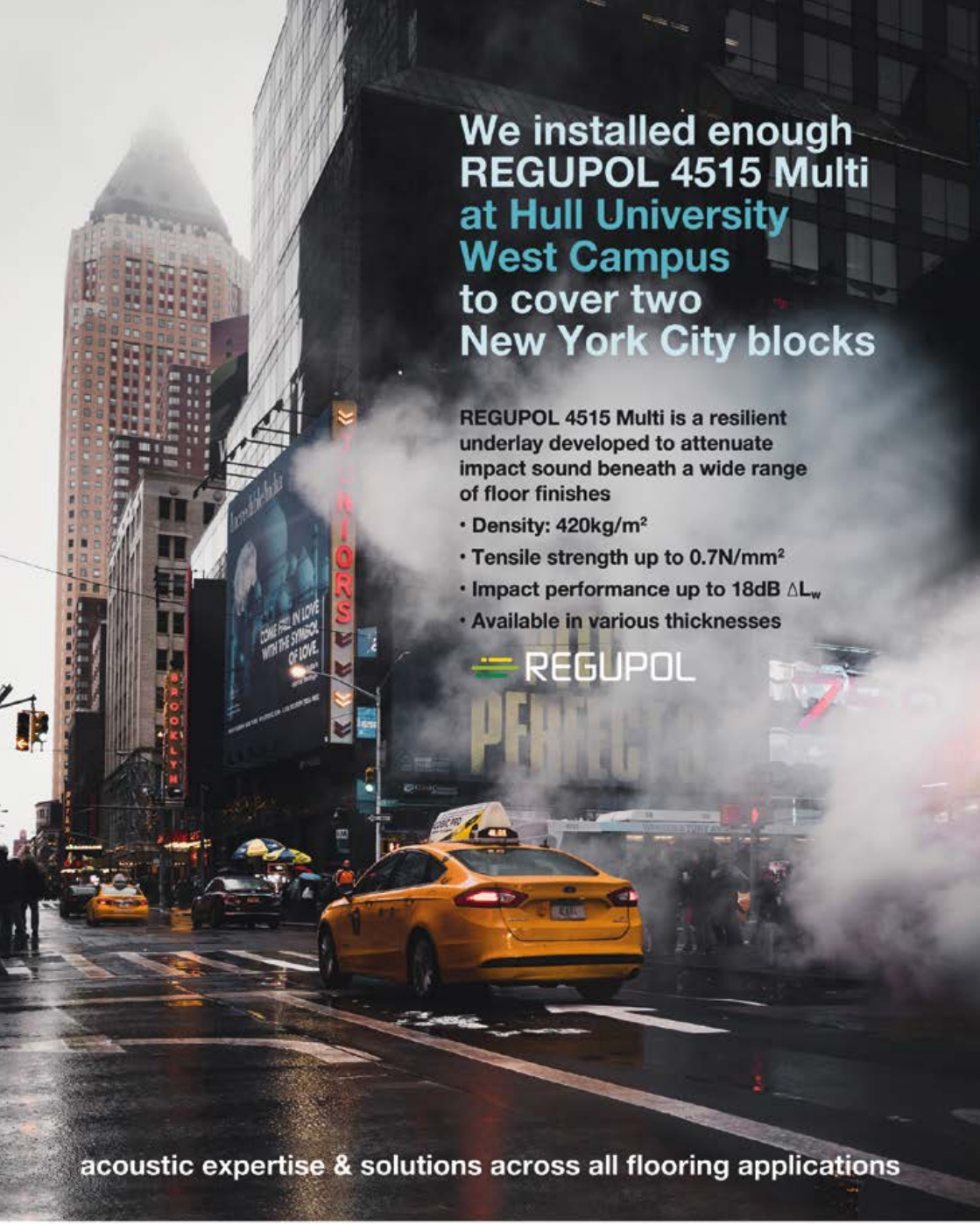
See section 16 for further information on static control.

CUSHIONED VINYL FLOORING TO BS EN ISO 26986 AND EN651

Cushioned vinyl floorings are available in a varied range of products and qualities for both domestic and commercial situations.

Domestic cushioned vinyls are excellent for the home because of their resilience and ease of maintenance. The integral foam backing provides comfort and warmth underfoot.

Static control flooring in the healthcare environment ensures the protection of people against electro-static discharge risks and the protection of premises against explosive risks



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Some cushion vinyls can be loose laid by perimeter fixing within defined maximum size areas. For larger areas, fully adhering the material is recommended to give a more robust installation. Manufacturers will offer guidance on the maximum room size that can be installed using perimeter fixing.

Cushioned vinyl floorings with commercial-use classifications are suitable for private housing, flats and light contract areas. It is important to select the appropriate quality for each individual area in order to achieve the desired performance and life expectancy.

Other vinyl floor coverings offering cushioning properties such as products with a fibre or polyester backing to **BS EN650,** or with a cork-based backing to **BS EN652** are also available.

Cork-backed vinyls offer firmer resistance to traffic but are not so sound absorbing.

NOTE: when used over UFH, the higher thermal resistance of foam backed products may reduce the efficiency.

SPORT FLOORING

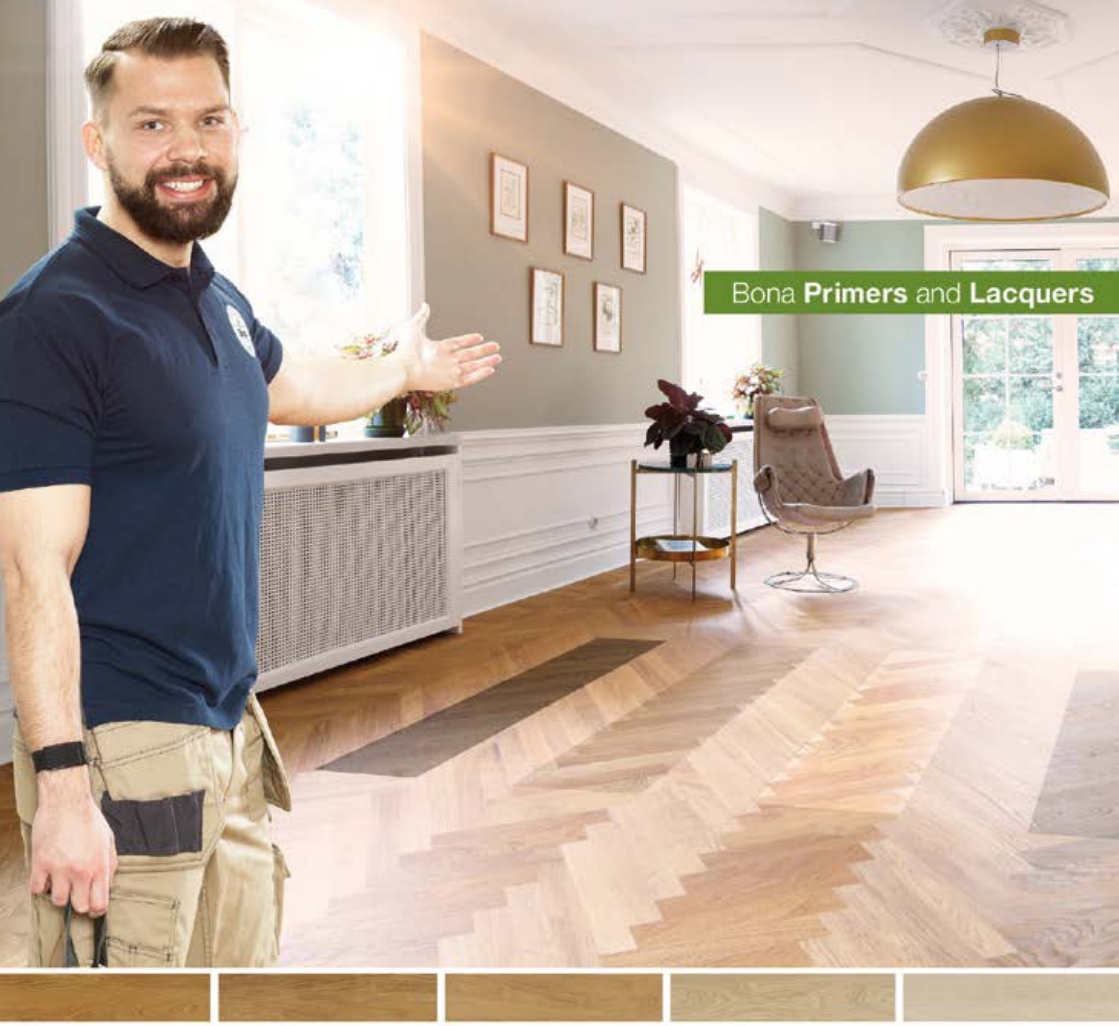
Special grades of foam backed vinyl floor coverings are available for sports hall installations. Whilst offering acoustic performance, the construction of these products is designed to meet the performance requirements of **BS EN 14904** for indoor surfaces for multi-sport use.

SEAM WELDING

Most PVC Flooring manufacturers recommend that joints in vinyl sheet are welded; this also includes internal and external joints where the vinyl sheet is site formed up walls. This prevents ingress of dirt and bacteria providing a surface impermeable to water. Seams can either be thermally welded using standard heat welding equipment; or cold welded using a special chemical adhesive.

Correctly grooved and thermally welded seams should not fail or open up during the life of a PVC sheet floor covering. Colour coordinated seam welding cable is available from all major PVC flooring manufacturers for use with standard thermal welding equipment on fully bonded flexible PVC sheet floor covering — whereas cold or chemical welding is more applicable to cushion foam and textile backed PVC sheet. In all

Performance vinyl sheet flooring used in a school sports hall provides a high specification multi-use solution



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cases, it is advisable to check first with the floor covering manufacturer to assess which method should be adopted.

LOOSE LAY TILES TO EN651/EN10582

Loose lay resilient vinyl tiles are available, suitable for laying, e.g., in conjunction with carpet tiles. They are ideal for areas where access may be a necessity or where permanent bond adhesives cannot be used, e.g., to enable the reuse of an existing flooring in the future. These tiles are generally thicker construction than standard vinyl tiles and available in different configurations (plank and tile). Typically of heterogeneous construction with a pure vinyl wear layer and either a filled PVC or closed cell foam backing, with reinforcement layers included for product stability.

Subfloor and installation requirements will vary by product type so the manufacturer should be consulted on suitability and installation guidance, some subfloor types will require significantly less preparation than with standard products, others will require the same level as that of standard resilient finishes.

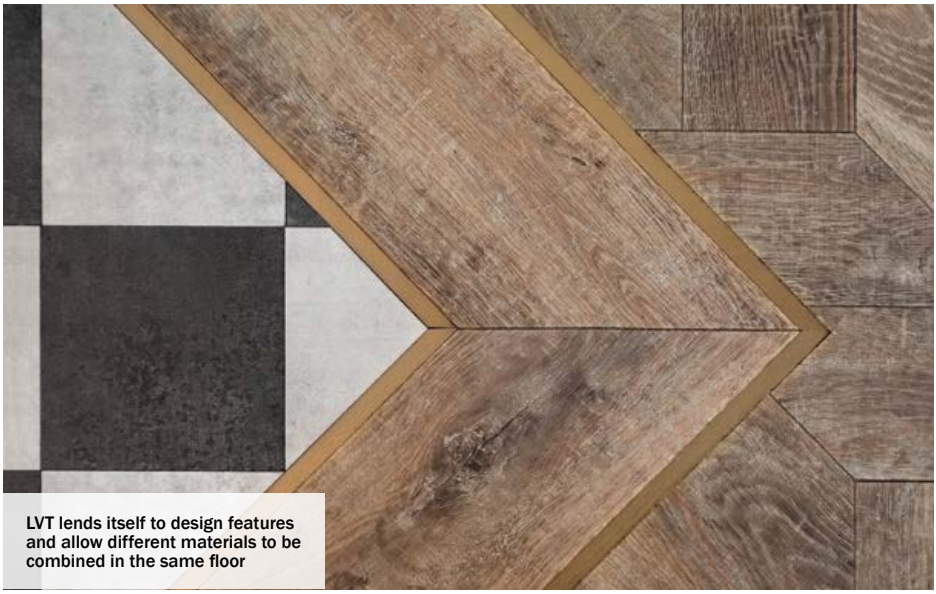
These tiles are usually adhered with a tackifier adhesive for ease of removal when used over raised access flooring (RAF). It is essential to check with the manufacturer what tolerances in terms of level and gaps the RAF must present before the floor finish can be installed, as imperfections can show through in exactly the same way as with most resilient floor coverings.

NOTE: Some loose lay tiles are constructed to be suitable for installation at higher levels of moisture than that prescribed in BS 8203. Consult product manufacturer for further advice.

CLICK LVT, LOOSELAY TO EN16511/ISO 10582

LVT is now available in thicker formats with the edges profiled to click together much as a laminate flooring. These layers can be made simply of LVT **(EN ISO 10582)** or the surface can comprise any resilient product with an engineered rigid core of a solid PVC or mineral or any other suitable material.

They may also require separate underlay, have integral cushion backing or be fitted without underlay as per manufacturer's recommendations.



LVT lends itself to design features and allow different materials to be combined in the same floor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The planks lock together to form a large floating floor, therefore correct expansion gaps should be left at perimeters and around all fixed items to allow movement especially in areas of temperature change. In areas of high traffic sometimes full bonding is sometimes recommended to avoid excessive movements and resulting faults.

Subfloor and installation requirements are sometimes minimal, but do not assume this to be the case as levels of preparation can often be similar to that of standard LVT product. This is to avoid movement that can create noise underfoot and plank connection damage. Consult the individual product literature along with the subfloor types to determine the preparation needed.

LINOLEUM

Linoleum is a natural flooring material made from oxidised linseed oil, pine resin, wood flour, fillers and pigments. Linoleum has been in use as a contract floor covering for over 100 years; it was first manufactured at Staines, Middlesex in 1864. It has a reputation for durability, toughness, easy maintenance and a wide colour choice. Linoleum is permanently anti-static, has bacteriostatic properties and is resistant to cigarette burns.

Linoleum has been extensively used in hospitals, schools, office buildings, travel termini, laboratories and residential applications where provision of a decorative and highly functional floor covering at a reasonable cost is demanded. In use, it has excellent dimensional stability, resistance to wear and aging and good resistance to the effects of dilute acids, and most common chemicals.

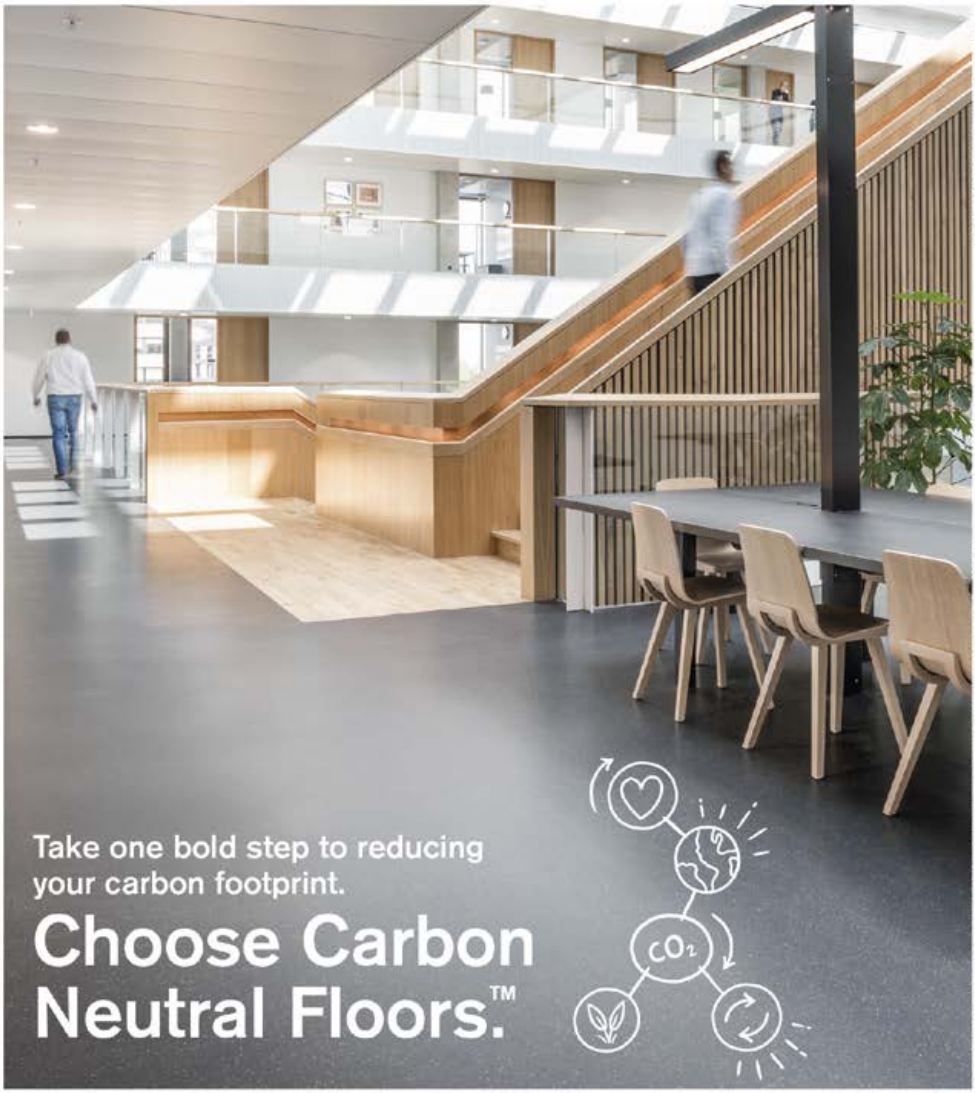
LINOLEUM SHEET AND TILE TO BS EN ISO 24011

Linoleum sheet is manufactured in rolls 2m wide and thicknesses between 2mm and 4mm. The most frequently used decoration is a soil-hiding marble effect but plain, linear and chip decorations are also available. The most commonly used thickness for commercial use is 2.5mm.

The backing for 2m wide sheet linoleum remains woven jute and a recommended adhesive must be used. Suitable adhesives with little or no solvent are now widely available.

Linoleum tiles are manufactured in a gauge of 2.5mm and, like carpet tiles, are available in 500 × 500mm. Other sizes in both square and rectangular tiles are available, offering greater design flexibility. Although the linoleum wear

Wood plank LVT laid in to adhesive applied with a notched trowel to control the amount of adhesive used



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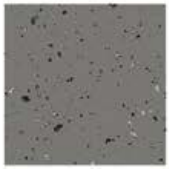

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surface is similar to that for sheet, the backing is woven polyester for extra dimensional stability. Some manufacturers offer 610 × 610mm tiles for raised access floors.

Adhesives approved for sheet linoleum may sometimes be used for tile linoleum but other adhesives may also be recommended. Check with the manufacturer for adhesive compatibility.

ACOUSTIC LINOLEUM TO BS EN686 (FOAM BACKED) & BS EN687 (CORKMENT BACKED)

Linoleum is available with foam or corkment backing offering higher levels of impact sound insulation to meet the requirements of building regulations when applied to a concrete slab.

LOOSE LAY LINOLEUM TILES AND PANELS TO BS EN14085

Linoleum is available in loose lay tile and plank format. Consult the manufacturer for advice on availability, suitability and installation guidance.

STATIC CONTROL LINOLEUM

Static dissipative linoleum ranges are available for use in static sensitive areas where protection from ESD (Electrostatic Discharge) is required. These floor coverings should not be confused with standard linoleums offering anti static properties only and which are used to provide personal comfort to the individual by offering protection against shocks from static electricity.

The installation of static dissipative linoleums will require conductive adhesive and a suitable metal tape /earth grid **(see section 18).** Consult the manufacturer for full installation guidance. **.**

OTHER RANGES

Other linoleum product ranges are available for a variety of specialist uses such as sports surfaces, desks and counter tops and notice boards. Consult with the manufacturer for product specifications and application details.

SEAM WELDING

A correctly cut seam will not shrink or open up during the life of the linoleum. Net fit (closed) butt seams are often considered to be aesthetically better than a welded seam. This is particularly so in the case of plain and cork linoleums. So, if the application and specification allows, welding of linoleum is not obligatory. Where seam welding is required, colour coordinated hot seam welding cable that can be applied using standard floor covering welding equipment is also available.

Sheet vinyl pulled back during installation to show good adhesive transfer

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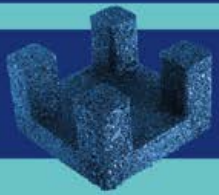

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ACCESSORIES
Preformed linoleum coved skirting is available.

Linoleum manufacturers offer acoustic underlays to provide additional impact sound resistance when used in conjunction with standard linoleum sheet or tile. Consult manufacturers for advice.

RUBBER FLOORING
Flooring made from rubber dates back more than 100 years. Once the technique of vulcanisation was fully proved, the quietness and resilience of rubber led to its wide use for floor coverings. Rubber floors are extensively used in airports, hospitals, the education sector, office buildings, laboratories and commercial premises.

They are permanently resilient, offering excellent resistance to wear and premature aging and offer excellent resistance to soiling, good resistance to acid and chemical spills, good impact resistance, resist most oils and grease and are also cigarette burn resistant.

Some qualities of rubber floorings also possess extreme fire resistance and some compounds are safe in terms of fire-toxicology.

Rubber floor coverings may be homogeneous or heterogeneous and are manufactured from natural or synthetic rubbers or a blend of these.

In compounding, the manufacturer is able to combine these various polymers with curing agents, naturally abundant fillers and natural colour pigments. The components are mixed, calendered and finally vulcanised.

SMOOTH RUBBER TO BS EN1817
Smooth rubber flooring that is compliant with **BS EN 1817** may be homogeneous or heterogeneous and is available in a variety of colours and thicknesses with either a plain or granulated effect and a large number of modern designs in sheet or tile form.

In sheet form, rolls vary between 122-200cm wide and varying lengths, normally 15lin/m and above, depending on the manufacturer, and at gauges 2-6mm. Tiles between 2-3mm thickness are usually cut from sheet, and tile sizes vary between 30cm-1sqm and 61 × 61cm for raised access floors.

RIBBED, PROFILED AND STUDDED RUBBER TO BS EN12199
In addition to the smooth surfaced rubber flooring, other types of rubber and/or synthetic rubber flooring are available with raised surfaces mainly in the form of ribs, studs or hammer blow surfaces, which are normally pressed out to profile in special moulds, available in a wide range of colours. This rubber flooring is usually in tile form, and apart from having a decorative value, can be used where a surface is required which offers a good degree of slip-resistance. For external use, some manufacturers offer a special quality.

Tile sizes are normally 50 × 50cm, 100 × 100cm and 61 × 61cm for raised access floors. Gauges vary according to the type of traffic conditions and are available from 2.5mm to 10mm.

SLIP-RESISTANT RUBBER FLOORING
Some manufacturers offer slip-resistant (safety) finishes and these should be selected with the level and type of contamination considered. The correct maintenance schedule should always be followed to ensure slip-resistant flooring maintains its slip-resistant properties for the life of the product. For further information on performance standards, selection and application of slip-resistant floor coverings, **see section 16.**

STATIC CONTROL FLOORING
Dissipative and conductive types of rubber floor coverings are available from some manufacturers, they are used to control static discharges to ultimately protect sensitive machinery and operatives. These types of flooring should not be confused with anti-static flooring, of which most rubber floor coverings possess inherent properties (body voltage generation). **See section 18.** It is important that dissipative and conductive floorings are installed using conductive adhesives and copper strips that are connected to suitable earthing points. Always consult the manufacturer for the correct specification of these flooring types.

ACOUSTIC RUBBER TO BS EN1816
Rubber is available in sheet form with foam/cork backing offering higher levels of impact sound absorption, greater walking comfort and increased resilience.

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UNDERFLOOR HEATING
The higher thermal resistance of acoustic products may reduce the efficiency of this form of heating.

SPORTS FLOORS
In recent years, increasing use has been made of the properties of rubber to provide resilient floors suitable for a wide range of sporting activities.

SEAM WELDING
Some manufacturers of rubber flooring state that seam welding is not required due to their inherent dimensionally stable properties. A correctly cut and installed seam in sheet material will not shrink or open up. Tiles are usually die-cut and do not need cutting or trimming. If seam-welding is required or requested, they can be heat sealed using colour matched hot-welding rod using standard welding equipment. It is also possible to weld vertical joins/mitres using one component sealing compound.

ACCESSORIES
Rubber accessories are available in the form of sit on and set in coved skirtings. Stair accessories are also available in the form of stair stringers, all in one nosing, tread and riser "stairtreads" and separate nosings. Inserts are also available for the visually impaired to highlight step edges, consult the manufacturer for guidance.

LOOSE LAY TILES
Some manufacturers offer removable tiles, they are normally 100 × 100cm and are fixed with low tack adhesives or double-sided quick fix stickers. They are designed for raised access panels where access is required, and in areas where permanent bonding is not an option.

Timber subfloors: Rubber floors have a good degree of flexibility and can be laid over suspended timber subfloors, providing the timber surface has been suitably prepared, otherwise, damage can occur on board joins.

INSTALLATION
Rubber floorings normally posses a smooth sanded backing, both in sheet and tile form. In the majority of applications, they can be adhered using modern water-based acrylic type of adhesives which must be recommended by the manufacturers of the flooring and adhesive. In certain instances, specialised fixing may be required using two-component chemical adhesives such as polyurethane and epoxy; these are normally high intensity, and industrial areas. Accessories are normally installed using contact adhesive. Although high-performance double-sided tapes are commonly specified by some manufacturers. Further guidance can be found in **BS 8203** and by consultation with the flooring manufacturer.

CORK TILES
Manufactured from granulated cork of selected quality, then compressed and baked, causing the natural resins and added binders to flow and form a firmly bonded homogeneous block from which tiles of varying size/thickness are cut.

Cork tiles are normally described according to density and thickness:

DENSITY	Domestic	385-445kg/m³
	Heavy Domestic	450-495kg/m³
	Contract	450-495kg/m³
	Heavy Contract	+500kg/m³
THICKNESS	Domestic	Min. 3mm
	Heavy Domestic	Min. 3mm
	Contract	Min. 4.80mm
	Heavy Contract	Min. 8mm

Specifiers should consult manufacturers for individual requirements.

Tiles are normally available in a standard size of 300 × 300mm (or 305 × 305mm) with other sizes to special order, and in thicknesses from 3mm (1/8in) to 8mm (5/16in), although 4.8mm (3/16in) and 6.4mm (1/4in) are most generally used. Cork tiles have a warm and attractive natural finish when appropriately maintained.

They can also be supplied pre-finished with either wax, urethane, polymer or bonded vinyl coatings. They are hard-wearing, quiet underfoot and resistant to damage from dilute acids and most common chemicals.

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Tiles vary in colour and are described as light, medium or dark, ranging from pale straw to a very dark brown, although some variation within each category shade is inevitable and the majority are produced in light and medium tones. Bleaching from strong sunlight can occur after installation.

Cork is only suitable for high traffic areas if selected from:

1. **Heavy duty PVC bonded cork with a minimum density 450kg/m³ minimum thickness 3.20 and minimum thickness of PVC 0.5mm.**
2. **Minimum 8mm thickness / density 500kg/m³ finished with either brush applied polyurethane, oleo-resinous coatings or pre-finished with a minimum of 90gm/m² of acrylated urethane.**

If not pre-finished with either a vinyl bonded surface or acrylated urethane, then the cork tile joints should be lightly sanded with a fine sandpaper to remove any "lipping", any adhesive or dirt removed and the surface brushed clean. Final surface application of a minimum of three coats of polyurethane or oleo coatings should be applied. Due to the varying porosity of cork, more than three coats may be required to achieve the required surface finish.

Application of cork tiles is normally carried out with rubber/resin emulsion adhesive for thickness up to 4.8mm. For 6.4mm and 8mm thickness, a gum spirit adhesive is used with, on occasions, the additional use of steel pins, or a solvent-based adhesive to manufacturers' recommendations.

Cork tiles with a PVC backing must be bonded with an adhesive approved by the manufacturer. The tiles have sufficient flexibility to allow application over suspended timber floors, subject to the substrate being correctly prepared to eliminate movement at board joints.

Underfloor heating: PVC-backed tiles are not recommended for installation over UFH systems.

Cork can be used in almost any situation by selection of a suitable density, thickness and surface finish. The manufacturers will provide advice on the selection and specification.

LVT can replicate natural finishes. Here, different colour stones come together for a striking effect.

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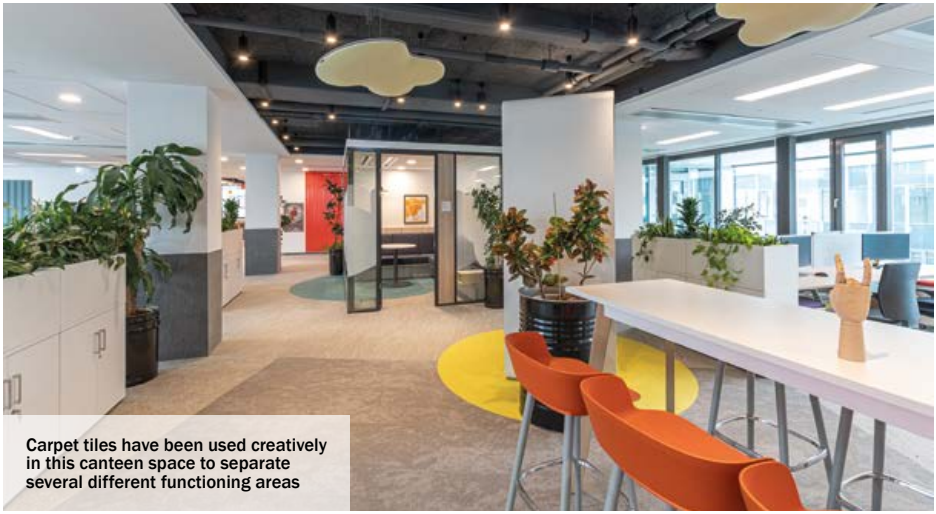

Carpet tiles have been used creatively in this canteen space to separate several different functioning areas

GENERAL

DETAILED INSTALLATION GUIDANCE

Can be obtained from the manufacturer and in **BS 5325** – Code of Practice for the Installation of Textile Floor Coverings, for all products contained within this section.

Much of the guidance is either replicated within this section or referred to elsewhere in this guide. If any doubt exists, the floor covering manufacturers' guidance and **BS 5325** should be consulted.

FLOORS NEXT TO THE GROUND AND ELIMINATING CONSTRUCTION MOISTURE

Unless otherwise stated by the manufacturer, the floor coverings covered in this section must be applied over subfloors with an effective structural DPM present in the construction.

The textile flooring should not be laid until a hygrometer test, carried out in accordance with Annex B in **BS 5325**, gives a reading of not more than 75% relative humidity, or the application of an appropriate surface applied DPM capable of controlling ground bearing moisture in the absence of a structural DPM.

UNDERFLOOR HEATING

The floor coverings covered in this section can be applied over subfloors incorporating UFH. Carpet and carpet tiles are excellent thermal insulators (Tog value typically 0.7-2.0) and this should be considered when using with UFH systems.

When used with UFH systems, the temperature at the surface of the subfloor must not exceed 27 °C. Guidance on the installation of floor coverings over underfloor heated subfloors is given in **Section 8.**

Product specific considerations are given in this section by product type where applicable.

CLEANING AND MAINTENANCE

Correct and effective cleaning and maintenance is essential if a floor covering is to provide optimum performance and appearance for the duration of its life. Products in this section can be cleaned and maintained using standard textile cleaning methods, cleaning products and equipment. However, there will be some differences between product types and ranges.

All textile floor coverings should be cleaned and maintained in accordance with the product manufacturer or supplier recommendations.

Section 20 provides a comprehensive overview of cleaning and maintenance for floor coverings. A regular and periodic cleaning and maintenance regime should be in place to ensure the textile floor covering retains it optimum appearance retention and life expectancy.

It is vitally important to consider the use of cleaning methods, cleaning machines and cleaning chemicals appropriate for the textile floor covering installed. **Section 18** highlights the need to protect newly installed flooring in order to avoid damage or soiling.

Many new floors are damaged in their early life because the builder, client or end user was not in possession of the relevant cleaning and maintenance information. Problems of this nature can be avoided by passing on the manufacturers' cleaning and maintenance recommendations on completion of the installation.

Cleaning and maintenance information is usually readily available which can normally be found on manufacturers' websites or in their brochures.

PRODUCT SUITABILITY

The manufacturers' advice as to the suitability of a product and recommended installation method should always be sought.

As with any floor covering, the specification of a contract carpet and carpet tile that is fit for purpose involves consideration of aesthetics and performance. Flooring is the most used and certainly the most abused, surface area within commercial premises, and as the largest space, any degradation in appearance through lack of maintenance or poor specification will be noticeable.

Carpets and carpet tiles both offer many benefits within commercial interiors including good sound absorption, underfoot comfort, thermal insulation and improved slip-resistance. The large variety of colours, textures and patterns also gives specifiers plenty of scope to design practical and attractive interior schemes.

Carpet fibre choice is important as it determines the core of the carpet or carpet tile aesthetics and performance attributes. Whilst consideration of the manufacturing and backing technology is important, the choice of fibre is key in determining long-term aesthetics, performance and ease of care and maintenance.

Cut and loop pile carpet tiles create a luxuriously opulent surface texture. The timeless surface visual of the tiles adds warmth and subtle interest to any interior space.

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The fibres available for manufacturers fall into two distinct categories: natural and man-made fibres. Within the contract carpet and carpet tile industry the three main fibres used are: wool; polyamide (nylon); and polypropylene.

FIBRES

WOOL

Wool is a natural fibre shorn from sheep. The type is determined by the breed of the sheep and the climate. Most fabrics use long and short fibres or wool fibres that are interlocked together. Wool carpet has the natural ability to hold and release water vapour by climate conditions, thus acting as a natural humidifier. A microscopic view of the wool fibre shows overlapping scales arranged much like roof shingles. The scaly character of the fibre scatters optical light, thereby reducing soiling visibility. Wool is naturally flame resistant, forming a char that will neither melt nor drip.

POLYAMIDE (NYLON)

Nylon carpet fibres take two forms: Nylon 6 and Nylon 6.6.

Chemically speaking, Nylon 6 is 1 monomer with 6 carbon atoms. Nylon 6.6 is made from 2 monomers with 6 carbon atoms each, which results in the designation of 6.6.

Nylon 6 resists fatigue and is very wear-resistant over time. It is often added to wool to create a wool-rich carpet with increased wear-resistance, particularly in lower pile weights and densities.

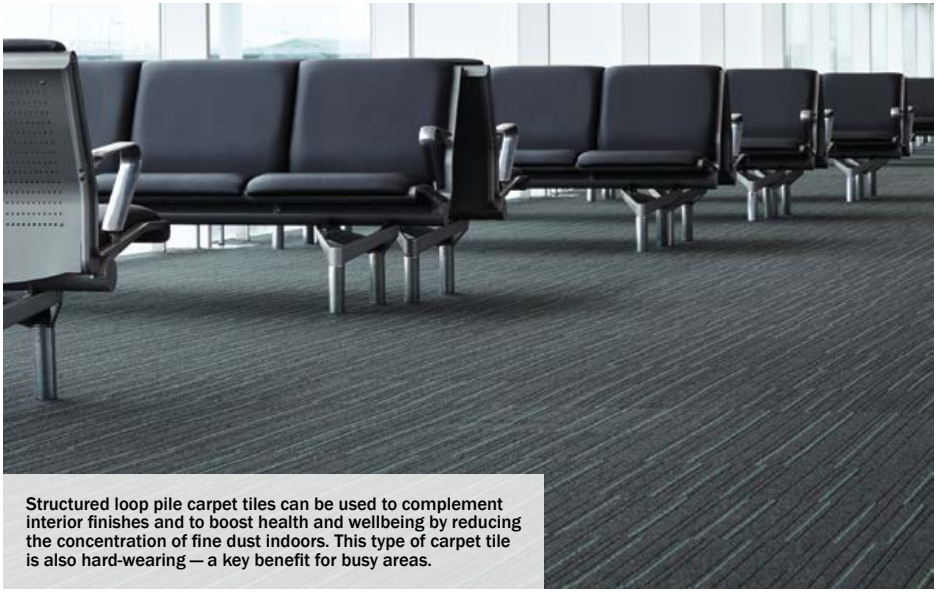
Nylon 6.6 has some extra benefits: its molecular structure provides an extremely hard-wearing fibre that also has a higher melting temperature and abrasion resistance.

POLYPROPYLENE

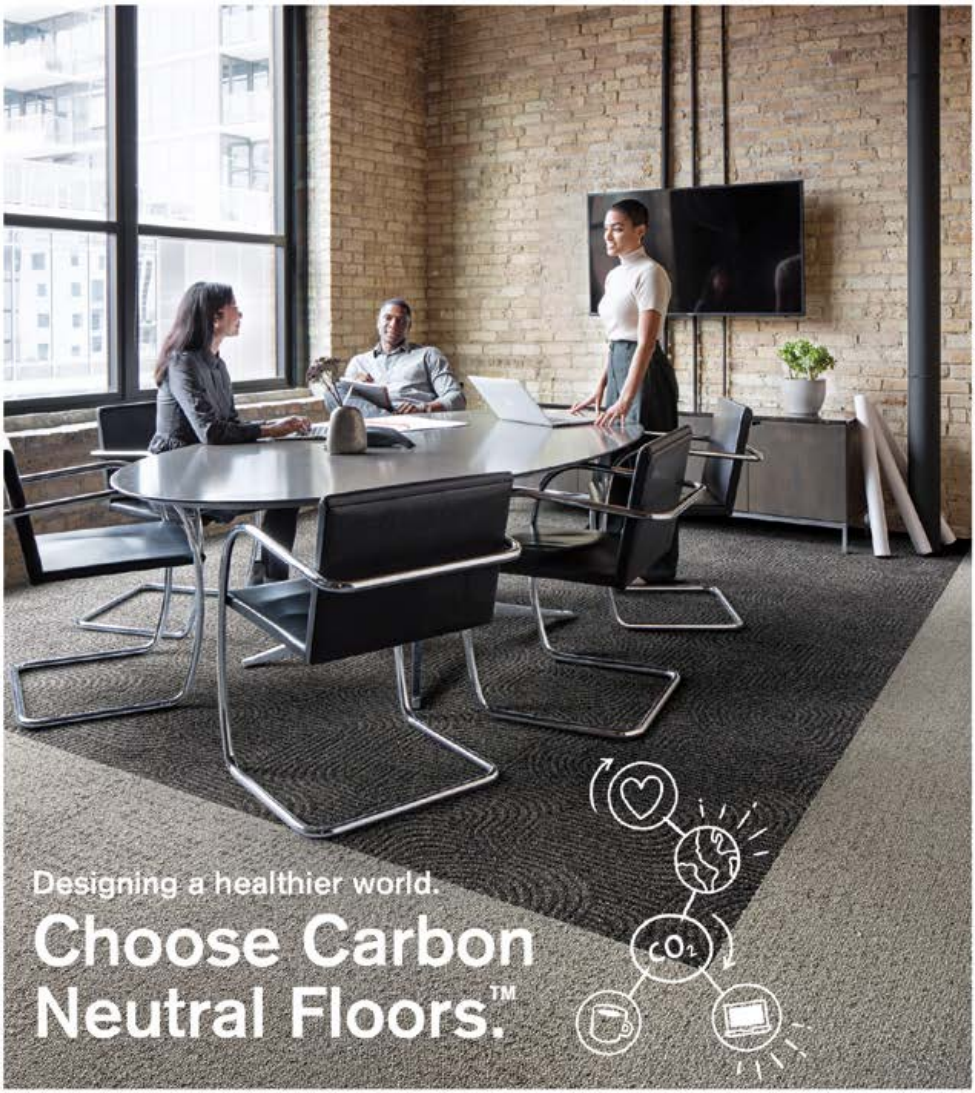
Polypropylene is a widely used fibre in carpet manufacturing, either as part of a blend, or as a single fibre type. Polypropylene is non-absorbent and dyed in the manufacturing process, so the colours are permanent. Polypropylene fibres are considered very strong and very abrasion resistant, though they are less resilient than some other fibres so may show increased pile flattening in heavy wear areas.

OTHER FIBRES

Other fibres used in the carpet and carpet tile market are acrylic and polyester. Polyester is becoming more popular in tile. These are lower cost



Structured loop pile carpet tiles can be used to complement interior finishes and to boost health and wellbeing by reducing the concentration of fine dust indoors. This type of carpet tile is also hard-wearing — a key benefit for busy areas.



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fibres often used to “fill out” the surface fibre.

BLENDED FIBRE YARNS

It is common practice to blend fibres to arrive at the most acceptable mix in terms of quality and cost for the finished product. The best-known example is the 80%/20% blend of wool and polyamide, where the latter enhances durability and antistatic properties without noticeably diluting the benefits of wool mentioned above.

This is particularly relevant in the hospitality and leisure market where products are exposed to a wide variation of adverse wear and use conditions.

MANUFACTURING TECHNIQUES

WOVEN

Machine woven carpets like Axminster and Wilton are made on looms that weave together “bobbins” of carpet yarn and backing.

WILTON

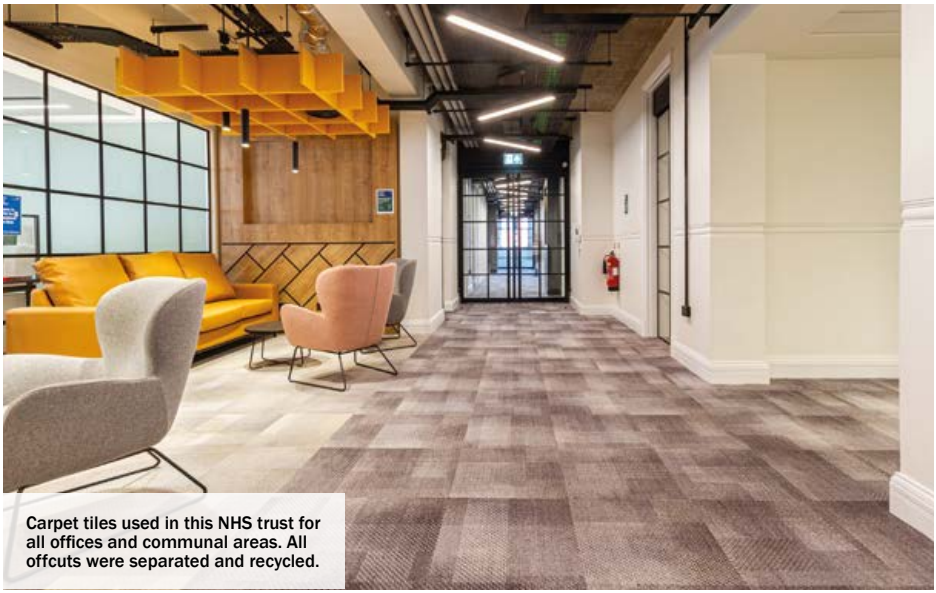
Original Wilton weaving combines all the pile yarns and backing materials into one structure, with everything running continuously through the backing. When the yarn is required in the surface, the loom selects the appropriate thread from the backing and brings it up to the surface and over a metal wire, which then holds it in position whilst the process is repeated, thus building up row after row of tufts.

The wire over which the yarn is stretched is then withdrawn to one side of the loom. A blade can be attached to the wire so that when it is withdrawn it slices through the yarn creating a “cut pile” surface. If a blade is not attached to the wire, when the wire is withdrawn the pile is left as a loop. This loop surface is commonly known as Brussels weave, after the original cloth weaving system that Wilton weaving is based on.

Patterned carpet designs are more usually made in narrow widths (0.69m and 0.91m)

Wilton weaving does have some limitations e.g., it can only use a limited number of colours when compared to other weaving types, and the product can consume more yarn making it more expensive. However, Wilton weaving also has some positive aspects such as, it can:

- **Be patterned or plain designs/colours**
- **Be highly durable in wear with good appearance retention**



Carpet tiles used in this NHS trust for all offices and communal areas. All offcuts were separated and recycled.

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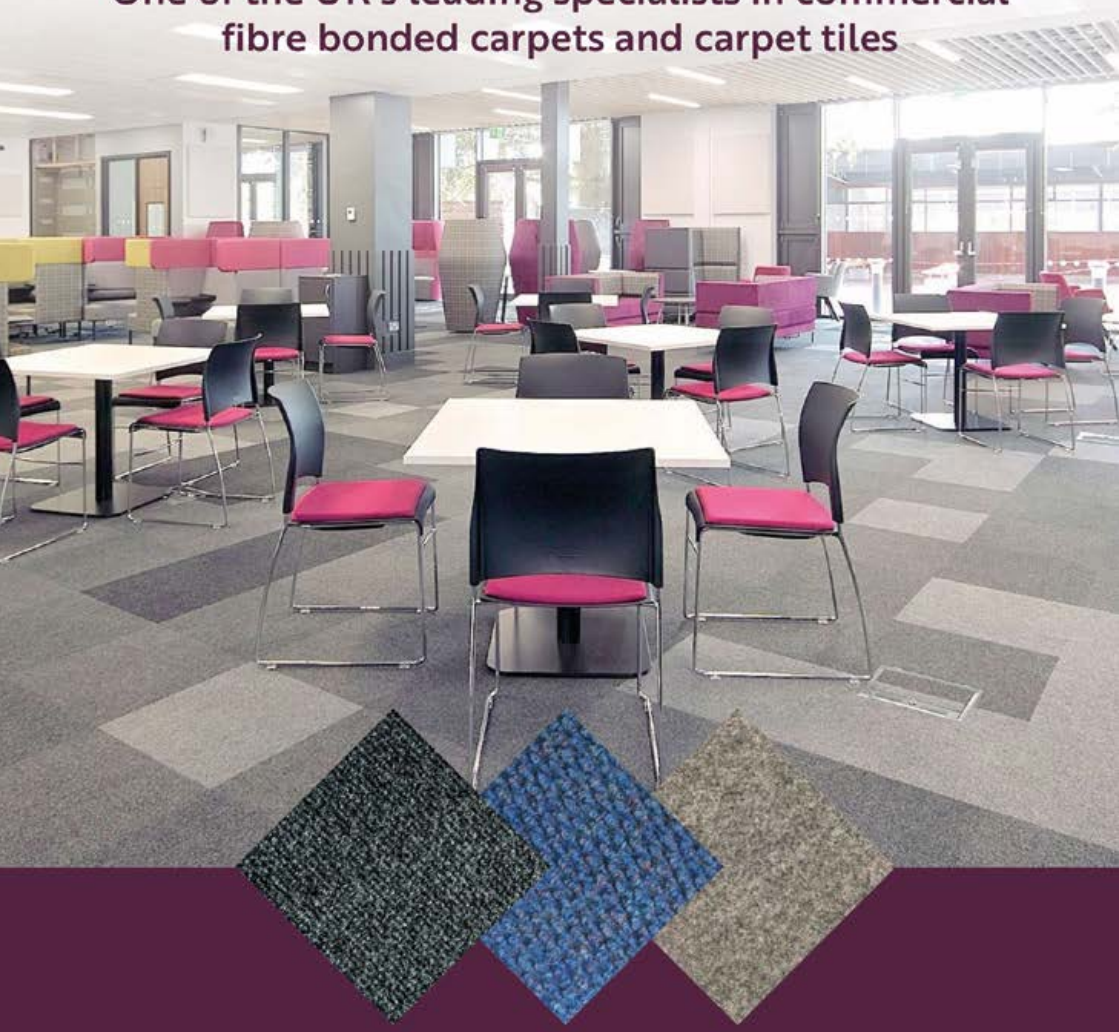

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- **Create textured effects such as loops and cut pile together with high and low pile all in one product**

AXMINSTER

Axminster weave was originally a hand knotting process that was mechanised into two types of looms known as Spool Looms or Gripper Looms.

Spool looms had the ability to incorporate an almost limitless number of colours, but this meant that very high production volumes were needed to make it cost effective. Weaving on this type of loom was popular for many years but started to diminish rapidly and is now very limited.

Gripper looms became more popular due to the fact that it was possible to make much smaller quantities more cost effectively. Engineering advances and the introduction of computers into the design process, together with Electronic Jacquards on the loom, meant that previous limitations on the size and scale of designs were almost eliminated. It is now quite common to see very large-scale designs together with elaborate rugs and panels woven in such a way to eliminate or drastically reduce the need for joins.

In addition to these design innovations, the Axminster loom can be readily adjusted in pile height, qualities and pile densities allowing for either very high quality or lesser, more cost -effective solutions. In recent years, there has been further development of Gripper Axminster looms speeding up production further, making this system by far the most common type of Axminster found today.

TUFTING

Created with the use of machinery, tufted carpet has a reputation for being sturdy and hard-wearing. Several popular styles of carpeting are made using the tufting process.

In tufting the yarn is stitched through the primary backing by multiple needles the full width of the machine and a fixed distance apart (the gauge usually 1/8th or 1/10th of an inch). The needles have eyes at the pointed end through which the pile yarns are threaded. The needles penetrate the primary backing, each insertion making one width wide row of pile.

The primary backing is usually woven polypropylene for broadloom or non-woven polyester for tufted carpet tiles.

Tufts are essentially clusters of yarn fibres that

Large format flocked floor covering planks laid in a herringbone pattern use different colour combinations to create a design effect

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are drawn through a primary backing, such as a natural fabric or synthetic base. The tufts project from the surface of the base and may be configured as a loop or cut strands.

Tufting machines operate at much higher speeds (900+ rpm) and are much more productive than weaving looms.

Settings on the machine can be programmed to create pile tufts uniform in height and distribution. The machines can also be set to create a pattern composed of tufts of different heights.

FIBRE BONDED (NEEDLEPUNCH/ NEEDLEFELT)

The principle of fibre-bonded manufacturing is to consolidate a web of blended staple fibres (predominantly polypropylene but also nylon and polyester) into a flat material, which is then processed to create a surface design. The final stage is usually to either back-coat or fully impregnate with a suitable resin, though other backings can be applied, such as foam, rubber crumb or PVC, or bitumen for modular tiles.

The creation of both flat material and structured product is by means of thousands of needles embedded into a needle board housed in looms, through which the material passes. Different types of needles are used for the fibre consolidation and structuring (patterning) stages. Most designs are variations of flat, rib and velour, with the latest designs making use of two-layer patterning to allow increased design scope.

FLOCKED

Flocked floor coverings are manufactured by electrostatically fixing short, pre-cut synthetic fibres into an impervious adhesive layer. This technique creates a uniform and perpendicular coverage with an extremely dense and durable pile with excellent resilience, appearance retention and thorough washability.

This type of floor covering is generally used in areas where resilience, durability and cleanability are of great importance, such as in healthcare, education, leisure, and general circulation areas. It is also used in residential properties in kitchens, conservatories and bathrooms.

CARPET TILES

Carpet tiles are available in regular square and

Some carpet tiles manufacturers now offer recyclable carpet tile collections. This product marries great innovation and performance with strong design to boost health and wellbeing in offices, schools, healthcare environments and other public spaces.

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rectangular plank formats to create different floor layout design effects. They can be laid in both domestic and commercial applications with suitability for awkward-shaped rooms, as you buy for the area, not the width of the carpet roll.

Easy to transport and handle on site, particularly in high rise projects (being in boxes), carpet tiles provide an all-in-one instant floor covering option.

They are generally fitted using a tackifier-type adhesive, although loose-lay options are available. Both methods allow individual tiles to be removed for subfloor access (important with raised access floors) or replacement.

Installations can easily be carried out in small areas or on a temporary basis (exhibitions, etc.).

TYPES OF CARPET TILES

Various construction types are available including woven, tufted, fibre bonded, and flocked. The backings options vary and include bitumen, PVC, fibre and recycled backings. Some carpet tiles are also available in an equivalent roll carpet option.

CARPET UNDERLAY

BS 5325 Section 5.1 states:

*"Carpet underlays should be in accordance with **BS EN14499.** Carpet underlays usually improve the walking comfort, impact sound insulation, thermal insulation, carpet life and can smooth minor surface irregularities of subfloors."*

The cushioning effect will help to reduce the pressure on the carpet. This decrease in pressure improves the carpet feel and look for longer and can extend the useful life of the carpet.

BASIC FORMS OF CARPET UNDERLAY

Carpet underlay is available in four basic forms:

- **Rubber**
- **Latex Foam**
- **Polyurethane Foam**
- **Fibre**

BS 5325 Section 5.1 states:

*"When choosing underlays for use in either domestic or commercial installations reference should be made to **BS EN14499** which defines the types of underlay available and details the areas of suitability for all types as an aid to their selection."*

Care should be taken in the choice of a carpet underlay, and it should always be matched to the

Flocked floor covering in plank format that combines the warmth, acoustics and underfoot comfort of a textile with the durability and cleaning properties of a resilient flooring

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area in which it is to be laid.

Manufacturers of textile floor coverings sometimes stipulate that their products should be installed by overall adhesion. In such cases, the benefits of the use of a carpet underlay can be retained by the use of one of the proprietary systems in which the underlay is adhered to the substrate and the carpet to the underlay. Any recommendations by the carpet manufacturer or the underlay manufacturer should be followed.

Each type of underlay comes in several varieties and thicknesses. The type of installation and the volume of expected traffic will determine the most appropriate underlay type. In residential areas, living spaces, stairs and landings will probably require a thicker and firmer underlay, whilst bedrooms can have softer options.

In commercial areas, the heavy traffic use means that a contract quality underlay is required.

CRUMB RUBBER UNDERLAY

Manufactured using recycled post-consumer vehicle tyres, the rubber crumb is mixed with latex compound before being spread at a predetermined thickness onto the backing material. A heated oven then cures the underlay which is then ready for trimming and packaging.

Crumb rubber underlays are firm and produce a highly resilient surface which offers maximum protection against carpet wear. Also used extensively for double-stick applications.

LATEX FOAM UNDERLAY

Specialist IMO rated underlay is produced using synthetic latex, incorporating Aluminium Trihydrate (ATH). This endothermic flame -retardant compound absorbs high quantities of heat when acted upon by fire, subsequently breaking down to release water molecules, thus giving the underlay a self-extinguishing property. This type of underlay is also suitable for double sticking.

POLYURETHANE FOAM UNDERLAY

Bonded polyurethane foam underlay is easy to recognise as it uses granulated pieces of foam in different sizes and colours and is initially bonded into a log for peeling into different thicknesses.

Recycled underlay is manufactured using recycled rubber crumb, sourced from worn tyres

Advantages include ease of installation, lightweight and long-lasting performance, also tog ratings and decibel ratings are higher than average, better recovery and environmentally friendly as it is made from recycled material.

SPONGE RUBBER UNDERLAY FLAT

Produced using moulded synthetic rubber mixed with other materials, heat is then used to cure it on a specialist belt (which forms a flat profile ideal for double sticking). It produces a soft resilient cushioning for a comfortable feel. Specialist versions are produced offering extremely low Thermal Resistance (TOG ratings) for use with UFH systems.

SPONGE RUBBER UNDERLAY WAFFLED

Produced using moulded synthetic rubber mixed with other materials, heat is then used to cure it on a chain link belt, forming the waffle pattern. It produces soft resilient cushioning with a comfort feel. Specialist versions can be produced which offer extremely high impact sound reduction.

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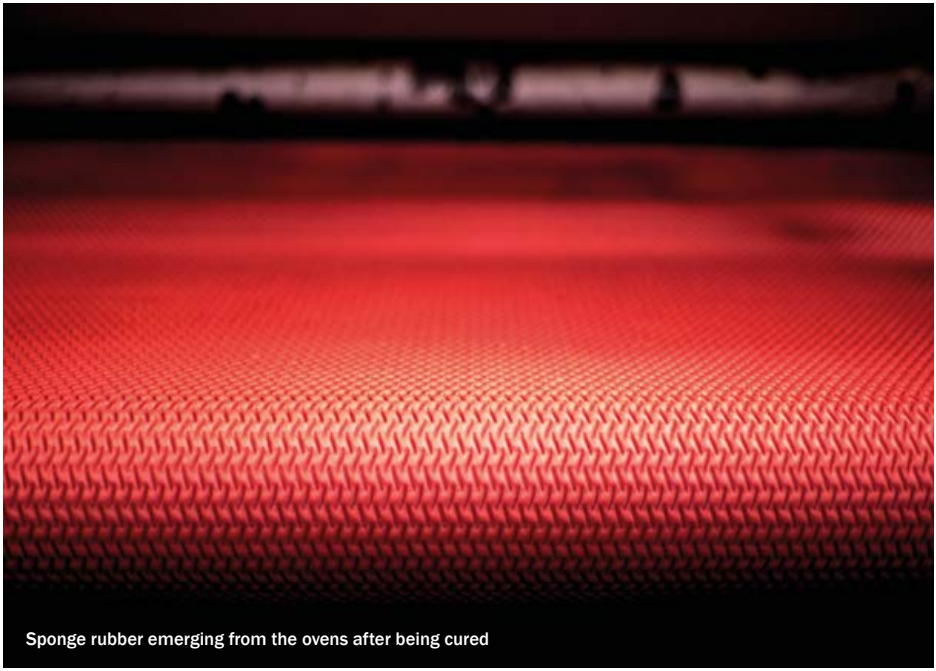

Sponge rubber emerging from the ovens after being cured

Finished PU underlay before rolling

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The Vita Group has a Silver EcoVadis sustainability rating

An example of image of a self-adhesive installation system, which can be used to install a whole range of different types of floorcoverings

Bespoke plaid carpet laid in golf club bar and restaurant area. With complex designs, care is needed by the installer to ensure the carpet pattern matches between rooms.

FIBRE

Uses existing fibres of virgin and recycled, man-made or natural fibres, which are then woven into a sheet of felt. The natural felt is manufactured using animal hair and jute (vegetable fibre). This is the oldest kind of underlay.

The synthetic fibres include nylon, polyester, polypropylene and other acrylics. These fibres are needle punched and made into rolls which have a firm feel. They can be produced to any weight to withstand relevant traffic flow.

SPECIAL APPLICATIONS

On occasion, special consideration needs to be given to all types of carpet construction and form, for specific reasons of hygiene, health and safety and tailored performance criteria issued by the appropriate recognised authority. For specialised information of a sensitive or scientific nature, the manufacturer's technical department should always be consulted.

CARPET FITTING METHODS

Following the correct instructions and using professional carpet fitters will ensure that you get the best out of your carpet and carpet tiles.

Textile floor coverings should be installed in accordance with **BS 5325 —** Code of Practice Installation of textile floor coverings.

This British Standard provides recommendations for the installation of textile floor coverings in new or existing buildings. It covers all products composed of textile material with a pile or non-pile use surface, and includes the laying of carpet tiles, either with the use of a permanent adhesive or a tackifier. It details suitable methods of design and installation and advises on the selection of the materials required for their implementation.

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Timber flooring in traditional herringbone style in a modern office environment

Timber flooring is traditionally one of the oldest forms of flooring which has seen an increase in popularity in recent years. Many different species of timber are available which are selected mainly for their appearance and durability. Hardwood flooring is available in many forms.

SOLID STRIP OR PLANK FLOORING

Mainly manufactured in T&G and end-matched prefinished boards but may be supplied as unfinished strips, fixed individually. Solid strip or plank floors are usually structural grade boards which will span between supports. Prefinished boards tend to offer a faster installation time and a high level of consistency of the surface finish. Boards are manufactured in a variety of sizes and may be installed by mechanical "secret fixing" through the tongue to a timber subfloor or softwood joists or battens. They may also be glued down to a solid subfloor using a proprietary adhesive or laid as a floating floor on an underlay and moisture barrier when using a proprietary manufacturer's system in accordance with the manufacturer's recommendations.

For sports, dance or other activity floors, the boards will usually be nailed to a "semi-sprung" batten system fitted with rubber or neoprene pads or a continuous layer of polyurethane foam on the underside. Some of these systems are height-adjustable to allow them to be laid on uneven concrete or where the subfloor level changes. Sports or dance floors will usually need to comply with **EN14904** class A3 or A4 to ensure the correct performance characteristics in terms of shock absorption, friction, etc.

ENGINEERED BOARDS

Available as a multi-layer board in various timbers and thicknesses. Boards are normally pre-finished at the manufacturing stage, comprising a top layer

of decorative hardwood 3mm to 6mm thick with a softwood ply or block-board substrate. Boards are usually T&G jointed and end matched.

Various board thicknesses are available to suit overlay or structural installations. Where fixed to battens or joists, boards will normally be "secret nailed" through the top of the tongue; where laid as an overlay they may be fully edge-glued or boards joined together with a special locking profile T&G joint; where installed as a floating overlay floor a proprietary underlay is necessary. For cementitious bases, a surface moisture barrier is usually required.

Thinner boards are predominantly used for residential installations and thicker, structural boards for sports and commercial buildings.

SOLID WOOD BLOCKS

Solid wood block flooring may be laid over any sound, dry, level subfloor and is usually glued to the subfloor using bitumen or polymer adhesives.

Wood blocks are normally supplied untreated and sanded/finished on site, as described below.

Blocks are manufactured in various sizes with a T&G on either side and grooved at either end. They are usually installed by adhering to a flat, dry screed base finished with a suitable smoothing and levelling compound.

They will often be manufactured in left hand and right-handed versions to allow them to interlock properly when laid in herringbone and similar patterns.

The most popular pattern is herringbone, but double herringbone, basket weave, ladder and brick patterns can be achieved. A two-block border may be used at the perimeter.

NOTE: It is desirable that block floors are set out so as to achieve a symmetrical layout but dimensional variations may dictate that an alternative be considered. The first two lines of blocks should be laid on either side of an approximate centre line and should then continue outwards until a space is left for a border of longitudinally placed blocks plus an expansion gap.

Solid hardwood T&G floorboards fully bonded to the base — often specified in commercial and public buildings and offers very low "footstep" sound

SOLID OVERLAY FLOORS, STRIP AND PLANK

Solid overlay strip or plank floors come in various sizes, typically 12mm or 14mm thickness and are often supplied factory finished. These floors require a sound, flat and dry subfloor to support them and will generally not span between joists or battens. May be laid as floating overlay floors using the manufacturer's proprietary system or glued down. On timber subfloors, they may be "secret-nailed" through the top of the tongue. For cementitious bases, a surface moisture barrier is usually required.

Solid timber floors expand mainly across the width and it is advantageous to lay boards and strips so that the number of board or strip widths is kept to a minimum. It is usual to lay the boards or strips parallel to the longest wall and to leave perimeter expansion gaps.

The position of doors and windows and the direction of existing floorboards or joists should also be considered when deciding which direction to lay the boards.

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NOTE: Boards and strips should be laid in as random pattern as possible. Header joints and stave ends must not fall in line and be at least two strip widths apart in adjacent runs.

Overlay strips should be set out in the same manner as boards and strips. Prefinished boards on battens or joists will usually be laid so the header joints are supported by battens.

WOOD MOSAIC PANELS

Manufactured from a variety of timbers such as walnut, oak and some tropical timbers which are chosen for their hardness and stability. Good resistance to wear and attractive appearance are just two features of mosaic panels. They are also among the cheapest type of hardwood flooring.

Mosaic panels are used in many applications including housing, schools, churches, recreational and sports areas. They are available in felt-backed, mesh-backed, paper-backed, paper-faced and are usually pre-sanded for easy installation.

The panels are supplied in various sizes, generally 480 × 480mm and 477 × 477mm, 8mm or 10mm thick. Sixteen opposing squares, each comprising five or six fingers per square, are then set in a basket weave pattern. Mosaic flooring can be laid over any sound, dry, level subfloor and are usually glued to the subfloor using bitumen or polymer adhesives and are then sanded and finished as described below.

It is desirable that the floor be set out to achieve a symmetrical layout, but dimensional variations may dictate an alternative be considered.

The first two lines of panels should be laid on either side of an approximate centre line, then continued outwards until a gap for expansion is left.

PARQUET BATTENS

These are manufactured mostly from oak, with finished sizes typically 380 × 60 × 10mm, or 280 × 70 × 10mm. Other sizes and timbers are available in order to produce a wider choice of patterns. Battens are supplied unfinished with plain non-jointed edges. They are generally installed onto a dry and level base covered with a minimum thickness of 4-6mm resin bonded plywood firmly fixed to the existing subfloor: They are usually glued with a PVA adhesive and pinned through the face using 25mm panel pins. The pins are punched home, filled, sanded and polished. At the perimeter, a two-line border of oak or a darker timber is formed.

Engineered wood being fully bonded to the subfloor

SUSTAINABLE

SOLID WOOD FLOORS

Junckers is Europe's leading manufacturer of solid hardwood floors with full sustainability credentials for sports, residential and commercial projects.

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Beautiful floors which are easy to install made in solid hardwood timber. Choose from herringbone, two-strip, and plank in a wide choice of colours and finishes. Works perfectly with underfloor heating.

COMMERCIAL

Hard-wearing, long-lasting floors that stand up to high-level foot traffic, Junckers is the flooring of choice for architects. Ideal for workspaces, museums and galleries, shopping centres, public buildings and more, a Junckers floor is a sustainable, low carbon option.

SPORT

From Olympic arenas to local schools and village halls, a Junckers sports floor performs with unique area-elastic characteristics providing the ultimate freedom of movement, protection against injury and excellent ball bounce. It can be sanded and re-finished up to ten times without losing performance - the lifecycle costs of a Junckers floor unbeatable.

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CHOICE AND SUITABILITY OF TIMBER

A wide variety of species is available for use as hardwood flooring. When used for flooring, many manufacturers offer different grades depending upon the number of knots and the amount of colour variation. Filler and splits may also be a normal part of some grades. Individual manufacturers must be consulted to obtain specific descriptions for the grades they offer.

SUITABILITY AND DURABILITY

Different timbers may vary in terms of strength, durability, indentation resistance, etc. However, this alone will not determine if an individual wood floor product is suitable for a particular application. Other factors to consider include the overall thickness of the hardwood (or wear layer for engineered/multi-layered boards), the construction of the board (plank, strip, multi-layer, core material, jointing method), and the type of surface finish.

Any consideration of the finish will need to include the type and frequency of maintenance, and costs of ownership for the client.

The manufacturer will advise upon the suitability of their individual product, its anticipated life span and any guarantees and warranties which are available.

AVAILABILITY OF WOOD SPECIES

Manufacturers offer a wide variety of timbers and those most readily available in the UK include oak, beech, maple, ash, walnut and cherry. Some tropical and "exotic" species are available including mahogany, teak, iroko, keruning, jatoba, etc. However, some of these are becoming increasingly difficult to obtain due to scarcity and growing demands from clients that timber must come from managed and sustainable sources.

It is not uncommon for contractors, manufacturers and specifiers to adopt a similar policy.

There are a number of accreditation schemes which have gained wide acceptance. The best known of these includes:

- **FSC — the Forest Stewardship Council**
- **PEFC — Programme for Endorsement of Forestry Certification**
- **Both offer certification schemes which extend from forest to installation, and both include the need for regular audits to ensure compliance**

INSTALLATION

ACCLIMATISATION

Unless a manufacturer clearly instructs otherwise the delivery of the timber flooring should be programmed so as to ensure the shortest possible storage period on site.

All materials should be stacked carefully to retain flatness and be kept in an environment that will maintain the moisture content at the recommended level, i.e., not less than 7% or more than 10% under normal circumstances.

BS 8201 states:

"Code of practice for installation of flooring of wood and wood-based panels" covers in detail many of the subjects included here including descriptions of different floor types and their selection, characteristics of commonly used timbers and their suitability for use as flooring, an overview of fixing methods and site related matters. It also sets out good practice methods for measurement of subfloor moisture in cementitious bases."

When installing timber floors over a cementitious base, contractors will also need to consider **BS 8204** Screeds, Bases And In-Situ Floorings which describes moisture protection in floors and surface level tolerances including methods for measurement.

SITE CONDITIONS

The moisture content of the timber floor, once installed, depends primarily upon the humidity and, to a lesser extent, upon the temperature in the building. There will usually be seasonal fluctuations and the timber floor will react to this either by expanding or shrinking to some extent.

The importance of using wood at correct moisture content cannot be over-emphasised. If, at the time of fixing, the moisture content is too great, shrinkage is inevitable and results in unsightly open joints; if the moisture content is too low, swelling may occur, causing lateral pressure to floors which can produce lifting.

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Manufacturers will normally supply timber flooring at the correct moisture content, therefore after delivery, the flooring should be stored and laid in dry and stable conditions to ensure it is correctly maintained at the recommended moisture content for laying.

To reduce the dimensional changes which take place after a wooden floor is installed in a building, it is desirable that the temperature and humidity in the building before, during and after laying the flooring should be approximately the same as those which will prevail during occupation. At an early stage, the flooring contractor should be informed of the form of heating to be installed and he should be consulted also as to when it would be advisable to turn on the heating for the first time.

When heat is first applied, latent moisture within the structure of the building is drawn out and this tends initially to increase the atmospheric humidity. Adequate ventilation should be provided therefore, and laying should not commence until the initial drying out is complete; this period will vary widely with the type of construction and weather conditions.

UNDERFLOOR HEATING

Not all manufacturers recommend their floors for use with UFH because of the wide range of temperature to which the flooring will be subjected. It is therefore important to check with the manufacturer first to see if there are any special requirements in respect of moisture barriers, drying of wet trades and operation of the UFH.

Where UFH is involved, particular attention should be paid to the moisture content of the timber flooring and the base at the time of laying **(see section 9 for further information on UFH).**

With some adhesives, it will be necessary to allow the screed to cool before installing timber flooring but the ambient conditions must always be maintained. The heating system should run in advance of timber floor installation and any sudden changes in the temperature should be avoided.

EXPANSION ALLOWANCES

When installing the floor it is important to consider that during the more humid summer months the floor will naturally expand. Most manufacturers will have specific recommendations for size and location of expansion allowances which must be left when the floor is fitted. Normally a gap at the floor's perimeter is required, and in some cases, smaller gaps between the boards as well.

TREATMENT OF PIPES

Where hot water or steam pipes (other than those for floor warming purposes) pass under the flooring it is essential that they are insulated sufficiently to reduce movement of the flooring in that area and they should be fixed at a sufficient depth to avoid possible damage from fixings for the new flooring. An appropriate type of insulation should be used to accommodate thermal movement of pipes.

FIXINGS

Timber flooring is normally fixed using either nails, staples, screws or adhesives or alternatively laid as a floating floor using manufacturers proprietary systems such as clips, T&G interlocking systems or self-adhesive installation systems.

MECHANICAL FIXING

Timber floors can be mechanically fixed to timber joists, existing timber floors, or to battens either by face or secret nailing through the tongue. The first and last rows of boards should generally be face-fixed.

The timber flooring must be fixed to every joist or batten or when laying over existing subfloors at centres appropriate to the type of product. Care must be taken not to damage the timber when fixing particularly within 50mm of the end of the board or strip. On existing timber floors mechanical fixings should correspond with the joist's centres wherever possible.

Where provision for expansion is required within the body of the floor then temporary spacers should be used to form gaps between the boards during installation. These will normally close as the floor acclimatises.

New and existing concrete subfloors should be overlaid with a vapour check before installing the timber battens or timber flooring. Suspended timber floors must be dry and have adequate ventilation to the void beneath.

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NAILS

Nails having a diameter in accordance with the manufacturers/supplier's recommendations and with plain shanks should have a length not less than 2.5 times the thickness of the flooring through which the nail is driven, except in the case of thin sheet materials when the minimum penetration into a timber base should be 19mm. Normal or improved nails may be either hand driven or machine fixed. The greater holding power of improved nails much increases resistance to "nail-popping" but may add to the risk of the wood splitting.

SCREWS

Screws, where used, should have a length at least twice the thickness of the flooring being fixed, except in the case of thin sheet materials when the minimum penetration into a timber base should be 19mm. Proprietary flooring screws are available which are designed for use with T&G flooring. The screw head is small enough to locate above the tongue whist allowing the floorboards to fit together correctly.

STAPLES

Staples should only be used for fixing timber floors where approved by the manufacturer.

BATTENS

Battens which are securely fixed to the subfloor are rarely used due to the difficulties in providing an effective moisture barrier. Generally, battens should not be less than 36mm wide and those for floating floors not less than 40mm wide.

They may be rectangular or splayed in cross section and should be of sufficient depth to accommodate the length of fixing.

Floating battens may be continuously supported by the subfloor and may have a continuous resilient strip on the underside. Others may be supported at intervals by cradles or pads.

Spacing of the battens should be determined by the design, loading, thickness and length of the floorboard available. Batten ends must be staggered and should not fall in line with each other in adjacent rows.

Other specialist systems are available and must be used strictly in accordance with the manufacturer's instructions.

SPECIALIST UNDERCARRIAGE SYSTEMS

Hardwood floors are used extensively in sports halls and for dance and similar activities. Specialist batten systems for these floors will normally need to comply with **EN14904** which sets out requirements for ball bounce, shock absorption, surface deflection and resistance to rolling load.

These systems will normally comprise a layer of timber battens (sometimes two layers) fitted with rubber or plastic foam pads or resilient proprietary cradles to allow the floor system to flex.

ADHESIVES

Where adhesives are used, the manufacturer's instructions should be followed. Some adhesives will act as a surface vapour barrier when applied with full cover to a screed for example. Wood flooring adhesives will usually have some flexibility when cured to allow for the natural movement of the timber. Some timber substrates may require preparation work to remove contaminants, protective treatments, wax and the like.

An example of a cradle and batten subfloor where the levelling capabilities of the system can be seen

An example of a cradle and batten subfloor system used below wood flooring

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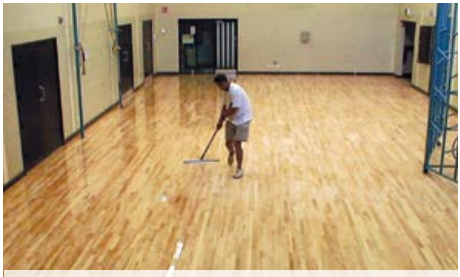

The sealing process: the floor being coated with water-based seal using an applicator pad

Wood blocks and mosaic panels should be installed using the recommended adhesive. Boards and strips should only be fixed by adhesive where this is expressly approved by the timber flooring manufacturer. Site conditions and preparation of the subfloor must be strictly in accordance with the recommendations given earlier in this section of the guide. Adhesive must be applied in accordance with the manufacturer's instructions, taking care that the coverage application and working times are observed.

FLOATING SYSTEMS

Many timber floors, particularly prefinished boards or planks are designed to be installed as floating systems i.e., not fixed to the subfloor. These floors should incorporate an underlay or resilient layer and (with the exception of timber subfloors) a vapour check. Boards and strips are installed by interlocking joints, gluing along the T&G or with proprietary clips in accordance with manufacturers' instructions. Solid timber boards and/or strips should not be glued together unless recommended by the manufacturer.

CLIPS

Floating floor systems where steel clips fit into grooves on the underside of the boards. Clips are flush-fitting and the boards are laid on a resilient underlay.

T&G INTERLOCKING SYSTEMS

Usually, floating floor systems where longitudinal board joints are held together by a specially designed T&G profile. The end (header) joints of the boards are glued together but the longitudinal joints are not.

SELF-ADHESIVE INSTALLATION SYSTEMS

Floating floor systems where an adhesive layer is incorporated on the underlay or resilient layer. This adhesive is then used to install the wood flooring (T&G or click joint systems).

FINISHING

The performance of the floor is very much dependent on the choice of surface treatment, the number of coats and the way it has been applied.

Timber flooring generally requires finishing to protect it from foot traffic, general wear and tear and staining.

Whilst many timber floors are supplied factory-finished, in some circumstances they may require a final surface treatment after installation, e.g., to protect painted court lines on a sports floor. When additional site finishing is done always ensure the floor is properly clean before applying the finish, abrading the floor where necessary.

Unfinished timber flooring will require sanding with a drum/belt floor sanding machine, starting with coarse grit sandpaper, followed by a medium grit paper and finishing with a fine grade.

This three stage operation is important to provide a smooth surface without "chatter" or "roller" marks, which will otherwise be very visible in the final finish.

NOTE: Spontaneous ignition can occur with sanding dust and it is important that the dust is disposed of safely.

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All finishes should be applied strictly in accordance with the manufacturer's instructions, and it is the responsibility of the users to ensure that all the current Health and Safety Regulations are being strictly observed.

SEALING AND POLISHING

Due to the increase in types and quality of wood floor finishes, the choice available to the contractor is large and it can be difficult to specify one particular type for a job. The condition and use of the floor should be taken into account as well as environmental conditions and future maintenance. Floors used for sport should be coated with products which comply with the slip-resistance and gloss level requirements of **EN14904.**

SOLVENT BASED PRODUCTS

TRADITIONAL WAXES

These impart good wood colour, usually giving a deep even finish. They allow natural movement of the timber and offer excellent repairability but require high maintenance in the form of regular buffing. They are known to "travel", producing slip problems in surrounding areas. They should be avoided in sports areas. When sanding or refurbishing a floor, traces of wax may cause problems when the floor is resealed. Thorough sanding is recommended and special primers are available to reduce the likelihood of a problem.

TRADITIONAL OIL

Imparts good wood colour usually used as a matt finish. Allows natural movement of the timber but can be slow drying and require high maintenance in heavily trafficked areas though easily repaired. Oiled finishes generally have poor penetration into dense oily hardwoods and can have the same problems as wax when over-coating is carried out.

HARDWAX OIL

Gives similar properties to traditional oils but with improved durability, water and chemical resistance. Normally available in satin/matt finishes.

OLEO-RESINOUS SEALS

These give very good penetration and are easy to use with similar wear and chemical resistance to Hardwax oils but with a deep "build"on the surface. These products allow natural movement of the timber but are comparatively slow to dry

and cure. Primarily available in high gloss. These products generally have low durability.

OIL MODIFIED POLYURETHANE AND URETHANE OIL

Visually, and in method of use, are similar to oleo-resinous seals but with significantly improved hardness, chemical resistance, and durability. Available in all gloss levels. As with hardwax oils, they're easy to maintain but need frequent maintenance.

SOLVENT BASED MOISTURE-CURING POLYURETHANE

Give excellent durability and chemical resistance with high build-up but may not allow wood the natural movement of the timber to take place due to high strength of the film. Are not recommended for use on new timber floors. Primarily available in high gloss. Generally, a very low maintenance finish. These products are rarely used today.

ACID CATALYSED LACQUER

Similar properties to solvent-based polyurethanes but faster in drying and curing. Generally, less durable and lower chemical resistance than moisture cured urethanes. Available in all gloss levels, generally low maintenance.

Due to VOC emission rules becoming more restrictive, some solvent-based products may in the future be taken off the market.

WATER BASED PRODUCTS

Water-based products are the most frequently used products today. The primary advantage of water-based products is improved environmental and personal safety.

Some lacquer products contain "ceramic" ingredients which can be very difficult to sand by conventional means, quickly blunting normal abrasives. Specialist diamond abrasives are usually recommended where these products are involved.

SINGLE PACK WATER-BORNE POLYURETHANE AND PU/ACRYLIC BLENDS & CO-POLYMERS

Depending on type they can be almost odourless and are fast-drying and curing. Good durability and chemical resistance. There are many

versions available, each with their own strengths such as clarity, UV stability, flexibility, or hardness. The use of a primer depends on the particular product used and the type of wood. Available in all gloss levels.

TWO PACK WATER-BORNE POLYURETHANES

These are the most common products used on sports and commercial floors today. Depending on type they can be almost odourless and all are known to have excellent durability and chemical resistance when cured.

The use of a primer depends on the particular product used and extent to which the wood may expand and contract. Available in variety of gloss levels from 10% matt to high gloss with good UV stability. The main disadvantage of this type is limited pot life when the lacquer has been mixed.

MAINTENANCE

Customers must be provided with appropriate maintenance information to allow them to maintain their floors properly. Instructions must also include guidance on heating and ventilation of the building to maintain the best possible environment for the floor.

Preventive maintenance is necessary to reduce the effects of wear and tear and to prolong the life of the floor and reduce the frequency of floor sanding.

It may be possible to commence a long term maintenance programme with a specialist contractor to ensure floors are maintained at correct intervals,

PROTECTION

If it is necessary to protect the floor prior to handover, use of a “breathable” protection material is recommended if the floor is to be covered for a long time. This will avoid “sweating” and subsequent moisture damage to the floor.

NOTE: Also that if corrugated plastic protection is used, heavy point loads may cause an imprint of the corrugated material on the surface of the timber floor.

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13 | Laminate Flooring

Pre-finished laminate flooring often replicates natural materials like wood and stone in addition to tiles and other abstract patterns. The wearing surface is usually textured to replicate that of the intended finish. Laminate floors are available in a wide range of sizes, thicknesses and finishes for both residential and commercial use.

Laminate boards comprise a top layer of usually one or more thin sheets of paper or a similar material which are impregnated with resins and cured. The top layer will have the decorative finish and base layers are laid beneath this. These paper sheets impregnated with resin form the wearing surface.

The top layer is bonded to a core material which is generally a particleboard, as defined in **EN309,** or a dry process fibreboard (MDF) as defined in **EN316** or a High-Density Fibreboard (HDF) which is a MDF-board with a density ≥ 800 kg/m3, and a balancing layer (backer) is adhered to the reverse side to add dimensional stability.

Boards may also have an underlay attached to the backing or laid separately to impart specific properties such as Impact sound reduction.

Boards are usually T&G and may have square or bevelled edges. Board joints are either glued together or have special interlocking joins which require no glue.

Specifications for laminate floor coverings are prescribed by the following standards:

- **BS EN13329–Laminate Floor Coverings–Elements with a surface layer based on aminoplastic thermosetting resins. Specifications, requirements, and test methods**
- **BS EN14978–Laminate Floor Coverings–Elements with an acrylic-based surface layer, electron beam cured. Specifications, requirements, and test methods**
- **BS EN15468–Laminate Floor Coverings–Elements with directly applied printing and resin surface layer. Specifications, requirements, and test methods**

The characteristics and general requirements for laminate floor coverings are prescribed in **BS EN13329** and are common to each of the above product standards.

PRODUCT SUITABILITY

The manufacturers' advice as to the suitability of a product for a specific area of use and recommended installation method for that area, bearing in mind type of use and location, should always be sought.

BS 8425 references **BS EN13329** which gives details of classification schemes for different grades of floor covering available. Recommendations for laminate floors in domestic or commercial areas depend largely on the type and frequency of the traffic to which the floor is subjected.

As with any floor covering, the specification of a laminate flooring that is fit-for-purpose involves a consideration of both aesthetics and performance. Flooring is the most used and certainly the most abused, surface area within commercial premises, and as the largest space, any degradation in appearance through lack of maintenance or poor specification will be highly noticeable.

DETAILED INSTALLATION GUIDANCE

This can be obtained from the floor covering manufacturer and in **BS 8425** Code of Practice for Installation of Laminate Floorcoverings, for all products contained within this section.

NOTE: At the time of publication, BS 8425 is currently under review by BSI. The current status and content of this standard may change during the life of this guide.

Much of the guidance is either replicated within this section or referred to elsewhere in this guide. If any doubt exists, the floor covering manufacturers' guidance and **BS 8425** should be consulted.

CONDITIONING

Laminate floor coverings are affected by variations of climatic conditions. Correct conditioning of the product prior to installation and the provision of the required ambient conditions for both acclimatisation and installation are important if a successful installation is to be achieved.

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ALLOWANCES FOR EXPANSION

Laminate floor coverings expand and contract laterally when subjected to changes in room climate. To accommodate such changes, an expansion gap should be left around the perimeter of the floor covering and around all other vertical parts of the building structure.

There should be no contact between the finished floor and any vertical building structures such as walls pillars or door jambs.

Manufacturers' recommendations regarding maximum uninterrupted flooring sizes can vary.

The manufacturers' installation instructions relating to the requirements for perimeter expansion joints and for the provision of expansion joints on larger areas should be carefully considered.

Where required, expansion joint profiles should be installed in accordance with the manufacturers' recommendations.

FLOORS NEXT TO THE GROUND AND ELIMINATING CONSTRUCTION MOISTURE

Unless otherwise stated by the manufacturer, the floor coverings covered in this section must be applied over subfloors with an effective structural DPM present in the construction.

Subfloors must be sufficiently dry to show an acceptable level of moisture when tested in accordance with the methods specified in the section on moisture testing **(section 5).** Surface applied DPMs are available to control residual or ground bearing moisture. Refer to section 6.

UNDERFLOOR HEATING

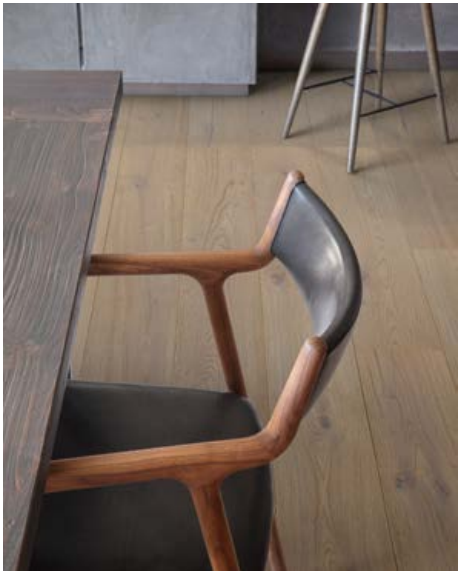
Laminate floor coverings may be laid over subfloors incorporating UFH. When used with UFH systems **BS 8425** states the temperature at the surface of the subfloor must not exceed 28°C.

The manufacturer of both the heating system and laminate floor covering should be consulted for specific advice for the floor covering and type of heating system being used. Further guidance on the installation of floor coverings over underfloor heated subfloors is given in **section 8.**

UNDERLAY

BS 8425 offers the following guidance on the use of underlays:

"For levelling minor surface irregularities, an underlay should be used. This underlay should have the compressive strength properties to avoid unnecessary deflection. The appropriate underlay should be chosen according to the manufacturer's recommendations and intended uses such as sound insulation, UFH, etc."



Where sound insulation is needed, for instance when there is a requirement to reduce impact or in-room sound, consideration should be given to the level of sound insulation required for the system (underlay and laminate floor covering) and sustainability of this performance over time.

On heated subfloors, the thermal resistance of the system (underlay and laminate floor covering) should not exceed the level required for the correct functioning of the heating system.

CLEANING AND MAINTENANCE

Correct and effective cleaning and maintenance is essential if a floor covering is to provide its optimum performance and appearance.

Laminate products in this section can be cleaned and maintained using the most current, cost-effective cleaning methods, materials and equipment. However, there may be some differences between product types.

All laminate floor coverings should be cleaned and maintained in accordance with the product manufacturer or supplier recommendations.

Section 20 in this guide provides a comprehensive overview of cleaning and maintenance for floor coverings. A regular and periodic cleaning and maintenance regime should be in place to ensure the resilient floor covering retains it optimum appearance retention and life expectancy.

It is important to consider the use of cleaning methods, cleaning machines and cleaning chemicals appropriate for the Laminate floor covering installed.

Section 18 in this guide highlights the need to protect newly installed flooring to avoid damage or soiling.

Many new floors are damaged early on because the builder, client or end user was not in possession of relevant cleaning and maintenance information. Problems of this nature can be avoided by passing on the manufacturers' cleaning and maintenance recommendations on completion of the installation, which can normally be found on manufacturers' websites or in brochures.

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FLOORING SYSTEMS

14 | Slip-resistance

GENERAL

According to research by HSE (Health and Safety Executive), slips and trips are the single most common cause of non -fatal injuries in the UK. In 2018/19 29% of all non-fatal injuries were caused by a slip trip or fall on the level.[1]

"The Health and Safety at Work Act 1974 requires employers to ensure the health and safety of all employees, and anyone affected by their work, so far as is reasonably practicable, which means balancing the level of risk against the measures needed to control the risk in terms of money, time or trouble. This includes taking steps to control slip and trip risks."[2]

It is a legal requirement under the 1992 Workplace Health, Safety and Welfare Regulations (Regulation 12) that every floor in a workplace and the surface of every traffic route in a workplace, shall be of a construction such that the floor or surface of the traffic route is suitable for the purpose for which it is used. [3]

HSE research has shown that most slips occur when floors become wet or contaminated. People are unlikely to slip on a clean, dry floor. Clean, dry, and uncontaminated surfaces are usually safe and slips on these are rare.

The HSE point to a number of factors that can have an impact on pedestrian slip risk and need to be considered within an overall risk assessment. Examples of these include (but are not necessarily limited to); drainage and expected floor contaminants, user behaviour, likely cleaning regimes, type of footwear used, the environment in the usage area and the type of use the floor is subjected to by pedestrians.

The HSE also offer advice on Risk Assessment and provide examples of practical steps that can be taken to help prevent slips [4] — these include:

- **Stop floors getting wet or contaminated in the first place e.g., use entrance matting (see section 17)**
- **Make sure that your cleaning method is effective for the type of floor you have (see section 20)**
- **Leave smooth floors dry after cleaning or exclude pedestrians until the floor is dry**
- **Remove spillages promptly**

1 www.hse.gov.uk/statistics/causinj/index.htm
2 The Law–Slips and Trips–HSE: www.hse.gov.uk/slips/law.htm
3 Workplace health, safety and welfare. Workplace (Health, Safety and Welfare) Regulations 1992. Approved Code of Practice and guidance L24: www.hse.gov.uk/pUbns/priced/l24.pdf
4 Health & Safety Executive; Preventing slips and trips at work: A brief guide — www.hse.gov.uk/slips/publications.htm

- **Have effective arrangements for both routine cleaning and dealing with spills**
- **Encourage your workers to keep the workplace tidy**
- **Floors likely to get wet or have spillages on them should be of a type that does not become unduly slippery**
- **Use appropriate footwear**

Cleaning is also a key factor in keeping smooth floors safe and, where floors with enhanced slip-resistant properties are used, ensuring that the slip-resistant properties are maintained in service. When cleaning is carried out effectively, it can make the difference between a floor being an unacceptably high or acceptably low slip risk.

Slip-resistance is just one, albeit important, factor in the selection and specification of floor coverings and should not therefore be seen as the sole, one-dimensional solution in managing slip risk. Prevention, reduction, and control of contamination are also important factors in keeping floors safe.

The selection and specification of suitable flooring for any application should include a risk assessment and should normally involve the manufacturer.

Flooring with enhanced slip-resistance (safety flooring) and those with applied specialised slip-resistant coatings are typically used in both commercial and residential areas where a risk assessment has identified that there is a high risk of contaminants or spillages getting onto the floor and the slip risk presented by these contaminants cannot be mitigated or controlled by other means.

Most safety flooring products are designed with various particles and aggregates incorporated within the construction to increase the friction between the sole of the foot and floor when in wet conditions and thereby reduce the slip potential. Safety flooring products offer slip-resistance that should be sustainable for the guaranteed life of the product. Particles being incorporated through the performance layer which will reduce the risk of slipping on a floor for this period, should it become contaminated.

When considering safety floors, it is important that the manufacturer's guidance is sought in selecting a grade of flooring that is appropriate for the area of use and suitable for the type of contaminants likely to be present.

Further information on safety flooring can be found in section 10.

ASSESSMENT OF SLIP-RESISTANCE

The slip-resistance of the floor surface, especially when contaminated, is just one, albeit important, factor to consider when choosing the correct flooring product for your installation. Understanding how this value is measured and what it means in terms of slip risk is equally important.

The UK Slip-resistance Group (UKSRG) [5] and the HSE[6] have issued Guidance on the assessment of floor slip-resistance that will assist the specifier in understanding the recommended test methods, how and why the instruments are used and provide guidance on how to interpret the test results.

NOTE: At the time of publication of this guide, the UKSRG Guidelines are being updated. The current version (V5/2016) will be replaced by the updated version during 2022.

The recommended test methods not only provide ex-factory slip-resistance data but can also be used on site to monitor the slip-resistance of a floor surface over its lifetime.

Where a slip-resistant coating has been applied to a floor it is advised to regularly check the slip-resistance using a Pendulum and the coating refreshed when testing in the wet condition indicates that the Pendulum Test Value (PTV) may drop below 36.

5 UK Slip-resistance Group — www.ukslipresistance.org.uk/

6 HSE: Assessing the slip-resistance of flooring — www.hse.gov.uk/pubns/geis2.htm

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The Pendulum machine simulates the action of a heel strike on the surface of the floor, determining whether a flooring has sustainable performance over the life of the floor

THE PENDULUM TEST

This test method is recommended by the HSE to assess the dynamic coefficient of friction for a floor. This can be carried out in both the wet and dry conditions. Safety flooring should always be tested in wet conditions as these are instances where most slips occur.

The Pendulum is a fully portable unit that can be used either in a laboratory or on site to monitor the slip-resistance of the floor surface in use and can therefore determine whether a flooring has sustainable performance over the life of the floor. Pendulum operators need to be fully trained and competent in order to give reliable results.

The Pendulum machine simulates the action of a heel strike on the surface of the floor through a swinging motion of the Pendulum arm which sweeps over and makes contact with the floor surface.

The foot of the pendulum is fitted with a rubber slider (Slider 96/Four S) of standardised material to represent a standard shoe sole.

To test floor coverings in continually wet areas, a softer rubber slider is used (Slider 55/TRL) to represent barefoot and soft soled footwear.

The Pendulum frame contains a free-swinging arm which is placed onto the surface of the material to be tested. The Pendulum arm is pulled back to, and dropped from, the horizontal position brushing the test material over a predefined length at the base of its arc and swinging through towards the horizontal position at the opposite side of the arc. As the Pendulum brushes the test material, its momentum is reduced such that it cannot reach the horizontal position on the through-swing. The distance by which the arm falls short of the horizontal on the through swing is measured against a scale attached to the frame, which is then read to give a Pendulum Test Value (PTV). This PTV equates roughly to the coefficient of friction (CoF) × 100.

The PTV obtained can be related to the potential for slip in the tested condition. The most quoted values are based on tested carried out in dry and water wet conditions.

Slip potential classification, based on Pendulum Test Values (PTV):

PENDULUM TEST VALUE	
0–24	High Slip Potential
25–35	Moderate Slip Potential
>36	Low Slip Potential

SURFACE MICROROUGHNESS

The surface microroughness of a product is measured using a roughness meter, which contains a stylus, either on the underside of the meter or attached to a moving arm. As the stylus is drawn across the test material, it follows the microscopic undulations in the surface of the material. The meter senses the movement in the stylus between the peaks and troughs of the undulations, measures this movement, and then expresses the result in microns.

The UK slip-resistance Group Guidelines Issue 5: 2016 states:

"Microroughness measurements can be useful to quickly identify locations where differences in wet slip-resistance might exist. They can be useful in identifying possible directionality, and for monitoring wear that might also cause a change in wet slip-resistance. In some situations, for example stair treads, the edge of a stair nosing or on the curved surface of a bath or shower tray, a measurement of roughness might be the only measurement it is possible to make. This is especially true when making on site measurements"

Micro surface roughness results should not be used in isolation as a basis for specification but evaluated alongside other relevant information such as the HSE recommended Pendulum Test Values.

Guidance on the measurement and interpretation of micro surface roughness values can be found in the UKSRG guidelines (see note above relating to update of the UKSRG Guidelines).

Other test protocols are available to determine the slip-resistance of floorings, but not identified by the HSE or UKSRG as preferred test methods:

- **DIN 51130 — European Ramp Test. Solely an ex-factory test with a human operative with boots and oil contaminant on the flooring which cannot be replicated on site. Provides R value classification ranging from R9 (least slip-resistant) to R13 (most slip-resistant).**
- **DIN 51097 — European Ramp Test. Ex-factory test relating specifically to the performance of flooring in barefoot and continually wet conditions. Uses a human operator in barefoot condition with soap solution as the contaminant. Classifies products by suitability to use area in Class A (the least slip-resistant), B and C (the most slip-resistant).**

NOTE: Both DIN 51130 and DIN 51097 have been withdrawn and are superseded by the ramp tests in DIN EN16165 Appendix A (barefoot) and (B Shod).

SLIP ALERT

Roller coaster test

Gives an indication of slipperiness of the flooring and developed to replicate a foot slipping. This involves a trolley rolling down a ramp and skidding across the floor surface to measure average slip-resistance over area tested.

Sometimes used as complimentary test to the pendulum to demonstrate/monitor changes in slip-resistance of a floor covering.

HSE SLIPS ASSESSMENT TOOL

Computer software used on-site to risk-assess slip potential on pedestrian walkway surfaces.

The operator feeds in information regarding various factors on-site, including surface microroughness results, amount and causes of floor surface contamination, type of footwear used, and the cleaning regime implemented to gain a slip risk classification for the flooring.

Not designed to be used as sole basis for product specification, but as a complimentary test to the pendulum.

BRITISH AND EUROPEAN STANDARDS

BS EN16165–DETERMINATION OF PEDESTRIAN SLIP-RESISTANCE–METHODS OF EVALUATION

This standard became a British and European standard in December 2021. It references four test methods for the evaluation of pedestrian slip-resistance:

- **Barefoot Ramp Test (Appendix A)**
- **Shod Ramp Test (Appendix B)**
- **Pendulum Test (Appendix C)**
- **Tribometer Test (Appendix D) for the assessment of dry slip-resistance**

Whilst this standard references four test methods the British Standard version contains a national forward which explains why the pendulum test is preferred in the UK over the other methods included in the standard.

A preview of **BS EN16165** including the full text of the forward can be found on the BSI shop at: **www.bsigroup.com**

NOTE: The 2022 update (issue 6) of UKSRG guidelines will clarify any differences between the Pendulum test method in the guidelines and that of EN16165 Appendix C.

BS 7976-2–Pendulum Testers–Methods of Operation
This standard has been withdrawn and replaced by **BS EN16165** Appendix C.

BS EN13893–Resilient, Laminate and Textiles Floor Coverings. Measurement of Dynamic Coefficient of Friction on Dry Floor Surfaces.
European measurement of dynamic coefficient of friction on dry floor surfaces only. Required for resilient, textile, laminate and modular multi-layer floor coverings to meet the requirements of the standard for CE and UKCA marking **(EN14041).**

BS EN13845–Resilient Floor Coverings–Polyvinyl Chloride Floor Coverings With Particle Based Enhanced Slip-resistance–Specification
This is a European Standard specifically relating to particle-based PVC safety flooring. Meeting this Standard is imperative if a flooring is classified as a true safety floor.

Products can be classified as ESf (Enhanced Slip for use with footwear) or ESb (Enhanced Slip for barefoot use) to this Standard. This Standard references both ramp-based tests and the pendulum test in barefoot and shod conditions.

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15 | Selection of Adhesives

Hybrid pressure-sensitive adhesive for bonding vinyl floor coverings where floorcoverings have to be tolerant of extreme temperature variations

The correct selection of adhesive plays a crucial part in the successful installation of any floor covering and it is therefore important that full details of the subfloor, site conditions, in-service conditions and floor covering itself, etc., are made fully known to all parties at an early stage.

Since the basic purpose of the adhesive is to bond two different surfaces together and ensure that they remain together, under the expected service conditions and for the full term of the installation, it is essential that a fully compatible adhesive is chosen. Most adhesive manufacturers work extremely closely with the appropriate floor covering manufacturers and publish extensive recommendations for adhesive suitability with particular floor coverings.

Many factors affect the choice of adhesive; the following lists the most important:

1. **Type of floor covering**
2. **Backing of floor covering**
3. **Type of subfloor**
4. **Temperature requirements (e.g., presence of UFH, use in conservatory, etc.)**
5. **Horizontal or vertical bond**
6. **Permanent or release bond**
7. **Internal or external installation**
8. **Special in-service requirements (e.g., electrical conductivity, wet areas, etc.)**
9. **Health and safety considerations**

TYPES OF ADHESIVES

- **WET SET — adhesive transfers to the floor covering backing and dries to create a bond**
- **PRESSURE SENSITIVE — adhesive allowed to dry before bonding**
- **HIGH TEMPERATURE — adhesive suitable for areas with sudden temperature variation and sun strike**
- **CONTACT ADHESIVE — impact bonding/ immediate bond**
- **ADHESIVE TAPES — preformed adhesive tapes**

APPLICATION OF ADHESIVE

Consider manufacturers' substrate priming advice for individual adhesives.

Most flooring adhesives are conventionally applied by steel trowel with the blade inclined at 60° with V-shaped notches along each edge. The depth and spacing of these notches are specified to control the quantity of the adhesive applied and to suit the floor covering being laid. With some adhesives it is possible to follow on using a fibre faced roller, pre-wetted with adhesive, to flatten out the ridges and minimise grin through of adhesive serration pattern. The adhesive manufacturers take great care to ensure that the correct trowel notch size is specified for each adhesive and situation, and it is essential to follow their recommendations. It is important that the correct notch size is maintained throughout the adhesive application.

Alternative methods of application, such as spray and roller, offer the advantage of adhesive application from the standing position and, with spray in particular, means that faster application rates can be achieved. Both these methods of application require specially formulated adhesives and will provide adhesive coatings without the normal ridged pattern.

The correct trowel notch is important to ensure the right amount if adhesive is applied. Always follow manufacturer's recommendations.

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It is important to remember that adhesives must be applied at the correct temperature and that good drying conditions are maintained throughout the installation. The open time of the adhesive should never be exceeded. All adhesives must be used in accordance with the instructions provided by the manufacturer and the British Standard Codes of Practice. Good working practices must be maintained at all times.

The relevant safety information for all specific adhesives should be reviewed before commencing work. Containers will be labelled accordingly. All safety instructions should be followed and where necessary, the correct Personal Protective Equipment (PPE) should be worn as detailed in the manufacturers Material Safety Data Sheet (MSDS) and the specific job Method and Risk Assessment. Completion of the site assessments may require advice being conveyed to the client ensuring personal safety.

All adhesives must be applied to clean, smooth, structurally sound, and dry substrates. Please refer to the section on subfloor preparation.

Application of water based rubber/resin flooring adhesive to secure a textile floorcovering using a 2mm × 6mm “V” notched trowel

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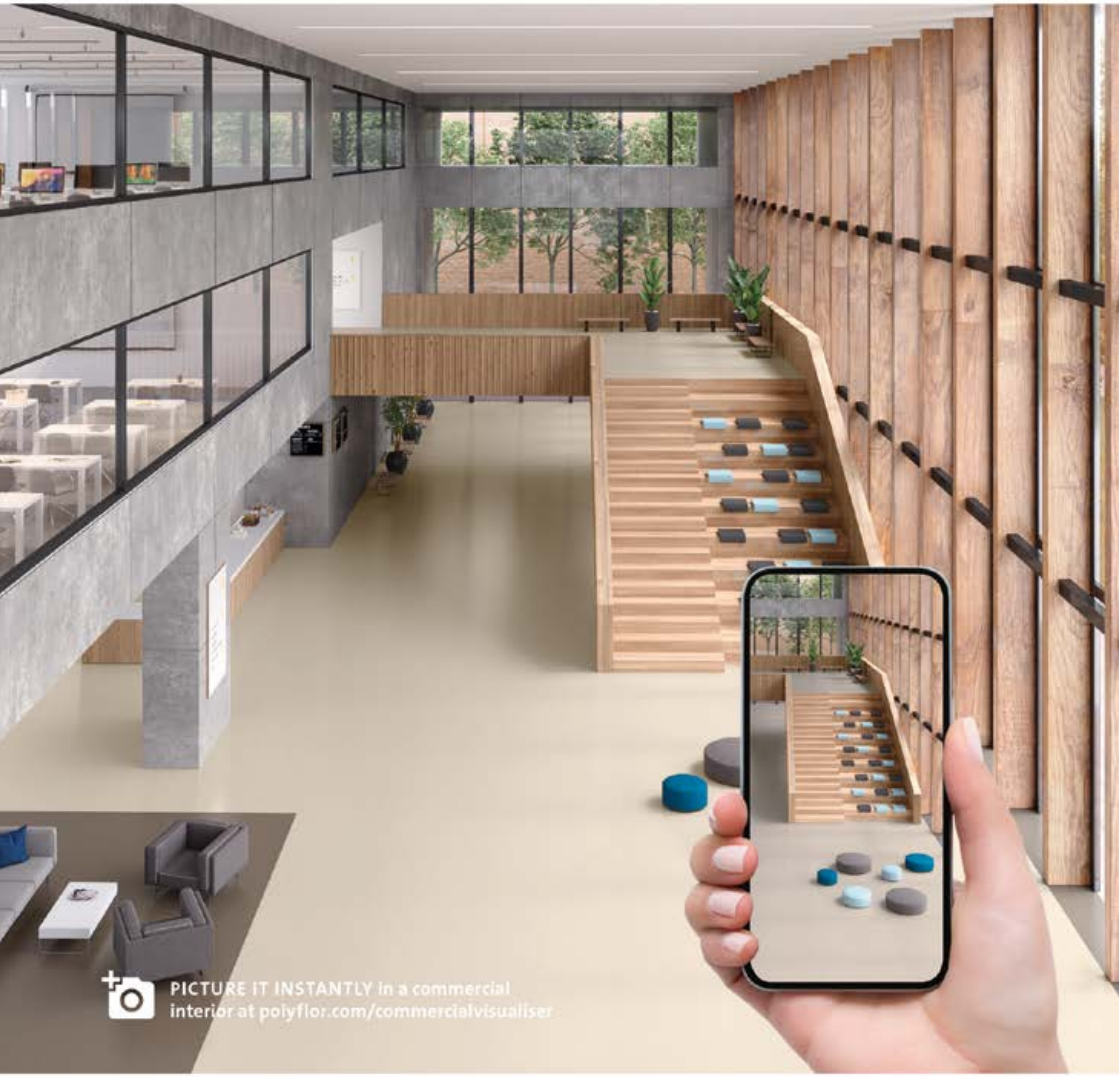

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Static control flooring across manufacturing, research and healthcare environment ensures the protection of people against electro-static discharge risks and the protection of premises against explosive risks

THE NEED FOR STATIC CONTROL

Control of static electricity will be required for a number of reasons, but primarily:

- **Protection of microelectronic components during assembly, test or repair**
- **Protection of in electronic equipment in use, e.g., main frame computers**
- **Prevention of spark generation where flammable gases are used, e.g., hospital operating theatres or areas where explosives are handled or stored**
- **Prevention of charged surfaces to prevent attraction of particles (clean rooms)**
- **Personal comfort (protection from electrostatic shock)**

When choosing a flooring system designed to control static electricity, one must keep in mind that the base components in the contract are of a more specialised nature than normal. The cost of installing static control flooring is usually more expensive than traditional floorings as the use of specific adhesives and earthing systems is required. The flooring system is usually selected by its static control performance rather than by cost. The cost to clarify at the specification stage is small, the costs to rectify errors post installation are much higher. The in-use performance specification must be agreed with the end user at the tendering stage and should include, method of installation, in use performance requirements with method of test and maintenance procedures to be used.

There are two main groups into which Static Control Floorcoverings can be divided.

1. **STATIC DISSIPATIVE (SD) — compliant products will have resistance to earth between 1 × 106 and 1 × 109Ω**
2. **ELECTROSTATIC CONDUCTIVE (EC) — compliant products will have resistance to earth of less than 1 × 106Ω.**

Care must be taken with the lower reading. Most products have a lower limit of 5 × 104Ω as this is generally accepted as providing some protection against mains voltages.

Specialist conductive products are available which have resistance below 5 × 104Ω.

Specification of such products is mainly into areas where explosive materials are handled and it is imperative that you liaise with the floor covering manufacturer to ensure the product and installation method used fully meets the design criteria.

STANDARD	ACTUAL	
EN1815	Assessment of Static Electrical propensity	Body Voltage Generation ≤2kV ≥ 109Ω “Stroll Test”, “Anti-Static”
EN1081	Resilient, textile, laminate, and modular multi-layer floor. Determination of electrical resistance.	Static Dissipative (SD) ≤ 109Ω Electro Conductive (EC) ≤ 106Ω
IEC 61340-5-1	Essential characteristic. Communicates the requirements for ESD control. Has values for flooring and footwear.	
IEC 61340-4-1	Specifies the test methods to determine the electrical resistance of floor coverings	Must not exceed 109Ω @ 12% RH @ 23°
IEC 61340-4-5	Two test methods to determine systems for personnel grounding is meeting requirements. Includes grounding straps and footwear.	The total resistance of the system shall be ≤ 3.5×107Ω and /or BVG ≤ 100V in combination with a system resistance of ≤1×109Ω
IEC 61340-6-1	Electrostatic control for healthcare, general requirements for facilities	

ANTISTATIC

There is another group in which floor coverings are classified by their potential to generate static. Coverings in this group limit generation of body voltage and hence reduce risk of personal shock. The terminology used for floor coverings in this group is “Antistatic”. It does not infer that the product has any capability to dissipate or conduct any charge. The test method for flooring is **EN1815** which is stroll test. Compliant flooring products do not generate static charges above 2kV.

NOTE: Some military and medical specifications refer to conductive and dissipative floor coverings as being antistatic. Contact the floor covering manufacturer to confirm performance.

ADHESIVE

Most static control products should be fully bonded using an electrically conductive adhesive. Check with flooring manufacturer to confirm suitability.

EARTH BONDING

Most static control products require earth bonding strips (grid) to be used. The layout of these strips varies according to the manufacturer and specification requirements.

STATIC CONTROL STANDARDS AND TEST METHODS

There are a great many test methods/Standards for static control systems. Some of the test methods are summarised below:

STATIC CONTROL STANDARDS AND TEST METHODS

There are a great many test methods/Standards for static control systems. Some of the test methods are summarised below:

OHMS

Due to the very large numbers involved in measuring resistance in flooring systems, a shorthand form is commonly used. The table and guide below show the shorthand representation of some large numbers commonly used.

Standard Terminology	Actual	Shorthand
1 × Gigaohm	1,000,000,000Ω	1 × 109Ω
1 × Megaohm	1,000,000Ω	1 × 106Ω
1 × Kilohm	1,000Ω	1 × 103Ω

ACHIEVING STATIC CONTROL

- **BASES — special measures are necessary for successful installation of floor coverings such as those used for static control and are not included in BS 8203. For specific advice check with the floor manufacturer.**
- **INSTALLED SYSTEMS — in preparing specification to a new or existing base the flooring system must consist of components, (underlay, adhesive, earth grid and floor coverings, etc.) that have been tested in combination and have been approved by the floor covering manufacturer as providing the level of static control required**
- **FLOORCOVERING — the majority of floor covering types are available in versions suitable for these types of installation**
- **RAISED MODULAR FLOORS — access panel applications require specific instructions to ensure product performance and achievement of electrical results outlined. Contacting the floor covering manufacturer for advice is recommended information.**

MAINTENANCE

Incorrect maintenance procedures can have a disastrous effect on the materials as well as their static control properties. Careful consultation with the flooring manufacturer is therefore essential. They will give details of how their products should be maintained.

Conductive polishes approved by the flooring manufacturer can be used to compliment the dissipative or conductive properties of their products.

Antistatic polishes to **EN1815** for use on insulative surfaces are readily available, reducing personal body voltage or personal shock caused by people walking across the floor. They are designed for use on insulative floors to give temporary protection against the generation of body voltage and hence reduce personal shock.

When applied to dissipative or conductive floors they can have a significant detrimental effect on the static control performance of the flooring. Advice must be taken from the floor covering or polish manufacturer.

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17 | Entrance Flooring Systems

As much as 80% of dirt entering a building is brought in by foot and wheeled traffic. However, a well-designed and planned entrance flooring system can remove and retain up to 95% of all dirt and moisture entering a building by foot and wheeled traffic.

When fitting any internal floor covering, it is important to ensure the use of an appropriate entrance flooring system in order to optimise the long-term wear and minimise the potential for slip hazards on internal floor coverings. It also provides a significant reduction in maintenance costs and maximizes the appearance retention of adjacent flooring products.

Entrance flooring systems are designed to protect internal floor coverings by reducing the "ingress of soiling and moisture into a building or to reduce the transfer of soil from one part of a building to another" **(BS 7953 Section 3.1).**

BS 7953 Entrance flooring systems – Selection, installation, and maintenance–further states that entrance flooring systems should perform the following functions:

- **Reduce slipping incidents by reducing the amount of soil and moisture tracked onto hard and resilient floors**
- **Prolong the life of interior floor finishes by reducing the ingress of abrasive soil**
- **Reduce the cleaning requirements of internal floors by reducing the ingress of soil onto internal floor finishes**

Section 3.1 also states that

"... the entrance flooring system should scrape, wipe and retain soil, making contact with both feet of people entering the building and, in the case of wheeled traffic, with the circumference of the wheels"

In addition, **BS 8300** Design of buildings and their approaches to meet the needs of disabled people states:

A well-designed and planned entrance flooring system can remove and retain up to 95% of all dirt and moisture entering a building by foot and wheeled traffic.

"... the ingress of soil and surface moisture to buildings, or their transfer between adjacent internal areas, should be reduced to the lowest practical level, e.g., through the use of appropriate matting systems conforming to ***BS 7953".***

HSE (Health and Safety Executive) recommend the use of entrance flooring systems and the need for the entrance flooring system to allow several steps to adequately remove soiling. Whilst no test method to measure the effectiveness of entrance flooring systems is available, **BS 7953** states that the length of entrance flooring system should achieve maximum number of footfalls within the available space.

The industry standard recommendation is to use at least 2m for light use areas and up to 7m for busy use entrances. The size and effectiveness will depend on the system selected but the general rule is the more matting used, the more effective the entrance flooring system is at preventing soil from entering the building.


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Various systems are available for both internal and external use — a combination of both may provide the most effective performance depending on the entrance type and location.

It is important to ensure that the entrance flooring system selected will remove and retain both the type and volume of soiling for each entrance location. Considering traffic type and volume as well as size of entrance flooring system, will help to optimise soil and moisture removal.

Various construction types are available, and **BS 7953** provides a simple overview of these: Grille; Random looped; Ribbed: Modular and Textile. Within these types there are reversible and single sided rigid systems, click together modular systems as well as a variety of textile options including tiles.

Soiling can be defined in two simple categories: wet and dry. When selecting entrance flooring systems, consideration should be given to ensure adequate protection from both. This may necessitate the use of a combination of product types in the form of a Primary External, Primary Internal and Internal Secondary Zone system format.

Primary Zone products are installed as the main line of defence from outside sources of soiling and are usually fitted within a recessed rigid matwell frame, incorporating a coarse or ribbed surface profile for effective removal of dry soil and debris and, depending on type and location, removal of moisture. External and internal grade Primary Zone entrance flooring systems are available. When using products externally, the matwell will require an appropriate drainage system to avoid flooding when wet.

Secondary Zone products are available in recessed or surface mounted options to suit the environment and constructed using surface materials suitable for the removal of wet soiling and fine particulate soiling. In addition, Secondary Zone products are particularly suitable for use inside buildings between soil sensitive locations such as break-out, kitchen, washroom or vending machine areas.

The zone selection and format may vary according to the type and level of traffic. The use of a Primary External Zone will positively contribute

to reducing larger particulate and level of soiling from entering a building.

Specialist fire retardant versions are available to suit specific site or location requirements. These are available in rigid and textile entrance flooring system formats.

It is essential that entrance flooring systems are regularly cleaned and maintained to ensure optimum performance so that they remain effective in service. The cleaning methods also need to be effective as significant levels of soiling and contaminants can be contained within the matting in a relatively small area compared to the overall building footprint. As with all cleaning processes, effective cleaning of entrance mats should be planned to take account of the nature and usage of the building and carried out when risks to building users are as low as possible.

Inadequate cleaning will result in the entrance flooring system transferring soiling from the mat itself onto adjacent areas. It is important to ensure that cleaning and maintenance instructions are provided for use by the end user.

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GENERAL

Protection of interior floor finishes is often required on both new build and refurbishment projects. Fast track programs often include floor coverings installed prior to the completion of work by other trades and, to reduce the risk of damage proper protection materials should be considered.

Levelling screeds and directly finished bases covered by Part 1 of **BS 8204** are not designed as wearing surfaces, therefore their surfaces should be given adequate protection against damage or wear during subsequent building operations and until the flooring is laid. Where cement and sand levelling screeds have dried sufficiently after curing, it can be advantageous for the temporary protection to be relatively impervious.

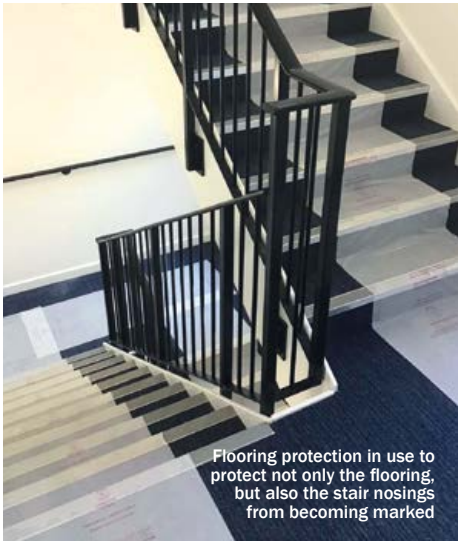
Such products may be breathable membranes, hardboard or similar. This will minimise the likelihood of differential moisture levels developing between the top and bottom of the screed before the flooring is installed, thus minimising the risk of lipping and curling at joints or cracks in the screed, as described in BRE Current Paper 94/74.

Breathable protection is available which avoids trapping in moisture vapour should you need to protect uncured floors immediately. Breathable membranes in roll format, fleece style materials or standard hardboard are all suitable. Where impact protection is needed a rigid product that offers impact resistance should be considered.

FLAME RETARDANCE

Flame Retardance & Joint Code of Practice on The Protection From Fire of Construction Sites & Buildings Undergoing Renovation–9th Edition

The Joint Code of Practice on protection from fire on construction sites and building undergoing renovation was first published in 1992. It was originally published following two significant fires that resulted in losses in excess of £150M. The objective of the Joint Code of Practice is the prevention of fire on construction sites. The



Flooring protection in use to protect not only the flooring, but also the stair nosings from becoming marked

Code applies to all stages of construction, prior to and during, including off site elements such as procurement and design, ending at completed/handover stage. The Code applies to projects with a value over £2.5M, but also applies to smaller projects forming part of a larger value projects. For projects under £2.5M you may be able to consider a non certified product.

The Joint Code of Practice compliance is often required by insurance companies. Requirements include that flooring contractors working on construction sites procure temporary protection materials certified to LPCB (Loss Prevention Certification Board) LPS1207 or Certifire TS63 standards.

Any temporary protection which purports to comply with BRE LPS1207 or Warrington Fire TS63 must be suitably marked and display the name and identification of the supplier. **See these links for more information:**

https://bit.ly/3NejCwJ
https://bit.ly/3GHxkWy

CHOOSING THE CORRECT PRODUCT

There are many forms of temporary protection. It is important to select a protection product fit for purpose and suitable for the project in hand. The following points should be considered in the selection process:

- **The surface requiring protection**
- **The site conditions and site traffic**
- **The length of time a surface requires protection prior to handover**
- **The level of protection required**
- **Is impact resistance required**
- **Slip-resistance of material**
- **Does the project call for flame retardant protection and if so to what standard**
- **Advice on selection of the appropriate material is available from suppliers**

SMOOTH FLOORS

For smooth floors (vinyl, resilient floors, screeds, marble, timber, laminates, etc.) a product providing impact protection is needed. Products to consider include impact board/twin wall/twin fluted polypropylene board/hardboard/plywood. Advice on selection of the appropriate material is available from suppliers:

For heavier traffic sites or sites requiring protection for a longer term heavier grade protection should be considered. Impact board or heavier duty fluted polypropylene board may be considered. Hardboard or plywood also offer impact protection and may be considered. Please consult your protection supplier.

SOFT FLOORS

For soft floors (carpets, etc.) impact protection is not an issue. For cut pile carpets an adhesive backed polythene can be used. This product is simply rolled out and bonds directly to the carpet. The adhesive backing will hold the product in place during the programme of works. The material should be of a type that peels clean after use, leaving no residue.

For loop and cut pile carpets, a loose fitting membrane can be used, either a polypropylene or polyethylene sheeting. This can then be fixed in place using either tapes (see note below regarding fixing tapes), or, for a loop pile carpet using a male Velcro dry fix method.

MOISTURE SENSITIVE FLOOR COVERINGS

There may be some risks if moisture-sensitive floor coverings are protected for prolonged periods with impervious protection material as there is a chance that the floor may “sweat” underneath. This is of particular relevance where there is UFH to be considered.

If impervious protection is to be used long term over a moisture sensitive floor covering, it is advisable to contact the manufacturers of the floor covering beforehand. Breathable protection products should be considered.

FIXING METHODS

Fixing methods for protection must be considered. For smooth and finished floors a peel clean adhesive tape must be used. Standard tapes may leave a residue or shadow on the floor.

For cut pile carpets a higher tack carpet tape that does not leave any adhesive residue should be used. For loop or twist pile carpets a Velcro dry fix method should be used.

REMOVAL OF PROTECTION

Temporary protection materials should be left in-situ until point of handover. Protection should not be lifted if trades are still working on site. Removal of protection too early may result in damage to finishes. Disposal of protection materials should be considered.

Manufacturers can support recycle, reuse or remanufacture of used materials. Removal of temporary protection materials may be the responsibilty of the Main Contractor or the sub-contractor. Whoever is responsible for its removal and disposal should look to recycle, reuse or remanufacture to avoid materials going to landfill, waste to energy or incineration.

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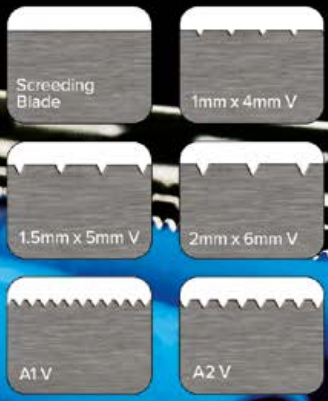

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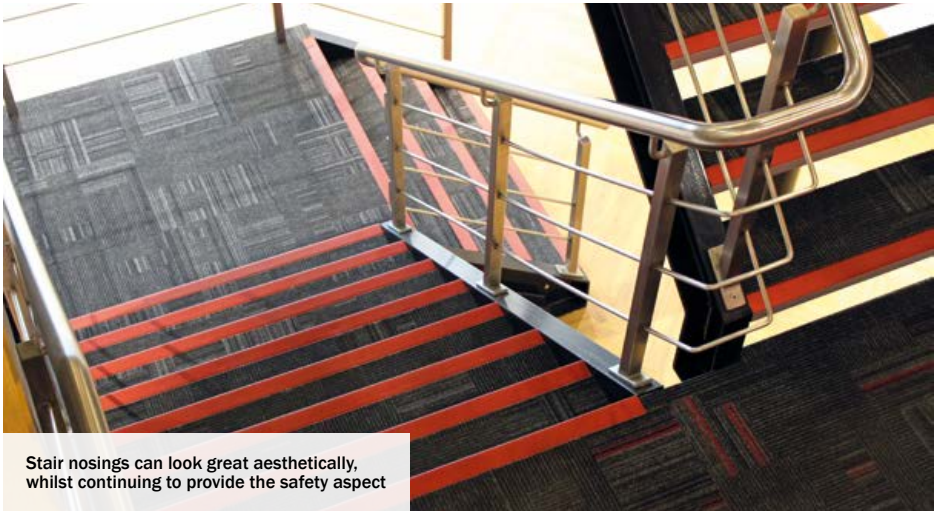

Stair nosings can look great aesthetically, whilst continuing to provide the safety aspect

STAIR NOSINGS

Stairs are features with potential for accidents as a result of slips, trips or falls. They need to be made as safe as possible and stair nosings are just one component that can help. An independent document called *"What Makes Stairs Safer"* has been produced by UKSRG (UK Slip-resistance Group) **www.ukslipresistance.org.uk** This document looks at stair nosings among other aspects of stairway safety.

It is a requirement that stair nosings (or stair edgings) are fitted to all steps in public, commercial and non-domestic buildings with shared use. This is to meet Approved Documents K and M of the Building Regulations (2013), **BS 8300:2, BS 9266, BS 5395-1 and BRE IP15/03.** These guidelines help to make stairs safer in line with the Equality Act 2010. Stair nosings can:

- **Reduce the risk of accidents on stairs by providing a visual contrast that can help the partially sighted**
- **Have a slip-resistant tread surface on the nose of steps, again reducing the risk of accidents**
- **Protect the step nose and surrounding floor coverings, reducing wear and tear**
- **Reduce maintenance costs**
- **Improve the aesthetics of a building**

The visual contrast is to be established using the difference in the respective Light Reflectance Values (LRVs) of the stair nosing and floor covering. LRVs should be measured in accordance with **BS 8493.**

To provide sufficient contrast, there should be at least a 30-point difference on the LRV scale between the stair nosing tread, or channel, and the floor covering.

Treads are available in a wide range of colours to enable a visual contrast to be achieved. LRV values for stair nosing tread colours are available from individual manufacturers.

NOTE: "Contrast visually", when used to indicate the visual perception of one element of the building, or fitting within the building, against another means that the difference in light

reflectance value between the two surfaces is greater than 30 points. Where illuminance on surfaces IS greater than 200 lux, a difference in light reflectance value should be a minimum of 20 points. For further information, reference should be made to *"Colour, contrast and perception–Design guidance for internal built environments–Reading University."* (Building Regulations Part M–For non-dwelling properties).

Providing a contrasting edge to the nose of steps is one of the key contributions that stair nosings make in helping to establish a safe stairway. It is often presumed that Building Regulation and British Standard guidelines include recommendations to provide extra highlighted steps at the top and bottom of stairs, but this is not the case. The guidelines in all cases recommend the same stair nosing tread colour should be on all steps of a staircase. However, the practice of placing extra highlights at the top and bottom of a stair is not uncommon.

The main criteria should always be that all steps on a stairway are clearly defined by a stair nosing which contrasts with the floor covering, and that the stairway is as safe as possible for the foot traffic conditions expected for the location.

Stair nosings are produced in a variety of profiles to suit the shape of a step's nose and in a choice of gauges to suit the thickness of the floor coverings used. Ramp-backed profiles are also available for use where there is no floor covering (ramp profiles can also be used with resilient floor coverings). Certain profiles can also be fabricated for curved steps.

Stair nosing materials range materials, includes:

- **METALS — aluminium (mill finished, polished or anodised), brass, bronze, cast iron and stainless steel**
- **NON-METALS — PVC-u, PVC, rubber, timber, ceramic and moulded stair tread units**

Stair nosings should incorporate a slip-resistant tread material. It is important to select the correct tread material for the application in order to minimise the risk of a slip or accident. This means thinking about, for instance, whether the site is internal or external, and whether conditions may be wet. Stair nosing profiles are available with single, double or multiple treads. Treads can be made from materials such as PVC, rubber composite, carborundum and silicon mixes.

In most cases, nosings should be installed using adhesive and screws, all in accordance with the recommendations of the nosing manufacturer. It is important that stair tread and riser are suitably flat and have no contaminants prior to receiving the stair nosing, to ensure a secure fixing.

Most UK manufacturers of stair nosings produce comprehensive details on their profiles and give guidance on the correct stair nosing specification for a given installation. This information should be available free of charge by visiting their websites or contacting them directly.

PHOTOLUMINESCENT STAIR NOSINGS

Stair nosings with photoluminescent treads are also an option. They provide step definition in darkened environments where light sources are removed through power failure or fire. They have the added benefits of being a fail-safe emergency solution and incorporating anti-slip tread material which provides superior step-edge definition. They are available to the contract flooring market, and in some cases will glow for 7.5 hours after only 30 minutes exposure to a light source.

Photoluminescent stair nosings can be used to supplement electrical emergency lighting systems as the products are fail-safe, operate immediately and do not require ongoing maintenance.

In poor or reduced light conditions, photoluminescent slip-resistant treads in nosings can help make stairways safer. The material can be charged and re-charged by natural and artificial light. It glows in the dark when a light source is removed.

Steps fitted with photoluminescent stair nosings will always have a clear contrasting band of colour, in all light conditions. Photoluminescent stair nosings can be fitted on internal or external stairs. When people are confident of where the edge of the step is and in what direction to travel, movement is faster and easier. Photoluminescent material uses recycled aluminium and a carbon neutral energy supply. All products are non-toxic and non-radioactive and can be readily recycled.

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LED LIGHT STAIR NOSINGS

Stair nosings with LED lights in are also available. However, these require specialist fitting skills and are expensive to install, while also having high ongoing maintenance costs.

SKIRTINGS AND ACCESSORIES

PVC, RUBBER AND PRE-FORMED LINOLEUM

- **SIT-ON SKIRTING — a profile with a small radius toe design that conceals the join between the floor covering and the wall. Typically used with resilient floor coverings where an impervious seal is not required.**
- **SET-IN SKIRTING — a profile typically used with resilient floor coverings. The extended foot is welded to the floor covering to create an impervious seal. Ideal for areas subject to wet cleaning or where cleanliness is critical, such as schools, hospitals, treatment rooms or pharmaceutical production.**
- **FLAT SKIRTING — typically used with textile floor coverings to form a neat, low-maintenance alternative to timber skirting**
- **COVE FORMERS AND CAPPING STRIPS — used when a floor covering is continued up the wall to form a skirting. The cove former ensures a consistent cove is achieved and provides support for the floor covering at the floor-to-wall junction. A capping strip provides a neat finish along the wall where the floor covering stops.**

Equality Act (2010) guidelines may, in certain circumstances, recommend a different colour material for the floor and skirting detail to assist the visually impaired. UK manufacturers can provide assistance on this and any other specification or installation requirement on request.

TIMBER SKIRTINGS

Where textile or resilient floor coverings are specified, timber skirtings are usually installed as part of the carpentry and joinery package. Whenever possible the timber skirtings should be installed after the timber flooring has been completed as the skirting can be used to conceal the expansion gap at the floor perimeter. Similarly, skirtings may be used to conceal perimeter insulation around screeded subfloors, particularly where UFH systems are incorporated and potential for

Stair nosings can help with any stair design whilst ensuring safety, Light Reflectance Values (LRVs) and minimal trip hazard guidelines are adhered to

Stair nosings can provide an extra safe option with an all-over slip-resistant wide tread application

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movement is raised. Timber skirtings should only be fixed to the wall, so as not to restrict any expansion of the floor finish.

Timber skirtings are available in a variety of profiles and different timbers, for painting or clear finish. Other materials used for skirtings, such as stainless steel and anodised aluminium, are available from manufacturers.

FLOORING TRANSITIONS

A flooring transition is a profile that joins two floor coverings together. The type of transition used will depend on the situation, e.g., a simple flat transition made of PVC or metal can be used to link floor coverings of similar thickness. For a junction between floor coverings of different height, a slightly ramped transition may be needed. This is just one of many considerations when selecting a flooring transition for a particular project.

Transitions are installed between floor coverings to protect flooring material edges and reduce the risk of a floor junction becoming a trip hazard. The correct selection of flooring transition is critical in reducing the risk of injury within the built environment.

In fact, RIDDOR (Reporting of Injuries, Diseases and Dangerous Occurrences Regulations) states: *"...slips, trips and falls make up more than half of all reported major injuries [within the built environment], causing suffering and financial loss to individuals, companies and society at large."*

According to UKSRG (UK Slip-resistance Group), every five minutes there is a slip, trip or fall in a non-domestic building, leading to over 300,000 hospital visits per year. Therefore, it is critical to remove any possible hazards which can lead to accidents related to fitted flooring. This makes it vital to fit robust transition profiles, to minimise the risk of hazards developing.

There are two Building Regulations that cover flooring transitions:

1. **Part K: Protection from falling, collision and impact.**
2. **Part M: Access to and use of buildings. This outlines provisions for entrances and general access, which includes the gradient of ramped access.**

LVT trims achieve a luxury look whilst providing room-to-room transition to any type of floorcovering

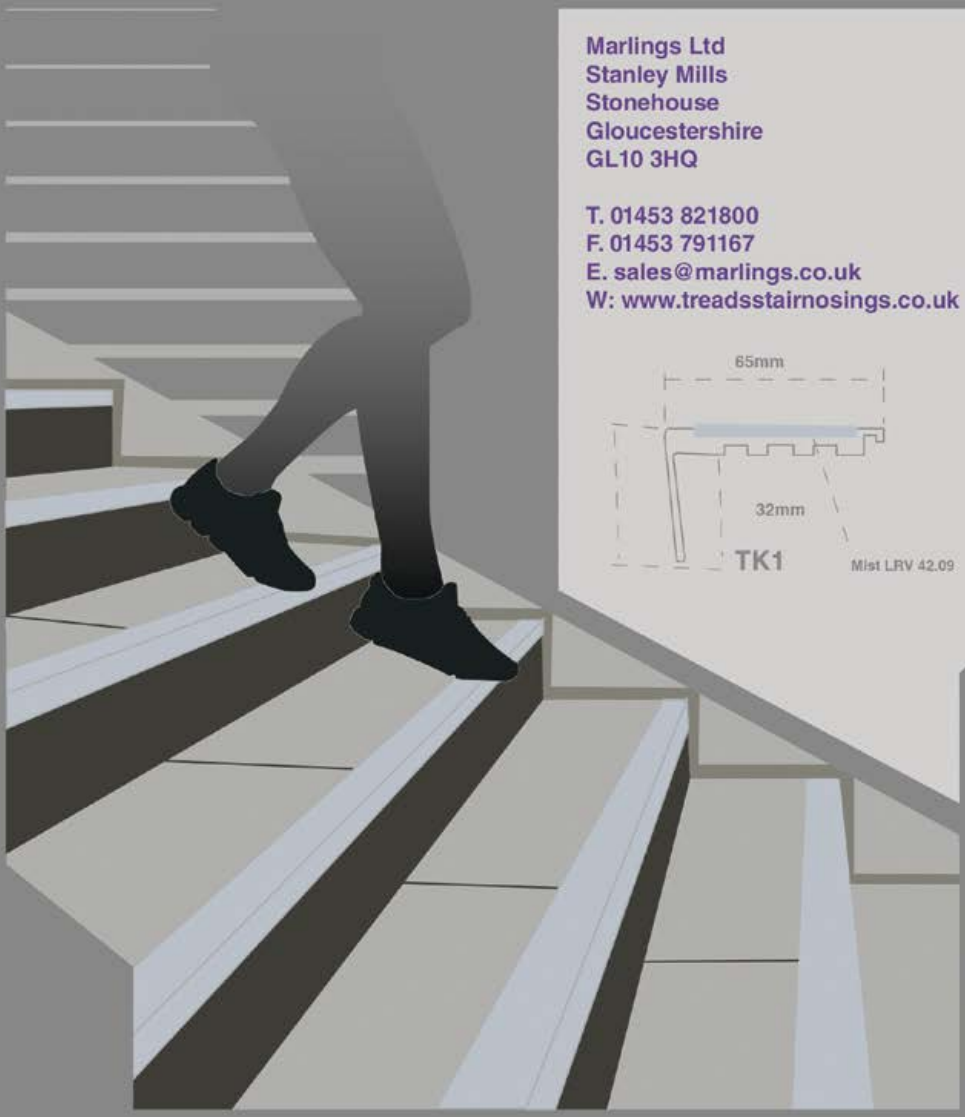
BS 8300-2 is also important, as it regards the design of an accessible and inclusive built environment. Building Regulations and British Standards both state the need for flooring to be safe for all users, and unnecessary ramps and hazards should be avoided.

So, what are the key considerations that you need to think about when selecting a flooring transition?

1. **HEIGHT — what is the height (or thickness) of both floor coverings you intend to transition? If there is a big difference, do you have enough room to use a gentle ramped profile?**
2. **TRAFFIC — how many people are accessing the area where the transition will be fitted? The more people who walk over the transition on a daily basis, the more robust the transition will need to be.**
3. **ENVIRONMENT — there are two key points here. Firstly, is the area at risk of being wet or is it continually dry? If the area has a risk of being wet, does the transition you will be fitting have a visible surface? If so, you should use a transition which can offer slip-resistant properties when wet, with a Pendulum Test Value (PTV) above 36. Secondly, will there be heavy items such as trolleys running over the transition? If this is the case, it is important to select a product that can deal with the weight and repeated impact without failing.**

T Range 8mm: Stair nosings for carpet tiles and ceramics.

TREADS
STAIR NOSINGS
By Marlings



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With you Step by Step

4. **COLOUR — within schools, bright and bold transition colours are often used to make a learning environment more exciting. However, at the other end of design considerations, such as in healthcare environments, dementia-friendly transitions may be necessary. In these instances, the colour of the flooring transition should match that of the floor coverings as closely as possible. The difference in colours between the transition and the floor covering on each side should not exceed 10° of Light Reflectance Values (LRV). This means that shiny metals or patterned transitions should not be used.**
5. **SHAPE — there are two options here, either straight edges or curves. This is a design choice: if there are curves in the design between floor coverings, it goes without saying that you need to use a transition that is easy to curve on site. It needs to be flexible enough to allow you to curve to the tightest radii of the floor covering specification.**

Flooring transition profiles are only a small part of a flooring project, yet are often overlooked and left until the last minute. Nevertheless, correct selection is critical as they can help to greatly improve the safety and longevity of a floor covering.

These profiles are vital in allowing people to safely move between different flooring areas and floor coverings. This can apply not just to the type of transition used, but also the colour of the profile. As Charles Eames once said: *"The details are not the details; they make the design".*

PERIMETER TRIMS

Available in a variety of profiles and materials, perimeter trims are installed to conceal an expansion gap where skirtings have been installed prior to the flooring. As with skirtings, they must not restrict the movement of the flooring where expansion occurs.

EDGINGS AND THRESHOLDS

Safety profiles designed to protect floor covering seams or edges from wear and tear. In the case of stretch-fitted textiles, they can secure the material and maintain the tension at doorways.

LINE MARKING

Resilient, textile and timber floor coverings can be line marked to indicate pedestrian traffic lanes and restrictions, or to indicate games courts in sports areas. The lines can be softened by "letting in" the floor covering material in alternative colours, painting or plastic tapes. In order to ensure that the method of marking is appropriate for the material used, the floor covering manufacturer should be consulted.

EXPANSION / MOVEMENT JOINTS

Expansion or movement joints in floor slabs or screeds should not be bridged by any resilient, textile or any other adhered floor finish. Movement joint covers may be flush, surface-mounted, or bedded-in. Where these are bedded-in, this can be in mortar and metal, metal with a rubber insert, or PVC.

NOTE: PVC expansion joint covers are not suitable for structural movement joints or joints wider than 10mm.

Surface-mounted movement joint profiles must be selected to suit the final floor covering. Mortar bedded movement joints should be set in at the correct level for the floor finish.

Other flooring accessories are available such as:

- **Slip-resistant strips (for use on ramps, etc.)**
- **Cork in-fill (for use where expansion gaps cannot be concealed)**
- **Dividing strips**
- **Radiator pipe ferrules**
- **Floor lighting**
- **Protection mats for use under castor chairs**
- **Stair rods**
- **Ventilation grills**
- **Tactile warning surfaces.**

Flooring manufacturers and contractors can provide information on these where necessary.

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20 | Maintenance — Prevention and Aftercare

This section aims to provide a practical guide to the cleaning and maintenance of flooring installed in commercial locations and problem solving in that regard. It is not designed to be exhaustive; defers to manufacturers recommendations, and in common with other CFA technical literature covers some subject areas that are not usually discussed. Its target audience includes specifiers, designers, facilities managers, manufacturers, distributors, suppliers, contract cleaners and flooring contractors. It has been designed to provide a summary of good practice for the cleaning and maintenance of most soft floor coverings in one helpful volume.

Soft floor covering within the flooring industry generally refers to resilient floor coverings (sheet and tiled vinyl, rubber and linoleum), textile (carpet and carpet tiles), laminate, engineered and solid wood finishes. As clarification, this guidance note does not include specific information for stone, cementitious, ceramic tiled and resin floors. Although many of the broad principles apply.

Whilst commercial cleaning is a multi-million-pound industry, in common with flooring, it is not highly regulated and therefore expertise and effectiveness of cleaning at the point of delivery is dependent on the commercial provider, which can vary greatly in competence.

Correctly specified, installed and maintained, floor coverings will provide years of good service. However, there are a number of service factors that should be considered that can have an influence on the long-term performance of the floor finish.

Keeping a floor clean is vitally important, not just because of hygiene, which is of course essential, but a well cleaned floor will last longer, retain its appearance and optimise safety aspects. Conversely a poorly maintained floor covering can lose its visual aesthetic, become less safe in relation to slip-resistance and wear prematurely, thereby reducing the return on the investment.

Whilst maintenance is not the only factor that influences the performance of a floor in use (floor coverings can become slippery due to contamination), both cleaning (regular removal of soiling) and maintenance (less frequent planned activity) are vitally important in ensuring that a floor covering remains safe and retains optimum aesthetics and performance. It is sometimes argued that poorly maintained floor coverings are no longer fit for purpose in use.

This is why it is so important that there is a common understanding of correct and recommended floor cleaning and maintenance across all the parties that are involved in the flooring design, specification, installation and care in use.

Within the CFA, our members are regularly asked to comment on poorly or incorrectly maintained floors where there is nothing wrong with the product or installation, yet the client believes it to be defective. This is costly in time to manage the query or complaint and potentially damaging to long-term relationships and repeat orders.

Unrealistic customer expectation or understanding in relation to maintenance can be an issue. All floor coverings need cleaning and maintaining, yet it is not uncommon for a client to express surprise if a floor becomes soiled even if it is never cleaned. Various practical assessments have shown that over 75% of soiling within a building comes from the outside, and yet buildings often have inadequate entrance flooring systems (barrier matting) or maintenance regimes for them specifically in place.

Whilst superficially appearing similar due to frequent use and heavy foot traffic, offices and hospitals will differ greatly in terms of cleaning. The cleaning and maintenance of a building should therefore be part of the initial considerations in design. Cleaning cupboards and access to water need to be part of the design process and to be fully considered.

Other factors, such as the nature and use (e.g., 24/7 access) of a building, all need to be factored into choices made around flooring and how floor finishes are cleaned.

Guidance in this section exposes some hidden facts, supports well researched good practice and helps to untangle aspects of poor practice and unhelpful guidance that is all too common surrounding the cleaning and maintenance of floor coverings. As with all flooring, the appearance, performance and durability of the installed floor covering will be determined to a large extent by the quality of the prepared subfloor and the conditions in which it is laid.

So, it is important to ensure that correct attention is given to provide a smooth, flat, level and sound substrate on which to fit any product in accordance with either **BS 8203** for resilient flooring, **BS 5325** for textile floor coverings and **BS 8425** for Laminate Flooring and, where applicable, **BS 8201** for wood and wood-based panels.

INITIAL DESIGN CONSIDERATIONS

This section covers initial design considerations, and equally ventures into areas such as the choice of colours for flooring, protecting floor coverings immediately after installation (before and up to handover) and some thoughts around what might be expected of the cleaning contractor.

Light weight rotary scrubber/washing machine, used to clean different flooring types including carpet and hard flooring surfaces

NATURE AND USE OF THE BUILDING: CORRECT SPECIFICATION — WHAT TYPE OF FLOOR COVERING IS IDEALLY REQUIRED?

The type of traffic and nature of use of the building are all important. A small office, when compared to a call centre or an office next to an engineering works, all have very different demands. Will the building be in use 24/7 (e.g. a hospital, supermarket or service station)? The type and level of soiling for many of these locations adds additional demands to the specification and maintenance required including the entrance system or matting.

PERFORMANCE EXPECTATION

Lighter colours may be better for energy consumption (lighting) and LRV (light reflection values) but will show soiling more readily and may therefore require more frequent cleaning.

DOES THE BUILDING DESIGN ALLOW FOR EFFECTIVE CLEANING AND MAINTENANCE?

Has the building got cleaning stations with access to water, cleaning sinks and adequate storage for equipment and cleaning solutions? Is power available in the relevant areas?

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As much as 80% of dirt entering a building is brought in by foot and wheeled traffic. However, a well-designed and planned entrance flooring system can remove and retain up to 95% of all dirt and moisture entering a building by foot and wheeled traffic.

INSUFFICIENT ENTRANCE FLOORING SYSTEMS (MATTING) AT ENTRANCES

Insufficient entrance matting is a common problem. All floor coverings with an external entrance need an entrance flooring system that British Standard **BS 7953** suggests should maximise the space available wherever possible to ensure soiling is removed from user traffic. Six steps is commonly offered as a guide but may not be practical in some spaces and equally higher traffic flow may require significantly more. They come in various forms with different characteristics for removing different types of soiling. Throw-down mats are generally accepted as the least effective and can present a trip hazard and should only be a temporary option. A fully designed and fitted entrance flooring system solution should be specified with the floor covering. **See section 17.**

PROTECTION

Ideally, floors should be one of the last items in a building to be completed. In those circumstances, where other trades are highly likely to traffic, it is vital that suitable protective covering material is used. Specific specialist products are available. Failure to protect floors prior to handover often results in permanent damage. **See section 18.**

PRE-HANDOVER CLEAN (OFTEN REFERRED TO AS A "BUILDER'S CLEAN")

Prior to the floor receiving regular cleaning, it is very likely to require an initial clean to remove builders' contamination and soiling. It is vital that the floor covering manufacturers' guidelines are followed at all stages.

The wrong regime and/or the wrong products used at this stage can be catastrophic going forward. If the new floor covering is not cleaned properly in this very first instance, it can make subsequent cleaning and maintenance virtually impossible.

HANDOVER

Ensure the cleaning contractor is fully informed of the products installed and the cleaning requirements for each flooring type. Cleaning operatives should be fully trained in the use of cleaning products and equipment that they are going to use.

RAMS (risk assessments and method statements) need to be issued and always be available. Make sure the cleaning contractor and their operatives have been fully trained about the floor covering type, products and equipment they are going to use. It is imperative this is in accordance with manufacturers' recommendations.

RESPONSIBILITIES — WHO IS RESPONSIBLE FOR WHAT?

- **It is the manufacturer's responsibility to ensure the product is of suitable quality and without defect**
- **The flooring contractor is responsible for the installation**
- **Where the flooring contractor has supplied and installed a floor covering, they are responsible for providing cleaning and maintenance guidance**
- **Where a client has specified the product and has a direct contract with the manufacturer for supply of the product (i.e., the client pays the manufacturer direct for the product and the flooring contractor installs on a labour only basis), the manufacturer is responsible for providing maintenance advice**
- **The end user is responsible for appointing the cleaning contractor**

NOTE: The cleaning contractor is responsible for appropriately applying cleaning instructions and for ensuring operatives are trained and competent.

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PRIOR TO BUILDING OCCUPATION

New floor finishes are easily damaged by items such as nails embedded in wheels of trucks or trolleys used to move furniture or equipment during the occupation phase of a new or refurbished building. Avoid such damage by using temporary protection in traffic lanes until all heavy equipment/furniture is in place. **See Section 18.**

Soiling of floors starts as soon as floor protection is lifted which may be some time before the building is put into full use and regular cleaning and maintenance is adopted by the end user. During this phase of the building programme, maintaining basic levels of floor cleaning will prevent damage such as scratches or soiling traffic lanes until the building is fully handed over to the end user.

It is important that the flooring manufacturers' cleaning requirements are passed onto the Main Contractor as soon as the installation is completed so that the correct initial cleaning of the floor finish can be carried out.

REGULAR CLEANING GUIDELINES

Obtain all recommendations for cleaning and maintenance from the flooring manufacturer or supplier. Failure to follow recommended cleaning and maintenance guidelines may permanently damage the floor covering (beyond repair) and invalidate the product guarantee. **ALWAYS** refer to manufacturers' or suppliers' recommendations.

CLEANING SOLUTIONS

Always use the correct cleaning solution for the correct floor type for the correct soiling. For most flooring products and purposes and for general daily cleaning, a neutral cleaner (pH7) at the correct dilution can be very effective. **ALWAYS** refer to floor covering manufacturers or suppliers' recommendations.

EQUIPMENT

In common with other guidance in this document, always use appropriate equipment for cleaning floor coverings. Manual mopping using microfibre as well as traditional mops, is generally used for resilient and wooden floors, damp mopping only in small areas.

Machine cleaning can provide increased productivity in larger areas. Ride-on scrubber driers are available for very big floors.

Vacuuming using a mechanically-driven, brush action-high-suction-machine is recommended for most textile finishes. **ALWAYS** refer to the manufacturers' or suppliers' recommendations.

COMMON CLEANING AND MAINTENANCE MISTAKES

NOT CHANGING WATER

Using a single bucket mopping system — for many commercial cleaning locations, a single bucket and mop is not adequate. A double bucket system employs a bucket of clean water used to rinse the mop before it is placed back into the cleaning solution. This is much more effective and avoids contamination of the cleaning solution. Rinsing is important with many cleaning products.

TOO MUCH CLEANING PRODUCT, WRONG DILUTION

There is a common perception that if a floor is dirty, you need to use more of the cleaning product, making a stronger dilution. This is incorrect and can create sticky residues, which can make a floor dangerous (slippery) underfoot as well as attracting more soiling.

POOR RINSING

This leaves residues behind and can create a slip hazard.

AGGRESSIVE CLEANING TECHNIQUES

The use of aggressive pads or inappropriate pads can cause issues. e.g., black pads and diamond pads on resilient and wooden floors.

ENTRANCE FLOORING SYSTEMS (MATTING) NOT EFFECTIVELY CLEANED / MAINTAINED

If entrance systems are not effectively maintained according to the manufacturer's recommendations, it will quickly become full of soiling and ineffective, and should therefore be included in a general cleaning and maintenance regime.

THE SAME CLEANING PRODUCT AND SYSTEM USED FOR ALL FLOOR SURFACES IN ONE BUILDING

Cross contamination is regularly seen by those who problem-solve cleaning issues.

PROTECTIVE FINISHES INCORRECTLY APPLIED OR SPECIFIED

Floor coatings can offer a different finish and are regularly applied to assist in creating a gloss level. However, when inappropriately applied, particularly on to a badly prepared surface, they can be ineffective and adversely affect the appearance of a floor and create other issues such as slip. Poorly applied finishes can also create issues for the visually impaired.

THE WRONG CLEANING SOLUTION IS USED

For most floor coverings and general soiling, a solution of neutral detergent is adequate. There is a vast range of cleaning product available on the market, some with very alkaline pH values; if used incorrectly these will damage the majority of floor coverings. In addition, it is not uncommon for floors to become damaged by bleach and strong pine-based disinfectants.

It is also important to differentiate between disinfecting and cleaning as these two processes are regularly confused. Effective cleaning should be carried out ahead of any disinfecting regime. The two processes are entirely separate.

Disinfecting kills germs and microbes, cleaning removes those dead germs and microbes. Simply applying layers of disinfectant to a resilient or hard floor surface (daily) will over time make that surface sticky from a build-up of residues and make it impossible to maintain.

IN SERVICE CONSIDERATIONS

FURNITURE

Damage from heavy items of furniture can generally be avoided if the right preventative measures are put in place at the outset of the project. Regular inspection and maintenance of items such as table and chair feet and castor wheels will help to prevent damage and therefore extend the useful life of the floor covering.

Floor coverings are particularly susceptible to damage from heavy furniture (such as pianos) fitted with small, wheeled castors and this will be exacerbated where castors are poorly maintained and wheels do not turn freely. Castor wheels should be inspected regularly to ensure that they are operating correctly and free from damage.

TOP AND CENTRE: Mechanical cleaning and slurry extraction being undertaken using a wet and dry rotary brush machine on textile flooring. This is a highly effective method in removing any build up of soiling; on both textile and vinyl (or soft and hard) surfaces requiring only minimal drying time before the floor is back in use.

BOTTOM: Wet slurry extraction using a wet vacuum. This this is an effective way of removing wet cleaning slurry from all types of floor surfaces and is especially useful in smaller areas following manual mopping and rinsing.

Legs of tables and chairs should not have sharp or hollow tubular edges in direct contact with the floor. Protection caps should be used and should be large enough to spread the applied load, inspected regularly and replaced as necessary. Avoid protection caps with small domed heads as they do not always provide enough load spread to prevent indentation of the floor covering.

Dragging furniture across the surface of the floor should also be avoided.

WHEELED TRAFFIC

At some point, floors will likely be subjected to wheeled traffic and the following points should be considered when preparing a specification:

1. **Max. weight of wheelchair, trolley or truck.**
2. **Number, size and width of wheels to spread the load.**
3. **Composition of the wheel e.g., rubber, pneumatic, polyamide, metal, etc.**
4. **Subfloor construction, the smoothing compound, adhesive and the floor covering must be able to withstand rolling and turning loads.**
5. **Design of buildings and their approaches to meet the needs of disabled people — see BS 8300 for advice.**

FOOTWEAR

Some forms of footwear may damage the floor covering by indenting, scratching or puncturing. In areas where non-standard footwear such as sports facilities, where studded or spiked footwear is worn, a floor covering that is highly suitable for this type of foot traffic and purpose should be selected.

In areas subject to normal daily use, poorly maintained stiletto heeled shoes with supporting steel pins are exposed are probably the biggest single cause of damage to floor coverings by footwear. The sharpness and small area in contact with the floor results in enormous point loading that at best will leave indentations in the floor surface which will attract soiling.

In severe cases the floor can be punctured or torn. This sort of damage is often considered to be a failing of the floor covering whereas in reality it is beyond what the floor covering can reasonably be expected to withstand.

GENERAL

- **If ever asked to provide comment on why a floor is not performing or looks soiled, one of the first things to do is ask to inspect the cleaning cupboard**
- **Is it well organised?**
- **Where are the guidelines and instructions for cleaning all the floor coverings within the building?**
- **It is important to see RAMS (risk assessments and method statements) as this also provides indication of how professionally the floors are being cared for**
- **Cleaning pads should be washed out and stored correctly, not stored on the bottom of a machine and re-used without being maintained themselves**
- **Mopping systems also need to be washed out regularly and stored appropriately**
- **Check for incorrectly specified, operated, and maintained machinery**
- **Leaving a mop in a bucket of dirty water is an all-too-common mistake**
- **It is important to be able to identify how cleaning solutions are measured to ensure the correct dilution is used**
- **Check the condition of the vacuum machine. Is the bag empty? Are the hoses clear and undamaged?**

SUMMARY

This section covers standard planned cleaning and maintenance, not crisis management where a floor has become very heavily soiled, contaminated or needs more complex attention to restore its appearance (e.g., sanding and re-sealing a wooden floor). It focuses on the general and broad requirements for effective regular cleaning of floors in commercial environments.

ALWAYS follow manufacturers' recommendations and seek professional advice when dealing with cleaning and maintenance of commercial floor coverings. Incorrect cleaning methods and mistakes can be costly and, in the worst-case scenario, may cause slips and falls.

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Supplying and fitting the right product in the right way needs skill and care.

Manufacturers of floorcoverings, adhesives and other flooring materials are a great source of helpful information, and some provide services to help specifiers and installers at all stages of the process

If you need further help, or a fully independent assessment of a flooring installation, Richard Renouf of Expertise With Integrity Limited, is available to provide:

- Independent flooring inspections throughout the UK
- Help and advice by telephone and email
- Training

Richard has extensive experience in flooring and complaints resolution. He is the former adjudicator and founder of the Furniture and Home Improvement Ombudsman, a consultant trainer for FITA (The Flooring Industry Training Association), a regular columnist in Contract Flooring Journal and Interiors Monthly, and a Judge of the UK Floor Layer of the Year Competition.

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www.richard-renouf.com

All flooring installations should be carried out with reasonable skill and care, and the flooring should be of satisfactory quality and fit for purpose. These are legal requirements, but there can often be disagreement about what is acceptable.

There are British Standards covering almost all types of flooring installation:

- **BS 5325 Code of practice for installation of textile floor coverings**
- **BS 5385 (various parts) Wall and floor tiling**
- **BS 8201 Code of practice for installation of flooring of wood and wood-based panels**
- **BS 8203 Code of practice installation of resilient floor coverings**
- **BS 8204 (various parts) Screeds, bases and in-situ floorings**
- **BS 8425 Code of practice for installation of laminate floor coverings**

There are also British Standards covering flooring products and building materials and construction.

When referring to standards, the latest issue and status of the standard can be verified on the BSI website "Standards–Information And Benefits" at **www.bsigroup.com/en-GB/standards**

These Standards are set by groups including experienced flooring professionals and set out what is good practice to help installers and those assessing the quality of any job.

British Standards and product installation instructions must be complied with at all times. Where the installation instructions have different requirements to any applicable Standard, the manufacturer's instructions prevail.

Visual defects should be assessed from a normal standing or sitting position, and should not need close inspection, magnification or special lighting unless they could cause a failure of the flooring.

An issue could be considered a defect if it adversely affects, or could affect, the satisfactory appearance, fitness for purpose, or performance of the flooring now or during its reasonable life expectancy. This excludes matters caused by normal wear and tear.

HARDWOOD FLOORS

This section provides practical guidelines for dealing with potential queries arising when handing over a newly laid hardwood floor.

It may also be found helpful when dealing with concerns at a later date. It provides guidance for frequently asked questions relating to installation and the generic product and aims to provide a tool to help the flooring professional provide end users with an understanding of any common misconceptions.

It seeks to avoid unnecessary escalation of claims, providing a framework for either identifying a genuine complaint, or guidelines to which reassurance can be offered that the product and installation are of an acceptable standard against criteria that are reasonable to all parties.

OVERVIEW

The following relates to all inspections providing some basic principles for evaluation. If the floor does not meet these criteria, it is reasonable to assume that it is unsatisfactory. Conversely, conformity implies a generally acceptable floor.

All installed flooring must conform to the relevant British or EU Standard both in terms of manufacturing tolerances and installation.

1. **Visual effects (potential defects) should be inspected from a normal viewing position either standing or seated. When viewing the floor, only those features which would be immediately obvious to any independent party should be considered as potential issues. Careful positioning of backlighting, unusual viewing angles (crouching or kneeling, etc.) would not be considered reasonable criteria for identifying a visual defect.**

2. **The overall appearance of the floor should be consistent (product and installation) unless intentional as part of the product design or pattern and therefore unavoidable.**

See further details on the following pages.

MEETINGS

The purpose of any meeting should primarily be to establish if the issue identified by the end user is related to manufacture, installation or expectation. Both the manufacture and installation of flooring are governed by Standards, so can be measured. However, expectation is not. So, any issues identified in this category require careful consideration and response.

All parties involved (e.g., client representative, main contractor, flooring contractor and all manufacturers involved in the flooring specification) should wherever possible be invited to attend site meetings to provide appropriate input and background information. It is also generally accepted as best practice and courtesy that any reports generated are also made available to the other parties.

NOTES ON EXPECTATION ISSUES

Expectation related issues must have a factual basis for them to be relevant i.e., the client can provide a clear evidence-based trail that they have been given a particular expectation, but the installed floor does not reach this expectation. It is a legal requirement for the product to be fit for purpose and as described. It is also reasonable to expect the flooring professional to give appropriate advice. This document cannot help resolving issues where the content of verbal advice is disputed, particularly as part of the sales process. See final section of this document relating to resolution for further guidance.

Expectation issues based on individual perception where the contractor and manufacturer have exercised the requirements described above would not be deemed as reasonable grounds for a complaint by the CFA.

The above aims to establish a reasonable duty of care on all parties.

The following section is further guidance and specific information on product, installation faults and common misconceptions seen with hardwood flooring.

1. GAPPING
   Floorboards will have gaps between them, this is quite normal and the size of the gaps will vary throughout the year as the floor expands or contracts. The size of the longitudinal edge gap may be up to 2mm wide at times; however, subfloor flatness and EU Standard manufacturing tolerances will mean that this will vary. Head joint gaps should be no more than 0.3mm wide. As long as the gaps are relatively even across the floor then this is acceptable and to be expected. Uneven, inconsistent or single gaps which stand out in an otherwise closely fitted floor need investigation.

2. LIPPING
   Horizontal surface lipping at the joints in hardwood flooring will be present but it is very fine. EU manufacturing tolerances state that 0.2mm-0.3mm is acceptable but unevenness of subfloors can include movement under foot and surface distortion caused by excessive moisture can also affect this. Manufacturing tolerances also cover the size and shape of hardwood flooring, e.g., the flatness across the width of the board.

3. MOVEMENT UNDERFOOT
   The firmness under foot of floating hardwood flooring is dependent on the density and thickness of the underlay and the flatness and stiffness of the subfloor. All floating floors will deflect under foot. The flatness of the subfloor should be no more than a 3mm gap showing under a 2m straight edge in accordance with the British Standard. As a guide, with normal residential and commercial floating floors (not sports flooring), the products chosen and installed should not create deflection any greater than about 5mm under foot.

Any additional excessive movement created by the stability of the subfloor should be pointed out prior to installation. In residential use, the underlay normally used is 2-5mm thickness. Tall furniture will move slightly on a floating hardwood floor.

4. DE-BONDING
Hardwood flooring which is stuck down will have an even, hard, solid feel all over the floor. Hollow spots should be investigated for lack of adhesive or the lack of adhesion to the subfloor as if widespread it can lead to failure.

5. COLOUR AND SHADE VARIATION OR SHEEN LEVEL
Hardwood flooring, whether pre-finished or site finished, should have a smooth appearance with an even sheen to the floor, either matt, satin or gloss dependent on the product. Uneven sheen patches need to be addressed. Certain uses such as sports demand a specific level of sheen and reflectance in accordance with the British and EU Standards.

6. SCRATCHING AND SCUFFING
The seal on the floor will mark as the floor is used. The sealed surface should be regarded as the sacrificial finish which is resealed from time to time. It is designed to wear down over time and so is flexible. Scuff and scratch marks are inevitable on a smooth surface such as hardwood so a proper maintenance schedule is required to deal with this.

7. DISCOLOURATION AND STAINING
Hardwood flooring is a natural product so will vary in colour over time when exposed to UV light. It would be normal to see a difference in the floors colour if a rug which has been in position for some time, is removed. Flooring which is nearer windows will change colour at a faster rate than away from it. Colour-stained hardwood flooring will fade at a faster rate than natural non-pigmented boards. Hardwood flooring is sealed but will mark if staining liquids are spilt onto the surface and not cleaned up straight away. Incorrect cleaning products can also cause staining.

8. INDENTATIONS
Heel marks are well recognised as causing minor indentations in the surface of the hardwood. This will occur more if the heel is damaged or has exposed nails. Point loads from stationary or moving items can also cause indentations.

9. SUBFLOOR IMPERFECTIONS
With floating floors, any unevenness of the subfloor will cause excessive vertical deflection in the hardwood floor. Uneven and irregular gapping may also occur. The flatness of the subfloor should be no more than a 3mm gap showing under a 2m straight edge in accordance with the British Standard.

10. SLIP-RESISTANCE
Generally, hardwood floors have a low potential slip. However, if they become wet then this level of friction will worsen. Specialist site applied coatings are available to resolve this. Sports flooring demands a specific level of friction in accordance with British and EU Standards which a clean hardwood surface would provide. Improper or insufficient maintenance will worsen the slip-resistance of the surface.

11. GRADING
Wood has natural variances which are sorted into grades supplied by the manufacturers. The grades are based on EU Standards; always refer to the individual manufacturers' grading charts and information on the difference between them. Remember small handheld samples will not always reflect the full characteristics of the grade of the wood.

12. MOISTURE
Generally sealed hardwood will have a level of moisture resistance but is not waterproof; excess moisture from both above and below the wood's surface will affect the hardwood floor. Do not expose the top surface to liquid spillage or excess water when cleaning. Always mop up spillages immediately. Raising of the grain, splitting, expansion and blistering are signs of excessive surface liquid. High or low rates of humidity within the room will also cause expansion or contraction of the wood, usually seen across the width of the board. Ideally keep the room within the range of 35-65%RH. Distortion of the surface of the board is a sign of excessive dampness under the floor. All hardwood flooring installed over a concrete or screed subfloor must have a surface moisture membrane installed. The moisture content of the concrete or screed subfloor must not exceed 75%RH. Check with individual manufacturers regarding this as some methods of installation may require a reading of below 75%RH. With suspended subfloors ensure that the void is both deep enough and correctly ventilated to current building regulations.

13. UNDERFLOOR HEATING
Confirm if the hardwood floor chosen is suitable for use over UFH. Some manufacturers will guarantee their flooring for this use. Expect to see slightly wider than normal gaps between the boards during the heating season. It is the responsibility of the end user/client to ensure that the top surface temperature on the hardwood does not exceed 27°C and does not vary more than 5°C over any 24 hour period. Some manufacturers ask for lower surface temperatures. Under floor heating systems should be fully commissioned before the installation of a hardwood floor.

14. MISCONCEPTIONS AND UNREASONABLE EXPECTATIONS
Hardwood flooring is a natural product chosen for that very reason and is not a man-made, seamless, fault-free product. So, expect to see some variations in its appearance. Remember, photographs of installed floors cannot always reflect the actual product. Wood is not waterproof, see above.

RESOLUTION

In concluding an inspection and issuing a report it is obviously beneficial if a resolution agreed by all parties can be established and documented. The CFA would recommend the format on page 266 for documenting the evaluation of a floor.

Where an agreed resolution cannot be achieved, the CFA would propose that an independent inspection is carried out by a trade specific CFA inspector bound by a code of practice, with all parties agreeing to abide by the findings. The report generated by the contractor can be used as background information.

For installation issues only, CFA contractor and Distributor members can benefit from the site inspection service offered to them. Further details of this service can be obtained by contacting the CFA on 0115 941 1126.

1. **The CFA assumes no responsibility or liability and does not establish responsibilities or liabilities for third parties through the application of principles or techniques contained in this document. Local or national regulations may apply and should be reviewed. Compliance with mandatory requirements contained in Health and Safety regulations and compliance with COSHH Standards should be followed.**

2. **While every attempt has been made to ensure that this information is accurate and reliable at the time of its publication, we cannot accept responsibility for any errors, omissions, inaccuracies or any changes that have occurred since the date of publication or for the results obtained from the use of such information. E&OE.**

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NOTE: Please see page 266 for a template for creating a report following a site meeting. This template is allied to all the documents for complaint handing within section 21. The intention is to assist you in producing a professional report as a record of your investigation and in the spirit of resolving the problem without escalation.

RESILIENT FLOORS

This section provides practical guidelines for dealing with potential queries arising when handing over a newly laid floor.

It may also be found helpful when dealing with concerns at a later date. It provides guidance for frequently asked questions relating to installation and the generic product and aims to provide a tool to help the flooring professional provide end users with an understanding of any common misconceptions.

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The following relates to all inspections providing some basic principles for evaluation. If the floor does not meet these criteria, it is reasonable to assume that it is unsatisfactory.

Conversely, conformity implies a generally acceptable floor.

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3. **Careful positioning of backlighting, unusual viewing angles (crouching or kneeling, etc.) would not be considered reasonable criteria for identifying a visual defect.**

4. **The overall appearance of the floor should be consistent (product and installation) unless intentional as part of the product design or pattern and therefore unavoidable.**

See further details on the following pages.

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The purpose of any meeting should primarily be to establish if the issue identified by the end user is related to manufacture, installation or expectation. Both the manufacture and installation of flooring are governed by Standards, so can be measured. However, expectation is not. So, any issues identified in this category require careful consideration and response.

All parties involved (e.g., client representative, main contractor, flooring contractor and all manufacturers involved in the flooring specification) should wherever possible be invited to attend site meetings to provide appropriate input and background information. It is also generally accepted as best practice and courtesy that any reports generated are also made available to the other parties.

NOTES ON EXPECTATION ISSUES

Expectation related issues must have a factual basis for them to be relevant i.e., the client can provide a clear evidence-based trail that they have been given a particular expectation but the installed floor does not reach this expectation.

It is a legal requirement for the product to be fit for purpose and as described. It is also reasonable to expect the flooring professional to give appropriate advice.

This document cannot help resolving issues where the content of verbal advice is disputed, particularly as part of the sales process. See the final section of this document relating to resolution for further guidance.

Expectation issues based on individual perception where the contractor and manufacturer have exercised the requirements described above would not be deemed as reasonable grounds for a complaint by the CFA. The above aims to establish a reasonable duty of care on all “parties”.

The following section is further guidance and specific information on product, installation faults and common misconceptions seen with resilient flooring.

1. GAPPING
   It is virtually impossible to install a resilient tiled floor with no gaps between the tiles. However, in general terms these should not detract from the overall appearance of the floor when viewed from a normal viewing position.

   No individual gap should be prominent from this perspective. Although generally manufactured to engineering standards, material will have manufacturing tolerances in terms of size and squareness. Minor subfloor imperfections (within recommended standards) may also have a cumulative effect, as will the accuracy of the fitter even if care is exercised.

   In addition to the visual guideline described above and, as an accepted industry standard, no gap in the body of the floor should exceed 0.3mm. This is not detailed in British or EU Standards and even gaps greater than this are unlikely to affect the general performance of a resilient tiled floor. Gaps at the edge of a resilient floor covering can generally be avoided with careful cutting in techniques and where possible fitting underneath skirting, plinths and other fixtures.

   The use of silicone sealant is not a technical requirement and is therefore an option to be discussed with a client but should not be used to mask poor workmanship; it may be considered a benefit in certain environments (e.g., around the toilet in a bathroom) where material has been installed to meet existing fixtures. Welded joints should be consistent in width, with no gaps. Gaps in butt jointed resilient sheets should be consistent and no more than 0.1mm wide.

2. LIPPING
   Unless intentionally profiled, most resilient floor coverings should have very accurate gauge. Lipping should not detract from the visual appearance of a resilient floor when viewed from a normal viewing position.

3. MOVEMENT UNDERFOOT
   Resilient materials installed onto solid substrates should not suffer from deflection. Material installed on to an appropriately prepared suspended floor should not move significantly.

   Any movement will be directly connected to the condition of the existing suspended floor (e.g., floorboards). British and EU pro-

vide guidelines relating to suitability of all common substrates (including suspended floors) to accept resilient floor coverings.

In principle, to accept a resilient floor covering the substrate needs to be dry, smooth, free from undulation and sound. British Standards suggest that it is the responsibility of the Main Contractor to provide a substrate that meets these basic criteria. In certain circumstances the flooring contractor may be considered as the main contractor.

4. DE-BONDING
Some resilient materials require firmly bonding to a suitably prepared substrate. De-bonding resilient flooring will be evident, either due to tiles lifting or a hollow sound when lightly tapped. Common causes of de-bonding include insufficient adhesive spread, late placement, insufficient rolling, subfloor or adhesive failure and moisture issues.

Most of these problems relate to installation and need further investigation. Other common causes include accidental floods particularly in domestic environments. Exposure to extreme thermal effects can also result in de-bonding of the resilient flooring, especially where the subfloor temperature exceeds the resilient flooring manufacturer's maximum subfloor temperature recommendations.

5. COLOUR AND SHADE VARIATION OR SHEEN LEVEL
Resilient materials are generally manufactured in batches, which often cannot be successfully mixed. In view of this, it is generally good practice to order all the material for an individual location from the manufacture at the same time.

Shade variation within the same batch of material should generally be referred to the manufacturer unless the product has an intentional shade or colour variation by design.

In terms of gloss, this is measurable, figures are produced for each product manufactured and therefore if a customer suggests there is a product fault, a definite answer can be given.

With heavily patterned materials or those with recurring features, as an installer, it is good practice to avoid similar features occurring all in one place or in a very prominent location that may be interpreted as a manufacturing defect. Where appropriate any setting out or layout should be agreed with the client before installation begins.

As manufactured, gloss levels should generally be consistent across a resilient floor.

6. SCRATCHING AND SCUFFING
Manufacturers' recommendation regarding suitability of a product should always be considered. However, in selecting a product it is important that intended use (residentially life style) is discussed between the contractor and end user. Most resilient materials will be scratch resistant but not scratch proof and therefore colour, pattern and texture are all important considerations for the different locations and traffic requirements. As an example, a mid-toned and patterned resilient floor will tend to be more sympathetic to soiling than a pure white floor and darker colours are more prone to show scratching and marking.

Textures are generally also recommended for heavier traffic areas, again providing sympathetic properties. Issues of this nature rarely relate to product quality, but generally reflect poor product selection, specification or maintenance and the omission and maintenance of suitable barrier matting.

7. DISCOLOURATION AND STAINING
Most resilient products will provide good resistance to discolouration or staining. UV degradation, even in areas of strong sunlight, e.g., conservatories, should be minimal, but some variation of areas continually covered for long periods of time could be expected. Resilient flooring can be stained by organic or inorganic compounds particularly if the compound is designed for this purpose or known to have these properties. Typical examples would include shoe polish, hair dye, paint and nail varnish. Simple organic compounds used to dye some decorative rugs (generally imported) can also transfer colour to the plasticiser element of some resilient products and therefore should be isolated.

It is always important to check that the backing of door mats is compatible with a resilient product. The backing of some door mats (generally inexpensive) can contain antioxidants that cause a yellow discolouration on vinyl materials. PVC (polyvinylchloride)-based products will discolour if heated for a prolonged period. Detection of localised sources of heat such as pipes close to the surface is an important consideration when surveying an installation.

8. INDENTATIONS
Free from external influence (unbonded samples), resilient tiles generally offer good indentation recovery properties. When installed, if the indentation does not recover, it will often be found to be a contour created in either in the adhesive layer or subfloor below.

This is particularly relevant to plywood substrates, grade 2 asphalt and softer smoothing underlayments if exposed to high point loading. Where high point loading is identified from static objects, suitable load spreading devices should be employed. e.g., under castors on a settee or chair. Indentation created by heavy permanent fixtures or those items of furniture that are not expected to be moved, would not normally be accepted as a complaint against the material or installation. Care should be taken to ensure that footwear e.g., stiletto heels are in good condition to avoid surface damage.

9. SUBFLOOR IMPERFECTIONS
Subfloor preparation should be in accordance with British and EU Standards, i.e., the flatness of the subfloor should be no more than a 3mm gap showing under a 2m straight edge. Visual imperfections relating to subfloor preparation should be evaluated against the criteria detailed at the beginning of this document. As an additional, but subjective measure, if the imperfection cannot be felt by brushing with fingertips, it is unlikely that it could be improved with additional subfloor preparation.

Resilient products, and particularly luxury vinyl tiles, also now include “loose lay” formats and sometimes include click systems that join the tiles together. These are generally not bonded to the substrate. Subfloor and installation requirements will vary by product type so the manufacturer should be consulted on suitability and installation guidance. Some subfloor types will require less preparation than standard products; others will require the same level as that of standard resilient finishes.

10. SLIP-RESISTANCE
Manufacturers’ specification should be considered when specifying a product. Where required, safety floor should be installed. Safety floors should not be sealed with any product. Decorative products generally have a low potential for slip when used in accordance with manufacturers’ recommendations. In common with most hard surfaces, frictional properties will be reduced when wet as compared to dry.

Most slip-related issues can be attributed to contamination, be that water, grease from food or other spillages or overspray from silicone-based sprays (wood polishes and glass cleaners, etc.). **Further information on slip-resistance can be found in section 14.**

The correct maintenance procedures are therefore important, as is the installation of adequate barrier matting at external entrances.

For a light commercial location, the industry standard recommendation is to use at least 2m of barrier matting. Longer runs may be required in very heavily trafficked and busy areas. **Further information on entrance flooring systems can be found in section 17.**

11. MOISTURE
Resilient tiles should not be installed in any area that is likely to be subjected to regular amounts of excessive surface moisture or require cleaning that could necessitate more than damp mopping. In these locations, suitable alternative products and systems should be considered, which may include sheet materials coved and welded. In extreme cases, excessive surface moisture may cause tiles to lift attacking both the adhesive and substrate.

Excessive moisture contained in new or existing substrates is a regular cause of failure within resilient floor installations. Prior to installation the moisture content of

any subfloor should be checked for excessive moisture.

The British Standard for the installation of resilient floor coverings **BS 8203** recommends that the moisture content of a substrate should not exceed 75%RH humidity when measured with a hygrometer or equivalent electronic device. If residual moisture in excess of these recommendations is identified, or if the property is old and may not have a DPM, then the subfloor preparation may need to include the application of a surface DPM.

In commercial locations, it is primarily the responsibility of the Main Contractor to carry out relevant testing. In residential locations, the flooring contractor may also reasonably be considered as the main contractor. Legal and commercial precedent suggests that it is in the interest of the flooring contractor to ensure that testing is adequate.

12. UNDERFLOOR HEATING

The installation of UFH systems is rapidly growing in popularity and the number of systems available is many and varied. Historically designed and used under ceramic, stone or other natural materials, the compatibility of the system and product needs to be carefully considered. Both the manufacturer of the floor covering and manufacturer of the UFH system should be consulted for their recommendations and guarantees. Temperatures of above 27 °C may lead to failure of adhesion of the flooring to the substrate. Some types of heating systems can cause localised excessive heating which may cause local discolouration.

The manufacturers of some floor coverings recommend that the temperature measured at the glue line should not exceed 27 °C. This is the responsibility of the end user/client, but they may reasonably expect guidance from the flooring contractor. Where higher temperatures are necessary, appropriate heat-tolerant adhesives and floor covering products should be carefully specified. There are heat dispersing underlays available for some click-together LVT systems for use over UFH and in areas where there could be high solar gain.

Underfloor heating systems should be fully commissioned before the installation of the floor covering.

13. MISCONCEPTIONS AND UNREASONABLE EXPECTATIONS

Resilient flooring material is often chosen as a cost effective, fast track replication of natural and other decorative finishes into new build and refurbishment locations. It can be installed onto most substrates and the design possibilities allow product combinations that would otherwise be difficult to achieve.

Resilient flooring is a decorative and practical surface that is durable and also easy to maintain with good lifecycle costs.

A common mistake is to forget these primary reasons for specification once installed and compare or attribute the resilient material with the properties of its natural counterpart, e.g., the scratch resistance of ceramics. With premium products, the level of expectation is understandably high, but expectation should not be raised to, or considered reasonable at, an unrealistically achievable level either in terms of product performance or installation.

RESOLUTION

In concluding an inspection and issuing a report it is obviously beneficial if a resolution agreed by all parties can be established and documented. The CFA would recommend the format on page 266 for documenting the evaluation of a floor. Where an agreed resolution cannot be achieved the CFA would propose that an independent inspection is carried out by a trade specific CFA consultant bound by a code of practice, with all parties agreeing to abide by the findings. The report generated by the contractor can be used as background information.

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SITE APPLIED SURFACE FINISH

This section provides practical guidelines for dealing with potential queries arising when handing over a newly laid floor.

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OVERVIEW

The following relates to all inspections providing some basic principles for evaluation. If the floor does not meet these criteria, it is reasonable to assume that it is unsatisfactory. Conversely, conformity implies a generally acceptable floor.

1. **All installed flooring must conform to the relevant British or EU Standard both in terms of manufacturing tolerances and installation.**
2. **Visual effects (potential defects) should be inspected from a normal viewing position either standing or seated. When viewing the floor, only those features which would be immediately obvious to any independent party should be considered as potential issues. Careful positioning of backlighting, unusual viewing angles (crouching or kneeling, etc.) would not be considered reasonable criteria for identifying a visual defect.**
3. **The overall appearance of the floor should be consistent (product and installation) unless intentional as part of the product design or pattern and therefore unavoidable. See further details on the following pages.**

MEETINGS

The purpose of any meeting should primarily be to establish if the issue identified by the end user is related to manufacture, installation or expectation. Both the manufacture and installation of

flooring are governed by Standards, so can be measured. However, expectation is not. So, any issues identified in this category require careful consideration and response.

All parties involved (e.g., client representative, main contractor, flooring contractor and all manufacturers involved in the flooring specification) should wherever possible be invited to attend site meetings to provide appropriate input and background information.

It is also generally accepted as best practice and courtesy that any reports generated are also made available to the other parties.

NOTES ON EXPECTATION ISSUES

Expectation related issues must have a factual basis for them to be relevant i.e., the client can provide clear evidence-based trail that they have been given a particular expectation, but the installed floor does not reach this expectation. It is a legal requirement for the product to be fit for purpose and as described.

It is also reasonable to expect the flooring professional to give appropriate advice. This document cannot help resolving issues where the content of verbal advice is disputed, particularly as part of the sales process.

See the final section of this document relating to resolution for further guidance.

Expectation issues based on individual perception where the contractor and manufacturer have exercised the requirements described above, would not be deemed as reasonable grounds for a complaint by the CFA. The above aims to establish a reasonable duty of care on all parties.

The following section is further guidance and specific information on product, installation faults, and common misconceptions seen with site applied surface finishes.

1. DE-BONDING
   The seal on hardwood flooring that has been re-sealed on site should adhere to the entire surface, if this does not occur then either unobserved contamination is present or there has been incorrect or insufficient preparation carried out.

2. COLOUR AND SHADE VARIATION OR SHEEN LEVEL
   Hardwood flooring when site finished, should have a smooth appearance with an even sheen to the floor. Either matt, satin or gloss, dependent on the product. Uneven sheen patches need to be addressed. Certain uses such as sports demand a specific level of sheen and reflectance in accordance with the British and EU Standards. Site applied finishes should not be expected to achieve the same "fine" quality possible in the controlled conditions of factory production but should be sufficient for the application allowing for variations expected on older worn floors when inspected from a normal viewing position.

3. SCRATCHING AND SCUFFING
   Site applied finishes should be expected to achieve the same quality as factory produced material. The seal on the floor will mark as the floor is used. The sealed surface should be regarded as the sacrificial finish which is resealed from time to time. It is designed to wear down over time and so is flexible. Scuff and scratch marks are inevitable on a smooth surface such as hardwood so a proper maintenance schedule is required to deal with this.

4. DISCOLOURATION AND STAINING:
   Site applied finishes should be expected to achieve the same quality as factory produced material. Hardwood flooring is a natural product so will vary in colour over time when exposed to UV light. It would be normal to see a difference in the floors colour if a rug which has been in position for some time, is removed. Flooring and the site applied seal which is nearer windows will change colour at a faster rate than away from it. Colour-stained hardwood flooring will fade at a faster rate than natural non-pigmented boards. The surface will mark if staining liquids are spilt onto the surface and not cleaned up straight away. Incorrect cleaning products can also cause staining.

5. INDENTATIONS
   Site applied finishes should move with the indentations of the wood, they cannot be expected to change the nature of the wood substrate. Care should be taken to ensure that footwear e.g., stiletto heels, is in good condition to avoid damage to the surface.

6. SUBFLOOR IMPERFECTIONS
Site applied finishes should not be affected by subfloor imperfections.

7. SLIP-RESISTANCE
Site applied finishes should be expected to achieve the same quality as factory produced material, however they can be used to alter the existing surface to (usually) improve slip-resistance if needed as it is possible that actual use of a floor will demand a different surface slip requirement than originally assumed. Decrease in the performance of these coatings is almost certainly linked to surface contamination due to improper or insufficient maintenance.

Generally, finishes on hardwood floors have a low potential for slip. However, if they are allowed to get wet, then this level of friction will worsen. Specialist site-applied coatings are available to resolve this. Sports flooring demands a specific level of friction in accordance with British and EU Standards which a clean surface will provide. Improper or insufficient maintenance will lessen the slip-resistance of the surface.

8. GRADING
Site applied finishes can enhance or reduce the sharpness and depth of colour of the wood dependant on type and formulation but they cannot be expected to change the nature of the wood substrate.

9. MOISTURE
Site applied finishes can be affected by excess moisture in two ways, directly and indirectly.

DIRECTLY: There are some solvent borne formulations that react with water to cure, these can show cloudiness or bubbling if such moisture is present. Other solvent borne formulations may show cloudiness and de-laminate if the amount of water is sufficient. Waterborne coatings are less likely to show visible defects but may not cure correctly giving weak films and consequently poor abrasion resistance and wear.

INDIRECTLY: When excess moisture affects wood (see above) it can expand and contract severely; dependant on the flexibility, hardness and adhesive strength of the coating the effect known as “side-bonding” or “rafting” can occur. This is where the bond strength of the coating is strong enough to resist the movement of the wood.

It is a symptom of excessive moisture not caused by the coating.

10. UNDERFLOOR HEATING:
Care should be taken in the choice and application of floor coatings to avoid problems caused by the movement of the floor as described in the Complaint Handling Guidelines for Hardwood Flooring in this section.

11. MISCONCEPTIONS AND UNREASONABLE EXPECTATIONS:
Site applied finishes should not be expected to achieve the same “fine” quality possible in the controlled conditions of factory production but should be sufficient for the application allowing for variations expected on older worn floors and the natural variations of timbers, when inspected from a normal viewing position.

RESOLUTION

In concluding an inspection and issuing a report it is obviously beneficial if a resolution agreed by all parties can be established and documented. The CFA would recommend the format on page 266 for documenting the evaluation of a floor.

Where an agreed resolution cannot be achieved, the CFA would propose that an independent inspection is carried out by a trade specific CFA consultant bound by a code of practice, with all parties agreeing to abide by the findings. The report generated by the contractor can be used as background information.

For installation issues only, CFA contractor and distributor members can benefit from the site inspection service offered to them. Further details of this service can be obtained by contacting the CFA on 0115 941 1126.

1. **The CFA assume no responsibility or liability and does not establish responsibilities or liabilities for third parties through the application of principles or techniques contained in this document. Local or national regulations may apply and should be reviewed. Compliance with mandatory requirements contained in Health and Safety regulations and compliance with COSHH Standards should be followed.**

2. **While every attempt has been made to ensure that this information is accurate and reliable at the time of its publication, we cannot accept responsibility for any errors, omissions, inaccuracies or any changes that have occurred since the date of publication or for the results obtained from the use of such information. E&OE.**

Further advice can be sought by calling the CFA office on 0115 941 1126.

NOTE: Please see page 266 for a template for creating a report following a site meeting. This template is allied to all the documents for complaint handing within section 21. The intention is to assist you in producing a professional report as a record of your investigation and in the spirit of resolving the problem without escalation.

TEXTILE FLOORCOVERINGS

This section provides practical guidelines for dealing with potential queries arising when handing over a newly laid textile (carpet) floor.

It may also be found helpful when dealing with concerns at a later date. It provides guidance for frequently asked questions relating to installation and the generic product and aims to provide a tool to help the flooring professional provide end users with an understanding of any common misconceptions.

It seeks to avoid unnecessary escalation of claims, providing a framework for either identifying a genuine complaint, or guidelines to which reassurance can be offered that the product and installation are of an acceptable standard against criteria that are reasonable to all parties.

OVERVIEW

The following relates to all inspections providing some basic principles for evaluation. If the floor does not meet these criteria, it is reasonable to assume that it is unsatisfactory. Conversely, conformity implies a generally acceptable floor.

1. **All installed flooring must conform to the relevant British or EU Standard both in terms of manufacturing tolerances and installation.**
2. **Visual effects (potential defects) should be inspected from a normal viewing position either standing or seated. When viewing the floor, only those features which would be immediately obvious to any independent party should be considered as potential issues. Careful positioning of backlighting, unusual viewing angles (crouching or kneeling, etc.) would not be considered reasonable criteria for identifying a visual defect. However, problems with the fitting of gripper and underlay, which could give rise to issues in the short or longer term, may require manual inspection and/or the uplift of some of the floor covering.**
3. **The overall appearance of the floor should be consistent (product and installation) unless intentional as part of the product design or pattern and therefore unavoidable.**

See further details on the following pages.

MEETINGS

The purpose of any meeting should primarily be to establish if the issue identified by the end user is related to manufacture, installation or expectation. Both the manufacture and installation of flooring are governed by Standards, so can be measured. However, expectation is not. So, any issues identified in this category require careful consideration and response.

All parties involved (e.g., client representative, main contractor, flooring contractor and all manufacturers involved in the flooring specification) should wherever possible be invited to attend site meetings to provide appropriate input and background information. It is also generally accepted as best practice and courtesy that any reports generated are also made available to the other parties.

NOTES ON EXPECTATION ISSUES

Expectation related issues must have a factual basis for them to be relevant i.e., the client can provide a clear evidence-based trail that they have been given a particular expectation, but the installed floor does not reach this expectation. It is a legal requirement for the product to be fit for purpose, of satisfactory quality, and as described. It is also reasonable to expect the flooring professional to give appropriate advice. This document cannot help resolving issues where the content of verbal advice is disputed, particularly as part of the sales process. See final section of this document relating to resolution for further guidance.

Expectation issues based on individual perception where the contractor and manufacturer have exercised the requirements described above would not be deemed as reasonable grounds for a complaint by the CFA. The above aims to establish a reasonable duty of care on all parties.

The following section is further guidance and specific information on product, installation faults and common misconceptions seen with textile floor coverings.

1. COLOUR, TEXTURE AND PILE DIRECTION
   Textile floor coverings, especially those with a pile, can vary in shade with the angle of viewing in relation to the pile direction. Where the pile direction turns there may be an apparent mismatch in shade. Over a period of time the pile direction may change in irregular areas due to the direction and pressure of use and this will result in a variable appearance in the floor covering.

   The process of manufacturing textile floor coverings may result in regular lines being apparent along the length of a carpet when it is first laid.

   New textile floor coverings may have regular shaded bands across the width due to pressure at the bottom of the roll during storage and handling. These will usually disappear as the pile settles and would not be considered a fault unless they do not reduce within the first 4-6 weeks of regular use and maintenance.

   Pile is soft and flexible. It will settle as a result of use and indentations will occur under heavy items or items with small points of contact with the floor covering.

   Wool carpets may change colour (fade) due to the natural effects of ultraviolet light within normal, indirect daylight and this is a characteristic of the fibre.

2. SEAMS
   Textile floor coverings are manufactured in standard width rolls and seaming of more than one piece of floor covering may be necessary due to the size of an area or to minimise the amount of material required. Seams should be closely butted with the pile securely held in place, but seams will be visible in most cases, especially with plain colours.

3. PATTERN MATCHING
   Patterned carpets can be matched by increasing the amount of material purchased to allow for this aspect at the planning and quotation stage.

4. UNDERLAY AND GRIPPER
   Whilst not visible to the user, underlay and gripper, where used, have a significant part to play in the long-term durability and appearance of a textile floor covering. Gaps in underlay could allow dust to be blown through the floor covering causing permanent soiling, incorrectly fitted gripper could cause loss of tension and puckering of the floor covering, etc.

5. **RETUFTING**
   During manufacture a textile floor covering is inspected and, if areas of missing tufts are found, new tufts are stitched in. If small areas of missing tufts are found in a fitted carpet this process can be done in-situ to bring the floor covering to the same quality and without detriment to the appearance of long-term durability of the floor covering. This can also be effective to deal with rogue tufts (tufts of a different colour) which may have been present in the yarn from which the floor covering has been manufactured.

   Occasionally tufts which have been bent within the floor covering during the manufacturing process can "sprout" and show as raised tufts. These can be simply trimmed flush with the pile surface without detriment to the floor covering.

   Looped pile textile floor coverings may get snagged. But snags should not be pulled further as the loops are linked and this will create a run in the carpet. Pulled loops can be trimmed to prevent further damage.

6. **SHEDDING**
   Natural fibres are relatively short and are twisted together into yarns. During the manufacturing process, short sections of individual fibres can be held in the pile, and these will shed from the floor covering during the initial period of use and maintenance. The volume of these shed fibres can be significant. Regular effective vacuuming is essential to avoid these shed fibres becoming attached to the pile surface.

RESOLUTION

In concluding an inspection and issuing a report it is obviously beneficial if a resolution agreed by all parties can be established and documented. The CFA would recommend the format on page 266 for documenting the evaluation of a floor.

Where an agreed resolution cannot be achieved, the CFA would propose that an independent inspection is carried out by a trade specific CFA inspector bound by a code of practice, with all parties agreeing to abide by the findings. The report generated by the contractor can be used as background information.

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SITE REPORT

Our ref:	Reference if allocated
Client details:	Site name, address, tel no and contact
Contractor details:	Contractor name/address/contact/tel number
Report created by:	Name of person generating report following site visit
Date of visit:	Date of site visit
Date of report:	Date of report
Persons in attendance:	Name of people who attended site meeting

The meeting should ideally include all parties involved and specifically the flooring contractor who should always be invited.

BACKGROUND

- The reason why the client is unhappy with the floor
- Background of the complaint to date
- Detail of the products installed and installation system
- Details of the location and use
- When the floor was installed and the size of the floor
- Any further background information

REPORT

- What you saw when you investigated the problem.
- Description of exactly where problem is occurring, i.e., localised, or all over the floor?
- Detailed information relating to anything that may be contributory factors, e.g., installation difficulties, site conditions, maintenance considerations, temperature-related issues, etc.
- Confirmation of prior conversations held on site that may relate to this issue.
- Detail of any tests undertaken on site, i.e., damp testing and results and if materials were lifted.
- Detail what was found, e.g., describing the spread of adhesive or the condition and makeup of the underlying subfloor.
- Confirm any restrictions in generating the report, i.e., if you were unable to lift materials to investigate.

Attach (or insert into document) any digital photographs to support your findings.

SUMMARY

- What do you believe are the prime causes of the client's dissatisfaction and a summary of supporting evidence?
- Any other comments relating to the installation and your general report below.

FURTHER ACTION

- What needs to be done to resolve the matter and what was agreed on site with those in attendance?

22 | Glossary

Base	Supporting structure to which the floor covering is to be applied.
Bonded screed	Screed that is bonded to the base.
Chipboard	See “Particleboard”.
Concrete base slab	Concrete slab cast as part of the building construction.
ERH (Equilibrium Relative Humidity)	Moisture migration from a material into the atmosphere and vice versa continues until stabilisation of the vapour pressures of water (inside the material and in the atmosphere inside a trapped pocket of air). When this equilibrium is reached, the moisture content of a material can be expressed in Equilibrium Relative Humidity (ERH).
Fabricated underlay	Wood-based panel applied to a subfloor/base to provide a smooth, even surface suitable for the installation of a floor covering.
Ideal drying conditions	A suitable level of temperature and RH% (i.e. <20°C & <65%RH) to promote drying of a material by vapour pressure, from a material with higher moisture to an atmosphere of lower moisture.
In-service moisture condition	The moisture content which the material will hold when it has achieved equilibrium with its intended surroundings, i.e., hospitals and nursing homes will achieve lower RH% than a normal domestic environment.
Levelling screed	Screed finished to obtain a defined level and to receive the final flooring.
Oriented Strand Board (OSB)	Also known as sterling board, a wood-based panel sometimes used for subfloors in the UK is similar to particle board, formed by adding adhesives and then compressing layers of wood strands (flakes) in specific orientations.
Particleboard	A wood-based panel that is commonly used for subfloors in the UK. Particleboard is made from particles of wood and formed under heat and pressure to cure the resin binder.
Power floated concrete	A power floated concrete floor is one that is finished using a power trowel to level and harden the floor's surface. Power floating is generally used for concrete surfaces that are expected to see heavy usage, such as warehouses. Power floated concrete surfaces must be shot blasted or sanded prior to applying a bonded covering to achieve a “key”.
Screed	Cement and sand/or calcium sulphate topping applied over concrete base slab and finished to receive the floor covering.
Smoothing compound	See “Smoothing underlayment”.
Smoothing underlayment	Smoothing and/or self-smoothing compound applied to subfloor to achieve a smooth, flat or level surface, suitable for the installation of the floor covering.
Subfloor	See “Base”.
Unbonded screed	Screed laid either onto a separating layer or onto a base not prepared to achieve bonding

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