

Carpet tiles

Supporting:

MSFFL3059:

Install carpet tiles



Learner guide

Version: November 2018



Carpet tiles

Learner guide



This Learner Guide is part of a suite of resources developed by Industry Network Training and Assessment Resources (INTAR) for learners undertaking the *Certificate III in Flooring Technology* (MSF30813).

Its purpose is to help apprentice floor layers, sales staff and other workers to acquire the background knowledge needed to satisfy the theoretical components of the competency covered by the resource.

It is not designed to replace the practical training necessary to develop the hands-on skills required.

This Learner Guide was developed for the National Flooring Trainers Network (NFTN), with funding provided by the Carpet Institute of Australia Limited (CIAL).

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In all cases, users should consult the original source documents before relying on any information presented in the resource.

These source documents include manufacturers' installation guides, Australian Standards, codes of practice and other materials produced by specialist industry bodies and government agencies.

About the Flooring Technology project

The Flooring Technology project is an ongoing resource development venture coordinated by INTAR to assist apprentice flooring installers undertaking the *Certificate III in Flooring Technology*.

For more information about INTAR, and to see the full range of Flooring Technology units available under this project, go to the following website and follow the links:

www.intar.com.au

For more information on the background of the Flooring Technology project, and the funding bodies, organisations and individuals that have been involved in its development work over the years, go to the following website and follow the links:

www.workspacetraining.com.au

Acknowledgements

All line drawn graphics were produced by Kath Ware (Workspace Training). Many of these graphics are based on drawings or photographs from installation manuals published by carpet manufacturers. The following manuals were used extensively as a reference source:

- Interface Installation Guide
- Ontera Wellbac Carpet Tiles Recommended Installation Guidelines.

Most of the on-site photos were taken by David McElvenny (Workspace Training). Many of these feature Hunter TAFE flooring apprentices, under the direction of Craig Bennett, demonstrating various carpet tile installation techniques. Craig Bennett supplied other on-site photos.

Photos showing completed carpet tile installations were supplied by the Carpet Institute of Australia Limited (CIAL) and display various products manufactured by CIAL member organisations.

Some of the photos used in Section 1 of this Learner guide come from other Learner guides in the Flooring Technology suite of resources and are acknowledged in those guides. See the 'Introduction' chapter for the list of references to these background resources.

Technical advice and support

In addition to the people and organisations named above, many TAFE teachers, RTO trainers and industry experts were involved in the development of this training resource. Below are the members of this project group.

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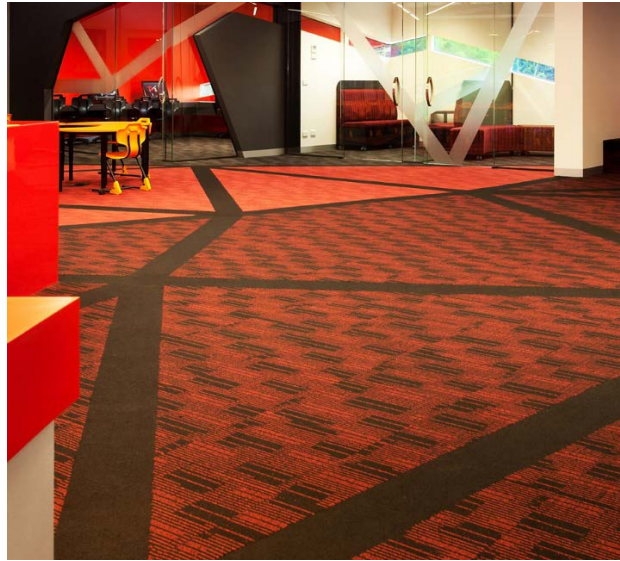
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Introduction

Carpet tiles are also called ‘modular carpet’, because they are manufactured in modules that are laid individually.

Most tiles are either square or rectangular (called ‘planks’). However, they can also be made in other shapes, such as hexagonals and triangles.

Since the 1980s, carpet tiles have made substantial inroads into the broadloom market share, and they now account for at least one third of all commercial carpet sales.



Carpet tiles are available in a huge range of colours and designs, and can be laid in creative ways to produce many different patterns and artistic effects.

Individual tiles can also be replaced easily in any areas of a floor that have become worn over time or damaged by stains. This makes them an excellent choice for high traffic areas or applications where they will be subjected to spills or abuse.

In this unit, we will look at the tools, materials and techniques used by flooring installers to lay carpet tiles.

By this stage of your training, you'll probably have completed several other units from the *Certificate III in Flooring Technology* relating to subfloor preparation, on-site safety, reading plans and completing work documents.

These topics are summarised in Section 1 of this Learner guide in the context of carpet tile installations.

Pre-requisite units

There are no formal pre-requisite units specified for the unit of competency: *MSFFL3059 Install carpet tiles*. However, you will find it easier to undertake this unit if you have already acquired the skills and knowledge covered in the units listed on the next page. These units all form part of the Flooring Technology series.

If there are any of these units that you haven't yet completed, speak to your trainer about the extra background information you'll need to help fill in the gaps.

Learner guide title	Units of competency covered
Safety at work	<i>MSAPMOHS200A: Work safely</i> <i>MSFFL3002: Establish and maintain a safe flooring technology work environment</i>
Inspecting and testing subfloors	<i>MSFFL2004: Moisture test timber and concrete floors</i> <i>MSFFL3003: Inspect sub-floors</i>
Subfloor coatings and toppings	<i>MSFFL2006: Prepare, select and apply smoothing and patching compounds</i> <i>MSFFL2007: Select and apply appropriate compounds and additives</i> <i>MSFFL2009: Select, prepare and apply moisture barriers and damp proof membranes to concrete sub-floors</i>
Preparing floor coverings	<i>MSFFL2002: Receive and prepare floor covering materials for installation</i>
Making measurements	<i>MSFGN2001: Make measurements and calculations</i>
Work documents	<i>MSFGN3001: Read and interpret work documents</i>
Hand and power tools	<i>MSFFL2001: Use flooring technology sector hand and power tools</i>
Carpet basics	<i>MSFFL2017: Install carpet cushion underlays and gripper accessories</i> <i>MSFFL2018: Install unpatterned tufted and bonded carpet floor coverings</i>

Working through this unit



There are three sections in this unit:

- *Preparing for the installation*
- *Carpet tiles, underlay and adhesives*
- *Installation procedures*

Each section contains a set of lessons, covering the background theory for that topic. At the end of each lesson is a 'learning activity'. You should use the Workbook for this unit to write down your answers to these learning activities.

Your final assessment of competency in this unit will include various practical demonstrations. To help you get ready for these hands-on assessment activities, see the performance checklists shown in the *Assessment criteria* section at the back of this Learner guide.

Section

1

Preparing for the installation



Overview

The preparations that apply to carpet tile installations are similar to the preps you need to carry out for broadloom carpet installations.

It is likely that you will already have completed the 'Carpet basics' unit and various other units relating to subfloor inspections and preparations.

If so, you may skip over the material shown in this section, since it is only a summary of the main points relating to these topics that you'll have previously covered.



However, if you need to refresh your memory on the details, you should read through this section, because these topics are still crucial to the successful installation of carpet tiles.

In particular, check the chapter titled 'Tools and equipment' in Section 1, since there may be some tools listed here that you haven't used before in your installation work.

Completing this section



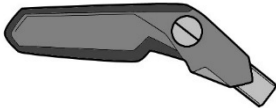
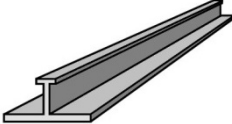


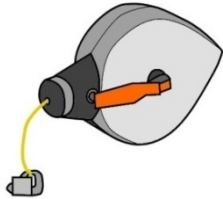
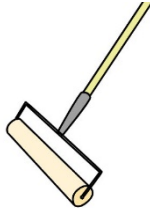
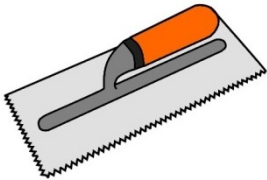
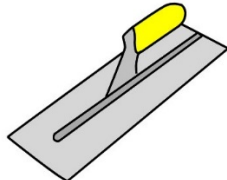

There are four lessons in this section:

- *Tools and equipment*
- *Health and safety*
- *Documentation*
- *Assessing the subfloor.*

You should use the separate Workbook to complete the 'learning activity' at the end of each lesson.

Tools and equipment

Below is a summary of the basic tool kit needed to lay carpet tiles in most circumstances. Note that not all installers use all of these tools, and some installers may use other items that are not shown here.

 <p>utility knife</p>	 <p>straight edge</p>	 <p>square</p>
 <p>tape measure</p>	 <p>chalk line</p>	 <p>10mm nap Paint Roller</p>
 <p>notched trowel</p>	 <p>flat trowel</p>	 <p>35-45 kg roller</p>

Learning activity



Are there any tools above that you don't use in your own on-site installations? Which ones are they?

Are there any additional tools that you do use, that aren't shown here? What are they, and what do you use them for?

Health and safety

You may already be carrying out an on-site risk assessment before you begin a new job, particularly if you do a lot of commercial work.

Even if you don't complete a formal risk assessment document, you're no doubt familiar with the process of signing onto a Safe Work Method Statement (SWMS) or Job Safety Analysis (JSA).

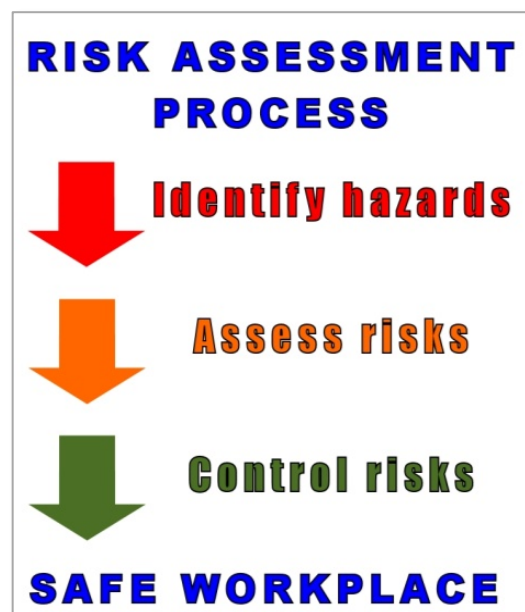
Some flooring installers think that the whole concept of doing a risk assessment only applies to big jobsites or commercial projects, and that on smaller domestic jobs everyone can relax and forget about it.



But the fact is that every professional operator utilises the basic risk assessment process on every jobsite they go to, regardless of its size, and regardless of whether they're required to record the outcomes on a template document.

This is because the three basic steps are actually very simple to carry out, and compared to the effort that's required, the rewards are huge in terms of avoiding injuries and other problems that might cause you grief. This means that even on the smallest domestic job in someone's home, you should still take the time to:

1. **Identify the hazards** – that is, look around and note anything that might cause a problem.
2. **Assess the risks** – decide on how serious each hazard is that you've noticed, and whether you should remove it or manage the issue in another way.
3. **Control the risks** – take steps to minimise the chance of that hazard causing an incident that results in injuries, damage or some other type of harm. If the potential outcomes are serious, put more thought into your control measures. If they're not so bad, don't spend as much time on the solution.



We've talked a lot about the various hazards that apply to particular tasks relating to working on-site, preparing subfloors and installing carpet in several other units from the Flooring Technology resource.

Below is a summary of the main safety issues relevant to the installation of carpet tiles, together with the units they are discussed in. You should go back over these topics if you need to refresh your memory on them, because you will be assessed on all of these factors when you undertake the practical demonstration events for this unit.

- **Manual handling** – including how to lift and carry heavy loads – see: *Safety at work*
- **Knee problems** – including injuries and chronic conditions caused by working on your knees – see: *Safety at work*
- **Dust and fumes** – including dust from subfloor preparations and fumes from primers and adhesives – see: *Subfloor coatings and toppings*
- **Skin contact** with hazardous substances – including cement-based products and solvents – see: *Subfloor coatings and toppings*
- **Personal protective equipment** – including eye protection, ear protection and other items of PPE needed on-site – see: *Safety at work*
- **Knife safety** – including the techniques for using a utility knife – see *Carpet basics*.

Learning activity



Below are some of the hazards you're likely to face on a jobsite while carrying out a carpet tile installation.

For each hazard, state what 'risks' they might pose to people's health and safety, and what 'control measures' you would put in place to minimise the risks.

1. Other people on-site who might walk through your installation area without realising that you're working there.
2. Boxes of carpet tiles that need to be moved from the truck into the work area.
3. Working in a room with poor ventilation.
4. Tools, offcuts and other building items scattered around the floor.

Documentation

The last thing any flooring installer wants is to put a lot of time, effort and hard work into an installation job, only to be told that the client isn't happy because something wasn't done according to their original specifications.

Good quality documentation is crucial to getting the job done properly, and being confident that you've correctly understood the requirements before you start the project.

Sometimes problems arise because certain details have been left out of the documents, and the installer has filled in the missing information with their own assumptions.



Other times it's because the installer simply didn't read the documents properly, or misunderstood what they were saying.

That's why it's so important that you check the work documents carefully before you load your vehicle and go out to the jobsite. If anything doesn't look right, or there are details that you don't understand, you should always check with someone who is authorised to give you the right information.

We have discussed the functions and make-up of the following types of workplace documents in the following units from the Flooring Technology resource. You should go back to these units if you need to refresh your memory on any of the details:

- **Floor covering plans** – see *Planning and costing and Carpet basics*
- **Job sheets** – see *Carpet basics*
- **Warranties and maintenance advice** – see *Carpet basics*
- **Work documents in general** – including building plans, SWMSs, SDSs and Australian Standards – see *Work documents*.

Learning activity



What is the purpose of a SWMS (safe work method statement)?

Why is it the case that on large commercial jobsites everyone has to sign the SWMS before they start work?

Assessing the subfloor

Good substrate preparation is essential in any floor covering installation.

We have covered this topic in several other Learner guides in the Flooring Technology series, in particular:

- *Inspecting and testing subfloors.*

We've also talked a lot about the different subfloor types and the problems you might encounter when preparing the substrate for a new covering.



If you need to refresh your memory on particular subfloor assessment and preparation techniques, go to the following topics in these units from the Flooring Technology resource:

- **Priming, patching, levelling and preparing different subfloors** – see: *Subfloor coatings and toppings*
- **Grinding techniques and equipment** – see: *Concrete grinding*
- **Moisture testing, inspecting and descriptions of subfloor structures** – see: *Inspecting and testing subfloors.*

Below is a checklist of the questions you should ask yourself before commencing a carpet tile installation. This checklist is similar to the one shown in the *Carpet basics* unit, with a few extra points that relate specifically to the use of adhesives.



Always keep in mind that as the flooring installer, it's your responsibility to decide whether the subfloor is suitable and has been adequately prepared.

If you're worried that the substrate isn't suitable, or that there is an underlying problem that might cause trouble later on, don't ignore it. Check with your supervisor or manager before going ahead. Everyone will be thankful in the long run, even if it means that there'll be a delay while the problem is fixed.

Questions to ask yourself

General issues

- *Is the substrate smooth and flat?*

AS/NZS 2455.1 has minimum standards for 'planeness' and smoothness'.

The **planeness** standard says that when a 3 metre long straight edge is placed on the surface at any position, no part of the surface is allowed to be more than 5 mm below the straight edge.



The **smoothness** standard says that when a 150 mm long straightedge is placed on the surface at any position, no part of the surface is allowed to be more than 1 mm below the straightedge.

Indentations, ridges and dents can sometimes show through to the surface of carpet. Ridges also tend to create wear points in areas where there is regular foot traffic or movement of furniture.

- *Is the surface free from dirt, oil, adhesive residues and all other contaminants?*

Dust and other substances on the surface will interfere with the strength of adhesive bonds in stick-down installations. Some contaminants will also degrade the carpet over time.

Concrete subfloors

- *Are the relative humidity (RH) and alkalinity (pH) levels within the allowable limits?*

Excessive moisture in the concrete subfloor can cause the carpet to change shape over time, and also allow fungal spores to develop.

There are limits set for RH and pH, both in the Australian Standards and in the flooring manufacturers' own installation instructions.

The only time you should over-ride these specifications is when an approved moisture barrier is being installed.



- *Is the substrate sound and free from loose, powdery or scaly material?*

If the substrate is concrete and you are planning to use adhesives, the surface must be sound and sufficiently porous to allow the adhesive to bond properly.

If it's not in good condition, the affected layer will need to be removed and resurfaced.

- *Are there expansion joints in the floor?*

Expansion joints need to be in good condition and free from dirt or obstructions. You'll need to keep them clear and finish them off with approved cover strips.

Don't get mixed up with relief cuts that have been put into the concrete to stop it from cracking during the curing process. These will be a 5 mm wide saw cut, and can be filled with a suitable compound.

- *Have heating elements been installed in the floor?*

Floor covering manufacturers provide recommended limits for the temperature of the subfloor. Make sure the heating elements will not exceed this temperature, and follow the specific instructions relating to substrate preparation for heated floors.

Wooden subfloors

- *Is the existing floor properly supported and well secured?*

Any structural problems or loose boards should be fixed before the installation begins, especially squeaky floorboards or springiness in the floor surface.

- *Are there gaps between boards, protruding nail heads or other surface defects?*



Gaps, ridges, cupped boards, protruding nails, and other defects will 'telegraph' through to the surface of the floor covering.

In general, structural floors made from plywood and strip flooring need to have a hard underlay placed on top to provide a flat smooth surface.

- *Is the subfloor ventilation adequate and in compliance with the relevant standards?*

Check that the air vents provide sufficient ventilation and that the subfloor cavity meets the minimum requirements for clearance between the floor and the ground.

- *Has the moisture content (MC) been checked and is it within the allowable limits?*

The moisture content of structural members and floor boards or sheets must all be within the allowable MC range. There must also be no evidence of plumbing or stormwater leaks that might have a long-term effect on the MC.



Existing floor coverings



As a general rule, it's best not to glue carpet tiles over the top of an old resilient or rubber floor.

One reason is that you would be depending on the old adhesive under the original covering to remain sound and not separate from the subfloor.

Another reason is that the new adhesive may not stick well to the top of the resilient covering, especially if it has old polish or ingrained contaminants on the surface.

Having said that, it is possible to apply an 'embossing leveller' to some existing floor surfaces, including resilients and quarry tiles, as a preparation for the new adhesive. Different levelling compounds are used for different types of substrates, so you need to make sure you select the correct one for the materials you're working with.

Learning activity



Why is subfloor moisture content an important consideration when you're laying carpet tiles?

What are the main problems that might occur in a carpet tile installation if the moisture content in the substrate was too high?

Section **2**

Carpet
tiles,
underlay
and
adhesives



Overview

The first carpet tiles were made in the 19th Century using pig's bristle for the yarn and bitumen as a backing.

Since that time, the range of materials used in tile manufacture have increased enormously, along with the patterns, shapes and performance characteristics available.

Adhesives have also come a long way, with many new products now on the market that are safer to use and more environmentally friendly.



In this section, we'll look at the construction of carpet tiles and materials used in their manufacture. We'll also discuss the pressure sensitive adhesives used and the underlay products applicable to modular carpet installations.

Completing this section



There are three lessons in this section:

- *Carpet tile construction*
- *Adhesives*
- *Underlay.*

You should use the separate Workbook to complete the 'learning activity' at the end of each lesson.

Carpet tile construction

Tufted carpet is by far the most common pile used for carpet tiles, making up over 90 percent of all modular carpet sold.

The other types of pile used in carpet tiles are needle punched and fusion bonded.

Let's look at each of these products in turn.

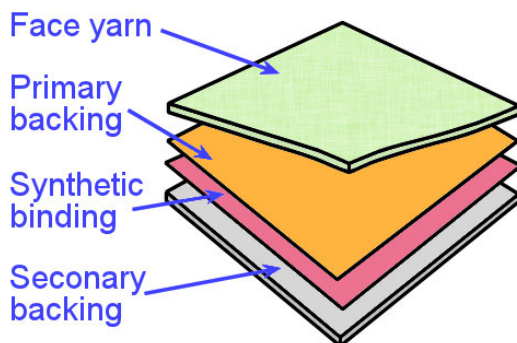
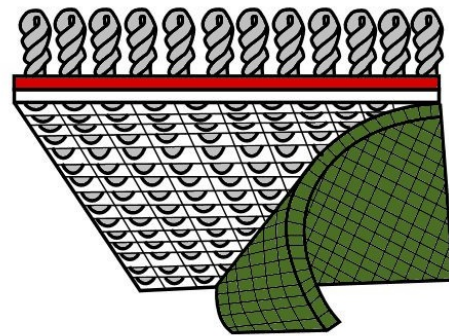


Tufted carpet

'Tufting' refers to the process of inserting tufts of **yarn** into a backing cloth with a needle.

Most products use a **nylon** yarn, although you may occasionally see polyester or wool in particular products.

Coloured yarn is generally 'solution died' (SD) before the tile is manufactured.



The yarn is held in place by the **primary backing**, and secured with an adhesive binding.

The materials used in primary backings include glass fleece, polypropylene or polyester.

A **secondary backing** is used to give the carpet tile extra strength and dimensional stability. In cushion-backed tiles, it also provides the padding.

Secondary backing materials include bitumen, PVC (polyvinyl chloride), polypropylene and glass fleece. Cushion-backed carpets generally have a polyurethane, PET (polyethylene terephthalate) or SBR (styrene-butadiene rubber) foam backing.

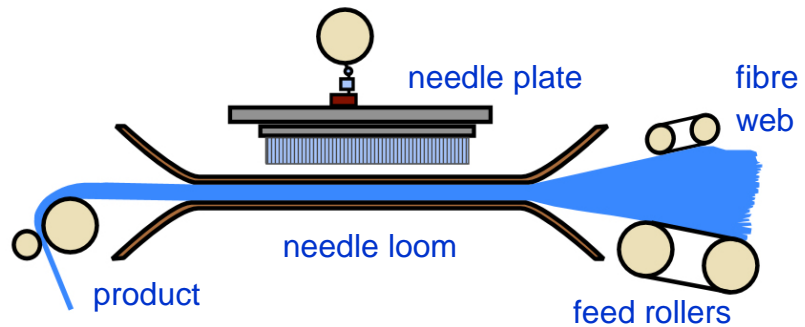
Recycled products are increasingly being used in the manufacturing process, and it is now common for at least 50% of the content to be derived from recycled materials.

Needle punched carpet

Needle punched carpet tiles tend to be used more in temporary installations, such as short-term set-ups in exhibition halls. In general, they are not suitable for the contract market.

The manufacture of needle punched carpet begins with the **fibres** being laid into a web.

The web is fed into to the **needle loom** by feed rollers and passed between two plates.



As the web passes through the loom, the needle plate moves up and down, allowing the needles to penetrate the web through corresponding holes in the plates. This process entangles the fibres and forms the carpet tile surface.

The underside of the material is sprayed with a 'sizing' adhesive to give the pile surface extra stiffness and body. A secondary backing is also laminated to the underside to provide the required amount of cushioning and improve the carpet tile's strength and dimensional stability.

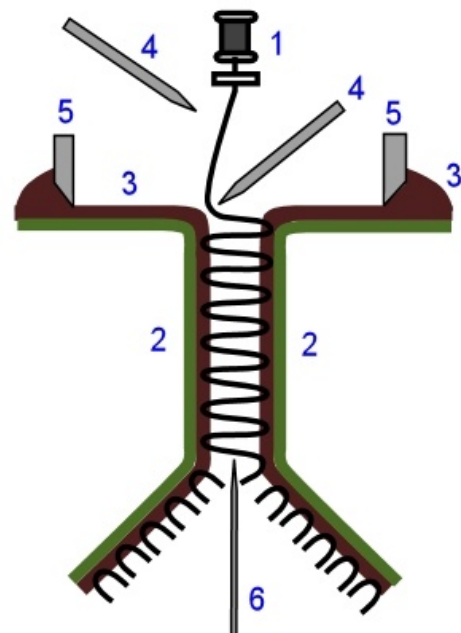
Fusion bonded carpet

The main difference between bonded carpet and tufted carpet is that fusion bonding relies entirely on the adhesive layer to hold the pile material in position – the yarn does not penetrate the backing fabric at all.

Bonded carpet is made by lapping the **pile yarn** (shown as 1 in the drawing at right) backwards and forwards between two backing materials (2) coated with adhesive (3).

The yarn is implanted into the adhesive with pleating blades (4), and the adhesive thickness is controlled by a glue scraper (5).

Once the adhesive has set, the 'sandwich' is then split down the centre with a knife (6) to form two separate carpets.



Antimicrobial treatments



Carpet tiles used in hospitals, nursing homes and other health care settings generally have an antimicrobial treatment incorporated into the yarns, precoat or backing system.

The chemical treatment helps to protect the carpet against the spread of moulds, mildew, bacteria and odour-causing microorganisms, especially where the carpet edges meet.

Learning activity



Choose one carpet tile product you are familiar with and do some research on its properties and the materials used in its manufacture.

Provide the following details about the product:

- brand name and manufacturer
- pile texture, and type of fibre used in the yarn
- materials used in the primary backing and secondary backing
- any other features, such as whether it has an antimicrobial treatment or particular properties that make it suitable for certain types of installations.

Adhesives

Most carpet tile installations use a **pressure sensitive** adhesive. This allows individual tiles to be pulled up and replaced easily at a later time.

However, there are times when a permanent bond is preferable, such as on ramped walkways or vertical walls.

The amount of adhesive you use will depend on the type of traffic the floor will be subjected to.

For example, you would apply more adhesive to areas that need to withstand heavy-duty traffic from wheeled items like pallet jacks, hospital beds and delivery dollies.



To achieve a **releasable bond**, the adhesive needs to be given time to dry, or **'tack up'**, before the tiles are placed in position. For a **permanent bond**, the tiles are placed into the **semi-wet** adhesive.

The set-up time depends on a range of factors, including temperature, humidity and the porosity of the substrate surface. It also depends on the chemical make-up of the adhesive itself. For more details on the properties of adhesives, see the unit: 'Adhesive fixed carpet'.

Priming the subfloor

For porous substrates, such as concrete, the surface generally needs to be primed before the adhesive can be applied. The adhesive manufacturer will specify the type of primer that must be used and the preparation required.

Spreading the adhesive

The adhesive manufacturer will specify the most suitable methods for spreading the adhesive.

This may vary depending on the size of the floor area, the type of adhesive being used and the porosity of the substrate surface.



Techniques can include:

- rolling with a long nap roller
- spraying with an airless spray gun
- spreading with a U shaped or V shaped trowel.

Adhesive-backed tiles

Adhesive-backed carpet tiles have an adhesive impregnated into backing. The adhesive is covered by a protective sheet which is peeled off when you're ready to lay the tile in place. We'll talk more about this procedure in Section 3: Installation principles.

Other systems

There are some new products on the market that do away with the need for a liquid adhesive and instead use other methods for fixing the tiles in place.

One example is TacTiles connectors, made by Interface (shown in the photo at right), which create a 'floating floor' by joining the tiles to each other with adhesive squares.

Another example is LokDots, made by Shaw Contract, which comprise pressure sensitive dots that are applied to the underside of the tile with a hand-held applicator.



Learning activity



Choose one full-spread pressure sensitive adhesive and one other product used for securing carpet tiles. Provide the following details for each adhesive system:

- brand name and manufacturer
- type of adhesive (in terms of its chemical composition)
- recommended installation method
- tack-up time (where applicable).

Underlay

Although it's common to install carpet tiles directly onto the substrate surface, an underlay can be used in situations where extra cushioning is required.

Tile underlays are generally 3 to 4 mm thick and are made of high density rebond foam, cork, or rubber latex.

To avoid any problems in your installations, you should always use the underlay specified by the carpet tile manufacturer.

Note that broadloom carpet underlays are not suitable for tiles. Some manufacturers also don't recommend the use of a separate underlay at all.



Problems that can occur if you use the wrong underlay include: curling of tile edges, wrinkling of tiles over time, and movement of individual tiles. You may also void the warranty offered by the manufacturer if you don't use the recommended underlay.



Most installations that incorporate an underlay are carried out using a dual bond system. The underlay can either be stuck down with a full-spread adhesive or with an embedded 'peel and stick' adhesive on the back of the underlay.

On subfloors that have ridges, grooves or other imperfections, a hard underlay can be used to achieve a smooth flat surface.

These include products such as MDF (medium density fibreboard) and fibre cement sheets. The Australian Standard describes the installation requirements for hard underlays in **AS/NZS 2455.1; Clause 1.5.2 Underlays**.

Learning activity



Choose one cushion underlay product and one hard underlay product suitable for use with carpet tiles. For each one, provide the following details:

- brand name and manufacturer of the product
- type of underlay, thickness, and composition.

Section **3**

Installation procedures



Overview

From an installer's perspective, carpet tiles are often easier to install than broadloom carpet.

This particularly applies to offices, public facilities and other commercial situations where there are fixtures, work stations or other obstacles that you need to work around on the floor.



AS/NZS 2455.2–2007

Australian standard®

Textile floor coverings:

Installation practice - Carpet tiles



There is also much less waste when you're cutting and fitting the tiles, since the modular units are a more efficient size to work with, especially when the floor shape is unusual.

The Australian Standard requirements for carpet tile installations are set out in Part 2 of AS/NZS 2455.

We'll make reference to the relevant clauses from the Standard as we discuss the installation procedures in this section.

Completing this section

There are eight lessons in this section:



- *Preparing the subfloor and room*
- *Installing the underlay*
- *Setting out the working lines*
- *Interpreting tile product details*
- *Laying square tiles*
- *Laying other tile shapes*
- *Motifs and custom designs*
- *Finishing the installation.*

You should use the separate Workbook to complete the 'learning activity' at the end of each lesson.

Preparing the subfloor and room

The carpet tile manufacturer will have an installation manual that sets out the preparation requirements for the subfloor surface and room conditions.

These requirements will vary depending on the products you're installing and their intended end-use.

Below is a summary of the typical requirements for common carpet tile installations.



However, you should always read the manufacturer's instructions before you use any product for the first time, just to be sure that you're doing the job properly. This will reduce the chance of anything going wrong during the installation. It will also help to protect you if a problem arises at some later time and the customer wants to lodge a warranty claim.

Remember, the manufacturer will be on your side if you have followed their instructions and complied with all necessary standards, but you won't have any comeback if you decide to take shortcuts or do the job your own way.

Conditioning the room and materials



Most manufacturers specify an ambient temperature range of about 15 to 30 degrees, with a relative humidity of 40 to 60 percent. This should be maintained for at least two days before and after the installation period.

If there is a heating or air conditioning system, it should be turned on and allowed to run for the full duration, in order to keep the temperature and humidity levels reasonably constant.

The carpet tiles should be taken out of their boxes and allowed to acclimatise to the room temperature and humidity for 48 hours before you begin the installation.

Preparing the subfloor surface

The subfloor surface must be clean, dry, flat and in a sound condition. In Section 1, we talked about these considerations in the chapter: 'Assessing the subfloor'.



Concrete subfloors should be checked for **moisture content** and **pH** levels, to ensure they are within an acceptable range.

The recommended levels and condition of the subfloor will be set out in the carpet manufacturer's installation guidelines.

Depending on the products you'll be installing, you may need to prime the subfloor with an approved primer. The primer manufacturer will specify the appropriate methods for applying the primer in their technical data sheet. The most common methods use either a spray gun or a long nap roller.

The entire installation area should be coated with primer, and then left to dry. Depending on the product, it could be as quick as 10 to 20 minutes.

If the subfloor surface is very porous, you might need to apply two coats. Again, this requirement will be described in the data sheet for the product you're using.



Learning activity



Select a specific carpet tile product and get a copy of the manufacturer's installation guidelines. Ideally, you should choose one of the products you will be installing for your practical demonstration assessment activity in this unit.

Answer the following questions about the tile product, using the manufacturer's guide as your reference source:

- What is the minimum acclimatisation period in the room?
- What is the specified ambient air temperature range and relative humidity in the room?
- What is the specified temperature range and maximum relative humidity in the subfloor at installation time?
- What other recommendations does the manufacturer provide in relation to the site conditions or preparation of the carpet?

Installing the underlay

If you're carrying out a **double bond installation**, you will lay the underlay first and then set out the working lines for the tiles on top of the underlay.

On the other hand, if you're doing a **direct stick**, you will skip the underlay installation and start setting out for the tiles on the subfloor surface (see next chapter).



Before you apply adhesive to the subfloor to stick down the underlay, you'll need to plan the layout of the material and trim it to size.

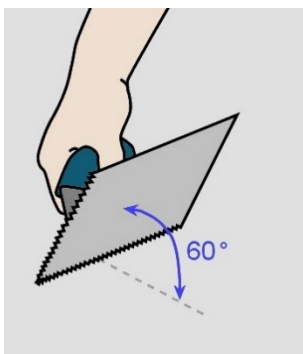
You'll also need to give the underlay time to acclimatise to the humidity in the room, and 'relax' as its moisture content adjusts to the surrounding air.

Depending on the product and the manufacturer's recommendations, the acclimatisation period might be three hours or even overnight.

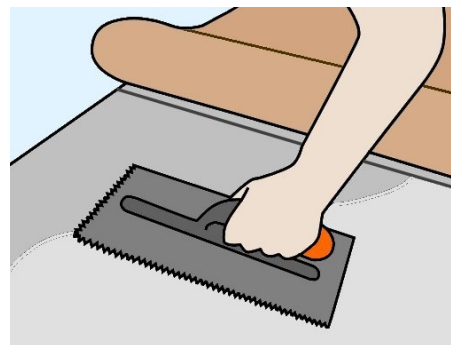
Installing the underlay

Trim the underlay to fit around the perimeter walls, and make sure any seams are butted neatly.

Fold one half of the underlay back on itself to expose the subfloor underneath.



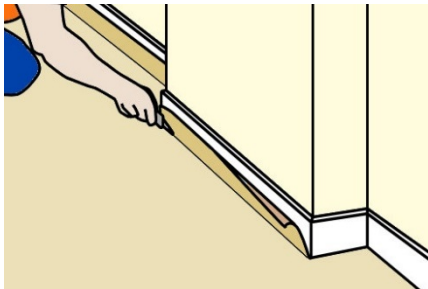
Pour a quantity of adhesive on the floor and spread it with a notched trowel.



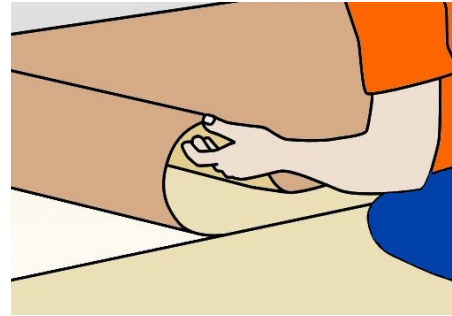
Make sure you use the correct trowel size, as specified by the adhesive manufacturer.

Remember to hold the trowel at 60 degrees to maintain the right consistency, and go right to the edges and into corners.

Wait for the adhesive to 'tack up', and then carefully lay the folded-back underlay into position on the adhesive.



Use the same procedure on the other half of the underlay.



Then trim in the underlay around the perimeter.

Most underlay manufacturers recommend that you use a roller – generally 25 to 35 kg – to roll out any bubbles or wrinkles.

Work from the centre towards the perimeter of the floor area and apply a smooth, even pressure.

Make sure the underlay seams are tight but not overlapping.



Learning activity



Choose a specific underlay product suitable for use under carpet tiles. If your practical demonstration assessment activity includes the installation of an underlay, you should select that product for this learning exercise.

Answer the following questions about the underlay, using the manufacturer's guide as your reference source:

- What are the recommendations concerning acclimatisation of the underlay?
- What are the recommendations regarding smoothing out bubbles or wrinkles for a dual bond installation?

Setting out the working lines

Carpet tiles should be laid parallel to the longest wall in the room, unless you have made other arrangements with the client.

The starting point is generally near the centre, although this may vary depending on where the doorways are and whether there are partitions or other features that will need to be allowed for.

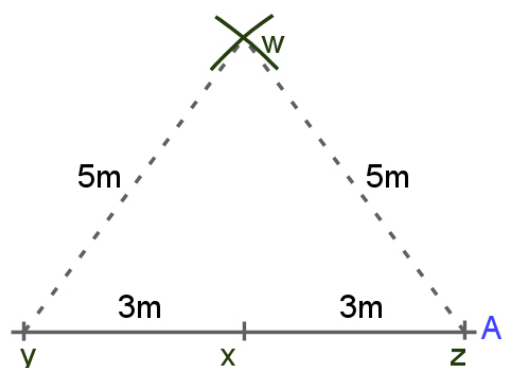
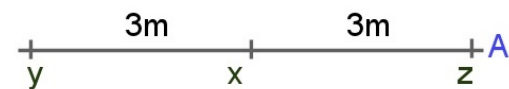
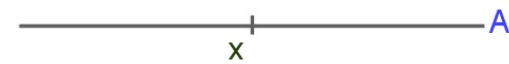
AS/NZS 2455 specifies that perimeter tiles should be at least **one third** of the full-tile width, and that doorways and high traffic areas should have full (uncut) tiles where possible.



Room set-out

Here is the procedure for setting out the working lines and starting point in a normal room.

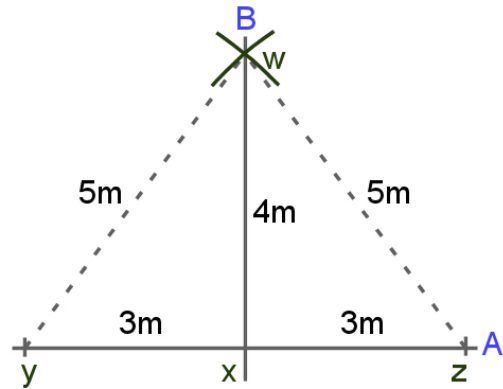
1. Mark a chalk line (A) parallel to the longest wall
2. Mark a point (X) about half way along line A, adjusting it to ensure that the perimeter tiles will be at least one-third width and that uncut tiles will fall in the doorways, where possible.
3. Mark two points (Y and Z) 3 metres either side of point X.
4. Scribe an arc with a 5 metre radius from both Y and Z to find the point where they intersect (W)



5. Mark a chalk line between W and Z to achieve a line (B) at right angles to line A.

If you remember your geometry from the unit 'Making measurements', you will know that we have just used the '3, 4, 5 Rule', also known as Pythagoras's theorem.

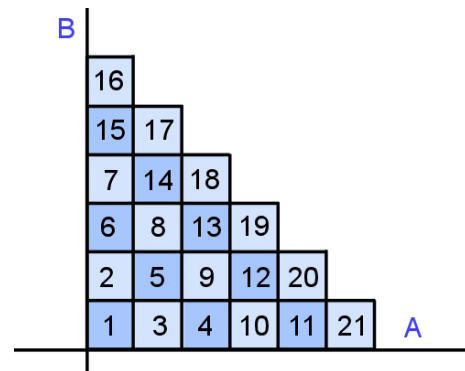
This rule states that any triangle drawn in the proportions of 3, 4 and 5 will form a right angle between the two shorter sides.



In fact, as long as the proportions stay the same, you can use any measurements you like.

When you lay the tiles, start at the centre point and build up the tiles in a triangular pattern, as shown at right.

When you have completed the quadrant, start on the next one, and work around all four quadrants in turn.



Elevator shaft

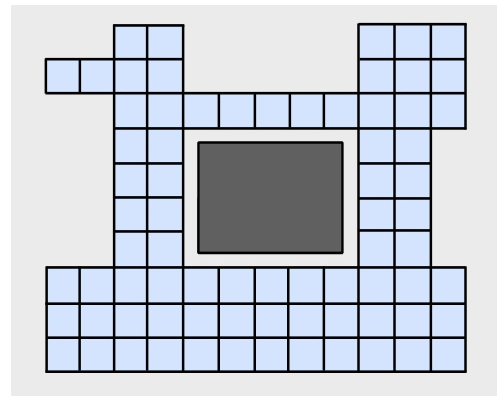
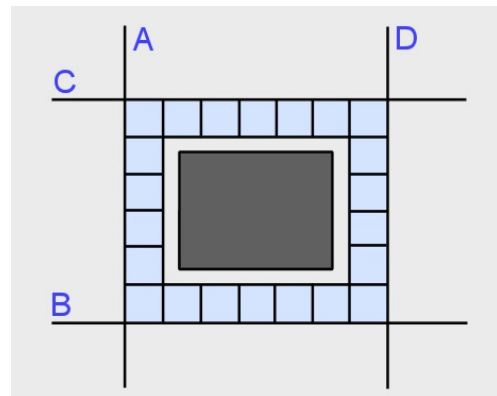
If you have an elevator in the centre of an area or other 'hollow square' that needs to be set out, use the following procedure:

1. Mark out lines A and B.

Make sure that there is at least a full tile and one-third tile between the line and the internal wall.

Check that the two lines intersect at 90 degrees.

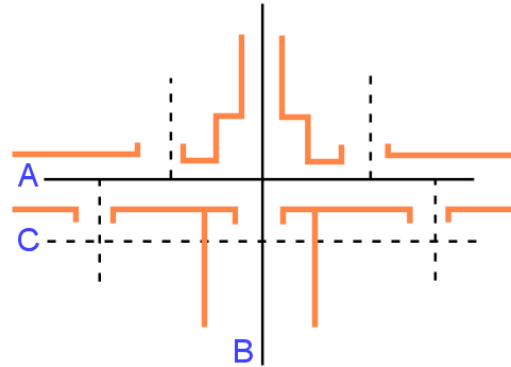
2. Mark out two more lines around the elevator shaft so that they are parallel with A and B.
3. Lay the tiles in quadrants.



Office complex

For an office complex with internal partition walls:

1. Establish a crossover point and mark lines A and B. Check that they intersect at 90 degrees.
2. Lay a row of tiles on either side of line A and stick them down.
3. At the entrance to each office, mark a new line at right angles to A (shown here as dotted lines through doorways)



Inside each room, you will need to establish another line at right angles (shown here as C).

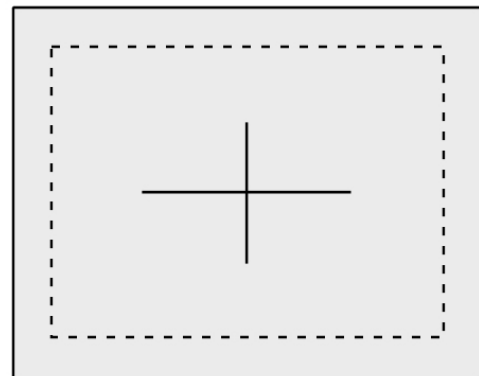
4. Finish laying the tiles through the corridor, including the cutting along the walls.
5. Lay the tiles into each office, building them up in a triangular pattern as you would for a single room.

Borders

To set out for a perimeter border:

1. Mark a chalk line around the perimeter the full width of the border. Check that the lines intersect at 90 degrees.
2. Use the chalk lines as wall lines and cut the last row of 'field' tiles (in the body of the floor) to the chalk lines.

Again, try to ensure that these cut tiles are at least one-third the width of a full tile.



3. Lay the border tiles, cutting them around the walls to accommodate any irregularities.

Tile line lasers

A tile line laser is a laser tool that projects working lines at 90 degrees onto the floor.

Some lasers, like the one shown at right, also project a line at 45 degrees.

These tools take the place of a chalk line, and are extremely accurate.

Just remember when you're using any laser tool to follow the safety precautions set out by the manufacturer.



In particular, don't look directly into the laser beam, and make sure no-one else, including pets, look into the beam.

Learning activity



Your trainer will give you a room to measure up for a carpet tile installation. You will also be given a specific tile size to work with.

Your task is to produce a sketch showing the details set out below.

The sketch does not need to be drawn perfectly to scale. However, it should be well set out with straight lines and information that's clearly marked and easy to read. You may need to produce a rough version first and then re-draw it when you have worked out the details.

1. Basic proportional sketch of the room, showing all measurements required to calculate and set out the working lines for the tiled floor.
2. Extra information showing the following set-out details:
 - chalk lines required to find the centre point of the room
 - finished size of the cut border tiles against the perimeter walls
 - lengths along the working lines between the walls and the starting point.

Interpreting tile product details

Carpet tiles are supplied in cartons, with the product details marked on the side.

Before you start to lay the tiles, you must check these details to make sure the installation is carried out as per the client's specifications.

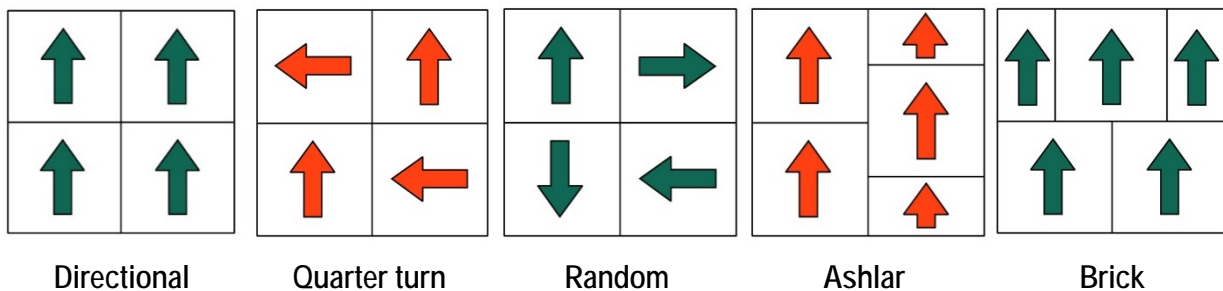
The first thing to check is that the **product type** and **colour** match the job order.

If they don't match, then the wrong tiles have been supplied, in which case they'll need to be returned.



The next thing to check is the **dye lot** numbers. You need to make sure that all tiles being laid in the same area are from the same dye lot, to avoid any obvious colour variation in the finished floor.

On the back of each tile will be an arrow that shows the **pile direction**. When you lay the tiles, the arrows must point in the directions that are appropriate for the installation method specified by the client. Below are some examples.



Learning activity



Have a look at the label on one of the cartons of tiles that you will be using for your installation demonstration.

Write down the following information from the carton label:

- product name and type
- tile size, quantity (number of tiles) and coverage in m²
- colour and dye lot number.

Laying square tiles

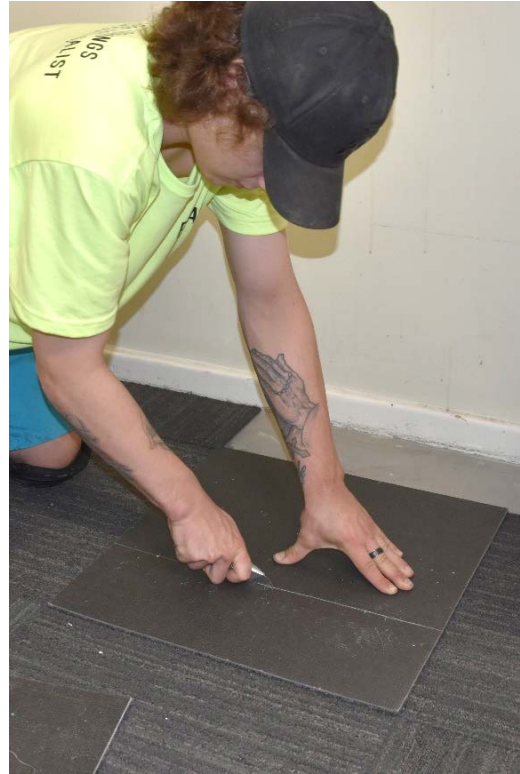
Once the working lines have been marked out on the floor, you can start the process of laying the tiles.

Some manufacturers recommend that the tiles be removed from the box and allowed to **acclimatise** for 24 to 48 hours at room temperature before they're laid.

This helps to ensure that the dimensions won't change after they've been placed in position.

You can also 'dry lay' a single row along your working lines if you want to check the width of the perimeter tiles around the walls.

Remember that the perimeter tiles should be at least one third of the full-tile width, and that doorways and high traffic areas should have full tiles where possible.



Spreading the adhesive



Spread the adhesive on the floor, following the recommended coverage rate shown on the product label. Note that there may be some variation depending on the porosity of the surface.

You might also need to apply more adhesive to certain areas, such as rampways and high traffic thoroughfares.

The most common methods for applying the adhesive are rolling with a long nap roller or trowelling with a V notched trowel that has 1.6 mm notches.

Wait for the adhesive to tack up before placing the tiles in position. The adhesive colour will change from a milky white colour to a clear film, and will feel 'touch dry'. This will give you a 'releasable' bond, which is what pressure sensitive adhesives are designed to do.

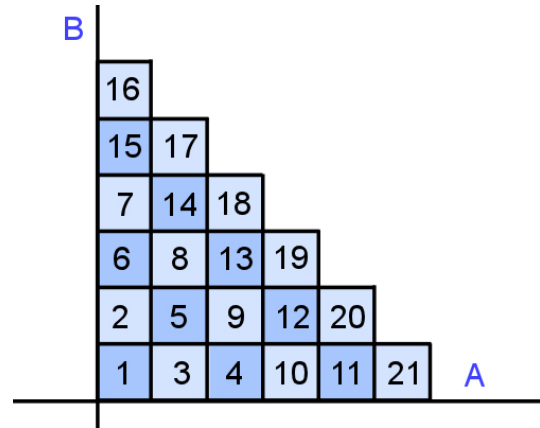
In high use areas that require a permanent bond, lay the tiles before the adhesive tacks up, while it is still semi-wet.

Laying tiles using the ‘stair’ method

AS/NZS 2455 says that square carpet tiles should be laid using the **stair method**.

Place the first tile at the intersection of lines A and B, and then lay the tiles in the sequence shown below. Complete the quadrants in turn.

As you lay each tile in position, hold it from both sides and slide it into place, paying attention to the corner and sides that abut the other tiles already on the floor.



Be careful not to let the pile get trapped between the edges of two tiles.

Keep an even tension throughout the installation to ensure that the tiles don't creep out of alignment as the rows build up.

Over-tensioning can also cause the tiles to buckle or peak at the joints.

Check the overall width every 10 tiles. There should be no more than 5 mm of gain in every 10 joints.

If you make a mistake with a tile and need to pull it up again, don't re-lay that tile. Use a new one instead so you can be sure that you've achieved a good transfer of adhesive to the backing.

Some tile manufacturers recommend that the completed installation is rolled with a weighted roller.

However, for most installations using pressure sensitive adhesive, it is normal practice to simply give each tile a quick hand rub to bed it down.

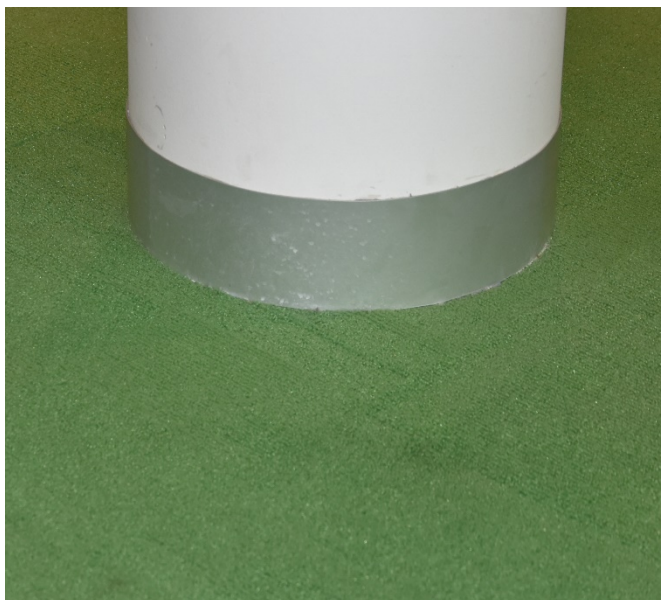
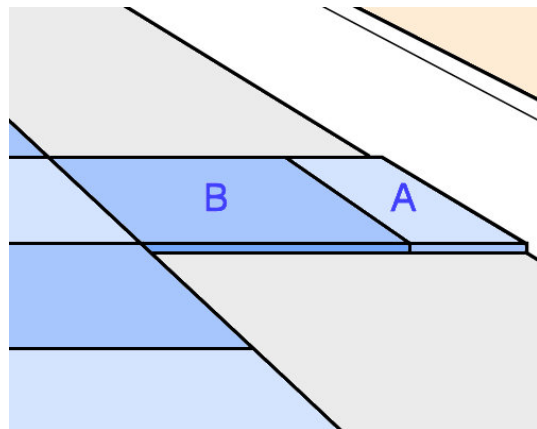
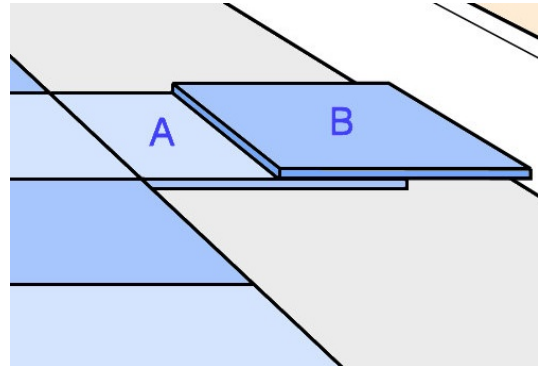


Cutting to size

Carpet tiles should be cut from the backing side using a utility knife with a straight blade or hook blade.

The procedure for cutting and fitting border tiles around the wall perimeter is as follows:

1. Place a full tile in position (A) and another tile hard against the wall (B), overlapping the first one.
2. Put nicks in the sides of tile A to mark each end of the overlap with tile B.
3. Remove tile A, turn it over, and cut the line from the back using a straightedge as a guide.
4. Apply adhesive to cover 100 % of both tiles (A and B).
5. Place A against the wall with the cut edge facing the wall, and tile B in the gap between tile A and the remaining field tiles.



For irregular shapes or curved walls, you should make up a template out of paper or cardboard.

Once you're happy that the template profile fits snugly into the contours that you're cutting around, turn the template over and lay it on the back of the tile (or tiles).

Check that you have the pile direction facing the right way on each tile, and trace the outline onto the backing. Cut the tile to shape using a utility knife.

If the edge of the tile pops up or 'tents' where it butts against an adjoining tile, you should re-trim the tile to relieve the tension. Don't try to push the edge down by stepping on it, because that won't solve the problem of it being too tight.

Installing tiles on stairs

Carpet tiles can't be installed over the nose of a stair. To carry out a stair installation, cut and install the carpet tiles to the riser first and then the stair tread. Make sure adhesive is applied to 100% of the riser and tread.

Then install a metal or rubber nosing, fixing it into position with the appropriate fasteners. The fasteners you use will depend on the substrate material and the brand of the nosing.

Metal and PVC trims

Trims are used to finish off the edges of the installation in doorways, on stairs, and wherever the carpet transitions to other floor surfaces.

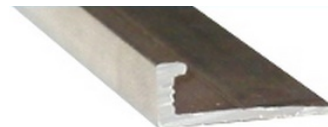
They are generally made of anodised aluminium or PVC (polyvinyl chloride), and come in a range of colours and finishes, designed to match or complement the colour of the carpet.



Learning activity



Below are some common aluminium trim profiles used with carpet tile installations. For each one, name the type of profile and give one example of where you would use it.



Laying other tile shapes

Carpet tiles are manufactured in a range of shapes other than square, including:

- rectangular
- triangular
- hexagonal.

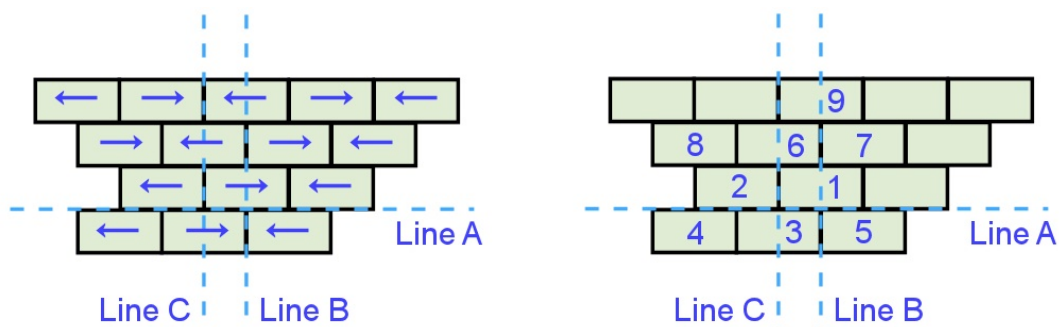
The installation procedures are basically the same as for square tiles, but the layout patterns are different because of the changed proportions.



Set out below are the main patterns and laying sequences used in rectangular tile installations.

Note that in these examples there are now three chalk lines marked on the floor. The third line allows you to offset every second tile to achieve the different patterns.

Brick



Start in one quadrant and lay the tiles in pairs, with the arrows facing each other, as shown the diagram above left. Then allow the tiles to flow into the other quadrants.

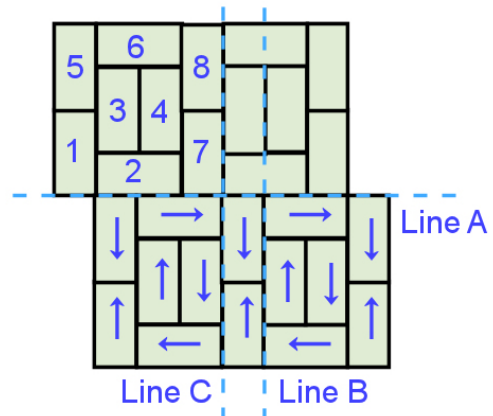
Lay the tiles in the sequence shown in the diagram above right, starting either side of line B, at the intersection of lines A and B.

Boxed in

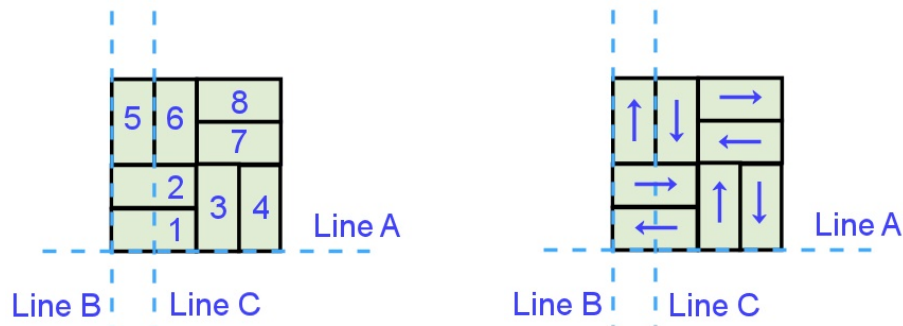
Start on either side of line B, where it intersects the lines A and B, as shown at right.

Note that this time, tile 1 is turned at right angles to tile 2, and that tiles 3 and 4 are boxed in by the tiles around them.

Allow the tiles to flow into the other quadrants as you work.

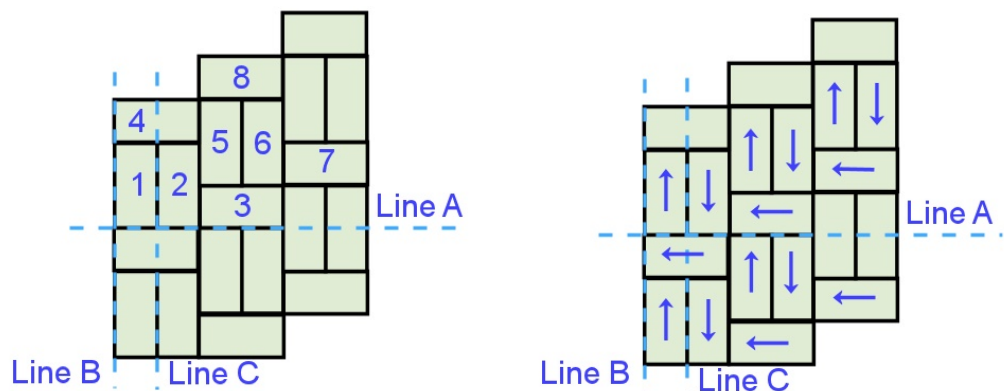


Basket weave



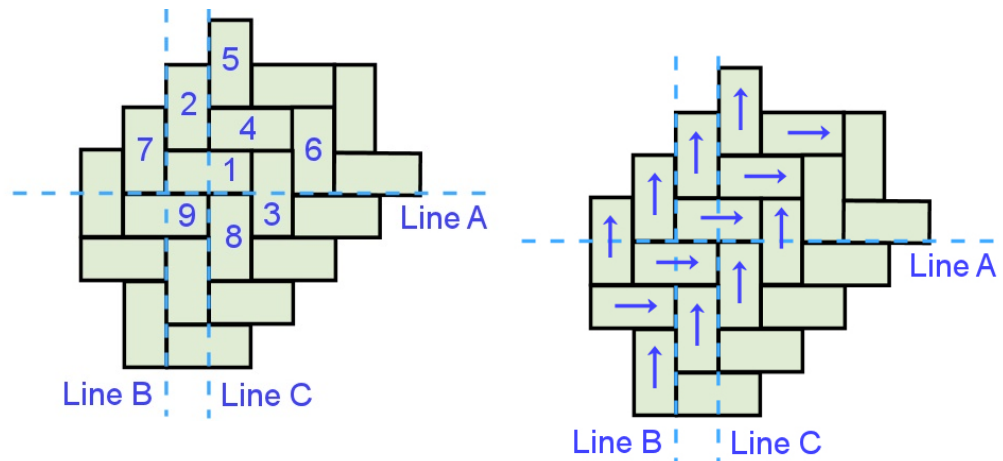
Start at the intersection of lines A and B, with the first two tiles facing in opposite directions. Lay the tiles in pairs, with each pair turned at right angles to the other pair, and the arrows opposing each other.

Half basket weave



Lay the tiles as you would for the full basket weave, but this time only place a single tile across the ends of the other pair. Work in columns as you form the half basket weave pattern.

Herringbone



Start in one quadrant and build up the herringbone pattern by laying each successive tile at right angles to the previous one. Let the tiles flow into the opposite quadrant as you go.

Other shapes

The rectangular patterns shown above are just some of the examples of different layouts that can be used with carpet tiles.

The range of patterns can be extended even further by triangular, hexagonal or non-symmetrical shapes.

The image at right shows a Shaw Contract hexagonal carpet tile floor.



Image courtesy Shaw Contract

Learning activity



The hyperlink below will take you to a Shaw Contract video clip showing the set-out and installation procedures for their hexagonal tiles:

- <https://www.shawcontract.com/en-us/products/technical/installation>

Watch the video clip and then answer the following questions:

1. How many chalk lines are used in the set-out?
2. How are the 'LokDots' (pressure sensitive adhesive) applied?
3. How many dots are required for each hexagonal tile?

Motifs and custom designs

Some clients specify unique designs that include motifs, logos or custom designs.

Sophisticated designs can be cut commercially using laser or water jet technology.



But it is also possible for a skilled installer to cut many designs by hand on-site.

You should always lay out the tiles in a dry run before applying the adhesive, especially when the design is complex.

This will let you make sure that each tile is in the right place before you stick it down.

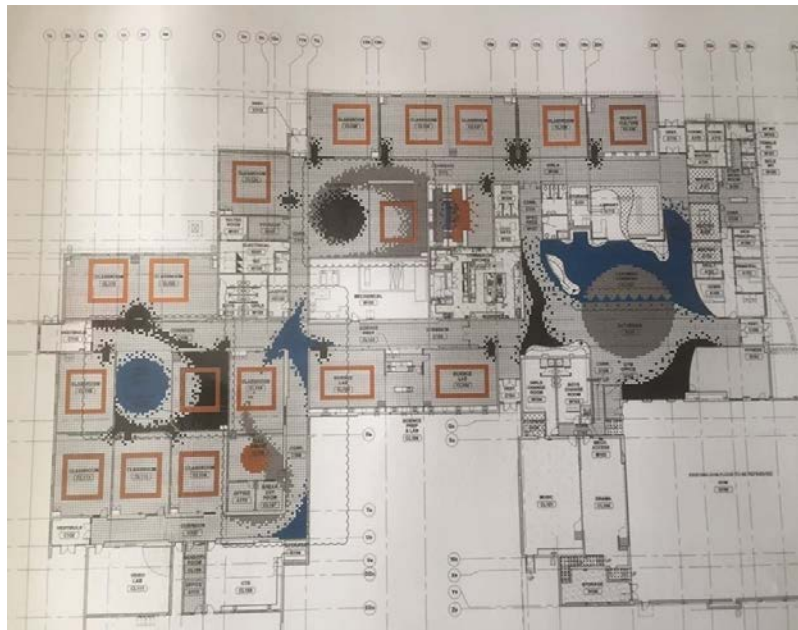
It also helps you to ensure that the surrounding tiles are cut correctly and fitting properly around the motif.

Computer generated plans

Complex designs are generally developed with the aid of a computer-generated plan.

If you haven't been given a copy of the plan, ask the client or architect to supply a copy so you can take it to the jobsite for reference.

As you carry out the installation, re-check the details constantly to make sure the patterns are being laid exactly as specified.



Scribing a circle

To scribe a large circle in carpet tiles, you will need some form of marking gauge that can be fixed at the centre point and rotated around the radius of the circle.

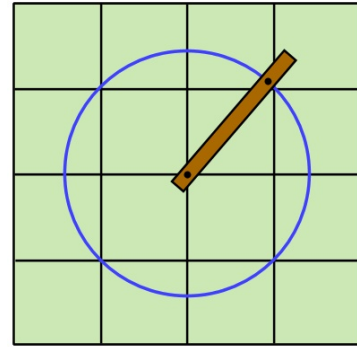
This could be a piece of timber or even vinyl flooring, as long as it will keep its shape and not stretch.

Fasten one end of the marking gauge to the subfloor floor with a concrete nail (or screw, if the subfloor is timber).

Insert a scribing pin or knife (such as an X-acto knife) into a hole at the other end, measured to the precise length of the radius.

Rotate the marking gauge around the arc of the circle.

Cut the tiles from the back with a utility knife and dry lay the pieces in position to check the fit.



Learning activity



Depending on the size of the circle and the number of circles you need to cut, it is sometimes more convenient to use a full-sized template, rather than a marking gauge as described above.

Let's say you needed to install several circles like the one shown in the photo above.

1. What material would be a good choice for the template?
2. What tool would you use to cut the template to shape?

Finishing the installation

Once all the tiles are laid and trims are fitted, you should tidy up the job and inspect it before handing over to the client or builder.

If you do see any problems that need fixing, it's always best to do it on the spot rather than turn a blind eye and wait for the client to pick it up.

Clients often do look closely at the installation after the installer leaves.



Even if they don't call you back to attend to a problem they've noticed, your workmanship will be on show to everyone who sees it, and the client will be offering an opinion on your work to anyone who asks.

A good reputation is the best asset an installer can have. It will win you jobs, employment opportunities and, above all, the respect of the people you work with.

Inspecting carpet edges and joins



When you inspect the laid tiles, make sure that all of the cut-to-size tiles are firmly fixed in position.

Also make sure there are no protruding or trapped yarns.

Use napping shears or sharp scissors to remove loose yarns.

Look for any lumps or air pockets in the floor, particularly if it is a double bond installation.

Also check that there are no signs of curling or cupping in individual tiles, or tiles that have been installed with the pile in the wrong arrow direction.

You should examine the floor from different angles to make sure you haven't missed anything.

The most common cause of curling or cupping is excessive tension, assuming that the substrate has been properly prepared.

In this case, you'll need to replace the affected tiles.

Make sure that the new tile is a good fit without being over-tight, and trim it to size if necessary. Also apply new adhesive to the substrate.



Cleaning up



Pick up all tools and rubbish, and vacuum the floor to remove all traces of debris.

Cardboard should be recycled.

If the cartons were delivered on pallets, the supplier may have an arrangement where the pallets can be returned.

Protecting the finished floor



To protect the newly installed carpet, you can lay sheets of plywood or cardboard over the areas where furniture or other items are going to be carried through.

Avoid using plastic sheeting, unless the contractor or client takes responsibilities for any condensation that might occur.

Also avoid putting adhesive tape onto the carpet pile to secure the protective sheeting.

Learning activity



Complete this learning activity after you have finished one of your practical demonstration installations.

Have a think about the way the installation went – starting with the initial measure-up and set-out, and continuing through to applying the adhesive, laying the tiles, cutting-in border tiles, cutting around other shapes or architectural features, and all other aspects of the overall job.

Do a self-evaluation on your performance. Then answer the following questions.

1. Which parts of the installation were you most comfortable with – that is, which bits were the easiest, or used skills that you are already good at?
2. When you inspected the finished floor, did you need to fix any problems that had occurred during laying, such as excessive tension, gaps, raised edges, tapered border tiles, or any other issues?
3. Overall, which skills do you think you need to improve on the most, so that you will get better results in future installations?

All professional tradespeople do this sort of self-evaluation when they look at their own work. It helps you to identify your strengths and weaknesses, and decide where you need to spend more time practising and watching others as you hone your skills.

Assessment criteria

The checklists below set out the sorts of things your trainer will be looking for when you undertake the practical demonstrations and knowledge tests for the unit of competency:

- **MSFFL3059 Install carpet tiles**

Make sure you talk to your trainer or supervisor about any of the details that you don't understand, or aren't ready to demonstrate, before the assessment events are organised. This will give you time to get the hang of the tasks you will need to perform, so that you'll feel more confident when the time comes to be assessed.

When you are able to tick all of the YES boxes below you will be ready to complete the practical demonstrations and knowledge tests for this unit.

Specific demonstration criteria	YES
Complete at least three carpet tile installations with:	
<ul style="list-style-type: none"> • two installations using full-spread pressure sensitive adhesive • one installation using low adhesive 	<input type="checkbox"/> <input type="checkbox"/>
All of the following design features must be demonstrated at least once in these three installations:	
<ul style="list-style-type: none"> • hallway with multiple connecting rooms • site link-up around a central core • custom design requirement • multi-directional patterns/borders 	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>

Specific knowledge evidence	YES
Adhesive fixed carpets – including types, characteristics, uses and limitations	<input type="checkbox"/>
Tools and equipment, including procedures for their safe use, operation and maintenance	<input type="checkbox"/>
Cutting, laying, fixing, joining and finishing adhesive fixed carpet	<input type="checkbox"/>
Characteristics and requirements of sub-floor preparation	<input type="checkbox"/>

General performance criteria	YES
Comply with all relevant WHS policies and procedures	<input type="checkbox"/>
Read the work documents to find the information required to carry out the job properly	<input type="checkbox"/>
Assess the subfloor to check that it complies with relevant Australian Standards and manufacturer's recommendations	<input type="checkbox"/>
Select suitable adhesive, trims and accessories	<input type="checkbox"/>
Select the correct tools for the job and check them prior to use	<input type="checkbox"/>
Plan the sequence of work to ensure the job proceeds efficiently	<input type="checkbox"/>
Check the carpet tiles to be installed against the work order and acclimatise them as per the manufacturer's recommendations	<input type="checkbox"/>
Handle tools, materials and products safely, and wear all required PPE	<input type="checkbox"/>
Establish working lines and starting point, taking into account site features, borders, wastage and the job specifications	<input type="checkbox"/>
Apply the adhesive and lay the tiles in accordance with specifications	<input type="checkbox"/>
Match and contrast tile grains and patterns where required	<input type="checkbox"/>
Cut tiles accurately, minimise wastage and maintain high quality joins and fitments	<input type="checkbox"/>
Install trims and accessories in accordance with job requirements	<input type="checkbox"/>
Inspect the job and rectify faults	<input type="checkbox"/>
Clean up the work area, dispose of rubbish appropriately and recycle waste products where applicable	<input type="checkbox"/>
Store unused materials according to site procedures	<input type="checkbox"/>
Complete all required workplace documentation	<input type="checkbox"/>
Background knowledge evidence	YES
Mathematical procedures for measuring lengths, calculating areas and estimating material quantities	<input type="checkbox"/>
Australian Standards relating to carpet tile installation	<input type="checkbox"/>

Workplace safety and environmental protection requirements	<input type="checkbox"/>
Carpet tile characteristics, types of construction and shapes available	<input type="checkbox"/>
Subfloor preparation requirements	<input type="checkbox"/>
Adhesives and fixing systems used for carpet tile installations	<input type="checkbox"/>
Tools and equipment used in carpet tile installations	<input type="checkbox"/>
Techniques for setting out, laying, cutting and fixing carpet tiles	<input type="checkbox"/>
Problems that may occur during installation and methods for avoiding or overcoming them	<input type="checkbox"/>
Workplace procedures for recording and reporting information	<input type="checkbox"/>