



forbo

Floorcoverings Installation Guide

creating better environments

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FLOORING SYSTEMS

Forbo-Flooring Floorcovering Installation Guide



Before



After

Introduction

The days when manufacturers concentrated only on production are long gone. Customer satisfaction is very much at the heart of business with the strength of the package only as strong as the weakest link. In our industry, for example, price, design, quality, marketing, availability, estimation, packaging, subfloor preparation, laying, maintenance and service are all critical aspects in giving customers the confidence to order and the loyalty to order again and to make recommendations to others. To be successful all parties that contribute in this chain of activity have to perform to the highest standards in order to succeed and maintain competitive edge. A poor quality product will never perform even though the product is laid to very high standards: likewise an excellent product poorly installed will fail to give satisfaction.

In most cases the flooring installer is the face of the manufacturer and your skills and professionalism significantly affect the outcome. At Forbo-Flooring Systems we recognise our role in partnership with you. We are continually trying to improve our service as well as our products. We were the first manufacturer to achieve ISO EN 9001 for all our manufactured products and we are working hard to improve our technical support facility.

To this end we have published this updated, sixth edition of the Forbo-Flooring Floorcovering Installation Guide in which we cover aspects of installation which we hope will be of use to beginners and to experts alike. The earlier editions were very well received.

We would continue to welcome your comments on its contents and hope you will use it extensively as your 'Bible'.

If you need any advice on any situation which is new for you please lift the 'phone or send a fax or e-mail. We'll be happy to help.

WAYNE DONOVAN
MANAGING DIRECTOR

March 2008

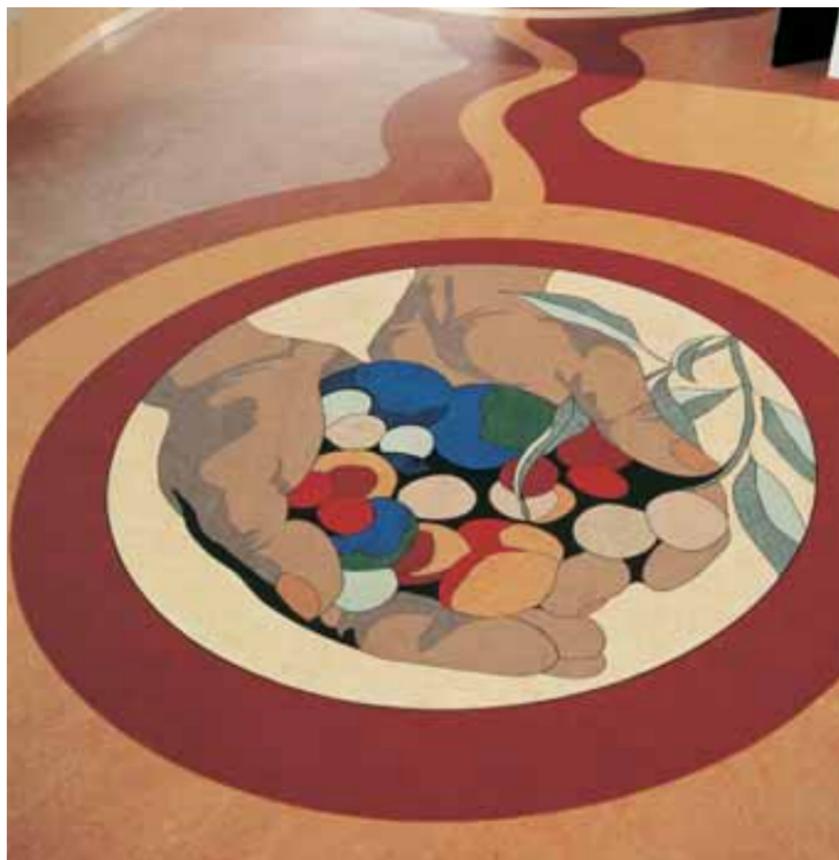


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Tools of the Trade

The professional floorlayer needs good tools in good condition. Many are simple and relatively inexpensive, other more expensive ones may sometimes be hired. Contact Forbo for pricing.

With electrical equipment a transformer may be necessary to fit equipment to the voltage available on site.

SUBFLOOR PREPARATION

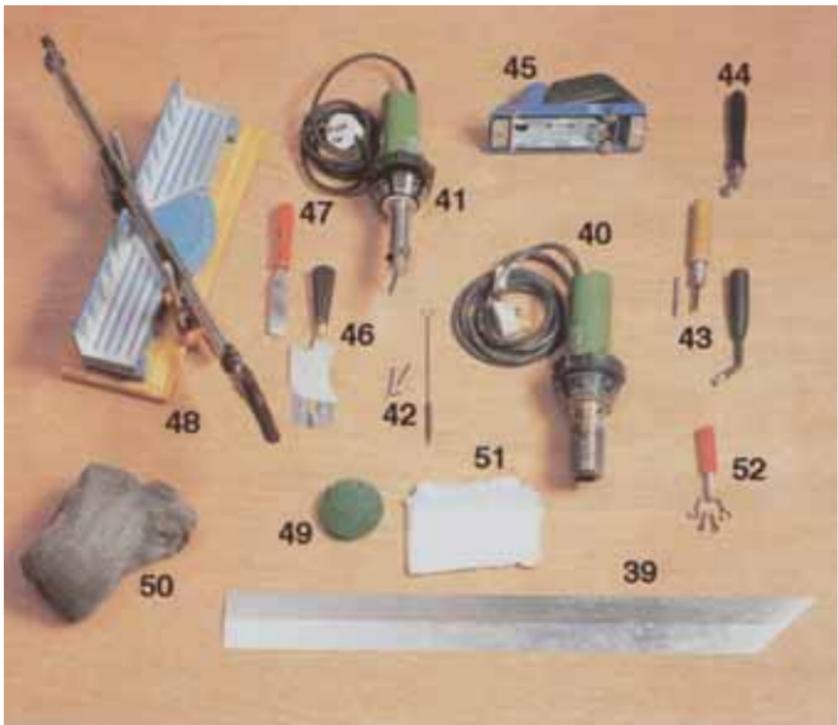
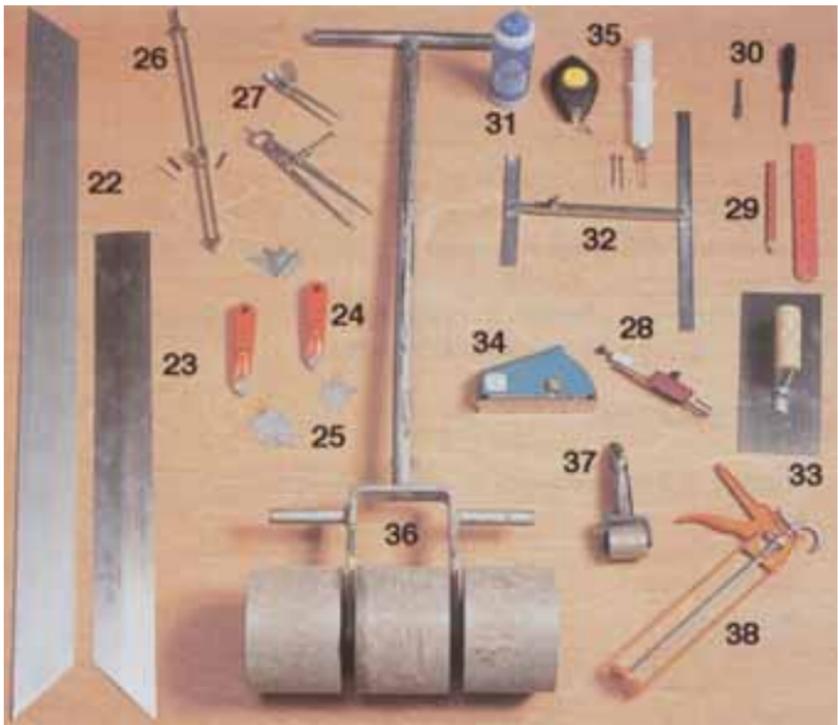
1. Stripping machine for removing old floorcoverings. (see p.14)
2. Scrapers.
3. Cold Chisel.
4. Claw Hammer.
5. Saws.
6. Screwdriver.
7. Kneepads.
8. Masks.
9. Drill and whisk for smoothing compounds.
10. Hand whisk.
11. Drill bits.
12. Plane.
13. Carborundum stone.
14. Screeding trowel.
15. Brush.
16. Broom.

SUBFLOOR TESTING

17. Surface hygrometer and insulating case.
18. Drill and bit.
19. Transformer.
20. Probe hygrometer kit.
21. Electrical probe.

FLOORCOVERING INSTALLATION

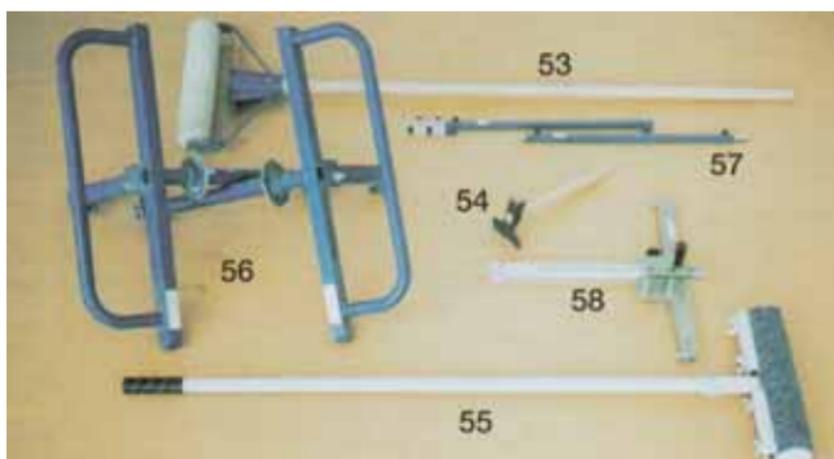
22. Straight edges.
23. Knife with straight blade.
24. Knife with hook blade.
25. Spare blades (including concave blade for decorative work).
26. Bar scribe with pins and blades for cutting cushioned vinyl.
27. Divider.
28. Over-and-under scribes.
29. Folding rule and flat pencil.



30. Pin vices.
31. Chalk line and powdered chalk.
32. Forbo Tile Scribe (for tiles on the diagonal).
33. Correctly notched trowel.
34. Forbo Trimmer.
35. Needles and syringe (for 'bleeding' adhesive blisters)
36. 68kg, or similar, floor roller.
37. Hand roller.
38. Skeleton gun for dispensing perimeter sealants.

FINISHING AND WELDING TOOLS

39. Straight edge.
40. Hot air gun.
41. Welding gun.
42. 'Speedweld' nozzle and cleaning brush.
43. 'P' groover and 'Safety Flooring' groover.
44. Welding cable guide roller (for vertical seams).
45. Forbo Groover.
46. Slider and spatula blade for trimming and welding cable.
47. Chisel blade knife.
48. Mitre Box
49. Nylon scouring pad.
50. Steel wool.
51. Cleaning cloth.
52. X-acto knife and router blades.
53. Spiked roller (see illustration page 5).
54. Smoothing Hammer.
55. Glyda.
56. Forbo Carryset.
57. Forbo Compass and extension.
58. Strip Cutter.



Other tools or variants of traditional tools come on the market from time to time and the fitter will make his own assessment of the value to him of such new items.



Subfloors - Type & Preparation

The final appearance and durability of a decorative flooring largely depends upon the subfloor it is stuck to.

For this reason a floorlayer should know about the construction of, and the problems associated with, the various types of subfloors which may be encountered. AS 1884-1985 give the requirements of a subfloor, the implications of which are set out below.

Clean. If the subfloor is contaminated with any substance which will prevent the adhesive sticking to it, then that contaminant must be removed. The surface should, of course, be thoroughly swept of all small loose debris.

Smooth. Any nibs of concrete, lumps of mortar, nail or screw heads, peaks of floorboards and wood knots must be smoothed off. Failure to do this will result in the 'telegraphing' of these to the floorcovering surface with subsequent premature wear. Similarly all cracks, holes, etc. should be filled and made good.

Even. Apart from being smooth, a subfloor must be even, otherwise a wave appearance will result in the finished floor, and, in the case of tiling, difficulties will be experienced in keeping the tiles in bond (i.e. in line with each other).

Sound construction. A subfloor must be rigid and not subject to flexing, otherwise cracking of the floorcovering will ultimately result. With solid subfloors, the screed should be of good quality. Failure of adhesion will result if floorcoverings are laid over weak or powdery screeds.

Permanently dry. Before any floorcovering is installed on a concrete floor the floorlayer must be satisfied that the subfloor is dry and that there is no possibility of rising damp occurring. There are several danger areas, covered below.

CONCRETE SUBFLOORS

Various types of concrete subfloors are commonly encountered. Note that under AS 1884-1885 the responsibility for ensuring the correct quality and dryness of the subfloor before floorcovering installation commences lies with those responsible for the design and construction of the subfloor. Nevertheless the following may be of help and interest to the floorlayer.

Suspended (or above grade). These floors are usually made of reinforced beams laid across steel girders and finished with a concrete screed. They are also found made of solid poured concrete, with a steel mesh reinforcement; or of lightweight reinforced concrete. All these floors are commonly found in new, multi-storey types of building.

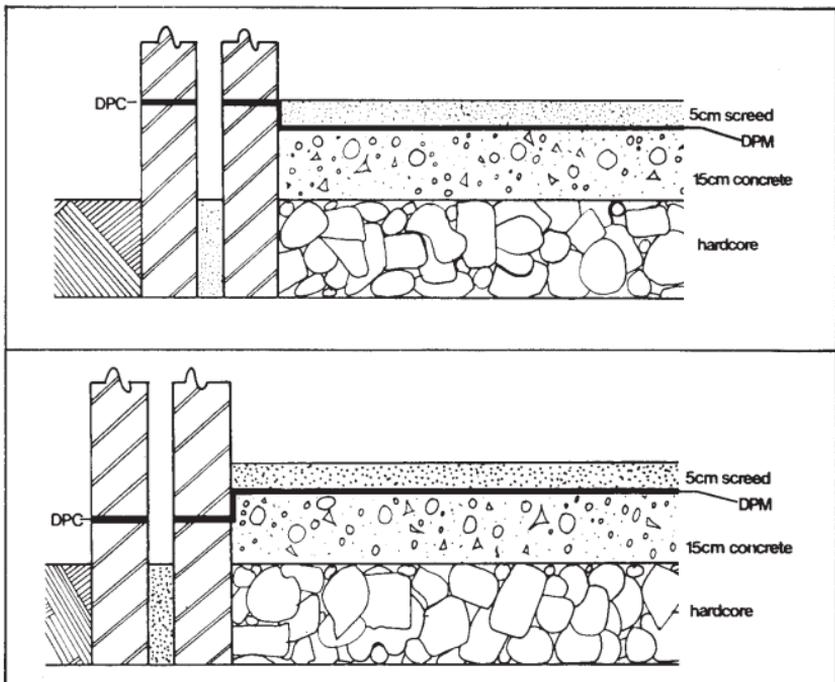
Direct to earth (or below grade) without a damp proof membrane (DPM).

These are constructed by pouring concrete over a hardcore base to a depth of 10 to 12cm, followed by a final sand and cement screed (2.5 to 5cm). This type of floor can present serious problems as it is prone to rising damp which will affect adhesion and in many cases damage the floorcovering itself. This type of floor will be encountered in both commercial and domestic buildings constructed prior to 1955.

Another factor to note is that these floors may appear to be dry during certain seasons of the year, but may in fact not be so. This may be due to faulty drainage around the building, or simply because the water table of the surrounding area is higher than that of the floor itself, making the floor subject to hydrostatic pressure.

Direct to earth (or below grade) with a damp proof membrane. These floors are of similar construction to the previous example, except that a damp proof membrane is laid between the base concrete and the top screed. These membranes can be of various types, e.g. mastic asphalt, bitumen (hot applied), 0.100 gauge polythene.

The efficiency of the DPM is largely dependent upon the skill of the operator at the time of installation. With certain cold applied membranes, care has to be



taken over very rough screeds, to avoid pooling of the membrane in hollows. If pooling occurs, solvent is trapped within the membrane, subsequently the solvent vapour will percolate to the surface of the overlying screed some six to nine months after the decorative floorcovering has been laid. This vapour will attack both the adhesive and the flooring with disastrous results.

Note that the DPM in the floor must be tied into the damp proof course of the wall.

Power floated (or power trowelled) concrete. On large scale new constructions, it is becoming increasingly common for concrete of perhaps 150-175mm thickness to be pumped into the bays and then levelled and compacted by a mechanical vibrating arm. The technique offers advantages to the builder and usually result in a densely compacted and often shiny surface. The shiny surface, although smooth, is usually too impervious for many adhesives to give a reliable bond.

In such cases the surface must be lightly scabbled or abraded with a grinding disk. Check with the adhesive manufacturer as to whether their adhesives can be used to bond the flooring directly to a surface so treated, as in the case with ForboFix 696 for Forbo-Flooring linoleums, or whether a smoothing compound must be applied.

ENSURING A DRY SUBFLOOR

Even where an efficient DPM has been installed, when sandwich membranes are incorporated into new solid floors the thickness of the floor above the DPM must be allowed to dry out sufficiently before the decorative floorcovering is laid. This applies whether screed alone or a combination of screed and concrete have been laid above the DPM.

Although suspended floors do not require a DPM for protection against ground moisture, they also must have a drying out period.

Generally, with good drying conditions, traditional concrete subfloors dry out from one side only at the rate of 1mm thickness per day. Where the subfloor thickness above the DPM is more than 50mm (2") the drying out time rate will probably be slower.

AS 1884-1995 "Installation of Sheet and Tile Flooring" gives valuable guidance on the question "Good" drying conditions are warm temperatures (i.e. above 15°C) with good ventilation. During winter months on an unheated site the floor may not dry out at all for weeks on end. On a heated site with poor ventilation, the humidity of the air may become as high as that of the slab preventing any further movement of moisture out of the subfloor. Densely surfaced power floated concrete has at best a semi-pervious surface and drying out can be very slow. Some 150mm slabs have taken over a year to dry out even when suspended with ventilation on both sides.

There are several types of Surface Damp Proof Membranes on the market, some tried and tested, others innovative. The supplier should be contacted to ensure suitability. For example, Forbo-Flooring offer one which is particularly cost-effective for use under Marmoleum or other Flooring linoleums.

SUBFLOOR PREPARATION

The surface of the base slab of any solid subfloor is seldom even and smooth enough to receive smooth surface resilient floorings. Each one usually has to be finished off in some way by the application of a screed sufficiently thick to give the smoothness necessary for a decorative floor finish. (The principal finishing methods involve the following types: sand/cement screed, mastic asphalt, latex cement, bitumen emulsion/cement, synthetic anhydrite screeds and resin emulsion/cement screeds.

Mastic asphalt can be used as a combined screed and damp-proof membrane, but in such cases ensure that it is connected with the damp-proof course in the walls.

It is the total amount of concrete above the DPM which affects the drying time, whether slab or screed. Specialised screeds are now available which dry very rapidly, as quickly as within 24 hours.

Each type of screed has its advantages and will prove satisfactory provided it is applied strictly according to the manufacturer's instructions. Unfortunately, many screeds are laid incorrectly, or are damaged in some way before the floor finish is laid. This means that they become totally unsatisfactory as a base for resilient floors as cracks, holes and excessive undulations in the subfloor surface show through resilient materials and make them more liable to excessive wear or irreparable damage.

In such cases, the surface must be rectified by the use of a levelling compound. These compounds are widely used for the skin coating and patch screeding of damaged or badly surfaced screeds, and they have the added advantage of hardening within 24 hours, thus allowing the work of laying the final floorcovering to proceed without undue delay.

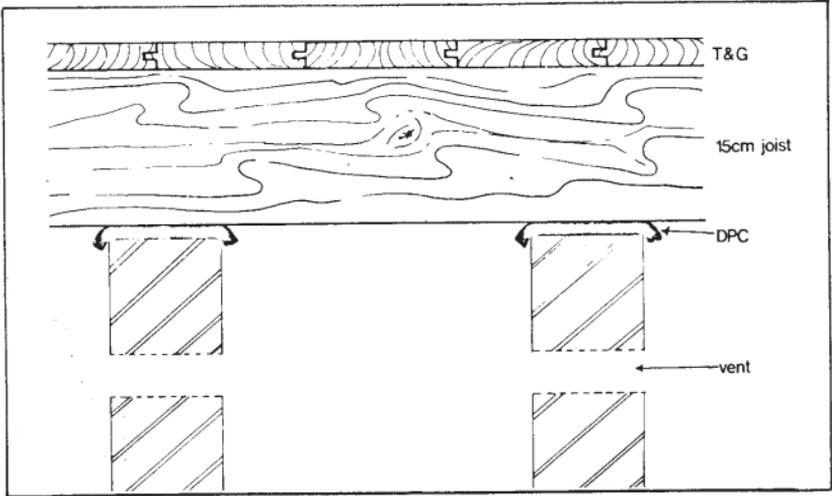
UNDERFLOOR HEATING

In floors incorporating underfloor heating systems, to eliminate the possibility of moisture being trapped beneath the warming system, the heating should be turned off for at least 48 hours before moisture testing is carried out.

Some floors may be heated by steam/hot water pipes. These should be treated with great caution. Difficulties with vinyl decorative floorcoverings can be experienced due to these systems which, if overheating, cause degradation of the covering. Similarly steam pipes and/or hot water pipes laid too close to the surface and unlagged, may also cause damage to both adhesive and decorative finish. Clauses 3.1.3 of AS 1884-1995 refer further to the requirements and conditions for the installation of resilient floorcoverings on subfloors incorporating underfloor heating or hot water pipes (see also page 18).

TIMBER SUBFLOORS

Timber subfloors can be of several types and these include tongued and grooved boards, chipboard or plywood, and wood block (parquet).



Tongued and grooved boards are one of the commonest types of subfloor in domestic installations, in both old and modern buildings, at ground level and above. On ground floors the boards are normally laid across joists, which are supported by the outer walls of the building and 'sleeper' walls, from which they are isolated by a damp proof course. Before laying any resilient floorcovering ensure that there is an airspace of at least 15cms between the floor and the ground, together with unobstructed air vents in the outer and sleeper walls which promote cross ventilation. Unventilated timber floors are prone to dry rot when covered with a floorcovering.

Ideally floorboards should not be wider than 10cms, as greater widths may present problems through curling. Timber subfloors shrink and swell due to changes in season humidity and unseasoned timber may shrink and/or warp.

Chipboard or plywood are often used for subfloors, laid over joists which should not be spaced wider than 40cms between centres. Adequate ventilation is again of prime importance.

Wood block or parquet floors are frequently laid with pitch direct on to concrete. If the concrete has been laid direct to earth there is a danger of movement known as rafting; or rot developing, when the wood blocks are covered with a resilient floorcovering, unless a DPM of 100 percent efficiency has previously been installed. For this reason they should be uplifted.

Timber subfloors require a variety of preparation techniques and the position of service runs (electricity, gas, water) must be established before nails or screws are used, and these should not penetrate through the boards. The use of bitumen saturated paper felt and dry felt paper as an underlayment is not recommended. Their use will only cause the

indentation characteristics of the flooring to be lowered, and will not provide any levelling.

INSTALLATION SPECIFICATIONS FOR DIFFERENT SUBFLOOR TYPES

A. SAND AND CEMENT SCREED

Ensure that the sand and cement subfloor is dry by testing with a hygrometer. The relative humidity (RH) should be below 70% RH. If the finish has a membrane at a depth of 50-70mm, the hygrometer should be in place for 24 hours to allow it to reach equilibrium prior to taking a reading. If the reading is above 70%, the floorcovering should not be installed until:

1. The level falls below 70% RH
or
2. A surface damp proof membrane is applied, usually followed by a 3mm smoothing compound.

It may be necessary to apply a 3mm smoothing compound to the surface of the sand and cement finish if it is uneven, damaged or porous. This will ensure that a smooth, level appearance is achieved and will also give a good “key” for the adhesives.

B. POWER FLOATED CONCRETE

Ensure that the power floated concrete is dry by testing with a hygrometer. The relative humidity (RH) should be below 70% RH. It will be necessary to leave the hygrometer in place for at least 7 days to allow it to reach equilibrium prior to taking a reading. If the reading is above 70%, the floorcovering should not be installed until:

1. The level falls below 70% RH
or
2. A surface damp proof membrane is applied, usually followed by a 3mm smoothing compound.

It may be necessary to apply a 3mm smoothing compound to the surface of the power floated finish if it is impervious. This will ensure a good “key” for the adhesives.

C. WOODEN FLOORBOARDS

Ensure that the floorboards are sound, rigid and properly fixed. Overlay with exterior plywood in the opposite direction to the run of the floorboards, staggering end sheet joints from the previous row. The levelness and evenness of the floorboards will determine whether the gauge should be 4mm or 6mm. Oil tempered or pre-soaked hardboard can also be used in gauges of 3mm or 6mm. The plywood or hardboard (rough side up for linoleum) should be fixed using 20mm-25mm ringed nails at 100mm intervals at perimeter or room and sheet joints and at 150mm centres within the body of the sheets. A power operated stapling gun can also be used. By priming the plywood an extended open time and coverage will be achieved with the adhesive.

D. CHIPBOARD

Ensure that the chipboard is sound, rigid and properly fixed. All joints should be level and nail heads should be flush with the surface. There should be no evidence of movement or shrinkage of the chipboard at joints or perimeter of room. Prime the chipboard and allow to dry prior to installing the floorcovering.

If evidence of movement or shrinkage exists, 4mm or 6mm exterior plywood, or 3mm or 6mm oil tempered or pre-soaked hardboard (rough side up for linoleum) should be installed using 20mm-25mm ringed nails at 100mm intervals at perimeter or room and sheet joints and at 150mm centres within the body of the sheets. A power operated stapling gun can also be used. By priming the plywood an extended open time and coverage will be achieved with the adhesive.

E. WOODBLOCKS

No guarantee can be given when our floorcoverings are installed directly or indirectly onto a wood block floor. A wood block floor that has performed satisfactorily in the past can fail rapidly when overlaid with plywood/hardboard, followed by the floorcovering, especially on a ground floor. This is due to the continuing movement of the blocks and/or the lack of a membrane within the construction of the subfloor on a ground floor. Uplift the wood blocks and remove the adhesive residue by mechanical means followed by an application of smoothing compound.

If no sandwich damp proof membrane exists (on a ground floor) a surface damp proof membrane will have to be applied. Alternatively, asphalt can be installed to bring the level of the subfloor up to the level of the previous wood block. It will be necessary to apply a 3mm smoothing compound on to the asphalt to prevent staining of a vinyl floor covering and also give a good “key” for the adhesive.

F. OLD FLOORCOVERINGS

New floorcoverings should not be laid over old, for a number of reasons. Old floorcoverings may not be correctly bonded to the subfloor and accumulations of polish will affect adhesives, even after attempts to remove all traces. Differing shrinkage rates may occur between the old and the new floorings and the indentation characteristics of the new floorcovering may be impaired.

Therefore, ensure that all of the old floorcovering is removed from the subfloor. Remove as much of the old adhesive residue remaining on the subfloor by hand or mechanical means.

G. QUARRY TILES/TERRAZZO

Ensure that on a ground floor the quarry tiles/terrazzo have been installed onto a subfloor incorporating a damp proof membrane. If there is any doubt, or one does not exist, a surface damp proof membrane will have to be applied followed by a 3mm minimum application of a smoothing compound.

On an upper floor, the quarry tiles/terrazzo should be primed using a suitable primer prior to a 3mm minimum application of a smoothing compound.



In both cases the quarry tiles/terrazzo should be thoroughly cleaned and be free from grease and other contaminants, prior to any proprietary materials being applied.

H. ASPHALT

Ensure that the asphalt is soundly bonded to the subfloor. If not, repair as necessary.

Prime the asphalt with a suitable primer prior to applying a minimum 3mm application of smoothing compound. It is extremely important that at least 3mm is applied to the surface of the asphalt to prevent staining of a vinyl floorcovering and also give a good “key” for the adhesive.

In all cases the asphalt should be thoroughly cleaned and be free from grease and other contaminants, prior to any proprietary materials being applied.

I. OTHER SUBFLOORS

Magnesite (magnesium oxychloride) and polyvinyl acetate/cement floors are generally laid on direct to earth concrete, without a DPM and are porous. Whilst they perform adequately when they are exposed to the atmosphere, overlaying them with a decorative floor finish will adversely affect them. They should be uplifted and a surface DPM installed, correctly tied in with the walls before a decorative floorcovering is laid.

Metal floors require special preparation and the accepted method is to cover them with a latex floor levelling compound, containing granite chips or cork as fillers. Initial preparation consists of cleaning off all dirt, grease, paint, rust, etc. before levelling.

Anhydrite screeds, natural or synthetic, are popular on the continent and are becoming increasingly so in the UK because they are quick to install. However, they are extremely sensitive to moisture, causing chemical reactions which will soften the surface and loosen the bond of the floorcovering. When installing a floorcovering on an Anhydrite screed it is essential that the manufacturers recommendations regarding dryness of the screed and the use of adhesives, primers and levelling compounds are followed. Contact Forbo Flooring for specific recommendations for Forbo installation and flooring products.

DAMPNESS TESTING

Laying linoleum or contract vinyl floorcoverings on a substrate which is insufficiently dry is asking for trouble - and the flooring contractor is usually the one who receives it. Some moisture will always remain in the concrete and does no harm as it is static. If, however, the moisture level is still such that, in the right conditions, it will move rapidly upwards and break the adhesive bond with the floorcovering, causing bubbles and blisters or mould growth then a very expensive relaying of the floor will become necessary. The trapped moisture will often move sideways and upwards so the problem may show itself initially at the edges of the room, where the trouble may have been made worse if the adhesive spread close to the wall has not been good or the edges have not been rolled into the adhesive sufficiently. The problem may not show itself until the building is in commission with hot central heating pulling the moisture quickly up through the slab - perhaps a year or more after installation.

The test accepted as valid under Australian Standard AS 1884-1995 is the hygrometer test, which measures the humidity level of the air immediately above the concrete. The AS illustrates the type of hygrometer suggested for use. Unfortunately, such a hygrometer is a precision instrument, good ones are relatively expensive and need to be left on site for some days with the risk of theft. They will give a false reading if disturbed or if not correctly calibrated before and after use and transported carefully after calibration. They take several minutes to set up correctly and several may be needed on a large site, as floors on the sunny south side of a building may be drier than those facing into the wet west winds or the chilly north. Even a good hygrometer, skillfully used, will have a 2-3% margin of error and a small, inexpensive, pocket hygrometer can be wildly out.

A correctly calibrated and installed hygrometer gives an accurate reading when the small volume of air trapped inside it is in equilibrium with the subfloor, i.e. when a series of readings show the same figure and it is not rising. If the readings show 70 percent relative humidity or less then they meet the acceptable dryness level suggested in AS 1884-1995. This standard suggests that on normal concrete equilibrium will be reached in not less than 72 hrs. Experience shows that the vapour movement from power floated slabs is much slower, so that it can be even 2-3 weeks before equilibrium is reached and a true reading shown.

When artificial drying aids have been used to accelerate drying out these should be turned off four days before taking final readings.

Calibration is done by placing the hygrometer over a saturated salt solution in a dessicator for four hours, after which the instrument should be adjusted to read 70°. In use the hygrometer should be sealed to the floor, either by using a ring of putty round the edges or by covering it with a 50-100cm square of transparent polythene, taped to the floor round the edges. Poor sealing will result in wrong readings.

The 70 percent figure set by Australian Standards realistically takes note of the margin of error still likely in a correctly used hygrometer. However, at above 70% RH fungus spores can grow. Note that the standard is the same for linoleum and vinyl.

In recent times a number of moisture testing instruments have been developed and offer quicker methods for establishing subfloor moisture content. Some are designed to provide an indication of how the drying of the slab is progressing. Others, for example, measure the moisture content in the slab using a probe inserted into a plug that has been placed into a previously drilled hole in the slab, offering an accurate reading of the relative humidity within the floor slab. Whilst these items of equipment are extremely valuable in assessing the drying of the floor slab the only test method prescribed by AS 1884-1995 is the Hygrometer.

Handling, Site Conditions and Estimating

Prior planning, including a visit to the site before floor laying begins, will help the floor installer to use his time more effectively and avoid delays that can arise due to unforeseen circumstances.

Discuss with the Main Contractor or Clients questions of access, which other trades will be active at the same time and the availability of power, (and of which voltage), of water, and of disposal skips.

The floorlayer must first ensure that the required materials can be transported to the site and securely and conveniently stored until they are required for laying. It is his responsibility to ensure that the quantity of material has not been made up from mixed manufacturing batches. All carton/rolls have batch and shade references marked. Where mixed batches are unavoidable select materials for designated areas with care. A full roll of linoleum and of some vinyls can be very heavy. It is normally not less than 150kg in weight, that is, equivalent to the weight of two grown men. This weight of material requires manhandling by at least two people. It is unlikely that full lengths can be carried up several flights of stairs. Use trolleys and sack barrows where possible. Observe safe handling procedures.

Sheet materials are tightly rolled by the manufacturer round a stout cardboard centre and protective packaging is added to avoid damage at the ends. On no account, however, should rolls be dropped (e.g. off a van or lorry) on to the ground. In cold weather linoleum and some vinyls can be cracked or fractured. These cracks may occur near the core and not be visible on the outer laps.

ON SITE

Once on site, do not pile rolls on top of each other. Any loose rolls or partly used rolls should be tied to avoid damage to loose ends and must be stored vertically. Minimum ideal storage temperature is 18°C (65°F). This is also an ideal temperature for laying, the material is then easy to handle and will lay well into the adhesive. Material lying on a cold floor will be affected by the floor temperature.

To open a roll correctly, pinch the ridge in the roll where the lap starts and insert a hook knife through the paper packing between the first lap of material and the under layer, taking care not to damage the surface of the floorcovering. The hook knife avoids damage to the surface of the

material.

Resilient flooring materials are always packed face outwards. Unrolling is best done using a special handling trolley with smooth rollers to avoid damage to the face of the floorcovering and cracking and distortion to the material.

A rough measurement of the length of material in a roll can be obtained from the following formula: add the outer circumference to the inner circumference (36cm), divide by two, and then multiply by the number of laps. This will give the approximate length.

SUBFLOOR CONSIDERATIONS

By this stage the subfloor must be completely ready for floorlaying, clear of all debris and dust, and if necessary primed with the correct solution as recommended by the adhesive manufacturer. Prior planning will ensure that all work such as laying of cables and ducting, power points, central heating and other services, pipes, telephone sockets, painting, etc will have been completed before floor laying starts.

Where underfloor heating is present, the following recommendation applies:

“Ensure that the underfloor heating system is switched off 48 hours prior to the floorcovering installation commencing and remains off for at least 48 hours after the installation is complete. Gradually increase the temperature over a number of days by only a few degrees per day until the desired room temperature is reached. The temperature should never exceed the floorcovering industry agreed maximum of 27°C at the underside of the floorcovering (the adhesive line). During the period of decommissioning of the underfloor heating system, an alternative heating source should be provided, if required, to ensure that the area of installation is kept at a constant temperature of between 18°C-27°C. Failure to adhere to these recommendations may have a detrimental effect on the floorcovering. This recommendation is applicable to all floorcovering types”.

The effects of solar heat should also be borne in mind. High temperatures can build up and cause difficulties in handling both to the floorcovering and the adhesive, affecting the bond to the sub-floor due to reduction of “open time” and rapid “skinning over” of the adhesive.

Handling of linoleum tiles is fairly easy. Each carton, however, weighs between 17 and 20 kg and they should not be stacked more than five high to avoid crushing and possible damage and distortion. Getting them to the site will be easier, but a lift or hoist is essential to reach higher floors. The same remarks regarding site preparation apply before tile laying starts.

ESTIMATING

The skill of estimating is one that is acquired with experience, although most situations call for little more than taking correct measurements of the site dimensions. Remember to allow sufficient over material (approx.

five per cent) to compensate for wastage of materials at seams, doorways, and walls which may 'run off'.

As lengths are cut from rolls, it is a good idea to mark the rest of the roll, indicating the length remaining.

Manufacturers of adhesives and floor smoothing compounds give coverage rates for differing types and conditions of sub floors and floor finishes.

When planning a straightforward rectangular room, seams and joints should avoid the main traffic area and best use be made of split lengths to avoid wastage.

Material for borders, feature strips, treads and risers must always be cut along the length of the roll to avoid the effects of roll set which will cause narrow strips to 'warp'. When planning borders the total number of metres is first measured and the border widths calculated, allowing sufficient over material for scribing. By dividing the number of border widths into the width of the roll, the floorlayer can calculate the required length of material. (See section on Borders). Doorways will require extra material to allow them to be fitted at least to the 'half door check'.

With patterned material the lengths of material required are measured with an allowance for the pattern repeat. If, for example, the room is 4.2m and the pattern repeat is 500mm, cut the first length 4.5m. The second length cut will then start with the pattern matching correctly. Remember that rarely can patterned material be matched length against breadth.

When using tiles, rectangular areas require only a simple measurement to determine the number required, although to achieve balance and a neat finish some wastage is inevitable. Awkward areas are best measured section by section. Tiles are normally supplied in full cartons only.



Adhesives

Despite recent advances in technology, there is no one adhesive which is ideal for all products and installations. A suitable adhesive must be selected and then applied by the recommended method to a suitably prepared subfloor.

In practice few contract resilient floorcoverings wear out: most failures are caused by curling, stretch, shrinkage, bubbling or cracking, and are directly attributable to faulty adhesion, caused either by damage through dampness, or incorrectly applied and selected adhesives or badly prepared subfloors.

Some of the requirements of a flooring adhesive include the following: good initial grab; reasonable open time; excellent final bond strength; compatibility with the subfloor and floor finish; ease of application; resistance to chemicals and water; non migratory properties; low toxicity; low fire risk; and cost.

The speed of drying of an adhesive will be affected by its formulation, the temperature of the air and the subfloor, the quantity applied and the porosity of the subfloor. The floorlayer must be alert to factors which will affect the average open time stated by the adhesive manufacturer.

TOOLS

The trowel is quite a sophisticated metering instrument, the notch spacing and depth controlling the amount of adhesive applied. If you don't maintain the instrument, you will get an incorrect application and a risk of floor failure.

TROWEL NOTCHINGS

Adhesive manufacturers always recommend the trowel notchings to be used to give the right spread of their adhesive. Spreading on concrete or cement subfloors will cause trowels to wear down causing too little adhesive to be spread, with the risk of an expensive floor failure. Not only will too little adhesive be applied it will skin over more rapidly making it more likely that the problem will be compounded by late placement.

The following are full size illustrations of some of the recommended notch sizes:

2mm depth at 6mm centres,
V notch
(ForboFix 638/414)



Replace worn trowel blades regularly.

Most adhesives start curing immediately on contact with the air and a skin starts to form on the surface of the adhesive. The ridges of adhesive then burst when the floorcovering is pressed into them and the wet adhesive moves into the spaces within the ridges and grips the back of the floorcovering. If the ridges are not the right size, there may be insufficient fresh adhesive to grip the floorcovering. During the spreading movement the trowel must be kept at the correct 60° angle. If too flat the adhesive ridges will be too low.



A 3 or 4 part heavy (68kg) floor roller used both along the floor and across it is necessary to ensure all the floorcovering is pressed firmly into the adhesive. Where this roller cannot reach then a hand roller or rubbing hammer must be used. Most floor failures start at edges and seams and these must be particularly well rolled into the adhesive.

PRIMERS

Adhesive manufacturers recommend the priming of very porous or dusty subfloor surfaces and bases of plywood, chipboard and hardboard. Primers are matched to the adhesive and are normally applied by brushing well into the subfloor surface and allowing to dry before spreading the adhesive. Failure to prime can result in rapid setting, leading to late placement; adhesives may also 'roll up' ahead of the trowel.

LINOLEUM ADHESIVES

SHEET LINOLEUM

An adhesive for jute backed linoleum must be firm when cured and prevent the material from stretching in the width, as a more elastic adhesive will permit it to do, and must immediately grab the linoleum and hold it down to the floor.

Specialised modern adhesives such as ForboFix 638/414 have the above properties in addition to providing when cured excellent bond strength and moisture resistance.

Gum spirit adhesives have until recently been the principal linoleum adhesive. They continue to perform well, with slight differences from one product to another in the 'feel' as the adhesive is spread, but are likely to be phased out as regulations increasingly prohibit the use of solvents. Lignin paste or casein adhesives are inexpensive and provide the right bond but quickly lose their powers of adhesion if water reaches them and will also powder under heavy loads (e.g. in a hospital corridor). For these reasons, they should be used with considerable caution and are not recommended. They are sometimes an inexpensive solution for applying linoleum dados or counter facings.

LINOLEUM TILES

Standard Forbo-Nairn Marmoleum Dual tiles have a backing of woven polyester. They should be stuck down with ForboFix 696 adhesive.

Lignin paste adhesives are not suitable. If, for some reason, jute backed tiles are being installed then an adhesive suitable for linoleum sheet must be used.

MARMOLEUM OHMEX

For this static-dissipative linoleum the recommended adhesive is 615 Eurostar Lino EL.

ADHESIVES FOR VINYL SHEET

Sheet vinyl floorcoverings require adhesives with good resistance to plasticiser migration and high temperature and a strong bond. The two main types are rubber resin emulsions (also known as SBR adhesives) and acrylic emulsions.

Acrylic emulsion adhesives are recommended for Forbo-Nairn sheet vinyl floorcoverings and for Colorex tiles where special static-conductive properties are not required. They are manufactured from non-staining synthetic resins. They have excellent final bond strength and resistance to plasticiser migration or bleeding. The service temperature limits of up to 49°C (120°F) allow their use in areas of relatively high temperature. Acrylic adhesives normally have a longer open time than other vinyl adhesives and good dry tack, although again care should be taken to avoid late placement of the floorcovering. They are non toxic and non flammable.

Pressure sensitive acrylic adhesives are also now becoming available which allow vinyl floorcoverings to be laid onto a dry adhesive.

Although not recommended for Forbo-Nairn vinyl floorcoverings owing to their poorer resistance to plasticiser migration the following general information is given on SBR adhesives. They are manufactured from styrene butadiene rubber resins. They are light coloured, non toxic and non flammable. There are two categories - Standard and High Temperature - as resistance to heat varies considerably.

Standard vinyl adhesive is designed to adhere most pvc floor finishes to substrates of concrete, plywood, hardboard, chipboard and most screeding compounds. Because of comparatively low costs, this adhesive is often the first choice, and incorrectly specified for areas such as car showrooms, where shear strength is an important consideration, or areas subjected to heat from electric underfloor warming systems. These latter operate at around the maximum permissible adhesive service temperature range of 25°C (80°F). Solar heat can be more demanding on adhesives; even in Britain surface temperatures can build up, through southern facing windows, to as much as 54°C (130°F).

Under heat, vinyl and other materials will expand, and if the adhesive does not provide adequate shear strength 'tenting' at the edges, or damage to the adhesive bond may occur. Inefficient bonding to the floor will allow seepage of maintenance products (some highly alkaline) under tiles, causing rapid breakdown of the installation.

The softer resin rubber adhesives tend to have a good 'dry' or 'after' tack. This tack is apparent even years after installation, making removal of the flooring difficult. It can also lead to floor failure where the fitter spreads too large an area and continues to lay tiles or sheet long after the recommended open time. Laying material into a semi-dry adhesive will,

although tiles appear to be firmly fixed, result in poor adhesive bond, cracking and shadow trowel notching, and apparent shrinkage even after intensive rolling of the material.

SPECIALISED ADHESIVES

High Temperature vinyl adhesives are synthetic resin or resin rubber emulsions, which are harder setting, with superior heat resistance and higher shear strength. They are non toxic and non flammable.

Asphalt tile adhesive or ATA is used in contract installations of filled vinyl and thermoplastic tiles. ATA is a solution of cutback bitumen in a petroleum mixture solvent. The traditional ATA is flammable and care must be taken to observe fire precautions relating to the storage and use of flammable materials. Although not regarded as toxic, adequate ventilation must be provided.

For general contract installation of filled vinyl and thermoplastic tiles on concrete or cementitious screeds an asphalt tile adhesive is recommended. These types of tiles may be laid on a direct to earth subfloor with no DPM, providing there is no hydrostatic pressure, excessive rising damp or surface moisture.

On new concrete floors, sufficient time must be allowed for construction moisture to dry out.

Filled vinyl and thermoplastic tiles must be laid using a warm laying technique and at the moment of fixing the tiles should be in a pliable condition. All gauges of tiles should be heated on site - but observing fire precautions due to the flammability of the adhesive - to achieve the degree of pliability necessary to mould them to the subfloor, and thus achieve overall contact with the adhesive and to reactivate it.

Heating can be carried out by using any of the normal methods (hot plate, gas torch, etc) but the tiles should not be heated beyond 60°C (140°F). Uniform heating of the whole tile is essential. After heating the tiles are packed into empty cartons to retain their heat and then passed to the layer, so that a continuous supply of pliable tiles is available for fixing.

Asphalt tile adhesive is also recommended for general contract installation of most semi-flexible vinyl tiles on concrete or cementitious screeds. These tiles may be laid on a direct to earth subfloor without a DPM, provided there is no hydrostatic pressure, excessive rising damp or surface moisture, and sufficient drying out time is allowed on new subfloors. Semi-flexible tiles are not heated before laying.

When applying the adhesive, the trowel should have notches 1.5mm deep at 5mm centres and after laying the floor it must be rolled in both directions with a floor layer's 68 kg (150lb) roller to ensure a complete adhesive bond. If this is not done and the installation is not trafficked immediately, the tiles may curl or emit hollow noises when walked upon or there may be 'clicking' sounds caused by tiles flexing and coming into momentary contact with the adhesive. ATA must not be used on asphaltic or bitumastic subfloors.

Non flammable asphalt tile adhesive is water based and composed of bitumen/rubber emulsion. This adhesive tends to have a longer open time which is greatly influenced by temperature and humidity. On non-porous bases such as asphalt it is recommended that the adhesive is allowed to develop tack. Take care when spreading to avoid late placement of tiles. Too heavy a spread of adhesive can cause seepage through tile joints, causing staining.

Static-conductive adhesives. Where a product such as ColoRex EC is being installed as part of a static-conductive system then the adhesive needs to be suitable for a vinyl floorcovering and have conductive properties at least as good as the floorcovering and the conductive standard required. 545 Eurosafe Special EL meets this requirement.

Epoxy adhesives will fix almost all floorcoverings, and unlike other adhesives, set as a result of chemical reaction rather than relying on the loss of solvent. These adhesives have excellent water and chemical resistance, and can withstand temperatures higher than the service temperature limits set for the floorcovering. Epoxy adhesives do not act as a DPM on damp subfloors and floor finishes can still be damaged due to moisture. When mixed they have a limited pot life, are much thicker and therefore more difficult to spread than conventional adhesives. This two part adhesive requires thorough mixing, in accordance with the manufacturers' instructions. The cost is normally regarded as prohibitive except in special cases. It is non flammable and non toxic but may act as an irritant to the skin.

Contact adhesives (neoprene). These are used primarily to fix covings and skirting. They are a synthetic resin/polymer solution in a blend of volatile solvents. This material is highly flammable, the petroleum mixture giving off heavy vapours, and although non-toxic, adequate ventilation is required. There are some non-flammable types now available which are still toxic and a water based version which requires a much longer drying time.

When using neoprene, a suitable flat surface is essential for bonding, and great accuracy in placement is required as adhesion is instant without the 'slip' often used to butt tiles tightly together. Over application will result in solvent trap and swelling or damage to the floor finish. Cost again is an important consideration and the method of application is to coat both surfaces evenly using a brush or flat blade, and then allow to dry for 15 to 45 minutes, or much longer in the case of water based types. The two prepared surfaces are then brought together to achieve instant bond.

Roller applied adhesives. Adhesive manufacturers are now beginning to offer adhesives for vinyl sheet where an even spread is achieved by applying the adhesive with a roller, with the installer standing rather than on his knees, associated sometimes with a double drop technique.

Release adhesives. Adhesives are designed to hold the floorcovering securely to the floor. However, when refurbishment is necessary, removing the old floorcovering can be time-consuming and expensive. Some adhesive manufacturers now offer systems, used most widely with

carpeting, enabling the floorcovering to be peeled back from the floor more easily.

POINTS TO REMEMBER

Storage. Adhesives must be kept in sealed containers when not in use and must not be exposed to extremes of temperatures. High temperatures will cause evaporation of solvent, and thickening, skinning and setting of the adhesive material. Low temperatures will result in poor workability, heavy spread or possibly in the case of emulsion types, break down or separation of the emulsion. Ensure that adhesive stocks are used in rotation, as many have a limited 'pot life'. Check for any 'settlement' and stir if required.

Uneven floors. An adhesive film will not conceal unevenness in a floor surface. Adhesives will pull down the floor finish to the contours of the floor and unevenness will be transferred to the floor finish.

Spread. Adhesives must be applied in the quantities recommended and with a trowel suitably notched for use with the condition and porosity of the subfloor having consideration for the type of backing of the floor finish.

Open Time. Most adhesive materials are dissolved or dispersed in water or other solvents. As adhesive 'set' takes place, varying proportions of this solvent are absorbed into the subfloor, evaporate, enter into the floor finish, or enter into a chemical combination with the adhesive materials. Therefore the correct open time must be observed, bearing in mind that open times can vary and are affected by temperature, floor porosity and relative humidity.

All the adhesives described must be used in accordance with their manufacturers' instructions, with regard to storage, priming, spread and open time. Adhesives must also be selected for use with materials as recommended by the manufacturers of floorcoverings.

Cleaning off. Remove any adhesive from the face of the floorcovering as work proceeds and take care to avoid smearing adjacent surfaces.

Health and Safety. Where flammable materials are employed, or materials with a significant amount of solvent base the laying area must be well ventilated to allow fumes to escape and warning signs posted. New regulations may require the presence of a fire extinguisher.

Adhesives fault diagnosis (Treat this information as a generalisation only, due to variations in types of subfloors and adhesives)

Appearance on subfloor	Appearance on flooring	Cause
Clearly defined ridges	No or slight transfer	Lack of rolling
Clearly defined ridges	Shadowing on surface with no or slight transfer	Late placing
'Pooling', smeared and crinkled, 'cratered'	Smeared and crinkled, especially at seams and edges	Uneven subfloor
Flat ridges	No transfers	Wrong adhesive
Wet, sludgy, smelly	Staining badly	Wet/damp screed
Adhesive soaked in	Granules of screed adhering	Dusty weak screed
Powdering of adhesive and wet patches, possibly smelly	Pale coloured, powder on tile edges and back	Alkali attack
Asphalt, subfloor softened	Tile stained dark brown or black (V)	Wrong adhesive, eg petroleum based
No key to subfloor	Good key	Contaminated subfloor
Sparse and low ridges	Not sticking, little transfer	Wrong trowel used
Heavy application 'skinned'	Indentation, little transfer	Over application of adhesive, late placing
Soft, wet, thick adhesive film	Adhesive squeezing through joints	Over application of adhesive, early placing
No adhesive	Curl at perimeter, no transfer	Adhesive stops short of walls
Clearly defined adhesive ridges (when present)	Perimeter tiles only. Loose, curled and hollow sounding	Late placing

Key: V = Vinyl products

RECOMMENDED ADHESIVES

At the time of going to press, Forbo recommend the following adhesives for their products. Other adhesive manufacturers may recommend other adhesives on their own responsibility.

Other manufacturers may modify their products to make them either more or less suitable for use with Forbo products.

Forbo-Nairn Sheet and Tile Linoleums (except Marmoleum Ohmex):
ForboFix 638/414 Euroflex Lino Plus / 614 Eurostar Lino Plus

Marmoleum Dual or Real Ohmex:
615 Eurosafe Lino EL

Forbo-Nairn Contract Vinyls (except ColoRex SD/EC):
540 Eurosafe Special / 640 Eurostar Special

ColoRex SD/EC:
545 Eurosafe Special EL

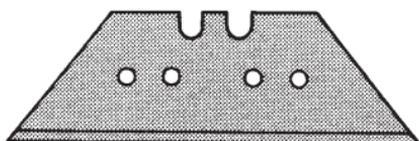
Pre-formed Linoleum Skirting:
ForboFix 638/414

Cushionflor:
540 Eurosafe Special / 640 Eurostar Special

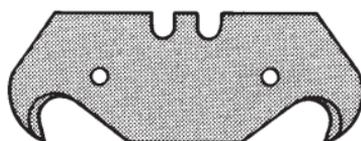


Cutting Floorcoverings

For the general cutting of linoleum and vinyls a utility knife and two different blade types are needed.



Straight blade



Hook blade



Concave blade

Always use sharp blades. Different materials will blunt blades at different rates, those containing quartz or carborundum doing so most quickly. Select the shape of knife handle you are most comfortable with. A knife held in the way it comes naturally to hand will give a slight undercut to materials - sometimes desirable - therefore always keep the scrap material on the outside of the cutting hand. Don't make the undercut more than 20° from the vertical or the edge may be too delicate and break or fold when butted up.

CUTTING CUSHIONED VINYL

Most general purpose grades of domestic cushioned vinyl can be cut in a single cut using a straight or hook blade, taking care to keep the knife vertical and using a straight edge or rule as a guide if necessary (see page 53). If a bar scribe is used it is sometimes possible to fit a blade instead of a pin, enabling the sheet to be scribed and cut at the same time.

CUTTING COMMERCIAL VINYL AND LINOLEUM SHEET

These thicker and tougher materials should be cut through in more than one cut using both types of blade.

In some cases, the surface of the material will already have been scored by a bar scribe or pin vice. If this scored line is difficult to see in the colour of material being cut, highlight it by rubbing chalk gently along the line.

A safe cutting method is essential. A fitter will spend thousands of hours

working with knives and the cutting method must be as 'fail safe' as possible to allow for the occasional lapse of concentration. Therefore keep the free hand and knees clear of the blade.

Rest the free hand on the floor beyond the knife, where it will be clear of a slipping blade. Keep your head behind and over the line of the cut.

Keeping the knife blade vertical cut through the surface along the scribe line or straight edge using a straight blade. On many materials it may be necessary to make more than one pass to achieve a cut of $\frac{1}{2}$ to $\frac{2}{3}$ of the thickness of the material. On others the score mark may have gone this deep. Don't attempt to force the blade too deeply into the sheet. If the knuckles show white then the pressure is too hard, there is less control and you will tire quickly.

Move back steadily as you cut, not cutting more than a metre or so before moving back. Where possible avoid working in a cramped position.

To complete the cut with the hooked blade, kneel at about an arm's length from where the cut is to start, with the hook knife in a comfortable grip. If a bevel cut is required, (i.e. fitting to wall) the blade may be slightly tilted.

Rest the free hand on the floor beyond the knife, where it will be clear should the knife slip.

Engage the hook knife at the start of the traced cut and draw the knife through the material with a steady pull. Do not lift the handle when pulling. Grip it well back from the blade, with the knuckles just touching the sheet under the handle. There is no need to press the knife down hard on the floor.



As the knife approaches the knees, move backwards, leaving the blade in the cut until it is at arm's length again.

When cutting along a straight line keep the arm as straight as possible, with the shoulder, elbow and wrist in the line with the cut.

The hook knife cuts through the material with one stroke and is designed with a flat heel, which prevents the cutting edge from being dulled or worn away, even when used on concrete floors. It will also allow cutting through one sheet lying on top of another, or even lying on a carpet,

without damage to the surface or underneath. Canvas backing is also cleanly cut, leaving no ragged ends. Remember that it is essential that scrap material is always on the outside of the cutting hand.

CUTTING VINYL AND LINOLEUM TILES

Resilient tiles are always cut from the surface.

Thermoplastic and filled vinyl tiles can be scored or partly cut from the surface and then snapped to give an edge clean enough for fitting to a wall, though not for butting to another tile.

For other vinyl and linoleum tiles the cutting procedures are similar to those for sheet.

Place only machine cut tile edges against each other unless this is impossible because of design work.





Setting Out and Laying Tiles

A well set out tile installation not only looks good but will well repay the time and effort spent in careful planning by avoiding awkward cutting and fitting at the room perimeter.

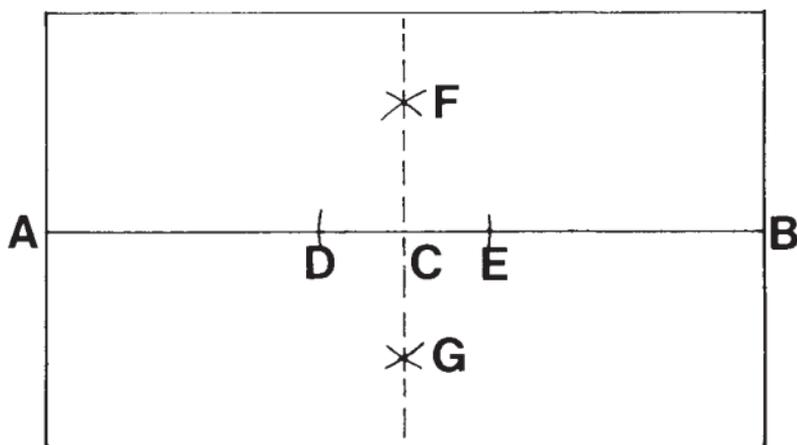
The correct starting point for setting out a tiled floor is traditionally the centre of the area - although this may not be the final starting point when tile laying begins. If the tiles are to be laid with a border, it may be essential to use this method (see Borders and Feature Strips).

However, an alternative starting point, which may be simpler and quicker, is also described below, on page 39.

If setting out from the centre first, find that centre.

REGULAR AREAS

To find the centre of a near rectangular shaped room



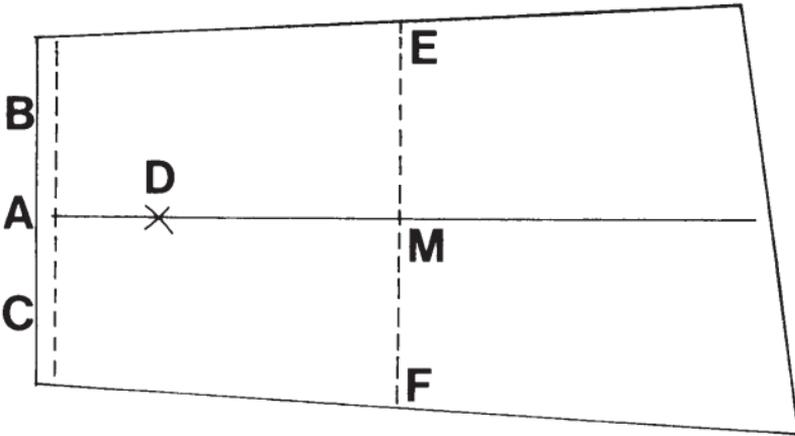
1. Measure carefully each of the two opposite walls and mark the centre points of each (A, B).
2. Strike a chalk line between these two points, making a line AB.
3. Measure this line and find its centre (C).
4. Using a bar scriber with 'C' as the centre, scribe marks D and E on the line AB approximately 200mm from C. Extend the scriber to its full length and make bisecting arcs at F and G using alternately points D and E. If you haven't a bar scriber use a ruler with a pencil held firmly in position at the correct distance. The shorter the arc the greater the need for precision.

5. A chalk line struck between points F and G will now pass through point C, giving a right angle to line AB. This then becomes the setting out or starting point.

IRREGULAR AREA

An irregular area as shown should be treated as follows

1. Select a wall which has the main entrance door.

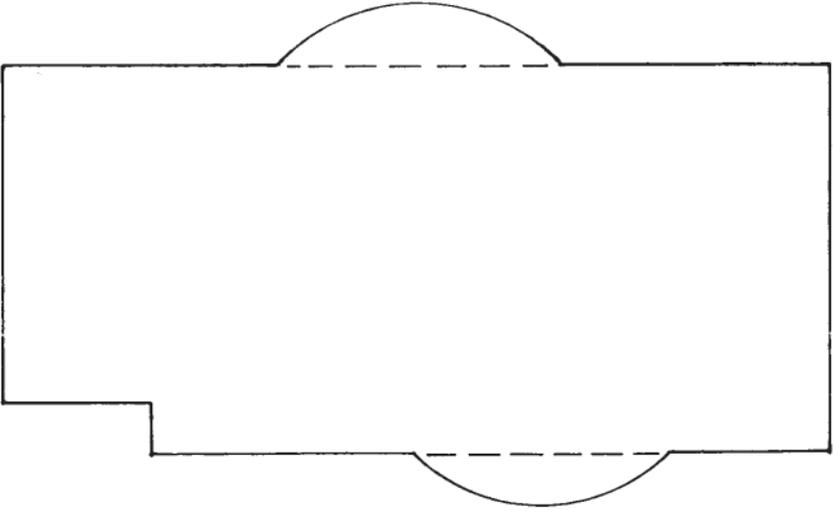


2. Strike a chalk line parallel to this wall, but some 75mm away from it, and find its centre point (A). The 75mm gives working space.
3. Place one of the ends of the scribe or rule on point A and mark - on the chalk line - points B and C.
4. Having extended the scribe or rule measure using points B and C on the line, make arcs at D. For accuracy this should not be too close to A.
5. Where the two arcs meet is point D and a chalk line running from A through D to the other wall will give a base line at right angles to the chosen wall.
6. After measuring to find the mid point on this line (M), strike the line EF at right angles as described for regular areas.

This then becomes the setting out or starting point.

In rooms with bays, alcoves and projections 'regularise' the room by striking false wall lines, as shown on page 37.

An alternative method of constructing a right angle is the use of 'Pythagoras' Theorem, the '3' '4' '5' method, where the base line of a triangle is 3 (or multiple), the vertical arc 4 (or same multiple) and hypotenuse arc 5 (or same multiple). For example, using the diagram on page 35, mark D 300mm from the mid-point (C) of AB then scribe from D an arc 500mm long across where the line FG is expected to run. A point on this arc exactly 400mm from C will give a right angle at C.



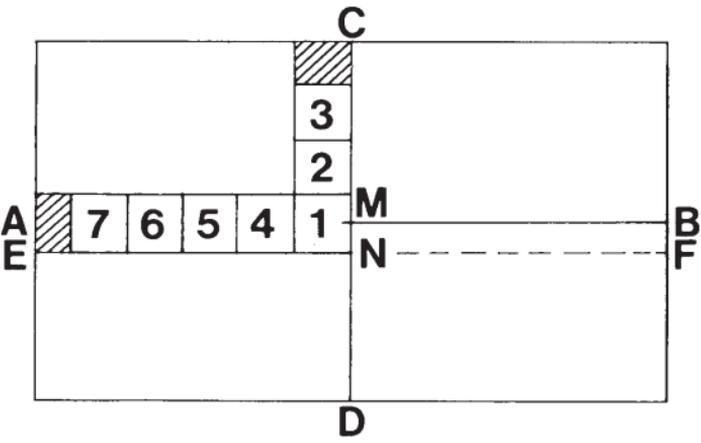
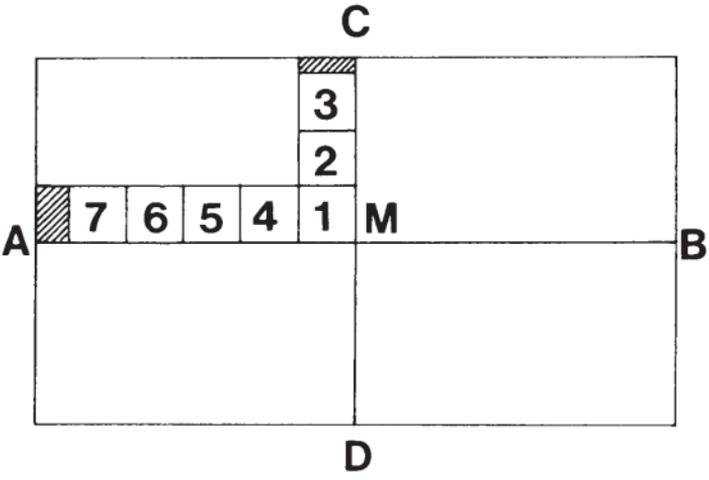
SETTING OUT OR STARTING POINT

Avoid wherever possible small strips of tile of under 60mm or so as these are more likely to come up at some future date and the wall may also run off, giving even smaller strips. To ensure the design will balance and that no awkward cuts will be needed either:

1. Dry lay two rows of tiles from the centre point as in the next diagram or
2. Divide the distance AM and the CM by the width of the tiles to find the width of the remaining piece (e.g. if AM = 7.75m and 500mm tiles are being laid this is 15 full tiles and 250mm (.5 of a tile left over) or
3. If the tile size makes mental arithmetic more difficult, take a straight rule and mark off along AM lengths which are multiples of the tile size being used (e.g. 900 = 3 x 300mm tiles) and then divide the length which is less than the 900mm by the tile size (e.g. if AM = 7.75m then this is 8 lengths of 900mm rule, leaving 550mm, or 1 tile + 250mm left over).

The size of area to be fitted and personal preference will decide which of the above methods is used.

If there will be a small strip of tiles if they are laid from the true centre point, as shown in the first illustration overleaf, then move to a new starting point, as shown next, 250mm down CD. For example, if CD were 7.15 metres long, the line each side of M would give 7 full 500mm tiles and a 7.5mm wide piece. Moving the start point 250mm towards D gives 7 full tiles plus a 325mm piece CN and 6 full tiles plus a 325mm piece ND. Striking the new base line EF parallel to AB gives the new starting point (N). There are three possible adjustments that may have to be made: a) no adjustment needed; b) length adjustment; c) width adjustment; d) length and width adjustment (see illustration). ('S' is the starting point).



a).no adjustment needed. b).length adjustment.



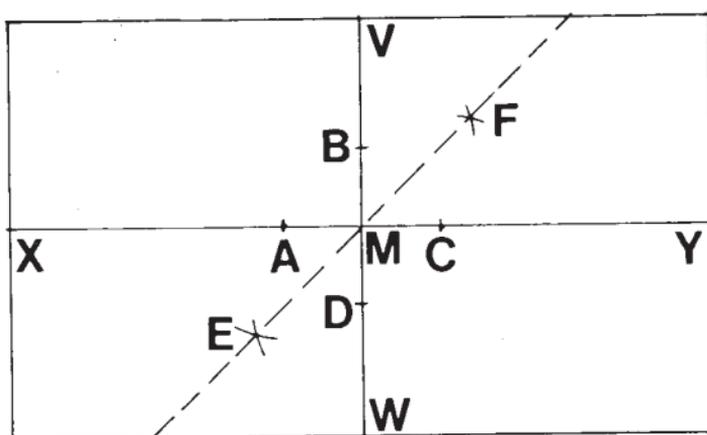
See page 41 for sticking the tiles down

STARTING POINT FOR DIAGONAL DESIGNS

Sometimes tiles are to be laid diagonally. The principles involved are the same as those described previously.

The steps are as follows:

1. Find the centre of the room (M) as previously described and strike chalk lines XY and VW.
2. Using the scriber, place one pin on M and mark points A, B, C, D on the base lines XY and VW.
3. Extend the scriber and, placing one pin on A, scribe arc at E. Move the scriber to B and scribe arc at F.
4. Repeat this exercise at C and D.
5. Strike a chalk line at the intersections of the arcs at E and F giving a base line passing through M for laying the tiles.
6. Check that the floor balance is correct. If not, adjust in the same manner as that used for square designs.



7. If the '3' '4' '5' method has been used to find the right angle then mark 300mm from M in all 4 directions and make the arcs at E and F using the 500mm measurement as in 3 and 4 above.

ALTERNATIVE METHOD

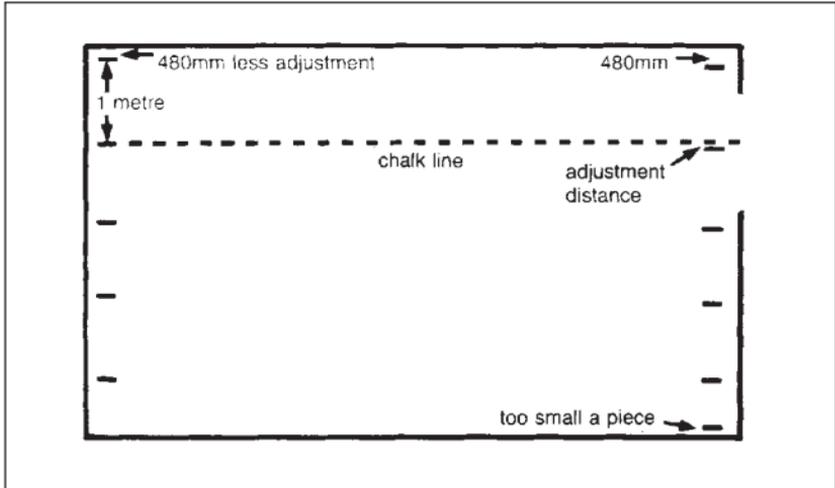
The floorlayer's aim is to install a perfectly acceptable floor as quickly as possible with the minimum of material wastage. The appearance of the floor will be judged subjectively and in most cases there will be no need for mathematical precision in tile layout provided the floor 'looks right'.

A slightly quicker method of laying out the tiles is as follows:

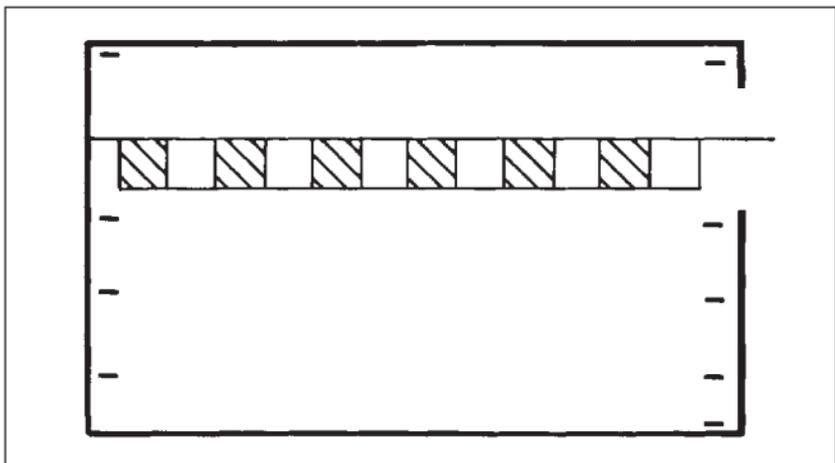
1. Decide which wall contains the main doorway and, assuming 500mm tiles, mark a point 480mm out from the wall running away at right angles to this doorway. Then with a rule mark off 1 metre lengths across the room, parallel to the doorway wall until you can measure the final length of less than 1 metre. If this results in a tile piece which looks too small, say, under 80mm, then increase the size of this final

piece (but not to more than 240mm) preferably to give a balance of cut tile size either side of the last full tile - important with a chequerboard effect, and make a mental note that all the marks are now moved by the same amount nearer the original wall.

2. Once this adjustment, if necessary, has been made then mark a point, taking account of it, near the 1 metre mark which is nearest the centre of the doorway or 500mm nearer the centre of the room if still under the doorway.



3. If the walls look reasonably square, measure the same, adjusted, distance out from the side wall at the far end of the room and strike a chalk line between these two points. With a straight edge pencil through the centre of this chalk line for greater accuracy. This is now the starting line for laying. Starting 480mm from the doorway wall mark the 1 metre units along this line in the same way as with the first line and adjust the 480mm downwards if necessary to give a satisfactory tile piece at the far end of the room allowing for the tile going back - say 3cm - into the doorway. Your starting point will be where the first full tile is laid on this line.

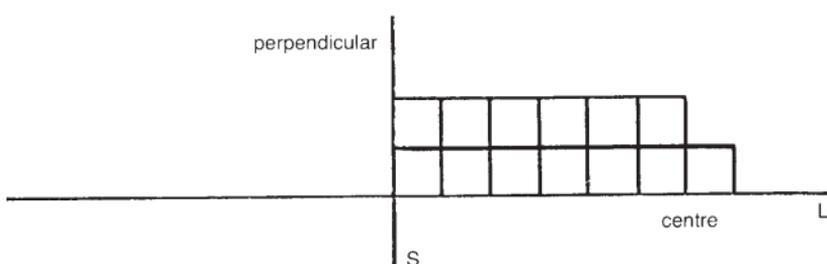


- Note that in this method only one line is actually drawn. It is important that it is precise. If an adhesive is to be used which lets you see the line through it, take a straight edge and carefully mark the centre of the chalk line with a pencil. The adhesive will make the chalk line appear fuzzy but the pencil line will continue to give an accurate guide.

See page 43 for sticking the tiles down.

STICKING THE TILES DOWN (FROM THE CENTRE POINT)

- The starting point 'S' needs to be established as described above and clearly and accurately marked. The centre of the chalk lines should be marked in pencil with a straight edge if they will be visible through the adhesive (see Alternative Method, point 4 above).
- Check the floor is well swept and free of contamination.
- Check tiles of the same colour to be used in one room are from the same batch. Tiles must always be tessellated.
- Spread adhesive, with a correctly notched trowel, two tiles wide to one side of the longer centre line stopping at the cross line. Only spread an area which you can cover with tiles during the time the adhesive will remain active at the temperature of the room - perhaps only 2-3 square metres. Let the adhesive reach a slight tack so that the tiles will not slip. Do not yet spread adhesive in the area to be covered by the last full tile and the cut against the wall unless you are sure it will still be active by the time the edge pieces are cut and ready for laying.
- Position the first tile very carefully in the corner of the pencil lines. Add two more tiles along the centre line and check for perfect alignment. Continue along this line to the end of the adhesive. Linoleum and quality vinyl tiles should be butted firmly but not forcefully against each other. Add a second row, aligning the first tile very carefully on the cross line.



- About turn, spread adhesive and lay 2 rows of tiles from the centre towards the facing wall. Then build up the floor from the centre cross line two rows at a time, leaving the last tile and part tile on the side and ends without adhesive for the time being.
- Wipe off with a damp cloth any adhesive which has oozed up between tiles.
- Roll the installed tiles in both directions with a 70kg roller or similar.

9. Cut the part tiles to be fitted to the wall. This is normally done by placing the last full tile in position, placing another overlapping full tile firmly against the wall and cutting the underneath tile along the edge of the upper tile. The cut edge of this part tile is then pushed against the wall and a full tile fitted in behind it.



10. For fitting to door frames, etc, use the same principle of fitting the tile to be cut in the position of the last full tile and marking each change of direction of the door frame by using a bar scriber set to 500mm (or the tile size), or a rule, before cutting carefully. The position of a pipe can be marked and cut in the same way.



11. Cut all such edge tiles and place them and the full tiles still to be stuck on the adjacent tiles while fresh adhesive is spread in the border areas. Place the tiles and roll them thoroughly, using a hand roller or side of a hammer if necessary in corners.

12. The method illustrated above will not work well where walls run off badly or are uneven and may not always give a perfect fit if large (610mm) tiles are being used. In such instances, with the tile to be cut positioned in the place of the last full tile and the scribe or ruler set to the width of the full tile, scribe or mark the tile, keeping the scribe at right angles to the wall.

STICKING THE TILES DOWN (ALTERNATIVE SETTING OUT METHOD)

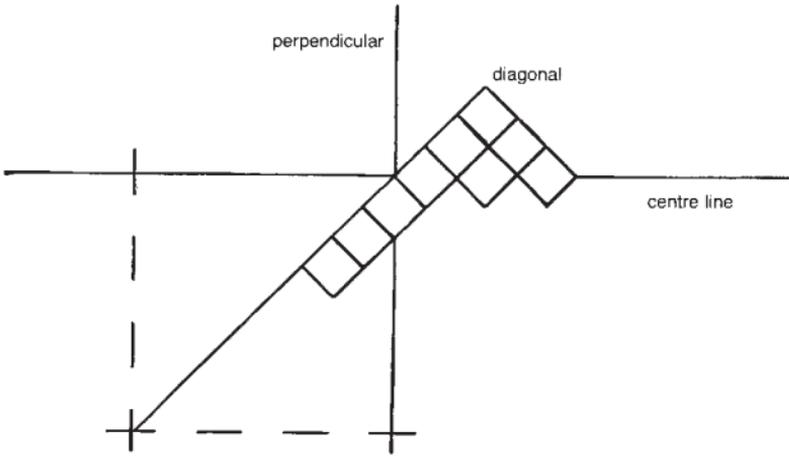
1. This differs from the above method in that the initial tile is placed on the line approx. 480mm - or whatever is the adjusted starting point - from the doorway wall. The first 3 tiles are still lined up very precisely and the adhesive spread is still only what can be covered while the adhesive is still active. The first line is taken the length of the room, checked for precision, and that side of the room then completed, two rows at a time.

LAYING TILES ON THE DIAGONAL

Mark out the area to be laid with a true diagonal as described in the previous section then lay and stick the first row of tiles.



Once again, the key and first row tiles are all important. When balance has been achieved and the first row tiles correctly stuck, lay the field tiles and roll them before the adhesive has set off. An extra check on accuracy is that the points of the tiles should fall precisely on the centre lines drawn at rectangles to the walls, as shown below:



The easiest method of marking the perimeter tiles is to use a template or the Forbo tile scriber. The length of the diagonal of the tile to be fitted will give the length of the template edges.

Either carefully measure between the diagonal points or calculate the square root. For example, using a 50x50cm tile, the diagonal would be the square root of the sum of the square on two adjacent sides or $2500 + 2500 = 5000 = 70.71\text{cm}$

When all the full field tiles have been stuck, except for the outer row, place a full tile exactly over the space that the last full tile will occupy (as described above).

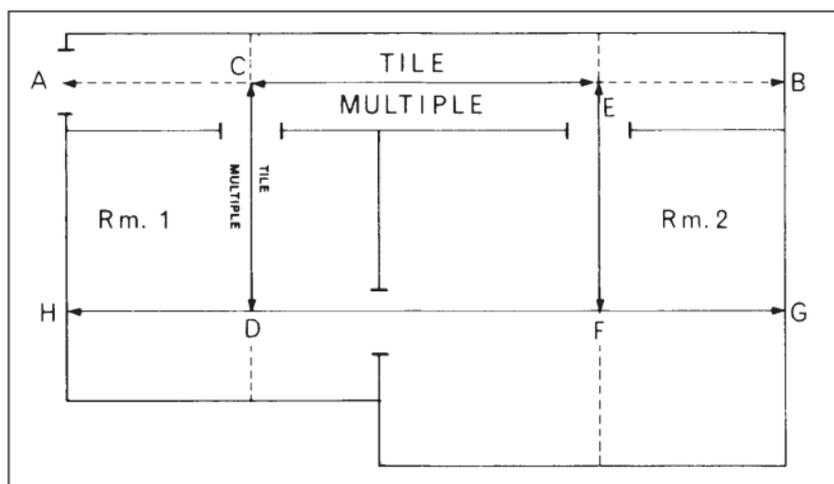
Placing the template or tile scriber with one edge against the wall, mark and cut the perimeter tile to size.



When all tiles have been cut to size and laid adjacent to the area they will occupy, spread the adhesive, lay the tiles and thoroughly roll them.

Special Fitting Situations with Tiles

FITTING ALONG CORRIDORS AND INTO ROOMS



The above illustration is a fairly common layout, where one or more rooms run off a corridor. The floorlayer's aim is to lay tiles overall, keeping them in bond and treating the floor as one whole area. Further complications can arise if there is also a doorway between the two rooms, as shown in the example.

Setting out is especially important. Start from a centre line drawn along the length of the connecting corridor (line A to B shown in the diagram). Find points C and E by measuring or dry laying an exact number of tiles along AB. Construct a right angle at E and draw in line EF. The distance between C and E must be an exact tile multiple.

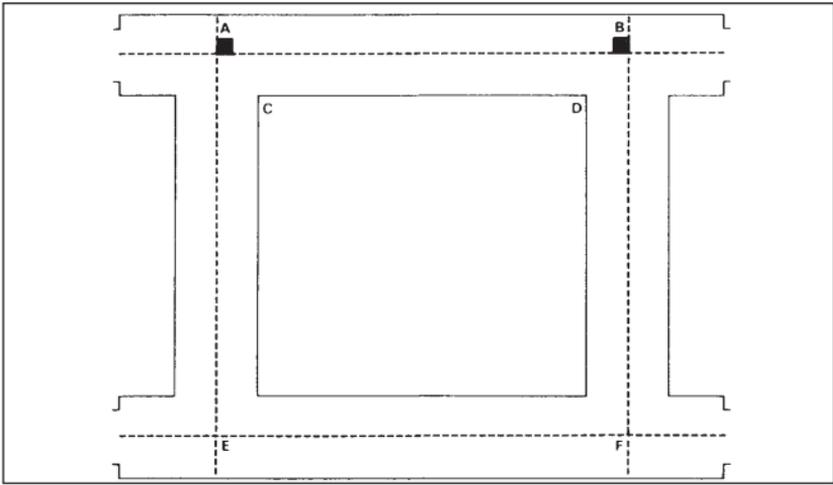
Where there is a communicating door as illustrated between Rooms 1 and 2 strike a further line G to H which is at right angles to C to D and E to F, and runs parallel with line A to B. Again a multiple of tiles has been taken from points C and E to locate the position of this line.

Check that the distance between D and F is an exact tile multiple.

Check the position of the various lines to the walls, to plan the field and eliminate any small tile cuts. Some adjustment may be necessary at this stage to achieve a correct balance.

This method of setting out must be adopted if it is intended to keep tiles in bond in either chequerboard or diagonal fashion, and is recommended for straightforward situations of the type described.

HOLLOW SQUARES



The illustration shows another fairly common situation, and represents corridors round a quadrangle, or a balcony, around which tiles are to be laid in bond.

Great care must be taken here especially if a border or decorative effect is included.

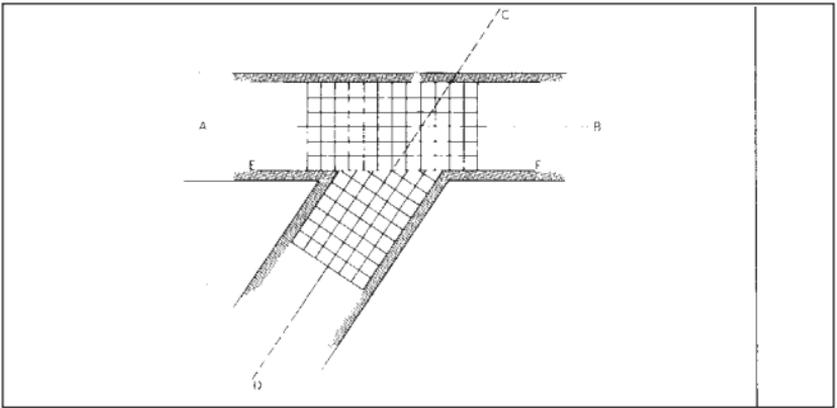
The problem is to achieve a balance on all the corridors. Take a centre line down each of the corridors, at the same time checking that the corridors run at right angles (if not, see next section).

The key to obtaining a balance is to make sure a full tile can be positioned at points A and B as shown. Take measurements to see if this is possible. If it is not possible, then the surplus length must be 'lost' in the run of tiles occurring between points C and D by slightly trimming rows of tiles, e.g. taking 5mm off a number of 500mm tiles, so that the discrepancy is not easily seen.

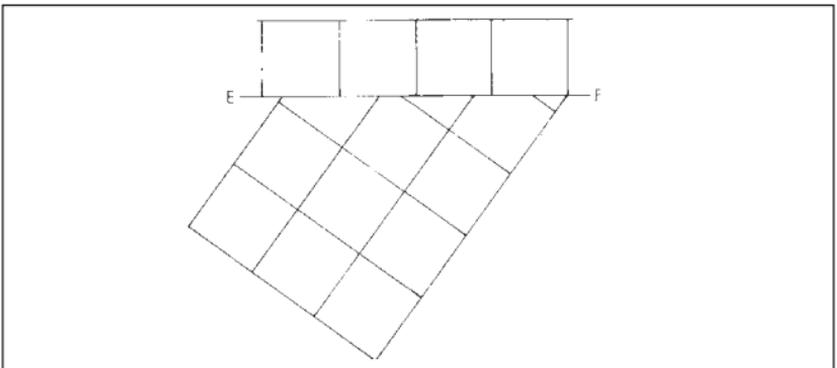
If the line of tiles falls short at point B, then the line A to E will have to be moved sideways, until a full tile appears at points A and B.

Next plan the section along line A to E, trimming and balancing as required, all the while ensuring that measurements are accurate and lines are constantly checked.

CORRIDOR JOINING ON THE DIAGONAL

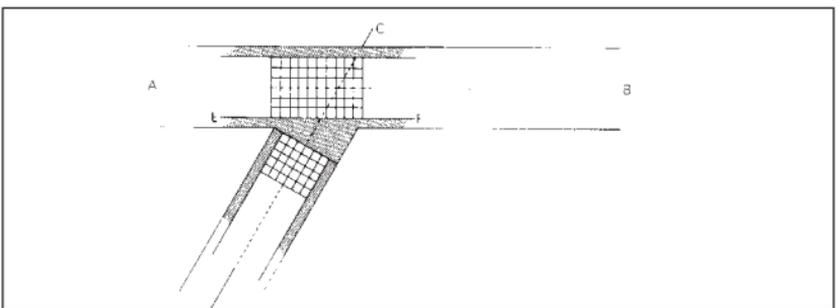


The above shows a variation of the previous conditions, where a corridor runs off at an angle which is not a right angle. In this situation it is not possible to achieve overall balance as in the previous example, and each corridor area is regarded separately. Locate a centre line A to B, and another line C to D running down the middle of the second corridor. At the junction of the two corridors, tiles are trimmed and shaped as illustrated, so that they butt together along the line E to F as shown.



As illustrated it is not possible to maintain bond where the corridor runs off at more than a slight angle. It may look better to fit a solid border as shown above to camouflage the junction.

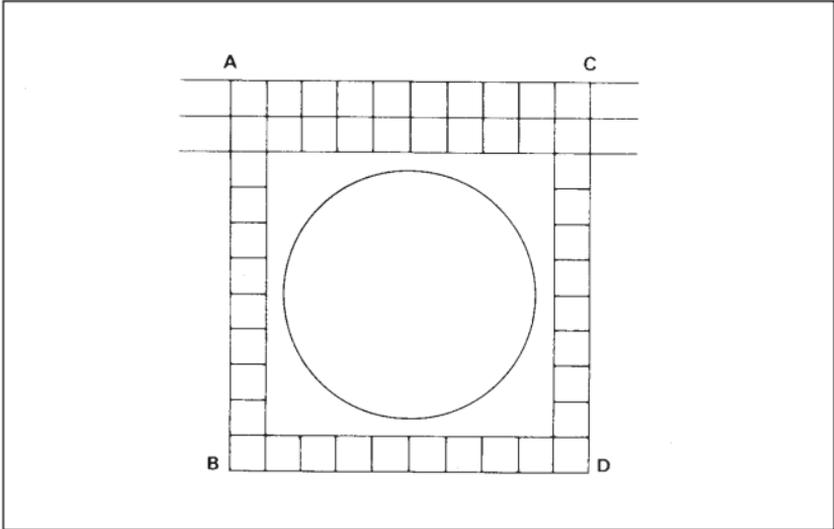
FITTING TO A ROUNDED EDGE



Above is a situation where tiles are laid around a pillar or another centrally placed object, such as a display unit.

Mark out an area, striking lines A to B and C to D, using full tiles only, as shown. Where it is not possible to lay full tiles (the blank area on the diagram) any discrepancy is made up by trimming and shaping within this area only.

This area must be marked off accurately before laying begins, otherwise there is a danger of tiles running off and gaps occurring which cannot be disguised.



TEMPLATING WITH TILES

An awkward situation sometimes encountered is laying tiles around a pedestal or WC pan. After laying all the full field tiles cut a template for the area to be fitted. Using methods described elsewhere for templating, draw the exact outline of the fitment and border of field tiles and before removing the template mark a check of the tile bond on the template. In an open space set out enough tiles for the area to be filled in, taping them together to prevent movement, and position the template check marks accurately on the appropriate tile joints. With the template firmly held in position trace the outline of the fitment back to the tiles; then trim and fit them.

WORKING WITH MORE THAN ONE INSTALLER

In a large area, two or more layers may be placing tiles at the same time. As finger pressure in butting the tiles together may be slightly different start from a common point and work away from it to avoid tiles going out of bond. Alternatively, the second layer can lay a second row of two tiles slightly behind the first layer's row, taking care to see they are kept in bond.

SOME AVOIDABLE PROBLEMS WITH TILE INSTALLATIONS

1. **LATE PLACEMENT**
Do not spread too much adhesive at one time with the risk that it has gone off before the last tiles are placed in it.
2. **LACK OF ADHESIVE**
Spread the adhesive right up to, or even beyond, the edge of the tile. If laying tiles alongside a row laid sometime previously smooth down or clean up any old adhesive and cover with fresh adhesive. See trowel notches are correct - both too little or too much adhesive can cause problems.
3. **TILES RUNNING OUT OF BOND**
If the subfloor has slight undulations some rows of tiles may 'gain' on others in a large area. A new line should be struck when this becomes apparent and tiles trimmed back to this line with a straight edge. Manufacturers will produce tiles within British Standard or International tolerances. Tiles in different batches or of different colours may be well within tolerances but of fractionally different sizes. Particularly if laying a chequerboard pattern check the different colours and see if finger pressure on butting up needs to be less with one than with the other.
4. **LACK OF ROLLING**
Rolling is essential to ensure a good bond. It is too often neglected at the edges of rooms. It is particularly vital for small tile pieces. Use a handroller or the side of a hammer if the large roller will not reach.
5. **LAYING HESSIAN BACKED LINOLEUM TILES**
Unlike standard linoleum tiles, which are made on a backing which ensures their dimensional stability, tiles or shapes cut from hessian-backed sheet linoleum are likely to move out of square as they absorb moisture from the air. To avoid extra trimming and cutting back install such tiles within a few days of their being despatched from the factory and open only as many boxes as you can lay within a few hours.



Cutting Seams in Sheet Material

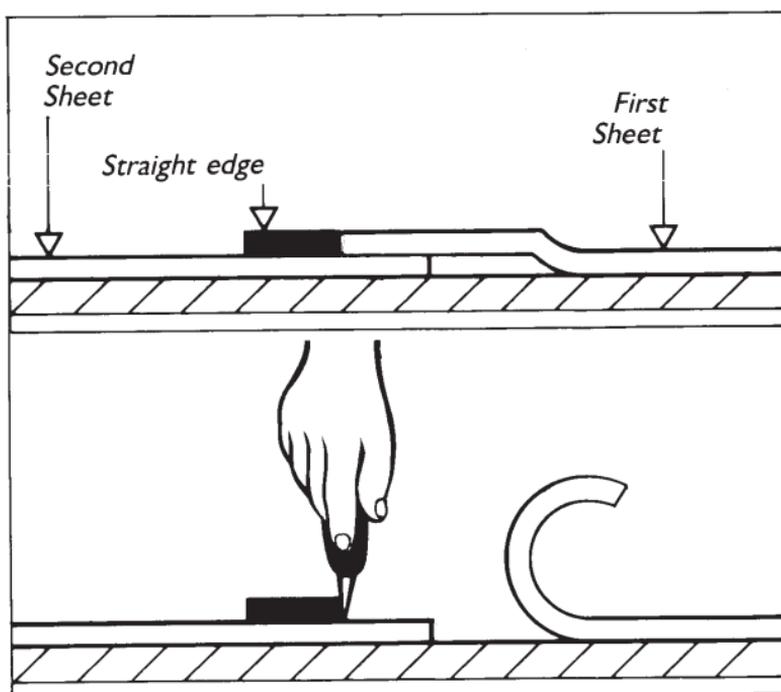
A high proportion of flooring failures occur eventually at seams. This failure will occur sooner rather than later if the seam is poorly made and badly stuck down.

Different seaming practices are needed for different materials.

CUSHIONED VINYL

Many Forbo-Nairn cushioned vinyls are offered in seamless wide widths. However, on occasions it may be necessary to make joins.

Cut a true edge with a straight edge along the line of the proposed seam, using the line of the pattern where possible. Insert the second sheet under this true edge, lining up the pattern exactly. A weight can be used, if necessary, to prevent movements.



To cut the seam on the second sheet butt a straight edge against the seam edge of the first sheet as shown in the diagram. Fold back the first sheet and trim the second sheet along the line of the straight edge, holding the knife as vertical as possible.

Attempting to cut through both sheets in one cut risks a mis-match in the pattern and an over-tight seam.

CONTRACT VINYL

The seam can be made using either

- a straight edge.
- 'over and under' scribes.

A Forbo vinyl seam is cut in tightly as the materials are reinforced and stabilised with a fibreglass scrim and will not stretch or shrink. Even if the material is subsequently to be hot seam welded a professional fitter will ensure he has a good seam to work with.

Check both sheet edges for any signs of damage which will need to be cut off. After this has been removed or allowed for, allow a sheet overlap of about 2cms.

USING A STRAIGHT EDGE

Follow the procedure as for Cushioned Vinyls above, cutting the true edge 1cm or so from the factory edge of the material. Cut both edges using first the straight blade then the hook blade as described in "Cutting Contract Vinyls and Linoleum Sheet".

USING 'OVER AND UNDER' SCRIBERS - VINYL

Cut a true edge on the first sheet, using a straight edge.

Set the 'over and unders' so that the 'over' scribe pin is exactly over the point where the 'under' will run along the true edge. Test the setting on the few centimetres nearest the wall and adjust if necessary. Place the second sheet over the first. Keeping the 'under' firmly against the now invisible true edge of the first sheet scribe the top of the second sheet. If the scribe mark is insufficiently clear rub with chalk as this will highlight it. Then cut through using a straight blade then a hook blade as described in the section "Cutting Contract Vinyls and Linoleum Sheet".

LINOLEUM SHEET

The tools and procedures are as for Contract Vinyls with the one crucial difference that allowance must be made for a fractional expansion in the width of the hessian backed material as it picks up moisture from the atmosphere or adhesive. This expansion is minute and will be halted by the curing of the special linoleum adhesive, but unless allowed for in the cutting the seams will peak and fail.

USING A STRAIGHT EDGE AND PIN VICE

Cut a true edge as for contract vinyls. Leave this sheet overlapping the second sheet. Score the second sheet by running the pin vice along the true edge. Make sure the pin vice is vertical and pressed against the true

edge. Cut through with straight and hooked blades, keeping the waste to the outside of the cutting hand and thereby giving a slight undercut. The resultant gap between the two sheets will be about the thickness of a pin vice.

USING 'OVER AND UNDER' SCRIBERS - LINOLEUM

Follow the procedure as for contract vinyls except that the upper scribe pin is offset to allow for a gap of about the thickness of a pin of a pin vice. Again, check on a few centimetres near a wall.

USING THE FORBO TRIMMER (SEAM AND STRIP CUTTER)

Instructions on the use of this tool are supplied with the tool.

The Forbo Trimmer (Seam and Strip Cutter) performs the scribing and cutting operations at the same time when held against a true edge and pushed away from the operator, leaving the ideal gap for linoleum seams. Sharp blades always make a fitter's job easier and make this tool particularly easy to use. Its Strip Cutting capability is described elsewhere.

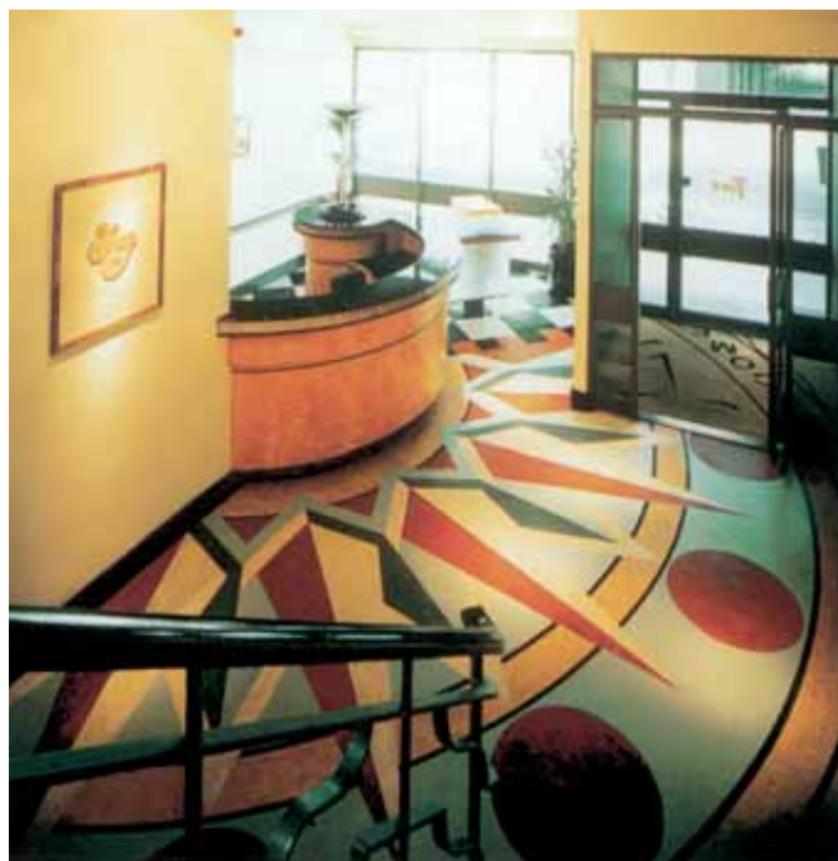
To enable the Trimmer to be fitted snugly against the true edge (to the floorlayer's left as he pushes the cutter forward) the first 10cm or so of the seam out from the wall must be scribed and cut using one of the other methods described. The final 5cm of the seam must also be treated likewise.

CROSS JOINTS

Cross joints should be avoided as much as possible by carefully planning the use of the lengths available in material of the same batch.

Where cross joints are necessary, cut the end seam in the same way as for vinyl side seams without leaving a gap for expansion. However, do not make this cut before sticking down most of the material.

Forbo Contract Vinyls, reinforced with glass fibre, do not shrink in the width. Because of the tight factory rolling both Contract Vinyls and Cork Carpet will shrink a little in the length upon being unrolled. In the case of Cork Carpet allow for 10mm per metre length in your calculations. For Contract Vinyls the maximum contraction in the roll length will be less than 100mm over the 25metres roll length.



Fitting Sheet Material (Scribing)

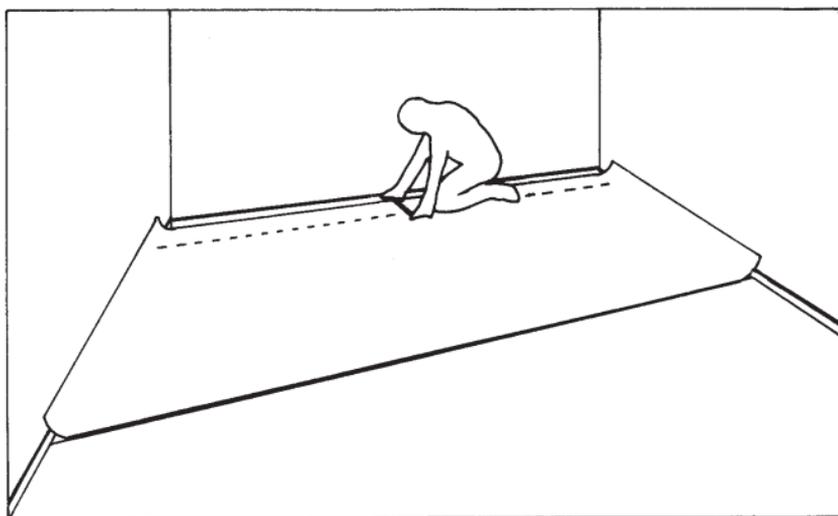
The method of fitting described here is simple, quick and logical and will ensure an accuracy that will eliminate unsightly gaps. The same techniques are used for sheet linoleum, solid and cushioned vinyls and, slightly adapted, the concept of scribing holds good for fitting to vertical surfaces and can also be used for fitting tiles.

BACK ROLLING

Both linoleum and sheet vinyl products are tightly rolled in the factory. The tension caused by this process will mean that the goods will shrink a little in the length when unrolled. It is advisable to reduce the effect of shrinkage by re-rolling the cut lengths of sheet back on themselves and allowing to stand in this state for 15 minutes prior to unrolling again and commencing fitting.

FITTING THE FIRST SHEET

Start by fitting the material to the longest wall. Cut a piece of material about 100mm longer than the length required, so that the sheet ends will ride up the end walls of the area to be fitted. Line up the sheet alongside the wall, about 25mm from it, so that it runs square to the door. Draw a cross check at the base of the wall and/or on the subfloor, and also on the sheet that is to be fitted.



Ensure that the mark on the sheet will extend beyond the final scribe/cutting line, and will not be removed when trimming.

Use a bar scribe.

Set the scribe to a distance from the wall just sufficient to catch the sheet all along the wall; unnecessarily long settings are more difficult to control during scribing. Use a comfortable but firm grip and tilt the bar scribe slightly towards you. Scribe a line at right angles to the sheet edge. Concentrate on keeping the end of the scribe firmly against the wall rather than watching the pin scratch.



On light coloured material where the scribe mark is difficult to see, rub a piece of chalk gently along it in order to highlight it.

Provide adequate working space by pulling the material clear of the wall.

With a straight blade, cut through the surface following the scribe line.

Cut the remaining thickness through with a hooked blade as described in the previous section.

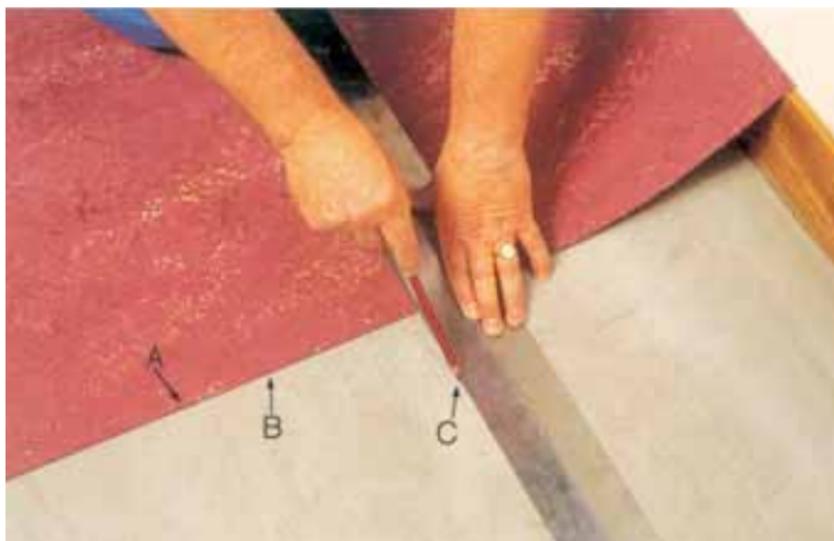
Fit the material to the wall, lining up with cross checks previously marked.

SCRIBING THE END WALLS

With the sheet fitted correctly in position along the length, and the ends riding up the end walls, draw a line (B) on the subfloor, traced along the selvedge (A). This line (B) acts as a guide line.

Place a ruler or straight edge, at right angles to the sheet. Across the edge of the sheet draw a cross check (C) on both material and subfloor. Fold one end of the sheet back on itself, pull the other end clear by about 25mm from the wall. Position the sheet to lie flat on the floor, with the edge true to the guide line (B). To allow for the slight shrinkage in the length when the Marmoleum is put into the adhesive set the bar scribe at about 2mm less than the distance (D) that the cross check has opened up.

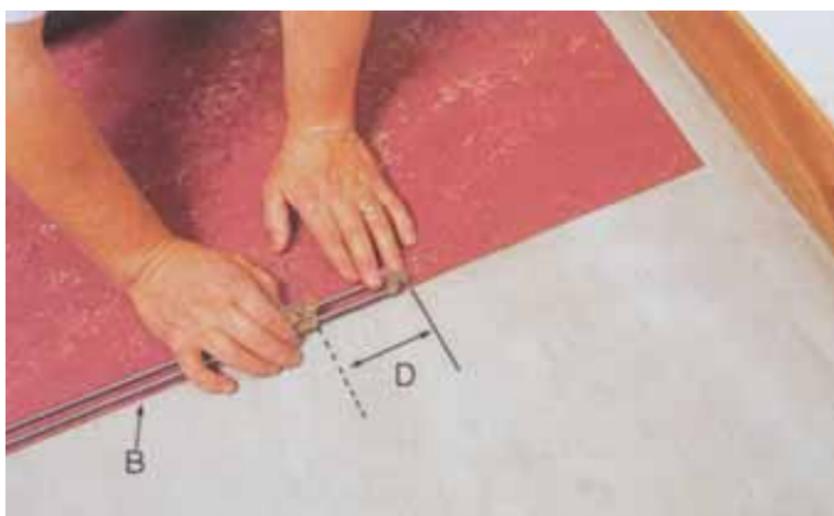
Keep the scribe parallel to the guide line (B) and scribe the end of the



sheet. Cut the material along the scribe line. Check fit to the wall, with the aid of the cross checks and the guide line.

Scribe and cut the other end of the sheet using the same method.

For end scribing some floorlayers are more comfortable with this alternative method. Set the bar scribe to a set size of, say 150mm, although the size is not crucial as long as it is more than the excess allowed for scribing the ends. Use a pencil to mark this distance on the material to be scribed, with one mark on the material and, in this case, the other on the skirting. Do the same on the open side, one mark on the material and one on the floor. Ease the sheet away from the wall and marry up the two lines on both sides of the sheet, using the thickness of the pencil line to allow for the slight shrinkage in length which will occur when the linoleum is put in the adhesive. Use the bar scribe and scribe the contour of the skirting to this size.



FITTING ANY INTERMEDIATE SHEETS

Cut the sheet a little longer than the exact room measurements. Place this sheet on the floor, parallel to the first sheet and overlapping it by about 20mm, allow the end to ride up the walls. Pencil in a guide line on the floor and cross checks on floor and sheet. Scribe and cut-in the two ends of the sheet as previously described then cut in the seam.

FITTING THE LAST SHEET

Cut the last sheet a little longer than the room measurements. Place this sheet on the floor overlapping the previous one and allow the ends to ride up the end walls of the room. Keep the two sheets parallel and adjust the amount of overlap to produce a gap of about 20mm between the edge of the sheet and the final (fourth) wall. Draw a cross check at the base of the wall and on the sheet edge to be fitted. Set the scribes at about 10mm more than the widest gap between the sheet and the fourth wall. Scribe and cut the sheet to fit this wall. With the last sheet fitted snugly against the fourth wall, draw a pencil guide on the face of the previously fitted sheet. Make a cross check mark on the overlapped edge of the last sheet and the previous sheet.

Slide the sheet along the guide line until it lies flat on the floor with one end about 25mm from the end wall and with the edge of the sheet true to the guide line. Set the scribe to the distance between the cross checks, and scribe and cut the end of the sheet, as previously described. Scribe and cut the opposite end of the sheet using the same method. Finally cut in the seam.

FITTING TO IRREGULAR OUTLINES

When fitting to walls which have several recesses and projections such as alcoves, bay windows and doorways, etc, scribing ensures an accurate fit in even the most complicated situations as can be seen in the accompanying diagrams. However, see also the section headed "Templating".

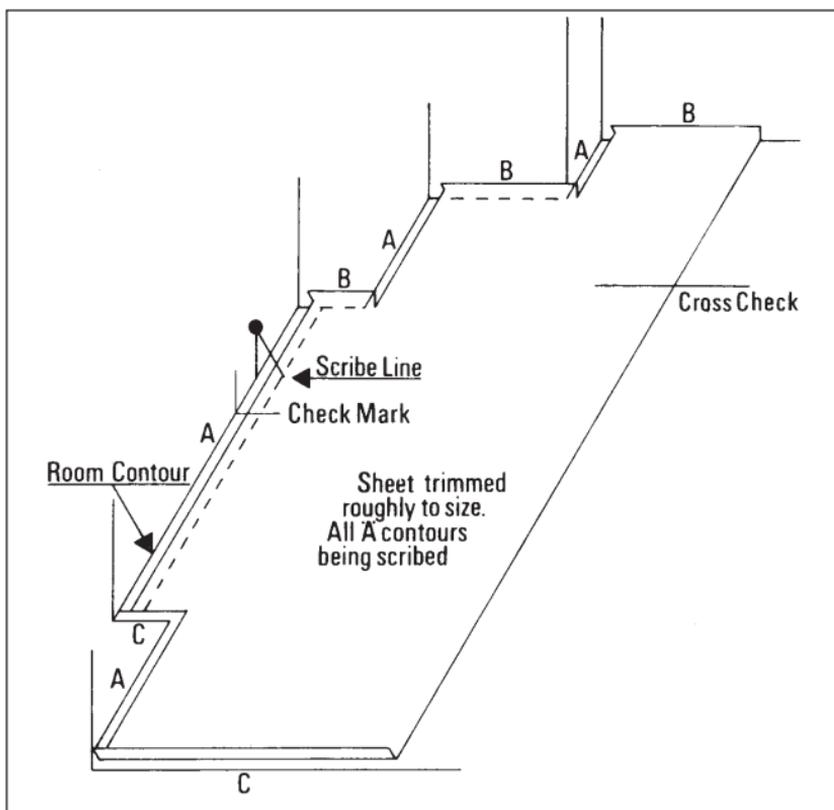
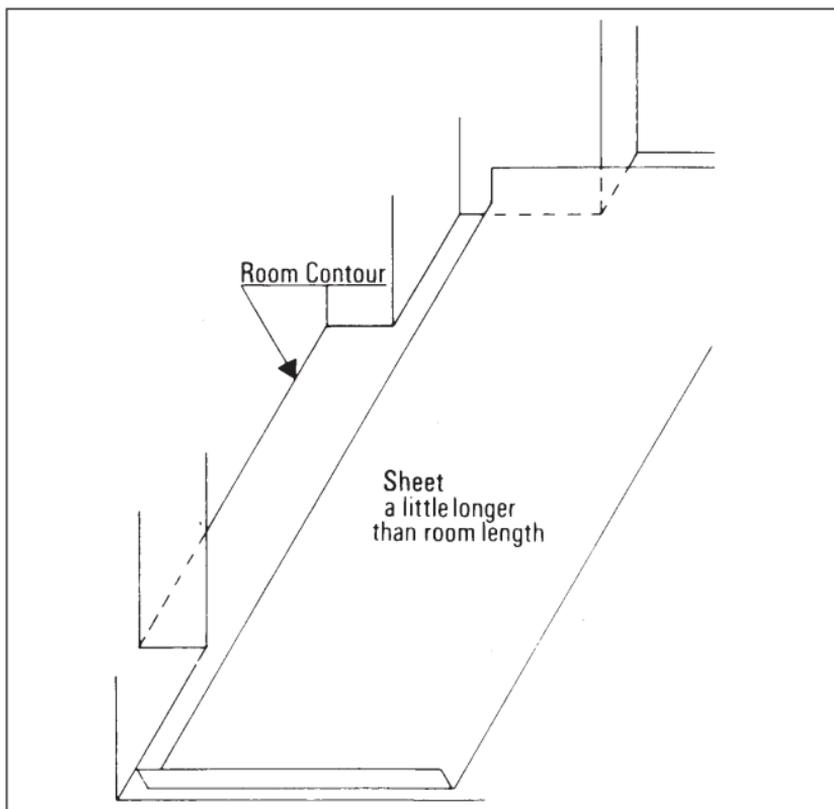
Cut the first sheet a little longer than required. Trim the sheet roughly to the outline of the wall, leaving an extra 10 to 12mm on the ends as an allowance for scribing.

Position the sheet on the floor so that it lies square to the doorway or other fitted sheets and about 25mm from the side wall (A), allow the sheet to ride up the end walls. The ends of the sheet must also ride up parts of the walls marked (B) and (C).

Draw a check mark on the edge of the sheet and on the base of the wall. Set the scribe to a convenient setting and scribe all the surfaces marked (A). Cut along the scribe line.

Move the sheet into position, so that it fits snugly along the wall (A), allow the extra to ride up against parts of the wall (B) and (C).

Draw a pencil guide along the edge of the sheet. Pencil in cross checks at the edge of the sheet.



Slide the sheet towards wall (C) and scribe all parts of the walls marked (B). The scriber setting is the distance the check mark has moved apart. Next move the sheet towards wall (B) and scribe all parts of the wall marked (C), remember to reset the scribers.

Cut the material along both sets of scribe lines just made and the sheet will fit neatly into position.

With deep alcoves or recesses you will need to measure and trim off excess material to bring the edge of the sheet near enough to the alcove wall. However, the client may find a seam across the alcove entrance preferable to excess wastage.

FREEHANDING

It is sometimes argued that vinyls are flexible and can be quickly freehanded to a wall. It may even be seen as a slur on a fitter's skills to suggest anything other than freehanding is necessary. Once done a few times, the scribing method described here will be found to be almost as quick and far more certain to give a perfect result and therefore a fully satisfied customer. That is professionalism.

With flexible thin vinyls, such as cushioned vinyls, a blade can sometimes be fitted in the bar scriber, enabling scribing and cutting to be carried out in one operation.

FITTING LONG LENGTHS

During the manufacture of sheet linoleum or sheet vinyls the material is stretched slightly in the length (see page 57). Often the first opportunity it has to relax fully is when it is unrolled, scribed and folded back for the spreading of the adhesive. If the length being fitted is a long one, this relaxation can be significant enough for a fitted end to be a little short of the wall once folded down again into the adhesive. Slight shrinkage may still occur in long lengths of linoleum and vinyl and more particularly, cork linoleum and Walton even when back rolled.

To avoid this, scribe and fit one end of the sheet and then stick all but the last 1½-2 metres at the other end before scribing and fitting this end. Any relaxation during the folding back of such a short length will not be significant. The whole length must be stuck while the adhesive is still active.

BIGHT MARKS IN LINOLEUM

During the maturing of linoleum the material hangs in large stoves in continuous festoons up to 16 metres high. At the top, the linoleum passes over a pole, face inwards, and at the bottom forms a loop, or bight, face outwards.

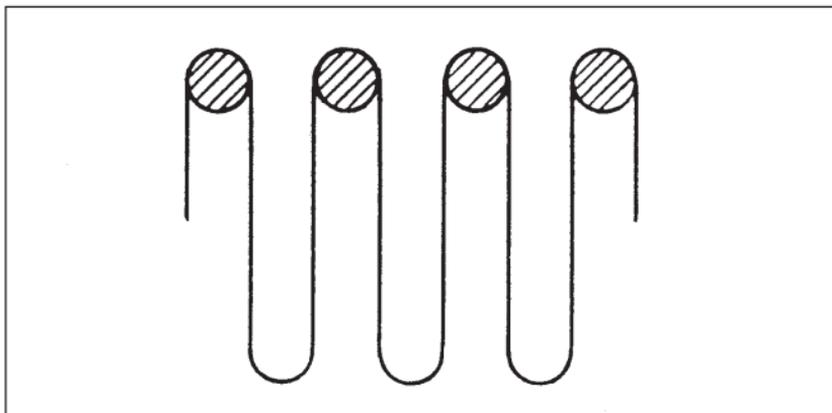
During the 2-3 week curing process the weight of the material causes the linoleum to mould a little to the pole causing a mark across the width which is always cut out at the factory.

The fold or bight at the bottom is however more gentle though sometimes

detectable as a slight ridge across the sheet, about 15cm wide. With modern flexible linoleum formulations this can usually be stuck down in 2.5mm or 2.0mm linoleum using normal adhesive spreading techniques provided the site is warm and the bight mark area is well rolled, firstly across the sheet and then along it.

With 3.2mm material or if site conditions are unfavourable it may be necessary to use a special technique. Some floorlayers prefer instead to cut such bight marks out.

When site conditions are good, bight marks should present no problems using ForboFix 696 adhesive spread by the specified 2mm x 6mm serrated trowel. Extra care is all that is required.



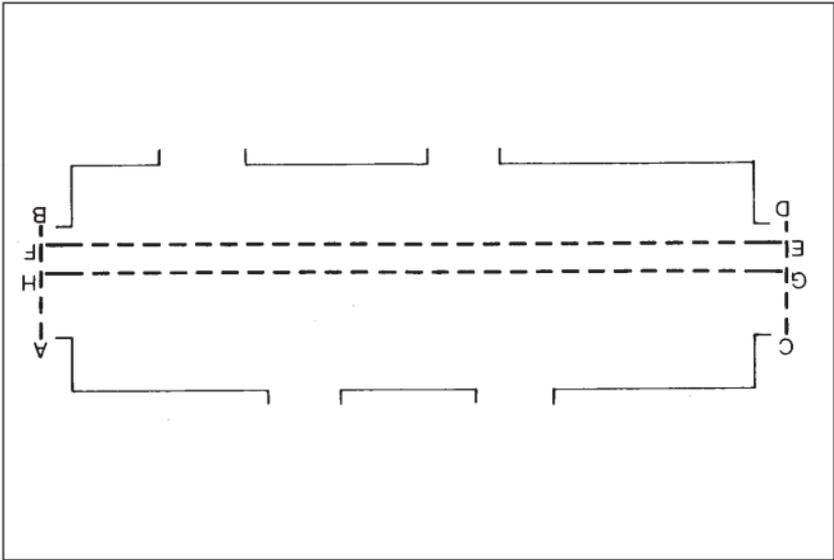
As the sheet is fed into the wet adhesive and the bight mark is reached lean gently on the bight mark to reduce the radius and rock in and out of the adhesive looking to make sure complete transfer is achieved on the hessian backing before proceeding. Once the loop of linoleum still to be fed into adhesive clears the area of the bight mark roll immediately with a 68 kilo roller, dealing with any bubbles or trapped air before moving on. Repeat the rolling of the bight mark at 15 minute intervals until fully bonded to subfloor.

An alternative method is to mark the subfloor where the bight mark falls, pull back the sheet and spread contact adhesive on the floor then on the back of the bight mark. When the contact adhesive is dry proceed as normal spreading ForboFix 696 as per specification up to the edge of and then beyond the contact adhesive. Lay the sheet into wet adhesive until the bight mark is reached then, (using the same leaning and rocking method as above) adhere it carefully, making sure overall contact is achieved and no air pockets are present.

Another alternative is to use a solvent free contact adhesive as a single stick adhesive. Spread this adhesive at the area where the bight falls using the same serrated trowel. Do **NOT** spread the adhesive on the back of the bight. Then proceed as above.

LONG-TOM' METHOD FOR FITTING CORRIDORS

This method, where the sheet is folded back across the width to form a



'gun-barrel' effect, gets its name from 'Long Tom', a siege gun of the 1914-18 war.

It is used where a single width of sheet material, wider than the corridor being fitted, is being fitted along a corridor and there are obstacles such as radiators, half doors, etc. It may well give an installation with fewer seams, which will please the client, but may use more material and take more time. Ideally discuss with the client prior to quoting.

Run out the sheet material and allow it to lap up the side walls. Pull one edge of the sheet clear of one long wall and scribe from this wall. Trace, cut and fit this side.

If the corridor ends are open or have doorways run a pencil line across them (A to B and C to D). Make check marks on the floor and the material at either end and spring a chalk line between them (E to F). Make another mark a set distance from the first, ensuring that this distance will be sufficient for the material to clear the second wall ready for scribing, and adjust the material to this second set of marks (G and H). Spring a second chalk line G to H and use dividers or a bar scribe to ensure the two lines are parallel and that the material has been pulled back evenly. Scribe (using the same setting as above), cut and fit back into position.

The sheet is now ready to be stuck down. Fold back half the sheet along its length in gun barrel fashion, mark a central line and spread adhesive to this line. With long corridors, it may be necessary for two fitters to spread the adhesive, starting from the middle and working towards opposite ends, to avoid the adhesive setting off too quickly. Roll the material into the adhesive with a 68kg roller.

Spread the adhesive for the second half, marrying it up carefully with the first half. Do this before the first adhesive spread is dry as if the over-spread at the centre line is not satisfactory elongated blisters or bubbles could result.

EASING THE END OF A LINOLEUM SHEET INTO THE ADHESIVE

As with bight marks above, to ensure the end of the linoleum sheet beds well into the adhesive, fold the end of the sheet back diagonally and feed the hessian backing down into the adhesive with a 'bouncing action' as in the illustration below. Do not make this so severe as to risk cracking the linoleum. This will ease the tension across the end of the length and the linoleum will have good contact with the adhesive. Roll thoroughly.





Templating

Many small or awkwardly shaped rooms present a challenge for the floorlayer, particularly where sheet flooring has to be laid to fit around pedestals, pipes and other obstructions.

Resilient sheet floorcoverings must be cut and measured to fit accurately first time. The simple method used to achieve this is Templating, and step by step instructions are given in the following illustrations.

1. Lay a sheet of stiff paper with the natural curl face down to the floor and cut to fit around the perimeter and projections such as pipes, radiators, etc to leave a gap of about 12mm ($\frac{1}{2}$ in) all round. Secure in place by weights or drawing pins. Alternatively, cut flaps in the paper and tape the paper to the floor underneath the flap. If it moves, the sheet will not be cut correctly.
2. Use a rule and a sharp pencil and move rule and pencil along the wall to give a pencil line on the paper. The rule must remain firmly pressed against the wall.



3. Use the same method to trace any objects such as WC pedestal, drawing a series of straight lines.



Another method is to let the paper ride up all the sides of the pedestal, making numerous relief cuts to enable it to do so, then draw a firm pencil line on the paper at the bottom of the relief cuts, pressing the pencil into the angle at the bottom of the pedestal.

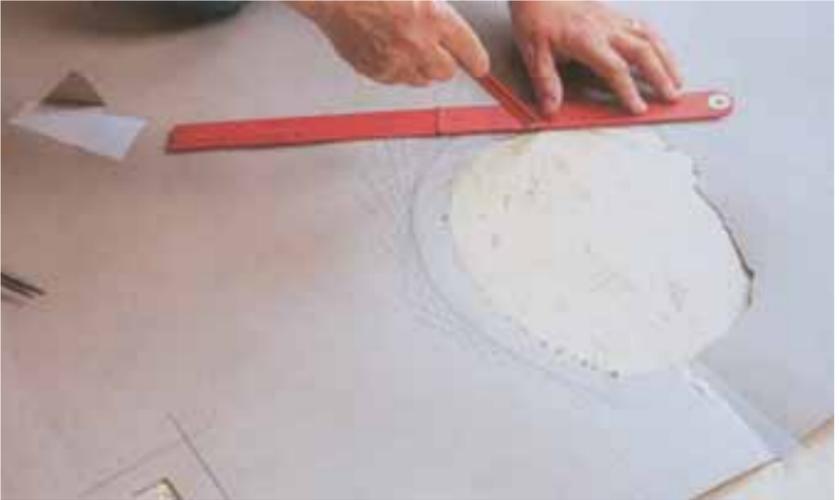
4. Pipes or supports which are circular in section are squared off on three or four sides.



5. At door jambs, mark each change of direction of the wall or doorway. Remember, in some toilets, the fitting at the doorway will be the most looked at example of your skills!
6. Thoroughly check that all fittings have been marked, remove the template and cut the required length of floorcovering from the roll. Using drawing pins, sellotape or heavy weights, fasten the template to the floorcovering.
Trace the outline on the template back onto the floorcovering, the

ruler following the traced line, the pencil or pin vice marking the material outside the ruler.

7. Around WC pedestals, keep the edge of the ruler on the lines of the template and mark back onto the material.
If the alternative method described on page 68 is used then scribe directly through the pencil line without back marking.



8. Trace back the square off shapes using the same rule.
9. Determine the centre of the square and draw a circle within the squared off lines.



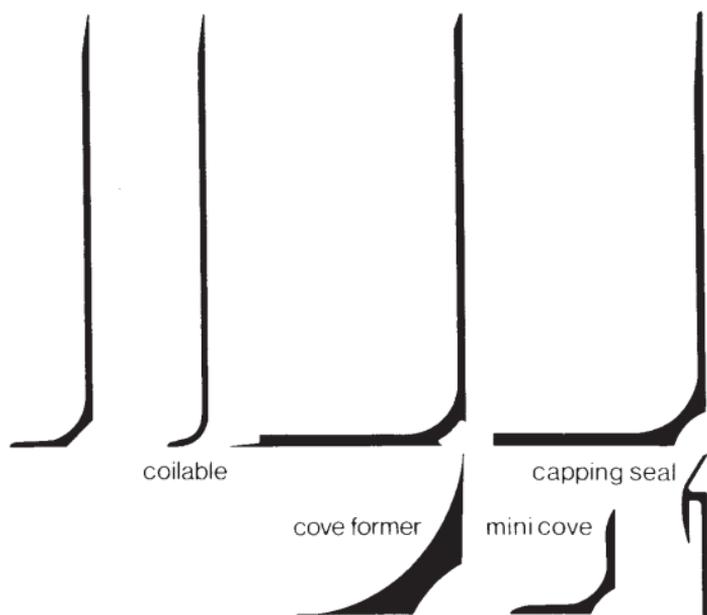
After checking that all scribe marks have been transferred, remove the paper template.

10. Cut to shape. If it is necessary with a patterned product, such as cushioned vinyl, to slit from the edge to the hole to fit around any upstanding projections follow if possible the line of the pattern (known as Vandyke cutting). This will make the cut less visible.
11. Loosely roll the material face in and place in position. Check fitting and secure with the recommended adhesive.
12. Accurate fitting is certain by this method and in confined areas handling is much easier and less time consuming. Make your pencil lines with care and have the courage to cut to them. Leaving a little material oversize 'for safety' wastes time and causes a difficult trimming operation.



Skirting and Coving

A neat attractive, hygienic and waterproof finish at the point where the floorcovering meets the walls is provided by a Cove Skirting. Its use will also give protection to the base of the wall during maintenance operations.



The majority of covings and ancillary products used are extruded pvc such as top set (sit-on), butt coving (set-in) and a wrap around type in coil form. The latter is only employed as a sit-on coving, but allows corners to be turned with the minimum of joins.

For Forbo linoleum, pre-formed linoleum coving is available with a radiused curve, reinforced at the back with resin to give a 90° angle with a self-sealing joint.

Alternatively, both vinyl and linoleum can be covered up the wall on site with the use of a cove former.

PREFORMED VINYL COVING (SIT-ON OR SET-IN)

Laying procedures are similar except that with sit-on coving the field is laid first and fitted to the walls whereas with set-in coving the coving is installed first and the field material fitted to it.

Measure out the length between corners. Where less than full lengths of coving are needed position any inevitable joins near to, but not at, internal angles. These will be less visible.

INTERNAL CORNERS

With sit-on coving fit and stick the first piece to one wall, leaving the toe unmitred. Using the scribes (dividers), scribe the vertical part of the second piece and with the dividers at the same distance mark the point on the toe where the mitre cut will come. Chamfer back the underside of this and stick to the surface of the toe of the first piece. This provides reinforcement of the corner of the coving.



With set-in coving, the toe of the first length is mitred before being stuck and the scribing of the second length continues down over the toe so that a fully mitred joint results.

EXTERNAL CORNERS

Mitred joints are necessary with both sit-on and set-in coving.

Use a piece of coving to extend the line of the edge of the toe of the coving beyond both walls until the lines intersect. Rule a pencil line from the corner out through this intersection point.

Place the first piece of coving in position, extending beyond the corner of the wall. Along the mitre line drawn out from the corner, rule a pencil line on top of the flat toe of the cove. With the coving still held in position and a piece of scrap to give the correct thickness, mark a pencil line down the back of the vertical part of the coving at the end of the wall.



Push the knife into the swing at two points on this line. This will show as two white marks on the front of the coving. Cut along this line and also along the pencil line on the toe. Join the two cuts with a curved freehand cut.

Pare the back away along the vertical and radiused part of the coving to give a 45° angle ready for a perfect mitre. If fitting both ends of the cove remember this paring operation effectively cuts away a length equivalent to the thickness of the cove. Once both ends of the length of coving are prepared correctly stick it in position with a contact adhesive.

Position the coving to be fitted along the second wall, extending it to beyond the mitre point and mark with a pencil as above. Alternatively, for the vertical line, chalk along the mitred edge of the first vertical and press the new piece of coving against it, transferring the chalk line to the back of the new length of coving. Cut through this vertical line, as before, freehand the extension to the pencil line and cut and chamfer as above.

COILED VINYL SKIRTING

This is a form of skirting supplied flat in coils (or perhaps 15 lin. metres) which is then formed on site to give a set-in or sit-on cove which gives a minimum of joints. Internal and external angles are cut as above.

PREFORMED LINOLEUM COVING (SET-IN)

Forbo-Nairn offer a pre-formed linoleum set-in coving in both Marmoleum, Artoleum and Walton. It can either be used in the same colour as the field or as a contrasting colour. In contrasting colours, it can be used with other Forbo linoleums of the same gauge. Remember it has to be installed before the field material and order in good time.

The coving available is Marmoform S pre-formed skirting. The standard material is 100mm high with a 50mm toe and is supplied in lengths of 240cm. It can be in 3.2mm, 2.5mm or 2.0mm. The backing support is glassfibre and resin and the internal radius of the cove is 9-10mm. 2.5mm gauge Marmoform S skirting can be supplied in the exact number of lengths. If 2.0mm or 3.2mm coving is required then it has to be ordered in multiples of 13 lengths. Marmoform S is available from stock in many of the Marmoleum colours - check current literature for information regarding stock ranges. The field can be welded to the skirting if wished.

INTERNAL AND EXTERNAL CORNERS IN PRE-FORMED LINOLEUM COVING

All corners cut from pre-formed coving need to be mitred and should be done with a mitre block to give the necessary precision when cutting through the backing reinforcement.



For pre-shaped coving, scribe internal corners for a mitred fit as described above and cut on the mitre block.

For external corners, pencil mark across the top of the first vertical at the point where it reaches the end of the wall. There is no need to mark the toe diagonal on the floor as the mitre block will give this automatically.

FITTING STRAIGHT LENGTHS OF COVING

Start from corners or from the fitted corner pieces. Using a 200mm long piece of coving reduced in height by 5mm as a guide, pencil mark the top of the coving along the wall. With the mitre block cut the ends of any lengths as required to give a fit or to remove handling damage. Use a contact adhesive in accordance with its manufacturer's instructions.

Spread the adhesive to the pencil line and at the correct time press the coving length firmly and accurately into position. It is possible to seal the ends of each length of coving at this stage, prior to fitting the next length, in lieu of welding (if discussed in advance - see page 81).

The light reflectance will be different for vertical surfaces compared with horizontal ones so the same material will appear to have a different shade on the upright part.

FITTING THE FIELD TO THE SET-IN COVING

Seam welding will be specified for almost all set-in covings. Prior to this ensure a good fit between the toe of the skirting and the field floorcovering by overlapping the field material over the skirting by 10mm and scribing to fit with over and under scribes, as described in the section on Fitting Sheet Materials.

SITE FORMED COVING

Both linoleum and vinyl can be covered up the wall on site.

With 2.0mm sheet vinyl the material will normally be flexible enough at

room temperature to be covered up a 20mm radius cove former (though 38mm may also be used) and the sheet of field material may be used without a seam, or a border may be formed if preferred. It is difficult to manhandle more than small areas of coved field material.

With 2.5mm or 3.2mm linoleum, it is advisable to plan a border of perhaps 100-300mm, in the same colour as the field sheet or a contrasting one, which is then extended up the wall to form the cove. A 38mm radius cove former should be used.

Widths of material to form the border and cove, whether of linoleum or vinyl, should be cut along the length of the roll. Strips cut off across the end of a roll will have a tendency to curl inwards, in the opposite direction to that required to form the coving. Linoleum should be warmed above room temperature to make it as flexible as possible. Use a hot air gun.

Mitre joint lengths of cove former at the corners. Cut accurately with a mitre block.

ONE PIECE COVE AND BORDER

Lay the field first as described in the section on Borders and Feature Strips.

Mark on the wall with pencil or chalk line the top line at the cove. Fit a capping strip, such as that illustrated in the diagram at the beginning of this section, and the appropriate cove former, using a contact adhesive. Ensure the bond is firm.

Use a flexible rule or piece of scrap material to check the width of the combined cove and border, taking the top edge under the capping strip, and cut strips of the appropriate width. Check the wall does not run off. Butt join the strip firmly against the field material. Make cross checks on field and border before sticking.

Form mitred internal and external corners in the way described above for pre-formed coving. Stick with the appropriate linoleum or vinyl adhesive, heating any capping strip and easing the material into place in the capping strip with a screwdriver or similar blunt instrument.



USING A FIELD AS COVING MATERIAL

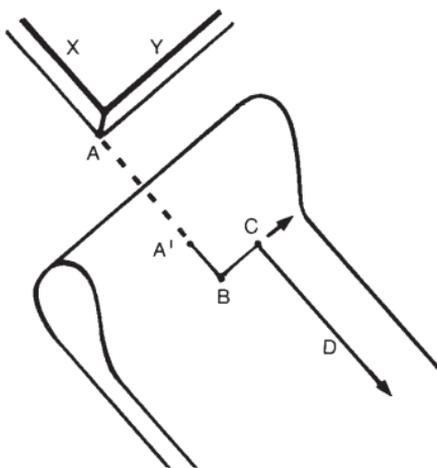
This is a skilled operation for use with very flexible vinyl floorcoverings and even then may be impractical in rooms of a complicated shape. Consider one piece cove and borders as an alternative.

After fitting the cove former lap the material up the wall at internal corners by the amount needed to reach the marked height, plus a little more to allow for accurate trimming. Make a relief cut in the material to allow the pieces of excess coving material to overlap and the heel of the material to fit against the cove former. If a capping strip has been fitted to not allow extra material beyond the top of the capping strip. Cut one piece of the cove material accurately into the corner with a mitred cut. Overlap the excess material from the coving on the other wall and cut through carefully to give a neat mitred joint. Use the accurately cut mitre of the cove former to guide the point of the blade. For external corners an inserted gusset is unavoidable. Choose the less obvious wall for the insert.

Strike a chalk line on the wall to mark the top line of the coving. Fit the cove former in position.

If other parts of the sheet have already been fitted make check marks on these sides.

Place the length of material in the position it will be on the floor. Bight back the length of material which will extend beyond the external corner to be fitted and mark on the back of the curve of the sheet the exact point, A^1 , where the material meets the point of the mitred cove former, point A. Measure the length from point A to the planned top of the cove. On the bighted back material mark a line $A^1 B$ parallel to the wall running away from you (wall X) which starts at point A^1 and is 4-5cm longer than the length from A to the top of the cove. From B mark a similar length BC at rightangles to $A^1 B$ along the direction of the other wall (wall Y). From C mark a line CD a rightangles to BC, moving away from point A^1 . Verify any check marks and cut lines $A^1 B$, BC and CD, extending the cuts through BC and CD (but not $A^1 B$) to remove any waste.



Push into position so that the mark A¹ is again at the point A of the mitred cove former.

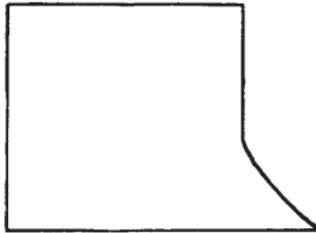


Trim the top of the coving to the chalk line on the wall or check it will fit into the capping strip, if one is being used.

If the corner is to be welded, chalk the point of the corner and of the cove former and press the upstanding material against it, which will transfer the line to the back of the material. Alternatively, mark the back of the vertical with a pencil. Cut along this line.

If the joint is to be mitred and not welded then take a piece of the scrap material and hold it in position in the gap against the back of the upstanding material. With over-and-under scribes set to scribe at the thickness of the material out from the wall scribe and cut through with a 45° mitre cut to be ready to join up with the edge of the insert.

Measure and cut an insert piece remembering to angle the material at the foot so that it extends to form a mitred joint along the line of the mitre join in the cove former. With the corner to the right of the insert the shape of the insert when flat will be similar to this:



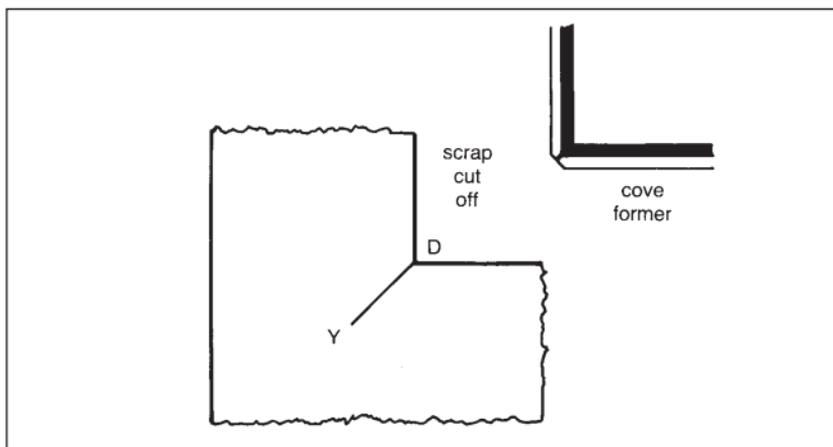
Before fitting this insert decide whether it would be easier and neater to extend the toe of this insert further out from the wall by cutting further material from the field. It may prove difficult to get a neat join at the bottom edge of the cove former.

EXTERNAL CORNERS: BUTTERFLY OR 'V' CUTS

The client is sometimes anxious to avoid a seam, even a welded one, at the external corners, feeling that it will be damaged or broken by knocks. An option here with very flexible vinyls is to insert a V of material around the vertical of the corner. This technique will work only where no cove former is used.

Having marked the lines for the top of the coving, measure and transfer these lines to their position on the sheet. Cut along these lines, or a little outside them to allow for trimming back later, and remove the scrap material.

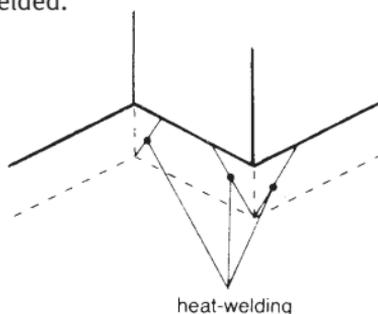
Measure with a piece of scrap material the distance from the bottom of the point of the corner to the top of the coving.



Draw a straight 45° diagonal along the line DY and cut from D along this line towards Y the distance marked on the scrap material.

When pushed into position against the wall with the end of the diagonal cut on the bottom of the corner and the top of the material along the lines on the wall the material will open up to form a V. Do not stress the material so that it tears an extension to the cut.

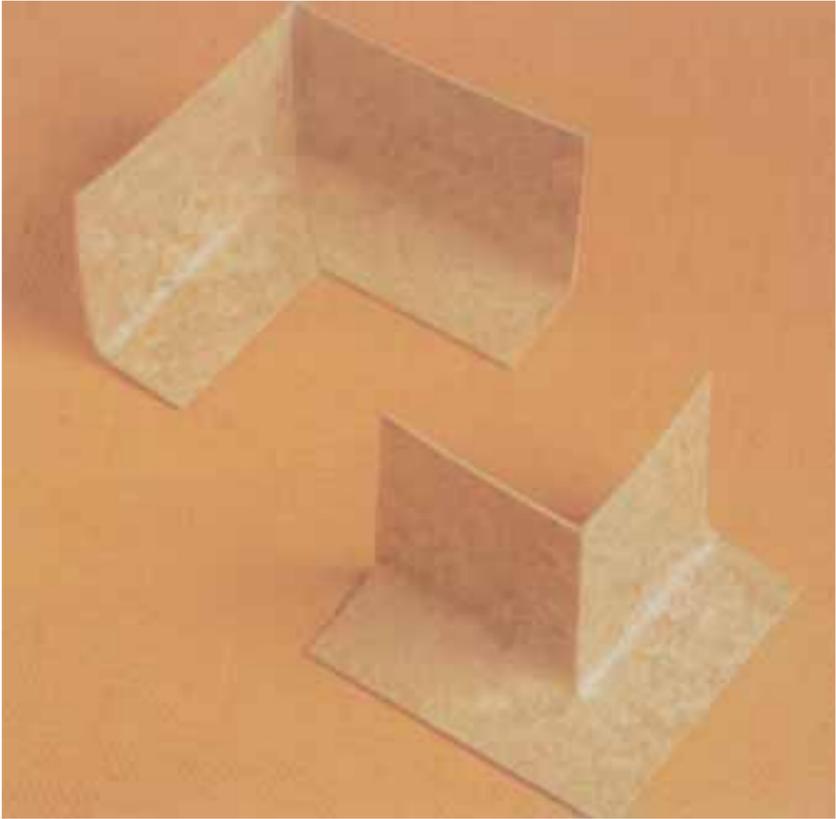
Depending on the flexibility of the material being worked with, either insert material behind this V and scribe with a pin vice, remove and cut. Ensure all angles are a precise 45° diagonal. You must ease the fold on the corner by marking the precise position of the corner when grouting out some material from the back along this line. The V seam can then be welded.



This technique is not suitable for linoleum or stiff vinyls.

PREFORMED ANGLES

Internal and external corners can be easily mitred in marmiform S using a standard mitre box. However, if preferred, pre-formed internal and external angles are available to special order.



Standard dimensions are 100mm high x 50mm toe with an internal radius of approximately 9mm. The top of each arm of the internal angle is approx. 140mm long and of each arm of the external angle 100mm long. They can be ordered in multiples of 8, assorted between internal and external.

Fit and adhere preformed angles before cutting and fitting the adjoining, coving, minimising joints as much as possible. Ensure all corners are smooth before fitting the angles.

If the corners to which the angles are to be fitted are not right angles, then the toe of the angle can be cut along the mitre line and trimmed for a more acute angle or opened up to take welding cable or a linoleum insert as appropriate.

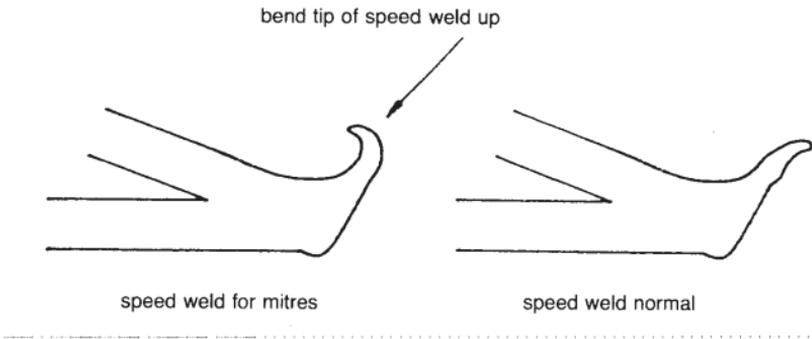
Some manufacturers also offer preformed set-in vinyl angles in a selection of plain colours. These are usually moulded and may not have a shade or texture identical to the extruded vinyl coving they are to be used with.

SEALING AND WELDING COVING

Coving is often specified where a floor which is impervious to spillages and maintenance liquids is required and sealed or welded joints are also specified in a co-ordinating or contrasting colour. Vinyl welding cable is used to hot weld set-in vinyl coving to vinyl sheet and linoleum welding cable to weld linoleum covings and fields. If set-in vinyl coving is being used with linoleum use linoleum welding cable and weld at the correct speed for linoleum.

When welding internal corners (not necessary with preformed angles) rout out with a 'P' groover, weld and remove the excess with a circular x-acto blade.

It requires considerable skill to achieve a neat vertical weld on an external corner. As set out above, the coving material should have been cut square in line with the walls to give maximum key to the material. The circular welding cable is then applied and trimmed back, once cool, with a normal blade. To make for easier vertical welding modify a Speedweld nozzle as shown.



If specified, vertical joints between cove lengths can be welded in the same way.

However, welding of verticals is time-consuming and therefore expensive and often not aesthetically pleasing. A well-cut joint backed by well-applied contact adhesive will in reality provide water resistance and the client may accept this if discussed in advance. Alternatively, the ends of the lengths of coving can be further sealed by applying hot-melt adhesive or silicone adhesive to the end of the coving length immediately before butting the next length up to it.



Treads and Risers

SUBFLOORS

Forbo products can be installed on wooden, concrete and steel stairs with satisfactory results. Corkment underlay can also be used if wished. Ensure that with any renovation work on old wooden stairs any old paint is removed and the treads are levelled with a suitable smoothing compound. If necessary fix a hardwood batten to the front of the step in such a way that the top of the batten is level with the unworn level of the step. Once the compound has cured remove this batten so that nosing can be fitted.

FITTING THE NOSING

Metal or rubber or PVC nosings are fitted after risers and before treads, using screws or double stick adhesives as recommended by their manufacturer. One method is to zig-zag a mastic to the back of the nosing, drill, plug and screw first one end then the other before screwing down the middle.

MATERIAL PREPARATION

Both treads and risers must be cut length-wise from the floorcovering, to avoid roll set (curl).

FITTING THE RISERS

Fit the risers first.

Cut the risers to the exact height and approx. 4cm wider than required. Place the material against the riser with the surplus overlapping onto the stringers or walls. Draw a check mark from the riser on to the uncovered tread. Slide the material along clear of one stringer. Set the scribe to the distance the check marks open. Scribe to the stringer and repeat this exercise on the other side.

All risers are fitted before being stuck, and stuck in position in one operation. If two fitters are working, they should work away from each other, i.e. one starting at the top of the stairs and the other in the middle. Both men then work downwards, not towards each other.

FITTING STAIR TREADS

Cut the tread material wider and longer than required. Scribe and fit to the risers. Allow the surplus to ride up the stringers, and using check marks and scribe scribe to stringers. Cut and fit to the stringers, prior to sticking.



STAIR NOSING

All resilient floorcoverings must be protected on the leading edge by a nosing unless the material is already supplied with tread and riser moulded together with a nosing. Regulations now require the stair edge (i.e. nosing) in public areas to be of a different colour from the tread material so that it can be seen clearly.

Butt or scribe the tread to the riser. With the nosing already in position use an over and under scriber to scribe the tread to the nosing.



Use an adhesive with a high initial tack for linoleum. For vinyls use an acrylic adhesive with a lift and drop double stick method. No adhesive is put under the vertical part of the nosing.

Both treads and risers must be firmly rolled with a hand roller to ensure good overall adhesion.

If the staircase is to be used by other construction workers or finishing trades cover with plywood.

BORDERS ON STAIRS

Borders can be used effectively on stairs. Spring a chalk line from the top to the bottom of the stairs, so that it marks each stair nosing. The marks are then squared back and joined, producing an accurate outline of where the border is to be placed. Fit the main treads and risers, using the methods just described, but this time the material should overlap the

chalk lines to which they are subsequently trimmed by some 2 to 3cm. Cut the border material 2 or 3cm wider and longer than required. The pieces are then scribed.



Trim and stick in position using exactly the same technique as for floors.



Two or three line borders can also be fitted, using similar methods to those used on floors.

WINDERS

With winders and treads of awkward shapes, use a paper template to ensure an accurate fit. If borders are used, they follow the line of the stringers.



Borders and Feature Strips

Borders and feature strips are a relatively simple way of making a floor more attractive. Borders can be of various styles and go around the field area, a feature strip is normally fairly thin and can be part of the overall floor design.

A SIMPLE BORDER

In the following example, the border is inset 650mm from the wall and consists of a 25mm strip on each side of a 100mm strip. The technique for measuring and fitting the actual border is the same whether linoleum or vinyl sheet is being used.

Many rooms will have recesses or projections and it is a question of judgement how to position the border in relation to these.

Having planned the floor, measure from the skirting the position of the inside edge of the innermost border strip, in this case 800mm, and mark with a chalk line, extending this line to the walls.



Cut the field material so that it overlaps this chalk line by about 50mm all round. Seam sheets in the normal way then pull back half at a time and spread the adhesive exactly to the chalk line, leaving the 50mm unstuck. Put the field sheets into the adhesive and roll thoroughly.

Copy the chalk line onto the top of the field material, guided by the extensions of the original line still in view, cut along this line with a straight-edge and upright knife and roll the edges again.



Cut the border strips along the length of the material, especially if it is linoleum. If cut across the width - which is often tempting as it could reduce scrap - the strips will curl and dome. For strips up to 30mm wide, the Forbo Trimmer is ideal. Cut wider strips with a straight edge.



Cut the strip to be fitted against the wall 50mm wider than its finished width (i.e. cut to 700mm in this example). Butt this piece firmly against the field material, set the bar scribe to the full width of the total border pieces (150mm) and scribe to the wall as described in earlier sections.



Remove this piece and fit the other border pieces into position, from the inside outwards. The scribed piece will fit neatly against the wall. Once the fit has been checked, remove the pieces and spread adhesive between wall and field, rolling thoroughly once the border pieces are in position. Clean off any surface adhesive while it is still wet. Mitre corners with the help of a straight edge.



If the border is only a single surround of a contrasting colour then cut this piece approximately 70mm wider than the area to be fitted and scribe and cut off approximately 30mm along the wall, leaving about 40mm of overlap over the field colour. Cut this in as you would a normal seam, as described in an earlier section. The installation may look even more attractive if this seam is hot seam welded with a contrasting colour of welding cable.

If the field is in tiles rather than sheet, it is preferable, if the layout permits, to have only full tiles in the field, so a quick check should be made to see if this can be done. If not, avoid small pieces adjacent to the border (see Section on Setting Out and Laying Tiles).

Seams of contrasting colours are often less obvious than those of the same colour. In a small room, a kitchen for example, it may be possible to lay the field in one 200mm wide sheet and give the appearance of a seam-free floor.

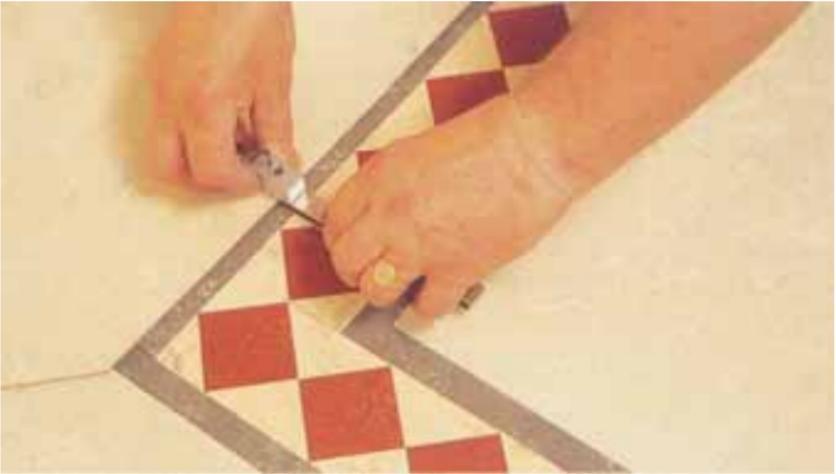
PATTERNED BORDERS

Some borders have a design repeat. Sometimes, specific corner pieces are part of the design and in other cases the border has to be cut to give a corner. Such corners are nearly always designed to be right angles, and any other angle can only be achieved by adjusting the pattern. It is best to discuss this with the client before starting to lay the floor.

Check the repeat size of the design module very carefully and calculate the number of repeats required for both the length and width of the room. If the field is to be in sheet material it is best to lay the border first. Mark the inside edge of the border with a chalk line, as in the “Simple Border” section on page 91. Check measurements, noting any important alignments, fit and adhere the border along this line, starting from the corner. A few millimetres can be gained or lost along the length by fractionally adjusting the tightness of fit of individual pieces. At right angles to the first border, fit and adhere the second border starting at the corner adjoining the first border. Repeat for the third and fourth sides of rectangle, taking care that the distance between the ends of the first and third border lengths still fit the design module precisely. Roll well after each side is installed. Note that this method gives a rectangular border. If the walls run off and it is visually more important that the border is parallel to the wall, then some fudging of the corners will be unavoidable. Once the border is in place, fit and adhere the field, overlapping the border and using the over and under scribe to cut the field material to the border.



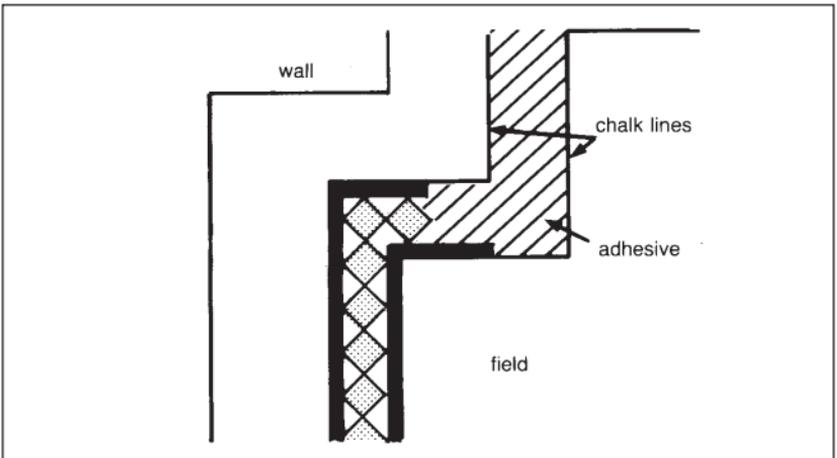
To fit the material between the border and the wall first scribe a piece of material about 50mm wider than the greatest distance between the outer edge of the border and the wall. Set the bar scribe to about 25mm, butt the material against the wall and scribe and cut to the wall. Fit the inside edge to the outer edge of the stuck-down border, using the over and under scribe.



If the field is in tiles, the border pattern module may or may not correspond to the tile size module, depending on the design. Depending on the room layout, it may look better to have a field of full tiles only and adjust the border in some way to fit, or vice versa.

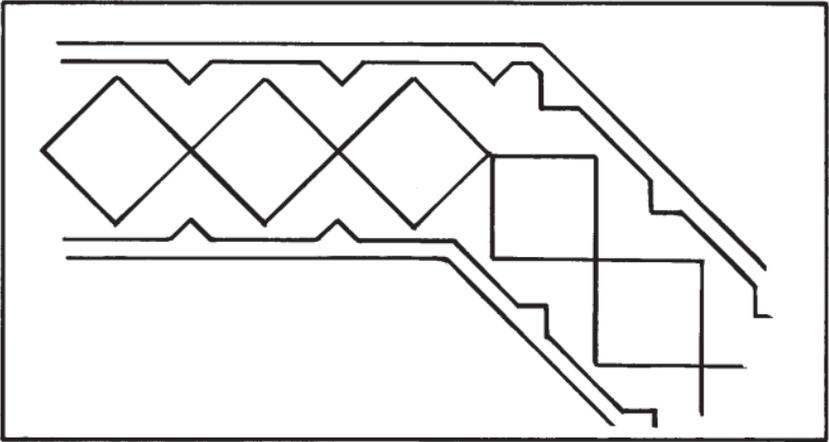
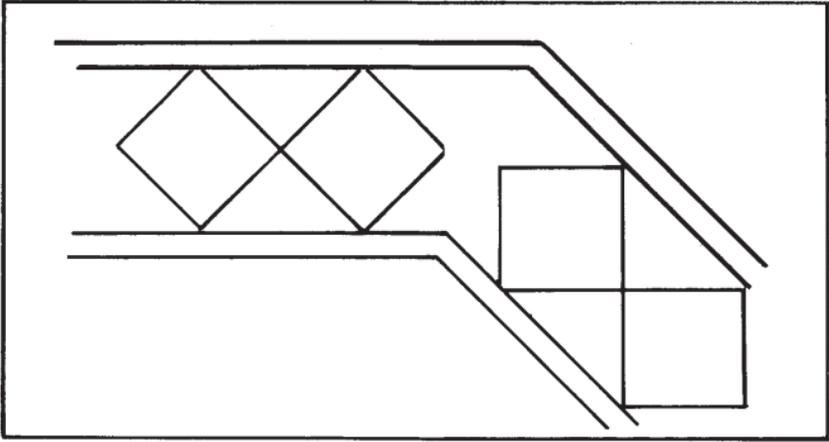
In the first case lay the field tiles and then lay the border butted to the tile edge without trimming. Pick less inconspicuous spots for adjusting the pattern to fit, usually not near corners. This option will usually be followed if the field is in a diagonal chequerboard pattern, with the border running along the points of the tiles.

If the border has to be a precise fit or if the room layout is complicated (with either sheet or tile) it is best to lay out and stick the border first, keeping the adhesive as far as possible to the line of the border and rolling well. Mark out with chalk lines.



Once the border is in place, fit the field as though the border was the wall of the room and scribe in the material between border and wall as described above.

A popular border design consists of a square on a diagonal. If a 45 degree angle is unavoidable with such a pattern then a solution is to make the angle as shown below.



OTHER BORDERS

Borders may form part of a more complicated overall design - circles, for example. These are dealt with in the section of Motifs, Inserts and Patterned Floors.

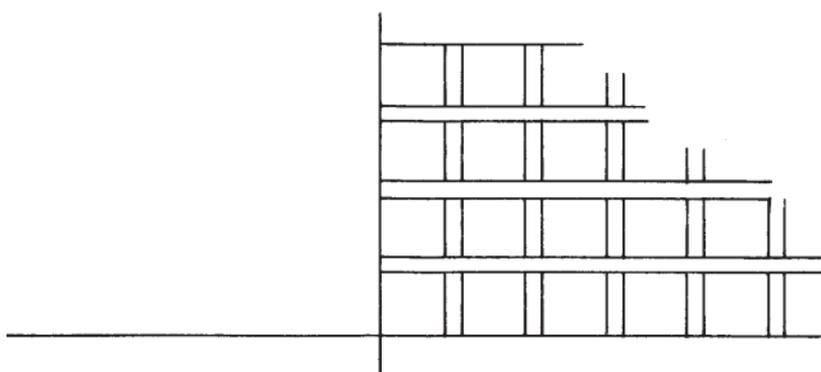
An even simpler feature strip is the welding cable alone, set in the floor in a contrasting colour.



FEATURE STRIPS

These may be supplied, or cut by yourselves, using the Forbo Trimmer or a straight edge, along the length of the material.

A feature strip is in fact a simple single-colour border and the same techniques are used as those described at the beginning of this section.



Narrow lacing strips can be gently bent into curves if the material has been well warmed (say by hanging the strips on a warm radiator), the narrower the strip the sharper the radius you can achieve.



Motifs, Inserts and Patterned Floors

Custom-designed patterning can improve the attraction and value of a floor and give a great opportunity for a floorlayer to demonstrate his skills and be rewarded accordingly.

There are several ways of making a patterned floor using Forbo-Nairn floorcoverings in addition to those described in the section on Borders and Feature Strips.

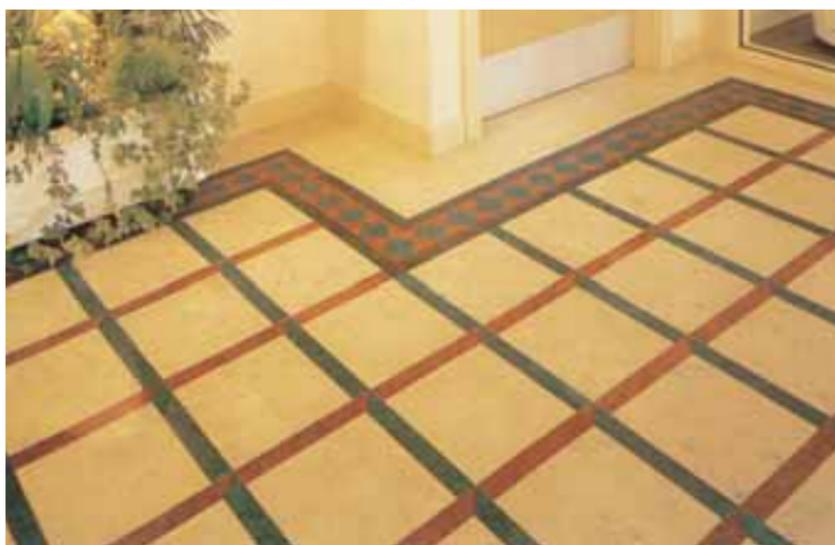
It is always important to plan carefully, in order to:

- position the pattern correctly.
- reduce wastage.
- cut perfect seams.

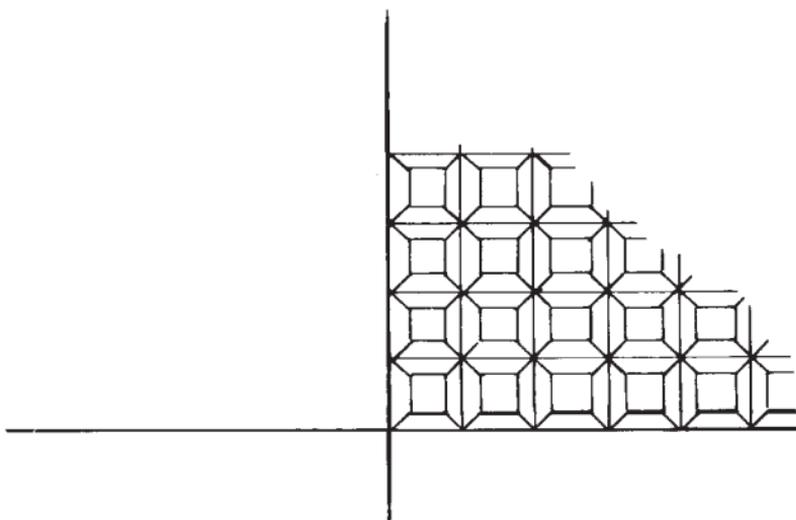
Take particular care to ensure the subfloor is smooth and that the pattern is well rolled into the adhesive at the correct time.

DESIGN OPTIONS

The Forbo Design Options package offers patterned tiles as well as borders. To install these follow the instructions given in the section on Setting Out and Laying Tiles. Sometimes a bespoke pattern is to be installed. If the pattern has a border decide which has priority in positioning. In the example below it looks better to maintain full tiles in the field by adjusting slightly the width between border and skirting and by cutting back on some of the border tiles.



Establish the repeat module of the pattern and treat this as you would a single tile as you fit it into the adhesive. For example, if you were installing the design below then the illustration on p45 would look like this:



Check regularly that all pieces are aligned precisely and that you haven't dislodged them as you kneel on them.

With a keysquare pattern fit the small corner squares into place as the corner is formed, don't wait until the larger tiles have been adhered over the whole floor. These key-squares are designed to be a neat fit but if some are too tight then one side can be sanded down slightly to give a perfect fit.

INSERTING PRE-CUT MOTIFS

Entrance foyers are one area where crests or motifs are often inset in the floor.

If the motif is small enough to be supplied to site pre-assembled and is of a style where it is inset in a surround which can be made a little larger than the finished dimensions required, it is best to mark and clean cut the exact position where the motif is to fit in the surrounding sheet material, slide the motif under the edges of this hole and trace the motif to the final size with a pin vice, using the edge of the hole as a guide. Remove and cut through with a vertically held knife. Replace in exactly the same position. If the motif is to be inserted near the end of a sheet then scribe and fit the sheet, spreading the adhesive to just short of the insert position. Fit the

insert, complete the adhesive spread and roll.

If the insert position is some metres from the end of the sheet, scribe and adhere one end of the roll before fitting the insert as pulling back a long length of sheet to spread adhesive under the inset could release enough tension in the sheet to mean that if the second sheet end was already scribed to the wall, it would no longer be a perfect fit. In this case stick, scribe and fit as described on page 63.

If the insert is supplied cut to the precise finished size (e.g. in a 500x500mm tile) then trace around the position of the insert with a pin vice pressed firmly against the edge of the motif. The difficulty here is to make sure the insert does not move while this is done and it will need to be pressed or weighted down while being traced.

Alternatively, first adhere the finished motif to the floor in the correct position. Then place the surrounding sheet over the motif before spreading the adhesive and rough cut a hole in this sheet over the motif, scribing this hole to the precise size with over and under scribes.

If large Aquajet patterns have to be assembled on site, start from the centre of the pattern and dry lay an area or a quarter of the pattern first to ensure the finger pressure applied is correct and gives a perfect fit. All pieces will fit as supplied if this is done.



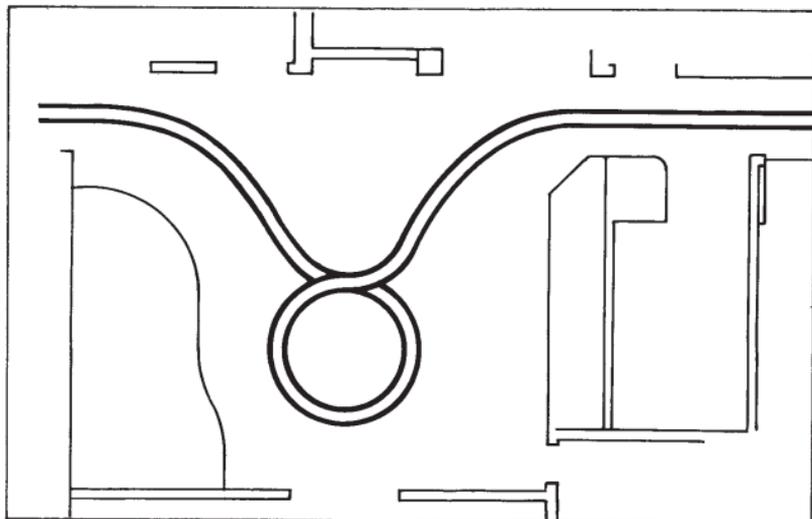
Pre-cut designs are almost always pre-assembled and held in place with clear tape. This should be removed immediately after rolling so that if any adjustments are necessary these can be made before the adhesive starts to cure.

SITE CUT PATTERNS

Some designs will be of such a scale and non-repetitive nature that they cannot be pre-assembled off site and in most cases a lot of the cutting will also need to be done on site.

Important preparatory work includes:

- Agreeing with the designer and client where any unavoidable seams are to come. This is best done at the quotation stage as it may affect material wastage.
- If the patterning of the material to be used is clearly directional (e.g. most marbled linoleum) agreeing the direction of the decoration.
- Calculating the radii and centre points necessary to give any curves in the design.

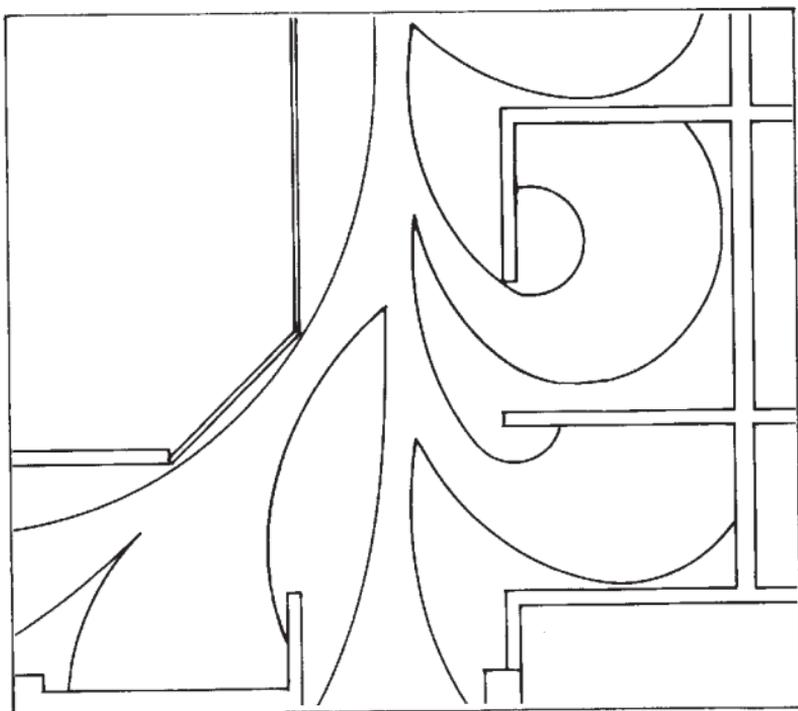


– Marking out the design on the floor, or in some cases, on the field material already partially fitted (see “Inserting Pre-cut Motifs” above). The nature of the design will determine the laying technique.

If the pattern consists of straight lines and angles then these can be measured and marked onto the material using the techniques described in the section on Setting Out and Laying Tiles to get true rightangles and diagonals.

In a pattern such as that illustrated below it is an illustration of the skills of the floorlayer that all the points come together. If they do not do so on a star pattern it may be best to agree with the designer that a small ‘bullseye’ circle be added to the design where the points meet.

If the pattern is very large scale and not straight line work then mark, cut and stick down a large dominant part of the pattern in one colour and then scribe and fit to it pieces of the adjoining colour using over and under scribes running along the edge of the adhered material to scribe the fit of the second colour. Then fit further pieces of the first colour, etc. The preparatory discussions mentioned above are particularly important with this sort of work.





Seam Welding and Perimeter Sealing

Forbo linoleum sheet and contract grade sheet vinyls can be hot seam welded to ensure watertight seams or for decorative effect. Tile installations are less often welded but welding can be used to good aesthetic effect on 500 x 500mm or 610 x 610mm tiles.

Hessian backed linoleum stretches slightly in the width during installation. This means that a skilfully cut seam will close tightly by the time the adhesive has cured to bond the linoleum in its final position. In many areas, therefore, if the installer possesses the skills to achieve a good seam, and if the application allows, welding of Marmoleum is not obligatory.

However, skill levels and site conditions cannot be guaranteed, and it is usual for seams to be hot welded with Marmoweld welding cable in areas likely to be subject to wet maintenance or in areas such as hospitals where hygiene is important. This is also a skilled operation but as floorlayers are accustomed to welding vinyl floors, which, unlike linoleum, may have a tendency to shrink, they are likely to be experienced in this task.

Although the welding cable is colour matched to the linoleum it will show as a shinier line until both it and the floorcovering receive a coat of polish. Polyester backed tiles are not normally welded, but some attractive installations have been achieved by welding Marmoleum Dual tiles using a contrasting colour weld cable as a feature.

- Welding should not be used as an excuse for poor original seams. They should still be well cut.
- Leave at least 24 hours after the floorcovering has been stuck down before starting to weld to allow the adhesive to cure.
- The same tools are used to hot weld both linoleum and vinyl and in both cases the welding cable is a nominal 4mm in diameter but the welding cables are chemically different and linoleum is welded at a lower temperature and slower speed. With vinyl welding both the welding cable and the floorcovering melt and fuse together. As linoleum cannot melt it is only the welding cable, in reality a hot-melt pigmented EVA adhesive, which melts and bonds into the routed seam.
- Even with colour matched welding cables seams are normally more noticeable when welded than when well cut in and unwelded.

– If linoleum is to be welded to a vinyl skirting use linoleum welding cable.

ROUTING OUT

– Using a ‘P’ shaped hand groover and a straight edge as a guide rout out two-thirds of the depth of the material at the seam, 3.5mm wide. Equal ribbons should be cut from both the sheets. See the blade is sharp and replace if necessary. Clear this channel of any adhesive waste or material granules. Alternatively use the Forbo Groover.

A power groover may be used. This is much quicker on large installations, such as a hospital corridor, but may not follow any subfloor undulations closely enough, giving a groove which is alternately too deep and too shallow. A hand groover will be needed near the wall.



PRE-HEAT THE WELDING GUN

Switch on the hot air gun and allow 5-7 minutes for it to reach the pre-selected operating temperature. For vinyls on a Leister Welding Gun this will be a 350-450°C or setting 6-7: for linoleum it will be 300-350°C, setting 4-5. Before switching on ensure that the guide nozzle is fitted. If the gun is resting on the floor see that the nozzle is not directed at the floor or anywhere dangerous.

THREADING UP

Cut the welding cable to a consistent and generous length or else unwind sufficient weld rod from the reel and put the reel in a position where you are working towards it. Have the power cable ahead of you too if possible.

Use a Speedweld nozzle. Thread the cable through and weld moving backwards. Don't let the cable melt in the nozzle.

WELDING

A good weld is obtained by the correct combination of temperature, speed and downward pressure. As guns will vary test first on a piece of scrap material.

Start at a wall and move away from the wall, exerting slight downward pressure. For vinyl expect to weld at about 2 metres a minute, for linoleum at not more than 1 metre a minute. Cost these times into your quotation accordingly. In theory linoleum can be welded at 350°-400°C and at 1.5-2.0 metres a minute but some installers find it difficult to achieve a good bond at this speed.



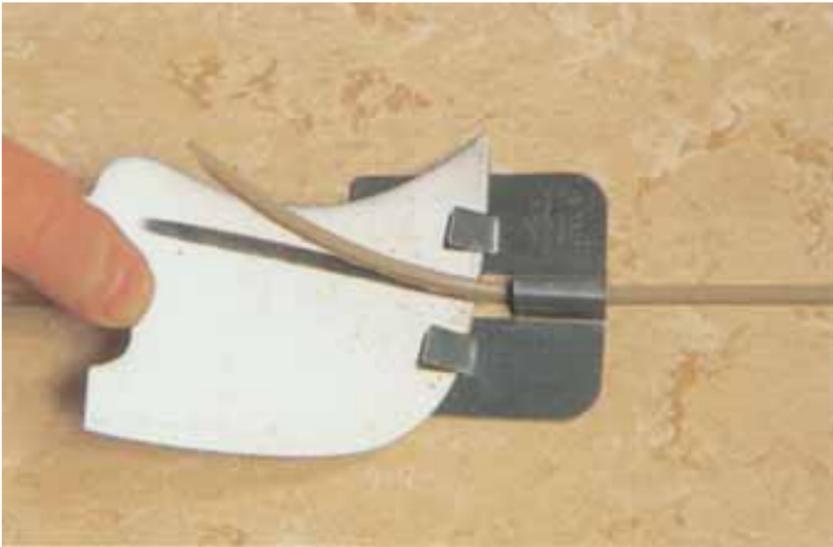
After the first 30cm check the weld is good by gently pressing the cable in the welded section from side to side. If the speed/heat/pressure combination is incorrect the weld will either come out or the cable will have melted over the sides of the groove, possibly with charred material either side of the groove. Below is an example of too hot a weld.



For the last few cm against the wall behind you, take the cable out of the feed, trim off at the end of the section you have welded and chamfer it down in the grout. Starting at the wall, weld over the chamfered section, applying pressure. Trim off.

TRIMMING

While the cable is still warm trim off most of the top half of the cable down to .5mm using a sharp spatula and a slider which fits over the cable. This enables the cable to cool more quickly and enables a quick first cut to be made without risk of gouging the material.



The welding cable will dish slightly as it cools. Wait until the material is cool before trimming flush with the surface of the sheet with a sharp spatula angled slightly across the line of cut. Alternatively, trim flush with a flat profile X-acto router blade. As this is slightly concave blunt the corners to avoid scratches on either side of the weld.

If trimming pulls out the weld this shows it is unsuccessful and the seam should be re-done with fresh welding cable.

JOINING UP A WELD

To join a weld in the middle of a seam trim off the loose ends and chamfer down the section to be overlapped with a hand groover. Ensure hot air gets into the groove and heats the cable. As the gun travels over the unwelded section apply pressure and carry the weld on over the section to be joined. Allow to cool and trim as normal.

GLAZING

Trimmed linoleum welding cable will tend to soil more rapidly than the linoleum and this may become obvious with light colours if, for some reason, the floor is not to receive a coat of polish over linoleum and cable alike. In that case run the hot air gun lightly back over the trimmed seam. This will glaze it and reduce soiling. However, the gloss on the welding cable may now be greater than on the linoleum and unless very lightly heated the weld will dish slightly.

PERIMETER SEALING

If the purpose of specifying welded seams is to prevent the risk of moisture getting under the floorcovering then logically the specification must ensure that perimeters are also sealed, together with any areas where pipes, etc come up through the floorcovering. This is usually done with a silicone sealer but in special areas, such as prisons, a hard-setting epoxy may be used.

WELD FINISH

Weld finish is an innovative solution from Forbo to prevent welded joints from collecting dirt and soiling. Weld finish comes in a unique applicator that is applied after trimming the weld rod and then left for ten minutes to dry. Once dry the weld will be sealed against dirt and provides a smooth impervious joint that reduces maintenance and matches the Topshield characteristics of the Material. Weld finish can be used on Linoleum, vinyl and rubber floors.



MULTI COLOURED “SQUARE WELD ROD”

Designed to blend in the Multi coloured weld is a first in weld rod technology. Creating a fully impervious seam that matches the pattern of the linoleum. Installation and nozzle are the same as conventional weld rods.



Anti-static and Static Conductive Floors

A specification sometimes calls for an 'anti-static' or 'static-conductive' floor. The word 'anti-static' is sometimes used loosely and it is best to check with the specifier the reason for the specification and whether specific electrical resistance figures are quoted. This can affect the installation procedures.

For example, if 'anti-static' performance is requested just to ensure that people do not receive a shock when touching metal after walking across a floor then ordinary linoleum in the range of normal humidity levels will meet that requirement with standard laying techniques and materials and no additional earthing. Marmoleum Dual Ohmex sheet has a further reduced electrical resistance of less than 10^8 ohm.

Measurements of electrical resistance are expressed either in terms of volume resistivity (between two points on opposite surfaces of the material) or surface resistivity (between two points on the same surface). Measurements for hospitals, for example, are usually of surface resistivity.

Static control floors are now categorised according to the following classification;

Anti-static (Astatic) -

Static Dissipative - Between 1×10^6 ohm and 1×10^9 ohm

Static Conductive - Between 4×10^4 ohm and 1×10^6 ohm

Health Technical Memorandum No.2 calls for new floors to have readings between 5×10^4 ohm and 2×10^6 ohm. Computer companies have varying requirements, usually up to 10^9 ohm.

For floors not required for grounding personnel is calls for a surface resistivity of between 1×10^4 to 1×10^{12} ohm, a volume resistivity of between 1×10^3 and 1×10^{11} ohm and a resistance to ground of between 7.5 and 10^5 and 1×10^{12} ohm. Forbo standard linoleums meet this requirement.

Low electrical resistance figures are required when static is to be avoided by discharging it to earth before a build-up can occur. The total path between the charged object and earth needs to have low resistance: it is pointless having a floorcovering with a low resistance if the materials between it and earth have a higher resistance.

The adhesives and levelling compounds used therefore also need a low resistance and the contact between all the materials needs to be good, therefore a static conductive primer is often used.

Installation of conductive floorcoverings over a grid of copper tape is often specified to improve control of static discharge.

INSTALLATION INSTRUCTIONS FOR COLOREX SD AND EC

Preparation of subfloor before installation.

Check that subfloor is sound, smooth, dry and free from any contaminants and

- Permanently dry: maximum relative humidity of 70% when tested with a hygrometer
- Acclimatise ColoRex and adhesive 24 hours before installation at 18°C

INSTALLATION OF AREAS SMALLER THAN 50m²

1. **Conductive primer:** In most cases the use of a conductive primer with Colorex SD and EC is not necessary.
2. Mark the centre lines in the centre of the room.
3. **Copper grounding:** Stick 1 m of copper stripe with 545 Eurostar Special EL directly onto the conductive primer or prepared subfloor and up to the wall to an earthing point.
4. **Conductive adhesive:** Use a conductive adhesive like 545 Eurosafe Special EL to adhere the tiles on the floor. 16 litres (13kg container) per 37m². Do not spread more than 10m² at a time and stick the tiles from the centre of the room outwards. (Trowel size to be used to apply the 545 Eurostar Special EL is 1.6mm x 4.75mm 'V' notched).

INSTALLATION FOR AREAS LARGER THAN 50m²

1. **Conductive primer:** In most cases the use of a conductive primer with Colorex SD and EC is not necessary.
2. Copper network and grounding: Install a copper grid in accordance with the layout detailed in the product installation guide. Copper strip should be adhered with 545 Eurostar Special EL and should be approximately 6m apart from each other (length and crosswise).
3. Punch all the intersections of the copper strip network with a steel nail or an awl.
4. Visual or acoustic tests for conductivity are recommended between ground connection strip and other areas of the copper network.
5. Mark the centre lines in the centre of the room.
6. **Conductive adhesive:** Use a conductive adhesive like 545 Eurostar Special EL to adhere the tiles on the floor. Do not spread more than 10m² at a time and adhere the ColoRex tiles from the centre of the room outwards. Place the tiles into the adhesive as a late but wet placement. Roll with a 68kg roller in both directions. (Trowel size to be used to apply the 545 Eurostar Special EL is 1.6mm x 4.75mm 'V' notched).

ALTERNATIVE INSTALLATION METHOD FOR ANY SIZE AREA

Install a copper network leaving 30.5cm from the grid line to the centre of the area.

Calculate the distance between copper strips so that the centre lines of the ColoRex tiles coincide with the copper strips.

Adhere copper strips with Forbo's 545 Eurostar Special EL adhesive.

Press the copper strips with a trowel into the wet adhesive, the upper part of the strip should also be brushed with adhesive.

No conductive primer is required.

Conductive adhesive: Use a conductive adhesive like 545 Eurosafe Special EL to stick the tiles on the floor. Do not spread more than 10m² at a time and stick ColoRex tiles from the centre of the room outwards. Place the tiles into the adhesive as a late but wet placement. Roll with a 68kg roller in both directions.

RECOMMENDATIONS AFTER INSTALLATION

Immediately after installation, the floor covering should be rolled with a 68kg roller.

After installation check the electrical conductivity. The earthing should be connected by a licensed electrician.

Heat welding is recommended for environments where wet cleaning methods are used.

INSTALLATION OF MARMOLEUM OHMEX

1. Prepare any subfloor as for normal linoleum floor covering.
2. Plan the floor as normal for linoleum.
3. Fix a 15cm length of copper strip (10mm wide and approximately 0.1mm thick) to the floor using 615 Eurostar lino EL (or any other recommended conductive adhesive) at a suitable point to be connected to earth. One such copper strip should be laid and connected to earth for every 36 square metres of area to be laid.
4. Using a paint roller, coat the floor with a layer of 041 Europrimer EL, covering the entire surface including the length(s) of copper strip. Coverage should be approximately 70 square metres per 10 Litre can.
5. Allow the primer to dry completely (min 2 hours), then apply the conductive adhesive to the floor using a V notched trowel with 2mm serrations at 6mm centre. Any surplus adhesive should be removed immediately using a clean cloth moistened with water. Dry spots should be removed with White Spirit.
6. If welded seams are required, allow 24 hours for the adhesive to set properly, then weld using standard Forbo-Nairn Marmoweld welding cable.

A NOTE ON LINOLEUM

Vinyl or rubber static control floors perform by dissipating an electrical charge very quickly. Traditional linoleum, which in normal conditions of Relative Humidity contains a little moisture, discourages the build up of a static charge in the first place. That is why it is widely used in computer rooms and electronics assembly areas, where it performs better than suggested by its average conductivity reading. As stated above, for enhanced results under 10⁸ ohm use Marmoleum Ohmex.



Introduction to Maintenance



Forbo-Flooring contract floorcoverings are designed to look good over many years in use. They will look their best and perform well for longer if they are properly installed and properly maintained.

Most Forbo floorcoverings are given a factory finish at the end of the manufacturing process, to protect them during laying. There is no need to attempt to remove this finish, which provides the perfect base for modern low cost cleaning and maintenance regimes - indeed could be harmful to the floorcovering to attempt to do so.

Do not apply any polish to anti-static or static-conductive floorcoverings. In the same way as a car needs petrol, oil and regular servicing to run smoothly, so a floorcovering needs to have soiling removed from it and a regular servicing programme 'tuned' to the performance required.

For detailed recommendations see our Forbo Floor Care system brochure which is geared primarily to non-domestic installations, or recommendations for maintenance AS 1884-1995 Section 4.

Please visit Forbo Website www.forbo-flooring.com.au for up to date maintenance data.

INITIAL TREATMENT

During installation the floor should always be protected from other trades, especially overhead work. This will prevent damage and reduce the cleaning involved prior to hand over.

At the very least the flooring contractor will be required to leave the finished site tidy and swept, with any adhesive traces removed from floor and skirting. First impressions as to tidiness may have more impact on the client than hours of skilled fitting.

In many cases an initial floor preparation is best left to or subcontracted to a professional cleaning and maintenance contractor who will have the staff and equipment to do the job thoroughly.

The selection of a mechanical or non-mechanical cleaning regime will be determined by a number of factors, for example the location, type of premises, size of areas and the time and budget which can be allocated. AS A GENERAL GUIDE IT IS UNLIKELY AN AREA OF MORE THAN 100 SQUARE METRES CAN BE ADEQUATELY MAINTAINED WITH NON-MECHANICAL METHODS.

A mop generates little friction and it is friction which removes adhered dirt. Mechanical cleaning methods, using a rotary machine of the correct speed for the job and the correct colour of pad will, in all but the smallest areas, result in better floor appearance and be more cost-effective as a

larger area can be covered more quickly. When this is combined with the regular use of a Wet Vacuum excellent results can be achieved. A 'dry' method of regular maintenance, where, after dust mopping, the floor is buffed with a red pad on a high-speed machine, and spots or patches of more obstinate soil are sprayed with maintainer during the clean, is a highly cost-effective way of keeping a floor looking good. As with all equipment, the operative should be trained in the use of the equipment and in the need to clean pads after use.

'Dry' cleaning is also more hygienic than wet cleaning as moisture provides a breeding ground for bacteria, especially if the premises are warm. A damp floor is also more likely to be slippery.

If however, the scale of the cleaning task and the nature of the soiling makes damp mopping the preferred solution then a Double Bucket Mopping System or a Flat Mopping System are strongly recommended. A cleaner who starts at one end of a room with a mop and a bucket of water and reaches the other with a mop and an empty bucket has been paid to do no more than paint the floor with dirty water.

Whether a mechanical or non-mechanical system is used IT IS OF KEY IMPORTANCE THAT THE FLOOR IS NOT OVERWETTED UNTIL THE ADHESIVE HAS HAD A CHANCE TO CURE. Modern flooring adhesives - once cured - have a good resistance to attack by water, even the alkaline moisture of cleaning fluids will need 5 DAYS before that level of resistance has been reached and the floorlayer's good work can be ruined unless minimum moisture techniques are used for any cleaning during this early period.

Although the following points apply as much to ongoing maintenance, which is unlikely to be the responsibility of the installer, the installer should be aware of them:

KEY PRINCIPLES

1. Where possible, PREVENT dirt from reaching the floorcovering: it will take less time and effort to clean.
2. Use MINIMUM MOISTURE and aim for MAXIMUM SOIL REMOVAL. Clean dry what can be cleaned dry: it is safer and more cost-effective.
3. PREVENTION is better than cure. Good initial preparation of a resilient floor will set a high standard of appearance which it will be cost-effective to maintain and which will enhance the life cycle of the product.
4. LEAVE NO RESIDUAL ALKALINITY. Many cleaning chemicals are alkaline: however, probably more cleaning problems are created by alkaline residues than by any other factor. Rinse neutralise wherever highly alkaline chemicals are used.
5. NO CONTAMINATION of equipment. Colour code mops to ensure contamination of maintenance materials does not occur.

PREVENTATIVE MEASURES

Barrier Mats. A completely 'maintenance free' floorcovering does not exist. However, as the majority of dirt (as high as 80%) entering any building, comes in on people's feet it makes sense to provide for an effective barrier mat system. It is also important that this is maintained correctly to ensure that it does its job.

A good mat system will not totally prevent soil from entering a building but it will substantially reduce the soiling and make for easier maintenance. A balance will have to be struck between the aesthetic requirements of the mat and its function.

Mats can be loose laid, provided by a mat rental company where they are changed for fresh mats on a pre-agreed schedule, or those which are sunk into a mat well.

Of those within a mat well a scraper function is provided by metal channels and moisture and dirt absorbency by the material inserted into the channels, which can be moved or replaced as it becomes worn.

A barrier mat when only one or two steps are taken prior to reaching the floor material will not remove sufficient soil and it can take 4-10 steps before the soil is removed.

If the mat is not properly maintained the dirt from the first steps will gradually clog the mat and be transferred subsequently to the floorcovering. The mats can be maintained in a similar manner to carpeting in heavy usage areas but the frequency of cleaning will be greater.

Colour. Colour choice can have a significant effect on the apparent cleanliness of a resilient floor. Very light colours show up dark coloured soil and dark colours show up light coloured soil. Patterned and marbled floorcoverings have very good soil hiding characteristics.

Anti-oxidants. Black rubber, as in car tyres, contains anti-oxidants which will cause a permanent yellow or brown stain on vinyl floorcoverings with which it is in contact for a period of time. Do not put rubber in permanent contact with vinyl floorcoverings. If a car showroom has a vinyl floor put small rigid plastic mats under each car wheel.

LINOLEUM AND VINYL SPOT AND STAIN REMOVAL

On very many occasions spots and spills can simply be wiped up. If the spot proves stubborn rubbing down with moist piece of nylon web e.g. kitchen pad or the centre of a floor pad and some neutral detergent will often suffice.

Occasionally volatile chemicals can be accidentally spilt on the floor surface. Very often these will evaporate before the damage is severe. It is however very important to tackle spots and spills as soon as is reasonably practical.

Spots which have dried in and become stains can be very often removed by abrading down the floor surface with a coarser nylon pad and neutral detergent.

Vinyl floorcoverings, though not linoleum, can be permanently stained if bitumen or asphalt, is trafficked onto them and not cleaned off. Likewise, if severe black rubber scuff marks are left on a vinyl floor the anti-oxidant in the rubber will migrate chemically down into the vinyl and cause a brown or yellow stain which cannot be cleaned off.

A similar brown or yellow stain can sometimes be seen on vinyl floors where an incorrect adhesive has been used and the stain has worked its way up through the floorcovering. A bitumen substrate which is not correctly covered will have the same effect. Such stains cannot be removed.

Cigarettes stubbed out or left smouldering on a good quality vinyl floor will melt the floorcovering. When it cools the ash and tar is trapped and the mark cannot be buffed away. The same is true of carpets with a synthetic fibre pile whereas a wool carpet will char and most of the charred fibres can be brushed away. Any protective coating on a linoleum floor will be melted by the cigarette but the linoleum underneath will only be charred and the mark can be removed by machine or Hand Scrub and the gloss restored by applying a little polymer or maintainer.

Resistance to various substances - LINOLEUM PRODUCTS
(Tests done on the basis of 24 hour wet contact)

SUBSTANCE	VISUAL EFFECT			PHYSICAL EFFECT			OTHER COMMENTS
	None	Slight	Severe	None	Slight	Severe	
Water	H			H			Water spillage can cause slipperiness with certain kinds of polish
Animal Fats (Butter, Lard)	H			H			
Vegetable Fats & Oils	H			H			
Mineral Oils	H			H			
Beverages	H			H			
Solvents							
Petrol		H			H		
Paraffin	H			H			
White Spirit (Turps Sub.)	H			H			
Chlorinated Dry Cleaning Fluid			H			H	Normally will evaporate before damage is severe
Ketonic (Nail Varnish & remover etc.)			H			H	Normally will evaporate before damage is severe
Paint Strippers			H			H	
Domestic Cleaning Agents							
Detergents	H			H			Containing alkaline builders, can cause softening on prolonged contact
Liquid Bleaches (Domestos)	H			H			Some colours may be lightened
Solid Cleaners (Harpic)	H			H			Some colours may be lightened
Washing Soda (dilute soln.)	H			H			
Washing Soda (strong soln.)		H	H		H	H	May produce pronounced softening and surface pitting
Oven Cleaners		H	H		HH		May produce pronounced softening and surface pitting
Miscellaneous Chemicals							
Dilute Mineral Acids		H			H		
Strong Mineral Acids			H			H	
Caustic Soda	H			H			
Caustic Soda (strong)			H			H	
Photographic Chemicals							
Hair Preparations		H					

Resistance to various substances - VINYL PRODUCTS
(Tests done on the basis of 24 hour wet contact)

SUBSTANCE	VISUAL EFFECT			PHYSICAL EFFECT			OTHER COMMENTS
	None	Slight	Severe	None	Slight	Severe	
Water	H			H			Water spillage will increase the slip risk
Animal Fats (Butter, Lard)	H			H			Water spillage will increase the slip risk
Vegetable Fats & Oils	H			H			Water spillage will increase the slip risk
Mineral Oils	H			H			Water spillage will increase the slip risk
Beverages	H	H	H	H			Cordials may cause staining to different degrees. Tea, Coffee no effect
Solvents							
Petrol		H			H		
Paraffin	H			H			
White Spirit (Turps Sub.)	H			H			Normally will evaporate without causing damage
Chlorinated Dry Cleaning Fluid			H			H	Normally will evaporate without causing damage
Ketonic (Nail Varnish & remover etc.)							
Paint Strippers		H	H	H	H	H	Normally will evaporate without causing damage Allow to evaporate - mopping will increase damage
Domestic Cleaning Agents							
Detergents	H			H			
Liquid Bleaches (Domestos)	H			H			
Solid Cleaners (Harpic)	H			H			
Washing Soda (dilute soln.)	H			H			
Washing Soda (strong soln.)	H			H			
Oven Cleaners	H			H			
Shoe Polishes		H	H		H		
Miscellaneous Chemicals							
Dilute Mineral Acids	H			H			
Strong Mineral Acids		H					
Caustic Soda	H			H			
Caustic Soda (strong)	H						
Photographic Chemicals						H	
Hair Preparations						H	

For information on other potential staining agents contact our
Customer Service Department

Covering Desks and Counters

Because of their durability and attractive appearance retention many floorcoverings, notably linoleum, can also be used to surface desks, bar tops, counters and check-out points or on walls, or as facing materials.

LINOLEUM OR VINYL ON DESK OR TABLES

This can be a specialised product, such as Forbo Desk Top Linoleum, where the hessian backing of this plain linoleum has been replaced by an impregnated paper felt to ensure that the surface is totally smooth, or a standard flooring material.

Material should be stored vertically in a dry and frost-free environment. Cut the material oversize and lay the panels horizontally for 24 hours at a minimum of 17°C to enable them to acclimatize. If possible, the material, the adhesive and the surface on which the material will be stuck should be acclimatized in the same room.

Before sticking, ensure all the materials are perfectly clean and free from dust, oil, grease, stains and any irregularities.

ADHESIVES

For flat horizontal surfaces an acrylic emulsion adhesive can be used for vinyls or Desk Top Linoleum. ForboFix 638/414 can be used for Desk Top Linoleum or hessian backed linoleums on an absorbent base. For curved surfaces a double stick technique or contact adhesive is recommended. For industrial installation of Desk Top or hessian backed linoleum a spray adhesive such as a PVA used in joinery is recommended. If the furniture manufacturer uses other solvent free systems they will usually prove suitable but should be tested first. Industrially, Desk Top Linoleum can be cold pressed or hot pressed (up to 100°C) with pressures between 75 and 150 bar. Pressing time will vary between 2 and 15 minutes depending on the type of adhesive.

BACKING AND COUNTERBALANCING

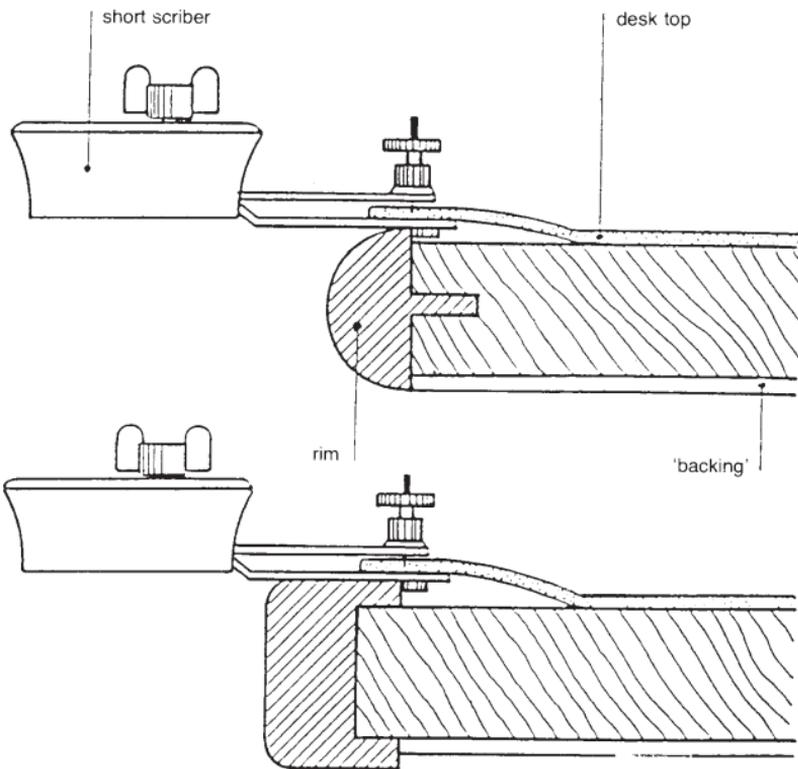
Glueing two different materials together creates tensions. To prevent the risk or warping or distortion both sides of the central material should be covered by a material which is subject to the same kind of dimensional change. This is especially important for suspended objects or objects which are not firmly supported. The larger of the surface to be covered the more important the choice of the type of backing (which acts as a

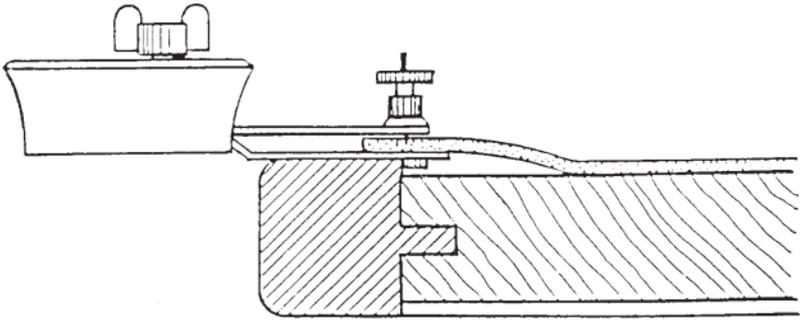
counterbalance) and the thickness, symmetrical construction and rigidity of the total construction. The best results are achieved when both sides are covered by the same material at the same time, applied in the same direction. A variety of materials can be used as backing if the Desk Top or flooring material is not being used on both surfaces but as individual installations will vary so much the safest solution for any surface considered to present a risk is to do a trial first.

MANUAL CUTTING AND FITTING TO A COUNTERSUNK SURFACE

FIRST METHOD

1. Cut the surface to size.
2. Fix the rim to the edge of the surface.
3. Sand and lacquer the rim.
4. Cut the acclimatized surfacing material to an oversize of about 2cm.
5. Apply the adhesive with an appropriate toothed spreader. For all except hessian backed linoleums then spread the adhesive out thinly and evenly with a paint roller.
6. Place the material into the wet adhesive with an overlap of 0.5cm or more on all sides.
7. Scribe off excess material with an over-and-under scribe.





8. Cut the material with a slight undercut along the scribe line, using a hooked blade.
9. Press the edges of the material into the adhesive. Note that with ForboFix 696 adhesive the maximum time to this stage from spreading the adhesive is 10 minutes.
10. Roll the whole surface thoroughly with a clean hand roller.
11. Remove any fresh adhesive stains with water. Dried stains of ForboFix 696 adhesive can be removed with white spirit.

N.B. When very long lengths are being fitted, fit the long edges first and stick the material to within 500 cm of the ends. Then scribe, cut and stick the ends. This eliminates any creep in the lengths.

SECOND METHOD

1. Cut the acclimatized material with an oversize all round of about 0.5cm.
2. Adhere the material as in 5 above with this slight overlap.
3. Saw, mill or plane this construction to size using sharp tools.
4. Stick the rim on and mill it to the desired height.
5. Before sanding and lacquering the rim, cover the strip of material which is butted to the rim with masking tape. Remove the tape immediately after the lacquer has been applied.
6. When sanding the rim avoid contact between the sandpaper and the Desk Top or flooring material.

MANUAL CUTTING AND FITTING TO A CURVED SURFACE

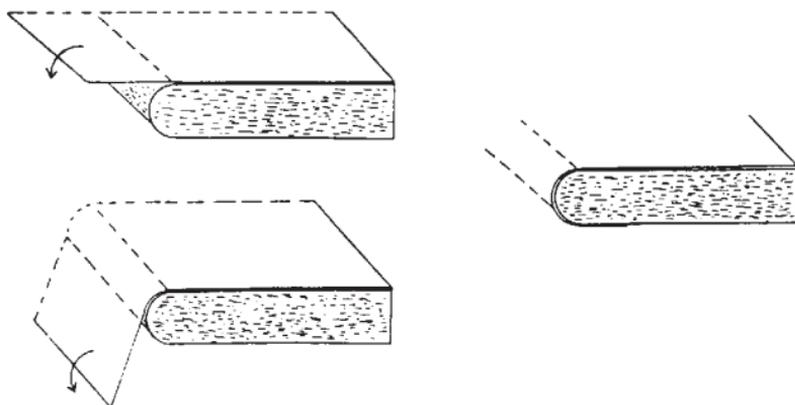
Use a double stick acrylic adhesive or a contact adhesive.

If Desk Top linoleum or vinyls are to be bent round curved chipboard pre-treat the chipboard the day before with the acrylic used as a primer and lightly sand the dry adhesive.

Desk Top or hessian backed linoleum will bend more easily at the sides than at the end of a piece e.g. with marbled linoleum, it is easier to form it over a butt nosing if the marbling is running along the nosing, not over it. In this direction, Desk Top linoleum, 2.5mm marbled linoleums and most vinyls can be bent round a 40mm diameter.

Always see the material is properly acclimatized and apply at temperatures of at least 17°C , warmer if possible.

Extend the material 3-5cm beyond the end of the curve to ensure it holds and make sure the curve has no sharp edges. Cut the material to shape.



Use a double-stick acrylic or contact adhesive in accordance with the manufacturer's instructions. Apply it first to the surface to which the Desk Top or other material is to be applied. Time the application of the adhesive to the second surface in accordance with the manufacturer's instructions. Bring the two surfaces together.

Start with the horizontal area of the surface and gradually work towards the rounded nose. Hand rub the material towards the sides to prevent any bubble entrapment.

As the curve is reached it is important to bend and rub bit by bit ensuring that each area is evenly bonded before bending the next bit. If necessary use a hand roller to apply sufficient pressure.

SURFACE TREATMENTS

Most flooring materials and Desk Top linoleum can be used as facing materials without further treatment. However, if regular future maintenance cannot be assured and coffee cup rings, etc may not be removed immediately then extra surface protection is recommended. This can be a normal floorcovering acrylic or metalised emulsion, applied in two thin coats, or perhaps a polyurethane lacquer. Before applying this, clean the surface of the material and remove grease from the material with white spirit, neutralizing the surface with water.

Furniture manufacturers can apply acid catalyst lacquers to Desk Top or hessian backed linoleums. They should be applied in thin coats - an over-applied thick coat may cause crazing of the lacquer and even of the surface material.

Floorcoverings on Walls and Vertical Surfaces

INSTALLATION OF SHEET MATERIALS ON WALLS AND VERTICAL SURFACES

Linoleums, Bulletin Board and vinyls can be applied to smooth, dry, clean, sound walls of concrete, plaster, hardboard, chipboard, plywood and fibreboard. Board material must be firmly fixed to avoid moving or warping (as only one side is covered) and concrete and plaster must have a relative humidity level of less than 70°RH. The wall surface must be strongly enough bonded to take the weight of the material.

Walls of impervious materials such as ceramic tiles should be primed and then levelled with a wall-leveling compound used in accordance with the manufacturer's instructions.

Outer walls must be damp-proof unless of good cavity construction.

Large areas of material will be heavy and need more than one fitter to handle and present to the adhesive.

Measurements should be taken from the wall and transferred to the material, laid out face upwards on the floor. Alternatively, a paper template can be made on the wall, being pinned or sellotaped in position and then transferred to the material laid out on the floor.

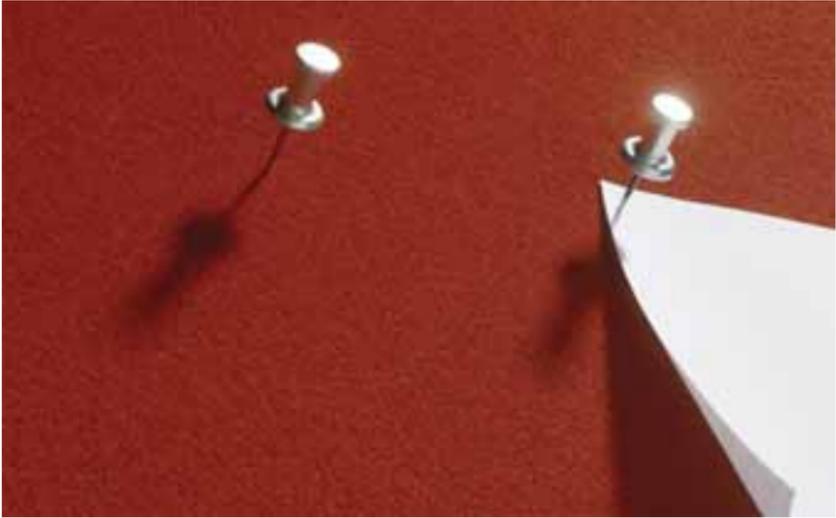
For material to dado height, it is possible for two fitters working in tandem to scribe the material while it is held in position against the wall. When cut to shape apply a strip of contact adhesive along the wall at the highest point to be covered. Apply contact adhesive to the corresponding part of the material to be installed. Spread the remainder to the wall to be covered with an appropriate flooring adhesive. Present the material to the wall, keeping the top edge off the wall and steadily the material into position. Once into position carefully bring the two parts of the contact together, ensuring no bubbles are trapped. The contact adhesive will hold the weight of the material until the other adhesive cures. For areas which are not too large, and therefore heavy, and which have the lower edge supported it is possible to use an adhesive which is standard floorcovering adhesive with a good tack.

Templating may be preferred for complicated areas on desk fronts or where a patterned panel is being inset.

BULLETIN BOARD

This is a heavy material and if stuck to a wall 530 Eurosafe Cork adhesive should be used. Larger pieces may be adhered using contact adhesive to hold the top 150mm in place whilst the remainder of the Bulletin Board is fixed using 530 Eurosafe Cork. Note that Bulletin Board has a Class 1 flame spread material and Fire Regulations should be followed.

Bulletin Board can also be mounted on a ply or similar backing and framed to prevent warping and these fittings are then screwed to the wall.



Drying Room Yellowing

The key raw materials of linoleum are natural. During the maturing process in the ovens a yellow tint, caused by the oxidation of the linseed oil, may appear on the surface of the linoleum. This is most noticeable on white, grey or blue colourways. This discolouration is, however, only temporary.

When exposed to light this “oxidation film” disappears, and the linoleum regains its standard colour. This process may take only a few hours in bright sunshine but could take up to several weeks in an area lit only by poor artificial light. The discolouration will disappear even if the linoleum has received a coat of polish. It is the blue part of the light spectrum which removes the tint.

A Quick Test

Cover half a tile and expose the tile to sunlight. After a few hours compare the covered part with the exposed part and you will see that the latter has brightened.

Therefore if you notice a shade difference between linoleum you are about to lay and that laid the day before from the same batch it is probably the effect of this normal and traditional phenomenon, which in no way affects the performance of the product.

See overleaf for illustrations.



Forbo-Flooring Products

See a current price list for the full range of items available. The following collections will be regularly updated in line with our policy of continuous product improvement.

SHEET LINOLEUMS

All 3.2mm and 2.5mm marbled linoleums are suitable for widespread very heavy commercial and institutional use.

Marmoleum Vivace	- 2.5mm
Marmoleum Dual	- 2.5mm
Marmoleum Real	- 4.0mm
Marmoleum Real	- 3.2mm
Marmoleum Real	- 2.5mm
Marmoleum Real	- 2.0mm
Marmoleum Fresco	- 2.5mm
Artoleum	- 2.5mm
Walton (Plain Linoleum)	- 2.5mm

LINOLEUM TILES

Suitable for very heavy commercial and institutional use.

Marmoleum Dual	- 2.5mm	500 x 500mm	330 x 330mm
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SPECIAL LINOLEUMS

Marmoleum Ohmex	- 2.5mm	Resistivity under 10^8 ohms	200cm wide
Desk Top Linoleum	- 2.0mm		183cm wide
Bulletin Board	- 6.0mm		122cm & 183cm wide
Corkment underlay	- 2.0mm		200cm wide

LINOLEUM PRE-FORMED COVINGS

Marmoform S Coving (radius 9mm) 100mm high, 50mm foot; 2.0mm, 2.5mm or 3.2mm gauge; 2.4m lengths.

Marmoform S Angles (radius 9mm) 100mm high, 50mm foot; 2.0mm, 2.5mm or 3.2mm gauge. Each arm of the internal angle has a length against the wall of 14cm; for each arm of the external angle this is 10cm.



DOMESTIC VINYL

The Nairn Cushionflor Collection. Suitable for all rooms in the home.

Cushionflor Supreme	3.2mm gauge	4m width
Cushionflor Deluxe	2.5mm gauge	3m, 4m width
Cushionflor Classic	1.5mm gauge	3m, 4m width

Novilon Nova	3.2mm gauge	4m width
Novilon Moda	3.0mm gauge	4m width
Novilon Viva	2.0mm gauge	4m width
Novilon Prima	1.5mm gauge	3m, 4m width

HIGH PERFORMANCE COMMERCIAL SHEET VINYL

Eternal Wood/Stone/Chip/Glass effects with Pearl surface R10	2.2mm	2m width
Smaragd Classic/original and Marble R10	2.0mm	2m width

STEP SAFETY VINYL

Surestep R10 PUR Surface	2.0mm	2m width
Safestep R11 and R12	2.0mm	2m width
Safestep Grip Wet Area R10	2.0mm	2m width
Sarlou Tech Canyon Acoustic 15Db R10	2.6mm	2m width
Sarlou Traffic Compact	2.0mm	2m width
Aqualon Relief Wetroom flooring R10	2.0mm	2m width
Onyx Wall Vinyl	0.9mm	2m width
Colorex SD Antistatic heavy duty pressed Vinyl Tile	2.0mm	610 x 610mm
Colorex EC Static Conductive pressed Vinyl Tile	2.0mm	610 x 610mm
Allura Luxury Vinyl Tile Wood Plank/Stone/Metal Glass	2.5mm	Various

ADHESIVES, WELDING CABLE AND UNIQUE TOOLS

ForboFix 638/414	- Forbo linoleum sheet and tile adhesive, 15 litre container.
615 Eurostar Lino EL	- static conductive linoleum adhesive 10 litre container.
545 Eurosafe Special EL	- static conductive vinyl adhesive. 10 litre container.
o41 Europrimer EL	- static conductive primer. 10 litre container.

A full range of primers, DPM's, adhesives and levelling compounds also available.

Marmoweld	- linoleum welding cable	- 50 metre reels.
Smaragd Welding Cable		- 50 metre reels.
Colorex Welding Cable		- 50 metre reels.
Stepweld		- 50 metre reels.
Eternal Weld		- 50 metre reels.
Sarlou Quartz Weld		- 50 metre reels.
Onyx Weld		- 50 metre reels.
Aqualon Relief Weld		- 50 metre reels.
Natura		- 100 metre reels.

Copper Strip	- for use with Colorex EL - 50 metre reels.
Forbo Trimmer	- hand tool for cutting seams and strips.
Forbo Groover	- hand tool for grooving out grouts
Forbo Tile Scriber	- template for cutting 500mm tiles on the diagonal
Forbo Compass	- hand tool for cutting/welding circles
Forbo Carryset	- end handles for carrying and unrolling Marmoleum

Marmoleum Cleaner (Monel) is available in cartons of 12 plastic bottles and are intended for use primarily on Marmoleum in domestic situations where mechanical equipment is not available and a satin finish is required. They can also be used on Forbo cushioned vinyls. Monel is also available for use in domestic applications.

Aquajet

Sometimes creative concepts call for representation of fine detail. Aquajet, the Company's precision eco-cutting system will help achieve this and allows the imagination to run free.

ARTWORK

For bespoke images an exact representation should be submitted. Usually this is in the form of a bromide quality print of at least A4 size, or an IBM compatible 3½" disc with image in a DWG or a DXF file. Alternatively, high quality black and white artwork with sharp black lines.

Supplying your image in one of the above formats will reduce the time to produce your floor and associated costs. Please contact us for advice if you are unable to supply your image in any of the above formats.

PRICING

Quotes are supplied on an individual basis upon request. The cost of your Aquajet image is governed by the total length of lines; number of colours and the preparatory work inputting the image.

PACKAGING & SUPPLY

Where possible each image is supplied pre-assembled, otherwise each element is clearly identified to help installation.

CLEANING AND MAINTENANCE

Your Aquajet does not require any specialist maintenance procedures nor does it require to be seam welded.

CUSTOMER SERVICE

For further information please call **02 9828 0201**.

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NOTES



forbo **marmoleum**[®]
forbo **desktop**[®]



green building council australia
MEMBER



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