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Synthetic resin floorings— Code of practice

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Contents

Page

Foreword

Rwanda Standardsarepreparedby Technical Committees and approved by Rwanda Standards Board (RSB) Board of Directors in accordance with the procedures of RSB, in compliance with Annex 3 of the WTO/TBT agreement on the preparation, adoption and application of standards.

The main task of technical committees is to prepare national standards. Final Draft Rwanda Standards adopted by Technical Committees are ratified by members of RSB Board of Directors for publication and gazettment as Rwanda Standards.

DRS 556 was prepared by Technical Committee RSB/TC 056, *Paints, Varnishes, Adhesives and Related Products.*

In the preparation of this standard, reference was made to the following standard:

BS 8204-6: Screeds, bases and in situ floorings —Part 6: Synthetic resin floorings — Code of practice

The assistance derived from the above source is hereby acknowledged with thanks.

Committee membership

The following organizations were represented on the Technical Committee on *Paints, Varnishes, Adhesives and Related Products*(RSB/TC 056) in the preparation of this standard.

Star Construction and Consultant (SCC) Ltd

Rwanda Inspectorate, Competition and Consumer Protection Authority (RICA)

Ministry of Environment (MoE)

Rwanda Forensic Laboratory (RFL)

Rwanda Investigation Bureau (RIB)

University of Rwanda/College of Sciences and Technology (UR/CST)

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Shalom Paints

Standards for Sustainability

REX Paints

AMEKI Color

Rwanda Standards Board(RSB) – Secretariat

Introduction

The term “resin” is derived from “epoxy resin”, the compound on which the first resin floorings were based.Many different types of resins are now used to manufacture resin floorings but the one common feature isthat a polymerization, or curing, reaction takes place in situ to produce the final synthetic resin finish.Synthetic resin flooring is available in a wide range of thicknesses from thin floor seals to heavy-dutyindustrial protective coatings. The resulting flooring can provide a seamless surface with greatly enhancedperformance compared with the concrete base on which it is applied.

Concrete wearing surfaces give satisfactory service under many industrial conditions but become lesseffective where there are specific requirements for chemical resistance, hygiene, cleanliness, and resistanceto high impact or abrasion. The main properties of synthetic resin floorings can be summarized as follows:

a) a strong permanent bond to the concrete base;

b) resistance to a wide spectrum of aggressive chemicals;

c) impermeability to liquids;

d) toughness, durability, resilience and resistance to impact or abrasion;

e) hygienic and easily cleaned surfaces;

f) resistance to cracking;

g) low applied thickness;

h) rapid installation and curing with minimum disruption to normal operations.

Synthetic resin floorings— Code of practice

1 Scope

This Draft Rwanda Standard gives recommendations for the design and installation of in situ synthetic resin flooring used internally in buildings, where they are bonded to direct finished concrete slabs, fine concrete screeds and to existing concrete floors. The installation of resilient sports surfacing based on synthetic resins is not covered by this code of practice.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the editioncited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

RS ISO 4618, *Paints and varnishes — Terms and definitions*

RS 142,*Design for concrete structures — Code of practice*

RS ASTM D 4602-93, *Standard Guide for Non-destructive Testing of Pavements Using Cyclic-Loading Dynamic Deflection Equipment*

ISO 19044,*Test methods for fibre-reinforced cementitious composites — Load displacement curve using notched specimen*

ISO 20326,*Resilient floor coverings — Specification panels/assembly for loose laying — Amendments depending on the substrate*

3 Terms and definitions

For the purposes of this standard, the terms and definitions given in RS ISO 4618 and the following apply.

3.1

base

building element that provides the support for a screed or flooring

3.2

flooring

uppermost fixed layer of a floor that is designed to provide a wearing surface

3.3

direct finished base slab

base that is finished to receive directly the flooring to be applied without the need for a levelling screed

3.4

levelling screed

screed finished to obtain a defined level and to receive the final flooring

3.5

synthetic resin

reactive organic polymeric binder for a flooring system comprising one or more components which react in situ at ambient temperature

3.6

departure from datum

deviation in height of the surface of a flooring layer from a fixed datum plane

3.7

Surface regularity

deviation in height of the surface of a flooring layer over short distance in a local area

NOTE This is sometimes referred to as flatness.

4 Exchange of information and time schedule

4.1 General

4.1.1 Consultation and exchange of information between all parties concerned with the building operationsshould be arranged, so that each party has full knowledge of the particulars of the flooring work and is ableto cooperate in producing the necessary conditions to complete a satisfactory job.

4.1.2 Some of the items listed in 4.3, 4.4 and 4.5 may need special precautions or procedures and responsibilityfor these should be determined in advance of the work.

4.2 Selection of flooring to be applied

It is essential that, in the design and construction stages, there should be full consultation with themanufacturer of the synthetic resin flooring to ensure that the product to be selected is entirely suited forthe conditions both during application and in subsequent service. This consultation should take account ofthe following items, however, it should be noted that some of these items may only apply where the clienthas specified particular performance requirements:

a) the intended use of the synthetic resin flooring, including the type, extent and frequency of traffic;

b) the type of loading (static or dynamic) and severity of impact;

c) the details of all chemicals, including those used for cleaning or sterilizing, which could come into contact with the floor, and likely extent, frequency and temperature of any spillage;

d) the temperatures that the flooring is required to withstand in normal service or as part of the cleaning operations and whether exposure is by radiant or conductive heat or by direct contact;

e) the uniformity and retention of colour, appearance and decorative effects;

f) the extent to which the flooring will be exposed to direct sunlight or ultraviolet light;

g) the appearance and quality of finish;

h) the need to reduce the risk of osmotic blistering (see 9.2);

i) compliance with hygiene or food industry requirements;

j) special requirements, such as slip resistance, fire resistance or anti-static characteristics;

k) expected life of the flooring;

l) thickness of flooring to be installed;

m) time available for the application and curing of the flooring;

n) age, specification where known and nature of the base, including information about any previous useof the floor that could affect adhesion, and any preparatory treatment required.

4.3 Information to be provided to the flooring contractor

4.3.1 All relevant information should be provided in good time to those responsible for installing the flooring and to others whose work could be affected. This should include the following:

a) description, situation and address of site and means of access;

b) those conditions of contract which could practically affect this particular work;

c) location and area of flooring to be installed;

d) finished floor level, falls and maximum permissible departure from datum in each location;

e) class of surface regularity of the finished flooring;

f) type of damp-proofing and insulation if present;

g) type and thickness of any levelling screed proposed, and whether any curing compound is to be applied;

h) type of finish of base or fine concrete screed;

i) any work consequent upon services passing through the floor;

j) treatment of joints;

k) treatment of channels;

l) treatment of skirtings and kerbs;

m) treatment of junctions with adjacent floorings and doorway thresholds;

n) any special requirements related to underfloor heating;

o) the timing of the introduction of heating in the building;

p) date for the completion of the base or fine concrete screed to receive the flooring;

q) dates for the start and completion of the individual sections of the floor;

r) details and frequency of any compliance testing required;

s) any potential restrictions on working hours;

t) any limitations on installation due to production or other activities.

4.3.2 It should be noted that some of items a) to t) may not apply in all cases and that this will depend on the individual client's requirements.

4.4 Information to be provided by the flooring contractor

The flooring contractor should provide in good time to those responsible for the building, details of the conditions needed for the installation of the flooring. These should include:

a) the extent of weatherproof areas to be provided for storage of raw materials and mixing of the flooringproduct and whether any temperature control is necessary;

b) the ambient temperature requirements in the area where the flooring is to be installed;

c) the power and lighting requirements to facilitate the laying operation;

d) the protective screening to isolate the working area from adjacent facilities;

e) the minimum time intervals after the flooring is installed before allowing foot traffic, vehicular traffic and water or chemical exposure;

f) the protection necessary for the flooring between installation and final handover.

4.5 Time schedule

When planning the floor installation, allowances should be made for the following:

a) curing and drying of the base concrete, fine concrete levelling screed, and/or polymer modifiedcementitious levelling screed;

b) time between commencement and completion of work;

c) period of curing and protection of the completed flooring from damage by other trades, including restriction of access.

5 Materials

5.1 General

5.1.1 For all synthetic resin flooring products the setting reaction, by which the initially liquid components are converted into a strong tough polymer, begins only when the base resin and the reactive hardener or catalyst are intimately mixed. To obtain the optimum results these components should be blended in the precise proportions needed for the chemical reaction to occur. Mixing should be thorough to ensure the final product is homogeneous and uniform in properties. Only pre-batched base resins, reactive hardeners andaggregates, if any, should be used to facilitate site operation and ensure optimum performance. Since, it isimperative that the chemical balance is not upset, no attempt should be made to use subdivided packs, orto blend in any other additional materials such as diluents or aggregates.

5.1.2 Any separate primers or surface seals should be applied strictly in accordance with the manufacturer's recommendations in order to achieve maximum bond between each application.

5.2 Synthetic resin types

5.2.1 A variety of synthetic resins can form the binder of a flooring system. These typically include epoxy, polyurethane and methacrylate resins.

5.2.2 The different resin types give different combinations of application characteristics and in-service performance. Careful consideration should be given to the factors that will affect the selection of a resin type (see clause 6).

6 Design

6.1 Selection parameters

6.1.1 Flooring systems should be selected on the basis of:

a) type and degree of traffic;

b) temperatures to which flooring will be exposed;

c) nature and duration of any chemical contact with the floor;

d) wet or dry service conditions;

e) slip resistance requirements;

f) ease and method of cleaning (including hygiene requirements);

g) moisture condition of the substrate;

h) time available for application and curing of the flooring;

i) prevailing site conditions at time of installation.

6.1.2 The most appropriate flooring for any situation will depend upon the particular conditions to which it will be subjected, and the choice should be made in discussions between all the interested parties, including client, designer, contractor and supplier. It is not possible to provide a simple guide to the usage of different flooring types, since so many parameters can affect the decision for a particular situation.

6.2 Types of synthetic resin flooring

6.2.1 Synthetic resin floorings can be divided into different types varying in thickness and surface finish (see Table 1).

6.2.2 Some of these types of flooring may be produced with special decorative effects by the incorporation of coloured particles or flakes in the surface. Terrazzo-like finishes (ground exposed aggregate) may be produced from certain trowel-applied floorings of Types 6 and 8. Slip resistant or anti-static/conductive versions of all these categories may also be available.

Table 1 — Types of synthetic resin flooring

Type	Name	Description	Typical thickness
1	Floor seal	Applied in two or more coats. Generally solvent or water-borne	Up to 150 µm
2	Floor coating	Applied in two or more coats. Generally solvent-free.	150 µm to 300 µm
3	High build floor coating	Applied in two or more coats. Generally solvent-free.	300 µm to 1 000 µm

4	Multi-layer flooring	Aggregate-dressed systems based on multiple layers of floor coatings or flow-applied floorings, often described as "sandwich" systems.	> 2 mm
5	Flow-applied flooring	Often referred to as "self-smoothing" or "self-levelling" flooring and having a smooth surface.	2 mm to 6 mm
6	Resin screed flooring	Trowel-finished, heavily filled systems, generally incorporating a surface seal coat to minimize porosity.	> 4 mm
7	Heavy duty flowable flooring	Having a smooth surface	4 mm to 6 mm
8	Heavy duty resin flooring	Trowel-finished, aggregate filled systems effectively impervious throughout their thickness.	> 6 mm

6.3 Durability

6.3.1 Generally, the service life will be proportional to the applied thickness of the synthetic resin flooring. However, many operational factors will directly affect the performance, including the severity of traffic (wheel type and loading), the frequency and efficiency of cleaning, mechanical handling abuse and impact. In most industrial facilities there will be a variety of situations for which a different type of synthetic resin flooring will be most appropriate. Conversely, there will be areas of a facility where some types of flooring are inappropriate.

6.3.2 Floorings of Types 1 to 3 should be installed only where there will be pedestrian or commercial use or in lighter industrial situations. Where there is regular or heavy fork-lift truck traffic, the thicker floorings of Types 4 to 8 should be installed. For the heaviest usage, particularly where there is the possibility of significant impact damage, then floorings of Types 7 and 8 should be installed.

6.3.3 Premature failure of the coatings of floorings of Types 1 to 3 could occur if grit or metal swarf were not cleaned away and were then ground into the surface under the action of traffic. A thicker type of flooring, which would be more durable, should be installed in such situations.

6.4 Timing

6.4.1 Synthetic resin floorings are frequently selected for use because they can permit rapid installation and hence minimum disruption to industrial or commercial operations. However, in planning the flooring installation other associated aspects of the work should be taken into account (see 4.4 and 4.5).

6.4.2 In new works, or in existing works where a new sub-floor is first to be installed, the curing of the concrete base should be taken into account. Where the synthetic resin flooring chosen is not susceptible to moisture in a concrete base, it may be applied over a new concrete base as soon as it is firm enough to withstand the physical loads imposed. Generally, the concrete should be allowed to dry for three to four weeks after the necessary curing, before the resin flooring is applied.

6.4.3 For those synthetic resin floorings that are moisture sensitive, sufficient time should be allowed in the installation programme for the concrete to dry out to a level acceptable for the application of the flooring. It should be noted that the use of curing membranes will effectively prevent drying out until they are removed.

6.4.4 Concrete bases dry slowly (see 7.3). It may be preferable to apply a purpose-designed damp-proof membrane over the concrete to provide a surface seal thus allowing the flooring to be applied at an early age. There is a risk when sealing moisture into a structure, that this may cause blistering of the synthetic resin flooring if other conditions prevail (see clause 9).

6.4.5 Most synthetic resin floorings achieve their full potential properties within seven days. Generally, they can be walked on after overnight cure and can take light traffic after one day to three days depending on the system and on the ambient temperature conditions. However, the flooring should be allowed to achieve full cure before it is washed or exposed to any chemicals, otherwise some surface disfigurement may occur.

6.5 Surface smoothness and slip resistance

6.5.1 The flooring should be finished in a manner that produces a slip resistance compatible with thecircumstances of use. The slip resistance value (SRV) should be not less than 40 when tested, wet or dry asappropriate for the anticipated service conditions, in accordance with RS 142. Specialconsideration should be given to the slip resistance of ramps.

6.5.2 As a general rule, the smoother and less porous a floor surface, the easier it is to keep clean. However,whilst resin-based flooring can be formulated to produce smooth, non-porous surfaces with excellent slipresistance under dry conditions, the surface may have to be textured if it is to have adequate slip resistanceunder contaminated conditions.

6.5.3 The heavier the likely build-up of contaminants, the coarser the surface texture has to be to retain therequired level of slip resistance. However, coarse textured surfaces are more difficult to clean, so whereboth slip resistance and ease of cleaning are important, a compromise should be made. Flooring should beselected with a texture to suit specific working conditions and hygiene standards, and the client should beadvised to implement a programme of frequent effective cleaning. In particularly wet areas, the clientshould be advised of the benefits of the use of special footwear with slip resistant soles, which can allow asmoother floor finish to be adopted. In such situations an SRV in the wet of not less than 33 might beacceptable.

6.6 Chemical resistance and resistance to staining

6.6.1 Synthetic resin floorings can provide an effective method of protecting concrete substrates sensitive to attack from aggressive liquid spillages, when correctly specified and applied.

6.6.2 Selected synthetic resin floorings can perform satisfactorily when exposed to many of the chemicals and products found in normal industrial service situations. Where the flooring is likely to be exposed to conditions of aggressive liquid spillage, the floor design should be carefully considered, e.g. provision of adequate drainage and maintenance of good housekeeping standards, to ensure an acceptable service life. In practice, prolonged contact with large quantities of aggressive chemicals is unlikely because of the potential health hazards involved.

6.6.3 No single synthetic resin flooring will be completely resistant to prolonged contact with all types and combinations of chemicals. On account of the wide variety of chemical products used in industry and the diversity of synthetic resin floorings, it is not practical to provide a simple guide to chemical resistance. Where floorings are likely to be exposed to chemicals, advice on which synthetic resin floorings would be appropriate should be sought from the manufacturer or contractor based on their laboratory testing or on their experience in similar locations.

6.6.4 Resistance to particular chemicals does not exclude the possibility of surface staining. Some chemicals may cause discoloration of the flooring surface without affecting the service integrity and durability of the flooring material. If aesthetic appearance is a major requirement, the client should be advised whether the proposed flooring would be resistant to staining as well as to chemical attack in the particular environment.

6.6.5 In deciding which product to recommend for a particular situation, the manufacturer or contractor should be provided with the following information:

a) chemical constituents and concentration of likely spillage;

b) temperature of the spillage;

c) quantity and frequency of the spillage;

d) presence of water and procedures for emergency wash-down;

e) regular cleaning procedures;

f) falls, drainage and sumps to be provided.

6.7 Colour and resistance to ultraviolet radiation

6.7.1 Synthetic resin floorings are generally selected for use for specific performance requirements. As a consequence, the range of colours available has traditionally been limited owing to the availability of pigments with the required level of chemical resistance. However, lighter and brighter colours are increasingly specified in order to improve the general working environment. The colour of the flooring then becomes more critical and special precautions should be specified in relation to batch control of the product in consultation with the manufacturer.

6.7.2 Care should be taken in selection of the flooring in areas where the surface will be exposed to strong sunlight or to ultraviolet radiation. Being organic in nature, most resin binders will discolour on prolonged exposure to this type of radiation. If aesthetic appearance is a major requirement, then the flooring system should be chosen accordingly.

6.8 Temperature resistance

6.8.1 Heat distortion temperature

6.8.1.1 Most synthetic resin floorings will withstand constant temperatures up to 50 _C without adverse effect. Such floorings have relatively low heat distortion temperatures (HDT), generally between 50 ˚C and 100 ˚C, much lower than for ceramic tiles or concrete floors.

6.8.1.2 In practice, some synthetic resin floorings have proved capable of withstanding temperatures higher than their HDT, e.g. for steam cleaning or hot water washing, through attention to formulation, application and floor design.

6.8.1.3 Where the flooring is likely to be exposed to high temperatures, the designer should follow the provisions of 6.8.2, 6.8.3, 6.8.4, and 6.8.5.

6.8.2 Nature and type of heat source

6.8.2.1 Owing to the low heat capacity of air and the relatively slow changes in temperature caused by convectedand radiant heat, dry heat is normally only a problem in extreme conditions, e.g. close to oven doors.Liquids in contact with floors give a much higher heat transfer and therefore pose more of a risk.

6.8.2.2 Particular care should be taken in the design of the flooring where extreme temperature variations arelikely, such as in cold stores and areas around ovens or furnaces. The thermal movement of the flooring inthese areas in relation to the surroundings should be carefully considered and appropriate joints installed.

6.8.2.3 Where direct radiant heat at a level the flooring cannot tolerate is anticipated, such as the thresholds tooven doors, a more heat-resistant flooring, such as ceramic tiling, should be installed in the immediatevicinity. A movement joint between such an area and the resin flooring may then be required.

6.8.3 Duration of contact with the flooring

The length of time that the flooring is exposed to heat will affect the temperature resistance of the resin flooring and this will depend on the overall design of the installation. Wherever possible, known bulk discharge should be piped direct to the drains. Where this is not possible, floors regularly subjected to discharge of large volumes of hot liquids should be laid to adequate falls (see 6.14) and be regularly washed down to the drains or be protected by the installation of cooling sprays. Such a cold water curtain not only cools the floor but can also dilute any aggressive spillage to safer levels.

6.8.4 Rate of change of temperature

6.8.4.1 With slow changes in temperature, the stresses that are transmitted to the bond line due to differential expansion between the synthetic resin flooring and the substrate can usually be accommodated. Rapid changes of temperature may cause failure in thinner flooring types on account of the faster heat transfer through to the bond line.

6.8.4.2 Prolonged exposure to high temperatures may lead to a higher degree of cure resulting in the product becoming more brittle or less flexible, and in the worst cases inducing shrinkage stresses within the product leading to cracking or detachment. Where rapid changes of temperature are likely, a thicker flooring type should be installed and a flooring product selected which can accommodate such changes.

6.8.5 Steam cleaning

A combination of softening and subsequent damage may be caused by misuse of high-temperature pressurecleaning equipment. Steam cleaning can be satisfactorily performed on some of the heavily filled resinfloorings of Type 8, when applied at a thickness of 9 mm or more, provided care is taken to ensure that thesteam lance is not allowed to discharge onto a single area for longer than is necessary to removecontamination. The client should be advised that steam cleaning should not be permitted on thinner resinfloorings where modern cleaning and sterilizing agents and machines will generally be effective.

6.9 Taint

6.9.1 Correctly formulated and fully cured synthetic resin floorings can be satisfactorily used in the proximity of foodstuffs. However, these floorings should not be used where there would be direct contact with unwrapped foodstuffs.

6.9.2 The critical periods when tainting is likely to occur are during the application of the flooring system and during the subsequent curing. During these periods, all foodstuffs should be removed from the work area and particular care taken to ensure extracted air from the work area is directed away from areas where foodstuffs are stored.

6.9.3 Potential taint problems can be reduced by using synthetic resin flooring products formulated with low volatility and/or low toxicity components. When foodstuffs are to remain within the application work area, only those resin flooring systems should be used for which the manufacturer provides evidence of lack of tainting for the particular types of foodstuff in the wet, semi-cured and fully-cured states.

6.10 Curing

6.10.1 The finished flooring should be allowed to cure in accordance with the manufacturer's instructions. At temperatures of 15 _C to 20 _C, these typically require one day to three days before allowing significant use by traffic and three days to seven days before wet cleaning, allowing contact with chemicals, or heavy traffic. Adequate curing should be allowed before wet testing of the flooring for drainage or ponding. At lower temperatures, longer curing periods should be allowed when planning the flooring installation (see 8.5.7).

6.10.2 At site temperatures below 10 ˚C, cure times will be substantially increased. In considering curing conditions, it should be recognized that the concrete slab temperature will generally be lower than the air temperature, often by as much as 10 ˚C, and this will govern the rate of cure.

6.10.3 The relative humidity of the environment can also affect curing times. When installing floor seals of Type 1 which are water-based a relative humidity of less than 85 % should be maintained to ensure that they cure completely throughout the thickness.

6.10.4 Synthetic resin floorings should not be applied unless both air and slab temperatures are greater than 5 ˚C and rising or unless the product has been designed for use at lower temperatures. Condensation onto the surface of the resin flooring as it cures may cause "blooming" (a clouding of the surface) in some resin systems, and this will be exacerbated if the slab is significantly colder than the air temperature. Therefore, the climate above the resin flooring as it cures should be maintained at a temperature at least 3 ˚C above the dew point or below 75 % relative humidity, to reduce this risk.

6.10.5 Where time constraints apply, the manufacturer should be consulted about the selection of the synthetic resin flooring in order to ensure that the flooring can cure sufficiently before it needs to be brought into service.

6.11 Reaction to fire

All types of synthetic resin flooring, in common with PVC flooring, mastic asphalt or wood floorings, are potentially combustible in severe fires due to their content of organic material. All such types of flooring will emit toxic fumes and smoke on combustion. In most situations, synthetic resin floorings present only a low risk because the flooring is fully bonded to concrete, which has a high heat capacity, so that the overall fire rating of the floor system will be low. However, in some situations, the performance of the flooring in fire could become critical, e.g. in underground or confined areas. In such cases, special grades of synthetic resin flooring with enhanced resistance to combustion and the spread of flame should be installed.

6.12 Damp-proof membranes

6.12.1 In new construction, for concrete bases in contact with the ground, a damp-proof membrane should be incorporated into the slab design, in order to prevent ground moisture adversely affecting the resin flooring. In the case of basement floors in contact with the ground, the provisions of RS 142 should be followed.

6.12.2 In existing buildings without an effective damp-proof membrane, one of the following options should be adopted:

a) selection of a purpose-designed resin flooring that is able to tolerate high levels of moisture in theconcrete slab; or

b) installation of a membrane followed by a new unbonded fine concrete overslab or an unbonded polymer modified cementitious screed. The thickness of a concrete overslab should be in accordance with therequirements of RS 142. An unbonded polymer modified cementitious screed should have aminimum thickness of 50 mm; or

c) application of a synthetic resin surface-applied membrane: the compatibility of membrane, flooring material and any levelling material should first be established. Systems vary in their resistance toosmotic blistering (see 9.2), and this aspect should be discussed in each situation with the flooringmanufacturer.

6.12.3 In basements of existing buildings or floors below ground level, groundwater seepage may, under certain circumstances, lead to adhesion failure between the flooring and the substrate. Where seepage is likely to occur, such as in areas where the water table is higher than the substrate, or where waterproof tanking has not been applied, a method of isolating groundwater should be provided, e.g. by directed drainage.

6.13 Tolerances

6.13.1 General

Installed synthetic resin floorings will generally follow the profile of the underlying substrate because of their method of application. The agreed specification for flatness, regularity and conformity to datum plane of the finished floor can only be met if the base concrete or levelling screed meet the same specification. When upgrading existing floors, the means of obtaining the required levels and flatness should be agreed in advance.

6.13.2 Tolerance to datum plane

6.13.2.1 The designer should specify the maximum permissible departure of the level of the wearing surface from an agreed or specified datum plane, taking into account the area of the floor and its end use. For large areas for normal purposes a departure of ±15 mm from datum will be found to be satisfactory. Greater accuracy to datum could be required in small rooms, along the line of partition walls, in the vicinity of door openings and where specialized equipment is to be installed directly on the floor.

6.13.2.2 The datum plane for the majority of floors will be horizontal but, on occasion, sloping. In the latter case, departure from datum should be measured from the sloping plane.

6.13.3 Surface regularity

6.13.3.1 The class of surface regularity specified for a floor surface will depend upon the use of the floor. Insistence on a higher standard than necessary will result in higher costs and this should be considered when specifying surface regularity and frequency of conformity testing (see 11.3).

6.13.3.2 The designer should specify one of the classes of local surface regularity given in Table 2. For the majority of floor uses, the straightedge method of testing surface regularity given in RS 142 should be used as the basis for specification.

Table 2 — Classification of surface regularity

Class	Maximum permissible departure from a 3 m straightedge laid in contact with the floor (mm)	Application
SR1	3	High standard: special floors
SR2	5	Normal standard: normal use in commercial and industrial buildings
SR3	10	Utility standard: where surface regularity is less critical

6.13.3.3 Where the straightedge basis for specification is used it may be advisable for the various interested parties to agree the sampling rate for testing the floor to check conformity, and the procedures to adopt if conformity is not achieved, before the floor is constructed. Such agreement should include the number of positions where the straightedge will be placed to check conformity.

6.13.3.4 The suitability of a flooring in service in terms of surface regularity is governed by its radius of curvature and changes in height over short distances. It is recognized that the straightedge basis for specifying floor surface regularity does not take into account the "waviness" or rate of change in elevation of a floor over any specified length. The straightedge method therefore should only be specified for floors finished by conventional techniques that will produce a smoothly undulating surface rather than an irregular "washboard" finish.

6.13.3.5 Where a higher degree of accuracy is required than SR1, e.g. for high level racking, the methods of assessment, should be specified.

6.13.3.6 The difference in height across any joints in the concrete base should be less than 1 mm with no abrupt changes in level. Where the difference in height across the joints cannot be accommodated within the thickness of the synthetic resin flooring, then the surfaces in the vicinity of the joint should be ground to remove the step.

6.14 Falls

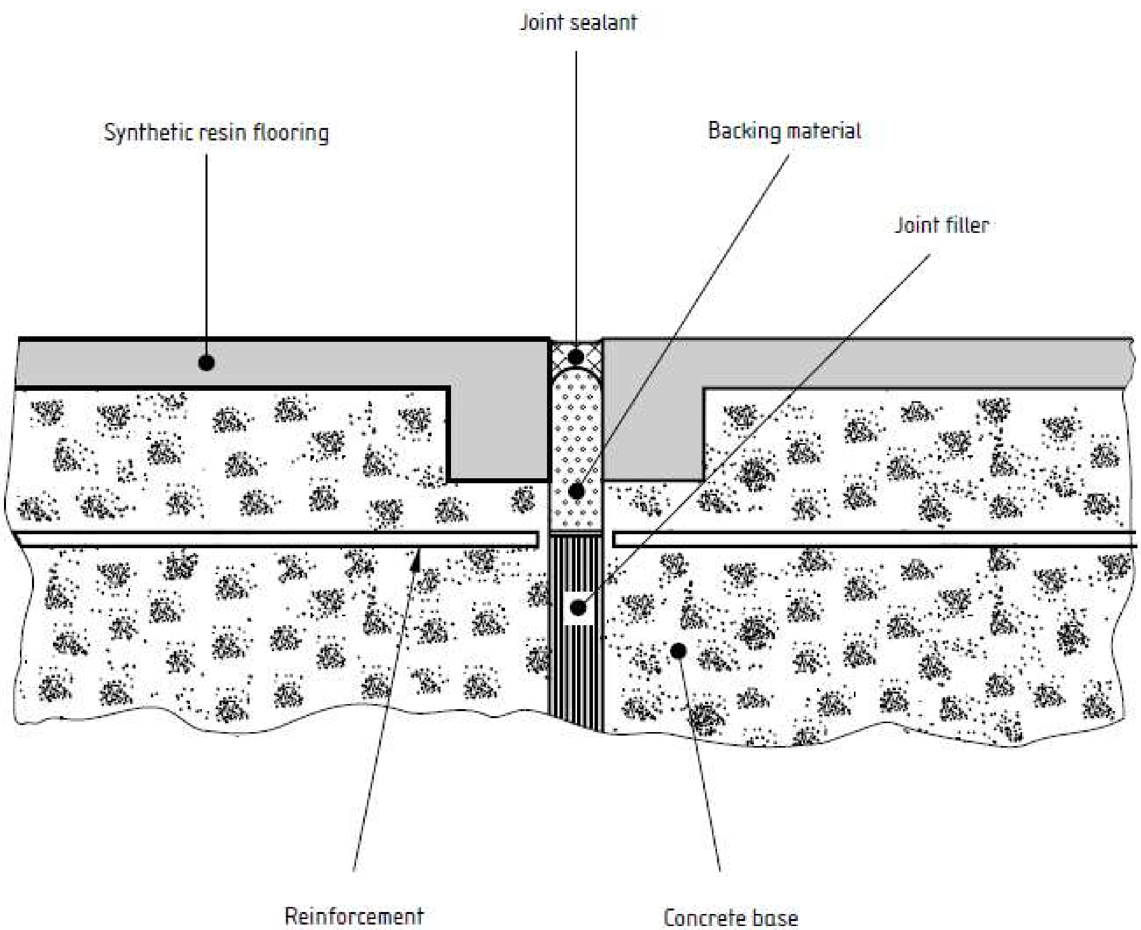
A synthetic resin floor, particularly one with a coarse surface texture, will not drain water satisfactorily unless sufficient falls are introduced. Falls should be provided in the substrate. A minimum slope of 1 in 80 should be specified to produce a free draining floor. To reduce the risk of accidents, falls should not exceed 1 in 40, except on ramps. It should be noted that if the eventual finish is to be flow-applied, slopes greater than 1 in 60 may lead to problems of slumping.

6.15 Joints

6.15.1 The number of joints in the concrete base should be minimized to obtain as far as possible a seamless surface that will be easy to maintain.

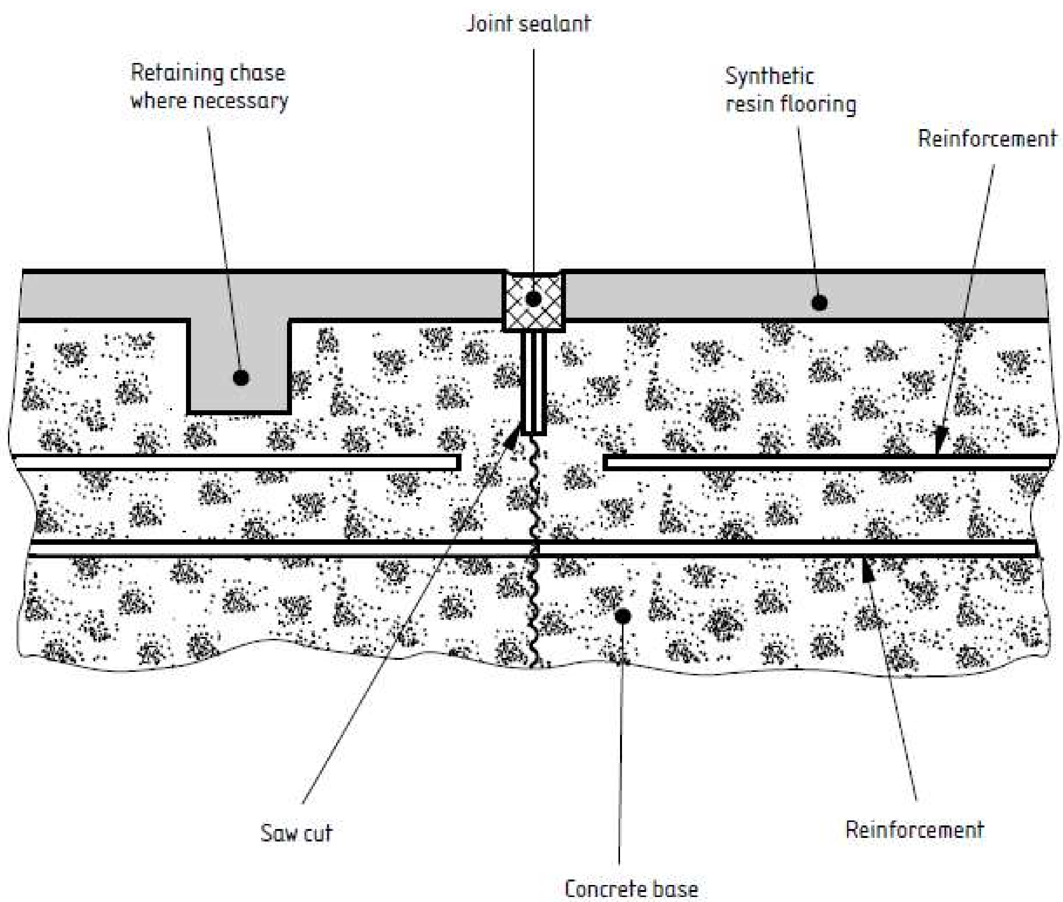
6.15.2 The spacing of movement joints will be determined by the design of the sub-floor. All movement joints in the sub-floor should be carried through the synthetic resin flooring. In certain circumstances, where the concrete is mature and stable, the resin flooring may be laid over any joint where further movement is no longer anticipated.

6.15.3 In all instances the necessity for joints and their type and positioning should be agreed at the design stage between all parties concerned. Methods for forming such joints are shown in Figure 1.



a) Expansion joint

Figure 1 — Typical movement joints



b) Induced joint

Figure 1 — Typical movement joints *(concluded)*

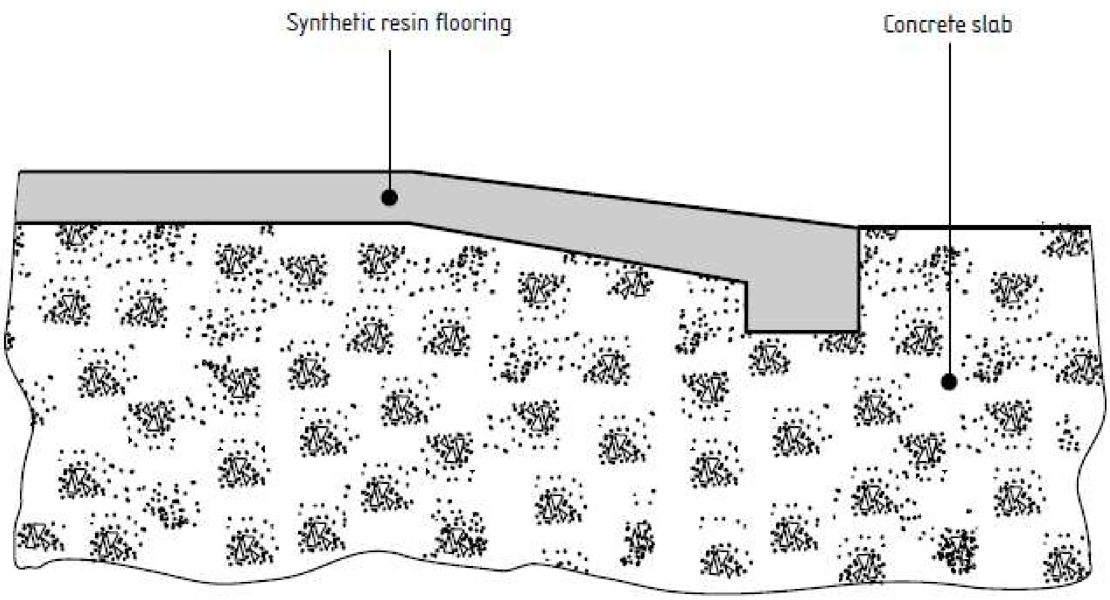


Figure 2 — Typical transition joint

6.16 Edge detail

6.16.1 Feather edging of the flooring should always be avoided. A toe-in joint (see Figure 2) should be provided wherever the thicker synthetic resin floorings, of Types 6 to 8, have to finish level with an existing floor, at joints or around the outside perimeter of the area. To achieve this, a chase should be cast when placing fresh concrete or a chase should be cut with a concrete saw and broken out with a percussion hammer in existing concrete.

6.16.2 Where the level of traffic will be heavy, this chase should be equal to the thickness of the flooring in depth and twice the thickness of the flooring in width, e.g. for a flooring of thickness 5 mm, the chase cross-section should be 10 mm wide and 5 mm deep. With flow-applied floorings of Types 4 and 5 a single concrete saw cut up to 5 mm deep into which the flooring will flow and terminate at the edge, should be provided.Floorings of Types 1 to 3 may not require a special edge detail.

6.17 Channels and gullies

Channels should be incorporated in the flooring to carry liquids such as spillages and washing water to drains. It is an essential part of their function that they prevent leakage of liquids into the structure. By the very nature of their purpose and design they may be subject to more stringent and diverse chemical duty than the individual floor areas from which they receive their contents. Gullies should be treated in similar fashion to channels.

Channel design detail can take a variety of forms and in new installations should be designed in conjunction with the specialist contractor taking into account the nature of the synthetic resin flooring to be used.

Where a preformed stainless steel channel (see Figure 3) is to be installed, there should be a flexible joint between the flooring and the channel to prevent leakage due to differential movement. In aggressive environments an alternative approach is to line the drainage channels with the flooring in order to maintain a monolithic surface to avoid joints in vulnerable areas.

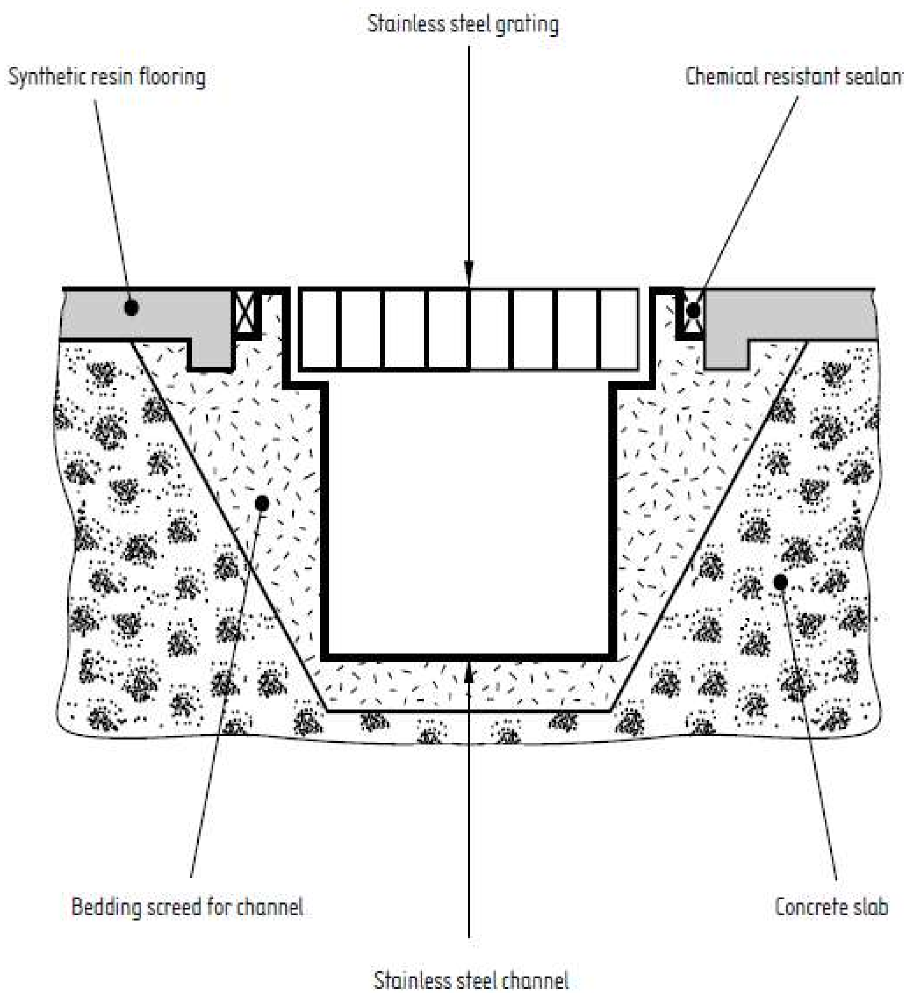


Figure 3 — Typical stainless steel drainage channel

6.18 Coved skirtings and kerbs

6.18.1 Figure 4 shows a typical method of terminating the synthetic resin flooring at perimeters, upstands and columns. Such terminations may require a vertical grade of the flooring product, with a slightly different visual appearance.

6.18.2 Simple skirting details may be extended to similar features such as kerbs or plinths.

6.19 Service penetrations

Although not desirable, in some circumstances services may be required to pass through the synthetic resin flooring. Where this is the case, a protective sleeve, preferably with a side flange, should be cast into the base concrete (see Figure 5). This sleeve would permit the services to pass through without direct contact with the flooring. This is particularly important if the services are to include pipes carrying liquid at temperatures other than ambient. The sleeve would also act as an upstand to prevent liquids flowing down through the floor. Where fire resistance requirements apply, the void between the services and the sleeve should be sealed.

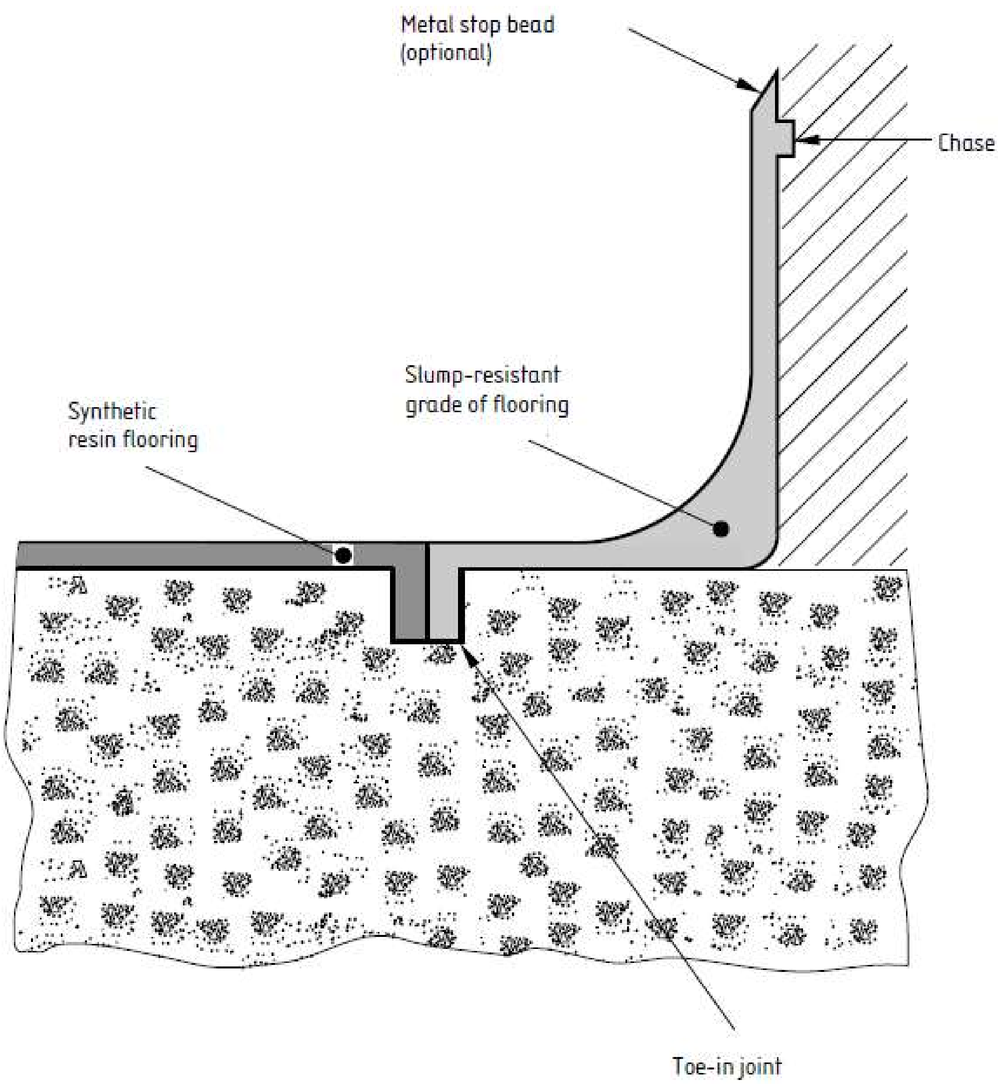


Figure 4 — Typical floor-to-wall joint

6.20 Stairs

Flooring to the treads of stairs can be formed from any of the different types of synthetic resin flooring. For the risers, special vertical grades of the synthetic resin flooring may be necessary. The structural concrete should be formed to the precise profile of the stairs less the thickness of the flooring. Before commencing application, the surfaces of the treads and risers should be prepared in accordance with7.3 for new bases or 7.4for old bases.

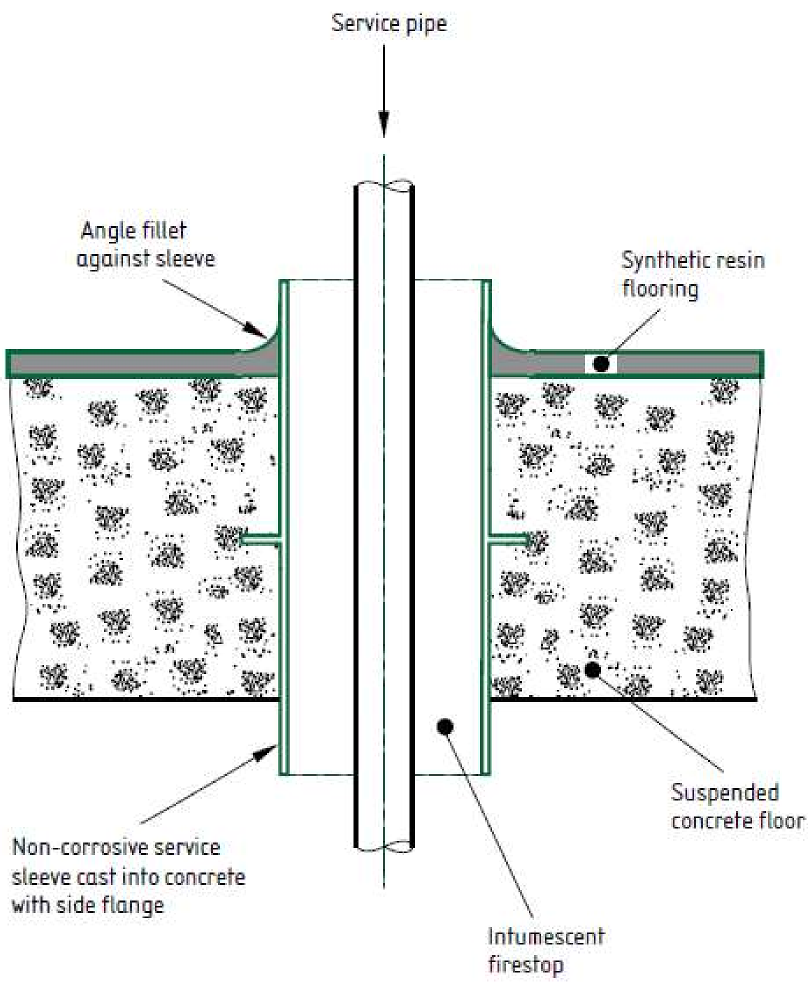


Figure 5 — Typical service duct

7 Design and preparation of concrete bases and fine concrete screeds

7.1 General

7.1.1 The sole function of the synthetic resin flooring is to provide a surface finish and it is not intended to make any contribution to structural performance. The substrate should therefore be designed independently of the flooring to withstand all structural, thermal and mechanical stresses and loads that will occur during service. It should remain stable whilst protected by the synthetic resin flooring and should be provided with all necessary expansion, contraction and crack inducement joints to enable it to do so. Failure of the substrate to remain stable will invariably affect stability of the finish. In particular, cracking of the substrate, however caused, is likely to be reflected in the finish.

7.1.2 The substrate should be finished with a strong even surface and laid to such falls as are necessary. Synthetic resin floorings are relatively thin and cannot, in most instances, economically alter levels or correct badly laid substrates. The difference in height across any joints in the concrete base should be less than 1 mm with no abrupt changes in level. Where the difference in height across the joints cannot be accommodated within the thickness of the synthetic resin flooring, then the surfaces in the vicinity of the joint should be ground to remove the step.

7.2 Surface strength

The surface strength of the base concrete, fine concrete screed or polymer modified cementitious screed should be sufficient to restrain any stresses imposed during service and those which occur during the setting and hardening of the synthetic resin flooring.

Where the installer, designer and/or client wish to verify quality of the base concrete, fine concrete or polymer modified cementitious screed, the surface strength should be tested after preparation, when the surface laitance has been removed, by one of the following methods.

a) Using a rebound hammer in accordance with RS ASTM D 4602-93. This test should only be performedat locations that have a smooth and clean surface. For all types of synthetic resin flooring the reboundhammer readings should be not less than 25. A lower reading may be acceptable if the surface tensilestrength of the base or screed exceeds 1.5 N/mm^2.

b) By the pull-off method in accordance with ISO 19044. The surface tensile strength should exceed 1.5 N/mm^2. On old concrete bases a lower value may be acceptable for certain types of synthetic resinflooring in line with the manufacturer's recommendations and this should be taken into account at thedesign stage.

NOTE The rebound hammer method has the benefit of allowing a rapid evaluation of wide areas with a larger number of point tests than the pull-off method and does not normally damage the surface.

7.3 New concrete bases and fine concrete screeds

7.3.1 Design and construction

7.3.1.1 A direct finished base slab, or fine concrete screed, should be designed and constructed in accordance with RS 142 and laid to falls as necessary. The concrete should not contain a water-repellent admixture. All services should be within the base concrete or screed and should not be allowed to penetrate into the synthetic resin flooring.

7.3.1.2 The base concrete and laying technique used should achieve the surface strengths before the flooring is laid. A minimum of Grade C35 concrete with a minimum cement content of 300 kg/m^{3}should be used. Aggregates used should be clean and with low soluble salt content in order to reduce the risk of osmotic blistering. The base concrete or screed should contain sufficient water to allow thorough compaction to provide a dense material throughout its depth and the required surface strength. On account of this, unmodified cementitious screeds should not be used to receive synthetic resin floorings, but a polymer modified sand/cement screed or fine concrete screed should be used, subject to the approval of the supplier of the synthetic resin flooring.

7.3.1.3 Many synthetic resin flooring systems are tolerant of significant moisture levels in the concrete base. However, in the absence of specific recommendations by the manufacturer, the base should have a relative humidity at the surface of no more than 75 % when measured in accordance with ISO 20326.

7.3.1.4 For those floorings that are moisture sensitive during application, a sufficient amount of the water used in the construction of the base should be eliminated in line with the manufacturer's recommendations. After the curing of the concrete, the excess water should be allowed to evaporate. The time for this to happen should be taken into account at the planning stage. Estimated drying times are necessarily only approximate because drying is influenced by ambient conditions, concrete quality, thickness, surface conditions and method of curing. It should be noted that the use of curing membranes will effectively prevent drying out until removed. In practice, it has been found that even under good drying conditions, concrete bases can take more than one year to dry from one face only. Moderate and heavy use of power-float and power-trowel finishing methods further delay drying. Suspended concrete slabs cast on permanent metal decking or other impermeable materials will have similar drying times to those laid over damp-proof membranes.

7.3.1.5 Where fine concrete or polymer modified cementitious levelling screeds are applied over new concrete, account should be taken of the time needed to dry the total thickness of base and screed.

7.3.1.6 The surface regularity of the base should be tested in accordance with RS 142, Annex B, and should match the requirement for the finished flooring.

7.3.2 Surface preparation

7.3.2.1 Surface preparation of the base is the most vital aspect of synthetic resin flooring application. Inadequate preparation will lead to loss of adhesion and failure.

7.3.2.2 The laitance on in situ bases and screeds, and any surface sealer or curing membrane should be entirely removed by suitable mechanized equipment, e.g. contained shot-blasting, planning or grinding, to expose the aggregate cleanly. Grinding or light contained shot-blasting only should be used for the thinner synthetic resin floorings of Types 1–5 so that the profile does not reflect in the finish. Percussive scabbling is not normally recommended because of the risk of weakening the underlying substrate.

7.3.2.3 The surfaces of precast units should be treated as in situ concrete and should be prepared using contained shot-blasting equipment.

7.3.2.4 After surface preparation all loose debris and dirt should be removed by vacuum equipment. The preparation operations should be carried out before the flooring is to be laid in a way that avoids the risk of fresh contamination or further accumulation of dirt.

7.4 Old concrete bases

7.4.1 All surface contamination, e.g. oil, paint and rubber, should be removed and adequate mechanical preparation carried out to achieve a sound surface with cleanly exposed aggregate.

7.4.2 With heavily compacted oil or grease deposits, the bulk of the contamination should first be removed mechanically or by steam cleaning. All residual contamination should then be removed by high pressure water blasting or high temperature burning (also known as hot compressed air — HCA) followed by the immediate application of a penetrating primer (see 8.5.1). Existing floor paints should be removed by mechanical abrasion or contained shot-blasting.

7.4.3 Where oil or grease contamination has been severe or of long duration, none of these methods may prove satisfactory in preparing the base to allow full bonding of the synthetic resin flooring. In such cases, the affected parts of the base should be removed. The base should then be reinstated with new concrete or polymer modified cement/sand screed.

7.4.4 When clear of all surface contamination, the concrete should be prepared mechanically to remove all laitance and expose a fresh surface. This should be carried out using proprietary equipment for contained shot-blasting, planning or grinding, preferably with integral vacuum containment. Percussive scabbling should not be used.

7.4.5 Prior to applying the flooring, a close visual examination should be made to verify cleanliness, soundness of the surface and freedom from soft deleterious materials such as lignite and iron pyrites. Any weak or suspect concrete or repair patches should be removed. When mechanical preparation is complete, all dust and debris should be removed by vacuum equipment. The preparation operations should be carried out before the flooring is to be laid in a way that avoids the risk of fresh contamination or further accumulation of dirt.

7.4.6 If the synthetic resin flooring to be applied is moisture sensitive, the moisture content of the concrete base and the presence or effectiveness of a damp-proof membrane should be established and, if necessary action should be taken. in accordance with 6.12.2.

7.4.7 Surface preparation by acid etching of the concrete should not be used because of the associated health and safety implications and also because the concrete surface is left saturated with water and calcareous salts which may ultimately lead to debonding or osmotic blistering of the synthetic resin flooring (see 9.2).

8 Work on site

8.1 Storage

8.1.1 Fillers (including any pigments) and aggregates

Bags of fillers, aggregates or other powdered components should be kept dry and should be stored in a weatherproof building. The bags should be stacked on pallets away from walls. Fillers and aggregates should preferably be kept at 15 ºC to 20 ºC to ensure that the resultant flooring mix has the correct application characteristics.

8.1.2 Resin and hardener components

8.1.2.1 The containers of resin and hardener should be stored in a weatherproof building maintained at 15 ºC to 20 °C, unless the manufacturer has stipulated other storage conditions for the stated shelf-life. Products having a low flashpoint will need purpose-designed storage.

8.1.2.2 Storage should be arranged so that consignments can be used in order of batch number and so that labels do not become detached from their containers. The flooring products should be used in strict batch rotation. Individual areas or rooms should be treated with product from a single batch to avoid the inevitable minor variations in shade resulting from batch manufacture, otherwise matched batches should be used to minimize these variations.

8.2 Preparation of base slab, fine concrete screed or polymer modified screed

The base or screed should be prepared in accordance with clause **7**.

8.3 Protection of base slab, fine concrete screed or polymer modified screed against damage and/or contamination

Care should be taken that during the hardening and curing of the base slab or screed it does not suffer mechanical damage or become contaminated with, e.g. grease or oil. If such problem do arise the slab or screed should be treated in accordance with 7.3.

8.4 Mixing

8.4.1 General

8.4.1.1 Only products supplied in pre-measured units in the correct proportions ready for mixing should be used. The liquid components should be thoroughly mixed together before blending in the fillers and aggregates, unless the manufacturer specifies otherwise.

8.4.1.2 The usable or working time of the mixed product will depend upon the initial temperature of the individual components and on the volume being mixed. Most resin reactions are exothermic, i.e.; heat is generated during the setting process, and in bulk the mixed product becomes very hot which in turn shortens the working time. The manufacturer's literature should be consulted for an accurate indication of the usable (pot) life of the properly mixed product at one or more temperatures. In general, a 10 °C rise in temperature will halve the pot life and a 10 °C fall will double the pot life. However, resin products should not be mixed and laid outside of the range 10 ºC to 25 °C unless the product has been designed to be used for a wider temperature range.

8.4.1.3 The rate at which batches of the product are mixed should allow sufficient time for the mixed material to be transferred to the area where the flooring is being installed and should also give sufficient working time.

8.4.2 Mixing unfilled systems

Liquid systems such as primers, seals of Type 1 or coatings of Types 2 and 3 are generally supplied as one or two component products, the components being mobile liquids. The two components should be thoroughly blended together using a mechanical mixer to form a homogeneous mix. Care should be taken to ensure that any material adhering to the sides and bottom of the mixing vessel is thoroughly mixed in. The two components should be mixed using a slow speed (200 to 500 rpm) drill fitted with a mixing paddle, taking care to minimize air entrainment. Where one or both of the components has a low flashpoint, a mixing drill with a flameproof motor or a pneumatically powered drill should be used.

8.4.3 Mixing filled systems

8.4.3.1 All products should be mixed mechanically, following the procedures recommended by the manufacturer.

8.4.3.2 Forced action mixers of the rotating pan, paddle or trough type should generally be used for all flow-applied and trowel-applied screeds of Types 5 to 8. Free fall mixers should not be used because there is insufficient shear action to disperse all the dry materials.

8.4.3.3 Some flow-applied floorings of Type 5 may be mixed using a heavy duty slow speed drill (200 to 500 rpm) fitted with a mixing paddle in line with the manufacturer's recommendations.

8.4.3.4 The liquid components should first be thoroughly mixed together and then the fillers and/or aggregates should be added gradually whilst continuing the mixing action. When all the fillers and/or aggregates have been added, sufficient mixing time (typically 3 min to 4 min) should be allowed to ensure thorough "wetting" out of the fillers and/or aggregates by the resin. Unduly extended or vigorous mixing should be avoided in order to minimize undesirable air entrainment. Care should be taken to ensure that any material adhering to the sides, bottom and corners of the mixer is thoroughly blended in.

8.5 Laying resin flooring

8.5.1 Priming the substrate

8.5.1.1 The functions of the primer are to provide adhesion and to seal and consolidate the surface of the concrete or screed substrate.

8.5.1.2 A primer that is appropriate for the nature and moisture content of the substrate should be selected. After mixing the components of the primer together, it should be applied as soon as possible, within its working life, to the prepared substrate. The primer should be applied evenly with a stiff brush, "lambswool" roller or by tight trowelling. The substrate should be completely wetted by the primer. Full saturation of the surface is essential but pooling of the primer should be avoided.

8.5.1.3 For porous or open-textured surfaces, a second coat of primer might be necessary to achieve full saturation and so minimize pin hole defects in the finish. This should be taken into account when planning the flooring installation. The second coat of primer should be applied within 24 h of the first. Alternatively, the use of an initial scratch coat, consisting of a primer with fine dry filler blended in, tightly trowelled over the surface, may be beneficial on porous or rough concrete prior to applying the resin flooring.

8.5.1.4 The working area of substrate that can be coated with the primer prior to the laying of the flooring will depend on the open time of the primer. The manufacturer's literature should be consulted for this information. The primed area should always be kept free of contamination until the flooring is applied.

8.5.1.5 Unless otherwise specified by the manufacturer, primers for flooring Types 4, 5, 7 and 8 should be applied and allowed to reach a tack-free state prior to application of the flooring. The primer may incorporate a light scatter of dry single-size aggregate, applied whilst the primer is still wet, in order to assist in the application of the flooring.

8.5.1.6 Primers for Type 6 flooring should only be allowed to reach a semi-set (tacky) state prior to application of the flooring.

8.5.1.7 Primers should not be permitted to cure for more than 48 h at 15 ºC to 20 °C before application of the flooring. If this time is exceeded, mechanical preparation of the surface may be necessary followed by application of an additional primer coat.

8.5.2 Resin coatings (Types 1 to 3)

Types 1 to 3 coatings should be applied by brush or roller in two or more coats in accordance with the manufacturer's recommendations. The first coat should be allowed to cure in accordance with the manufacturer's recommendations until it is just tack-free before the second coat is applied. This is typically 16 h to 24 h. Exceeding this time between coats may lead to a reduction in inter-coat adhesion.

8.5.3 Multi-layer flooring (Type 4)

Type 4 floorings are made using combinations of floor coatings (Types 2 and 3) or flow-applied floorings (Types 5 and 7) with intermediate aggregate scatter. They should be applied strictly in accordance with the manufacturer's instructions and with 8.5.2 and 8.5.4.

8.5.4 Flow-applied systems (Types 5 and 7)

Flow-applied floorings are designed to flow out readily in order to provide a smooth surface. They should be applied by spreading evenly over the surface, using a serrated trowel, pin rake or squeegee. This should be followed immediately by rolling with a spiked roller to release any entrapped air and assist in smoothing out. The use of the spiked roller on areas that are starting to thicken or are partially set should be avoided. The quality of surface finish achieved with flow-applied systems is especially temperature sensitive and the manufacturer's recommendations in terms of minimum air and slab temperatures should be strictly followed.

8.5.5 Trowel-applied resin flooring (Types 6 and 8)

8.5.5.1 The mixed product should be spread out over the primed substrate, by trowel, sledge or screed box, or between screeding laths or bars to ensure a uniform thickness overall. The screed should be well compacted in order to obtain the optimum properties from the end product. A steel trowel should be used to obtain a uniform finish. The trowel should be kept clean at all times by using a minimum amount of cleaning solvent or water in accordance with the manufacturer's instructions.

8.5.5.2 Since this type of flooring is hand-finished, there will inevitably be slight variations in surface appearance resulting from the trowelling. These variations should be kept to a minimum by careful application so that the overall performance of the flooring will be unaffected.

8.5.5.3 Where a hygienic surface is specified, the surface of a Type 6 screed flooring should be sealed. In accordance with the manufacturer's instructions, one or more coats of a compatible solvent-free or solvent-containing resin seal should be applied by brush, squeegee or roller after the screed has cured sufficiently. Most of this seal will be absorbed into the trowel-applied flooring.

8.5.5.4 Alternatively, where a hygienic surface is specified, an impervious screed of Type 8 may be used which does not require a surface seal.

8.5.6 Reinforcement

Where there are pre-existing cracks or bay joints in the substrate, reinforcement, e.g.; fibreglass cloth, should be incorporated in the flooring system. After applying the primer, a thin layer of the resin flooring should be applied and the fibreglass rolled into it, with the edges of the fabric overlapping by at least 50 mm. The final layer of resin flooring should then be applied before the first layer has fully hardened.

8.5.7 Curing the flooring

8.5.7.1 The finished flooring should be allowed to cure in accordance with the manufacturer's instructions. These generally require one day to three days at 15 ºC to 20 °C before allowing traffic and three days to seven days before wet cleaning or allowing contact with chemicals, or heavy traffic. Such curing should always be allowed before wet testing the flooring for drainage or ponding. At site temperatures below 10 °C the time allowed for curing should be substantially increased.

8.5.7.2 To reduce the risk of "blooming" of the floor finish caused by condensation on the synthetic resin flooring, the climate above the uncured resin floor should be maintained at least 3 °C above the dew point or below 75 % relative humidity (see 6.10) during the curing period through the use of dehumidifiers or continuous low-level heating.

9 Blistering of the completed floor

9.1 General

9.1.1 A defect sometimes seen in completed synthetic resin floorings is blistering of the surface. This can take the form of a few large blisters up to 150 mm in diameter and 10 mm in height or a rash of smaller blisters. These blisters, which occur approximately within a day of application, are generally caused by air or water vapour contained in the concrete base under the impermeable synthetic resin flooring. In rare cases, blistering may be caused by hydrostatic pressure from external groundwater, e.g.; in basement floors.

9.1.2 Under the influence of temperature differentials, water vapour can exert sufficient pressure to deform a partially cured resin flooring and force it away from the concrete surface causing a blister. This can be caused by exposure to draughts close to external openings in the building, by exposure to direct sunlight, or by direct radiant heat from ovens or similar equipment.

9.1.3 Some blisters can also be caused by displacement of air from pores in the sub-floor during application and curing of the synthetic resin flooring.

9.1.4 Blisters occurring at a much later stage can generally be attributed to a form of osmosis (see 9.2).

9.1.5 Blisters are not only unsightly, but because the flooring becomes isolated from the concrete base, it is liable to fracture under regular traffic and progressively break up in service.

9.2 Osmotic blistering

9.2.1 Description

9.2.1.1 In rare cases, severe blistering of thin synthetic resin floorings occurs between six weeks and 12 months after laying, but can sometimes occur earlier than this. The blisters commonly vary in size from a few millimetres in diameter up to 100 mm with heights up to 15 mm. When drilled into or otherwise broken the blisters are found to contain an aqueous liquid under very high pressure. The mechanism of their formation is not fully understood but because of their physical state it is assumed that they are caused by a process of osmosis.

9.2.1.2 Osmotic blisters generally occur only with the thinner synthetic resin floorings, resin coatings of Types 2 and 3 and flow-applied systems of Types 4 and 5, up to 6 mm in thickness. The problem has not been observed with trowel-applied resin floorings of Types 6 and 8 probably because of their higher resistance to deformation and greater lateral permeability. With the thinnest coatings, blisters may rupture as they form due to the high pressure, and the surface will then be marked with small craters.

9.2.2 Prevention

9.2.2.1 The mechanism of osmotic blister formation is not fully understood so specific recommendations about the steps that should be taken to avoid blistering cannot be made. However, the following steps should be considered, where appropriate, in order to minimize the risk.

a) In new construction, care should be taken to ensure that the base concrete has a low level of solublesalts by avoiding poorly washed aggregates and by fully curing the concrete immediately after laying toprevent premature surface drying.

b) New concrete or cementitious screeds should be allowed to dry out thoroughly after curing, to a relative humidity below 75 %. It should be noted that a prolonged period may be required (see 4.5 a).

c) Mechanical rather than chemical methods should be used to prepare the concrete surface (see 7.3.2). In particular, the use of acid etching should be avoided.

d) The concrete surface should not be washed with detergent solutions as part of the preparation procedure.

e) All contamination from old concrete floors should be thoroughly removed. This may be difficult wherethe concrete has been saturated for long periods with water-soluble materials.

f) Only polymer modified cementitious levelling screeds should be used in order to minimize permeabilityand salt migration.

g) Water vapour permeable synthetic resin floorings should be used.

h) Where impervious resin floorings are to be installed, solvent-free primers rather than water-bornesystems should be used.

i) Care should be taken to ensure that the synthetic resin flooring is precisely proportioned, either by mass or volume as specified by the manufacturer, and thoroughly mixed.

9.2.2.2 It should be noted that even if all the steps in this sub-clause are followed there is still some risk that osmotic blistering will occur.

9.2.3 Repair

Where osmotic blistering has occurred, the affected area should be cut out and the exposed concrete should be mechanically cleaned. One of the following options should then be considered to reduce the risk of the problem recurring.

a) A penetrating primer should be applied in two coats to the base to ensure complete coverage andmaximum adhesion of the replaced flooring.

b) The affected area should be replaced with a trowel-applied flooring (Types 6 or 8) at a thickness of at least 6 mm.

c) The exposed concrete should be prepared by HCA blasting followed by the application of a penetrating primer whilst the concrete is still warm.

d) The affected area should be replaced by water vapour permeable synthetic resin floorings.

10 Health and safety

Certain synthetic resin flooring components may be classified as hazardous under health and safety legislation. Before starting any operations, the manufacturer's Materials Safety Data Sheets should be studied for all the flooring products to be applied, including resin components, primers, cleaning solvents and all recommendations therein followed. An appropriate risk assessment should be made for the flooring installers and others likely to be affected in adjacent areas.

11 Inspection and testing

11.1 Inspection

The works should be inspected during progress and after completion. Special attention should be paid to the following:

a) quality and preparation of the base (see clause 7);

b) levels and surface regularity of the base (see 6.13);

c) priming of the base (see 8.5.1);

d) mixing of the synthetic resin flooring (see 8.4);

e) levels and surface regularity of the finished flooring (see 11.3);

f) sealing, if any (see 8.5.5);

g) g) curing (see 8.5.7);

h) h) appearance (see 8.5.5).

NOTE Certain lighting conditions, such as shallow angle illumination, may accentuate minor irregularities, e.g., trowel marks, in the surface finish. However, such irregularities may not be noticeable under normal lighting. These irregularities do not normally affect the overall performance of the floor.

11.2 Testing

11.2.1 After completion of the work, the appropriate tests from the following, detailed in accordance with **4.3**r) should be carried out:

a) surface regularity (see 11.3);

b) adhesion of the flooring to the base (see 11.4);

c) slip resistance (see 11.5).

11.2.2 Tests b) and c) are normally made only when there are specified performance requirements and the quality of the flooring is in doubt.

11.3 Surface regularity

If the finished flooring is required to be tested by the methods described in RS 142, the surface regularity should be within the limit given in Table 2 for the appropriate class specified.

The number of measurements required to check surface regularity should be agreed between the parties concerned and should take into account the standard required and the likely time and costs involved.

11.4 Adhesion of the flooring to the base

11.4.1 General

Resin flooring is designed to adhere strongly to concrete. Adhesive failure usually only arises from substrate contamination, inadequate preparation or incorrect priming. Tests to check the adhesion of a flooring to its base should be made as late as possible in a construction programme when the resin flooring will be fully cured.

In cases of doubt, and where the base is solid, the adhesion between the flooring and the base should be initially tested by tapping the surface, e.g. with a rod or a hammer, a hollow sound indicating lack of adhesion. Any areas of flooring that are considered to be unsatisfactory should then be tested in accordance with **11.4.2** and the reason for the lack of adhesion should be determined. The unsatisfactory areas should be treated by isolating the area concerned by saw cutting, followed by removing and re-laying the affected flooring, or by resin injection. When removing an area of flooring, care should be taken to minimize any disturbance to the bonding of the adjacent parts of the floor.

11.4.2 Quantitative test method

The adhesion of the flooring to the base should be tested using the pull-off method of BS 8204-3:1993. When tested by this method, the flooring should have a bond strength of at least 1.5 N/mm^2.

11.5 Slip resistance

Where specified, the completed floor should be tested for slip resistance in accordance with RS 142, annex C. The slip resistance value (SRV) should be not less than 40 in both the wet and dry state except where people using the floor wear special slip resistant footwear. In this latter situation, an SRV of not less than 33 in the wet might be acceptable.

12 Maintenance

12.1 In order to ensure the flooring is kept in a hygienic condition, the client should be advised that there should be close liaison with the flooring manufacturer to identify the most appropriate procedure for regular and thorough cleaning of the specified resin flooring. Generally, a mechanical scrubber fitted with clean water rinsing and wet vacuum will be effective. The client should be advised that washing with mop and bucket is not appropriate.

12.2 Where hygiene levels are required to be high, e.g.; in food preparation areas, the client should be advised to use a bactericide solution and pressure washing, typically at a temperature of 60 ºC to 80 °C, or steam cleaning. It should be noted that in these cases, the appropriate synthetic resin flooring should have been specified (see 6.8).

12.3 The client should be advised that any spillage of chemicals should be cleaned off the surface as soon as possible to avoid damage to the floor.

12.4 The client should also be advised that any mechanical damage to the floor surface should be repaired at the earliest opportunity to prevent further mechanical damage, and the possibility of liquids penetrating to the bond line and causing progressive delamination.

Annex A
(normative)

Determination of slip resistance of pedestrian surfaces by the ramp/trolley method, alternatively known as the roller coaster method

A.1 Principle

The device consists of a trolley having four wheels and a slider, together with a ramp. The trolley is givenan initial velocity by running down the ramp under the action of gravity. The trolley then runs across thefloor area to be tested. The friction generated by the slider traversing the floor causes the trolley to come torest. The dynamic coefficient of friction is calculated from the distance it takes for the trolley to come torest.

The device is used to determine the slip resistance of a floor surface by measuring the dynamic coefficient of friction. It might be used, particularly by floor end users, to detect changes in the dynamic coefficient of friction caused by contamination or wear of the floor surface and/or changes caused by the method of cleaning the floor.

A.2 Apparatus

A.2.1 Trolley

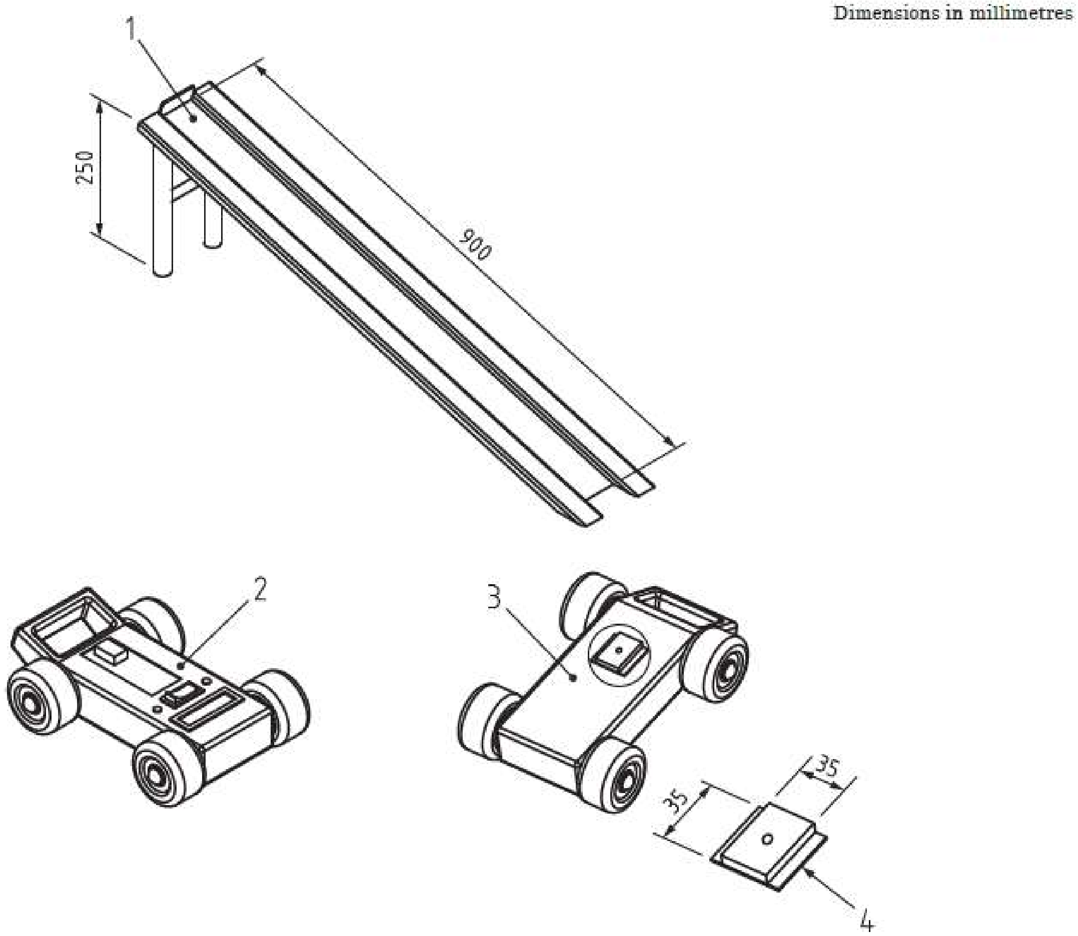
Trolley, with four wheels, the front wheels being set such that they, together with the slider, support the main body of the device as it travels across the floor. The rear wheels should be set at a level above the level of the slider such that they are clear of the floor.

The trolley should incorporate a means of measuring the distance it has travelled. This should be connectedfrictionlessly to the front wheels and shown as a digital read-out on the trolley.

A rubber slider should be mounted on the central longitudinal axis on the underside of the trolley. Thisshould be set towards the rear of the trolley and at an angle of 10º to the plane of the floor. It should consistof a rubber slider 35 mm square. The rubber should have a Shore A hardness of 95±3. The slider shouldhave a striking edge which should not exceed 10 mm, i.e. the wear should not extend beyond the fixingscrew hole.

A.2.2 Ramp

Ramp, with a central channel which allows the device to roll down on its four wheels without the rubber slider making contact with the ramp. The ramp should be 900 mm in length and 250 mm in height. It should be provided with a stop at the top end to ensure the correct position of the trolley at the start of the test run.



Key

1 Ramp

2 Trolley

3 Bottom of trolley, showing slider

4 Detail of slider

Figure A.1 – Trolley and ramp

A.2.3 Calibration of trolley

C.2.3.1 Checking the digital read-out

Move the trolley forwards in a continuous movement by 1.00 m. The digital read-out should indicate (95±1) units.

C.2.3.2 Checking the bearing friction

Set the ramp to a slope of 1 in 100. Place the trolley on the ramp. After an initial nudge the trolley should roll down the ramp.

C.2.3.3 Checking the bearing friction

The mass of the trolley should be (5.0 ± 0.1) kg.

A.3 Preparation for test

A.3.1 Set-up of the ramp

The ramp should be set-up on the level surface of the floor, pointing towards and adjacent to the area to betested. Sufficient space beyond the toe of the ramp should be allowed for the trolley to transit the floorwithout meeting an obstruction.

NOTE In most situations 1.2 m will be sufficient but on floors which are likely to be slippery in wet conditions 2 m might be required.

On floors with minor slopes, e.g., 1º - 2º, the test should be conducted in two opposing directions and the average value taken. On steeper slopes the test should be conducted across the slope so that the path of the trolley is essentially level.

A.3.2 Checking the slider

The wearing face of the slider should be smooth and free from score marks. Re-preparation of the wearingface can be achieved by laying a sheet of P400 abrasive paper on a smooth surface and pushing the deviceover it several times while holding the rear edge of the sheet to ensure it is not dragged forward during theprocedure.

A.3.3 Preparing the floor

If the floor is to be tested as found, no preparation of the floor surface is needed. If the floor is to be testedin the dry/clean state, clean and thoroughly dry an area of 0.5 m × 0.2 m wide beyond the toe of the ramp.If the area is to be tested in the wet state, spray a film of water over an area approximately0.1 m wide × 1 m long leading from the toe of the ramp.

NOTE This wetted area might need to be extended if the first test run goes beyond the prepared area; this can occur on smooth, lowslip-resistant floorings.

A.4 Conducting the test

The trolley should be placed centrally on the ramp and drawn up to the top of the ramp such that the trolley contacts the stop at the top of the ramp.

While the trolley is still in contact with the stop, release the trolley cleanly to allow it to roll down the ramp.

NOTE It is important to ensure that the release does not cause the trolley to be accelerated or retarded during this procedure.

When the trolley has come to rest record the counter-reading.

The trolley should not be touched or moved in any way after it has come to rest and before recording the counter-reading.

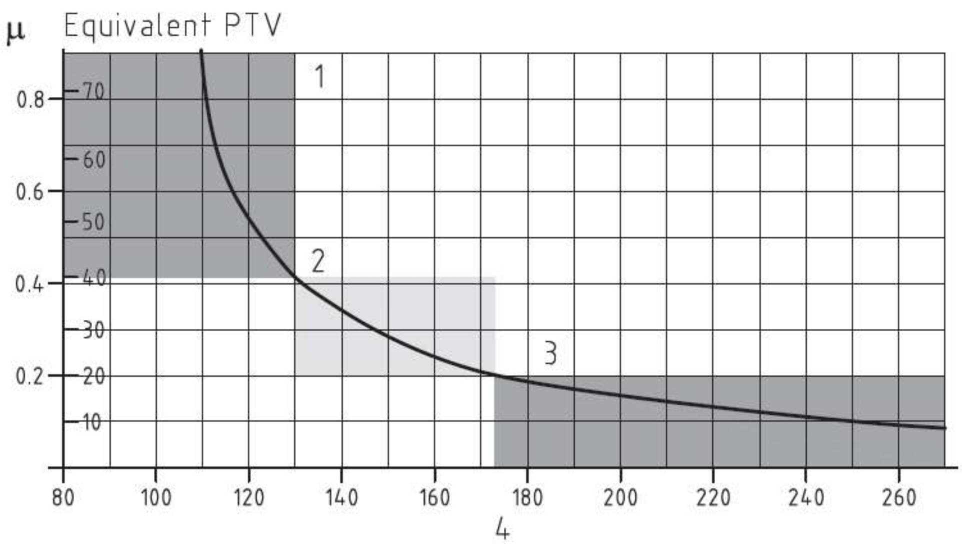
Three further test runs should be conducted for that condition in that location.

If the floor is to be tested wet, it should be re-prepared between each run.

A.5 Calculation of result

Calculate the mean of the last three of the last three of the four counter-readings.

Use the figure A.2 to determine the dynamic coefficient of friction (μ) or the equivalent slip resistance [Pendulum Test Value (PTV)]



Key
1 Reading less than 130 = low risk of slip
2 Reading between 130 and 173 = medium risk of slip
3 Reading greater than 173 = high risk of slip
4 Counter-reading

Figure A.2 – Calculation to determine the coefficient of friction or the equivalent slip resistance

A.6 Reproducibility

Tests have been conducted using 10 machines and two operators on two surfaces in both wet and dry conditions. Based on the total of 20 results for each of the surface conditions the results were as presented in Table A.1.

Price based on nnn pages