Republic of South Africa

EDICT OF GOVERNMENT

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SANS 10400-J (2010) (English): The application of the National Building Regulations Part J: Floors

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SANS 10400-J:2010

Edition 3

SOUTH AFRICAN NATIONAL STANDARD

The application of the National Building Regulations

Part J: Floors

Published by SABS Standards Division
1 Dr Lategan Road Groenkloof ✉ Private Bag X191 Pretoria 0001
Tel: +27 12 428 7911 Fax: +27 12 344 1568
www.sabs.co.za

SANS 10400-J:2010
Edition 3

Table of changes

Change No.	Date	Scope

Acknowledgement

The SABS Standards Division wishes to acknowledge the work of the South African Institution of Civil Engineering in updating this document.

Foreword

This South African standard was approved by National Committee SABS TC 59, *Construction standards*, in accordance with procedures of the SABS Standards Division, in compliance with annex 3 of the WTO/TBT agreement.

This document was published in October 2010.

This document supersedes the corresponding parts of SABS 0400:1990 (first revision).

Compliance with the requirements of this document will be deemed to be compliance with the requirements of part J of the National Building Regulations, issued in terms of the National Building Regulations and Building Standards Act, 1977 (Act No. 103 of 1977).

SANS 10400 consists of the following parts, under the general title *The application of the National Building Regulations:*

Part A: General principles and requirements.

Part B: Structural design.

Part C: Dimensions.

Part D: Public safety.

Part F: Site operations.

Part G: Excavations.

Part H: Foundations.

Part J: Floors.

Part K: Walls.

Part L: Roofs.

Part M: Stairways.

Foreword *(concluded)*

Part N: Glazing.

Part O: Lighting and ventilation.

Part P: Drainage.

Part Q: Non-water-borne means of sanitary disposal.

Part R: Stormwater disposal.

Part S: Facilities for persons with disabilities.

Part T: Fire protection.

Part V: Space heating.

Part W: Fire installation.

This document should be read in conjunction with SANS 10400-A.

Annex A forms an integral part of this document.

Contents

The application of the National Building Regulations

Part J:
Floors

1 Scope

This part of SANS 10400 provides deemed-to-satisfy requirements for compliance with part J (Floors) of the National Building Regulations.

NOTE 1 Part J of the National Building Regulations, issued in terms of the National Building Regulations and Building Standards Act, 1977 (Act No. 103 of 1977), is reproduced in annex A.

NOTE 2 SANS 10400-B establishes the representative actions and impacts applied to floors, and the structural response of floors to representative actions and impacts. Compliance with the requirements of this part of SANS 10400 will result in floors performing in accordance with the structural design performance parameters established in SANS 10400-B.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies. Information on currently valid national and international standards can be obtained from the SABS Standards Division.

SANS 629, *Softwood flooring boards.*

SANS 929, *Plywood and composite board.*

SANS 1460, *Laminated timber (glulam).*

SANS 1783-2, *Sawn softwood timber – Part 2: Stress-graded structural timber and timber for frame wall construction.*

SANS 1931, *Particle board – Highly moisture-resistant exterior type.*

SANS 2001-CC1, *Construction works – Part CC1: Concrete works (structural).*

SANS 2001-CC2*, Construction works – Part CC2: Concrete works (minor works).*

SANS 2001-CT1, *Construction works – Part CT1: Structural timberwork (flooring).*

SANS 10005, *The preservative treatment of timber.*

SANS 10082, *Timber frame buildings.*

SANS 10109-1, *Concrete floors – Part 1: Bases to concrete floors.*

SANS 10177-2, *Fire testing of materials, components and elements used in buildings – Part 2: Fire resistance test for building elements.*

SANS 10177-5, *Fire testing of materials, components and elements used in buildings – Part 5: Non-combustibility at 750 °C of building materials.*

SANS 10400-A (SABS 0400-A), *The application of the National Building Regulations – Part A: General principles and requirements.*

SANS 10400-B (SABS 0400-B), *The application of the National Building Regulations – Part B: Structural design.*

SANS 10400-H (SABS 0400-H), *The application of the National Building Regulations – Part H: Foundations.*

SANS 10400-T (SABS 0400-T), *The application of the National Building Regulations – Part T: Fire protection.*

SANS 10400-V:2010, *The application of the National Building Regulations – Part V: Space heating.*

SANS 50312/EN 312, *Particleboards – Specifications.*

3 Definitions

For the purposes of this document, the definitions given in SANS 10400-A (some of which are repeated for convenience) and the following apply.

3.1
accredited testing laboratory
laboratory that has been accredited by the South African National Accreditation System (SANAS)

3.2
Agrément certificate
certificate that confirms fitness-for-purpose of a non-standardized product, material or component or the acceptability of the related non-standardized design and the conditions pertaining thereto (or both) issued by the Board of Agrément South Africa

3.3
Board of Agrément South Africa
body that operates under the delegation of authority of the Minister of Public Works

3.4
competent person (civil engineering)
person who

a) is registered in terms of the Engineering Profession Act, 2000 (Act No. 46 of 2000), as either a Professional Engineer or a Professional Engineering Technologist,

b) has a tertiary qualification (degree or diploma) in civil engineering, and

c) is generally recognized as having the necessary experience and training to undertake rational assessments or rational designs in the field of civil engineering

3.5
deemed-to-satisfy requirement
non-mandatory requirement, the compliance with which ensures compliance with a functional regulation

3.6
floor joist
horizontal beam which is the primary structural member in the construction of a timber floor

3.7
flooring board
board of face side width not less than 50 mm and not more than 140 mm, which may be tongued on the one edge and grooved on the opposite edge

3.8
foundation
that part of a building which is in direct contact with, and is intended to transmit loads to, the ground

3.9
foundation wall
that portion of a wall between the foundation and the lowest floor above such foundation

3.10
functional regulation
regulation that sets out in qualitative terms what is required of a building or building element or building component in respect of a particular characteristic, without specifying the method of construction, dimensions or materials to be used

3.11
load
value of a force corresponding to an action

3.12
occupancy
particular use or the type of use to which a building or portion thereof is normally put or intended to be put

NOTE Regulation **A20** (see SANS 10400-A) classifies and designates occupancies.

3.13
sleeper wall
masonry wall constructed to support a suspended ground floor

3.14
sole plate
strip of timber which is laid on top of walls to level the underside of flooring joists

3.15
span
distance between the centres of supports

3.16
strip flooring
floor that comprises strips of width not less than 35 mm and not more than 90 mm and that are tongued on the one edge and grooved on the opposite edge

3.17
suitable
capable of fulfilling or having fulfilled the intended function, or fit for its intended purpose

3.18
suspended floor
floor that spans supports

4 Requirements

4.1 General

The functional regulations contained in part J of the National Building Regulations (see annex A) shall be deemed to be satisfied where

a) floors in any laundry, kitchen, shower room, bathroom or room containing a toilet pan or urinal comply with the requirements of 4.2;

b) suspended floors are in accordance with the requirements of one of the following:

   1) SANS 10400-B and SANS 10400-T;

   2) SANS 10082; or

   3) 4.3 in the case of occupancies classified as E4, H3, H4 and H5 (see Regulation **A20** in SANS 10400-A) in single-storey and double-storey buildings where floors are not exposed to the elements;

c) slabs supported on the ground are in accordance with the requirements of

   1) SANS 10400-B,

   2) SANS 10400-H, or

   3) 4.4; and

d) all timber (see Regulation **A13(b)** used in the erection of a building shall be preservative treated in accordance with SANS 10005, as relevant.

4.2 Water-resistant floors

A water-resistant floor shall

a) be constructed of concrete in accordance with the requirements of SANS 2001-CC1 or SANS 2001-CC2; or

b) comprise an impervious material, fit for its intended purpose, laid on top of, or bonded to, the flooring system, which

   1) can hold any surface water in such a manner that it prevents the flooring system from deteriorating in any way until such time that the water can evaporate, be drained or be removed, and

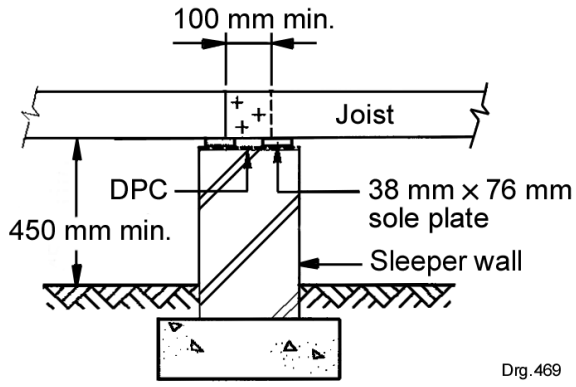
   2) can accommodate any movement in the flooring system without losing its impermeable properties.

4.3 Suspended timber floors not exposed to the elements

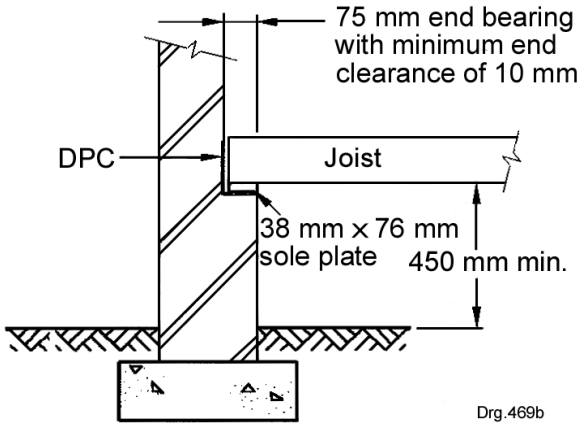
4.3.1 Floor joists, which are either built into walls with a minimum end bearing of 75 mm or bolted to walls by means of joist hangers (see figures 1 and 2), shall comply with the requirements of SANS 1460 or SANS 1783-2, shall be in accordance with the provisions of table 1 or table 2, and shall comply with the requirements of SANS 2001-CT1.

NOTE 1 Joists under a long-term dead load will have a deflection to span ratio of less than 1:300.

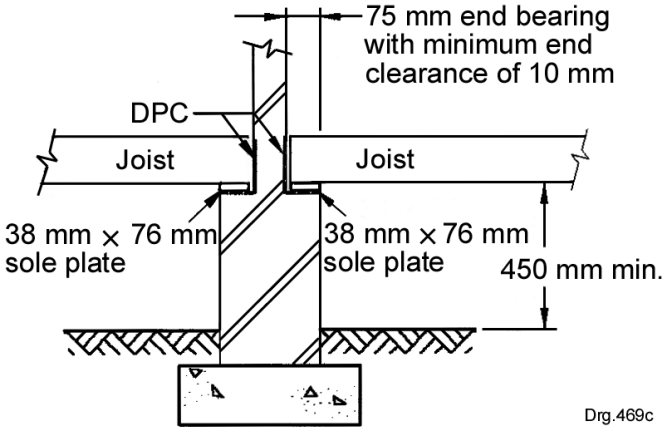
NOTE 2 The availability of timber sizes should be confirmed.



a) Detail at sleeper wall



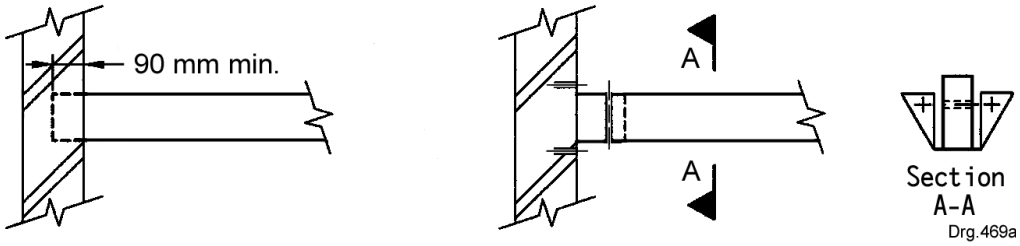
b) Detail at external wall



c) Detail at internal wall

DPC = damp-proof course

Figure 1 — Bearing details for suspended timber ground floors



a) Joist built into wall **b) Joist bolted to wall with joist hanger**

All timber built into masonry shall be coated with carbolineum or a similar preservative.

Figure 2 — Bearing details for suspended timber floors other than ground floors

Table 1 — Maximum span for floor joists of sawn SA pine in H3 or H4 occupancy classes in single-storey or double-storey buildings

1	2	3	4
Width	**Depth**	**Joist spacing**	
		450 mm	**600 mm**
mm	mm	**Maximum span** m	
Grade 5			
38	152[a] 228[a]	3,1 4,6	2,7 4,0
50	152 228[a]	3,5 5,3	3,1 4,6
76	228	6,0	5,5
Grade 7			
38	152[a] 228	3,5 5,2	3,1 4,7
50	152 228	3,8 5,7	3,4 5,2
76	228	6,5	5,9
[a] Commonly available sizes.			

Table 2 — Maximum span for floor joists of laminated SA pine (grade 5 or higher) in H3 or H4 occupancy classes in single-storey or double-storey buildings

1	2	3
Width	**Depth**	**Maximum span of joists at 600 mm centres**
mm	mm	m
32	133[a]	2,1
45	133[a]	2,4
70	133[a]	3,1
32	166	2,5
45	166	3,0
70	166	3,8
45	200[a]	3,7
70	200[a]	4,6
45	233	4,3
70	233[a]	5,4
70	266[a]	6,1
70	300	6,9
[a] Commonly available sizes.		

4.3.2 Timber flooring shall be in accordance with the provisions of table 3, shall comply with the requirements of SANS 2001-CT1, and shall be fixed to floor joists at centres that do not exceed 600 mm.

Table 3 — Suspended timber floor specifications in H3 or H4 occupancy classes in single-storey or double-storey buildings

1	2	3
Flooring type	**Specification**	**Minimum thickness** mm
Flooring board	Flooring boards shall comply with the requirements of SANS 629, or all of the following: a) have a face side width of not less than 50 mm and not more than 140 mm and shall be tongued on one edge and grooved on the opposite edge with square-sawn or end-matched ends; b) be a softwood, derived from trees of the genera *Pinus, Cedrus, Podocarisus* or *Cypressus*; or have a density of more than 640 kg/m^3 at a moisture content of 12 %; c) be free of loose knots, pith, pitch pockets, in-bark or pockets of parenchymatous tissue; d) have individual, sound through-face knots and splay knots of size that does not exceed one-quarter of the width of the face side; e) have tongues and grooves, which produce a tight sliding fit, and a flush joint on the face side of boards; and f) have a length of at least 1,8 m if square-sawn at its ends, or 0,6 m if matched.	22
Strip flooring	Flooring shall comply with all of the following requirements: a) have a density of more than 640 kg/m^3 at a moisture content of 12 %; b) have a width between 35 mm and 90 mm and a nominal length of not less than 460 mm; c) be free of loose knots and knot holes that have a diameter that exceeds 6 mm, or sound knots that have a diameter that exceeds 20 mm; and d) have tongues and grooves, which produce a tight sliding fit, and a flush joint on the face side of the strips.	20
Particle board	Boards shall comply with the requirements of SANS 50312 or SANS 1931.	20
Composite and plywood board	Boards shall comply with the requirements of SANS 929.	19

4.3.3 The clearance between the under-surface of the ground floor joists and the ground beneath shall be at least 450 mm (see figure 1). Access to the space below shall be provided for inspection purposes and shall be fitted with covers or doors that prevent entry of rain, termites (in their flying stage), reptiles and vermin. All debris and the like shall be removed from the void below such floors upon completion.

4.3.4 Ventilation of the subfloor space in suspended ground floors shall be provided by means of openings spaced not more than 2,4 m apart with at least one opening within 0,75 m of each corner. The total area of ventilation openings provided shall be not less than 1 000 mm^2 of unobstructed air passage per square metre of floor area. All ventilation openings shall be fitted with corrosion-resistant screening of nominal aperture that does not exceed 1,2 mm.

NOTE A 0,220 m × 0,170 m airbrick has an unobstructed area of between 0,006 m^2 and 0,009 m^2. Accordingly, one such airbrick is required to serve between 6 m^2 and 9 m^2 of flooring.

4.3.5 Floor joists in suspended ground floors shall be set on and skew-nailed to sole plates that have minimum dimensions of 38 mm × 76 mm on top of sleeper walls (see figure 2). Sleeper walls shall be provided with sufficient openings to ensure good cross ventilation.

NOTE At the junction of solid and suspended floors, e.g. at verandahs, ventilation pipes might have to be provided underneath solid concrete floors. Where sleeper walls are used, ventilation openings of size at least 115 mm × 75 mm spaced at 1,0 m centres should be provided.

4.3.6 Metal masonry anchors shall be of the expanding type, be corrosion resistant, have a diameter and length of not less than 10 mm and 45 mm, respectively, and shall be installed in accordance with the manufacturer's instructions. Such anchors, when embedded in grade 20 concrete for standard test purposes, shall have a safe working load in shear of not less than 2,5 kN, certified by the manufacturer. Such certification shall be substantiated by test report certificates from an accredited testing laboratory.

4.3.7 Metal punched plate hangers shall have a zinc galvanized coating of not less than 275 g/m^2 and shall bear a mark which readily identifies the manufacturer or supplier. Hangers shall be tested by an accredited testing laboratory to demonstrate that, when bolted or nailed through predrilled or prepunched holes into structural softwood (pine) members, they can transfer a permissible load of at least 4,0 kN across the joint without slippage occurring.

4.3.8 No timber floor joist or trimmer or any other combustible material shall be built into any hearth (see 4.4.3 of SANS 10400-V:2010), or within 200 mm of the inside of a chimney (see 4.3.1(c) of SANS 10400-V:2010), or penetrate a fire separation element.

4.4 Floors supported on ground or filling

4.4.1 A floor supported on ground or filling and which does not form an integral part of a foundation system, does not pass over or is not supported on foundation walls, shall

a) be designed and constructed in accordance with the requirements of SANS 10109-1 under the direction of a competent person (civil engineering); or

b) in the case of a building not used for storage or industrial purposes, be constructed of

   1) impervious floor units, not less than 40 mm thick, consisting of slate, bricks, natural stone or other suitable material; or

   2) a plain grade 10 concrete slab where the slab does not serve as the final wearing surface, or a plain grade 15 concrete slab where the slab serves as the final wearing surface, of thickness not less than 75 mm, laid on a polyolefin underfloor membrane and constructed in

accordance with the requirements of SANS 2001-CC1, provided that any panel dimension does not exceed

- 3,5 m where floors are covered with carpets and flexible floor covering, or
- 2,5 m where floors are covered with semi-flexible or rigid tiles.

NOTE 1 Plain concrete panels that have a panel dimension greater than 2,5 m and 3,5 m, depending upon the proposed floor covering, fall outside the scope of 4.4.1(b)(2). Such slabs should be designed by a competent person (civil engineering) or be fabric-reinforced in accordance with the requirements for slab-on-the-ground foundations contained in SANS 10400-H to mitigate the effects of drying shrinkage.

NOTE 2 Plain concrete floors that comply with the requirements of 4.4.1(b)(2) should perform in accordance with the relevant requirements of SANS 10400-B. Fabric reinforcement will be required to improve performance to a lower category of expected damage (see SANS 10400-B). Guidance in this regard is provided in SANS 10109-1.

NOTE 3 Finishes to concrete floors are described in SANS 10109-2.

4.4.2 A floor supported on ground or filling shall comply with the relevant requirements of SANS 10400-B or SANS 10400-H should it

a) form an integral part of a foundation system;

b) be constructed of plain concrete and have any panel dimension exceeding 3,5 m; or

c) pass over or be supported on foundation walls.

4.4.3 Floors provided in terms of 4.4.1 and 4.4.2 shall be constructed level or have a slope that does not exceed 4 mm/m.

4.4.4 Polyolefin underfloor membranes shall have a thickness of not less than 250 µm or be the subject of an Agrément certificate and be provided where site and ground conditions necessitate that the floor be underlain with such membranes. Such membranes shall be turned up around the perimeter of the floors by at least the thickness of the floor and be provided with an overlap of 200 mm at joints. Penetrations by pipes, plumbing fittings or punctures shall be taped with a pressure-sensitive adhesive tape approved for such use by the manufacturer.

4.4.5 Filling beneath floors constructed in accordance with 4.4.1(b) shall comprise material that

a) contains little or no organic material (material produced by animal or plant activities);

b) excludes stones of average dimensions larger than 75 mm;

c) does not contain more than 10 % rock or hard fragments of material retained on a sieve of nominal aperture size 50 mm;

d) does not contain large clay lumps that do not break up under the action of compaction, nor be a predominantly clayey material; and

e) can be placed without significant voids.

4.4.6 Filling shall be moistened before compaction so that a handful squeezed in the hand is firm, but does not show signs of moisture. Filling shall be placed in uncompacted layers not exceeding 100 mm in respect of hand compaction or 150 mm in respect of compaction by mechanical means. Each layer shall be well compacted before additional fill material is added.

4.4.7 A competent person (civil engineering) shall design and inspect fills where the maximum height of fill beneath floors, measured at any point, exceeds 400 mm.

Annex A
(normative)

National Building Regulations
Part J: Floors

Definitions

adequate
adequate

a) in the opinion of any local authority, or

b) in relation to any document issued by the council, in the opinion of the council

fire resistance
shortest period for which a building element or building component will comply with the requirements for stability, integrity and insulation when tested in accordance with the relevant provisions of SANS 10177-2

non-combustible
classified as non-combustible when tested in accordance with SANS 10177-5

Regulations

J1 General requirement

(1) Any floor of any building shall –

(a) be designed and constructed to safely support its own weight and any actions which can reasonably be expected to occur and in such a manner that any local damage (including cracking), deformation or vibration do not compromise the efficient use of the building or the functioning of equipment supported by such floor; and

(b) have a fire resistance appropriate to its use and where required, be non-combustible.

(2) The floor of any laundry, kitchen, shower-room, bathroom or room containing a toilet pan or urinal shall be water-resistant.

(3) Any suspended timber floor in a building shall be provided with adequate under-floor ventilation.

(4) Where any concrete floor slab is supported on ground or filling, such floor shall be so constructed that any moisture present in such ground or filling is prevented from penetrating such concrete floor slab.

(5) The requirements of subregulations **(1), (2), (3)** and **(4)** shall be deemed to be satisfied where the design and construction of any floor complies with SANS 10400-J: Provided that where the local authority deems it necessary in order to satisfy the requirements of subregulation **(4)**, such local authority may require that the entire area within the foundation walls of any building be covered by a suitable damp-proof membrane, and in the case of the floor of a basement or semi-basement where the highest known level of the extreme watertable is higher than the floor level of the basement to such an extent that uplift of the floor might occur, the local authority may require that adequate sub-soil drains under the floor be provided together with means of removing the water so drained.

Bibliography

SANS 10109-2, *Concrete floors – Part 2: Finishes to concrete floors.*

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SABS – Standards Division

The objective of the SABS Standards Division is to develop, promote and maintain South African National Standards. This objective is incorporated in the Standards Act, 2008 (Act No. 8 of 2008).

Amendments and Revisions

South African National Standards are updated by amendment or revision. Users of South African National Standards should ensure that they possess the latest amendments or editions.

The SABS continuously strives to improve the quality of its products and services and would therefore be grateful if anyone finding an inaccuracy or ambiguity while using this standard would inform the secretary of the technical committee responsible, the identity of which can be found in the foreword.
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