Republic of South Africa

EDICT OF GOVERNMENT

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SANS 10400-W (2011) (English): The application of the National Building Regulations Part W: Fire installation

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Edition 3

SOUTH AFRICAN NATIONAL STANDARD

The application of the National Building Regulations

Part W: Fire installation

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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 reinterpreting functional regulations and updating the deemed-to-satisfy requirements that relate to fire installations in this document.

Foreword

This South African standard was approved by National Committee SABS SC 21E, *Fire safety – Fire threat to the community and environment*, in accordance with procedures of the SABS Standards Division, in compliance with annex 3 of the WTO/TBT agreement.

This document was published in March 2011.

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 W 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.

Part N: Glazing.

Part O: Lighting and ventilation.

Foreword (*concluded*)

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. Annex B is for information only.

Contents

The application of the National Building Regulations

Part W:
Fire installation

1 Scope

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

NOTE Part W 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.

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 2001-DP2, *Construction works – Part DP2: Medium pressure pipelines*.

SANS 2001-DP6, *Construction works – Part DP6: Below-ground water installations*.

SANS 10252-1, *Water supply and drainage for buildings – Part 1: Water supply installations for buildings.*

SANS 10287 (SABS 0287), *Automatic sprinkler installations for fire-fighting purposes.*

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

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

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
acceptable
acceptable

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

3.2
communication pipe
pipe in a water supply system downstream of the municipal supply valve and meter (where applicable) to which any water installation is connected

3.3
competent person
person who is qualified by virtue of his education, training, experience and contextual knowledge to make a determination regarding the performance of a building or part thereof in relation to a functional regulation or to undertake such duties as may be assigned to him in terms of the National Building Regulations

NOTE This is a generic definition, to be used where no other definition is given, or no references are made to other standards. Other parts of SANS 10400 contain definitions of a more specific nature relevant to their disciplines.

3.4
competent person (fire 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, and

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

3.5
competent person (wet services)
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 or mechanical engineering, and

c) is generally recognized as having the necessary experience and training to undertake rational designs in the field of wet services

3.6
deemed-to-satisfy requirement
non-mandatory requirement, the compliance with which ensures compliance with a functional regulation

3.7
division
portion of a building separated from the remainder of such building by one or more separating elements

3.8
fire installation
any water installation which conveys water for the purpose of fire-fighting

3.9
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

3.10
non-return valve
reflux valve
water fitting that automatically permits flow to occur in one direction only

3.11
rational assessment
assessment by a competent person of the adequacy of the performance of a solution in relation to requirements including as necessary, a process of reasoning, calculation and consideration of accepted analytical principles, based on a combination of deductions from available information, research and data, appropriate testing and service experience

3.12
rational design
design by a competent person involving a process of reasoning and calculation and which may include a design based on the use of a standard or other suitable document

3.13
service pipe
pipe which conveys water from a communication pipe to a hose reel or a fire hydrant other than a hydrant which is connected directly to the water supply system

3.14
sprinkler system
system of piping and sprinkler heads connected to a water supply which, when activated by the effect of fire, automatically releases water

3.15
suitable
capable of fulfilling or having fulfilled the intended function, or fit for its intended purpose

3.16
water installation
installation used or intended to be used for the conveyance or storage of water in any building or on any site on which such building is situated and includes any pipe or any water fitting other than any water meter vested in the local authority

3.17
water supply system
any system of structures, aqueducts, pipes, valves, pumps, meters or other appurtenances relating thereto which are vested in the local authority and are used or intended to be used by it in connection with the supply of water

4 Requirements

4.1 General

The functional regulation **W3** contained in part W of the National Building Regulations (see annex A) shall be deemed to be satisfied where

a) fire installations comply with the requirements of 4.2, 4.3, 4.4 and 4.5,

b) a supply of water is provided in each division for the effective operation of the number of hose reels, hydrants and sprinkler heads that are required in accordance with SANS 10400-T and which may be operated or come into operation simultaneously, and

c) the fire installation is either

1) the subject of a rational design prepared by a competent person (wet services) or a competent person (fire engineering) in accordance with the general principles and requirements contained in SANS 10252-1 and, if relevant, SANS 10287, or

2) in accordance with the requirements of 4.6 where the area in which the building is located is serviced by a fire brigade, contains no sprinkler system, and serves not more than three fire hydrants in a division.

NOTE 1 A fire hose reel is an emergency piece of equipment available for use by the occupants of buildings to contain the fire until the fire brigade arrives to take over.

NOTE 2 A fire hydrant is provided for use by the fire brigade to allow the firefighter to get as close as possible to the fire and to connect his hose reel to a fire hydrant to fight the fire. The fire brigade will then boost the fire hydrant system to the pressure which they need to fight the fire.

NOTE 3 The local authority cannot guarantee the pressure or supply of water and can only indicate what the residual pressure at a water connection should be. Accordingly, the owner should assess the risk or secure his water supply by means of on-site storage facilities.

4.2 Communication pipe

A fire installation shall be connected to a communication pipe provided by the local authority and located at a position and depth as determined by such local authority.

4.3 Water meter

Where so required by the local authority, provision shall be made in a fire installation for the supply and installation, by the local authority, of a water meter. Such meter and any related valve(s) shall not significantly restrict the flow of water.

4.4 Isolating valves

An isolating valve shall be fitted in a fire installation at a position that is not more than 1,5 m inside the boundary of the site, and shall be clearly marked as such.

4.5 Fire pump connections

4.5.1 In any fire installation

a) any pipe which serves any hydrant or an automatic sprinkler installation, shall be provided with a twin pumping connection; and

b) any pipe fitted with one or more fire-pump connections, unless such pipe discharges directly into a storage tank, shall be fitted with a pressure gauge reading up to 2 500 kPa and a non-return valve so located as to shut off automatically the direct supply of water from the local authority system to such installation whenever and for so long as any such fire pump connection is in use.

NOTE It is not necessary to provide a pumping connection to any pipe serving only hose reels.

4.5.2 Any pumping connection shall be

a) situated in a readily accessible position outside the building at ground level,

b) mounted on the face of the building in an accessible position, and

c) clearly marked as such.

4.5.3 No non-return valve in a fire installation shall be so positioned as to prevent or hinder the flow of water from a fire-booster connection to a fire installation.

4.6 Pipework

4.6.1 In any fire installation

a) the nominal diameter of

1) a communication pipe serving such installation shall be not less than 75 mm,

2) a service pipe supplying water to a fire hydrant shall be not less than 75 mm, and

3) a service pipe supplying water to a hose reel installation shall be not less than 25 mm;

NOTE SANS 10400-T establishes requirements for the number of hose reels and fire hydrants.

b) the pressure head (P_F), when calculated in accordance with the following formula, shall equal or exceed

1) at any hose reel within a building or any division within a building: 30 m

2) at the fire pump connection: 5 m

$$P_F \geq P_M - (H_F - H_C) - P_L$$

where

P_M is the static pressure head, in metres, at the juncture between the communication pipe and the service pipe, and which, unless otherwise directed by the local authority, is the minimum head measured at a point in time;

H_F is the elevation of the fire pump connection or hose reel, in metres, above a common datum (see figure 1);

H_C is the elevation of the communication pipe at the juncture with the service pipe, in metres, above or below, or on the same level as the common datum (see figure 1). If the elevation is below the common datum, the volume between H_F and H_C shall be added and not subtracted;

P_L is the sum, in metres, of all the products of the length of service pipe of a particular diameter serving the fire pump connection or hose reel, and the friction factor obtained from table 1 based on the following:

a) fire hydrants: the simultaneous use of all hydrants within a division; or

b) fire hose reels: the simultaneous use of all fire hose reels within a division.

NOTE 1 Fire hydrants and hose reels are not used simultaneously.

NOTE 2 The requirements of 4.6.1 ensure that the hose heels are operated as intended and enable the fire brigade to boost the supply to the fire hydrants. A rational design is required where the minimum pressure heads cannot be achieved.

NOTE 3 The requirements of 4.6.1(a) test whether or not the water supply has sufficient head.

NOTE 4 1 m head of water = 10 kPa. 10 m head of water = 1 bar.

NOTE 5 Annex B provides an example of a calculation for sizing pipework.

4.6.2 All fire installation pipework shall be constructed in accordance with the relevant requirements of SANS 2001-DP2 or SANS 2001-DP6 and shall have a pressure rating of not less than 1 200 kPa.

4.6.3 All fire installation pipework installed above ground or within the structure of a building shall comprise metallic pipes and suitable metallic couplings which comply with the relevant requirements of SANS 2001-DP2 or SANS 2001-DP6.

Table 1 — Friction factors associated with a particular diameter of service pipe serving a specified number of fire hydrants and fire hose reels

1	2	3	4	5	6	7	8	9	10
Nominal diameter of pipe	**Friction factor for service pipes**								
	Number of hose reels served by a service pipe						**Number of fire hydrants served by a service pipe**		
mm	**1**	**2**	**3**	**4**	**5**	**6**	**1**	**2**	**3**
25	0,11	0,41	0,86	1,47	2,21	3,11	[a]	[a]	[a]
32	0,05	0,18	0,38	0,65	0,98	1,38	[a]	[a]	[a]
40	0,02	0,05	0,10	0,18	0,27	0,37	[a]	[a]	[a]
50	0,01	0,02	0,04	0,06	0,10	0,13	[a]	[a]	[a]
75	0	0	0	0	0,01	0,02	0,53	1,91	4,05
100	0	0	0	0	0	0	0,11	0,39	0,83
150	0	0	0	0	0	0	0,02	0,05	0,11
[a] Not permitted									

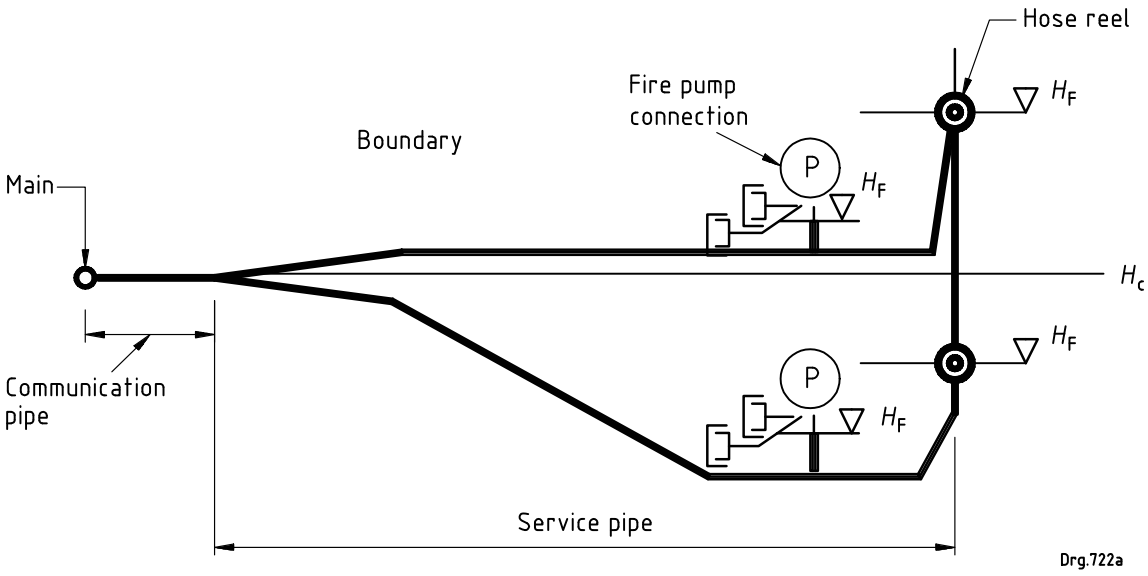


Figure 1 — Schematic layout of service pipes serving a fire pump connection of hose reel

Annex A
(normative)

National Building Regulations
Part W: Fire Installation

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

application
application contemplated in section 4 of the Act

approved
approved by

a) any local authority, or

b) the Review Board on appeal to the Review Board in terms of the Act

Regulations

W1 Fire Installations

All approved fire installations shall be connected to a communication pipe supplied by the local authority: Provided that such local authority may, subject to any conditions it may consider necessary, allow such fire installation to be connected to –

(a) any approved alternative source of supply; or

(b) any source of non-potable water where such water is not to be used for domestic or any other purpose which, in the opinion of such local authority, might give rise to a health hazard.

W2 Supply of Water

Water shall not be taken from a supply system for use in any fire installation, unless –

(a) an application has been made to the local authority for the supply of such water and such application has been granted; and

(b) the use of such water and such fire installation complies with any conditions imposed by the local authority.

W3 Design of Fire Installations

In any fire installation –

(a) adequate and suitable connection and means of measuring water pressure shall be provided;

(b) so many isolating valves shall be provided to control the flow of water to the installation, and to such points within the installation, as the local authority may require; and

(c) the quantity, pressure and rate of flow of water shall be adequate for the supply of any hose reel, hydrant or sprinkler system connected thereto.

W4 Deemed-to-Satisfy Requirements

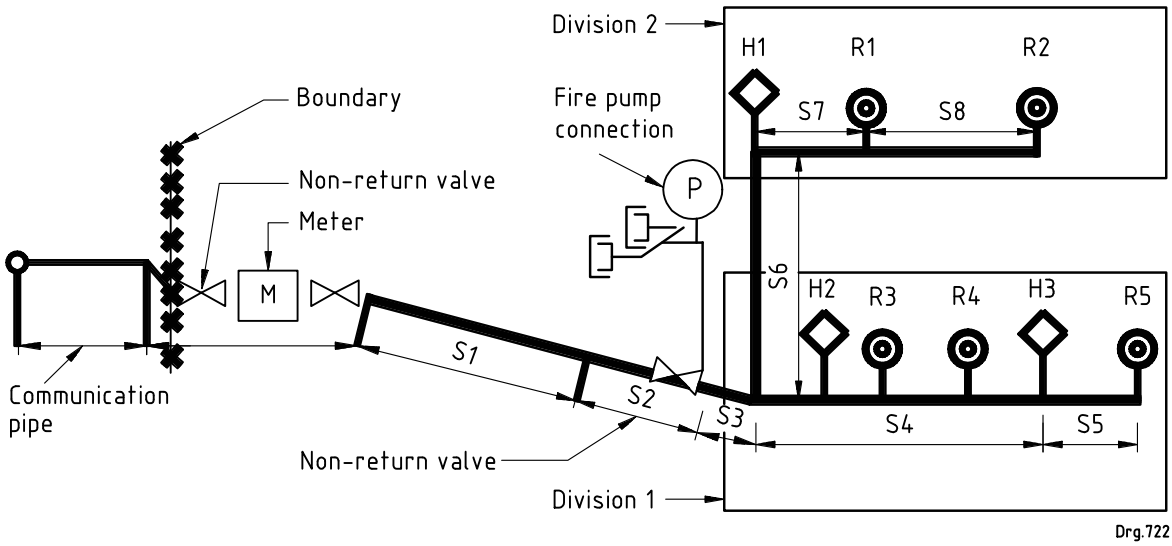
The requirements of Regulation **W3** shall be deemed to be satisfied where any fire installation complies with SANS 10400-W: Provided that where a local authority is of the opinion that it is essential for the fire installation to be the subject of an acceptable rational design prepared by an approved competent person, such local authority shall, in writing, notify the owner of such site of its reasons for the necessity for such design, and may require such owner to submit for approval plans and particulars of a complete fire installation, based on such design.

Annex B
(informative)

Example of a calculation for sizing pipework (see 4.6.1)

B.1 Introduction

A double-storey building has two fire divisions: one with one fire hydrant and two hose reels, and the other with two fire hydrants and three hose reels (see figure B.1). The static head is measured as being 36 m. The lengths of service pipes and the elevations of the various hydrants and hose reels are as shown in the figure.



Installation data

Hose reel	Relative elevation m
R1	12
R2	12
R3	7
R4	6
R5	6

Hydrant	Relative elevation m
H1	12
H2	7
H3	6

Connection	Relative elevation m
Fire pump connection	5
Service pump - communication pipe junction	10

Service pipe	Length m	Minimum pipe diameter permitted mm
S1	60	75
S2	30	75
S3	5	75
S4	30	75
S5	30	25
S6	5	75
S7	20	25
S8	10	25

	Fire hydrant
	Hose reel

Figure B.1 — Schematic layout of service pipes serving a building

B.2 Service pipe to fire pump connection

The head loss in the service pipe from the communication pipe to the fire pump connection (S1 + S2) for the maximum fire load of the two fire hydrants, is as follows for a 75 mm diameter pipe:

$P_F \geq P_M - (H_F - H_C) - P_L$

$= 36 - (5 - 10) - (60 \times 1{,}91 + 30 \times 1{,}91)$

$= 130{,}9$ m (< 5 m is unacceptable (see 4.6.1(b)))

If S1 and S2 are increased to 100 mm diameter:

$P_F \geq P_M - (H_F - H_C) - P_L$

$= 36 - (5 - 10) - (60 \times 0{,}39 + 30 \times 0{,}39)$

$= 5{,}9$ m (> 5 m is acceptable (see 4.6.1(b)))

B.3 Service pipe from fire pump to hose reels in division 1

The head loss in service pipes from the communication pipe to hydrant H3 (S1 + S2 + S3 + S4) for three hose reels is 0 as the friction factor for 75 mm and 100 mm diameter service pipes supplying three hose reels is 0 (see table 1).

At R3: $P_F \geq P_M - (H_F - H_C) - P_L$

$= 36 - (7 - 10) - 0$

$= 39$ m (> 30 m is acceptable (see 4.6.1(b)))

At R4: $P_F \geq P_M - (H_F - H_C) - P_L$

$= 36 - (6 - 10) - 0$

$= 40$ m (> 30 m is acceptable (see 4.6.1(b)))

At R5: $P_F \geq P_M - (H_F - H_C) - P_L$

$= 36 - (6 - 10) - 30 \times 0{,}11$

$= 36{,}7$ m (> 30 m is acceptable (see 4.6.1(b))) (25 mm diameter pipe is acceptable and there is no need to increase the pipe size)

B.4 Service pipe from fire pump to hose reels in division 2

The head loss in service pipes from the communication pipe to hydrant H3 (S1 + S2 + S3 + S6) for two hose reels is 0 as the friction factor for 75 mm and 100 mm diameter service pipes supplying two hose reels is 0 (see table 1).

At R1: $P_F \geq P_M - (H_F - H_C) - P_L$

$= 36 - (12 - 10) - 20 \times 0{,}41$

$= 25{,}8$ m (< 30 m is unacceptable (see 4.6.1(b)))

Therefore, if S7 is increased to 40 mm diameter:

At R1: $P_F \geq P_M - (H_F - H_C) - P_L$

$= 36 - (12 - 10) - 20 \times 0{,}05$

$= 33$ m (> 30 m is acceptable (see 4.6.1(b)))

At R2: $P_F \geq P_M - (H_F - H_C) - P_L$

$= 36 - (12 - 10) - (20 \times 0{,}05 + 10 \times 0{,}11)$

$= 31{,}9$ m (> 30 m is acceptable (see 4.6.1(b))) (25 mm diameter pipe is acceptable and there is no need to increase the pipe size)

B.5 Summary

The pipe sizes in table B.1 are required.

Table B.1 — Pipe sizes

1	2	3
Service pipe	**Length** m	**Pipe diameter** mm
S1	60	100
S2	30	100
S3	5	75
S4	30	75
S5	30	25
S6	5	75
S7	20	40
S8	10	25

NOTE A rational design would have been required if the pressure head (P_F) at a hose reel was less than 30 m, as a pump and storage tank would need to be installed in accordance with the requirements of SANS 10252-1.

Bibliography

SANS 10090, *Community protection against fire.*

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