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Edition 1

SOUTH AFRICAN NATIONAL STANDARD

Fire safety cabinets

Part 1: Safety storage cabinets for flammable liquids

WARNING
This document references other documents normatively.

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Table of changes

Change No.	Date	Scope

Foreword

This South African standard was prepared by National Committee SABS/TC 048/SC 01, *Laboratory equipment – Laboratory controlled environment*, in accordance with procedures of the SABS, in compliance with annex 3 of the WTO/TBT agreement.

This document was approved for publication in March 2017.

Compliance with this document cannot confer immunity from legal obligations.

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Fire safety cabinets

Part 1:
Safety storage cabinets for flammable liquids

1 Scope

1.1 This part of SANS 54470 gives performance requirements for fire safety cabinets to be used for the storage of flammable liquids. This part of SANS 54470 is applicable to cabinets which may be free standing, restrained to a wall or mounted on wheels or castors. It is not applicable to brick enclosures or walk-in storage rooms.

NOTE This part of SANS 54470 does not discriminate between different flammable liquids which may have considerably different physical properties. The suitability of this part of SANS 54470 in respect of any given flammable liquid should be ascertained by the user.

1.2 This part of SANS 54470 describes the design and testing criteria for fire safety cabinets to be used to store flammable liquids in closed containers at normal room temperatures.

1.3 This part of SANS 54470 covers the three major safety requirements for storage of flammable liquids, which are

a) minimizing the fire risks associated with the storage of flammable substances and protection of the contents of the cabinet in the event of fire for a known (tested) minimum length of time (fire rating),

b) minimizing the amount of vapour released into the working environment, and

c) retention of accidental spillage within the cabinet.

1.4 This part of SANS 54470 is not applicable to cabinets which do not take their weight on their base. Requirements are given in respect of the construction of the cabinet and its capacity to resist fire conditions on the outside. A classification of cabinets is given, according to the level of fire resistance offered, and a type test is included, which draws on already existing fire resistance tests such as those given in ISO 834-1 and EN 1363-1.

2 Normative references

The following referenced documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. 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.

EN 1363-1, *Fire resistance tests – General requirements.*

ISO 834-1, *Fire-resistance tests – Elements of building construction – Part 1: General requirements.*

3 Definitions

For the purposes of this document, the following definitions apply.

3.1
sump
low space that collects undesirable liquids such as water or chemicals

3.2
type testing
conformity testing on the basis of one or more specimen of product representative of the production

4 General

4.1 Testing of the cabinet (see 1.3(a)) under fire conditions is a normative part of the this part of SANS 54470, and the procedures and interpretation of the tests are described in detail.

4.2 The fire test (see 1.3(a)) provides for five categories of fire protection and ratings. In practice, the degree of fire protection and rating allows the user to select, depending on individual circumstances, a cabinet which will allow sufficient time for personnel to leave, and fire fighters to enter the area before it is likely that the flammables stored turn a possible minor an extinguishable fire into an uncontrollable one.

4.3 The methods of achieving the safety requirements in 1.3(b) and 1.3(c) are sufficiently flexible to allow for local and national needs. Caution should be exercised when determining the appropriate cabinet fire rating with regard to flammable liquids with an auto-ignition temperature below 200 °C or having a high vapour pressure at room temperature (or both). When such flammable materials are being stored, expert advice should be sought.

5 Classification

5.1 Type classification

A safety storage cabinet shall be classified as one of the types listed in table 1.

Table 1 — Fire safety storage cabinet classification

1	2
Classification type	**Time taken for temperature inside the cabinet to rise by 180 °C from a starting temperature of (20 ± 5) °C** min
10	≥ 10
15	≥ 15
30	≥ 30
60	≥ 60
90	≥ 90

5.2 Fire resistance

The fire resistance capability of the cabinet shall be investigated by a type test. This test is performed by heating the cabinet in a furnace according to the temperature-time curve described in EN 1363-1 and measuring the temperature increase inside the cabinet. The cabinet shall then be classified as type 10, 15, 30, 60 or 90, according to the time for which the interior does not rise by more than 180 °C, at any point of measurement, from stating temperature of (20 ± 5) °C. The test is given in clause 7.

6 Construction

6.1 Requirements

6.1.1 Fire protection

In the case of a fire, the cabinet shall assure that, for at least 10 min, the contents of the cabinet do not contribute any additional risks or spread of fire.

6.1.2 Doors

6.1.2.1 The doors of the cabinet shall close and seal according to the type classification.

6.1.2.2 Self-closing doors shall close and seal within 20 s from the time the self-closing device is activated.

6.1.2.3 If a hold-open feature is included, the doors shall close fully in the event of a maximum temperature of (65 ± 20) °C. The temperature release mechanism for this shall be positioned so that it can heat up rapidly.

6.1.2.4 It shall be possible to operate each door with one-hand.

6.1.2.5 Locking devices shall not compromise the complete closure performance required in 6.1.2.2.

6.2 Side and back walls

The side and back walls of the cabinet shall be of the same thickness and comparable construction.

6.3 Ventilation

6.3.1 Cabinets may be equipped with ventilation for inlet and exhaust air. In a cabinet in which the ventilation is taking place, with the doors closed, air exchange at the rate of at least 10 times the volumetric capacity of the cabinet per hour shall take place with air pressure drop not exceeding 150 Pa.

6.3.2 The ventilation shall be equipped with flame arrestors or shall close automatically when subjected to a temperature of (70 ± 10) °C.

6.4 Shelves

6.4.1 The shelves and their fastenings shall be of non-absorbent material and shall carry the load specified in the product information to be supplied (see clause 8) without any damaging distortion at the testing temperature according to clause 7.

6.4.2 The shelves shall not hinder the complete closure of the doors.

6.5 Spill containment sump

6.5.1 A spill containment sump shall be installed underneath the lowest storage level. The sump shall be designed such that liquids spilled from higher shelves are collected in the sump.

6.5.2 The sump shall have a minimum depth of 50 mm or a minimum capacity of 10 % of the specified storage capacity of the cabinet. All spillages or condensation up to this volume shall be retained.

NOTE Type and volume of liquids to be stored should be taken into consideration when choosing the correct sump capacity.

7 Methods of test

7.1 Principle

The fire safety storage cabinet is exposed to flames in a suitable furnace, such that the standard time-temperature curve specified in ISO 834-1 is generated. The temperature increase inside the cabinet is measured, as well as the time taken until the temperature increase reaches more than 180 °C from a starting temperature of (20 ± 5) °C. The cabinet classification type is then ascertained by reference to the criteria set out in clause 5.

7.2 Apparatus and means of heating

7.2.1 The furnace shall be arranged so that the doors, walls and roof of the tested cabinet receive equal heat conditions, without flames directly touching the cabinet body.

7.2.2 Measuring equipment for monitoring ambient temperature, the furnace temperature and the temperature inside the test cabinet shall be in accordance with the requirements of ISO 834-1.

7.2.3 Plain steel weight(s) shall be used to load uniformly the highest shelf of the cabinet to the maximum of the manufacturer's specification.

7.2.4 The means of heating shall be in accordance with the requirements of ISO 834-1.

7.3 Test models

7.3.1 Quantity and description of test models

For testing the fire resistance capability, there shall be one cabinet provided (per model). The cabinet shall be used to conduct the fire test and verify the diagram specifications of the cabinet. Detailed construction drawings with manufacturer’s specifications shall be provided, which include the following:

a) inner and outer dimensions;

b) cabinet wall thickness;

c) gap dimensions around and between the doors;

d) material specifications;

e) closing mechanisms;

f) inlet and outlet air openings;

g) welded and other seals and their design and workmanship;

h) the hold-open device, if provided;

i) weight of the test model; and

j) manufacturer's information on the material or components (or both) that have a bearing on the fire performance of the cabinet.

7.3.2 Preliminary examination of the test model

7.3.2.1 Before fire testing, the following should be checked:

a) conformity of the test model with drawing specifications;

b) the weight of the test model; and

c) full-closure mechanism of doors shall be demonstrated to meet the requirements of 6.1.2.

7.3.2.2 Photographic documentation shall be performed both before and after testing, with views of the open and closed cabinet, as well as detailed views of the doors, conditions of seals etc.

7.4 Preparation of fire test

7.4.1 Installation of the test model

7.4.1.1 All cabinets are to be tested as free-standing single cabinets. The cabinet should be positioned with its back wall at a minimum of 100 mm from the furnace wall.

7.4.1.2 The test shall be performed as follows:

a) with open air inlet and outlet but without connection to an exhaust air system;

b) with the doors closed, but not locked manually;

c) with the highest shelf loaded with plain steel weights according to the manufacturer's specification (see 6.4); and

d) with control points for the testing of stability of the maximum loaded shelf until the end of the fire test.

7.4.1.3 If the cabinet is intended to be used mounted on wheels or castors, the fire resistance capability shall additionally be determined in that configuration.

7.4.2 Temperature measuring device placement in the test model

Temperature measuring devices shall be installed as follows:

a) four air temperature measuring devices in the upper four corners, each 25 mm away from the wall, door and ceiling surfaces of the cabinet (see figure 1 – points labelled (a));and

b) contact temperature measuring devices fixed to the ceiling, floor, walls and door(s) of the cabinet, each in the middle of the surface (see figure 1 – points labelled (b)).

7.4.3 Temperature measuring device placement in the furnace

At least four temperature measuring locations are required (see figure 1) as follows:

a) each 100 mm away from the wall, ceiling and door surfaces of the cabinet;

b) each located centrally with respect to each surface; and

c) measurement locations should be at least 400 mm deep into the fire room.

7.5 Fire test procedure

7.5.1 Heat cabinet front wall, side walls and ceiling with flames in accordance with standard temperature-time curve given in ISO 834-1.

7.5.2 Ensure the time of temperature increase; the temperatures at all the measured locations within the cabinet are recorded continuously.

7.5.3 General test methods to be performed

7.5.3.1 Test for doors

7.5.3.1.1 Cabinets shall be loaded to maximum capacity and subjected to a minimum of 100 operational cycles. No failure to close shall result (see 6.1.2.1).

7.5.3.1.2 The time for closing doors from their completely open position or from the position given by a hold-open feature shall be measured with a stopwatch, at an ambient temperature (see 6.1.2.2).

7.5.3.1.3 The manufacturer shall confirm by written declaration that the temperature release component of the closing device conforms to the requirements specified in 7.5.3.1.1 and 7.5.3.1.2 (see 6.1.2.3).

7.5.3.2 Test for ventilation

7.5.3.2.1 By using visual inspection of the openings, the measurement of the air exchange and temperature drop, check for compliance with 6.3.1.

NOTE The cabinet should be empty when the test is conducted.

7.5.3.2.2 By using the type test report, check for compliance with 6.3.2.

7.5.3.3 Test for shelves

7.5.3.3.1 By using visual inspection, check for compliance with 6.4.1.

7.5.3.3.2 By using visual inspection, check for compliance with 6.4.2.

7.5.3.4 Spill containment sump

7.5.3.4.1 By using visual inspection, check for compliance with 6.5.1.

7.5.3.4.2 By using visual inspection in comparison with user information, in case of doubt, use measurement of the sump capacity in accordance with 6.5.2.

7.6 Test report

The test report shall include at least the following:

a) reference to this part of SANS 54470;

b) the name of the testing laboratory;

c) the test report number;

d) the place and date of type testing;

e) the name of the manufacturer;

f) the product brand of test model;

g) the weight of test model;

h) description and drawings of the test model as stipulated in 6.3.1;

i) details regarding the positioning of the temperature measuring devices and procedures;

j) the type of fuel used in the test;

k) observations during the test;

l) comment regarding the ease with which the test model could be opened after the type test;

m) comment about the sturdiness of shelves during the heating process in so far as information is available;

n) indication of the fire resistance capability in minutes and resulting classification;

o) proof of certification of test facility;

p) photographs taken before and after the test;

q) details of the temperature measurements;

r) result of position and time taken of the temperature measuring device (when the temperature increase of 180 °C from a starting temperature of 20 ± 5 °C) was reached; and

s) result of the sump test (in accordance with 7.5.3.4).

8 Information to be supplied

8.1 An information manual shall be supplied with each cabinet, containing the following information:

a) the maximum load capacity (mass and volume) of each shelf and of the whole cabinet;

b) the sump capacity;

c) a list of parts which have to be checked or replaced on a routine basis (or both), if applicable;

d) instruction on the use of ventilation and hazard zones;

e) instruction to the user not to use the sump for storage; and

f) recommendation to the user to undertake regular inspection and maintenance.

8.2 Declaration of conformity or certificate(s) from a test house shall be supplied with each cabinet.

9 Marking and labelling

9.1 The following inscriptions shall be mounted on the front of the cabinet in a suitable and visible place:

a) advice that the door(s) shall remain closed when not in use;

b) the appropriate international warning signs;

c) the fire resistance capability, specified in minutes, for example type 10, 15, 30, 60, 90; and

d) the maximum shelf load, evenly distributed and maximum load of cabinet.

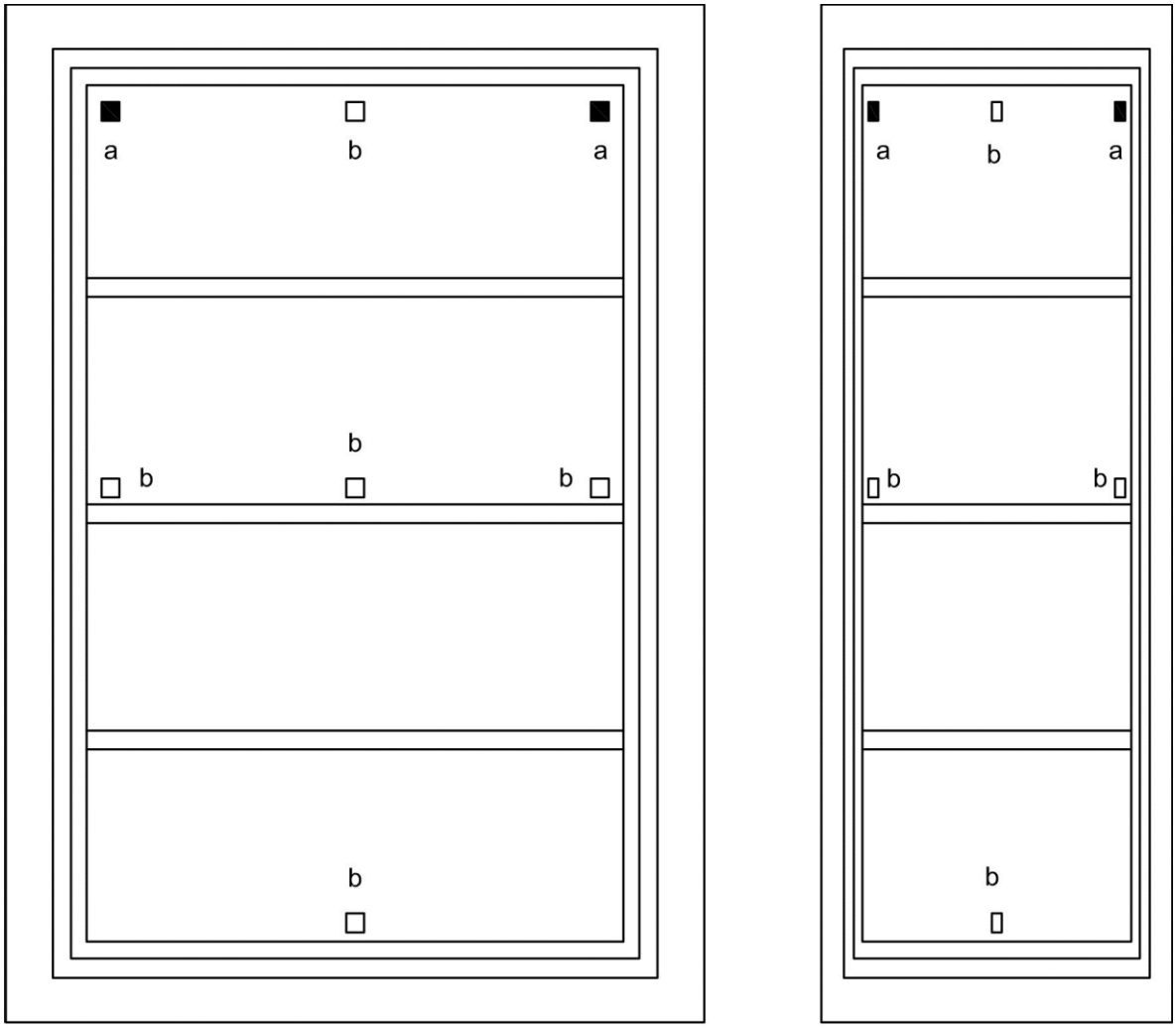
9.2 The following inscriptions shall be mounted in a suitable location on the cabinet:

a) the name or trademark (or both) of the manufacturer;

b) the model number and year of production;

c) labels for inlet and outlet air openings so that it is possible to differentiate between them; and

d) the manufacturer's compliance with an approved standard.



Front elevation

Side elevation

Key

a Air temperature measuring devices

b Contact temperature measuring devices

Figure 1 — Schematic representation of fire safety cabinets

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