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Community protection against fire

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Table of changes		
Change No.	**Date**	**Scope**

Acknowledgement

Standards South Africa wishes to acknowledge the valuable assistance derived from publications by the Fire Protection Association of Southern Africa.

Foreword

This standard was approved by National Committee STANSA SC 5120.06E, *Fire safety – Community fire protection* in accordance with procedures of Standards South Africa, in compliance with annex 3 of the WTO/TBT agreement.

Edition 3 cancels and replaces the first revision (SABS 090:1972).

Annex A forms an integral part of this standard. Annexes B and C are for information only.

Introduction

Fire services in South Africa

The main functions of a fire service is to prevent fires and to protect life and property should a fire occur. To carry out these functions the service should be well organized.

The purpose of this standard is to provide advice on the measures that may be taken to ensure that fire services are efficient. It includes a schedule against which the performance potential of each aspect, as well as of the whole, of a fire service can be judged. A fire-risk rating based on this schedule will indicate the extent to which loss of life and property can be avoided in any particular given area.

Two essentials for protection against fire are an efficient fire service and an adequate water supply. Local authorities should achieve and maintain a category 1 service.

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1 Scope

1.1 This standard outlines a system of determining the requirements for the operational and fire safety functions of emergency services rendered to communities.

1.2 It also gives recommendations for water supplies for fire-fighting.

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this standard. All standards are subject to revision and, since any reference to a standard is deemed to be a reference to the latest edition of that standard, parties to agreements based on this standard are encouraged to take steps to ensure the use of the most recent editions of the standards indicated below. Information on currently valid national and international standards can be obtained from Standards South Africa.

NFPA 291, *Fire flow testing and marking of hydrants.*

NFPA 1201, *Developing fire protection services for the public.*

NFPA 1500*, Fire department occupational health and safety program.*

NFPA 1561, *Fire department incident management system.*

NFPA 1710, *Standard for the organization and deployment of fire suppression, emergency medical operations and special operations to the public by career fire departments.*

NFPA 1901, *Automotive fire apparatus.*

SANS 10400 (SABS 0400), T*he application of the National Building Regulations.*

3 Definitions

For the purposes of this standard, the following definitions apply:

3.1
aerial appliance
turntable ladder or a hydraulic elevating platform

3.2
appliance travel time
interval from time mobile to time in attendance

3.3
attendance time
sum of call receipt/despatch and appliance travel time

3.4
fire area
city, town, village, or other defined area, that is afforded protection against fire

3.5
fire flow
amount of water required by the fire service for the extinguishing of fires

3.6
pumping appliance
self-propelled vehicular appliance equipped to project one or more streams of water on to a fire

3.7
turn-out time
interval from the time a call comes into a control facility to the time appliances are mobile (includes time of transfer from call centres to brigade despatch facilities, etc.)

4 Fire protection

4.1 General

4.1.1 A survey of the fire hazards in the area should be made to determine the extent of the fire service needed to provide adequate protection for a fire area.

4.1.2 Such a survey should cover the height and the type of construction and occupancy of buildings, the means of approach to the buildings, the water supply available, and other features that might affect fire risks.

4.1.3 Regular surveys of the area should be made at intervals of not more than three years to keep abreast of the expansion of the area.

4.1.4 The survey should be made by persons suitably qualified to undertake such work.

4.2 Fire-risk categories

A fire area should be divided into sub-areas which fall into one of the following fire-risk categories:

Category A: Central business districts and extensive commercial and industrial areas normally found in cities and large towns (areas where the risk to life and property due to fire occurrence and spread is likely to be high).

Category B: Limited central business districts, smaller commercial or industrial areas normally associated with small towns and decentralized areas of cities and large towns (areas where the risk to life and property due to fire occurrence and spread is likely to be moderate).

Category C: Residential areas of conventional construction.

Category D: Rural areas of limited buildings and remote from urban areas.

Category E: Special risk areas. Individual areas requiring a pre-determined attendance over and above the predominant risk category in an area. Includes large shopping/entertainment centres, informal settlements, harbours, hospitals, prisons, large airport buildings and petrochemical plants.

5 Organization of fire services

5.1 General

The fire service department should be organized in accordance with the recommendations of NFPA 1201.

5.2 Fire brigades

5.2.1 Classification

5.2.1.1 Brigades should be classified according to the type and quantity of equipment held, and fall into one of the following categories:

Category 5(a): A brigade with adequate arrangements and provisions in place in relation to risk as given in annex A and annex C for:

1) risk profile of area of jurisdiction;

2) weight and speed of response;

3) call receipt and processing requirements;

4) vehicle/equipment availability and maintenance;

5) incident management procedures;

6) pre-fire planning and risk visits;

7) training/personnel;

8) water supplies; and

9) fire safety functions; and

Category 5(b): A brigade that is able to meet performance criteria for staff availability per appliance availability, pre-determined attendance (PDA), manning levels and attendance times, 35 % to 45 % of the time, measured annually.

Category 4: A brigade as given in category 5(a) as monitored by relevant performance indicators or statistics, or both, and which is able to meet performance criteria given for category 5(b) 46 % to 55 % of the time, measured annually.

Category 3: A brigade as given for category 5(a) as monitored by relevant performance indicators or statistics, or both, and which is able to meet performance criteria as given for category 5(b) 56 % to 65 % of the time, measured annually.

Category 2: A brigade as given for category 5(a) as monitored by relevant performance indicators or statistics, or both, able to meet performance criteria as given for category 5(b) 66 % to 75 % of the time, measured annually.

Category 1: A brigade as given for category 5(a) as monitored by relevant performance indicators or statistics, or both, and which is able to meet performance criteria as given for category 5(b) more than 75 % of the time, measured annually.

5.2.1.2 All brigades should endeavour to fall into a category 1 classification.

5.2.2 Weight and speed of response

5.2.2.1 General

NOTE Successful control and extinguishing of fires depends on sufficient appliances responding with adequate manpower and arriving within a reasonable time.

NFPA 1710 should be followed for guidelines to successfully control and extinguish fires.

5.2.2.2 Weight of response

5.2.2.2.1 The appliances in service should, when staffed, be sufficient to provide adequate fire protection in the area protected by the brigade. Appliances shall comply with NFPA 1901.

5.2.2.2.2 In brigades which have only one station, the number (see table 1) of appliances shall be sufficient to meet the full demands of a first fire call to the most congested area and to provide at least one pump in reserve to respond to a second fire call.

5.2.2.2.3 In the case of brigades which have more than one station, the number (see table 1) of appliances allotted to any particular substation will depend on the fire-risk category in the area assigned to the station.

Table 1 — Weight of response at fires

1	2	3	4
Risk category	**Minimum number of pumping units**	**Minimum manning level per appliance**	**Minimum pumping capacity of each unit (L/min)**
A	2	5	3 850
B	2	4	3 850
C	1	4	2 250
D	1	4	2 250
E	As determined by individual risk assessment		
NOTE Arrangements for vehicle fires, grass/bush and special services and the need for specialist vehicles such as aerial appliances and water carriers will be determined by local conditions.			

5.2.2.3 Speed of response

The efficiency of a fire service is judged largely by the attendance time that the fire brigade is capable of achieving. The attendance times should not exceed those shown in table 2.

Table 2 — Attendance times at fires

1	2	3	4
Risk category	**Maximum call receipt and turn-out time** min	**Maximum appliance travel time** min	**Maximum attendance time** min
A	3	5	8
B	3	7	10
C	3	10	13
D	3	20	23
E	Within requirement of appropriate risk category		

5.2.2.4 Siting of fire stations and determination of station areas

The ability to meet attendance time requirements will be directly influenced by the siting of stations and the size of turn-out areas which should be determined by taking into consideration street grid networks, speed of appliances, terrain, traffic conditions, etc.

Table 3 shows examples of possible station turnout areas under various conditions of appliance average speed. Once determined, station turn-out areas should be verified by trial responses to test points in the risk area using vehicles of performance characteristics similar to those likely to attend. Full records of verification activities should be kept.

Table 3 — Examples of station areas

1	2			
Estimated speed of appliance (km/h)	**Example of possible turn-out area for various risk categories** (km²)			
	A	B	C	D
25	8	15	30	120
30	10	20	40	180
35	15	30	60	240
40	20	40	80	320
45	25	50	100	400
50	30	60	120	480

NOTE 1 Estimated speed of appliance is the likely average speed between two points in a risk area including stops and starts, traffic congestion and terrain.

NOTE 2 Station turn-out area is the area that can be covered taking weight and speed of response requirements into consideration.

NOTE 3 Turn-out areas above are based on the straight line distance that can be covered in the appropriate appliance travel time, less 25 % to compensate for street grid networks.

5.2.3 Communications

5.2.3.1 General

Each brigade should be equipped with suitable facilities to enable rapid communication between headquarters and units operating at a fire scene. These shall include the following:

a) suitable number of telephone lines;

b) alarm or callout facilities to despatch crews; and

c) voice logging on emergency lines and radios with date and time imprint, queuing facilities and, if necessary, trouble signal facilities.

5.2.3.2 Telephone lines

Lines should be subdivided as follows:

a) a number of lines shall be dedicated to emergency calls only (see table 4); and

b) at least one line for administration.

NOTE The number of lines for administration will be determined by the brigade's needs.

Table 4 — Emergency lines

1	2
Population served	**Number of dedicated emergency lines**
Up to 40 000	1
40 001 – 125 000	2
125 001 – 300 000	3
Over 300 000	4

5.2.3.3 Control centre operators and or supervisors

5.2.3.3.1 There should be sufficient operators so that calls are answered within 15 s and appropriate response despatched within 30 s the call being completed.

5.2.3.3.2 It should not take longer than 60 s to respond to the call.

5.2.3.4 Supervisors

For up to two operators, access to a supervisor is required. For three or more operators, a supervisor shall be on duty in the control centre.

5.3 Vehicle and or equipment availability and maintenance

5.3.1 General

Fire departments should have sufficient rescue vehicles and special appliances to adequately protect the risks within each fire station's area of operation.

Management of the emergency vehicle fleet shall include:

a) replacement policy;

b) procurement of additional vehicles;

c) reserve vehicles; and

d) a maintenance programme.

5.3.2 Replacement of vehicles

5.3.2.1 Every fire department should have a documented emergency vehicle replacement programme which will ensure that older and obsolete chassis (cab, pump, gearbox, engine) are replaced systematically.

5.3.2.2 Frontline emergency vehicles should be replaced in accordance with the recommendations of table 5.

Table 5 — Replacement periods

1	2
Type of vehicle/equipment	**Period**
	Max. number of years service
Pumping appliances	15
Aerial appliances	20
Off-road vehicles	10
Special appliances	20
Light vehicles	8

5.3.2.3 A replacement programme should ensure that newer and older vehicles are spread as evenly as possible throughout the fleet to avoid too many ageing emergency vehicles remaining in commission simultaneously.

5.3.2.4 Provision shall also be made in the replacement programme to replace problematic vehicles sooner than the maximum prescribed period. Such vehicles would include units which have high maintenance and repair costs and vehicles which do not serve the purpose for which they were intended.

5.3.3 Procurement of additional vehicles

5.3.3.1 Fire departments should assess the suitability of their emergency vehicle fleet on a regular basis to ensure that the department has a fleet which has the capacity, capability and flexibility to meet the needs of the changing and expanding fire-risks of the community.

5.3.3.2 Where necessary, the emergency vehicle fleet should be increased by the procurement of suitable, additional vehicles in accordance with a specification compiled by competent persons.

5.3.3.3 The refurbished vehicles should not be used for first turnout appliances.

5.3.3.4 Refurbished vehicles used for support functions should be tested and certified annually. (See also 5.3.4.)

5.3.3.5 Re-manufactured vehicles are deemed suitable for frontline emergency use when certified by a competent automotive engineer.

5.3.4 Reserve fleets

5.3.4.1 Fire departments should maintain a reserve emergency vehicle fleet to ensure that the number of vehicles required to attend an incident, in a particular fire risk area, can be maintained even when frontline emergency vehicles are undergoing maintenance or repair.

5.3.4.2 Reserve emergency vehicles may be utilized by overtime personnel who are called back on-duty when very large or numerous incidents are in progress.

5.3.4.3 Reserve emergency vehicle fleets should comply with the recommendations of table 6.

Table 6 — Number of reserve vehicles

1	2
Type of appliance	**Required number**
Emergency pumping appliances	One reserve unit in cases where the required fleet consists of five or less pumping appliances. Twenty percent of the required fleet plus one additional reserve unit if the required number of pumping appliances exceeds five
Aerial Appliances	Sufficient reserve units should be available to ensure that the aerial appliance portion of the fleet is not reduced by more than one aerial appliance at any time
Off-road vehicles	As per pumping appliances
Special Appliances	Nil – provided that acceptable temporary arrangements can be made while a frontline special appliance is out of commission
Light vehicles	As per special appliances

5.3.4.4 Emergency vehicles which have been taken out of service may be used as reserve vehicles provided that such vehicles are certified to be suitable for reserve purposes by a competent automotive engineer and a competent fire officer (competent in appliances evaluation) annually.

5.3.4.5 No emergency vehicle which has been taken out of service should form part of a reserve fleet for more than five years beyond the maximum number of years of service for that particular category of vehicle.

5.3.5 Vehicle maintenance programme

5.3.5.1 All emergency vehicles should be subjected to regular, documented maintenance carried out by competent persons.

5.3.5.2 When developing a maintenance programme the vehicle manufacturer's requirements and recommendations should be included.

5.3.5.3 Safety checks shall form an integral part of all maintenance programmes.

5.3.5.4 In fire departments which handle a large number of incidents per vehicle all emergency vehicles should be serviced at least once every six months or sooner.

5.3.5.5 In addition to routine servicing at least one major service should be carried out on each vehicle annually.

5.3.5.6 At fire station level, emergency vehicles should be subjected to routine daily checks to ensure immediate serviceability for operational use.

5.3.5.7 Defects revealed during routine daily vehicle checks should be remedied immediately where possible.

5.3.5.8 Defects affecting an emergency vehicle's operational ability should be referred to competent maintenance personnel.

5.3.5.9 Where fire pumps, aerial platforms or aerial ladders form part of an emergency vehicle or its equipment, the necessary maintenance, checks and tests, prescribed by the manufacturer, should be carried out and documented.

5.3.5.10 Unless the manufacturer's directives require anything to the contrary all fire pumps, aerial platforms and aerial ladders should be checked and tested on initial acceptance, quarterly and on any other occasion should such a check or test be deemed necessary.

5.3.5.11 Additional annual tests and checks should be conducted to assess pump, aerial platform or aerial ladder performance, where such assessments are not a compulsory part of the quarterly assessments.

5.3.6 Equipment maintenance

5.3.6.1 Emergency vehicles should carry a complete range and quantity of equipment suitable for the specific type of vehicle and adequate for use at incidents within the fire risk categories protected.

5.3.6.2 All equipment should be subject to replacement and procurement policies and testing, examination, checking and maintenance procedures.

5.3.6.3 All fire department equipment should be subjected to regular, documented examination, testing and maintenance.

5.3.6.4 Occupational safety and the recommendations of the manufacturer shall be included in all examination, testing and maintenance programmes.

5.3.6.5 Procedures for examining, testing and maintenance shall include the following:

a) the frequency at which the procedure is to be carried out;

b) how the procedure is to be performed;

c) at what level of supervision the procedure is to be performed;

d) how defects detected during the procedure is to be remedied; and

e) suitable records.

5.3.7 Replacement of equipment

5.3.7.1 Every fire department should regularly assess its equipment to determine whether or not such equipment is obsolete or unserviceable.

5.3.7.2 Documented annual equipment replacement programmes should be developed to ensure that obsolete and unserviceable equipment is replaced systematically.

5.3.8 Procurement of additional equipment

All fire department equipment should be assessed regularly to ensure that the equipment is suitable for the changing and expanding fire-risks in the community and to keep abreast of developments. Where necessary additional equipment should be procured.

5.4 Incident management system (IMS)

5.4.1 General

The efficiency of a fire service in dealing with an emergency incident is to a large extent dependent on the manner in which it successfully assesses the incident and applies and co-ordinates resources to control and normalize the situation. This process is generally referred to as Incident Management (IM) and should be documented in a suitable IMS.

5.4.2 Incident management policy and procedure document (see NFPA 1561)

All fire and emergency services should adopt a policy and develop suitable procedures with regard to IMS which should be clearly documented and readily available to all personnel.

5.4.3 Key components of an Incident management system

5.4.3.1 Operational objectives

The operational objectives of the system should be detailed, and should include:

a) rescue or evacuation of endangered persons;

b) treatment of injured persons;

c) stabilizing the incident and providing for life safety;

d) protection of property and the environment; and

e) provision for the safety and welfare of personnel.

5.4.4 Command modes

The system should distinguish between the various modes of command as appropriate to the scope and nature of emergency incidents and may include:

a) investigation mode (during the size-up phase);

b) attack mode (for minor incidents not requiring a large span of control); and

c) stationary command mode (for incidents requiring a co-ordinated approach to a large span of control).

5.4.5 Incident management structure

5.4.5.1 The incident management structure shall provide for the roles of:

a) an incident commander; and

b) branch and sector officers to provide for an effective span of control.

5.4.5.2 The system should provide for predetermined sectors (both functional and geographical, including fire ground safety) which should be activated by the incident commander.

5.4.6 Responsibilities of command

The responsibilities of command should be clearly detailed. These shall include the following:

a) evaluation of an emergency incident;

b) assumption of command;

c) identification of an appropriate command mode;

d) identification of an overall strategy to manage the incident;

e) development of an effective command structure;

f) assigning resources to deal with the incident;

g) initiating, controlling and maintaining communications;

h) on-going evaluation of the incident and appropriate revision of the incident management plan;

i) providing the continuity of command; and

j) incident termination.

5.4.7 Inter-service co-operation

Provisions should be made for co-ordinating co-operation between various services present at any emergency incident in an integrated management team. These provisions should include the following:

a) **Communications**

Details of communication provision during an emergency incident should include:

1) means of communication;

2) communications procedure and protocols; and

3) control of communication.

b) **Staging**

The system should provide for the orderly staging of both vehicles and equipment so that reserve vehicles and equipment are readily available without impeding the effective management of the incident.

c) **Zoning of incidents**

Zoning of incidents as well as access and egress control should be defined.

d) **Rehabilitation of personnel**

The system should make provision for the medical monitoring and rehabilitation of personnel engaged in physically demanding operations.

e) **Tactical worksheet**

Tactical worksheets should make provision for the monitoring of vehicles, equipment movements, and personnel assignments.

f) **Incident termination**

Provision for the official declaration of incident termination.

5.4.8 Incident management system review

The IMS should be assessed as part of the operational incident review process to assess whether the system was appropriately applied, and to identify weaknesses.

6 Training

6.1 General

Efficient training of fire-fighting personnel is essential to the effective performance of a fire brigade. NFPA 1201 shall be applied for training requirements. The ability of a brigade to meet the attendance times laid down in table 2 should be tested during exercises. A standard system of training should be adopted throughout the fire service. This would ensure a greater measure of efficiency when neighbouring brigades collaborate in attacking large fires and also when personnel are transferred from one brigade to another.

6.2 Training components

Service delivery relies extensively on the abilities and competence of staff responding to the incident. Emergency services should, for the fire extinguishing function and in relation to the risk profile covered, have implemented the following as minimum recommendations:

a) personnel selection, appointment and advancement criteria detailing qualifications and experience requirements for all posts;

b) suitable provisions, planning and record keeping for initial, continuation, conversion and specialist training for fire-fighters and officers; and

c) accurate records for all training attended and conducted by subject and staff members.

6.3 Fire-fighter and officer training phases

6.3.1 General

The training of fire fighters and officers should be subdivided into phases as follows:

6.3.1.1 Initial training

Based on 6.2 above, it shall include basic training and specialist courses.

6.3.1.2 Continuation of training

Continuation of training shall be conducted regularly on the station to consolidate and practice knowledge and skills during initial training and help ensure that proficiency is maintained.

6.3.1.3 Conversion training

To update skills and knowledge as a result of the acquisition of new equipment or changes in policies and procedures, conversion training shall be conducted.

6.3.4 Minimum training requirements

Recommendations as given in table 7 should be considered as the minimum training requirements.

Table 7 — Minimum training requirements

1	2	3
Training	**Class of personnel**	
	Full or part time	**Volunteer or reservist**
	Duration of training h per month	
Initial (basic) fire-fighter[a](1)	As given in an approved and accredited curriculum in accordance with NQF requirements	
Continuation[a]	20	4
Conversion[a]	As and when required	
[a] Fire fighters and officers		

7 Fire alarms

The most common single cause of fires developing into large fires is delay in the initiation or transmission of fire calls. It is of the utmost importance that notification of the start of a fire should be made as quickly as possible.

8 Fire prevention

8.1 General

Fire prevention is an important feature of the fire service and it has been proved that in brigades where this division of the service is efficiently organized fire losses have been reduced by more than 20 %. The purpose of fire prevention measures is to prevent, eliminate, or reduce hazards that contribute to the occurrence and spread of fire.

8.2 Fire safety inspections

8.2.1 Authorities should conduct fire safety inspections in response to complaints or requests or both to assist owners, occupiers, and developers and to satisfy local requirements for scheduled routine inspection of all occupancies other than dwellings as given in by-laws or other applicable legislation.

8.2.2 The inspection capacity can be supplemented by the use of a suitably trained and experienced operational staff.

8.2.3 Effective records of all inspection activities should be maintained.

8.2.4 Records should include the name of the inspecting official, the date of inspection, the findings and recommendations and should indicate whether the activity warrants a follow-up.

8.2.5 All outstanding activities should be logged as current until abated as required.

8.3 Regulation of hazardous activities

8.3.1 Departments should regulate the storage, transportation, processing sale and handling of flammable liquids and gases and other dangerous goods that could lead to the existence of dangerous conditions that could affect life safety or property loss, or both.

8.3.2 Distinction between vehicles and premises should be made in respect of certificates of registration. Certificates shall have a limited period of validity not exceeding 12 months.

8.3.3 Suitable records regarding registration should be maintained and available.

8.4 Reviewing building plans

8.4.1 A suitable system should be in place for the evaluation of building proposals and plans to ensure compliance with the relevant parts of T1 and T2 of SANS 10400 or rational designs.

8.4.2 A record of all plans or designs received, evaluated and recommendations should be maintained.

8.4.3 Fire safety officials should ensure suitable inspections are carried out during construction and prior to occupation to ensure compliance.

9 Pre-fire planning and risk visits

9.1 Pre-fire planning

A formal pre-fire plan should be available for key special risks and other premises as deemed necessary by brigade management. Accurate records should be kept of the latest revisions and details of emergency exercises involving the brigade

9.2 Risk visits

Risk visits to all special risk areas and other specific industrial or commercial risk areas scheduled by brigades should be conducted by operational staff for familiarisation purposes with regard to the layout of the premises, processes or contents and fire protection features. Risk visits should be a planned function with accurate records of visits conducted and staff involved.

10 Occupational health and safety

10.1 Every fire brigade should implement a suitable occupational health and safety programme in accordance with NFPA 1500.

10.2 The programme should include the following written policy to provide a safe and healthy work environment for all its members including:

a) vehicle/appliance design/maintenance;

b) health and safety education programme;

c) protective clothing/equipment requirements;

d) emergency operations; and

e) fire station facilities.

10.3 Every brigade shall fully meet the needs of the Occupational Health and Safety Act (Act 85 of 1993) and NFPA 1500.

11 Water supply

11.1 General

11.1.1 The supply from reservoirs should be so reticulated that the supply to any area can normally be served from more than one direction.

11.1.2 Quantities available should be based on the highest average daily consumption plus the required fire flow and shall be sustainable for the minimum duration period.

11.1.3 The following should be taken into consideration when doing an assessment of the water supply potential of an area:

a) quantities available;

b) sources of supply (including emergency arrangements);

c) minimum residual pressure;

d) reticulation components including pumps, filters and piping systems; and

e) type, size, distribution and availability of hydrants.

11.2 Highest daily consumption

The average of the highest daily consumptions should be recorded over the last three years in L/min.

11.3 Fire flow

11.3.1 The fire flow and the duration of such flow should be at least equal to that given in table 8 for the appropriate category of risk area.

Table 8 — Minimum fire flow

1	2	3
Risk category	**Possible fire sizes**	**Flow in** L/min
A	Non-residential buildings with divisions not greater than 5000 m².	13 000
B	Non-residential buildings having divisions not greater than 2 500 m².	9 000
C	Non- residential premises not greater than 1 250 m².	6 000
D1 D2 D3 D4	Houses > 30 m apart. Houses 10,1 m to 30 m apart. Houses 3 m – 10 m apart Houses < 3 m apart	1 900 2 850 3 800 5 700
E	As determined by risk assessment.	

11.3.2 Fire flows shall include mobile/alternative supplies available within the required attendance time.

NOTE Fire flows are based on possible division sizes for occupancies as described in SANS 10400.

11.4 Delivery of fire flow

11.4.1 The required fire flow should be available to the fire-fighting team on arrival at the fire.

11.4.2 Close liaison between the water supply authority and the fire service should be maintained at all times so that the water department can assist by augmenting the water supply to the scene of the fire if a fire occurs during a period of peak domestic demand or there is any other factor that may decrease the supply.

11.4.3 The minimum quantity of water available should be based on the highest daily consumption plus the required fire flow and must be sustainable for the minimum duration period at the required residual pressure.

The supply requirements should be calculated in accordance with the following formula:

$$SR = \frac{(FF + HDC) \times D}{1\ 000}$$

where

SR is the supply requirement expressed in cubic meter (m^3)

FF is the required fire flow in relation to risk as given in 11.3

HDC is the highest daily consumption as given in 11.2

D is the duration

11.4.4 When the duration is up to and includes 6 000 L/min, the minimum duration shall be 2 h.

11.4.5 When the duration is greater than 6 000 L/min, minimum duration shall be 4 h.

11.5 Hydrants

11.5.1 The minimum flow required from each hydrant and the maximum spacing of hydrants should be as given in table 9 for the different risk zones.

Table 9 — Hydrants flow and spacing

1	2	3
Risk category	**Minimum hydrant flow** L/min	**Max. distance between hydrants** m
A	2 000	85
B	2 000	120
C	2 000	200
D1 (Houses > 30 m apart) D2 (Houses 10,1 m – 30 m apart) D3 (Houses 3 m – 10 m apart) D4 (Houses < 3 m apart)	1 200 1 200 1 400 2 000	300 200 200 200

11.5.2 Authority having jurisdiction shall ensure that hydrants are serviced (and the flow measured for conformity with table 8) at intervals as given in table 10 and shall include the following:

a) hydrant markings in accordance with NFPA 291;

b) positions as indicated on water reticulation drawings;

c) hydrant serviceability including condition, access and operation;

d) individual flow and pressure tests; and

e) availability of suitable accurate records.

11.5.3 The location of hydrants should be adequately indicated.

Table 10 — Hydrant maintenance intervals

1	2
Risk category	**Interval**
A & E	Annually
B	Biennially
C & D	Triennially

12 Key performance indicators (KPI)

KPI's enable a service to evaluate and monitor actual service delivery levels on a regular basis in relation to set standards and objectives. Individual brigade KPI's will also be evaluated on an annual basis to monitor standards in relation to this document and to motivate adjustments to ratings where necessary. Performance indicators guidelines are given in table 11.

Table 11 — KPI guidelines

1	2
Element	**Relevant specimen form**[a]
Brigade statistics – call attended by type, time etc	B.1, B2
Weight and speed of response – manning levels – attendance times – PDA's	Table A. 1
Call receipt and processing – call receipt and despatch times – ratio of calls to operators	
Vehicle/equipment availability – age and condition of fleet – failure/breakdown rate	B. 6
Training – initial training (courses conducted, attended etc. – continuation training in relation to requirements	B. 7
Risk visits/pre-fire planning – statistics regarding visits/pre-plans/emergency exercises conducted – performance in relation to listed risks and frequency of visits	B. 8
Hydrant inspection – statistics regarding number of inspections – performance in relation to objectives	B. 9
Fire safety division – statistics for division regarding plans reviewed, inspections conducted, etc. – performance in relation to objectives for inspections	B. 10
[a] Specimen forms are given in annex B.	

Annex A
(normative)

Assessment schedule

Table A.1 — Assessment schedule

1	2	3	4
	YES	**NO**	**Comment**
1 Risk profile of area of jurisdiction			
1.1 Map of area protected showing risk categories of developed areas.			
1.2 Summary of area of jurisdiction in km² depicting total area developed area (incl. summary of risk categories) undeveloped area.			
1.3 Population estimate for area.			
1.4 Special risks identified and listed.			
2 Weight and speed of response			
2.1 Predetermined attendance policy meets or exceeds minimum requirements as given in table 1.			
2.2 Attendance time policy meets or exceeds minimum requirements as given in table 1.			
Sufficient appliances/manpower available and siting of fire stations appropriate to meet pre-determined attendance and attendance time requirements.			
Review			
i) Map of area showing risk categories and siting of stations.			
ii) Suitable brigade/station establishment in relation to number of stations, vehicles required and shift system in operation as given in C.1 attached.			
3 Call receipt and processing requirements			
3.1 Suitable facilities/resources available including telephone lines available as given in table 4 and 5.2.3.2 supervisory staff as given in 5.2.3.3 alarm/call out facilities to despatch staff voice logging facility for emergency lines and radios trouble signal facilities.			
4 Vehicle/equipment availability and maintenance			
4.1 Vehicles suited to risk protected and in sound operational condition. Fleet age maximum as given in table 5 and form 4.1 attached.			
4.2 Planned vehicle replacement policy adopted and in operation.			
4.3 Are vehicle maintenance/service requirements scheduled, carried out and adequately documented?			
4.4 Are suitable routine daily vehicle checks carried out and documented?			
4.5 Are standard tests scheduled and carried out for pumps, aerial platforms and ladders as given by manufacturers recommendations (at least on acceptance, quarterly and/or annually) and records available?			
4.6 Are vehicles suitably equipped in relation to risk protected?			
4.7 Is suitable equipment replacement policy in place?			
4.8 Is equipment inspection, test and maintenance provisions as given in 5.3.6 in operation and records available?			

Table A.1 *(continued)*

1	2	3	4
	YES	**NO**	**Comment**
5 Incident management system (IMS)			
5.1 Policy			
5.1.1 Is the Department's policy with regard to Incident management clearly stated?			
5.1.2 Is it documented?			
5.1.3 Are personnel familiar with the policy?			
5.1.4 Is the policy document available to all staff?			
5.2 Incident management procedure			
5.2.1 Is the Department's Incident Management System documented in a suitable procedure?			
5.2.2 If 'Yes' to 5.2.1 above, does it make provision for:			
a) operational objectives;			
b) command modes;			
c) incident management structures;			
d) responsibilities of command;			
e) inter-service co-operation;			
f) communications;			
g) staging;			
h) zoning of incidents;			
i) rehabilitation of personnel;			
j) tactical worksheets; and			
k) incident termination?			
5.2.3 is the document available to all personnel within the department?			
5.2.4 Are departmental personnel trained in the application of the incident management system?			
If 'Yes' Are records of training presented available? Is personnel assessed in the application of the procedure? Are evaluation records available? Are exercises conducted using the procedure? Do "external" emergency services anticipate in exercises? Are exercise debriefings conducted?			
5.3 Are strategies for the control of specific incident types documented as procedures, available to all personnel and practised as part of the continuation of training programme?			
5.4 System review amended as part of operational incident review to ensure system appropriately applied, to identify weaknesses and motivate improvements.			
5.5 Communications infrastructure.			
5.5.1 Does the service operate a radio communications system which is utilised for Incident management purposes?			
5.5.2 Is radio procedure documented?			
6 Pre-fire planning and risk visits			
6.1 List of key special risks available as deemed necessary by brigade management (List adequate in relation to risks).			
6.2 Individual pre-fire plans and records of exercises available.			
6.3 Planning and records of risk visits conducted by operational staff available and adequate .			

Table A.1 (*continued*)

1	2	3	4
	YES	**NO**	**Comment**
7 Training/Personnel			
7.1 Is personnel selection, appointment and advancement criteria (including qualifications/ experience requirements) available, practised and suited to brigade profile?			
7.2 Is suitable identification of needs and provision for the following training phases for fire-fighters/officers as given in 6.3: initial training, continuation of training, conversion training met?			
7.3 Are detailed records available for training attended/conducted by subject and staff member?			
7.4 Are minimum requirements as given in table 7 suitably met?			
8 Occupational health and safety			
8.1 Is suitable system in place to provide for a safe and healthy work environment including:			
a) vehicles/appliances including design;			
b) protective clothing/equipment;			
c) emergency operations;			
d) fire station facilities; and			
e) health and safety education programme?			
8.2 Are relevant requirements of the Occupational Health and Safety Act addressed?			
9 Water supplies			
9.1 Evaluation of supply with regards to quantities available in relation to minimum requirements and system reliability by water authority for each risk category as given in 11.1 to 11.4 inclusive and attached C.2 by building/site owner or occupier of individual sites for special risks where quantities and fire flows in excess of 4.8.1 are required as given is C.3.			
9.2 Fire flow requirements verified as given in C.3 by either			
a) evaluation of water supply and hydraulic calculations by registered engineer; or			
b) actual output test.			
9.3 Hydrant flows, residual pressure and spacing as given in 11.5.1 and table 9.			
9.4 Hydrant maintenance functions and intervals as given in 11.5.2 and table 10.			
10 Fire safety functions			
10.1 Is there an established fire safety division capable of performing the following core activities adequately:			
a) building plan and fire design review;			
b) regulation of flammable and hazardous activities/installations; and			
c) inspections?			
10.2 Is there a suitable documented system in place for the evaluation of building proposals in accordance with the SANS 10400 and rational designs including:			
a) records of plans/designs received;			
b) results of review; and			
c) inspections carried out to ensure compliance?			

Table A.1(*concluded*)

1	2	3	4
	YES	**NO**	**Comment**
10 Fire safety functions (*concluded*)			
10.3 Are the following inspections planned, carried out and recorded as necessary as given in 8.2 and the following:			
a) in response to complaints;			
b) to assist owners, occupiers and developers in satisfying legal requirements;			
c) routine inspections of occupancies other than dwellings;			
d) others as in given applicable by-laws or other relevant legislation?			
10.4 Are flammable and hazardous substances regulated and controlled as given in 8.3?			
10.5 Does the service have:			
a) sufficient trained, qualified and experienced staff to fulfil the fire safety programme requirements and to meet expected work loads; and			
b) are by-laws to regulate the control, storage and transportation of flammable and hazardous substances enforced?			
11 Key performance indicators (KPI)			
Are suitable key performance indicators as listed in annex B available for the last 12 month period?			

Annex B
(informative)

Key performance indicators specimen forms

B.1 Monthly record of fires attended by emergency services for statistical purposes

Emergency service: . . . . . .

Date: . . . . . .

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Code	Occupancy or property	Probable cause													Sprinkler performance		
		Smoking	Elec. faults	Open flames	Cooking	Heating	Welding and cutting	Lightning	Arson	Undeter-mined	Other (specify)	Number of fires	Number of fatalities	Estimated damages	Number of protected premises	Systems	Result
	Residential:																
1	Formal																
2	Informal																
3	Flats																
4	Hotels and boarding houses																
	Institutional:																
5	Hospitals and nursing homes																
6	Educational establishments																
	Public assembly:																
7	Churches and halls																
8	Cinemas and theatres																
9	Museums, libraries, art galleries																
10	Night clubs and dance halls																
	Commercial:																
11	Restaurant and cafes																
12	Offices																

Table B.1 (*continued*)

Emergency service: . . . . . .

Date: . . . . . .

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Code	Occupancy or property	Probable cause													Sprinkler performance		
		Smoking	Elec. faults	Open flames	Cooking	Heating	Welding and cutting	Lightning	Arson	Undeter-mined	Other (specify)	Number of fires	Number of fatalities	Estimated damages	Number of protected premises	Systems	Result
	Commercial (*concluded*):																
13	Shops																
14	Department stores																
15	Garages and workshops																
	Storage:																
16	Warehouses																
17	Outside storage																
	Industry:																
18	Furniture																
19	Plastics and rubber																
20	Textile																
21	Printing																
22	Milling																
23	Petroleum																
24	Food and drink																
25	Paper and packaging																
26	Chemical																

Emergency service: . . . . . .

Date: . . . . . .

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Code	Occupancy or property	Probable cause													Sprinkler performance		
		Smoking	Elec. faults	Open flames	Cooking	Heating	Welding and cutting	Lightning	Arson	Undeter-mined	Other (specify)	Number of fires	Number of fatalities	Estimated damages	Number of protected premises	Systems	Result
	Industry: (*concluded*)																
27	Metal																
28	Electronics																
29	Mines (surface)																
30	**Utilities:**																
	Transport:																
31	Cars, motorcycles																
32	Buses																
33	Heavy goods vehicles																
34	Ships																
35	Trains																
36	Aircraft																
	Other:																
37	Rubbish, grass and bush																
38	Plantations and forests																
39	Agricultural																
40	Miscellaneous fires																
	Totals																

B.2 Fire information report form

Fire service:			Date of fire:			Time of call: .....
Description of premises:						
Nature of occupancy:			Where fire started:			
Material first ignited:			Source of ignition:			
Automatic systems operated and result:						
Extinguished before or after arrival:			**Fire extinguished by (state number and type)**			
			Extinguishers	Hose - reels	Large diameter hose	Other .....
	Adults	**Children**		**Adults**		**Children**
Fatalities	Male ..... Female		Serious injuries	Male	Female	
Extent of damage:			Approximate loss	Contents: R		
				Building: R		
Other comments:						
Date:			Name:			Signature: .....

B.3 Vehicle availability

1	2	3	4	5	6
Appliance type	**Min No. required per day**	**Actual number on the run per day**	**No. of days min required met**	**Days in a month**	**% of days required met**
1 Major pumps (3 800 L/m or more)					
2 Medium pumps (1 800 L/m - 3 850 L/min)					
3 Other appliances as given in PDA's for special risks:					
• Aerial appliances					
•					
•					

B.4 Driver availability

Month:						
1	2	3	4	5	6	7
Day	**Minimum number of drivers required per shift**	**Actual available per shift Total**				
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						
13						
14						
15						
16						
17						
18						
19						
20						
21						
22						
23						
24						
25						
26						
27						
28						
29						
30						
31						
% required met:			% required not met:			

B.5 Actual performance

Month: .....

Risk category travel	PDA requirements				Number of fires	Number and % requirements met							
	Appliance	Manning levels	Call Reg. Proc	Appl. travel time		Appliances		Manning levels		Call Rec. Proc		Appliance time	
						No	%	No	%	No	%	No	%
A B C D													
Specific risks (state)													

B.6 Appliance age and condition (all vehicles forming part of PDA including special risks)

B.6.1 Vehicles details

Type	Reg. No.	Model	Condition			Age	Comment
			Poor	Good	V. good		

Year: .....

B.6.2 Vehicle summary

Appliances	Total number	Number < 15 years old	Number > 15 years old	Average age in years	Overall fleet condition
1 Pumping appliance					
2 Aerial appliance					
3 Special appliance					

B.6.3 Reserve appliances

Pumping appliances: Number available: .....

Availability as percentage of front line fleet: .....

Aerial appliances: Has fleet been reduced by more than one in last 12 month period?:

YES	NO

B.6.4 Details of vehicles off the run where no replacement vehicle available

Vehicle type	Duration of the run where no replacement available

B.7 Training requirements

Year: .....

B.7.1 Initial training

Number of recruits appointed and in service	Number completed basic training	% still requiring basic training

B.7.2 Continuation of training for operational fire-fighters and officers

B.7.2.1 Full/part time staff

Number of fire-fighters/officers in service	Number who received 2 hrs per shift or more training	% that received less than 2 hrs per shift training

B.7.2.2 Volunteers/recruits

Number of volunteers/recruits in service	Number who received 4 hours a month or more training	% that received less than 4 hours a month training

B.8 Pre-fire plans and risk visits

Year: .....

B.8.1 Pre-fire plans

B.8.1.1 Total number of pre-fire plans available .....

B.8.1.2 Number renewed or updated .....

B.8.1.3 Number of emergency exercise scheduled .....

Number of emergency exercises held .....

Number held as percentage of number scheduled .....

B.8.2 Risk visits

B.8.2.1 Total number scheduled .....

B.8.2.2 Number of risk visits conducted .....

B.8.2.3 Number conducted as percentage of number scheduled .....

B.8.3 Pre-fire plan review and exercise frequency

.....

.....

B.8.4 Risk visit policy including frequency

.....

.....

B.9 Hydrant inspection

Year: .....

1	2	3	4	5	6
Risk category	**Inspection interval**	**Total number in risk category area**	**Number due for inspection in year in review**	**Actual number inspected**	**% overdue for inspection**
A	Annual				
E	Annual				
B	Biannual				
C and D	Triannual				
Total					

B.10 Fire safety functions

Year: .....

B.10.1 Statistics

B.10.1.1 Building plans

Number of plans reviewed: .....

Number of rational design reviewed: .....

Total: .....

B.10.1.2 Inspections

Occupancy clearance inspections conducted: .....

Flammable liquid/gas permit inspection (including vehicles): .....

Inspections in response to complaints: .....

Routine inspections conducted: .....

Dangerous goods: .....

Other (state): .....

B.10.2 Performance in relation to inspection policy

Total number of inspections planned for year to meet inspection policy	Actual number conducted	Actual number as percentage of total number

Annex C
(informative)

Assessment schedule forms

C.1 Appliance/manpower assessment

C.1.1 Fire stations

Total number required to meet speed of response	Actual number

C.1.2 Weight of response

C.1.2.1 Required per shift

Risk category	Number of appliances required to meet weight of response	X	Required manning lever per appliance	=	Total drivers required	Comment
A		X		=		
B		X		=		
C		X		=		
D		X		=		
Total		X		=		
E	Evaluate individual as given in PDA requirements					

C.1.2.2 Actual per shift

Risk category	Number of appliances required to meet weight of response	X	Required manning lever per appliance	=	Total drivers required	Comment
A		X		=		
B		X		=		
C		X		=		
D		X		=		
Total		X		=		
E	Evaluate individual as given in PDA requirements					

NOTE Attach detailed organogram.

C.2 Water supply evaluation — general risk category areas

(TO BE COMPLETED BY WATER SUPPLY AUTHORITY)

C.2.1 Minimum quantity available

a) Calculate highest daily consumption as given in 11.2

b) Calculate minimum supply storage requirements for each risk category as given in 11.4.3 and evaluate sources available and reliability.

Minimum supply storage requirements met or exceeded and supply system reliable

YES	NO

C.2.2 Water supply reliability and sustainability

a) **Option 1 — Assessment by registered engineer**

Evaluate reticulation system in relation to risk profile map prepared by brigade including reliability and sustainability with particular attention to:

1) reticulation components including pumps, filters and piping systems,

2) ability to deliver required flow in each risk category area, fire flow plus highest daily consumption for area, and

3) minimum residual pressure of 200 kPa available type, size and distribution of hydrants as given in (d) overleaf.

Is supply in each risk category area able to supply and maintain requirements as given in duration times:

YES	NO

If "NO" give details

.....
.....
.....
.....
.....

NOTE Assessment to be conducted by registered engineer and include hydraulic calculations.

b) **Option 2 — Fire flow test**

1) Using risk category map, select a test point in each risk category area

2) Drawing from hydrant supply, test ability of system to supply fire flow as given in requirements and in clause 11.3 of evaluation document.

Test point location	No. of hydrants used	Result	Test point location	No. of hydrants used	Results

C.2.3 Fire flow test data

Choose closest hydrants to test point subject to the following maximums

Risk category	Maximum No. hydrants
A	6
C	4
D and E	3
	as available in relation to supply requirements

C.2.4 Pump output guide

Select an appropriate number of suitably sized nozzles in relation to rated output of pump (see examples below)

Nozzle size in mm	Approximate discharge L/min at 5,50 kPa
15	400
20	625
25	975
30	1 400

C.3 Water supply evaluation — special risks

To be completed by emergency service/client with input from registered engineer for fire flows exceeding requirements for surrounding predominant risk.

C.3.1 Fire flow requirement

State needs based on construction, contents, demand for fixed installations, hydrants etc. Details:

.....
.....
.....
.....
.....

C.3.2 Quantity of water available

Total ..... m^3

Duration that fire flow can be sustained ..... h.

C.3.3 Water reticulation system

System evaluated with regard to adequacy, reliability and ability to supply required flows to specific risk areas with particular attention to:

a) pumps and control panel;

b) piping system including sectional valves; and

c) hydrant outlet (distribution, flows/pressure tests, inspection).

Fixed installations such as sprinklers, water sprays etc. (adequately, designed, installed and maintained)

System evaluated in relation to the above and adequate.

YES	NO

If "NO" give details

.....
.....
.....
.....
.....

Name: ..... Signature: ..... Date: .....

Bibliography

FPA: Evaluation criteria for the classification of fire brigades.