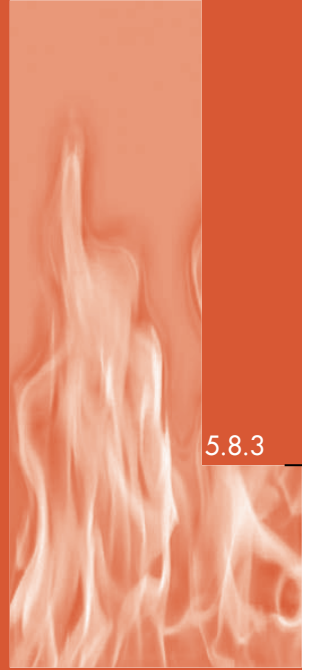


Fire safety



5.8.3

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INTRODUCTION

As more and more people congregate closer and closer together in settlements as urbanisation increases, risks associated with fire increase. In the case of more formal settlements, the National Building Regulations, SABS 0400-1990 Part T, first published in 1987, control fire safety in buildings, considerably limiting the incidence and spread of fires in formal areas, as well as the damage caused by fires. It is in the case of more informal settlements, where fires have more recently had devastating effects on life, shelter, livelihood and possessions. By their very nature, informal settlements are more susceptible to fire hazard due to:

- high building and occupancy densities with limited open areas between units;
- a lack of - or limited - electricity services (necessitating the use of flammable fuels and open-flame cooking and lighting);
- the use of combustibile building materials;
- poor structural stability;
- poor road surfaces unable to carry fire-fighting equipment;
- the lack of sufficient on-site water; and
- often, the settlements' location in flat, wind-swept areas.

During the two-year period from 1 September 1994 to 30 September 1996, a public media search by the Institute for Contemporary History at the University of the Orange Free State, revealed a total of 39 fires having occurred in informal settlements throughout South Africa, causing 31 deaths, destroying almost 4 000 informal dwellings and leaving nearly 20 000 people homeless (CSIR, 1996). Of the fires, 45% had been deliberately started, 8% were accidental and in the remaining 35%, the cause was undetermined. Weather conditions, particularly dry and windy conditions, played a role in 40% of the fires. From the limited statistics available, it is obvious that fire safety should be a crucial element of settlement planning and design. Fires, whether accidental or malicious, will always be a factor with which any community has to contend. The focus of the guidelines is therefore on how to limit their extent and impact on the community by means of layout planning and design.

PURPOSE OF THIS SUB-CHAPTER

Although layout planning and design is only one of a number of measures which can be taken to contribute to fire safety in settlements, the purpose of this section is to bring about an awareness of fire safety in

settlement planning and design, and to make explicit the settlement layout considerations that can reduce the incidence, spread and damaging consequences of fires. Fire-safety issues are inherent to other parts of the guidelines. Specific aspects pertaining to fire safety in terms of emergency balancing requirements are included in Chapter 8 (water supply). Many of the specific guidelines relating to the provision of hard and soft open spaces (5.3 and 5.4), movement networks (5.1), subdivision (stand size) (5.6), and the location of public facilities and utilities (5.5 and 5.7) implicitly support and enhance fire safety in settlements. This fire safety section attempts to introduce fire safety as a cross-cutting issue, worthy of receiving pertinent attention in a range of settlement dimensions in its own right.

THE PROBLEM

The problem of fire in human settlements can be disaggregated into:

- cause of the fire;
- spread of the fire;
- escape from the fire; and
- fire-fighting.

Fire in human settlements is caused predominantly accidentally, usually in relation to the use of various fuel types for open-flame cooking, lighting and heating, but also deliberately as public violence and arson. Fire-safety education and law and order can be the major factors in reducing the causes of fires. Settlement planning and design would not play a major role in limiting the incidence of fires other than in introducing fire safety as an issue in the participation process.

Once a fire has begun, its spread is influenced by natural factors such as wind and topography. In hilly areas, settlements tend to be more dispersed, reducing the spread of fire, but high wind speeds can exacerbate its spread. Building density (in relation to the distances between buildings and groups of buildings), the use of combustibile building materials for wall and roofs, and structural instability, all have a considerable influence on the spread of fire and one's ability to escape.

The ability to fight the fire depends on access to sufficient water, and access routes for fire-fighting equipment and vehicles.

Settlement planning and design has limited influence on reducing the incidence of fire, but can significantly affect its subsequent spread, one's ability to escape from the fire, and the fighting of the fire.

PRINCIPLES OF FIRE SAFETY

The aims of implementing measures to limit the incidence and spread of fires are:

- to ensure the safety of people, minimising loss of life and injury;
- to minimise loss of - and damage to - property and possessions; and
- to minimise the negative impact on the environment.

EXISTING REQUIREMENTS

Existing formal requirements in terms of laws and guidelines relate predominantly to buildings, and include requirements of buildings in relation to each other. This has implications for layout planning and design. Also, principles applicable at the building level can be applied and adapted to the layout level. Where appropriate, existing requirements are incorporated into the guidelines presented below.

Requirements in terms of SABS 0400:1990 formal legislation for buildings

All buildings erected within the boundaries of the RSA, from a fire safety point of view, should comply with Part T, Fire Protection, of SABS 0400:1990 - The application of the National Building Regulations. The following requirements from sub-paragraph (1) of the general requirements of Regulation T1 are appropriate to, and can be adapted for, settlement planning and design:

- Any building shall be so designed, constructed and equipped that in case of fire:
 - the protection of occupants or users therein is ensured and that provision is made for the safe evacuation of such occupants or users;
 - the spread and intensity of such fire within such building and the spread of fire to any other building will be minimised; and
 - adequate means of access, and equipment for detecting, fighting, controlling and extinguishing such fire, are provided.

Agrément Certification and MANTAG

The minimum fire safety requirements for a building in terms of **Agrément Certification** conform to the requirements stipulated in Regulation T1, SABS 0400, and are intended mainly for more formal developments. MANTAG (Minimum Agrément Norms Technical Advisory Guide 1993) guidelines, on the

other hand, are mainly intended for informal developments to establish some degree of fire safety. The MANTAG guidelines appropriate to settlement planning and design relate to minimum safety distances between any building and the lateral or rear boundary of the site or, where there are two or more buildings on a site, the distance between each building and a notional boundary line between them. Minimum safety distances are determined according to the following:

- The fire resistance of walls: If a wall has a fire resistance of at least 30 minutes, with no openings, there are no requirements for safety distance. Fire resistance is measured in terms of structural stability, structural integrity and insulation. Stability refers to the ability to remain standing without collapse. Integrity refers to the ability to remain intact and not move and buckle to create openings through which flames can escape. Insulation relates to the ability to either contain the fire within the building and not to ignite any material outside, or to insulate what is inside the building from being ignited by a fire outside.
- The combustibility of wall and roof material: The higher the combustibility of the material, the greater the safety distance required.
- The area of openings in the wall facing a particular boundary: As the area of wall covered by openings increases, so the safety distance requirements increase.
- The wall area facing a particular boundary: A wall area of less than 7,5 m², with no openings, has no distance safety requirements.
- The size of groups of dwellings - if dwellings are in groups of 20 or less, this effectively means that the spread of the fire is limited to 20 units at a time, and the safety distance between the buildings can be reduced.

GUIDELINES FOR FIRE SAFETY

Create awareness of fire safety during the stakeholder participation process

- Provide education regarding fire safety in the use of open flames for cooking and lighting.
- Promote the choice of electricity within limits of affordability during trade-off debates in the participation process.

- Introduce the concept of watch towers for early warning, which could be operated by the community and could simultaneously fulfil a number of other uses, such as crime prevention.

space network which is linked to the road network at some point; or

- 90 m of a paved road.

Ensure adequate space between groups of buildings to limit the spread of fire, to provide escape and to provide access for fire-fighting equipment

- Ensure that there are fire breaks between groups of units, which can correspond to hard or soft open spaces or movement networks. The amount of space is dependant on local weather and the topography - in windswept, flat areas, more space is required and open spaces should be downwind of the prevailing wind direction.
- Heavy fire-fighting tanker vehicles can move only along paved surfaces, but usually have fire-fighting teams capable of handling 90 m of hose, whereas smaller-terrain vehicles carry less water and have 30 m hoses, but can negotiate unpaved surfaces (gravel roads or well-maintained and clear hard or soft open spaces, including servitudes). Where regularly spaced fire hydrants are not provided, each building should be within
 - 30 m of a gravel road or a maintained open

Ensure adequate space between individual buildings to reduce the spread of fire

- Decisions regarding stand size and arrangement, and the relationship between stand size, coverage and housing type should take into consideration minimum safety distance guidelines.
- Minimum safety distance guidelines based on MANTAG requirements, but applicable to all development types, are as follows:
 - In the case of both non-combustible and combustible externally cladded walls with a fire resistance where at least the stability and integrity are greater than 30 minutes, the minimum safety distance is according to the size of the opening (Table 5.8.3.1). In the case of combustible walls, the entire wall area is considered as an “opening” and the recommended safety distance can be read off Table 5.8.3.1 accordingly.

Table 5.8.3.1: Safety distance recommendations for combustible and non-combustible walls in relation to size of wall opening

FIRE RESISTANCE OF WALL	AREA (m ²) OF WALL “OPENING”	MINIMUM BOUNDARY DISTANCE (m)	MINIMUM DISTANCE BETWEEN BUILDINGS (m)	
High (stability and integrity at least or > 30 minutes)	No opening, but with wall area of > 7,5 m ²	No requirement	No requirement	
	No opening, but with wall area of < 7,5 m ²	< 5	0,5	1,0
		5	1,0	2,0
		7,5	1,5	3,0
		10	2,0	4,0
		30	2,4	4,8
		50+	3,8	7,6
				4,5
Low (stability and integrity either or both < 30 minutes)	Not relevant	4,5	9,0	
Low, but where units are in groups of less than 20	Not relevant	2,0	4,0	
High or low, but with combustible roof (e.g. thatch)	Not relevant	4,5	9,0	

- In the case of both non-combustible walls, combustible walls with external cladding, and combustible roofs (e.g. thatch), even if walls are non-combustible, where fire resistance is low (i.e. either integrity or stability or both are less than 30 minutes), the minimum safety distance from wall (or roof edge in the case of combustible roofs) to boundary must be 4,5 m, or there should be 9 m between buildings (Table 5.8.3.1).

The maximum safety distance of 4,5 m from wall to boundary or 9 m between buildings can be reduced to 2 m from wall to boundary or 4 m between buildings, where dwellings units are in groups of less than 20 units.

- Where space is at a premium, an option is that walls, possibly containing internal services, with a fire resistance of at least 60 minutes, could be erected as a common wall on the boundaries, which would mean that no safety distance between buildings would be required. Higher densities could thus be facilitated without compromising fire safety, although there are cost implications.

Land-use arrangements

- Consider the location of watch towers at strategic places in the settlement. These would involve
 - an early warning system to alert inhabitants of the occurrence to facilitate escape and rescue of possessions; and
 - an early warning system to alert fire-fighters.
- Locate “valuable” community facilities along major movement networks so that the areas can be easily accessed by heavy fire-fighting equipment. As a minimum, provide water utilities along these routes.

Adequate water provision

Refer to the relevant provisions of Chapter 8.

BIBLIOGRAPHY

CSIR, Division of Building Technology (1996). *Fire safety in informal settlements*. Interim internal report. Project No BF 041/002.

MANTAG 1993: MANTAG criteria. Booklet B2. Agrément South Africa: Pretoria.