

RWANDA
STANDARD

DRS
186-1

Second edition

**Code of practice for fire safety
of building —**

Part 1:

**General principles of fire grading and
classification**

Reference number

DRS 186-1: 2018

FOR PUBLIC COMMENTS

In order to match with technological development and to keep continuous progress in industries, Standards are subject to periodic review. Users shall ascertain that they are in possession of the latest edition

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Foreword

Rwanda Standards are prepared by Technical Committees and approved by Rwanda Standards Board (RSB) Board of Directors in accordance with the procedures of RSB, in compliance with Annex 3 of the WTO/TBT agreement on the preparation, adoption and application of standards.

The main task of technical committees is to prepare national standards. Final Draft Rwanda Standards adopted by Technical committees are ratified by members of RSB Board of Directors for publication and gazettment as Rwanda Standards.

DRS 186-1 was prepared by Technical Committee RSB/TC 28, Fire safety.

In the preparation of this standard, reference was made to the following standard:

IS 1641:1988; *Code of practice for Fire Safety of Buildings (General): General Principles of Fire Grading and Classification*

The assistance delivered from the above source is hereby acknowledged with thanks.

This second edition cancels and replaces the first edition (RS 186-1: 2013) of which has been technically revised.

DRS 186 consists of the following parts, under the general title Code of practice for fire safety of building:

- *Part 1: General principles of fire grading and classification*
- *Part 2: Details of Construction*
- *Part 3: Fire Safety in public buildings*
- *Part 4: Selection, installation and maintenance of automatic fire detection and alarm system*
- *Part 5: Exit requirements and personal hazard*

Committee membership

The following organizations were represented on the Technical Committee on Fire Safety (RSB/TC 28) in the preparation of this standard.

City of Kigali

College of Science and Technology

CABLELINE

Energy Utility Corporation Limited

ELECTRICOM

ISCO

Institute of Engineers Rwanda

Ministry of Disaster Management and Refugees

Ministry of Infrastructure

Rwanda Housing Authority (RHA)

Rwanda Motor Ltd

Rwanda National Police

REAL

Société Rwandaise d'Assurance (SONARWA)

SONATUBES

Rwanda Standards Board (RSB) - Secretariat

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Code of practice for fire safety of building — Part 1: General principles of grading and classification

1 Scope

This standard covers the general principles of fire grading of buildings and classification according to the use or the character of occupancy.

2 Terms and definitions

For the purposes of this document, the terms and definitions given in RS ISO 13943, RS ISO 23932 and the following apply.

3.1

building element

integral part of a built environment

Note 1 to entry: This includes floors, walls, beams, columns, doors, and penetrations, but does not include contents.

3.2

function

role and actions assigned to, or required or expected of, various parts of a structure to achieve a specified objective or task

3.3

load-bearing element

building element that is designed to resist mechanical actions

3.4

mechanical actions

defined force impacts on other elements due to strain or stress redistribution within a structure, or part of a structure, in fire

3.5

non-load-bearing element

building element that is not designed to resist mechanical actions besides its own weight

3.6

reliability

ability of a structure or structural element to fulfil the specific requirements, including working life, for which it has been designed

3.7

structure

assembly of materials forming a construction for occupancy or use to serve a specific purpose

Note 1 to entry: This includes, but is not limited to, buildings, open platforms, bridges, roof assemblies over open storage or process areas, tents, air-supported structures, and grand stands.

3.8

structural fire performance

extent to which a structure or structural element fulfils the specific requirements, including working life, for which it has been designed, when exposed to fire for a given time

3.9

thermal actions

description of the variation of temperatures or heat fluxes as a function of time in an enclosure

Note 1 to entry: These temperatures or heat fluxes depend on fire load density, fuel arrangement, geometry of and openings within the enclosure.

3.10

Public building

Building intended to be used by many people because of various activities carried out therein

3.11

Flammable material

Solid, liquids or gases that can burn easily and harm people, other than living organisms, property or the environment

3 Fire load;

2.1 Fire load is the amount of heat in kilocalories which is liberated per square meter of floor area of a compartment by the combustion of the contents of the building itself. This amount of heat is used as the basis for classification of occupancies.

2.2 The fire load is determined by multiplying the weight of all combustible materials by their calorific value and dividing the figure by the floor area under consideration.

2.3 Different materials having the same weight and same calorific value may present different hazards on account of their other properties, such as ease of ignition; speed of burning, and liberation of heat and fumes. Thus, some materials are more readily ignited than other, again, some burn more rapidly than others, some materials when heated on fire liberate dangerous fumes, and some may readily cause ignition of other materials.

2.4 The content of a building are rarely distributed uniformly over the whole floor area. From the fire protection point, it would be undesirable to have all combustible material concentrated on a fraction of the floor area, as the average taken over the whole area would not give a true representation of the actual conditions, and the resulting effects on the structure immediately surrounding would be out of all proportion to these expected on the basis of average fire load.

4 Classification of buildings

4.1 Classification by occupancy

All buildings should be classified, according to the use or the character of occupancy in one of the following groups and shall be described as in table below:

Table 1-Use and occupancy classification

Group	Classification	Sub Group	Description
A	ASSEMBLY	A-1, A-2, A-3, A-4, A-5	These shall include any building or part of a building, where number of persons not less than 50 congregate or gather for amusement, recreation, social, religious, patriotic, civil, travel and similar purposes, for example, theatres, motion picture houses, assembly halls, auditoria, exhibition halls, museums, gymnasiums, restaurants, places of worship, dance halls, club rooms, passenger stations and airports, surface and marine public transportation services, recreation piers and stadia, etc.
		A-1 - Entertainment and public assembly	Occupancy where persons gather to eat, drink, dance or participation other recreation
		A-2 - Theatrical	Occupancy where persons gather for the

		and indoor sport	viewing of theatrical, operatic, orchestral, choral, cinematographically or sport performance
		A-3 - Places of instruction	Occupancy where school children, students or other persons assemble for the purpose of tuition or learning
		A-4 - Worship;	Occupancy where persons assemble for the purpose of worshipping
		A-5 - Outdoor sport;	Occupancy where persons view outdoor sports events
B –	BUSINESS (COMMERCE)		Occupancy where transaction of business of non-industrial process is carried out. Example of use of the building or structure, or a portion may include;- office, professional or service-type transactions, including storage of records and accounts, airport traffic control towers, Banks; Civic administration; Clinic— outpatient; Electronic data processing; Laboratories—testing and research; Motor vehicle showrooms; Post offices; Print shops; keeping of accounts and records and similar purposes, Professional establishment and services (architects, attorneys, dentists, physicians, engineers, etc.); Radio and television stations; Telephone exchanges; Training and skill development not within a school or academic program.
		B 1- High risk commercial service	Occupancy where a non-industrial process is carried out and where either the material handled or the process carried out is liable, in the event of fire, to cause combustion with extreme rapidity or give rise to poisonous fumes, or cause explosions
		B 2- Moderate risk commercial service	Occupancy where a non-industrial process is carried out and where either the material handled or the process carried out is liable, in the event of fire, to cause combustion with moderate rapidity but is not likely to give rise to poisonous fumes, or cause explosions
		B 3- Low risk commercial service.	Occupancy where a non-industrial process is carried out and where neither the material handled nor the process carried out falls into the high or moderate risk category
	E- EDUCATIONAL		Places of instruction Occupancy where school children, students or other persons assemble for the purpose of

			tutoring or learning. These shall include any building used for school, college, and other training institutions for day-care purposes
		E 1 – Up to Senior Secondary level.	This sub-division shall include any building or a group of buildings under single management, which is used for students not less than 20 in number
		E 2 - All others/training Institutions	This sub-division shall include any building or a group of buildings under single management that is used for students not less than 100 in number
	F-FACTORY AND INDUSTRIAL		Places where goods are manufactured or repaired (unless considered "High-Hazard"
		F- 1 - High risk industrial	Occupancy where an industrial process is carried out and where either the material handled or the process carried out is liable, in the event of fire, to cause combustion with extreme rapidity or give rise to poisonous fumes, or cause explosions
		F -2 - Moderate risk industrial	Occupancy where an industrial process is carried out and where either the material handled or the process carried out is liable, in the event of fire, to cause combustion with moderate rapidity but is not likely to give rise to poisonous fumes, or cause explosions
		F- 3 - Low risk industrial	Occupancy where an industrial process is carried out and where neither the material handled nor the process carried out falls into the high or moderate risk category. This shall include any building in which the contents are of such comparative low combustibility and there are hardly any possibilities for any self propagating fire to occur and the only consequent danger to life and property may arise from panic, fumes or smoke, or fire from some external source
		F- 4 - Plant room	Occupancy comprising usually unattended mechanical or electrical services necessary for the running of a building.
	I- INSTITUTIONAL		Places where people are physically unable to leave without assistance. Examples: hospitals, nursing homes, and prisons.

		I- 1-Place of detention[Restrained]	Occupancy where people are detained for punitive or corrective reasons or because of their mental condition
		I -2- Hospitals and health centres [Incapacitated]	Occupancy where people are cared for or treated because of physical or mental disabilities and where they are generally bed ridden
		I-3- Institutional Other	Occupancy where groups of people who either are not fully fit, or who are restricted in their movements or their ability to make decisions, reside and are cared for
	M- MERCANTILE		These shall include any building or part of a building, which is used as shops, stores, market, for display and sale of merchandise, either wholesale or retail. Mercantile buildings shall be further sub-classed as follows:
		M-1-Large shops	Occupancy where merchandise is displayed and offered for sale to the public and where the floor area exceeds 250m ²
		M-2-Small shops	Occupancy where merchandise is displayed and offered for sale to the public and where the floor area does not exceed 250m ²
		M-3-Wholesalers stores	Occupancy where goods are displayed and stored and where only a limited selected group of persons is present at any one time
	R- RESIDENTIAL		These shall include any building in which sleeping accommodation is provided for normal residential purposes with or without cooking or dining or both facilities, except any building classified under I (Institutions); Examples: houses, apartment buildings, hotels, and motels. Residential- shall be further sub-classed as follows:
		R-1-Hotel	Occupancy where persons rent furnished rooms, not being dwelling units.
		R-2-Lodging	These shall include any building or group of buildings under the same management, in which separate sleeping accommodation is provided on transient or permanent basis, with or without

			dining facilities but without cooking facilities for individuals is provided. This includes inns, clubs, motels and guest houses.
		R-3-Dormitory	These shall include any building in which group sleeping accommodation is provided, with or without dining facilities for persons who are not members of the same family, in one room or a series of closely associated rooms under joint occupancy and single management, for example, school and college dormitories, students, and other hostels and military barracks.
		R-4-Domestic residence	Occupancy consisting of two or more dwelling units on a single site
		R-5-Dwelling house	Occupancy consisting of a dwelling unit on its own site. May include a garage and other domestic outbuildings, if any. It will usually be occupied by members of one or two families and has a total sleeping accommodation for not more than 20 persons.
	S- STORAGE		These shall include any building or part of a building used primarily for the storage or sheltering including servicing, processing or repairs incidental to storage) of goods, ware or merchandise e.g. warehouses, cold storage, freight depots, transit sheds, storehouses, hangers and stables.
		S-1- High risk storage	Occupancy where material is stored and where the stored material is liable, in the event of a fire, to cause combustion with extreme rapidity or give rise to poisonous fumes, or cause explosions
		S-2- Moderate risk storage	Occupancy where material is stored and where the stored material is liable, in the event of a fire, to cause combustion with extreme rapidity but is not likely to give rise to poisonous fumes, or cause explosions
		S-3- Low risk storage	Occupancy where the stored material does not fall into the high or moderate risk category
		S-4- Parking garage	Occupancy used for storing or parking of more than 10 motor vehicles
	MEM- MEMORIAL		Sites or building erected for commemoration and honor of genocide victims

	MIX – MIXED USE		<p>Many buildings may have multiple occupancies. These are referred to as "mixed occupancies" and the different parts will be required to meet the codes for those specific areas. An example of this is a shopping mall with apartments on the upper floors. The shopping area itself is Group M (mercantile), while the apartments would qualify as Class R (Residential).</p>
		MIX-1- Accessory occupancy	<p>The intent of the accessory occupancy provisions recognizes that buildings often have rooms or spaces different from but accessory to the main occupancy. The accessory occupancy provisions require that the space be accessory or ancillary to the main occupancy and that it does not exceed 10% of the area of the story in which it is located. The accessory occupancy does not need to be accounted for in construction type determination and related height/area determination for a building. The allowable building area and allowable building height are permitted to be based solely on the main occupancy classification(s).</p>
		MIX-2- Non-separated occupancy	<p>The non-separated occupancy provisions allow multiple occupancies without a physical separation between them. Occupancies are individually classified in accordance with this code but are not subject to the 10% area limit applicable to accessory occupancies. The requirements of the code are based on the occupancy classification of the space, except that the most restrictive requirements for fire safety are applied to the total non-separated occupancy fire area.</p>
		MIX-3- Separated occupancies	<p>The separated occupancy provisions require physical separation by fire barrier walls and/or horizontal assemblies with a fire-resistance rating between occupancies. Occupancies are located in separate fire areas, and each fire area is required to comply with the code based on the occupancy classification of that portion of the building.</p>
	MISC-		Buildings and structures of an accessory

	MISCELLANEOUS UTILITY		character and miscellaneous structures not classified in any specific occupancy shall be constructed, equipped and maintained to conform to the requirements of this code commensurate with the fire and life hazard incidental to their occupancy. Examples: Agricultural buildings; Aircraft hangars, accessory to a one- or two-family residence; Barns; Carports; Fences more than 6 feet (1829 mm) high; Grain silos, accessory to a residential occupancy; Greenhouses; Livestock shelters; Private garages; Retaining walls; Sheds; Stables; Tanks
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3.2 Minor occupancy incidental to operations in another type of occupancy should be considered as part of the main occupancy and should be classified under the relevant group for the main occupancy.

3.3 Any building not covered by the above groups should be classified in the group which most nearly resembles its existing or proposed use.

3.4 Where change in the occupancy of any building places it in a different group or in a different subdivision of the same group, such building should be made to comply with the requirements of this standard for the new group or its subdivision

3.5 Where the new occupancy of any building is less hazardous, based on life and fire risk than its existing occupancy, it should not be necessary to conform to the requirements of this standard for the new group or its subdivision

4.2 Classification by fire resistance

Buildings and structures erected or to be erected, altered or extended in height or area shall be classified in one of the five construction types provided below

- a) Types I and II: Types of construction in which the building elements are of non combustible materials. In this type of construction the building elements are of noncombustible materials such as concrete and steel. The roof is also of noncombustible material such as concrete or steel.
- b) Type III: type of construction in which the exterior walls are of noncombustible materials and the interior building elements are of any material. It has masonry bearing walls but the floors, structural framework and roof are made of wood or other combustible material.
- c) Type IV: Heavy Timber, HT is that type of construction in which the exterior walls are of noncombustible materials and the interior building elements are of solid or laminated wood without concealed spaces.
- d) Type V: Type V - Wood-frame construction is the most combustible of the five building types. The interior framing and exterior walls may be wood. A wood frame building is the only one of the five types of construction that has combustible exterior walls.

5 Fire zones

5.1 Demarcation

The city or area should, for the purpose of this standard be demarcated into distinct zones, bases on fire hazard inherent in the buildings and structures according to occupancy (see 4), which should be called the 'Fire Zone'.

5.2 Number and designation of fire zones

5.2.1 The number of fire zones in a city or area under the jurisdiction of the authority depends upon the existing layout, types of building construction classification of existing buildings based on occupancy (see 2) and the expected future development of the city or area. In large cities on areas, three fire zones may be necessary, while in smaller ones, one or two may be adequate.

5.2.2 The fire zones should be made use of in land use development plan and should be designated as follows:

- a) **Fire Zone No 1;** this should comprise areas having residential (Group R), educational (Group E), institutional (Group I), assembly (Group A), small business (Sub-division B-3) and retail mercantile (Group M) buildings, or areas which are under development for such occupancies.
- b) **Fire Zone No.2;** this should comprise business (Subdivisions B-2 and B-3) and industrial buildings (Subdivisions F-2 and F-3) except high hazard industrial buildings (Subdivision F-1) or areas which are under development for such occupancies.
- c) **Fire Zone No.3;** this should comprise areas having high hazard industrial buildings (Sub-division F-1), storage buildings (Group S) and buildings for hazardous uses or areas which are under development for such occupancies.

5.3 Changes in the fire zone boundaries

When the boundaries of any fire zone are changed, or when it is intended to include other areas or types of occupancies in any area zone, it should be done by following the same procedure as per promulgating new rules.

5.4 Overlapping fire zones

5.4.1 Any building so situated that it extends to more than one fire zone, it should be deemed to be situated in the fire zone in which the major portion of the building or structure is situated.

5.4.2 Any building so situated that it extends equally to more than one fire zone, it should be deemed to be situated in the fire zone having more hazardous occupancy buildings.

5.5 Temporary buildings

5.5.1 Temporary buildings should be permitted only in Fire Zone No.1 and Fire Zone No.2 as the case may be, according to the purpose for which these are to be used, by special permit from entrusted authority for a limited period and subject to such conditions as may be imposed in the permit. More precaution should be taken while issuing special permit for the temporary buildings in Fire Zone No.3

5.5.2 Buildings stated in 5.5.1 should be completely removed on the expiry of the period specified in the permit.**5.5.3** The following restriction on type of construction for new buildings should apply:

- a) Buildings erected in Fire Zone No.1 should conform to construction of Type 1, 2, 3, 4. or 5
- b) Buildings erected in Fire Zone No.2 should conform to construction of Type 1, 2, or 3.
- c) Buildings erected in Fire Zone No. 3 should conform to construction of Type 1 or 2.

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