

Minimum dimensions for fire resistance of private residences constructed in reinforced concrete

Minimum periods of structural fire resistance and dimensional guidance for reinforced-concrete private residences, referencing the UBBL and structural design standards.



Photograph: C2 Builder.

In Malaysia, like most countries, it is a statutory requirement that in the event of a fire, a building has to be able to maintain its structural integrityⁱⁱ for a given minimum period. This duration is termed the minimum period of fire resistanceⁱ.

Note on the date of publication

The statutory provisions and design-standard references in this note reflect the February 2023 publication. Requirements and applicable standards may have changed. Confirm the current UBBL provisions, adopted design standards and project-specific fire-resistance requirements with the relevant authorities and qualified professionals before relying on the values below.

Minimum period of fire resistance

This has to be determined in accordance with the Ninth Schedule of the Uniform Building By-Laws (UBBL) and is dependent on the type of use and height of the building structure.

For private residences: the above-ground structure needs to have a minimum resistance period of 30 minutes for three storeys and below, and 60 minutes for above. Basements require 60 minutes for four storeys and below, and 90 minutes for above.

Purpose group	Maximum dimension			Minimum period of fire resistance (hours)	
	Height (m)	Floor area (m ²)	Cubic capacity (m ³)	Ground or upper storey	Basement storey
Small residential — house of not more than 3 storeys	NL	NL	NL	½	1(a) (x)
Small residential — house of 4 storeys	NL	250	NL	1(b)	1 (x)
Small residential — house of any number of storeys	NL	NL	NL	1	1½
Institutional	28	2,000	NL	1	1½
Institutional — over 28 m	over 28	2,000	NL	1½	2

Extract from the Ninth Schedule of the UBBL, as cited in February 2023. Original notation retained; refer to the full Schedule for qualifications and exceptions.

Minimum dimensions

As it is a statutory requirement for buildings in Malaysia to be designed in accordance with the UBBL, the minimum dimensions given in the Ninth Schedule of the UBBL must be met.

Although it is statutorily sufficient to meet the minimum dimensions given in the UBBL, where the code of practice adopted for the design of the structure gives a larger value, it may be best practice to adopt the larger value as codes of practice are reviewed and updated more frequently than the UBBL. This is something to be discussed and agreed with the client.

The minimum dimensions needed in accordance with the UBBL, British Standard and Eurocode are summarised below, as published in February 2023. The dimensions of a structural element will be the largest of what is needed for fire resistance and other design considerations (collapse under permanent loads, deflection, etc.).

Slab

Fire resistance	UBBL	British Standard	Eurocode
30 minutes	— ¹	75 mm	60 mm
60 minutes	— ¹	95 mm	80 mm

¹ Not defined.

Beam — minimum width

Fire resistance	UBBL	British Standard	Eurocode ²
30 minutes	— ¹	200 mm	80–200 mm
60 minutes	— ¹	200 mm	120–300 mm

¹ Not defined. ² The exact value has to be calculated based on several factors.

Column

Fire resistance	UBBL: fully exposed ¹	UBBL: built into wall ²	BS: fully exposed ³	BS: 50% exposed ³	BS: one face exposed ³	Eurocode: exposed more than one side ³	Eurocode: exposed one side
30 minutes	150 mm	75 mm	150 mm	125 mm	100 mm	200–300 mm	155 mm
60 minutes	200 mm	75 mm	200 mm	160 mm	120 mm	200–350 mm	155 mm

¹ UBBL allows smaller dimensions if reinforced plaster, vermiculite or fire-rated plasterboard encasement is used. Refer to the Ninth Schedule for more details.

² Fully built into a full-height wall that extends 600 mm on either side of the column, has the same fire rating as the column, and with no part of the column projecting beyond the face of the wall. 63 mm if 12.5 mm thick vermiculite gypsum plaster is used.

³ Definition of exposure: when a face of a column is exposed to fire. Exact values are to be computed based on several factors.

Wall

Fire resistance	UBBL ¹	BS: $p < 0.4\%$ ²	BS: $0.4\% < p < 1\%$	BS: $p > 1\%$	Eurocode ³
30 minutes	75 mm	150 mm	100 mm	75 mm	100–120 mm
60 minutes	75 mm	150 mm	120 mm	75 mm	110–140 mm

¹ 63 mm if 12.5 mm thick vermiculite gypsum plaster is used. ² p is the percentage of reinforcement provided. ³ The exact value has to be computed based on several factors.

References

1. Uniform Building By-Laws 1984, Amendment 2021.
2. Figure 3.2, BS 8110-1:1997.
3. BS EN 1992-1-2:2004.

ⁱ The UBBL gives this technical definition for fire resistance period: the period for which an element will meet the requirements in respect of transmission of heat or resistance to collapse with passage of flame when tested in accordance with BS 476.

ⁱⁱ Structural integrity in terms of fire resistance is the ability of the structure or structural element to provide an appropriate degree of resistance to flame penetration, heat transmission and collapse.

ⁱⁱⁱ The minimum dimensions detailed are from part one of the British Standard and Eurocode. However, part two of the respective codes can be used for more detailed assessments that may result in more economical solutions.

Revision 00: February 2023