

## Design Note TB3

# Fire Resistant Ratings

## Limitations

The information contained in this document is limited to the following

1. 70mm or 90mm clay brick veneer/ timber frame/gibboard Fyreline, fixed to Winstones specification.
2. Stud height not exceeding 3.0m spaced max. 600mm crs.
3. Fire hazard categories 1 and 2
4. Maximum permissible loads per stud are:  
Light Roof 4kN  
Heavy Roof 6kN  
Lower Storey 9kN

## Table 1. Fire Resistant Ratings

(70mm Clay Brick Veneer) NZCB&PMA									
Table of S ratings (mins)									
Wall height = 3.0 m or less									
Studs at 600mm centres									
	Light Roof			Heavy Roof			Lower Storey		
Fyreline Gib thickness	10	13	16	10	13	16	10	13	16
Nominal Stud Size									
90 x 35	30	46	57	26	40	49	24	37	46
100 x 50	31	48	60	28	44	54	27	41	50
125 x 50	33	49	60	32	48	60	31	47	58
140 x 35	32	48	60	31	47	60	30	46	57
150 x 50	33	49	60	33	49	60	32	48	60

**Note:** Wall configurations shown in the shaded areas can only be used when the fire exposure is on the Fyreline plasterboard side of the wall.

## Procedure

1. Design building.
  2. Refer to Table 2 Purpose Groups. Determine Fire Hazard category for your building.
  3. Refer to Table 3.
  4. Calculate the percentage of windows to floor area ( $A_v/A_f$ ) and the percentage openings in roof to floor area ( $A_h/A_f$ ).
  5. Under the correct category table, determine from the above information the number of minutes (S rating) required. If appropriate, take into account the installation of sprinklers. If sprinklers are installed, the S rating is half the value given in Table 1.
  6. Refer to NZCB&PMA S rating table. Select the stud size you wish to use, and the roof situation involved. For the appropriate roof situation, look along the row relevant to your chosen stud size and determine the fire resistance (FR) of the NZCB&PMA wall system. Compare the required S rating, as derived from Table 3, with the FR of the NZCB&PMA wall system in Table 1. The thickness of the wall lining is selected from the column where the FR of the NZCB&PMA wall system is equal to or greater than the required S rating specified in Table 3.
- For a chosen stud size and any wall lining in that row, if the FR of the NZCB&PMA wall system is less than the required S rating then select another, larger stud size and repeat the procedure in this section.
7. If the chosen stud size and wall lining do not give adequate fire resistance values, then please refer to NZCB&PMA.

## Table 2. Purpose Groups

Purpose group	Description of intended use of the building	Some examples	Fire hazard category
<b>Crowd activities</b>			
CS or CL	For occupied spaces. CS applies to occupant loads up to 100 and CL to occupant loads exceeding 100. (Amd 1 1993)	Cinemas when classed as CS, art galleries auditoria, bowling alleys, churches, clubs (non-residential), Community halls, court rooms, dance halls, day care centres, gymnasia, lecture halls, museums, eating places (excluding kitchens) taverns, enclosed grandstands, indoor swimming pools.	1
		Cinemas when classed as CL, schools, colleges and tertiary institutions, libraries (up to 2.4m high Book storage), nightclubs, restaurants and eating places with cooking facilities (non-residential), theatre stages, opera houses, television studios (with audience).	2
		Libraries (over 2.4mm high book storage).	3
CO	Spaces for viewing open air activities (does not include spaces below grandstand).	Open grandstands, roofed but unenclosed grandstand, uncovered fixed seating.	1
CM	Spaces for displaying, or selling retail goods, wares or merchandise.	Exhibition halls, retail shops. Supermarkets or other stores with bulk storage/display over 3.0m high.	4
<b>Sleeping activities</b>			
SC	Spaces in which principal users because of age, mental or physical limitations require special care or treatment.	Hospitals, care institutions for the aged, children people with disabilities.	1
SD	Spaces in which principal users are restrained or liberties are restricted.	Care institutions, for the aged or children, with physical restraint or detention.	1
		Hospital with physical restraint, detention quarters in police station, prison.	
SA	Spaces providing transient accommodation, or where limited assistance or care is provided for principal users.	Motels, hotels, hostels, boarding houses, clubs (residential), boarding schools, dormitories, community care institutions.	1
SR	Attached and multi-unit residential dwellings. (Amd 1 1993)	Multi-unit dwellings or flats, apartments, and includes Household units attached to the same or other purpose groups, such as caretakers' flats, and residential accommodation above a shop.	1
SH	Detached dwellings where people live as a single household or family. (Amd 1 1993)	Dwellings, houses being household units, or suites in purpose group SA, separated from each other by distance. Detached dwellings may include attached self-contained suits such as granny-flats when occupied by a member of the same family, and garages whether detached or part of the same building and are primarily for storage of the occupants vehicles, tools and garden implements.	

# Table 3. Values of $t_e$ for Calculating s Ratings

(Table 1. Acceptable Solutions C3/AS1 Page 21)										
	Fire hazard category 1 (FLED = 400 MJ/m <sup>2</sup> )					Fire hazard category 2 (FLED = 800 MJ/m <sup>2</sup> )				
Av/Af	Ah/Af					Ah/Af				
	0.00	0.05	0.10	0.15	0.20	0.00	0.05	0.10	0.15	0.20
0.05 or less	65	43	36	32	30	130	87	72	64	60
0.06	60	40	34	30	28	120	81	67	61	57
0.07	56	38	32	29	27	111	75	63	58	54
0.08	52	35	30	28	26	103	70	60	55	52
0.09	48	33	29	26	25	96	66	57	53	50
0.10	45	31	27	26	24	89	62	55	51	49
0.11	41	30	26	25	24	83	59	53	49	48
0.12	39	28	25	24	23	77	56	51	48	47
0.13	36	27	25	23	23	72	54	49	47	46
0.14	34	26	24	23	22	68	52	48	46	45
0.15	32	25	23	23	22	64	50	47	45	44
0.16	30	24	23	22	22	61	48	46	44	44
0.17	29	24	22	22	22	58	47	45	44	43
0.18	27	23	22	22	21	55	46	44	43	43
0.19	26	23	22	21	21	52	45	43	43	42
0.20	25	22	21	21	21	50	44	43	42	42
0.25 or greater	22	21	21	21	21	44	42	41	41	41

## Notes

### Interpretation

**Af** = floor area of fire cell (m<sup>2</sup>)

**Av** = area of verticle openings in external walls of the firecell (m<sup>2</sup>)

**Ah** = area of horizontal openings in roof of firecell (m<sup>2</sup>)

Linear interpolation is permitted where values of Av/Af or Ah/Af lie between those given in the table.

### Location of openings

Openings to allow fire venting should be located in the most practicable manner to provide effective cross-ventilation. This reduces structural fire severity and facilitates fire fighting operations.

### Effective openings

(a) Only those areas of external walls and roofs which can dependably provide airflow to and from the fire shall be used in calculating Av and Ah. Such areas include windows containing non-fire resistant glass and likely to break shortly after exposure to significant heat.

(b) An allowance can be made for air leakage through the external wall of the building envelope. The allowance for inclusion in Av shall be no greater than 0.1 % of the external wall area where the wall is lined internally, and 0.5% if unlined.

(c) Only roof venting which is specifically designed to open or melt rapidly in the event of fire shall be included in the event of fire shall be included in the area Ah.

(d) For single floor buildings or the top floor of multi-floor buildings, where the structural system supporting the roof is non-rated and directly exposed to the fire, Ah/Af may be taken 0.2.

### Areas not regarded as openings

For purpose of calculating Av it shall be assumed that external doors in external walls are closed. Wall areas clad in sheet metal shall not be included in the area Av.

### Intermediate floors

Where a fire cell contains intermediate floors, separate calculations shall be made to determine  $t_e$ , first by taking Af as the total floor area in the firecell (as defined in paragraph 3.2.1(c)), then by taking Af separately as the floor area of each level. The highest value of  $t_e$  shall be used to determine the S rating.

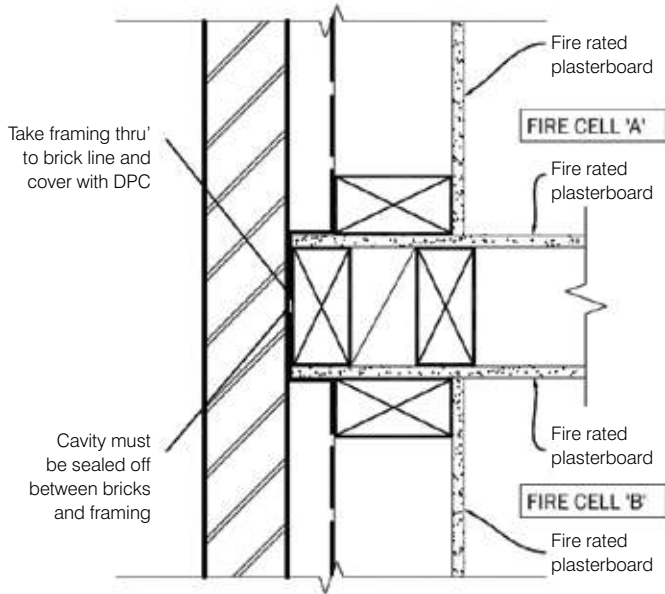
### Background to table

This table (Table 1) is based conservatively on unpublished information currently being used to develop a suitable series of Eurocodes. The table contents will be reviewed at the time of Eurocode publication. Less conservative results may be obtained with specific fire engineering design, something which is mandatory for fire hazard category 4.

### Note

**Design Note TB3 is in abbreviated form and should be used in conjunction with Department of Building & Housing Fire Hazard Rating Information and Acceptable Solutions.**

**Fig. 1: Separation of Fire Cells with Brick Veneer**



**Fig. 2: Fire Rating System**

