The following information has been put together to assist Designers with the selection of either Insolite Building Blocks or Standard Concrete Blocks for walls exposed to fire conditions in either load bearing or non load bearing circumstances.

DESIGN GUIDE FOR FIRE LOADS

With the Introduction of the B.C.A. a masonry wall now has three Fire Resistance Levels (F.R.L.) expressed in minutes E.G. 180/180/180.

The figures represent:

Structural Adequacy

The Ability of the wall to remain stable and resist collapse when subjected to Fire Conditions (Structural Adequacy can be calculated in accordance with design charts attached).

Integrity

The Integrity of a wall is a measure of its ability to resist the passage of flames or hot gases through cracks and fissures. The F.R.L. for integrity is accepted if the F.R.L. for insulation and structural adequacy has been met.

Insulation

The Insulation of a particular wall is a measure of its ability to resist the passage of the heat through the wall. The F.R.L. requirement for insulation determines the material thickness designed into the wall. The structural adequacy, integrity and insulation Fire Resistance Levels are strongly influenced by the type of material used in the construction of the Fire Wall.

EASY FIND • FIRE RESISTANCE LEVELS FOR WALLS FROM THE B.C.A.

Step 1.

Select your required Building Classification (Note 1 Page 4)

Step 2.

Check the type of construction e.g.: No. of storeys
(Note 2 Page 5)

Step 3.

Consider other factors e.g.: Mezzanine floors, Compartmentation and Separation and other General Requirements
(Refer the B.C.A.)

Step 4.

Find F.R.L. from Table 1 for your wall - Page 4

Step 5.

Select Block Type from F.R.L. Table 2 of Maximum Wall Heights and Lengths - Page 6

EASY FIND • FIRE RESISTANCE LEVELS FOR WALLS FROM THE B.C.A.

Note 1. Class of Building Required

Class 1. - One or more buildings which in association constitute:
(a) Class 1a -a single dwelling being
(i) a detached house; or
(ii) one or more attached dwellings, each being a building separated by a fire-resisting wall, including a row house, terrace house, town house or villa unit; or
(b) Class 1b - a boarding house, guest house, hostel or the like with a total *floor* area not exceeding 300m2 and in which not more than 12 persons would ordinarily be resident,- which is not located above or below another dwelling or another Class of building other than a private garage.

Class 2. - A Building containing 2 or more sole -occupancy units each being a separate dwelling.

Class 3. - A residential building, other than a building of Class 1 or 2, which is a common place of long term or transient living for a number of unrelated persons, including -
(a) A boarding-house, guest house, hostel, lodging-house or backpackers accommodation; or
(b) a residential part of a hotel or motel; or
(c) a residential part of a school; or
(d) accommodation for the aged, disabled or children; or
(e) a residential part of a health-care building which accommodates members of staff.

Class 4. - A dwelling in a building that is Class 5,6,7,8 or 9 if it is the only dwelling in the building.

Class 5. - An office building used for professional or commercial purposes, excluding buildings of Class 6,7,8 or 9.

Class 6. - A shop or other building for the sale of goods by retail or the supply of services direct to the public, including -
(a) an eating room, cafe, restaurant, milk or soft-drink bar; or
(b) a dining room, bar, shop or kiosk part of a hotel or motel; or
(c) a hairdresser's or barber's shop, public laundry, or undertaker's establishment; or
(d) market or sale room, showroom, or service station.

Class 7. - A building which is -
(a) a public car park; or
(b) for storage, or display of goods or produce for sale by wholesale.

Class 8. - A laboratory, or a building in which a handicraft or process for the production, assembling, altering, repairing, packing, finishing, or cleaning of goods or produce is carried on for trade, sale, or gain.

Class 9. - A building of a public nature -
(a) Class 9a - a health-care building; including those parts of the building set aside as a laboratory; or
(b) Class 9b - an assembly building, including a trade workshop, laboratory or the like in a primary or secondary school, but excluding any other parts of the building that are of another Class.

Class 10.- A non-habitable building or structure -
(a) Class 10a - a non-habitable building being a private garage, carport, shed, or the like; or
(b) Class 10b - a structure being a fence, mast, antenna, retaining wall or free-standing wall, swimming pool, or the like.

TABLE 1 — FIRE RESISTANCE LEVELS FOR WALLS FROM THE B.C.A.

CLASS OF BUILDING (Refer Note 1)			**NUMBER OF STOREYS** (Refer Note 2)											
CLASSES 1	>>>>		-	-	-	-	-	-	-	-	-	-	-	-
CLASSES 2, 3, & 4 PART	>>>>		1	2	3 or Over	-	-	-	-	-	-	-	-	-
CLASS 5	>>>>		-	-	-	-	-	1 or 2	3	4 or Over	-	-	-	-
CLASS 6	>>>>		-	-	-	-	-	1 or 2	-	-	3	4 or Over	-	-
CLASSES 7 (EXCEPT CAR PARKS) AND 8	>>>>			-	-	-	-	1 or 2	-	-	-	-	3	4 or Over
CLASS 7 CAR PARKS	>>>>		-	-	-	1 or 2	3 or Over	-	-	-	-	-	-	-
CLASS 9	>>>>		-	-	-	-	-	1	2	3 or Over	-	-	-	-
CLASS 10	>>>>		-	-	-	-	-	-	-	-	-	-	-	-
TYPE OF CONSTRUCTION			**C**	**B**	**A**	**C**	**B-3 storeys A-4 or over**	**C**	**B**	**A**	**B**	**A**	**B**	**A**
External Walls Load Bearing	Distance from Fire-Source Feature (Refer Definition Note 3)	LESS THAN 1.5m	90/90/90	90/90/90	90/90/90	60/60/60	60/60/60	90/90/90	120/120/120	120/120/120	180/180/180	180/180/180	240/240/240	240/240/240
		1.5m TO LESS THAN 3m	N/A	90/60/30	90/60/60		60/60/60	60/60/60	120/90/60	120/90/90	180/120/90	180/180/120	240/180/120	240/240/180
		3m TO LESS THAN 9m		90/30/30	90/60/30				120/30/30	120/60/30	180/90/60	180/120/90	240/90/60	240/180/90
		9m TO LESS THAN 18m		90/30/ -	90/60/30				120/30/ -	120/60/30	180/60/-	180/120/90	240/60/-	240/180/90
		18m OR MORE			90/60/30					120/60/30		180/120/90		240/180/90
External Walls Non-LoadBearing	Distance from Fire-Source Feature (Refer Definition Note 3)	LESS THAN 1.5m	90 / - / -	90/90/90	90/90/90	60/60/60	60/60/60	90/90/90	120/120/120	120/120/120	180/180/180	180/180/180	240/240/240	240/240/240
		1.5m TO LESS THAN 3m	N/A	90/60/30	90/60/60		60/60/60	60/60/60	120/90/60	120/90/90	180/120/90	180/180/120	240/180/120	240/240/180
		3m OR MORE		N/A	N/A			N/A	N/A	N/A	N/A	N/A	N/A	N/A
Internal Walls	FIRE-RESISTING LIFT SHAFTS	LB		90/90/90	90/90/90		120/120/120		120/120/120	120/120/120	180/120/120	180/120/120	240/120/120	240/120/120
		NLB			90/90/90		120/120/120			120/120/120		120/120/120		120/120/120
	FIRE- RESISTING STAIR SHAFTS	LB	60/60/60	90/90/90	90/90/90		120/120/120		120/120/120	120/120/120	180/120/120	180/120/120	240/120/120	240/120/120
		NLB	60/60/60	90/90/90	90/90/90		120/120/120		120/120/120	120/120/120	120/120/120	120/120/120	120/120/120	120/120/120
	Between or bounding sole-occupancy units bounding public corridors, hallways and the like.	LB	60/60/60	60/60/60	90/90/90				120 / - / -	120 / - / -	180 / - / -	180 / - / -	240 / - / -	240 / - / -
		NLB	60/60/60	60/60/60	60/60/60				N/A	N/A	N/A	N/A	N/A	N/A
	Ventilating pipe, garbage and like shafts not used for the discharge of hot products of combustion	LB			90/90/90					120/90/90		180/120/120		240/120/120
		NLB			90/90/90					90/90/90		120/120/120		120/120/120
	COMMON WALLS & FIRE WALLS		90/90/90	90/90/90	90/90/90		120/120/120	90/90/90	120/120/120	120/120/120	180/180/180	180/180/180	240/240/240	240/240/240
	OTHER LOAD BEARING WALLS			60 / - / -	90 / - / -				120 / - / -	120 / - / -	180 / - / -	180 / - / -	240 / - / -	240 / - / -

Note 2. - C1.1 Type of Construction

(a) The minimum Type of *fire*-resisting construction of a building must be specified in Table C1.1 and Specification C1.1, except as allowed for -

(i) Certain Class 2 or 3 buildings in C1.5; and

(ii) Class 4 parts of buildings in C1.6; and

(iii) Open spectator stands and indoor sports stadiums in C1.7;

and

(iv) Lightweight construction in C1.8.

(b) Type A construction is the most fire-resistant and Type C the least fire-resistant of the Types of construction.

Table C1.1
TYPE OF CONSTRUCTION REQUIRED

RISE (In Storeys)	CLASS OF BUILDING 2,3,9	5,6,7,8
4 or More	A	A
3	A	B
2	B	C
1	C	C

Calculation of Rise in Storeys

(a) The rise in storeys is the greatest number of storeys at any part of the external walls of the building-

(i) Above the finished ground next to that part; or

(ii) If part of the external wall is on the boundary of the allotment, above the natural ground level at the relevant part of the boundary.

(b) A storey is not counted if-

(i) It is situated at the top of the building and contains only heating, ventilating or lift equipment, water tanks, or similar service units or equipment; or

(ii) It is situated partly below the finished ground and the underside of the ceiling is not more than 12m long, the average for the 12m part where the ground is the lowest.

(c) In a building of Class 7 or 8, a storey that has an average internal height of more than 6m is counted as-

(i) One storey if it is the only storey above the ground; or

(ii) 2 storeys in any other case.

Note 3. Definition - Fire Source

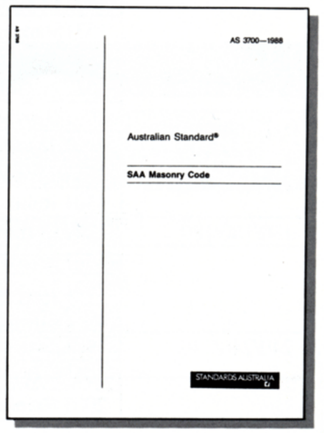
(a) The far boundary of a road adjoining the allotment;
(b) A side or rear boundary or the allotment; or
(c) An external wall of another building on the allotment which is not of Class 10.

Exposure to Fire-Source Features

(a) A part of a building element is exposed to a fire-source feature if any of the horizontal straight lines between that part and the fire-source feature, or vertical projection of the feature, is not obstructed by another part of the building that-
(i) Has an FRL of not less than 30/-/-and
(ii) Is neither transparent nor translucent.

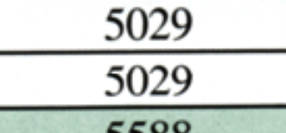
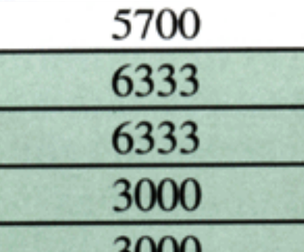
(b) A part of a building element is not exposed to a fire-source feature if the fire-source feature is-
(i) An external wall of another building that stands on the allotment and the part concerned is more than 15m above the highest part of that external wall; or
(ii) A side or rear boundary of the allotment and the part concerned is below the level of the finished ground at every relevant part of the boundary concerned.

(c) If various distances apply for different parts of a building element-
(i) The entire element must have the FRL applicable to that part having the least distance between itself and the relevant fire-source feature; or
(ii) Each part of the element must have the FRL applicable according to its individual distance from the relevant fire-source feature.



MAXIMUM WALL HEIGHTS AND LENGTHS FOR GIVEN FIRE RESISTANCE LEVELS

TABLE 2

REQUIRED FIRE RESISTANCE LEVELS	BLOCK TYPE	MAXIMUM WALL HEIGHT		MAXIMUM WALL LENGTH	
		Partial Restraint at top Av = 0.85 (See notes 1, 3 & 4) 	Full Restraint at top Av = 0.75 (See notes 2, 3 & 4) 	**Apply only if wall height limit exceeded. (See notes 3, 4, & 5)**	
				Length between supports Ah=1.0	Length from support to free end Ah=2.0
60/60/60	1001 Standard	2382	2700	2025	1013
	1031 Standard	2382	2700	2025	1013
	1001 Insolite	2647	3000	2250	1125
	1031 Insolite	2647	3000	2250	1125
	120715 Insolite	3235	3666	2750	1375
	120715 Standard	2911	3300	2475	1238
	1501 Standard	3706	4200	3150	1575
	1531 Standard	3706	4200	3150	1575
	1501 Insolite	4118	4667	3500	1750
	1531 Insolite	4118	4667	3500	1750
	2001 Standard	5029	5700	4275	2138
	2031 Standard	5029	5700	4275	2138
	2001 Insolite	5588	6333	4750	2375
	2031s Insolite	5588	6333	4750	2375
90/90/90	**1001 Insolite**	2647	3000	2250	1125
	1031 Insolite	2647	3000	2250	1125
	120715 Insolite	3235	3666	2750	1375
	120715 Standard	2717	3080	2310	1155
	1531 Standard	3459	3920	2940	1470
	1501 Insolite	4118	4667	3500	1750
	1531 Insolite	4118	4667	3500	1750
	2001 Standard	4694	5320	3990	1995
	2031 Standard	4694	5320	3990	1995
	2001 Insolite	5588	6333	4750	2375
	2031s Insolite	5588	6333	4750	2375
120/120/120	**1001 Insolite**	2647	3000	2250	1125
	1031 Insolite	2647	3000	2250	1125
	120715 Insolite	3235	3666	2750	1375
	1531Standard	3294	3733	2800	1400
	1501 Insolite	4118	4667	3500	1750
	1531 Insolite	4118	4667	3500	1750
	2031 Standard	4471	5067	3800	1900
	2001 Insolite	5588	6333	4750	2375
	2031s Insolite	5588	.6333	4750	2375
	1501 Reinforced*	4447 (5929)	5040 (N/A)	3780 (5040)	1890 (2520)
180/180/180	**120715 Insolite**	3235	3666	2750	1375
	1531 Insolite	4118	4667	3500	1750
	2001 Insolite	5588	6333	4750	2375
	2031s Insolite	5588	6333	4750	2375
240/240/240	**1531 Insolite**	4118	4667	3500	1750
	2031s Insolite	5588	6333	4750	2375
	2001 Reinforced*	6035 (8047)	6840 (N/A)	5130 (6840)	2565 (3420)

NOTES

Note: 1 Partial restraint means lateral support only (eg roof framing).

Note: 2 Full restraint means lateral and torsional restraint (eg concrete slab poured on top of wall).

Note: 3 For Walls carrying significant load, loadbearing capacity requirements may reduce the tabulated values. Loadbearing walls should be checked by an engineer.

Note: 4 Walls exposed to wind loads need to be checked for wind load capacity by an engineer.

Note: 5 A wall length limit applies only if the wall height limit is exceeded and additional lateral support is required. This may be provided by cross walls, mullions or columns. If the wall length between supports is less than or equal to the tabulated values, there is no limit to the height of the walls. If the wall length between supports is greater than the tabulated values, there may be some increase in permissible height of the wall. This should be determined by an engineer using AS 3700 Clause 4.8.2 (b) (iii) and the robustness provisions of Clause 4.10.

Note: 6 This Table is based on the following criteria:
Standard Blocks: Slenderness ratios from Table 7.1 A.S. 3700
(basalt aggregate at least 45%)
Insolite Blocks: Slenderness ratio of 25 as proven by tests.

Note: 7 Cavity wall ratings are calculated as follows:
Load bearing skin exposed to fire, other skin not exposed: use rating of exposed skin.
Otherwise, the equivalent thickness of the wall is taken as 2/3 the sum of the two leaves.

***Note: 8** For grouted and reinforced walls, the second figure (in brackets applies if the load is less than 5% of capacity.

Comparison of the tabulated values for Insolite and standard blocks illustrate the advantages of Insolite building blocks over standard concrete blocks with regard to the B.C.A.

e.g. A 1501 Insolite wall provides a 120/120/120 up to a height of 4667 (with full restraint at the top). In standard blockwork 1531 blocks provide for a 120/120/120 rating and have a maximum wall height of 3733. The Insolite blocks weigh only 9.7 kg each compared with 24.7 kg for the standard concrete blocks. Use of Insolite blocks in this situation will provide a weight saving of 60% plus a possible increase in wall height of 25%.

J.R. Gandy - BE Hons, MIE Aust.

PROPERTIES OF INSOLITE BLOCKS

Unit Code	Dimensions (mm)	Unit Type	Equivalent Thickness (mm)	Block Weights	F.R.L. for Insulation and Integrity	Maximum Slenderness Ratio F.R.L. for Structural Adequacy				
						60	90	120	180	240
10.01	390x90x190	Cored	68mm	11kg	120 Minutes					
10.31	390x90x190	Solid	90mm	15.5kg	120 Minutes					
120.715	230x110x76	Solid	110mm	4kg	180 Minutes					
15.01	390x140x190	Hollow	92mm	14.2kg	120 Minutes	25	25	25	25	25
15.31	390x140x190	Cored	127mm	24kg	240 Minutes					
20.01	390x190x190	Hollow	107mm	17.3kg	180 Minutes					
20.31s	390x190x190	Cored	142mm	29kg	240 Minutes					

NOTE: Insolite Building Blocks are available in all Standard Concrete Block sizes and accessories

TECHNICAL INFORMATION

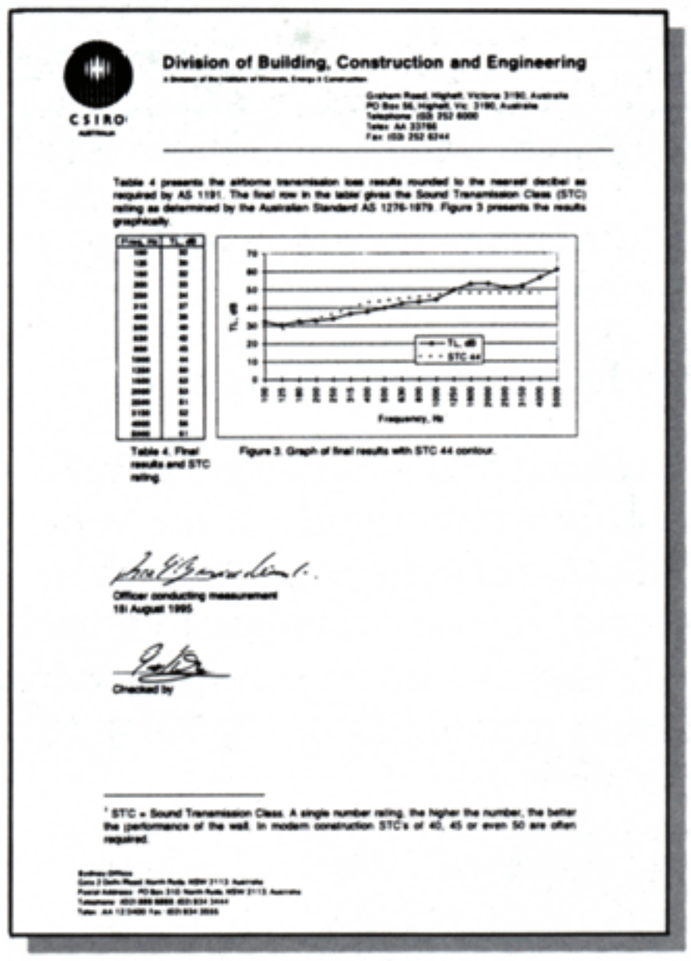


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Table 4 presents the airborne transmission loss results rounded to the nearest decibel as required by AS 1191. The final row in the table gives the Sound Transmission Class (STC) rating as determined by the Australian Standard AS 1276-1979. Figure 3 presents the results graphically.

Freq. Hz	T_L dB
100	30
125	30
160	30
200	30
250	30
315	30
400	31
500	32
630	33
800	34
1000	35
1250	36
1600	37
2000	38
2500	39
3150	40
4000	41
5000	42

Table 4. Final results and STC rating

Figure 3. Graph of final results with STC 44 contour.

Officer conducting measurement
18 August 1995

Checked by

' STC = Sound Transmission Class. A single number rating, the higher the number, the better the performance of the wall. In modern construction STC's of 40, 45 or even 50 are often required.

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SOUND INSULATION

Sound insulation of Blockwork depends on the porosity and density of the surface. The aerated nature of the Insolite aggregate results in very low air porosity. This gives a high resistance to the flow of airborne sound relating to density. Insolite blocks have had S.T.C. Tests completed and these show (with a simple Unitex sealer coat to one face of the blocks) similar S.T.C. Ratings as Standard Concrete Blocks can be achieved. Insolite also provides better sound absorption properties than Standard Concrete Blocks. This property reduces the echoing effect in empty rooms.

Block Type	Coating	S.T.C.
10.31	Unitex	44
120.715	Sealer	47
15.01	Coat to	44
15.31	one side	50
20.01	of blocks.	45
20.31s		50

Note: S.T.C. Ratings can be increased with either render, plaster board or acoustic insulation. C.S.I.R.O. tests have shown that blocks having a S.T.C. of 42 or more can be increased to S.T.C. 50 with the addition of 13mm plaster board resiliently mounted (50mm) to one side of the wall.

THERMAL INSULATION

The Closed Air Cells of the Insolite Blocks give far better Thermal Insulation Qualities than Standard Blocks, causing the buildings energy use to being lower. Buildings as a result will be warmer in winter and cooler in summer.

DEFINITIONS

Thermal Resistance (R) 0 The Measure of the resistance to heat flow of a material of a given thickness.

Thermal Transmittance (U) - The amount of the heat which will flow through one square metre of the wall of a structure for every degree of temperature difference between the inside and outside environment.

Block Type	Thermal Resistance (R)	Thermal Transmittance (U)
10.01	0.51	1.96
10.31	0.57	1.75
120.715	0.68	1.40
15.01	0.63	1.59
15.31	0.75	1.33
20.01	0.81	1.27
20.31s	0.75	1.33

INTERNAL/EXTERNAL FINISHING AND FIXINGS

Another advantage of Insolite Blocks is that they can be used as a face block if required. Because of the blocks neat texture and edges a coat of paint can be applied for finishing or in turn if a textured coating is required our Company's Unitex Applied Finish System is suitable. Insolite Blocks have been tested for shrinkage and have *half the shrinkage rate as standard masonry* which gives added security against wall cracking in your finished surface.

No special fixing instructions are required, the same methods of fixing should be taken into account as for Standard Masonry.

$$$ Insolite Building Blocks are cost effective and have a similar price structure to Standard Concrete Blocks, whilst still providing the designer with all the many advantages of the Insolite Product $$$

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"No one knows Blocks and Pavers better"