HESBIA

HOLDS EVERY SIZE BRICK IN AUSTRALIA

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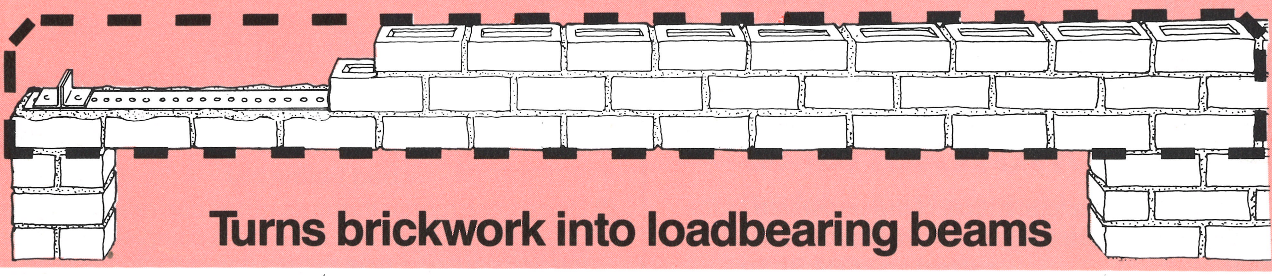
Patents approved in Australia, Great Britain and West Germany.

BRICKWORK REINFORCEMENT SYSTEM



Turns brickwork into loadbearing beams

MANY USES

- BRICKWORK BEAMS
- DOOR & WINDOW HEAD LINTELS
- GARAGE DOOR LINTELS
- CANTILEVERS
- BRICK PARTITION WALLS ON SUSPENDED SLABS
- BRICKWORK ARCHES

APPROVALS

For use with clay bricks

- ABSAC TECHNICAL OPINION No. 46
- VICTORIAN BUILDING CONTROL ACCREDITATION AUTHORITY CERTIFICATE OF ACCREDITATION No. V85/11

For use with calcium silicate and concrete bricks

- DEAKIN UNIVERSITY MASONRY RESEARCH REPORT No. MRC-26

HESBIA BARS

HESBIA uses a 60 x 3.15mm hot-dip galvanised steel tension-bar which is usually laid into the first bed joint above the opening. Anchorage of the bar to the brickwork is ensured by end-stops which are riveted to the bar and located in the vertical joints (perpends) at each end of the tension-bar. Because of the spacing of the holes in the tension-bar and the arrangement of the spigots in the end-stops, the distance between the upright portions of the end-stops can be set to within 5mm of any length. Therefore no cutting of bricks is needed and any span or brick size can be accommodated.

The end-stops are attached to the tension-bar by spigots that are riveted in position by the bricklayer.

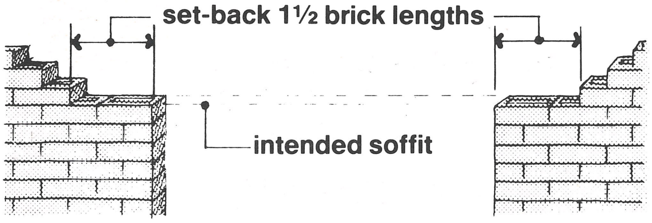
HESBIA bars have a standard length of 4000mm, but are also available in 1000, 2000 and 3000mm lengths. Longer bars can be supplied by arrangement.

A HESBIA lintel of 2100mm clear span under test at the Brick Development Research Institute. Bricks were used to load the beam to show that long-term creep deflection is small.

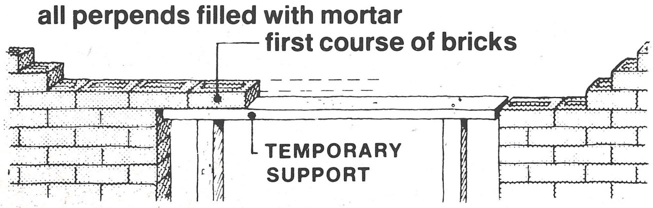
Original testing in the Brick Development Research Institute laboratory suggested that only clay bricks with a minimum compressive strength of 50 MPa could be used in the HESBIA system. More recent work by Assoc Prof L R Baker at the Masonry Research Centre at Deakin University has shown that silica lime and concrete bricks can also be used. The only restriction on bricks now is that their Characteristic Compressive Strength must be at least 15 MPA.

Bricklayer Guide

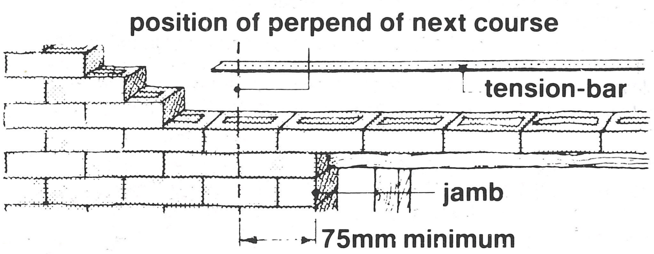
HESBIA lintels are constructed by the bricklayer using a mortar not weaker than 1 cement: 1 lime: 6 sand.
Temporary support is required for a minumum of 3 days after completion of the brickwork.



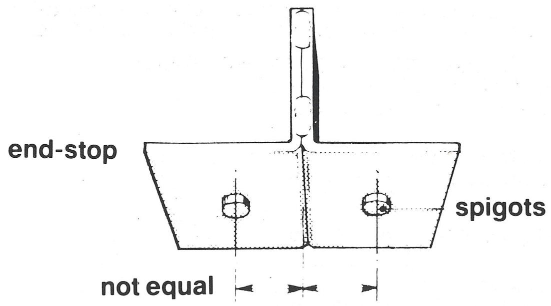
1 Build up the walls to the level of the underside of the opening. Leave at least 1½ brick lengths clear on either side.



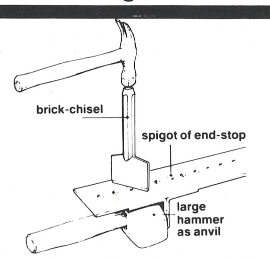
2 Provide a stiff, temporary support for the brickwork. Lay the first course of bricks across the opening. All perpends must be completely filled with mortar. The first course can be in stretcher bond, or be a soldier, or rowlock course (i.e. bricks on edge or on end).



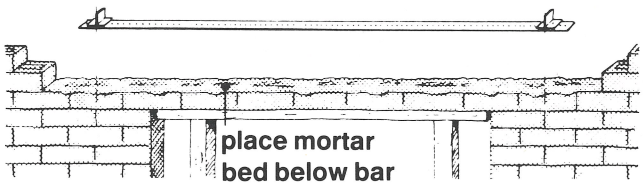
3 Place the *tension-bar* next to the bricks. Mark on it the position of the perpends that will enclose the *end-stops*. They must be at least 75mm beyond the line of the jambs.



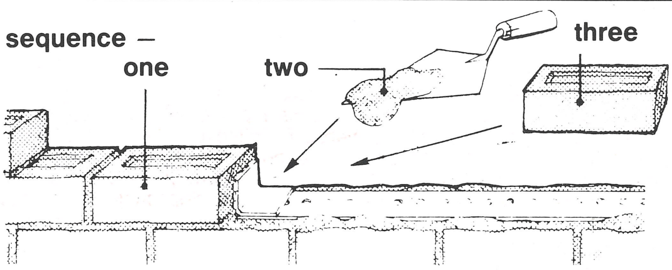
4 Fit the *end-stops* to the bar with the upstands as close as possible to the positions of the perpends drawn on the bar. The position of the uprights can be varied slightly by reversing the direction of the *end-stops*. Check the position of the uprights against the brickwork.



5 Rivet over the spigots protruding through the *tension-bar* using a large hammer as an anvil and a bolster to form a cross in the protruding spigots.



6 Using fresh mortar that is as wet as can reasonably be used by the bricklayer, string-out a complete bed over the first course. Press the tension-bar into the mortar ensuring that the uprights are in the correct positions and cut off surplus mortar.
Do not lay the HESBIA Bar before the mortar bed.



7 Lay the bricks on each side of the *end-stop* first. Mortar must be placed over the bar to give a good bed for the bricks. All perpends must be filled with mortar. If any joints are disturbed, lay them again with fresh mortar.

8 The remaining courses of brickwork can be laid in the normal way. Ensure that the required number of courses are built and that high standards of workmanship and materials are employed. The formwork must be left in position for 3 full days after construction is completed. Protect the brickwork from hot sunlight, rain or impact.

MR BRICKY – IMPORTANT!
Please use a 1–1–6 mortar mix. Bed joints & perpends must be filled properly & Hesbia bar must be laid into wet mortar.

IMPORTANTE!
Per favore usa 1–1–6 quando mischi la malta. Lo spessore dei giundi riembili bene. Hesbia barra devi posarla nella malta fresca (o bagnata).

ΚΥΡΙΕ ΤΥΒΛΑΝΤΖΗ
Υποχρεωτικώς παρακαλείσαι να χρησιμοποιείς Α 1--1--6 Mortar Mix σε ανώμαλες ενώσεις και πρέπει οπωσδήποτε να γεμίζεις σωστά τα Hesbia bar μέσα στη βρεγμένη λάσπη.

MAJSTORI ZIDARI!
Molimo Vas upotrebite 1 cement, 1 krec, 6 pijeska muzar. Postolje sastav fugiranja mora bit tocno napunjeno. Hesbia bar mora se staviti u mokru (muzar).

HERR MAURER! SEHR WICHTIG!
Gebrauchen Sie 1–1–6 Speis-Mischung. Alle Fugen mussen vollgefullt sein und Hesbia bar muss in nassen Speis gelegt werden.

THREE BASIC COMPONENTS

1. Tension-bar

- Standard lengths 1000 to 4000mm
- Longer lengths are available by arrangement

2. End-stops

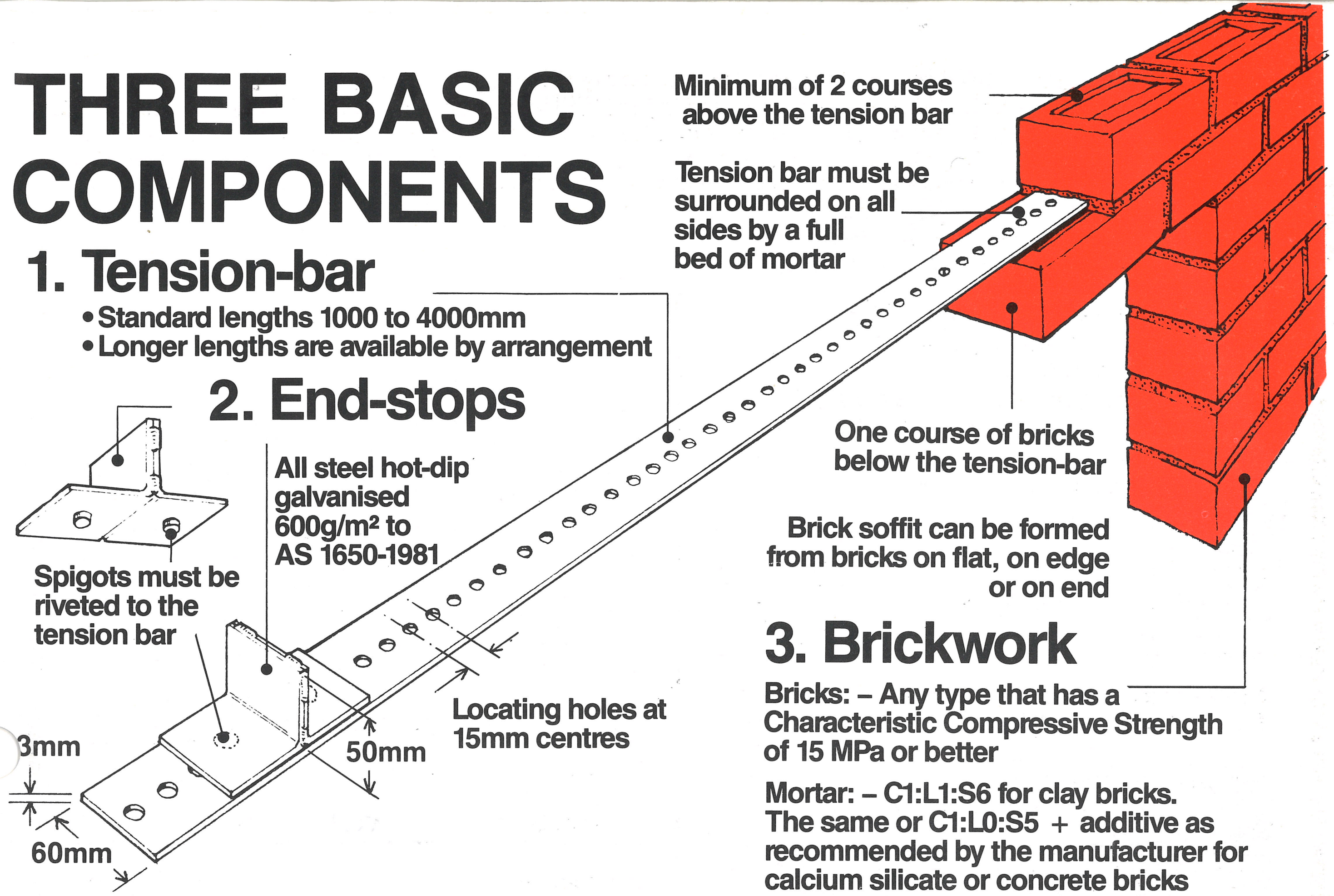
All steel hot-dip galvanised 600g/m² to AS 1650-1981

Spigots must be riveted to the tension bar

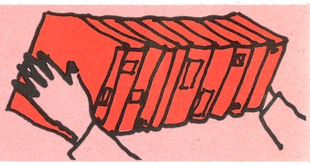
3. Brickwork

Bricks: – Any type that has a Characteristic Compressive Strength of 15 MPa or better

Mortar: – C1:L1:S6 for clay bricks.
The same or C1:L0:S5 + additive as recommended by the manufacturer for calcium silicate or concrete bricks



WHAT HOLDS UP THE BOTTOM BRICKS?
People unfamiliar with reinforced brickwork sometimes ask what holds the bottom course of bricks in a HESBIA lintel in position. HESBIA lintels are designed to be very stiff; deflection being limited to 1/1200th of the span. With brickwork as rigid as this, bricks below the bar have no room to move and are therefore secure in all but the most exceptional circumstances. The situation is similar to the one where a row of books can be carried with none slipping out because of the pressure applied to the ends of the row by the two hands of the carrier. The end-stops make certain that those two hands are always there.



TECHNICAL DATA
BRICKWORK BRICKS
A brick of any size or type can be used provided it has a width of at least 90mm and a Characteristic Compressive Strength of at least 15 MPa. Effectively this will mean that all but some second hand bricks can be used, but a check should be made about strength when any doubt exists. This publication does not give details for the use of 90mm bricks except in tables 2 and 3.

MORTAR
The mortar used in a HESBIA lintel must not be weaker than an accurately batched 1:1:6 cement:lime:sand mix. Half a bag of cement and one third of a bag of lime will fill up the spaces between the sand grains in a three cubic foot mixer full of sand to provide a convenient way of achieving accuracy. No plasticisers should be added because their use is usually accompanied by the entrainment of too much air. This makes the mortar, and hence the brickwork, too weak to play its part in the lintel. If washed plasterer's sand is mixed with bricklayer's sand and the lime is included, the resulting mortar will need no plasticiser to make it workable and the brickwork will be stronger as a result.
With calcium silicate and concrete bricks, the manufacturer may recommend the use of a mortar of composition 1 cement: 5 washed sand plus the methyl cellulose water thickener that he supplies. Such a mortar is accepted as being equivalent to the 1:1:6 mortar required by this brochure.

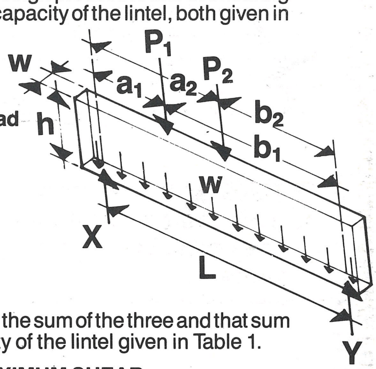
DESIGN OF HESBIA LINTELS
GENERAL
HESBIA lintels may be designed using the methods given in the SAA Brickwork Code AS 1640 or the tables that follow may be used. Table 1 assumes that F'_m is 1.77 MPa and the maximum stress in the steel is 133 MPa, both values being slightly lower than would be obtained from the code.

USING TABLE 1 WITH UNIFORMLY DISTRIBUTED LOADS
BRICKWORK DIMENSIONS FIXED
When the span of the opening and the number of courses over it is fixed, Table 1 can be used to calculate the maximum load that can be carried.
Example 1 Span equals 2400 and the lintel is four courses high. Table 1 shows that this member can carry a load of 2.3 kN/m as well as its own weight.

LOAD AND SPAN FIXED
When the span of the opening is fixed and the load is known, Table 1 is used to determine the number of courses of brickwork needed in the lintel.
Example 2 Span equals 2700 and the load is 5 kN/m. Table 1 shows that a six course lintel will carry a 4.5 kN/m load over the span – not enough – therefore use a seven course lintel with a capacity of 6.3 kN/m.

LOAD AND HEIGHT OF BRICKWORK FIXED
When the load and the number of courses in the lintel are fixed, Table 1 can be used to determine the maximum span of the lintel.
Example 3 The load on the lintel is 3 kN/m and it is three courses high. Table 1 shows that a three course 1800 span lintel will carry 2.1 kN/m and a 1500 span lintel 3.2 kN/m. By interpolating between these two values it is possible to determine that 1550 is the maximum span.

USING TABLE 1 WITH POINT LOADS
When point loads are applied, they will usually occur in conjunction with a uniformly distributed load, even if that load is only the mass of the brickwork in the lintel. In this case the design process is one of ensuring that neither the moment nor the shear capacity of the lintel, both given in Table 1, is exceeded.



CALCULATING AND CHECKING MAXIMUM BENDING MOMENTS

1) **For the Uniformly Distributed Load**
Max BM $= \frac{WL}{8}$

2) **For the Point Loads**
P_1:Max BM $= \frac{P_1 (a_1 \times b_1)}{L}$

P_2:Max BM $= \frac{P_2 (a_2 \times b_2)}{L}$

The total maximum bending moment is the sum of the three and that sum must be less than the moment capacity of the lintel given in Table 1.

CALCULATING AND CHECKING MAXIMUM SHEAR

1) **For the Uniformly Distributed Load**
The shear at both X and Y is $\frac{WL}{2}$

2) **For the Point Loads**
The shear at X is $\frac{P_1 \times b_1}{L} + \frac{P_2 \times b_2}{L}$

The shear at Y is $\frac{P_2 \times a_1}{L} + \frac{P_1 \times a_1}{L}$

3) **The Total Shear**
at X is $\frac{P_1 \times b_1}{L} + \frac{P_2 \times b_2}{L} + \frac{WL}{2}$ and

at Y is $\frac{P_2 \times a_1}{L} + \frac{P_1 \times a_1}{L} + \frac{WL}{2}$

Provided neither value exceeds the shear capacity of the lintel, as given in Table 1, all is well.

Example 4 A HESBIA lintel of single leaf 110mm brickwork with a span of 2100mm and a total depth of 506mm is required to carry its own weight plus two point loads; one of 2kN located at 600mm from the left hand end and the second of 3kN located 1000mm from the right hand end. Check to see that the lintel is safe.

$L = 2.1m$ $w = 110mm$
$a_1 = 0.6m$ $h = 506mm$
$a_2 = 1.1m$ $P_1 = 2kN$
$b_1 = 1.0m$ $P_2 = 3kN$
$b_2 = 1.5m$ $W = 1.06kN/m^*$

*The mass of brickwork applies a force of about $19kN/m^3$; therefore:–
$W = 19 \times 0.11 \times 0.506 = 1.06kN/m$

Check for maximum bending moment

$$= \frac{1.06 \times 2.1}{8} + \frac{2 \times 0.6 \times 1.5}{2.1} + \frac{3 \times 1 \times 1.1}{2.1} = 2.7kN/m$$

Table 1 shows the moment capacity of this lintel to be 8.45kN/m. It is therefore OK.

Check for maximum shear

$$\text{Shear at X} = \frac{2 \times 1.5}{2.1} + \frac{3 \times 1}{2.1} + \frac{1.06 \times 2.1}{2} = 3.97kN$$

$$\text{Shear at Y} = \frac{3 \times 1.1}{2.1} + \frac{2 \times 1.5}{2.1} + \frac{1.06 \times 2.1}{2} = 4.11kN$$

Both are less than the shear capacity of the lintel – 8.36kN – given in Table 1. It is therefore OK for shear.
The experienced designer will observe that shear at Y will be bigger than at X and will therefore not need to check both.

Table 1
PERMISSIBLE LOADS EXCLUDING SELF WEIGHT ON BEAMS 110mm IN THICKNESS

No. of Courses of Brickwork	Depth to (m) Steel	Uniformly distributed loads (kN/m)											Moment Capacity (kN/m)	Shear Capacity (kN)
		Span (mm)												
	d	1200	1500	1800	2100	2400	2700	3000	3300	3600	3900	4200	Mc	V
3	0.167	5.3	3.2	2.1	1.4	1.0	0.7	0.5	0.3	0.2	0.1	0.0	3.16	3.1
4	0.252	11.0	6.8	4.5	3.2	2.3	1.7	1.2	0.9	0.7	0.5	0.3	4.89	4.8
5	0.338	18.2	11.3	7.6	5.4	4.0	3.0	2.2	1.7	1.3	1.0	0.8	6.66	6.5
6	0.424	26.6	16.7	11.3	8.1	6.0	4.5	3.5	2.7	2.1	1.7	1.3	8.45	8.3
7	0.509	36.1	22.7	15.4	11.1	8.2	6.3	4.9	3.8	3.0	2.4	1.9	10.23	10.1
8	0.595	46.7	29.5	20.1	14.4	10.7	8.2	6.4	5.1	4.1	3.3	2.7	12.04	11.9
9	0.681	58.3	36.8	25.1	18.1	13.5	10.4	8.1	6.5	5.2	4.2	3.5	13.85	13.2
10	0.767	70.8	44.8	30.6	22.1	16.5	12.7	10.0	8.0	6.5	5.3	4.3	15.67	15.5

Table 2
HESBIA LINTELS FOR OPENINGS IN WALLS SUPPORTING TILED ROOFS
See Note 1

REQUIRED NUMBER OF COURSES (including the one below the tension bar)							
Span (mm)	Wall Thickness	Distance between walls = Span of roof (m) = A or C or A+C See Note 2					
		3.0	4.0	5.0	6.0	7.0	8.0
1800	90	3	3	3	3	3	4
	110	3	3	3	3	3	4
2100	90	3	3	3	4	4	4
	110	3	3	3	4	4	4
2400	90	3	4	4	4	4	4
	110	3	3	3	4	4	4
2700	90	4	4	4	4	5	5
	110	4	4	4	4	4	4
3000	90	5	5	5	5	5	5
	110	4	4	4	4	5	5
3300	110	5	5	5	5	6	6
3600	110	5	5	6	6	6	7

Table 3
HESBIA LINTELS FOR OPENINGS IN WALLS SUPPORTING 125mm CONCRETE SLABS See Note 1

REQUIRED NUMBER OF COURSES (including the one below the tension bar)							
Span (mm)	Wall Thickness	Distance between walls = Span of roof (m) = A or C or A+C See Note 2					
		3.0	4.0	5.0	6.0	7.0	8.0
1200	90	5	6	7	7		
	110	4	5	6	7		
1500	90	5	7	8	9		
	110	5	6	8	9		
1800	90	6	8	9			
	110	6	7	9	10		
2100	90	7	9				
	110	7	8	10			
2400	90	8					
	110	8	9	11			
2700	90	9					
	110	9					
3000	110	9					

Values in this shaded area must be calculated

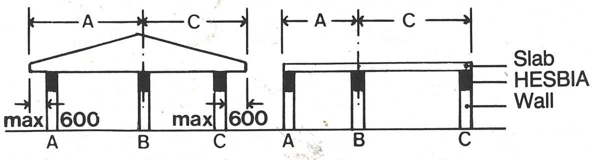
Notes to Tables 1 and 2

1. The roof loads are taken from the SAA Loading Code: AS1170 – Part 1, as follows:
   (a) – Roof framing and 10mm fibrous plaster 8.30kg/m²
   – Terra cotta roof tiles 58.60kg/m²
   – Concrete roof tiles 53.70kg/m²

   Total load – say 0.66kPa

   NO PERMANENT LIVE LOAD ALLOWED FOR

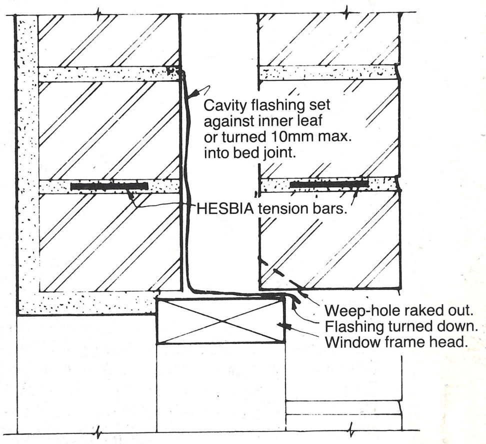
   (b) – The dead-load from the slab is based on a concrete density of $2400kg/m^3$.
   – The live-load is taken as 2.0kPa.
2. The distance between walls: – the span of the roof or suspended floor slab, shown in the following diagram:



is determined as follows: Wall A – distance = A
Wall C – distance = C
Wall B – distance = A + C

HEAD FLASHINGS FOR WINDOW AND DOOR OPENINGS

It is important that cavity flashings do not penetrate through the thickness of a HESBIA lintel. The method shown in the accompanying detail will act to divert any water running down the inside face of the external leaf and will be satisfactory in all but very severe conditions of exposure where workmanship is poor and the cavity has been bridged.
If either of these conditions is likely to prevail, it is permissable to build the flashing material into the inner leaf for a maximum distance of 10mm.



HESBIA PTY. LTD.

TELEPHONE [redacted]

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PATENT APPROVED No. 535657