

## Peter's Problem 2017: Suggested Solution

**Q1** *Verify that there are approximately 10 blocks per square metre of the wall, allowing 10mm of mortar between the blocks.*

Block dimensions (in mm): 440 x 215 x 100. With mortar (10mm) : 450 x 225 x 100.

The face area covered per block will be  $450 \times 225 = 101250\text{mm}^2$  or  $0.10125\text{m}^2$ .

The number of blocks required to cover  $1\text{m}^2$  is  $1 \div 0.10125 = 9.87654321$  blocks.

**Conclusion:** 9.8765 blocks per square metre is 10 blocks per square metre to the nearest block.

Or, 10 blocks will cover  $1.0125\text{m}^2$ , slightly more than one square metre.

This verifies that there are approximately 10 blocks per square metre.

**Q2.** *Calculate suitable dimensions for the window*

Visible wall: view D-D between the Book Store and the end wall.

Length of visible wall (in metres) =  $14.2 - (3 + 0.1 + 2.16 + 0.1) = 14.2 - 5.36 = 8.84\text{m}$ .

Height of wall = 3.15m which allows for 14 block courses ( $3.15 \div 0.225 = 14$ ).

Area of visible wall =  $8.84 \times 3.15 = 27.846\text{m}^2$ .

Window area = 40% of  $27.846 = \mathbf{11.1384\text{m}^2}$ .

### **Possibilities:**

To calculate possible lengths and heights for the window we observe that we require a product of *height x length* which gives the result 11.1384.

However, for building purposes it may be more practical to consider heights which match the courses of blocks. This is the approach taken here.

Allowing for a minimum lintel space of 1 course and a minimum radiator space of 2 courses we could have up to 11 courses (2475mm) available for the window height.

Furthermore, a window height of less than 1350mm (6 courses) would produce a window length ( $11.1384 \div 1.125$  (5 courses) = 9.9008m) greater than the 8.84m visible wall.

Thus, there are six practical possibilities of window design with heights ranging from 6 to 11 courses of blocks. Here we provide the calculations for a design which has a height of 1575mm (7 courses). This design allows for a radiator space of 5 courses (1125mm) and a course above the lintel. It also allows for the lintel overhang of 600mm at both ends.

### **Window Dimensions:**

Height: 1.575m.

Length:  $11.1384 \div 1.575 = 7.072\text{m}$

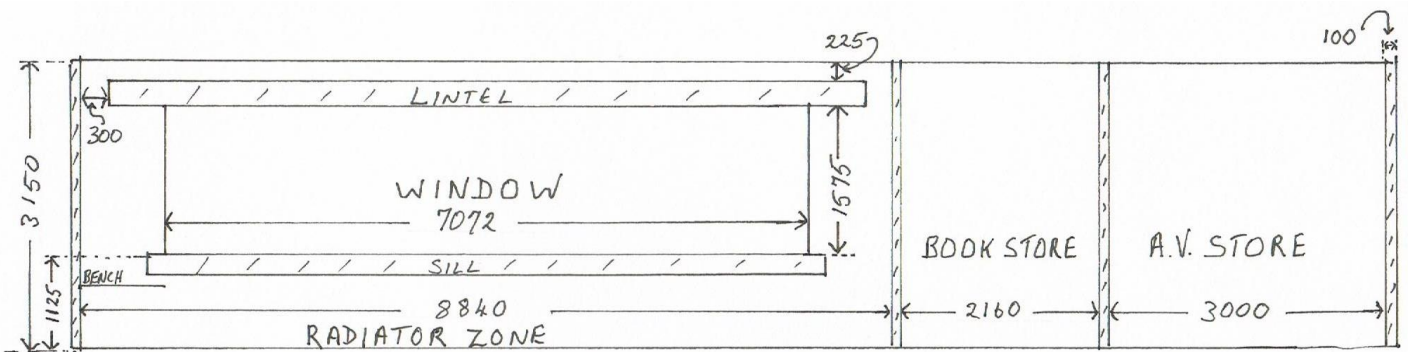
Window lintel length:  $7.072 + 2 \times 0.6 = 8.272\text{m}$ .

Window sill length:  $7.072 + 2 \times 0.2 = 7.472\text{m}$ .

**Q3. Make a scale drawing of the elevation D-D, to include the position of the window.**

**Considerations:**

The drawing will reflect the choice of window dimensions.



Note: All measurements are in mm

**Q4. Calculate the number of concrete blocks required to complete the building, using the dimensions given in the DES file drawing.**

There are numerous valid methods of doing this calculation. One method is presented here.

**Method:** The gross wall area is calculated on a piece-by-piece basis without making allowances for doors or window. The total area of the doors, window, lintels and sill is calculated and removed from the gross total area.

**Observations on Calculations:** The height of the building is 3.15m. We must allow for overlapping end-joints, insulation width and both leaves of blocks when finding lengths.

<b>Calculation of Gross Area of Walls (in m<sup>2</sup>)</b>			
View	Inner Wall (HxL)	Outer Wall (HxL)	Total area (m <sup>2</sup> )
A-A	3.15 x 7 = 22.05	3.15 x (7 + 2 x 0.1 + 2 x 0.09) = 3.15 x 7.38 = 23.247	45.297
B-B	3.15 x (14.2 + 2 x 0.1) = 3.15 x 14.4 = 45.36	3.15 x (14.4 + 2 x 0.09 + 2 x 0.1) = 3.15 x 14.78 = 46.557	91.917
C-C	As for A-A: 22.05	As for A-A: 23.247	45.297
D-D	As for B-B: 45.36	As for B-B: 46.557	91.917
<b>Total for A-A, B-B, C-C, D-D:</b>			<b>274.428</b>
	AV Store (HxL)	Book Store (HxL)	Total area (m <sup>2</sup> )
Side Wall	3.15 x 3 = 9.45	3.15 x 3 = 9.45	18.9
	AV Store with Book Store		
Front Wall interior	3.15 x (3 + 2.16 + 2 x 0.1) = 3.15 x 5.36 = 16.884		16.884
<b>Total for AV Store and Book Store</b>			<b>35.784</b>
<b>Grand Total Gross Area:</b>			<b>274.428 + 35.784 = 310.212</b>

**Observations on Areas to Remove:**

Door height:  $11 \times 0.225 = 2.475\text{m}$  (Lintel is in 12<sup>th</sup> course of blocks).

Door width: Internal door  $850 + 2 \times 25 = 900\text{mm} = 0.9\text{m}$  (allowing for the frame width).

Internal door lintels length:  $900 + 2 \times 300 = 1500\text{mm} = 1.5\text{m}$ .

External door:  $2.6 \times 900 = 2340\text{mm} = 2.34\text{m}$ .

External door lintel length:  $2340 + 2 \times 300 = 2940\text{mm} = 2.94\text{m}$ .

Parts to remove	HxL	Areas to Remove (m <sup>2</sup> )
Two Internal door openings	2.475 x 0.9	2.2275 x 2 = 4.455
Two Internal door lintels	0.225 x 1.5	0.3375 x 2 = 0.675
External door openings (inner and outer walls)	2.475 x 2.34	5.7915 x 2 = 11.583
External door lintel (inner and outer walls)	0.225 x 2.94	0.6615 x 2 = 1.323
Window area x 2	1.575 x 7.072	11.1384 x 2 = 22.2768
Window lintel x 2	0.225 x 8.272	1.8612 x 2 = 3.7224
Window sill	0.225 x 7.472	1.6812
<b>Total area to remove</b>		<b>45.7164</b>

Area remaining for blocks:  $310.212 - 45.7164 = 264.4956\text{m}^2$ .

**Number of blocks required @ 10 blocks per m<sup>2</sup> and rounded up: 2645**

**Added wastage @ 5% is 132.25 which requires 133 blocks.**

**Total number of blocks: 2645 + 133 = 2778.**

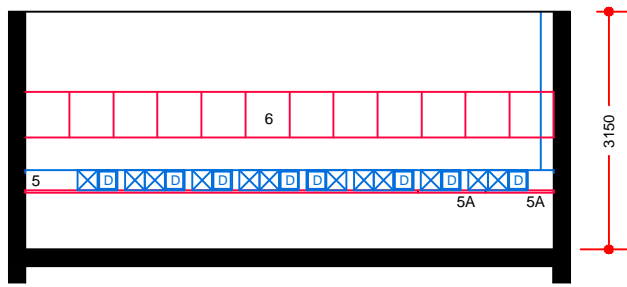
**Q5. Using the standard bale found on-line in Ireland, calculate the number of bales of blocks required to complete the building.**

Any suitable online reference may be used.

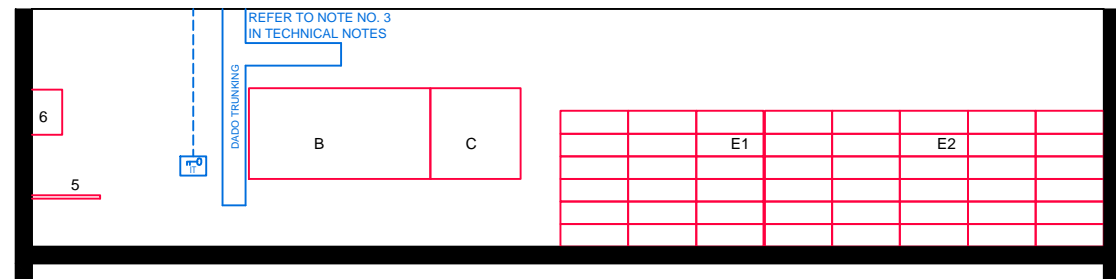
The number of blocks per bale is 44 for our calculations.

$2778 \div 44 = 63.13636$  bales.

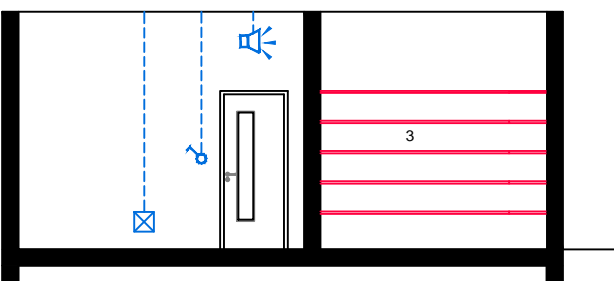
This rounds up to 64 bales required.



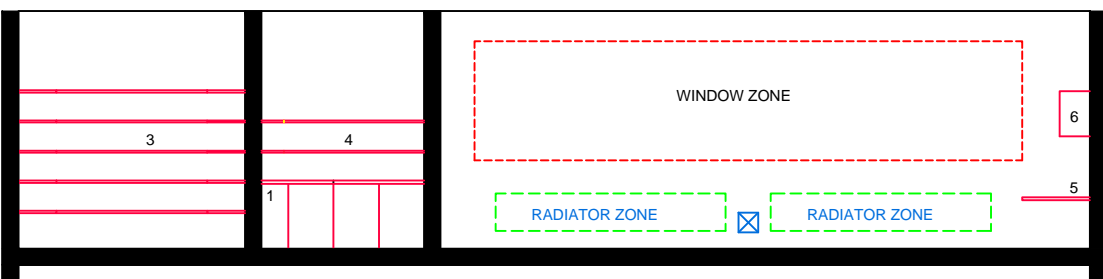
ELEVATION: A - A



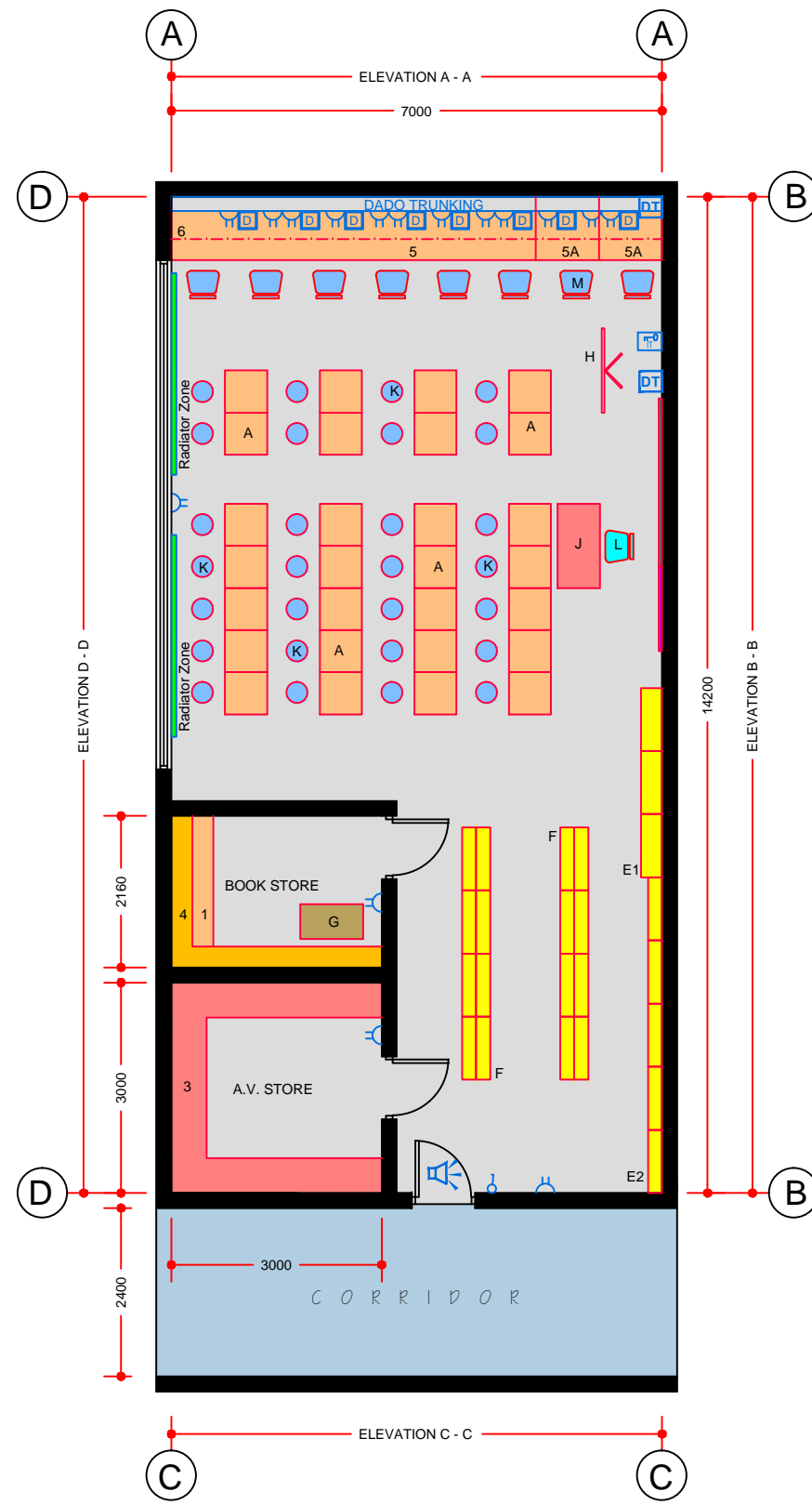
ELEVATION: B - B



ELEVATION: C - C



ELEVATION: D - D



FLOOR PLAN

**TECHNICAL NOTES**

1. This document provides guidance in relation to the requirements for a Library & Ancillary Stores.
2. This document should be read in conjunction with the Technical Guidance Documents (TDGs) as published by the Department of Education & Skills.
3. Refer to Drawing Ref No. RT-ICT-A-100 'Data Projector Installation' for detailed requirements.
4. Final position of network points and associated power outlets shall be above desk/worktop height.
5. Dado trunking shall feed from above in ground floor situations and from ceiling void below if room is located on upper floors.
6. In teaching spaces containing data projectors manual two way switching shall be provided on the row of lights nearest the teaching wall.
7. Control heating to room using 2-port valve and lockable digital type electronic room thermostat.
8. A.V and bookstore to be designed as secure areas with outward opening security door, appropriate locks, hinge bolts and steel frames. There should be no windows to these areas.

**FURNITURE & EQUIPMENT SCHEDULES**

FIXED FURNITURE		
Quantity	Code	
1	01	BU
3	as shown	FS3/6
4	as shown	AS2/3
5	01	CWT
5A	02	CWT
6	5.5	HL6
LOOSE FURNITURE		
Quantity	Code	
A	28	T2
B	01	WB2
C	01	PB
E1	01	LSDM.3
E2	01	LSSB.5
F	02	LSDB.8
G	01	BTR
H	01	MW
J	01	T4
K	28	SIE0
L	01	S5
M	08	SCC

Appropriate provision of loose furniture for Special Education Needs should be made when required.

**BUILDING SERVICES LEGEND**

BUILDING SERVICES ENGINEERING SYMBOLS	Plan	Elevation
Light Switches	☐	☐
Single Switched Socket Outlets	⊕	⊕
Single Switched Socket Outlets (under worktop)	⊕	⊕
Cleaner's Socket Outlet (not controlled by isolator)	⊕	⊕
Twin Switched Socket Outlets	⊕	⊕
Water Boiler Point	⊕	⊕
Cooker or Built-in Oven Point	⊕	⊕
Data Projector Isolating Switch	⊕	⊕
Single Phase Power Supply	⊕	⊕
3 Phase Power Point	⊕	⊕
Mechanical Ventilation Power Point	⊕	⊕
Key Operated Isolating Switch on ICT Installation only	⊕	⊕
Key Operated Isolator/ knockout Button on Electrical Supply	⊕	⊕
Emergency Knockout Button on Electrical Supply	⊕	⊕
Gas Pressure Proving System Control Panel	⊕	⊕
Emergency Knockout Button on Gas Supply	⊕	⊕
PA Loudspeaker	⊕	⊕
Telephone Point	⊕	⊕
Network Point	⊕	⊕
Projector Audio Faceplate (PAF)	⊕	⊕
Sub-distribution Board (possible location)	⊕	⊕
Dado Rail Trunking	⊕	⊕
Dado Trunking (vertical drop/ rise)	⊕	⊕
Radiator	⊕	⊕

**GENERAL NOTES:**

1. This drawing is for information and reference only, designers are responsible for co-ordination issues and compliance with Building Regulations.
2. Doors shall provide 850 mm clear opening width, except where indicated otherwise.
3. Do not scale the drawing. Use figured dimensions only. All dimensions given are in millimetres.
4. All room dimensions are "internal dimensions".
5. Area = net internal area of the room.
6. All elevations are internal room elevations.
7. Any discrepancies between this document and other documents shall be reported to the Department.

POST-PRIMARY SCHOOL ROOM LAYOUTS:

## LIBRARY & ANCILLARY STORES

(100 m<sup>2</sup>)

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**THE DEPARTMENT OF EDUCATION AND SKILLS**

**Planning and Building Unit**