

OLLSCOIL NA hÉIREANN, GAILLIMH
THE NATIONAL UNIVERSITY OF IRELAND, GALWAY

SUMMER EXAMINATIONS, 1999

SECOND ENGINEERING

PRINCIPLES OF BUILDING

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Time allowed **2 hours**. Answer **four** questions

1.
 - (a) Describe what is meant by *strength* and *stability* in relation to building.
 - (b) Describe four methods of structural organisation of a building, giving details of materials, structural components, load transfer and the relative merits and demerits of each method.

2.
 - (a) Describe the aim or philosophy underlying the Building Regulations Second Schedule Part L on Conservation of Fuel and Energy. List the principal components of building design and construction which Technical Guidance document L emphasises as contributing to this aim.
 - (b) Calculate the U-value (in $\text{W/m}^2\text{K}$) of the cavity wall construction shown in the attached diagram. The following information may be used:

Standard values for thermal resistance of exposed walls

outside surface	$0.06 \text{ m}^2\text{K/W}$
inside surface	$0.12 \text{ m}^2\text{K/W}$
air space (cavity)	$0.12 \text{ m}^2\text{K/W}$

Thermal conductivities of building materials:

concrete block (heavyweight)	1.13 W/mK
external rendering	0.50 W/mK
plaster (lightweight)	0.16 W/mK
 - (c) Illustrate with a sketch a construction detail that allows thermal bridging to occur at windows and doors. Sketch modifications to this detail that reduce thermal bridging.

3. *Strength and stability* and *thermal comfort* are some of the performance requirements for a building. List **four other** performance requirements and discuss their implications for material choice and building design.

4. (a) Sketch a section through a concrete ground floor for a domestic dwelling. The floor is to include insulation and radon barriers. Name all elements.
- (b) Describe the advantages and disadvantages of each of the following tender options:
- (i) negotiated tender;
 - (ii) open tender;
 - (iii) selected tender.

5. (a) With regard to room illumination, indicate what is meant by the terms:

- (i) Coefficient of utilisation;
- (ii) Maintenance factor;
- (iii) Room index.

- (b) A room 12m long and 6m wide and with a ceiling height of 3.5m requires a lighting level of 350 lux at a height of 1m above floor level. It is proposed to use twin tube fluorescent fittings with plastic diffusers mounted flat against the ceiling. Given the following data, estimate how many lighting fittings are required:

Coefficient of utilisation of light fitting	0.52
Maintenance factor	0.70
Lumen output per lamp or tube	5100 lumens

What is the value of the room index?

- (c) Transformers are extremely important devices in electrical engineering. Discuss briefly their operation and importance. Give two examples of where they might be used.

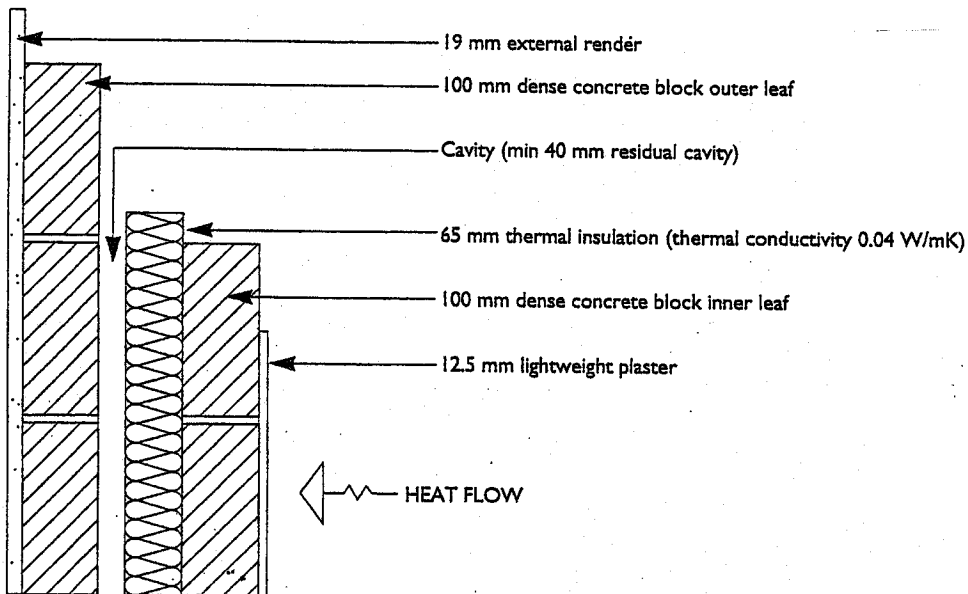


Fig. Q2 Section through cavity wall