UNIVERSITY OF SOUTH AUSTRALIA
SCHOOL OF NATURAL & BUILT ENVIRONMENTS

PROGRAM: **Bachelor of Construction Management & Economics**

COURSE: **BUILDING SURVEYING 2 (BUIL 4019)**

EXAMINATION: **Semester 2, 2004**

DURATION: **3 hours of exam time (1 ½ hours each for Parts A and B) preceded by 10 minutes of reading time, a total of 3 hrs 10 mins. For ENTEXT students 10 minutes of reading time plus 3.5 hours of exam time, a total of 3 hrs 40 mins.**

EXAMINERS: **Part A – John Mazzarolo. Part B – Andrew Gehling. Acting Course Coordinator – Stephen Pullen. Ph. 22753.**

EXAM REVIEWED BY : **George Zillante and Stephen Pullen**

INSTRUCTIONS TO CANDIDATES:

- This exam is worth 50% of the total course marks
- Part A and Part B of this examination are of equal value.
- Attempt all questions.
- The value of each question is as shown.
- The exam is open book. A calculator is allowed.
- State any assumptions made.
- Answer Parts A & B in separate exam booklets.
- Write on both sides of the page.
- Commence each new question on a new page.

NOTES FROM EXAMINER:

PART A

Question 1 — 12½ marks

The external walls of a factory are constructed of 200 mm hollow concrete blocks that are required to achieve an FRL of 120/120/120. The walls are laterally restrained by steel columns at 6m centres. The height of the walls is 4.5m. The walls are not laterally restrained at the top.

The effective thickness of the blocks is 100mm. The blocks have a basaltic aggregate content less than 45% and a density of 1750 kg/m^3.

Determine if both of the following statements apply, explaining your reasoning:

(a) The wall achieves the required FRL using the methodology set out in AS 3700;

and

(b) The wall achieves the required FRL using the 190 "X" Series blocks for which the fire testing data is attached (next page).

Question 2 — 10 marks

Determine whether a 120 x 120 radiata pine post that carries a limit state load of 2.6 kN can achieve an FRL of 30/0/0. The allowable compressive stress in the post is 2.5 MPa.

The density of pine timber is 550 kg/m^3.

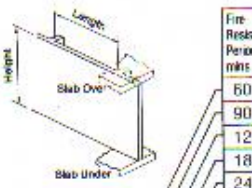
Please show all the processes that you have used to arrive at your answer.

Fire Testing Data

Unit 190 mm Hollow Unit

Mix Ba Sc 1

t = 190
C_1 = 0.0557
C_s = 8.60
a_v = 0.75
a_h = 1.0
K_t = 1.0



Fire Resistance Period mins	Required Equivalent Thickness mm
60	61
90	76
120	91
180	116
240	137

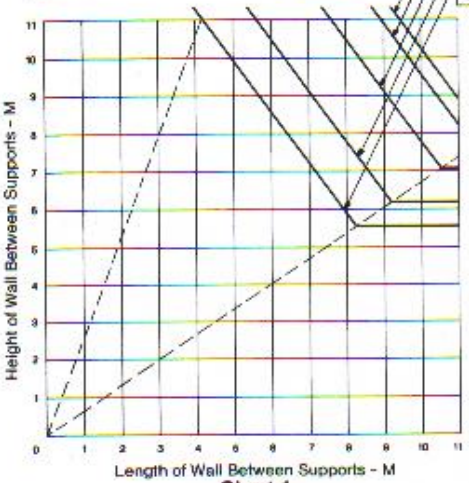


Chart 1

FIRE RATED CONCRETE MASONRY WALLS - PERMISSIBLE WALL CONFIGURATIONS

These tables refer only to concrete masonry units manufactured by Amatek Building and Paving Products and tested by CSIRO. They are not applicable to units manufactured by other manufacturers. All test result extrapolations are in accordance with AS3700 "SAA Masonry Code".

TO USE THE DESIGN CHARTS

1) Select the appropriate Chart.

   Both Charts assume that laying the first course in a mortar bed provides rotational restraint at the base, that there is no stiffening by built in piers ($K_t = 1$) and that the wall is not rotationally restrained at the ends ($a_h = 1$).

   If the wall supports a concrete floor slab such that rotational resistance is provided at the top, use Chart 1 ($a_v = 0.75$).

   If the wall is held in position at the top but is not rotationally restrained, use Chart 2 ($a_v = 0.85$).

   If the wall has no top support, use Chart 3 ($a_v = 2.0$).

2) Select the required Fire Resistance Period.

3) Plot the wall configuration (height between supports and length between supports) on the Design Chart and ensure that it lies below or to the left of the design line.

4) Check any other design requirements as required by AS3700.

Unit 190 mm Hollow Unit

Mix Ba Sc 1

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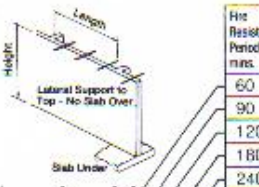
C_1 = 0.0557
C_s = 8.60
a_v = 0.85
a_h = 1.0
K_t = 1.0



Fire Resistance Period mins	Required Equivalent Thickness mm
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90	76
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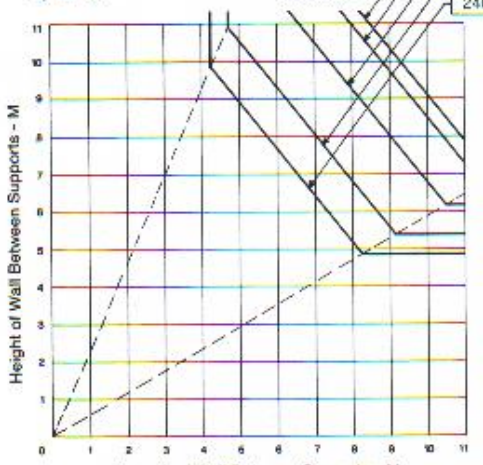
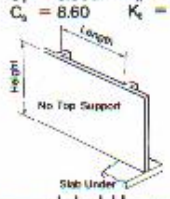


Chart 2

Unit 190 mm Hollow Unit

Mix Ba Sc 1

t = 190 a_v = 2.0
C_1 = 0.0557 a_h = 1.0
C_s = 8.60 K_t = 1.0



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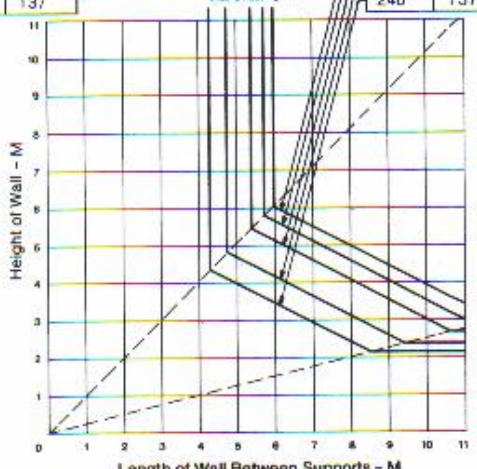
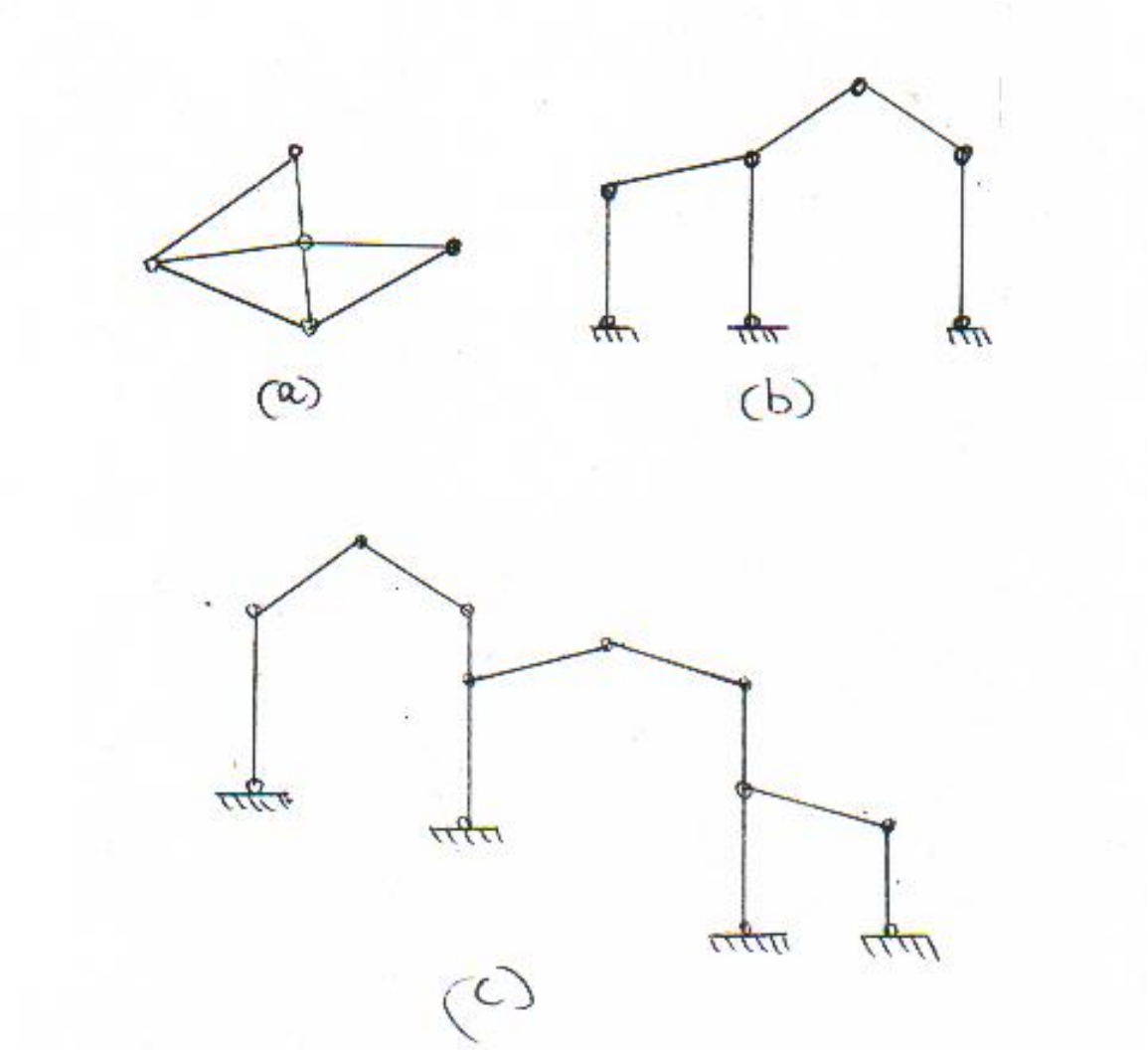


Chart 3

Question 3 12½ marks

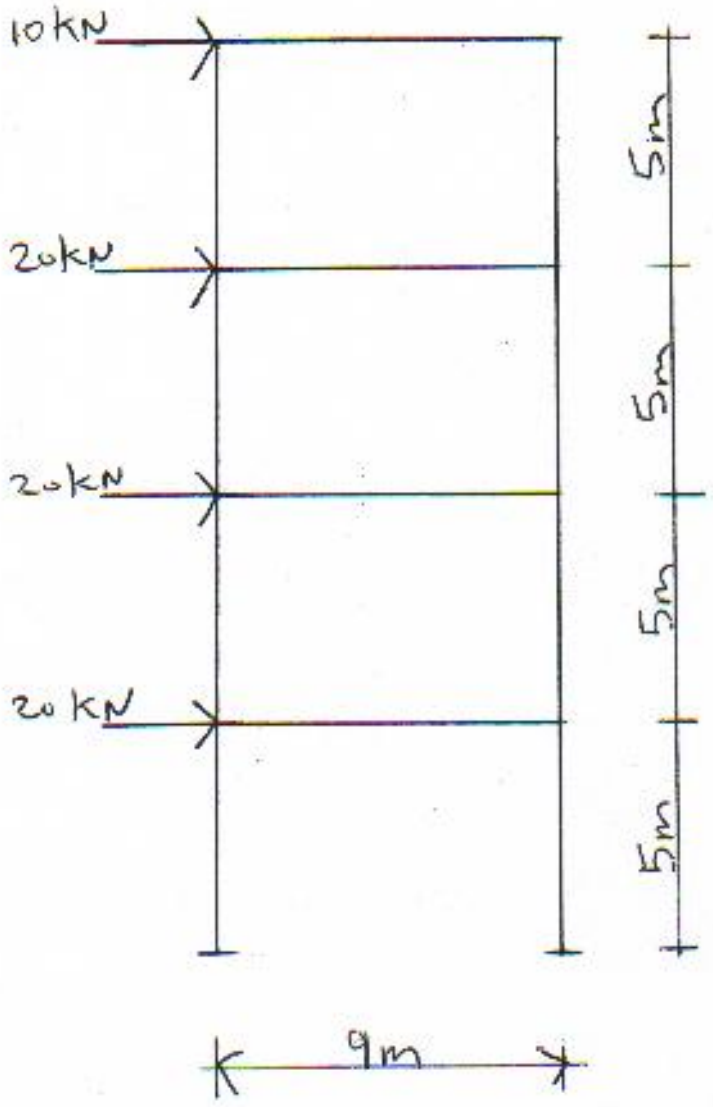
Determine whether the following structures are stable, mechanisms, or hyperstatic.

Draw the frames and show the additional bracing, if any, required to ensure the structures are stable.



Question 4 15 marks

Determine the approximate axial forces, shear forces and bending moments in the frame due to the lateral loads shown.



PART B 50 marks

You have recently been appointed to the role of "Built Assets Manager" for a newly established Council in metropolitan Adelaide. It was established as a result of the amalgamation of two smaller councils in 1998 and is a new senior administrative position in the Council. The appointment is for two years for the purpose of developing an asset management plan for the built assets owned by the Council. It is an initiative of the newly elected mayor.

The Council has asked for an asset management strategy to be developed to guide all facilities related expenditure over the next five years.

The Councils' built asset portfolio comprises the following:

1. Three (3) Customer Service centres (i.e. Council Offices) being the originals for the two former councils and a newly built centre for the combined council.
2. Four Libraries comprising two large libraries, one in a heritage building and another in a 40 year old building attached to one of the original council office complexes, and two smaller branch libraries adjacent to suburban shopping centres
3. Two Town Halls one of which is leased out as a cinema and the other is hired out to local theatre groups on a minimal rental. Both are heritage buildings that have had minimal maintenance and are not up to current fire safety, and disabled access standards
4. Four recreation grounds including three with significant clubrooms and gymnasia attached.

The Council is funded by rates but it also receives funds from hire of some facilities.

You have been asked to give a presentation to the Council about how you would go about developing the asset management strategy.

Prepare a draft presentation, in which you outline the key points you would include in your presentation to the Council, to give them confidence that you can produce an appropriate asset management strategy for the Council .

Topics to be covered include

- Information to be gathered and maintained
- Maintenance issues
- Addressing deficiencies
- Developing budgets

Note that this is an initial presentation to the Council. They are not expecting detail.

Background material

(This intended to assist you in framing your answer, but there is no need to respond to any of the points below unless you consider them relevant to your proposal.)

- The Council facilities are distributed across the Council area.
- The estimated replacement value of the Council owned buildings is $15 million.
- Since the amalgamation, very little attention has been given to management of these assets because the Council has been focussed on other aspects of its service. Most of the detailed knowledge of these assets disappeared when a number of former staff retired at the time of the amalgamation.
- Council staff numbers have reduced from 150 to 100 since the amalgamation and many traditional council services (e.g. rubbish collection, parks and garden maintenance, and road and footpath maintenance) are now contracted out.
- There are a number of occupational health and safety issues associated with the older facilities including the original council offices.
- A recent survey of ratepayers and residents indicated that the community listed the following improvements in council services as top priorities.

    1. Improved recreation facilities.
    2. Improved library services – more books and other material and longer opening hours.
    3. Improved services for retired residents including a range of recreation, life long learning and volunteering opportunities.
    4. Retain and enhance the identity of the area through the preservation of heritage items.

END OF QUESTIONS