

UNIVERSITY OF SOUTH AUSTRALIA
SCHOOL OF GEOINFORMATICS PLANNING AND BUILDING
CONSTRUCTION AND FIRE ENGINEERING 2N—FIRE COMPONENT
(FIRE TECHNOLOGY 2)

Internal Examination

Date of examination: November, 2002
Examiner: Graham Brown

General instructions to candidates :

Write your name on the examination booklet.

You must answer all questions.

All questions and parts of questions have marks indicated in brackets e.g. (20 marks)

Lecture notes and text books and Australian Standards are permitted references.

Reading time is 10 minutes before commencing the paper.

Time for examination is 2 hours.

Maximum marks are 100.

Question 1.

- (a) Pressure available at the hydrant outlet is an important factor to be considered when deciding whether water tanks and pumps are required for the fire hydrant service in a building.

Discuss how the available pressure is affected by the height of the building and whether tanks and pumps would be required for a building five storeys in height given that the storey height of the building from slab to slab is 3 metres, the losses due to friction do not exceed 150 kilopascals (kPa), the static pressure loss is 10 kPa per metre, the residual pressure required for un-pumped hydrants is 250 kPa and the available pressure in the water main at ground level is 550 kPa.

(10 marks)

- (b) Discuss how the Fire Service would use the installed fire hydrant system to fight a fire on the tenth storey in a building having an effective height of more than 25 metres.

(10 marks)

Question 2.

- (a) You are responsible for ensuring that the sprinkler system installed in a building will still be satisfactory after the relocation of several full height partitions, the changing of office accommodation to storage areas and the installation of exposed evaporative cooling ductwork.

Discuss the factors that you would look at in deciding this.

(10 marks)

- (b) The correct assignment of hazard classification can have a major effect on the results achieved by a sprinkler system.

If you had a shop area where upholstered furniture was stacked to about 2 metres high and a fire occurred, what sort of outcomes would you expect from the situations of having

- no sprinklers
- an ordinary hazard sprinkler system installed.

Also comment on the effects of the sprinkler system on

- temperatures reached in the fire
- carbon monoxide production
- visibility.

(10 marks)

Question 3.

- (a) What type of smoke or heat detection devices, or systems of devices, would you recommend for the following buildings, and why would you make such a recommendation ?

- A large warehouse
- An aircraft refueling area
- The atrium space of an office building
- A hotel room

(10 marks)

- (b) What are the advantages that a “rate of rise” detector has over a conventional fixed temperature detector and why is this so ?

(10 Marks)

Question 4.

The Council has required your client to install a wall having a fire resistance level of 90/90/90 around the kitchen area of a restaurant which is adjacent to a shopping mall in a single storey shopping centre complex. Fire doors are required for the openings in this wall.

Your client wants to have the kitchen open to view from the restaurant and the mall so that the actions of the various extrovert chefs are highly visible and provide entertainment for the customers and will attract people into the restaurant from the mall.

Using the “performance solution” approach discuss any special extinguishing systems you would propose to satisfy the Council and meet your clients wishes.

(20 marks)

Question 5.

Smoke from a fire can be a hazard to the occupants of any building.

Discuss why this is so and explain why it is particularly dangerous in an enclosed shopping mall and the precautions you would recommend to mitigate the hazard.

(20 marks)

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EXTERNAL EXAMINATION

Date of examination: November 2002

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Time for examination is 2 hours.

Question 1.

You are the Consultant to a building owner who is proposing to construct a 6 storey office building in the central business district of Adelaide.

The effective height is 15 metres.

It is built to the side boundary on both sides and to the rear boundary on the other.

There is a narrow laneway along the rear boundary. The front faces a main road.

The floor area per storey is 3000 square metres.

The owner cannot understand why the building has to have storage or break tanks, pumps with varying flow and pressure characteristics, internal fire hydrants, and a fire service booster connection for use by the fire service when “they already have perfectly good fire hydrants in the street”.

Prepare a submission to the owner explaining why these requirements are necessary from a fire fighting point of view.

(20 marks)

Question 2.

By the use of diagrams explain what the differences are between a “purge system” and a “zone system” used for smoke control in the event of a fire in a building.

Discuss why one system performs better than the other and why this is so.

(20 marks)

Question 3.

Your client wants to install a sprinkler system into an existing building which has cold rooms in a kitchen area, a storage area for rare books, and a reading room area with a vaulted roof, exposed air conditioning duct work, and open web trusses.

Discuss the recommendations that you would make for such an installation and the things that you would check to ensure that the system would be effective.

(20 marks)

Question 4.

Discuss the types of extinguishing systems or equipment that you would recommend for the following situations and explain the reasons for your recommendations :

- (a). a fire in a deep fat fryer in a restaurant **(5marks)**
- (b). a fire in an electrical switchboard **(5 marks)**
- (c). a fire in a computer suite **(5 marks)**
- (d). a fire in a rare books storage room **(5 marks)**

Question 5.

Smoke from a fire can be a hazard to the occupants of any building.

Discuss why this is so and explain why it is particularly dangerous in an enclosed shopping mall and the precautions that you would recommend to mitigate the hazard.

(20 marks)