



1933

Building Construction (Honours): Technical School Examinations 1933

Department of Education: Technical Instruction Branch

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COURSE IN BUILDING.

(38)

AN ROINN OIDEACHAIS
(Department of Education).

BRAINSE AN CHEARD OIDEACHAIS
(Technical Instruction Branch).

TECHNICAL SCHOOL EXAMINATIONS.

1933.

BUILDING CONSTRUCTION.

(HONOURS.)

Friday, May 26th—7 p.m. to 10 p.m.

Examiner—F. W. WARWICK, ESQ., B.A., B.E., A.R.C.S.C.I.

Co-Examiner—J. P. HACKETT, ESQ., B.E., A.R.C.S.C.I.

GENERAL INSTRUCTIONS.

You are carefully to enter on the Answer Book and Envelope supplied your Examination Number and the subject of examination, but you are not to write your name on either. No credit will be given for any Answer Book upon which your name is written, or upon which your Examination Number is not written.

You must not have with you any book, notes, or scribbling paper.

You are not allowed to write or make any marks upon your paper of questions.

You must not, under any circumstances whatever, speak to or communicate with another candidate; and no explanation of the subject of the examination may be asked for or given.

You must remain seated until your answer-book has been taken up, and then leave the examination-room quietly. You will not be permitted to leave before the expiration of twenty minutes from the commencement of the examination, and will not be re-admitted after having once left the room.

If you break any of these rules, or use any unfair means, you are liable to be dismissed from the examination, and your examination may be cancelled by the Department.

Three hours are allowed for this paper. Answer-books, unless previously given up, will be collected at 10 p.m.

INSTRUCTIONS.

Read the General Instructions on page 1.

- (a) Not more than *six* questions in all may be attempted.
- (b) Answers must be written in *ink*; diagrams may be drawn in *pencil*.
- (c) Small diagrams and sketches, to illustrate written descriptions, should be made upon the squared paper.
- (d) Write the number of the question before the answer.
- (e) Equal values are assigned to the questions.

NOTE.—The following values are to be used in the calculations :—

Safe tensile stress in steel=16,000 lbs. per square inch.

Safe compressive stress in concrete=600 lbs. per square inch.

Modulus of elasticity for steel= 30×10^6 lbs. per square inch.

Modulus of elasticity for concrete= 2×10^6 lbs. per square inch.

Weight of reinforced concrete=150 lbs. per cubic foot.

1. Give dimensioned sketches of a form of concrete sill suitable for a window 3 feet wide in a 14-inch brick wall.

Twenty such sills are required; describe a suitable mould for making them.

2. Design a short square pillar to carry a central load of 100 tons. The pillar is to be reinforced with four vertical rods, each $1\frac{1}{2}$ inches diameter.

3. A concrete beam 14 inches wide is required to stand a bending movement of 500,000 lbs.—ins. Find the depth and suitable reinforcement if it is reinforced on the tension side only.

4. In a reinforced concrete beam some of the reinforcing rods are bent up to take shear. Explain why this may be done and how the positions at which they are bent up are determined.

5. A reinforced concrete floor slab is carried on beams running in one direction, the beams being supported on square columns. Sketch and describe the arrangement of the reinforcement—which consists of round rods—at the junction of the pillar, beam and floor slab. Explain the purpose of each reinforcement.

6. Write a short specification of the materials to be used and directions for the construction of a reinforced concrete upper floor.

7. A concrete beam 12 feet long is supported at its ends and has a cross section 10 inches broad by 20 inches deep. It is reinforced at midspan with four $\frac{3}{4}$ -inch diameter steel rods whose centres are 2 inches above the tension edge and by two 1-inch diameter rods whose centres are 2 inches below the compression edge. Find the position of the neutral axis of the section. If the beam carries a total load of 3,000 lbs. per foot run, find the stresses in the tension and compression reinforcements.

8. Design a reinforced concrete wall 12 feet high to retain loose earth, level with the top. The earth weighs 100 lbs. per cubic foot and its angle of repose is 30° .

You may use the formula $P = \frac{wh^2}{2} \tan^2 \frac{90^\circ - \theta^\circ}{2}$ for the total thrust on the wall.

9. Give a short account of the construction of spun reinforced hydraulic pipes. What advantages do you consider they possess over cast pipes?

OR

State what you know of the use of fibre web reinforcement in the construction of walls, roofs and paths.