Research news

Strength of joints in panel construction

REASONS FOR THE PROJECT

A programme of research has just begun to examine the strength and deformation of joints in panel construction. In panel construction, bending resistance is generally weak at the joints, owing to cracking of the concrete accompanied by inelastic rotations at the joints. The degree of cracking under various critical combinations of loadings and the resulting weakening of the joint is uncertain and may be serious.

OBJECT OF THE TESTING PROGRAMME

The object of the project is to examine the behaviour of joints under various possible critical combinations of loads, to identify the influencing parameters and to establish semi-empirical design formulae of general application. It is also hoped that the investigation will indicate the appropriate detailing of a preferred joint.

PRELIMINARY TESTS

Some thirty preliminary tests will be carried out first on 300 mm wide elements consisting of a beam strip 2 m long connected to short upper and lower wall strips by an in situ joint as in actual construction. The principal parameters in this preliminary study are the reinforcement detailing, the vertical pressure in the wall, the moment-shear ratio of the joints and the effect of critical vertical cracking through joints.

MAIN PROGRAMME OF TESTS

Full-scale joints will be tested in the project proper. The wall and slab components will be approximately 1·2 m wide and the details of joints investigated will depend upon the findings of the preliminary tests. The specimens will be heavily instrumented in order to examine the distribution of curvature, the rotational deformation characteristics, distribution of strain in the walls, the slip, the bond of the reinforcement and so on.

Seven possible combinations of loading will be considered:

(1) Dead load + live load + eccentricity on wall
(2) Case (1) + wind pressure
(3) Case (1) + wind suction
(4) Case (3) + thermal effect—higher temperature inside building
(5) Case (3) + thermal effect—lower temperature inside building
(6) Case (1) + explosion on floor above
(7) Case (1) + explosion on floor below

Joints with the above combinations of loading will be tested for the twentieth, tenth and ground floor of a twenty-storey building.

It is envisaged that the testing of the full-scale joints will begin in January 1971 and that the whole programme will be completed in September 1973.

SPONSOR

The sponsor of the project is the Ministry of Public Buildings and Works.

STAFF

Supervisors: Professor A. L. L. Baker and Dr C. W. Yu
Project leader: Dr P. Regan
Address: Department of Civil Engineering
Imperial College of Science and Technology
Imperial Institute Road
London SW7

High-strength steel as web reinforcement in prestressed concrete beams

AIM

An investigation has been started to determine the stress developed by various types of web reinforcement at the point of shear failure of a prestressed beam, and to ascertain whether this is governed primarily by the strength of the steel or by the deformation of the concrete. It is also proposed to consider whether the width of the inclined cracks is likely to impose a limitation on the use of high-strength steel in practice.

BACKGROUND

Previous tests have established that web reinforcement of mild steel may often attain its yield stress, but for high-strength steel an upper limit of stress is usually assumed (e.g. 420 N/mm^2) as for flexural tensile reinforcement. There does not, however, appear to be much experimental evidence either for or against this limitation.

PROGRAMME

Tests are to be made on prestressed beams of I section 330 mm deep, hard-drawn wires being used as post-tensioned tendons. The webs of the beams are 50 mm wide and are reinforced by single vertical shear links of different strength and spacing. Links of 6 mm diameter are being used with nominal tensile strengths of 280, 420 and 560 N/mm^2 and a smaller number of tests is to be made with links of larger diameters. Most of the beams are to be tested with two different levels of prestress.

A series of supplementary tests is being planned on concrete specimens with embedded bars in direct tension, in order to study width of cracks.

PROGRESS

A few tests have already been made. These have resulted in some modifications to reduce the risk of premature flexural failure.

STAFF

Supervisor: Dr E. W. Bennett
Project leader: Mr S. Y. Debaiky
Address: Department of Civil Engineering
The University
Leeds
LS2 9JT

Future 'Research news'

The Editor will welcome submissions for future editions of 'Research news'. Entries should relate to programmes of research which are just starting, or which are just entering a substantially new phase. The items above and in *MCR* 70, 71 and 72 should be taken as models as far as they are relevant. Each item must be submitted, or at least authorized in its final form, by the head of department or director of research concerned.

Entries for 'Research news' will be considered by the Editorial Advisory Board in the usual way and so, if it is convenient to submit up to eight copies (at least two, please), this is helpful. It is hoped to publish all items accepted in one of the two issues following the date of their receipt. As a general guide only, items for the March issue should reach the Editor by the end of January at the latest, and so on quarterly.