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Analysis of New Types of Composite Beams

Etude de nouvelles poutres mixtes

Analyse von neuartigen Verbundträgern

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1. INTRODUCTION

Increasing use of composite steel-concrete structures in the construction of buildings has called for the development of a new type of composite steel- concrete beams. The first object of this paper is to present composite steel-concrete beams which have been developed at the VITKOVICE steelwork company and at the Slovak Technical University, Faculty of Civil Engineering, Bratislava. The second object is to present the experimental results obtained through the series of test programmes.

2. CHARACTERISTIC OF THE NEW COMPOSITE BEAMS

The proposed composite steel-concrete or steel-reinforced concrete beams consist of a steel member and of a concrete or reinforced concrete. The steel member is built with the two rolled [profiles (steel channels) placed at the outside surface of the cross section. These beams can be mainly used as precast composite steel-concrete beams. The arrangement of steel part enables horizontally concreting without the need of special formwork. Beam joints can be solved as steel-steel. The basic idea is to built a composite steel-concrete beam without stud connectors. Theoretical analysis is based on the model of the trussed structure [1] .

3. TEST SPECIMENS, APPARATUS AND MEASUREMENTS

Six beams (three pairs UBO, UBA1, UBA2) were tested in the first series. The specimens, of total length 4,2 m were simply supported and subjected to the two point loads. Details of the specimens are summarized in Fig. 1, Fig. 2, and Fig. 3. The cross section of the beam UBO was built only with two channels [140 and concrete. The cross sections of the beams UBA1 and UBA2 were completed with the reinforced concrete. The arrangement of the reinforcement 2 Ø 25 or ⧺ 60.16 schow the Fig. 2 and Fig. 3. The overall design of each beam was made using simple plastic

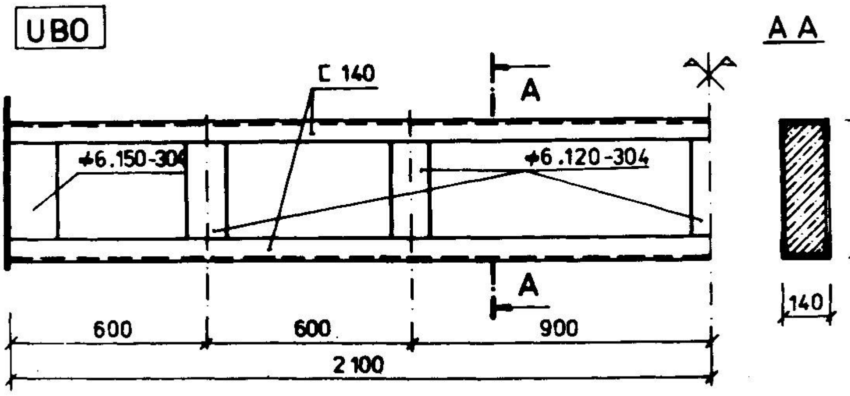

Fig. 1 Details of the beam UBO

theory. The performance of the beams can be seen in Fig. 4 which schows the midspan deflexion and from the condition at ultimate load which is given in the Table 1.

Measurements of deflexion were taken at midspan by indicating gauges. Longitudinal strains on both steel channels and concrete were measured in three cross sections using mechanical strain gauges with a 200 mm gauge length and electrical resistance strain gauges, too. The test programme continues and we are testing another types and arrangements of the connectors between two steel channels.

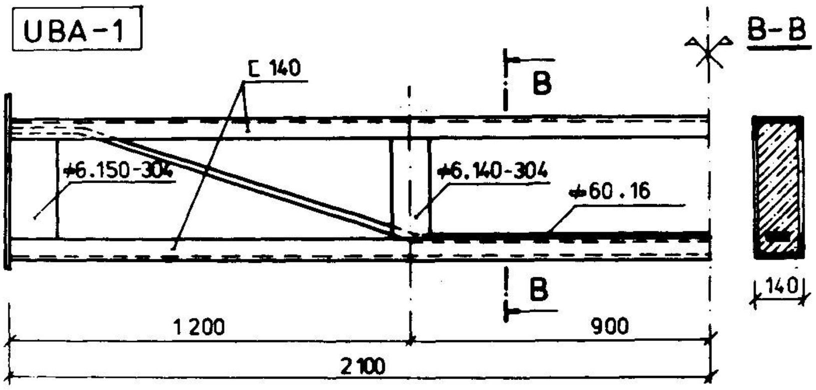

Fig. 2 Details of the beam UBA1

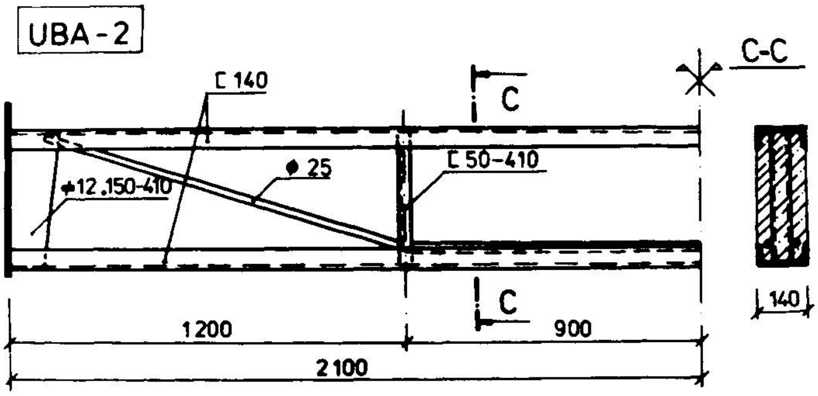

Fig. 3 Details of the beam UBA2

Type of the beam	Ratio M_t / M_d
UBO - 1	1,38
UBO - 2	1,45
UBA1 - 1	1,40
UBA1 - 2	1,43
UBA2 - 1	1,21
UBA2 - 2	1,20

Table 1 Values of the ratio M_t / M_d.

M_t is maximum bending moment in the test, M_d is design bending moment

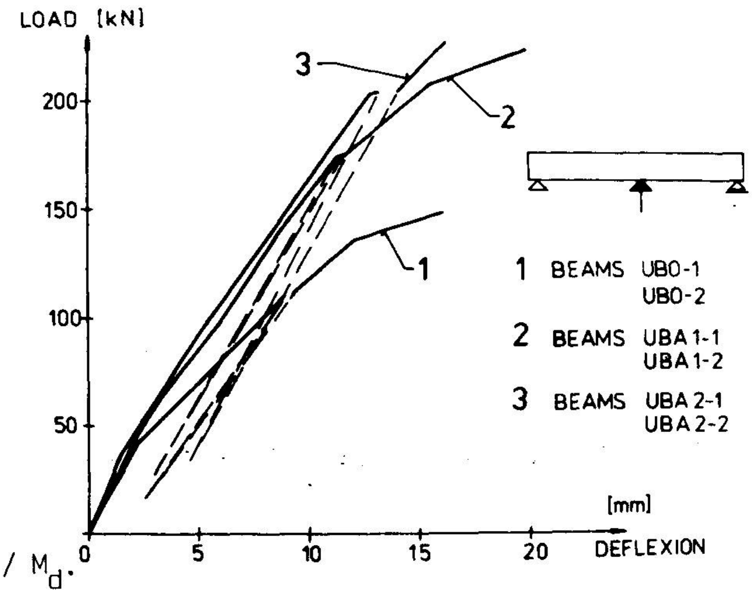

Fig. 4 Load-deflexion curves for centre spans

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