Tests on Prefabricated Centrifuged Columns

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To satisfy the requirements of the architects and the building owners the structural engineers are induced to curtail the size of the vertical structural members. As an alternative to steel columns the Company Gram S.A., Villeneuve, Switzerland has developed centrifuged concrete columns. These structural members, with an extremely high degree of reinforcement up to 20 % have a very high load capacity, an excellent appearance and a good fire-resistance. In order to observe the behaviour under load and imposed deformations of such columns, the Institute of Reinforced and Prestressed Concrete (IBAP) of the Swiss Federal Institute of Technology, Lausanne (EPFL) has carried out theoretical and experimental studies. These are a part of the more general investigations on columns in buildings presented by R. Favre at the 12th IABSE Congress in Vancouver [1].

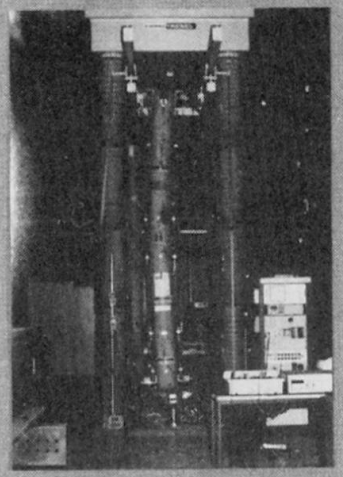
The columns have been tested in a 10000 kN press and the load was applied either using inclined built-in ends (test type I) or linear knife edges (test type II).

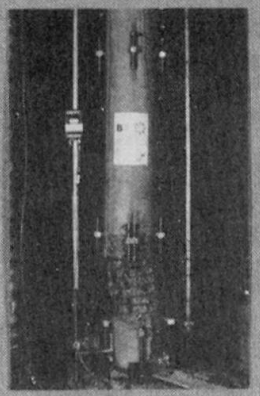
The ten columns which have been tested have a length of 4,00 m and a diameter of 0,29 m; six of them have a longitudinal reinforcement of 8 bars of 34 mm (ρ = 12,4 %) and four have a HEM 140 steel section in the interior (ρ = 18,0 %). The test results [2] demonstrate the high load capacity of centrifuged columns as well as a high degree of ductility. In the tests type I this characteristic allows the column to centre gradually the vertical load, even with imposed angles up to 1,5 %. In the tests type II however, which agree with the usual calculation model of such structural members, columns with both ends hinged and vertical load brought in with an initial eccentricity, the load capacity is much lower.

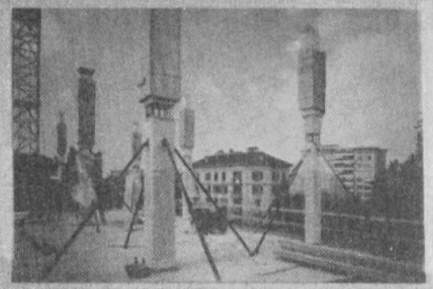
[1] R. Favre, D. Najdanovic, R. Suter, C. Thürlimann
A new Concept for R.C. Columns in Buildings Proceedings of 12th IABSE Congress, Vancouver, 1984.

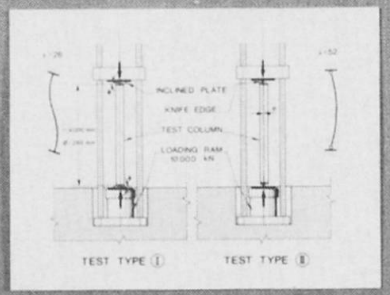
[2] R. Suter, S. Dal Busco
Tests on prefabricated centrifuged columns (test report) Swiss Federal Institute of Technology, Lausanne, 1984.

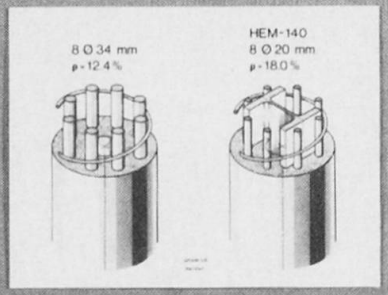
TESTS ON PREFABRICATED, CENTRIFUGED COLUMNS











RESULTS	COLUMN TYPE	HOOP REINF.	TEST TYPE	N_u	NOTES
COLUMN					
A 1		Ø 4 mm	I θ = .008	5170 kN	Hoop failure
A 2		Ø 8 mm	I θ = .007	5770 kN	
B 1		Ø 6 mm	I θ = .013	5740 kN	2nd order
B 2			I θ = .012	5670 kN	
B 3			II e = 30 mm	3240 kN	+29.0 mm
B 4			II e = 60 mm	2420 kN	+36.8 mm
B 5			I θ = .01	5350 kN	
B 6			II e = 30	2790 kN	+39.5 mm
B 7			II e = 60	2100 kN	+42.1 mm
B 8			II e = 60	2680 kN	+33.4 mm