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PRELIMINARY REPORT ON RESULTS OF RESTRAINED COLUMN TESTS

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September, 1963.
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This report briefly presents the results of seven restrained column tests conducted at Fritz Laboratory between January and August, 1963.

I. HISTORY

The tests were proposed in Fritz Laboratory Report 278.6 (Proposal for Restrained Column Tests) in 1962 and accepted at the 1962 Lehigh Project Subcommittee meeting. A report on the novel testing technique is now (September, 1963) in the final stages of preparation and will be distributed as Fritz Laboratory Report 278.7. A report on the seven test results will follow.

II. TEST SET-UP

The test set-up is shown diagrammatically on page 3.

III. TEST VARIABLES

The Table 1 on page 4 presents the variables introduced in the seven tests.

IV. TEST RESULTS

The results are presented in graphical form on pages 5 to 11. A summary of the results is given in Table 2 on page 12.

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V. CONCLUSIONS

- 1) For all P/P_y , except 0.8, the column deflection curve approach provides close and slightly conservative estimates of the behavior of structural frameworks containing significant axial forces.
- 2) There are no instability effects associated with the unloading portion of the column curve. This region can be used in design to effect a further increase in load capacity estimates.
- 3) Care must be taken in using standard design methods in those situations in which the columns meeting at a joint are markedly less flexible than the beam. In such a situation compatibility and deformation must be considered.

TESTS CONDUCTED IN 5 MIL LB MACHINE. LOADS ON STUB BEAMS APPLIED BY HYDRAULIC JACK. BEAM-TO-COLUMN CONNECTIONS ARE WELDED.

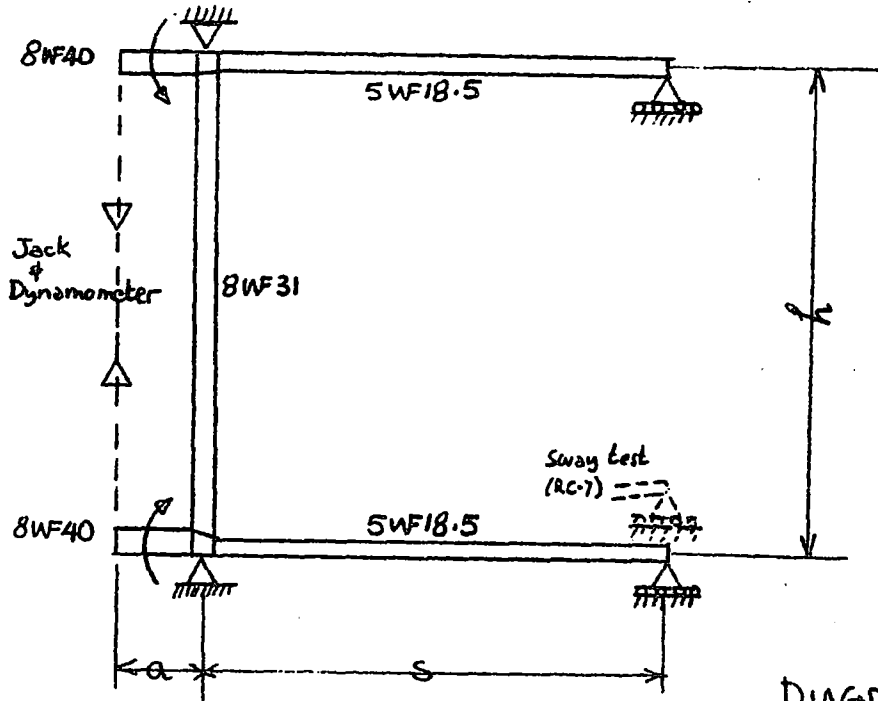
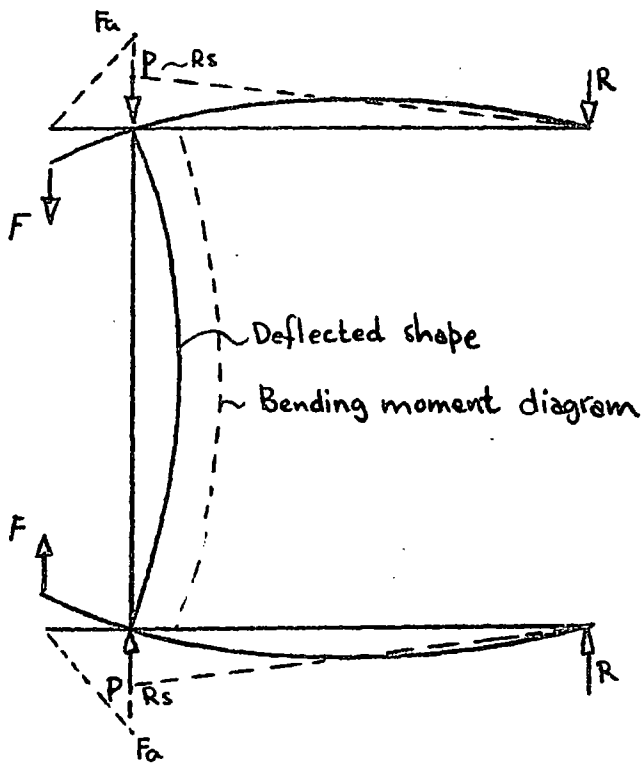


DIAGRAM OF TEST SET-UP



DEFLECTED SHAPE & BENDING MOMENT DIAGRAM

TEST NO.	P/P_y	h/r	e/d	NOTES
RC-1	0.4	60	38.4	P/P_y increased from 0.4 to 0.53
RC-2	0.4	60	28.8	
RC-3	0.4	60	19.2	
RC-4	0.6	40	38.4	
RC-5	0.6	40	28.8	
RC-6	0.8	30	28.8	High axial load test.
RC-7	0.4	60	28.8 [#]	Sway test, $\theta_{\text{sway}} = \frac{1}{2} \theta_{\text{joint}}$.

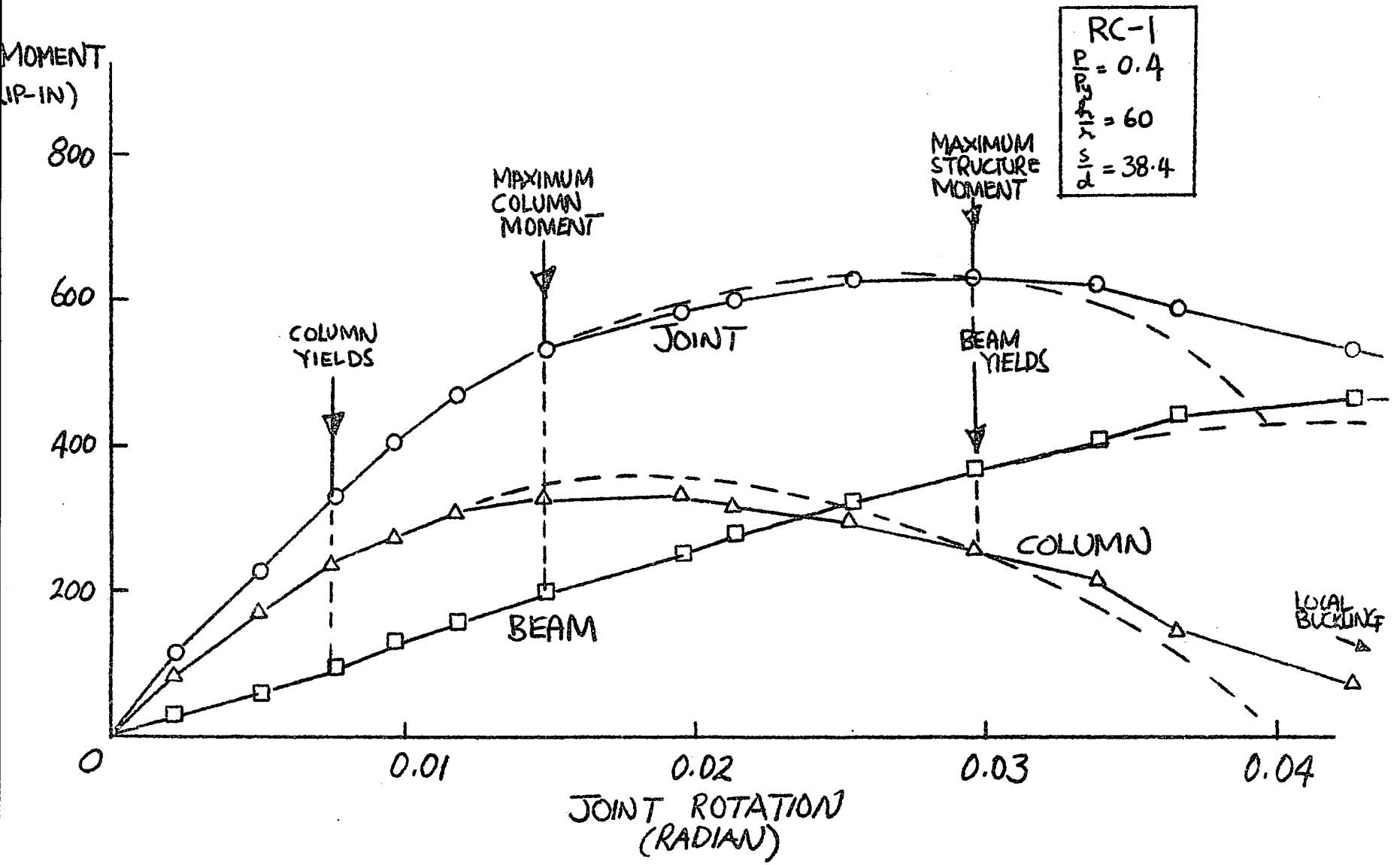
P_y = Area x yield stress

r = radius of gyration (column)

d = depth (beam)

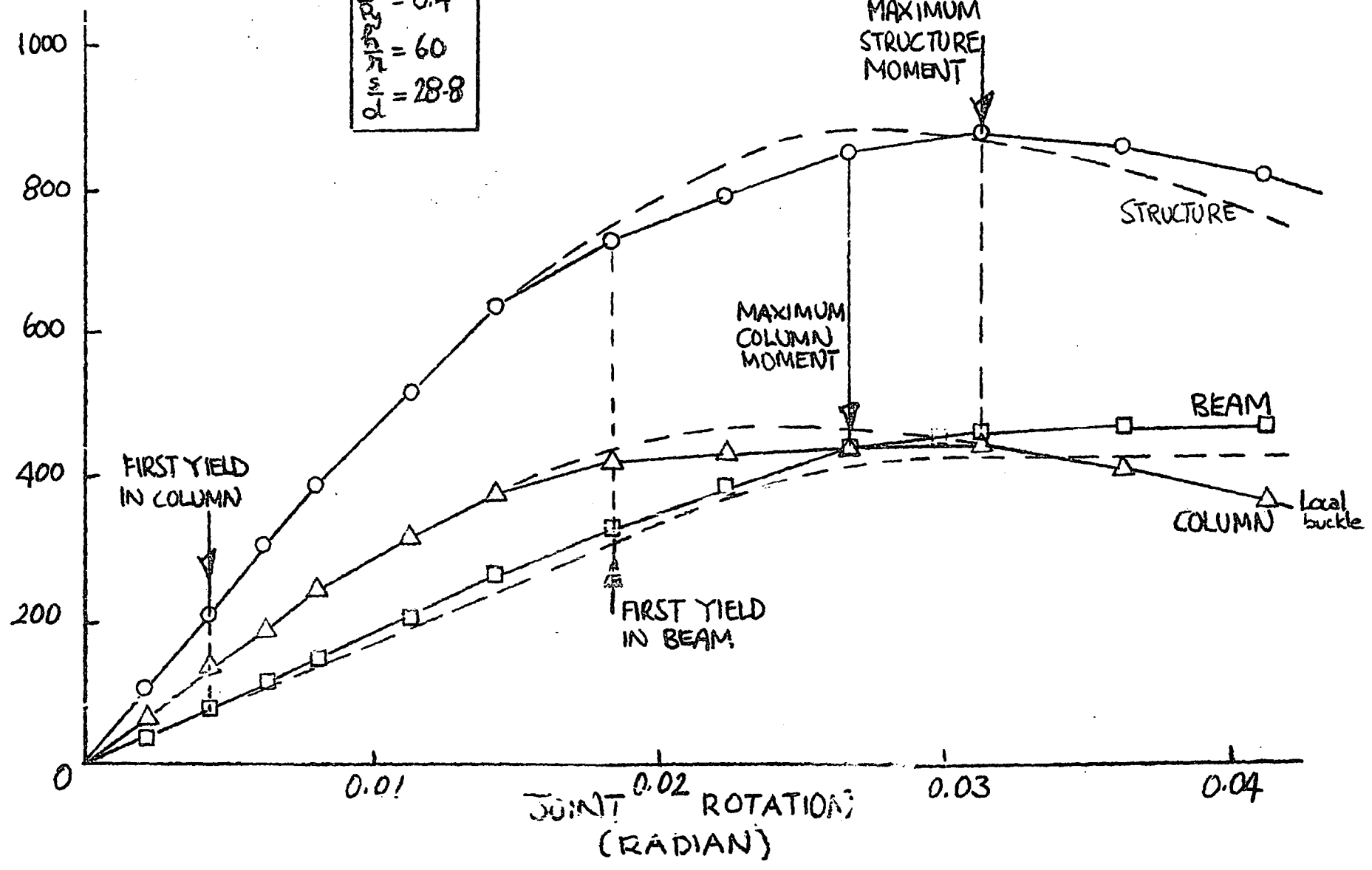
[#] top beam omitted

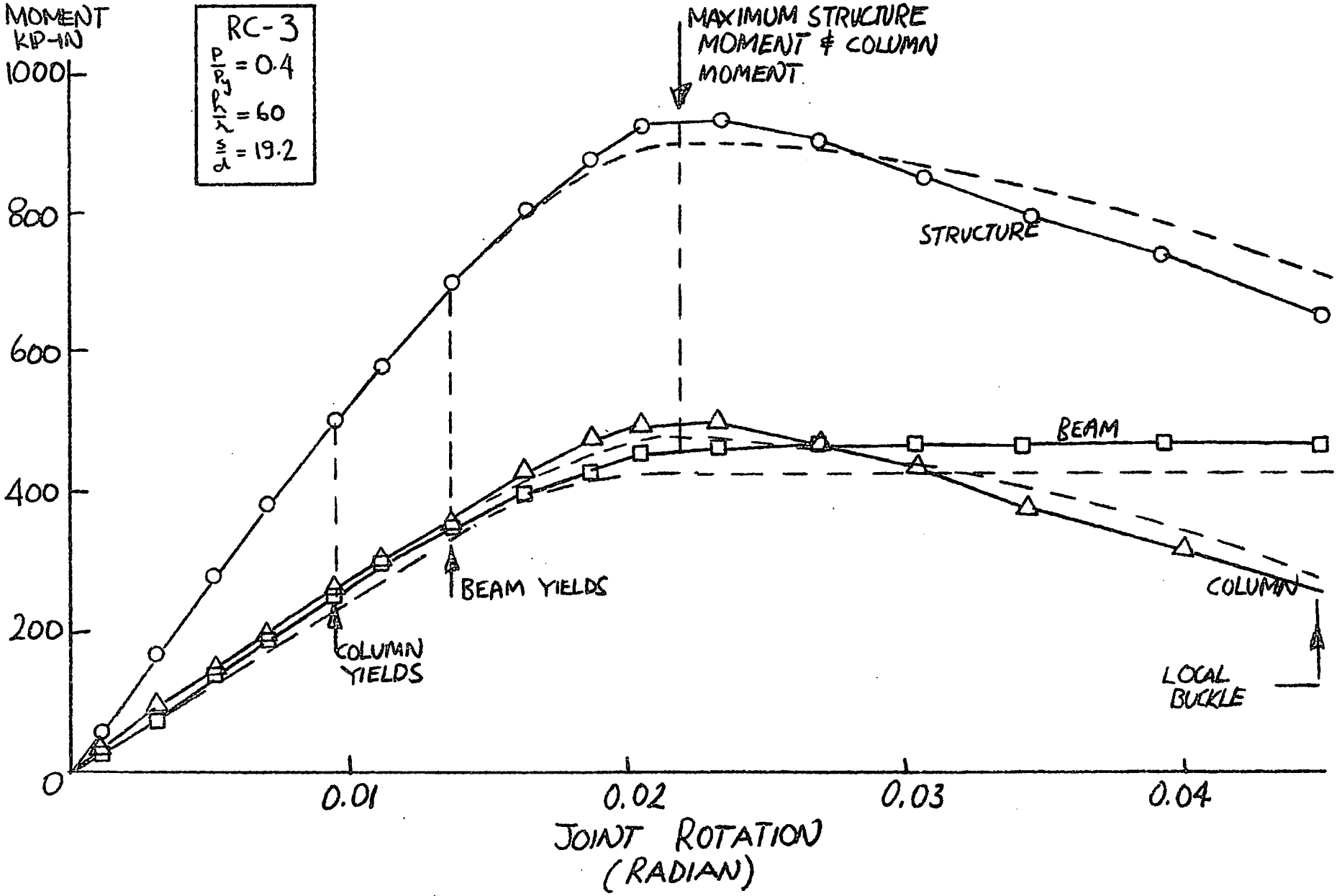
TABLE I



MOMENT
KIP-IN.

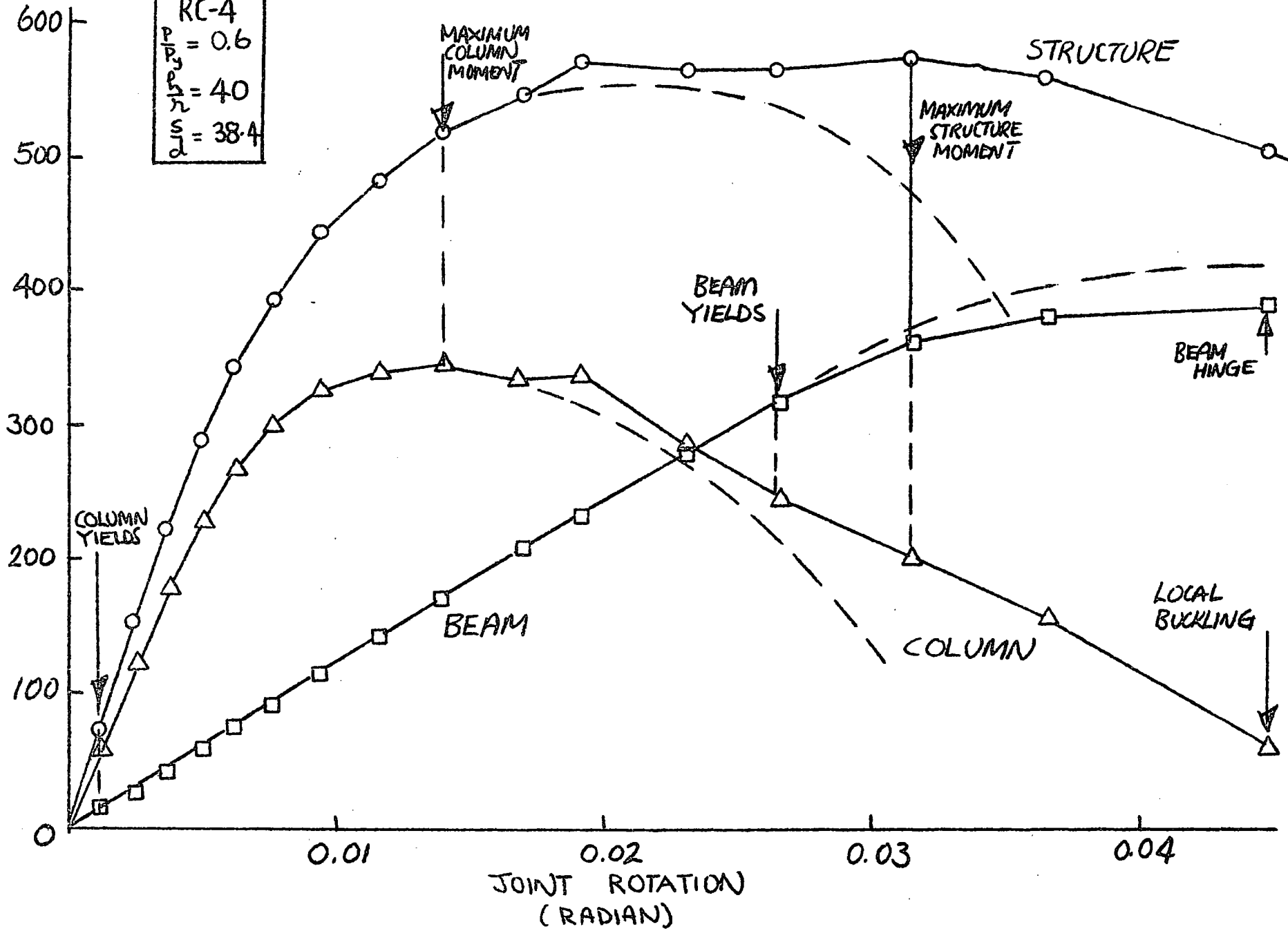
RC-2
= 0.4
= 60
= 28.8





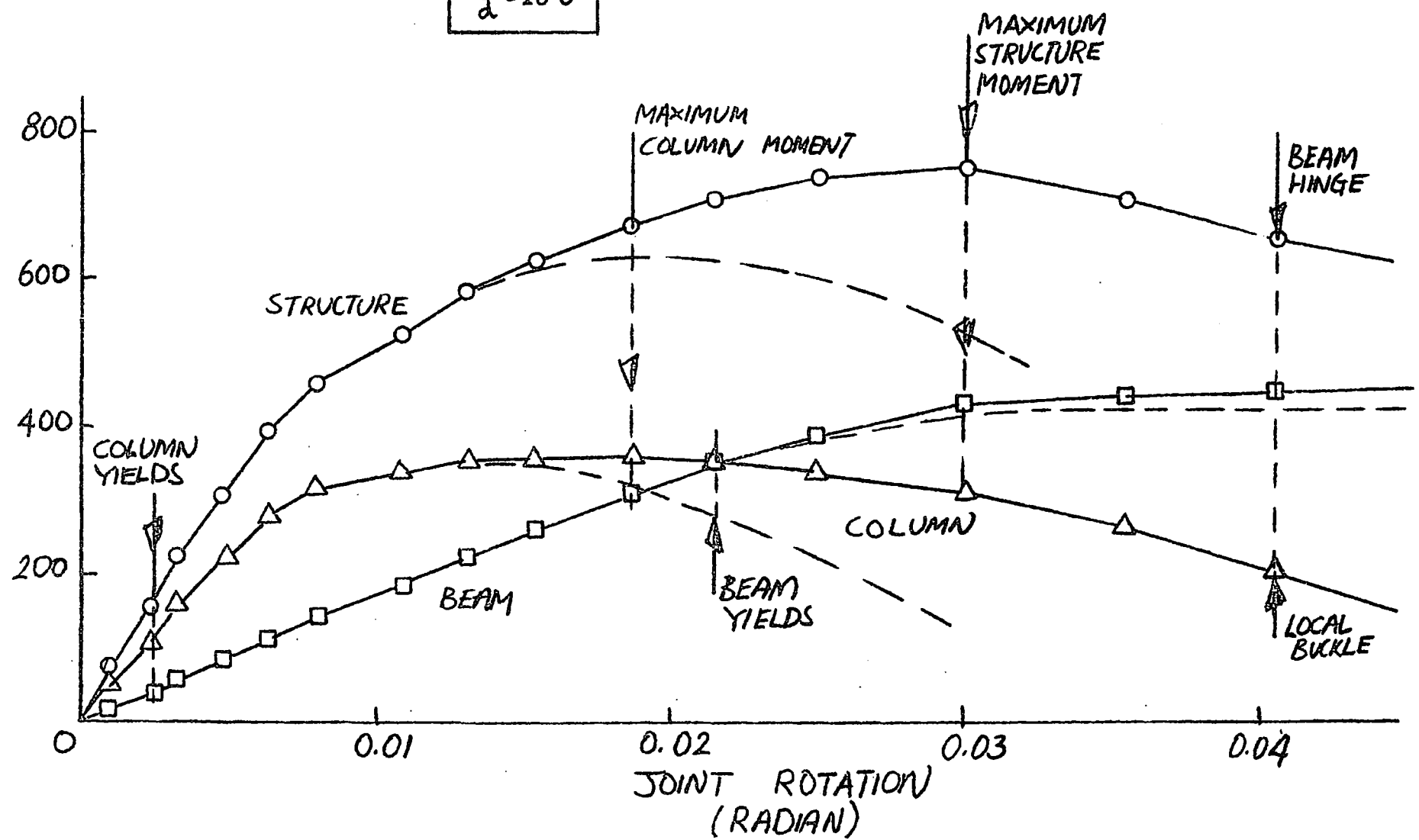
MOMENT
(KIP-IN)

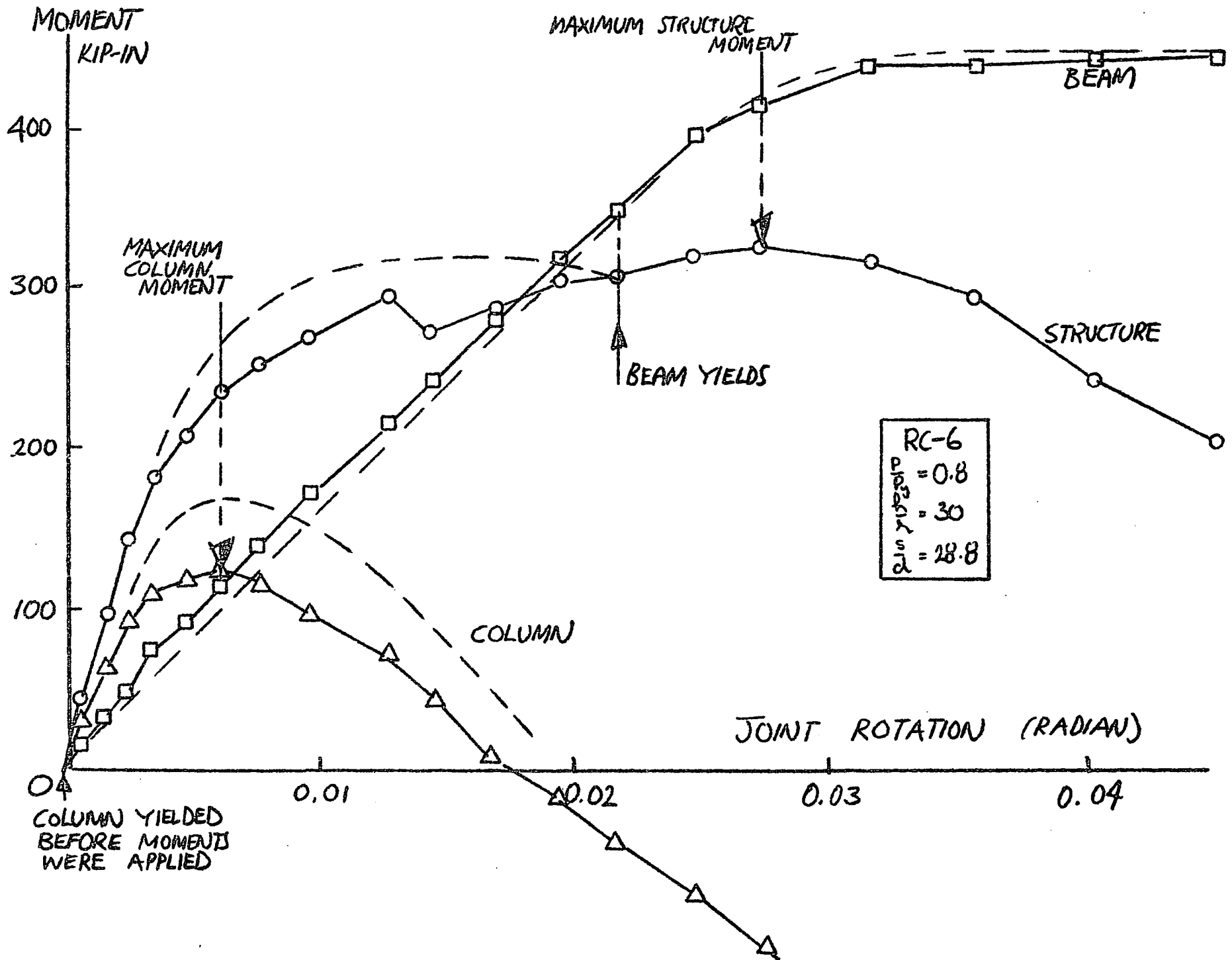
RC-4
 $\rho/\rho_s = 0.6$
 $r/r_s = 40$
 $s/d = 38.4$

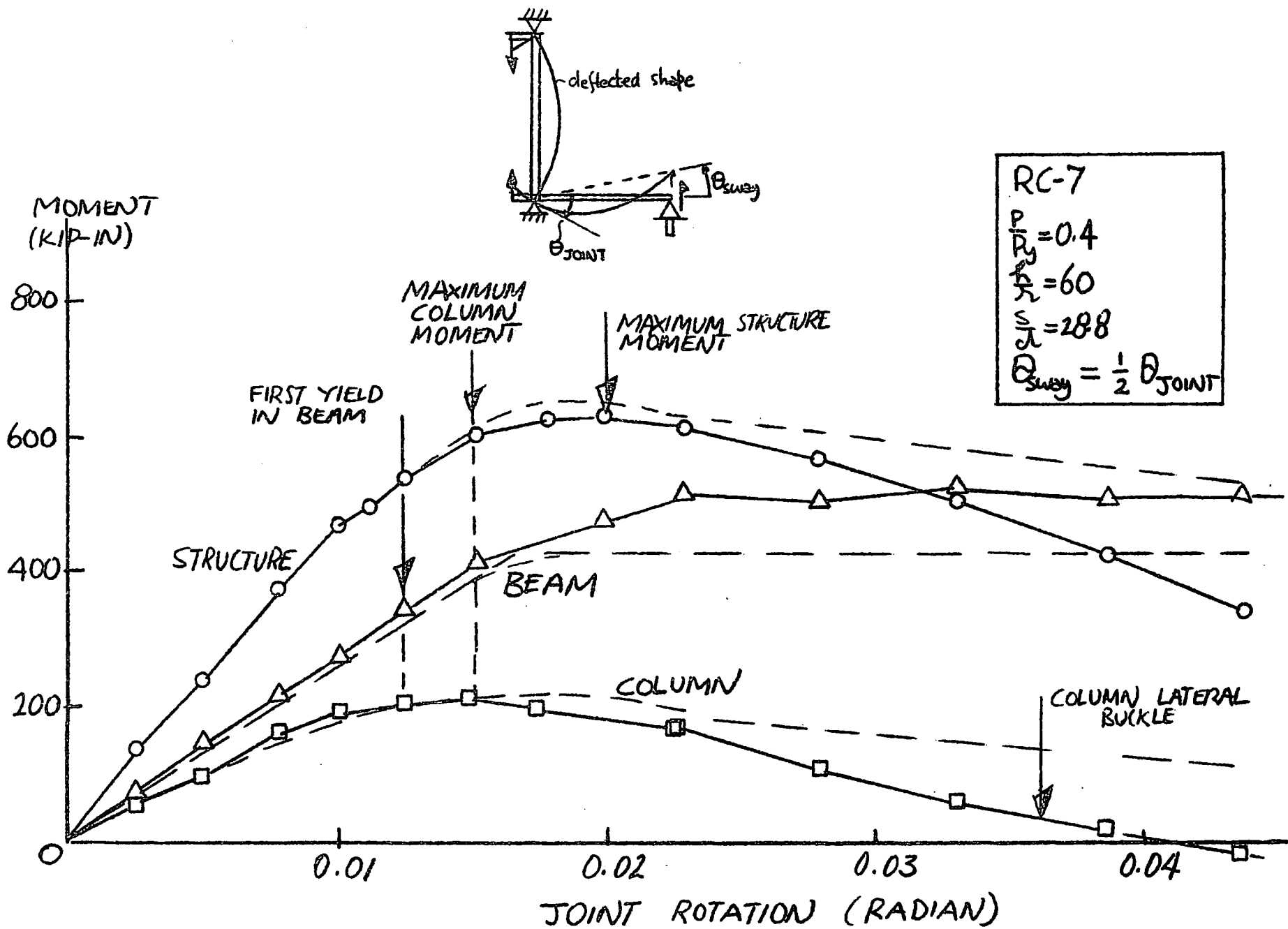


RC-5
 $\rho_{max} = 0.6$
 $\rho_{min} = 40$
 $\rho = 28.8$

MOMENTS
(KIP-IN)







Test	Max. Frame Load	Axial Load	Pred. I	<u>Test I</u>	Pred. II	<u>Test II</u>	Pred. III	<u>Test III</u>	Pred. IV	<u>Test IV</u>
RC-1	625	139 to 184	630	0.99	785	0.80	(a)	(a)	383	1.63
RC-2	880	139	880	1.00	895	0.98	313	2.81	509	1.73
RC-3	940	139	910	1.03	895	1.05	313	3.00	526	1.79
RC-4	575	208	550	1.04	775	0.74	(a)	(a)	381	1.51
RC-5	750	208	630	1.19	775	0.97	(a)	(a)	437	1.72
RC-6	330	278	325	1.02	595	0.56	(a)	(a)	238	1.38 (b)
RC-7	630 top 210 bot.	139	660	0.95	645 (c)	0.98	326	1.93	343	1.84

moments in kip-in
forces in kip

Pred. I:-

Prediction I Use of column and beam deflection curves together with equilibrium and compatibility, i.e. "exact" analysis.

Pred. II:-

Prediction II Plastic design without considering rotation capacity or compatibility.

(c) Assuming C.D.C.s are used to find maximum column moment.

Pred. III:-

Prediction III AISC Specifications (1) assuming all axial load applied first.

(a) Axial load alone greater than allowable capacity.

Pred. IV:-

Prediction IV AISC Specifications (1) assuming axial load and moment are proportional.

(b) No moment in column.

TABLE II