BIBLIOGRAPHY

1. Woinowsky - Krieger, S., "Berechnung der ringsum frei aufliegendnglichseitiger Dreiecksplatte," Ingr. -Archiv, Vol. 4, 1933, pp. 254.

2. Timoshenko, S. and Woinowsky - Krieger, S. Theory of Plate and Shells, McGraw-Hill Book Co., New York, 1959, pp. 60, 82, 94, 313.

3. Lee, S.L. and Ballesteros, P., "Uniformly Loaded Rectangular Plate Supported at the Corner," Int. J. Mech. Sci., Vol. 2, No. 3, 1960, pp. 206-211.

4. Girkmann, K., Flachentragwerke, Einfuhrung in de Elastostatik der Scheiben, Platten and Fattwerke, Springer, Wieh, 1954, pp. 37.

5. Vijakhana, C., Karasudhi, P. and Lee, S.L. "Corner Supported Equilateral Triangular Plates," Int. J. Mech Sci., Vol. 15, 1973, pp. 123 - 128.

6. Poonchainavaskuen, S. "Concentrated and Partially Distributed Loads on a Corner Supported Equilateral Triangular Plate." Master's thesis, Department of Mechanical Engineering, Graduate School, Chulalongkorn University, 1978.

APPENDIX I

INSTRUMENTATION

Equipments

(a) Static Strain Indicator Type SM-60D, Kyowa

Measuring range	:	$-29,500$ to $+ 30,500 \times 10^{-6}$ strain Minimum reading 5×10^{-6} strain.
Meter scale	:	$\pm 500 \times 10^{-6}$ strain, Scale length 123 mm. Minimum scale 10×60^{-6} strain
Gage resistance	:	60 to 500 ohms
Bridge voltage	:	1.6 V.DC.
Gage factor	:	2.00, constant
Accuracy	:	10×10^{-6} strain of least reading 1 % of each range
Operating temperature	:	-10°C to + 50°C

(b) Switching and Balancing Box Model SS-24R, Kyowa

Input Configurations and Gage Compatibility	:	Quarter bridge 60, 120, 350 and 500 Ohms, 3-lead-wire arrangement Half bridge 60-1,000 ohms Full bridge 60, 120, 350 and 500 ohms

Resistive Bridge Balance	:	Screwdriver adjustment on built-in 10-turn potentiometers, up to 1.5 % of difference in gage resistances.
Zero Drift due to Switching	:	2×10^{-6} strain or less with Gage Factor setting at 2.00
Bridge Co-ordinate	:	4 position 1, 2, 4 gage and Next
Gage Resistance Co-ordinate	:	4 positions : 60, 120, 350 and 500 ohms
Bridge Balance Change-over	:	Toggle Switch NON-BAL/BAL, useful when no bridge balance is required

(c) Strain Gage, Kyowa

Type	:	KFC - 5 - D16 - 11
Gage Resistance	:	120.0 $\pm$ 0.4 ohms
Gage Factor	:	2.10 $\pm$ 1 %
Thermal output	:	$\pm$ 1.8 $\mu\varepsilon/^{\circ}C$

(d) Dial Gage, Mitutoyo

Range	:	20 mm.
No.	:	2050 B
Graduation	:	0.01 mm.

APPENDIX II

TABLES

This content is composed of the results obtained from the proposed solution and the experimental investigation. The results are shown in tabular from table 1 through table 11.

Table 1 Measured points.

Point	Positions for Measuring Deflection		Positions for Measuring Strain	
	x (mm.)	y (mm.)	x (mm.)	y (mm.)
1	270	0	270	0
2	210	0	210	0
3	150	0	150	0
4	90	0	90	0
5	30	0	30	0
6	30	17	30	17
7	90	52	90	52
8	150	87	150	87
9	210	121	210	121
10	270	156	270	156
11	270	95	270	104
12	270	60	270	52

Table 2 Theoretical values of deflection for case 1.

Co-ordinate (x, y)	wD/qa^4	
	$\nu = 0.3$	$\nu = 0.1$
300, 0	0.0614	0.0596
250, 0	0.0813	0.0854
200, 0	0.1029	0.1111
150, 0	0.1223	0.1336
100, 0	0.1373	0.1506
50, 0	0.1466	0.1612
0, 0	0.1498	0.1648
50, 28.87	0.1456	0.16
100, 57.73	0.1331	0.1459
150, 86.6	0.1133	0.1231
200, 115.47	0.0852	0.0919
250, 144.34	0.0488	0.0517
300, 173.2	0	0

Table 3 Experimental deflections for case 1.

Point	w x 10^2 (mm.)					
	490.5 (N/m^2)	981 (N/m^2)	1471.5 (N/m^2)	1962 (N/m^2)	2452.5 (N/m^2)	2943 (N/m^2)
Dial gauge rdg. No.						
1	10.5	14	21.5	27.5	34	40.5
2	13.3	21	31.5	41	52.5	63
3	15	19	42.5	56	72	85.5
4	16.2	34	51	68.5	85.5	101.5
5	17	37	57	76	96	113
6	11	35	52	69.5	87	104
7	19	30	44	59.5	73	87
8	25	22.5	32	44	55	65.5
9	29	13	18.5	25	31.5	37

Table 4 Theoretical values of moment for case 1.

Co-ordinate (x, y)	M_x/qa^2		M_y/qa^2	
	$\nu = 0.3$	$\nu = 0.1$	$\nu = 0.3$	$\nu = 0.1$
300 0	- 0.1288	- 0.139	0.3993	0.4329
250 0	0.0483	0.0391	0.3216	0.3388
200 0	0.1626	0.153	0.2885	0.2937
150 0	0.2324	0.2217	0.2819	0.2715
100 0	0.2721	0.2601	0.2873	0.2783
50 0	0.2919	0.2789	0.2946	0.284
0 0	0.2978	0.2844	0.2978	0.2844

Co-ordinate (x, y)	M_η/qa^2		M_ξ/qa^2	
	$\nu = 0.3$	$\nu = 0.1$	$\nu = 0.3$	$\nu = 0.1$
0 0	0.2978	0.2844	0.2978	0.2844
50 28.87	0.2904	0.2776	0.2931	0.2811
100 57.73	0.2721	0.2608	0.2753	0.2674
150 86.6	0.2535	0.2454	0.2337	0.2318
200 115.47	0.2529	0.2503	0.15	0.1556
250 144.34	0.2957	0.302	- 0.0011	0.0123
300 173.2	0.4144	0.4344	- 0.2522	- 0.2322

Table 5 Experimental strains for case 1.

Point	Strain x 10^6					
	490.5 (N/m^2)	981 (N/m^2)	1471.5 (N/m^2)	1962 (N/m^2)	2452.5 (N/m^2)	2943 (N/m^2)
1x	0	0	2	4	8	10
1y	0	10	20	22	36	43
2x	8	16	20	40	53	65
2y	10	20	34	44	58	71
3x	10	20	42	58	70	88
3y	16	30	44	60	76	92
4x	18	40	60	80	108	140
4y	16	30	50	70	79	82
5x	20	48	66	90	133	168
5y	16	40	56	90	112	132
6η	20	40	62	80	105	133
6ξ	20	40	54	70	98	128
7η	20	38	54	66	98	132
7ξ	20	36	42	66	94	121
8η	18	34	50	60	79	94
8ξ	10	20	30	40	52	68
9η	16	32	40	56	75	92
9ξ	8	16	24	36	52	64
10η	2	2	10	20	22	29
10ξ	0	2	2	6	9	10

Table 6 Experimental moments for case 1.

Point	Moment (N-m/m)			
	490.5 (N/m^2)	981 (N/m^2)	1471.5 (N/m^2)	1962 (N/m^2)
1x	0	0.4	4.51	5.99
1y	0	5.65	11.6	13.12
2x	6.21	12.42	17.06	30.1
2y	7	14	22.6	31.65
3x	8.37	16.4	31.2	42.96
3y	10.73	20.35	32	43.75
4x	12.88	27.7	42.4	46.81
4y	12.1	23.72	38.44	53.14
5x	14.02	33.9	46.81	66.1
5y	12.43	30.75	42.8	66.13
6η	14.7	29.4	44.2	57
6ξ	14.7	29.4	41.04	53.14
7η	14.7	27.6	39.34	48.5
7ξ	14.7	26.79	38.55	48.5
8η	11.86	22.6	33.35	40.7
8ξ	8.7	17.07	25.44	32.78
9η	10.4	20.8	26.7	37.7
9ξ	7.23	14.5	20.35	29.84
10η	1.13	1.5	6	12.3
10ξ	0.34	1.5	2.8	6.8

Table 7 Theoretical values of deflection for case 2.

Co-ordinate (x, y)		wD/Pa^2	
		ν = 0.3	ν = 0.1
300	0	0.021	0.0219
250	0	0.0312	0.0345
200	0	0.0421	0.0473
150	0	0.0526	0.0593
100	0	0.0618	0.0696
50	0	0.0688	0.0773
0	0	0.072	0.0808
50	28.87	0.0679	0.0763
100	57.73	0.0591	0.0666
150	86.6	0.0476	0.0537
200	115.47	0.0341	0.0383
250	144.34	0.0186	0.0207
300	173.2	0	0

Table 8 Experimental deflections for case 2.

Point	w x 10^2 (mm.)				
	10 (kg)	20 (kg)	30 (kg)	40 (kg)	50 (kg)
Dial guage rdg. No.					
1	6	13	19.5	25.5	32
2	11.4	23.6	35.2	47.2	59
3	15.7	32	48.7	64	80.5
4	20.6	40.8	61	81.5	101
5	23.5	46.5	69.5	91	115
6	23.5	48	71.6	96	119.5
7	19.2	39	57.2	79	98
8	14.4	29.6	44	59.6	74.6
9	8.2	17	23.6	34.7	43

Table 9 Theoretical values of moment for case 2.

Co-ordinate (x, y)		M_x/P		M_y/P	
		$\nu = 0.3$	$\nu = 0.1$	$\nu = 0.3$	$\nu = 0.1$
300	0	- 0.0348	- 0.0438	0.1349	0.1553
250	0	0.013	0.0054	0.1199	0.135
200	0	0.0503	0.0422	0.1227	0.1336
150	0	0.0844	0.0741	0.1404	0.1473
100	0	0.1239	0.1096	0.1738	0.176
50	0	0.187	0.1653	0.2355	0.2302
0	0	∞	∞	∞	∞

Co-ordinate (x, y)		M_η/P		M_ξ/P	
		$\nu = 0.3$	$\nu = 0.1$	$\nu = 0.3$	$\nu = 0.1$
0	0	∞	∞	∞	∞
50	28.87	0.1741	0.154	0.2224	0.2186
100	57.73	0.113	0.1004	0.1588	0.1623
150	86.6	0.082	0.0743	0.1169	0.1242
200	115.47	0.0706	0.0677	0.0765	0.0853
250	144.34	0.0812	0.084	0.0257	0.0336
300	173.2	0.1206	0.1314	-0.0465	-0.0427

Table 10 Experimental strains for case 2.

Point	Strain x 10^6				
	10 (kg)	20 (kg)	30 (kg)	40 (kg)	50 (kg)
1x	0	0	0	0	0
1y	0	4	10	17	23
2x	6	16	19	31	38
2y	11	24	38	52	64
3x	30	35	49	64	82
3y	13	26	44	64	87
4x	27	50	80	112	144
4y	24	56	87	120	169
5x	40	89	132	178	233
5y	45	94	144	195	259
6η	35	70	111	157	204
6ξ	49	97	150	208	266
7η	18	33	57	80	108
7ξ	23	48	78	111	151
8η	16	23	28	45	62
8ξ	14	28	45	65	87
9η	10	17	27	41	56
9ξ	4	14	19	28	38
10η	14	17	17	19	24
10ξ	0	0	0	0	0

Table 11 Experimental moments for case 2.

Point	Moment (N - m/m)			
	10 (kg)	20 (kg)	30 (kg)	40 (kg)
1x	0	0.68	1.7	2.88
1y	0	2.26	5.65	9.61
2x	5.26	13.11	17.18	26.34
2y	7.23	16.28	24,70	34.65
3x	19.16	24.2	35.16	47.03
3y	12.44	20.63	33.18	47.03
4x	19.33	37.76	60	83.66
4y	18.15	40.13	62.75	86.83
5x	30.24	66.25	99	133.69
5y	32.22	68.23	203.78	140.41
6η	28.09	56.02	88.18	124.02
6ξ	33.63	66.70	103.61	144.2
7η	14.07	26.79	45.45	64.04
7ξ	16.05	22.73	53.76	76.31
8η	11.41	17.75	23.46	36.46
8ξ	10.63	19.73	30.19	44.37
9η	6.33	11.98	18.48	27.92
9ξ	3.96	10.8	15.32	22.78
10η	7.91	9.61	9.61	10.74
10ξ	2.37	2.88	2.88	3.22

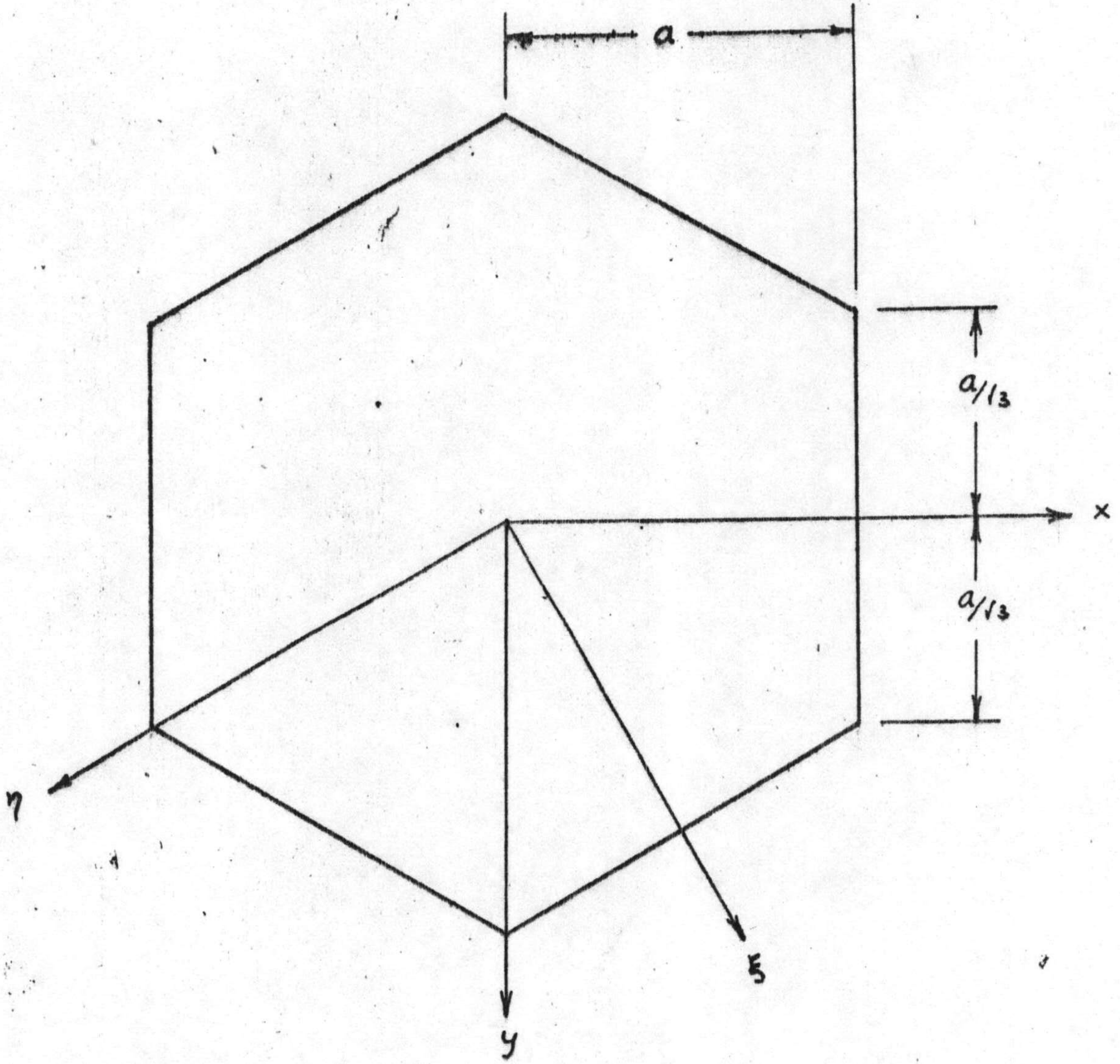

Fig 1. Hexagonal Plate

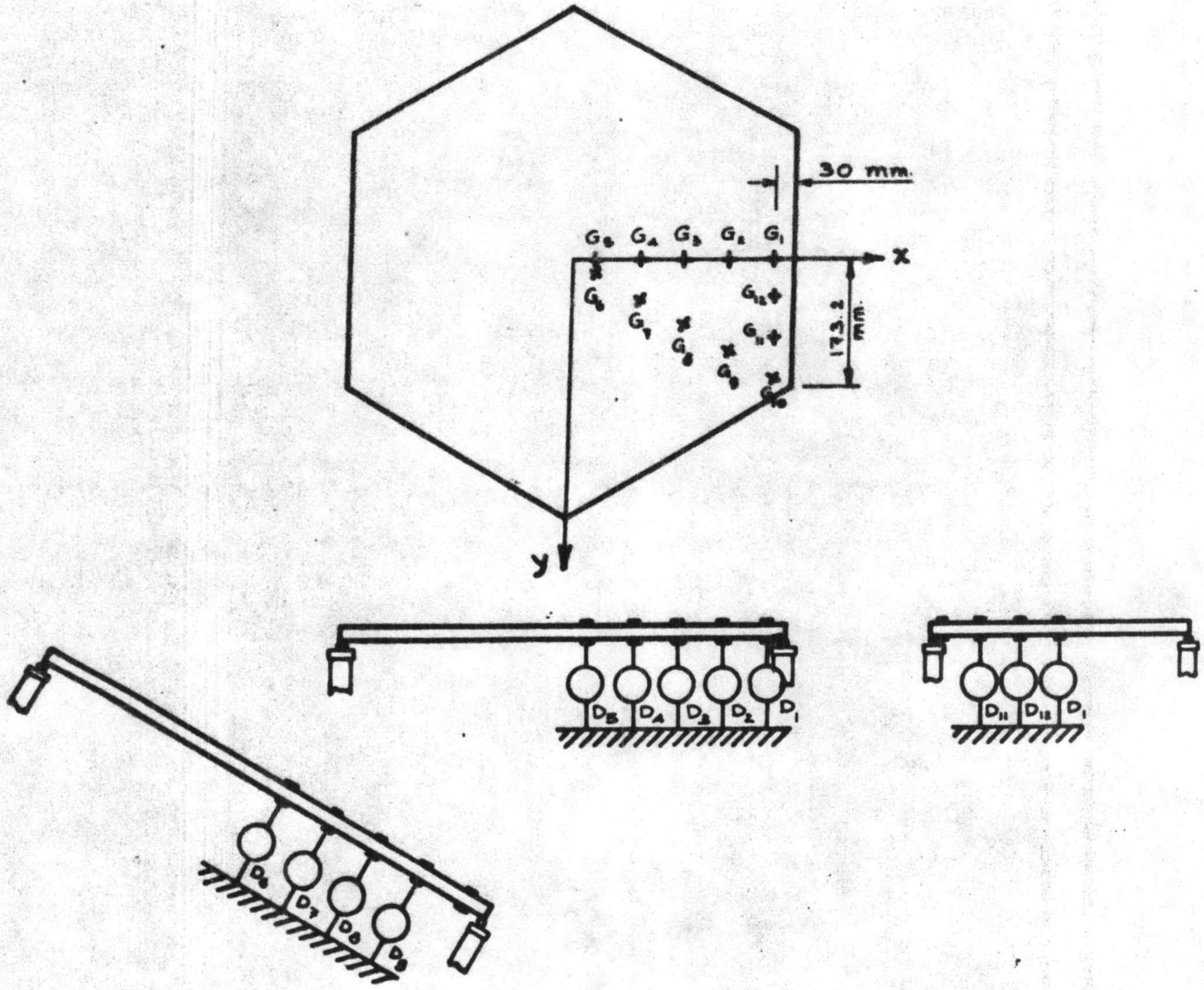

Fig. 2. Schematic Diagram of supports and instrumentations

Fig. 3. Set up for the experimentation. Case 1.

Fig. 4 Set up for the experimentation. Case 2.

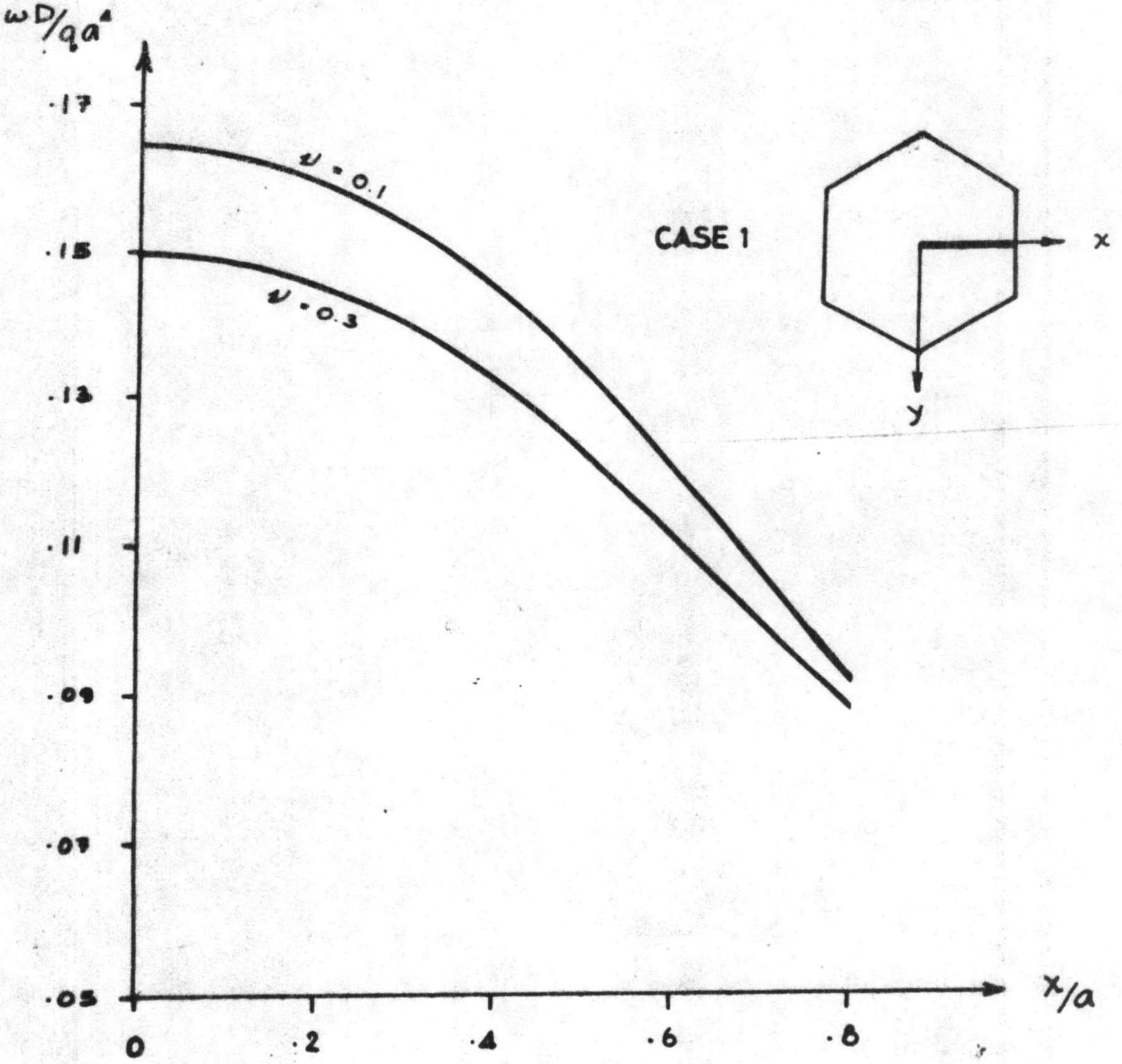

Fig. 5. Theoretical deflection v.s. x/a , y/a = 0

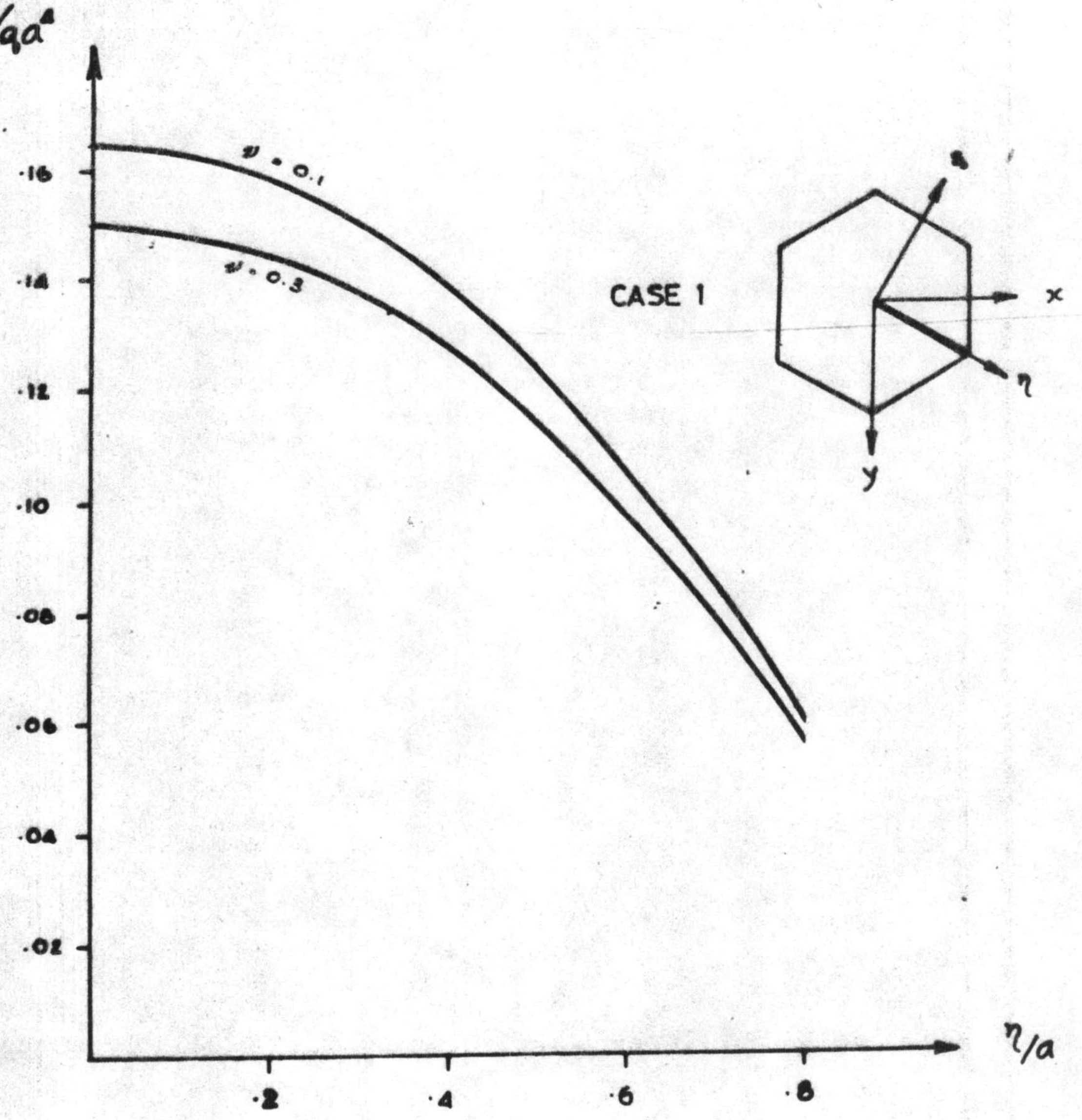

Fig. 6. Theoretical deflection v.s. η/a, $\xi/a = 0$

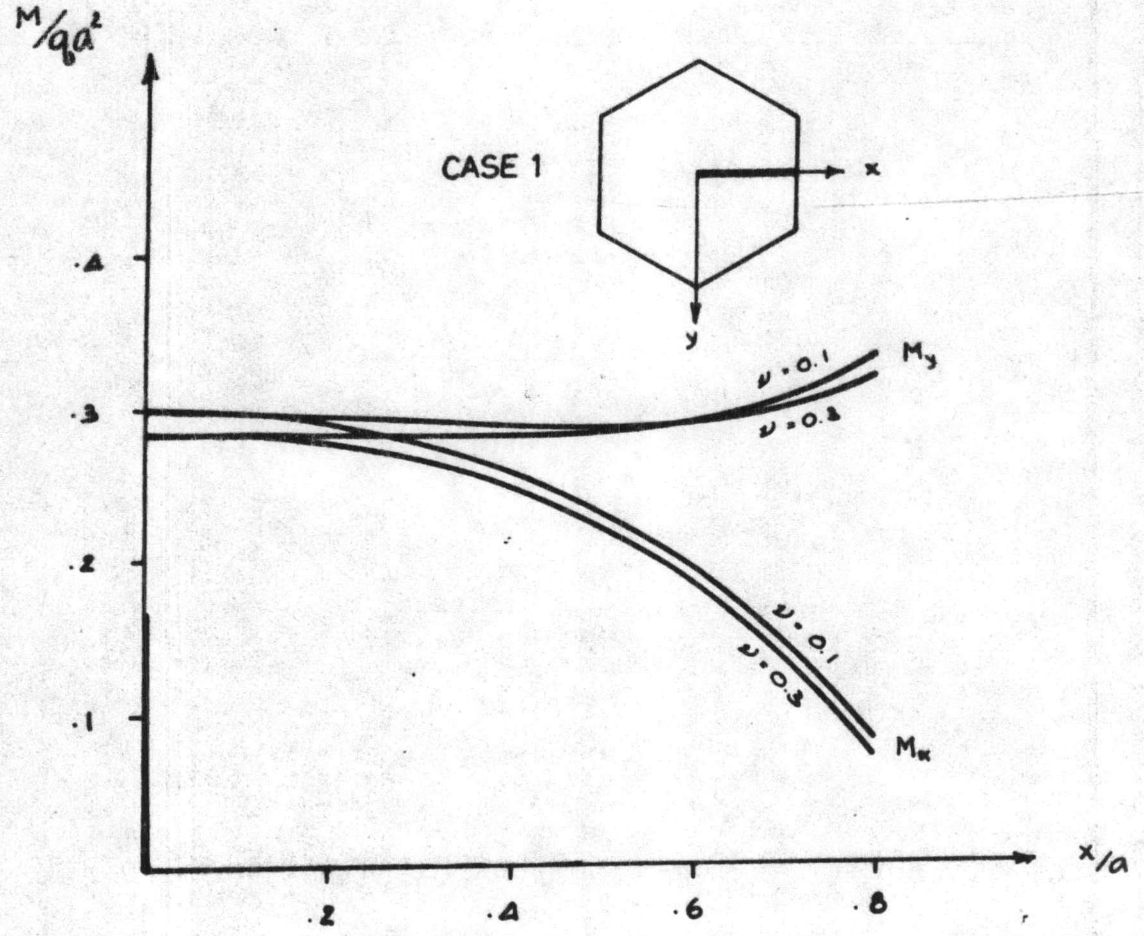

Fig. 7. Theoretical moment v.s. x/a, y/a = 0

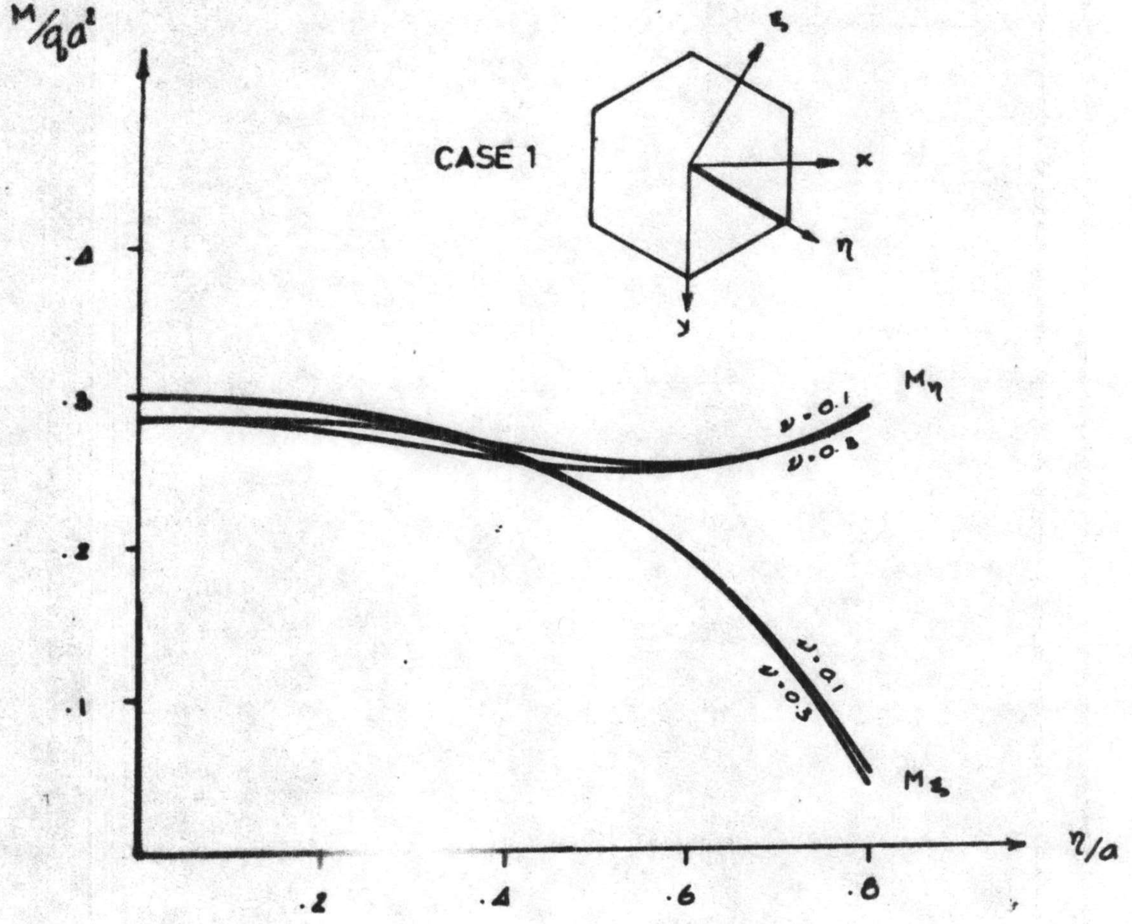

Fig. 8. Theoretical moment v.s. η/a, $\xi/a = 0$

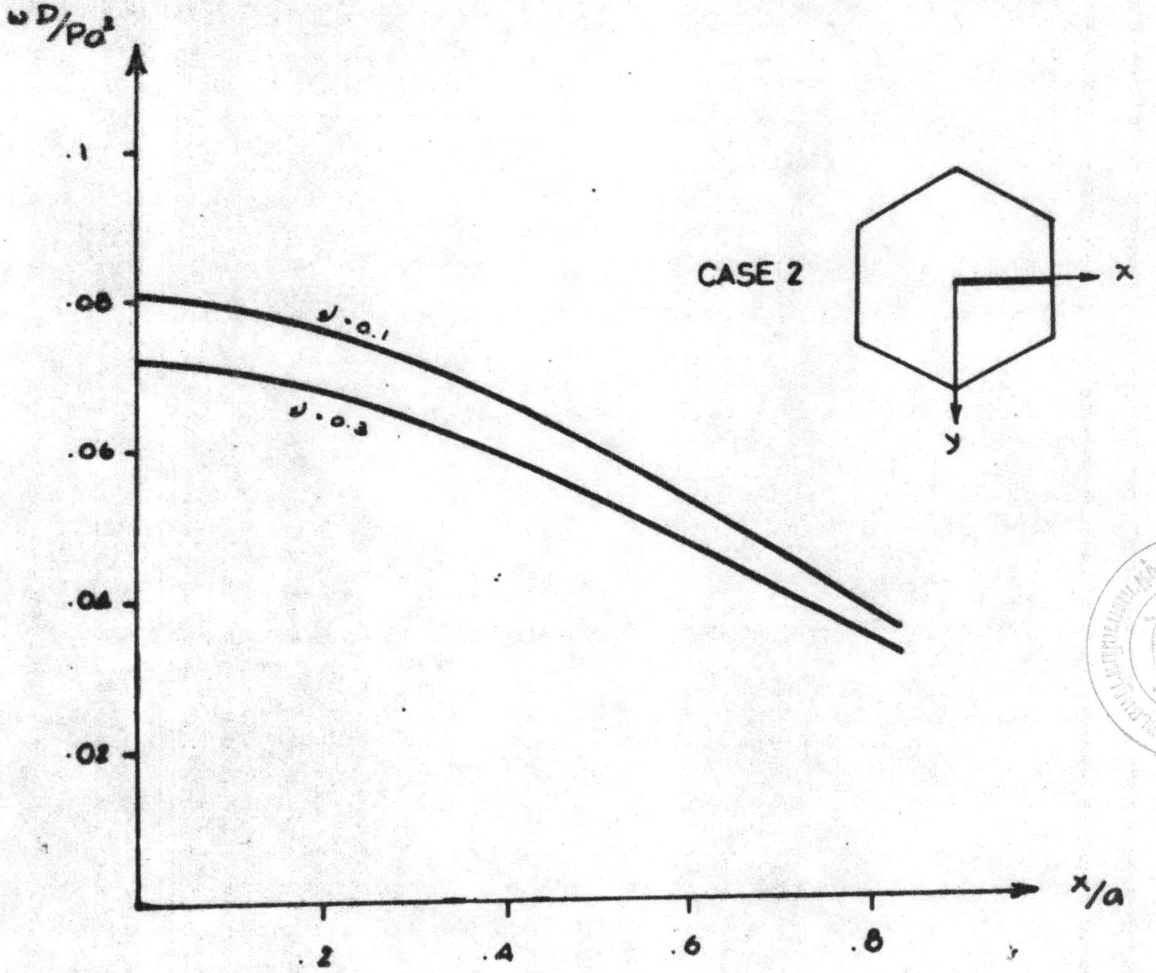

Fig. 9. Theoretical deflection V.S. x/a, $y/a = 0$

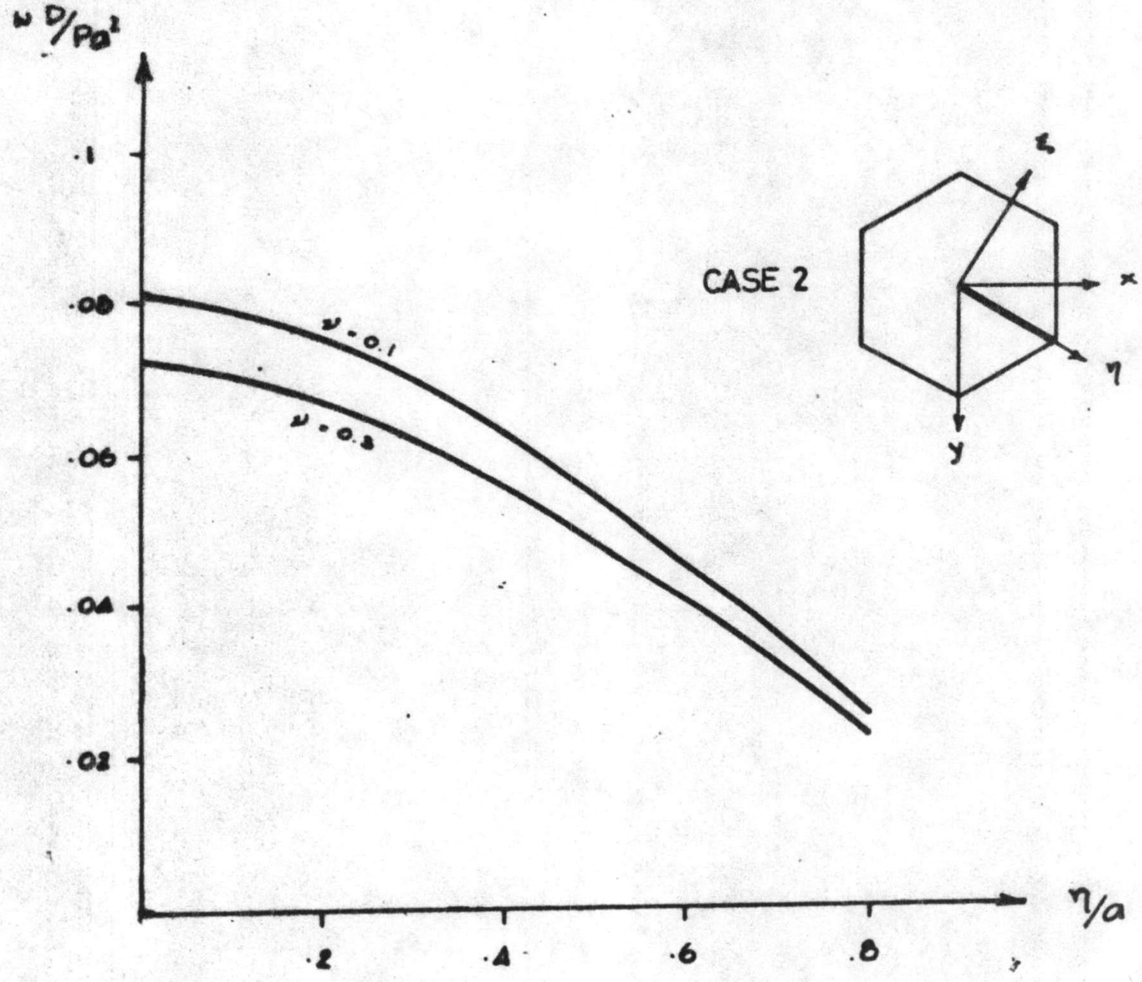

Fig. 10. Theoretical deflection v.s. η/a, $\xi/a = 0$

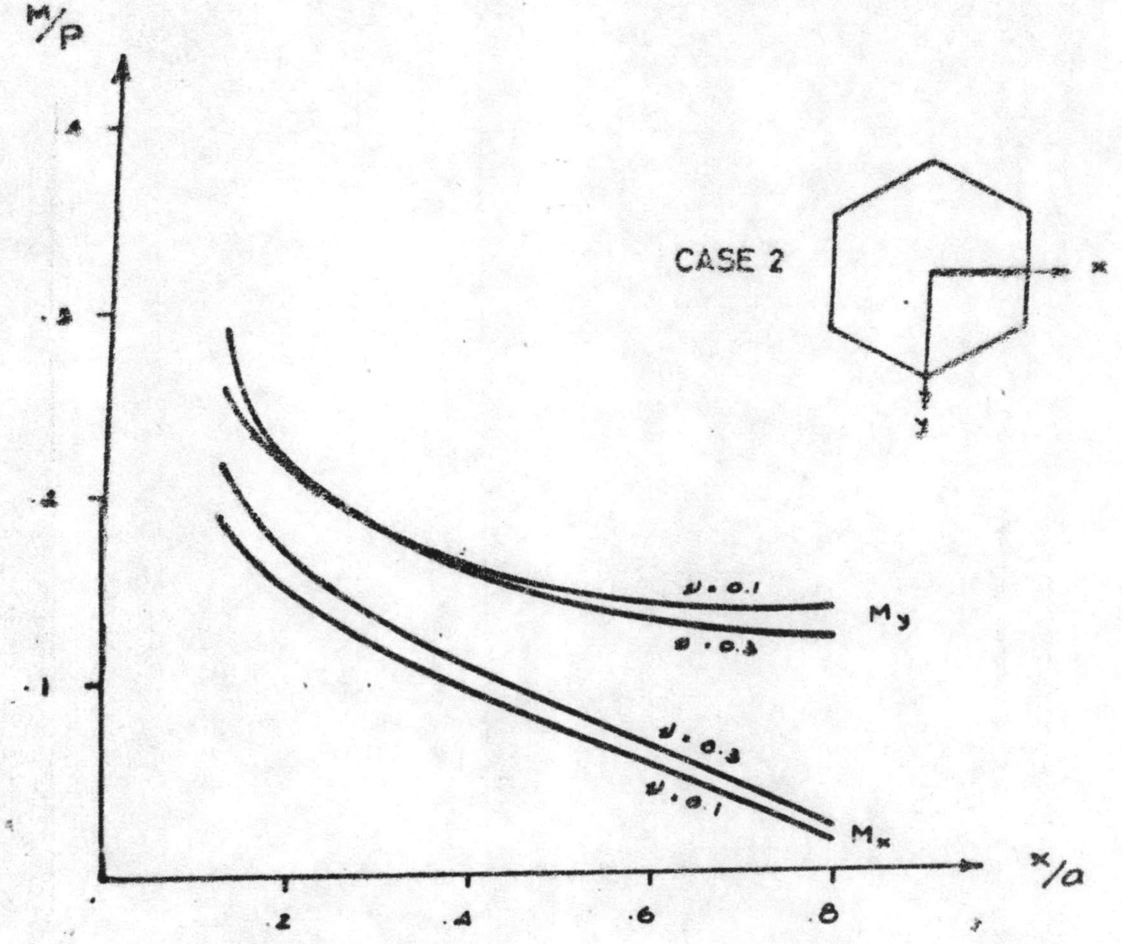

Fig 11. Theoretical moment v.s. x/a, y/a = 0

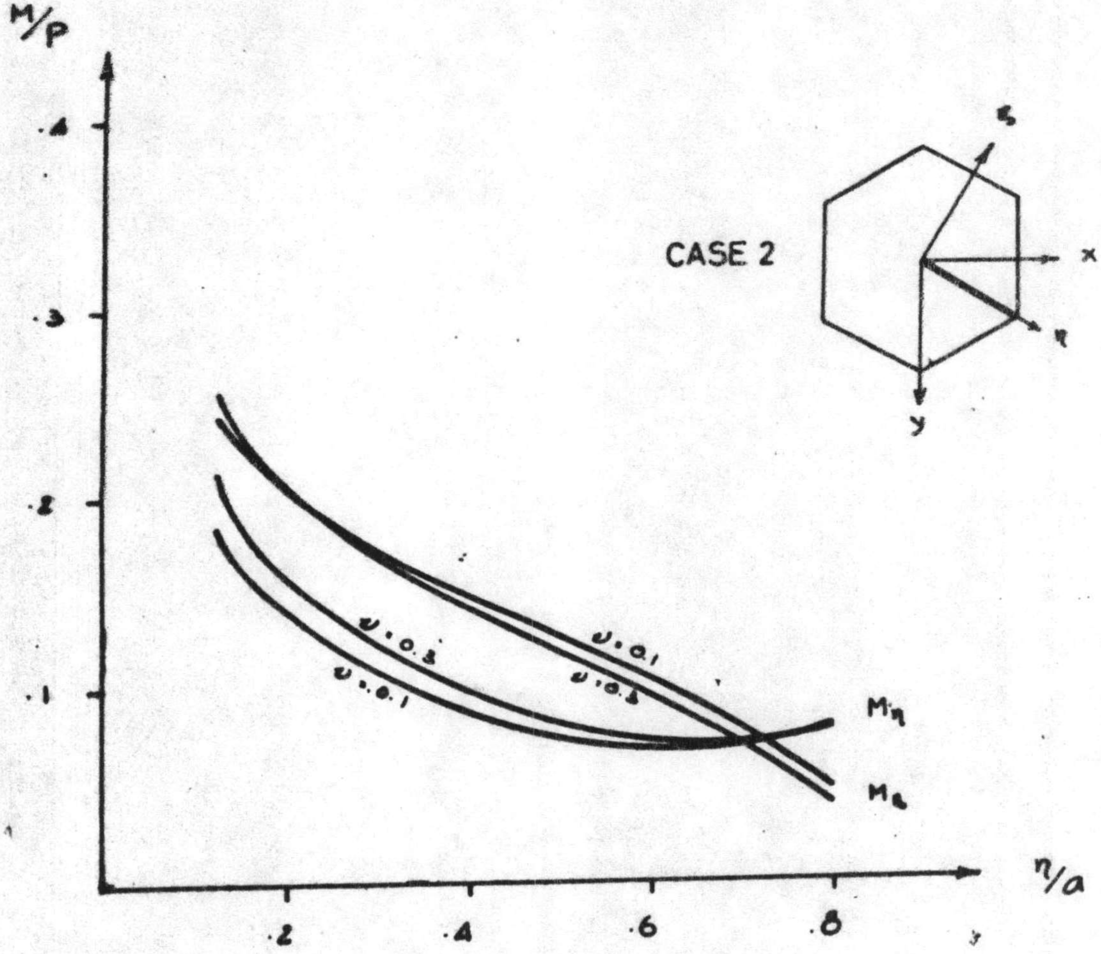

Fig 12. Theoretical moment v.s. η/a, $\xi/a = 0$

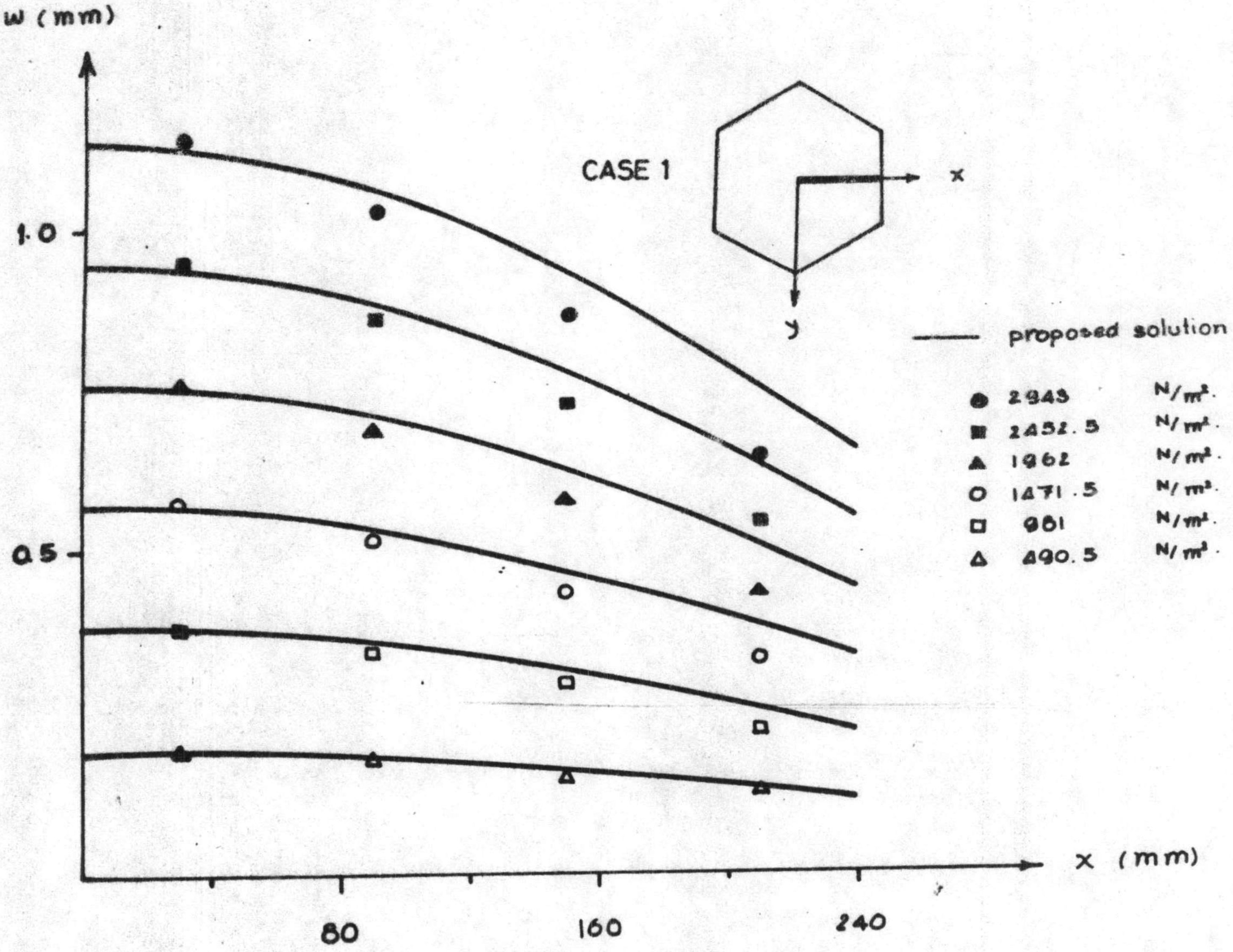

Fig. 13. Experimental deflection v.s. x, y = 0

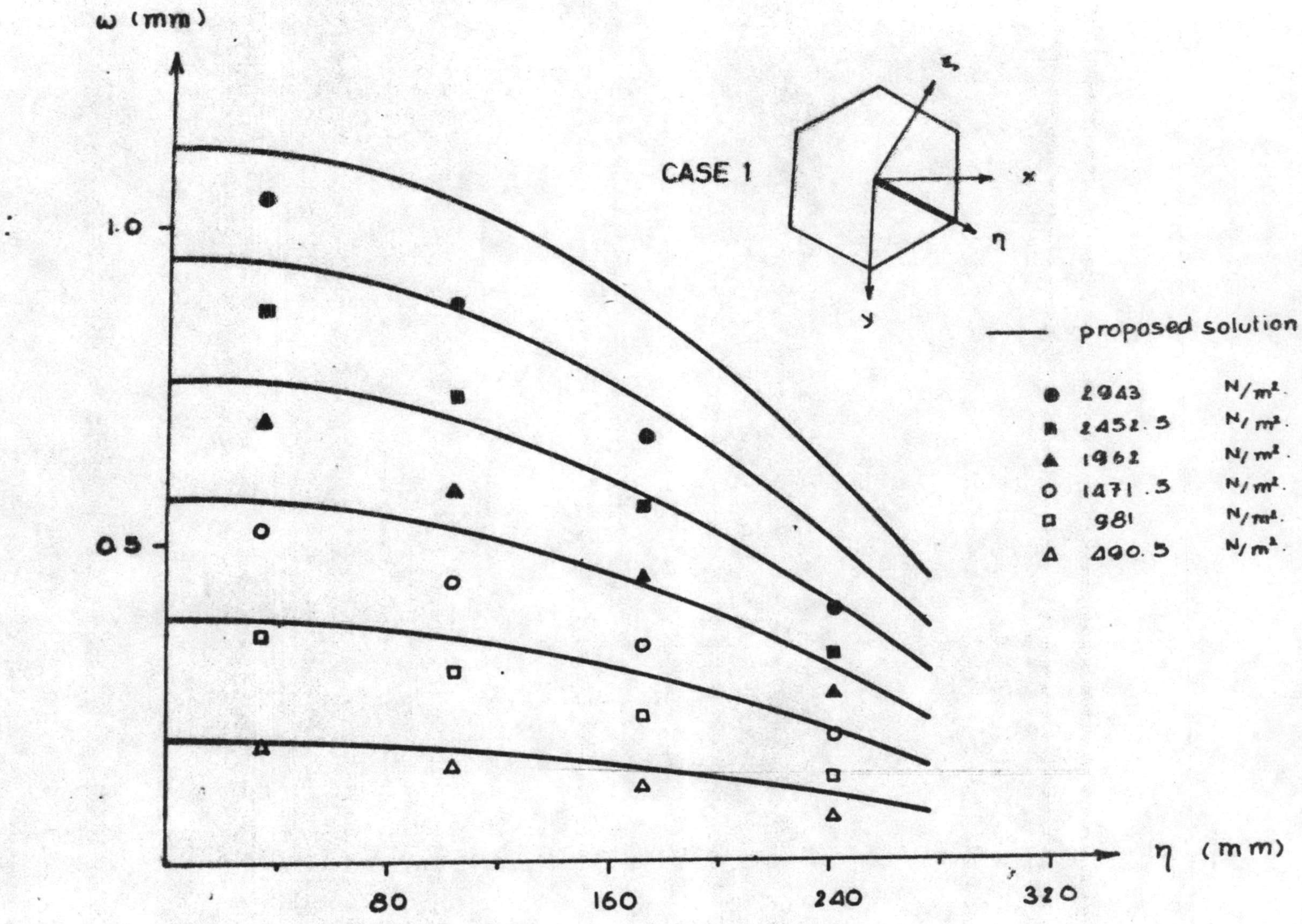

Fig. 14. Experimental deflection v.s. η. $\xi = 0$

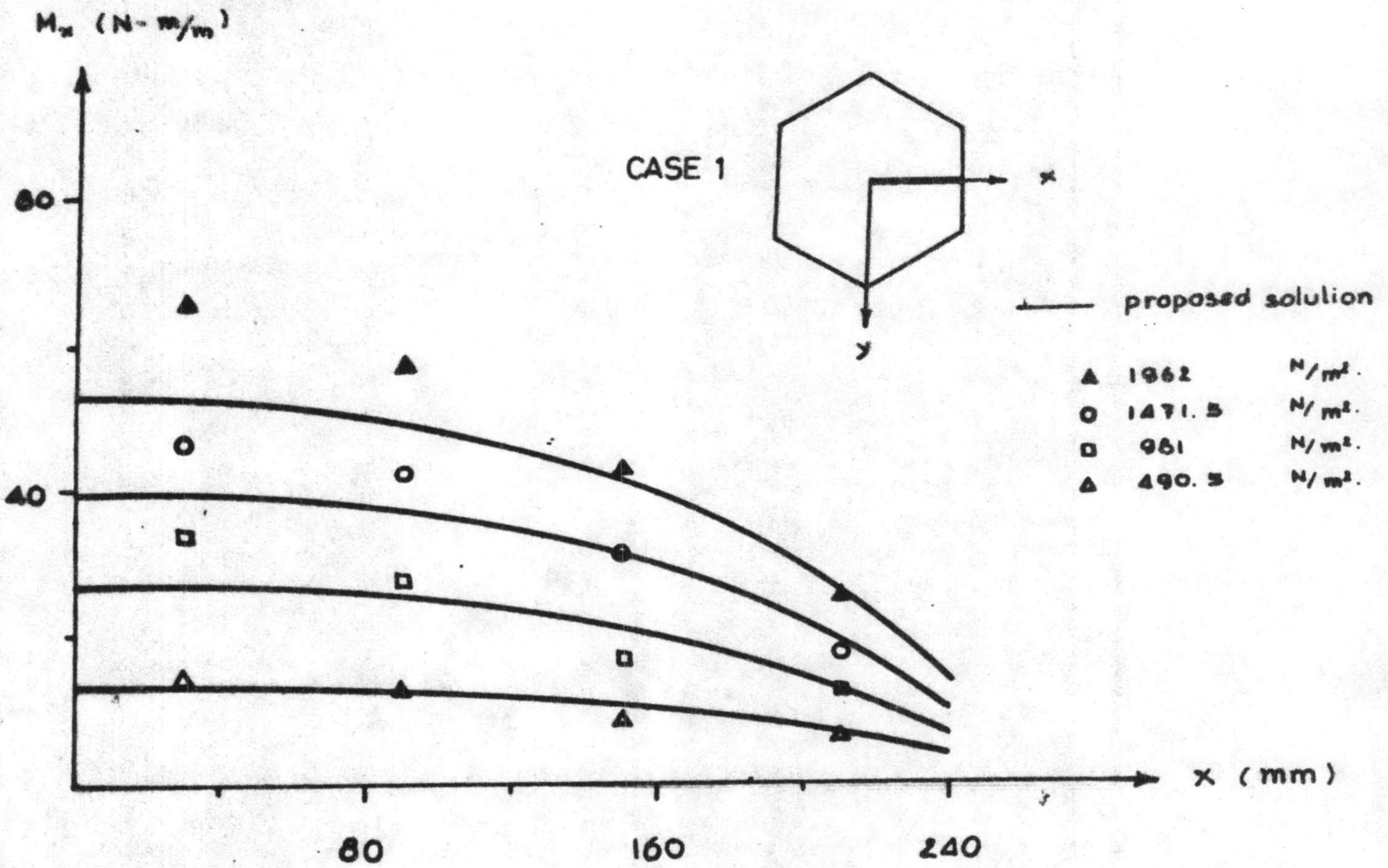

Fig. 15. Experimental moment (M_x) v.s. x, y = 0

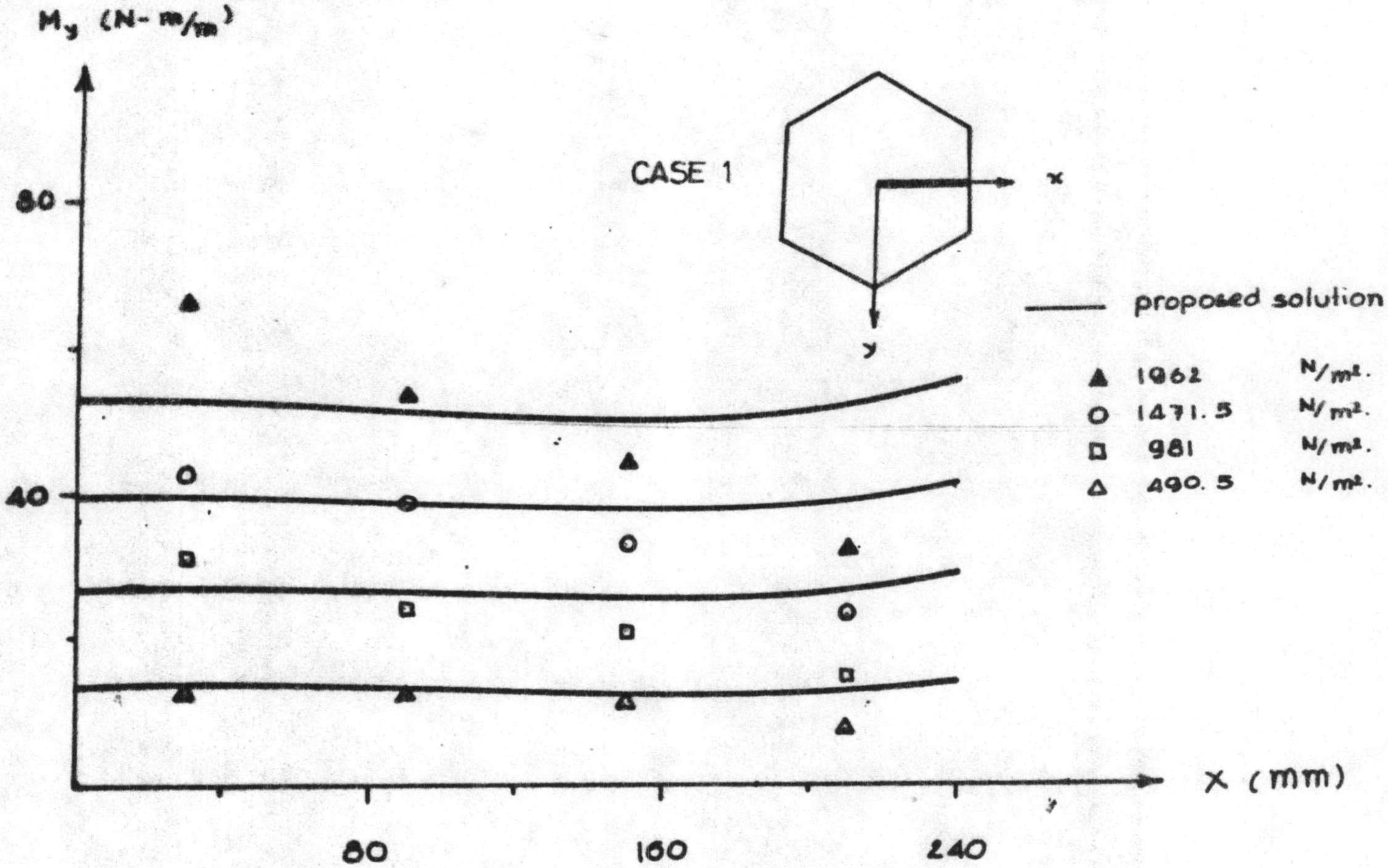

Fig. 16. Experimental moment (M_y) V.S. x, y = 0

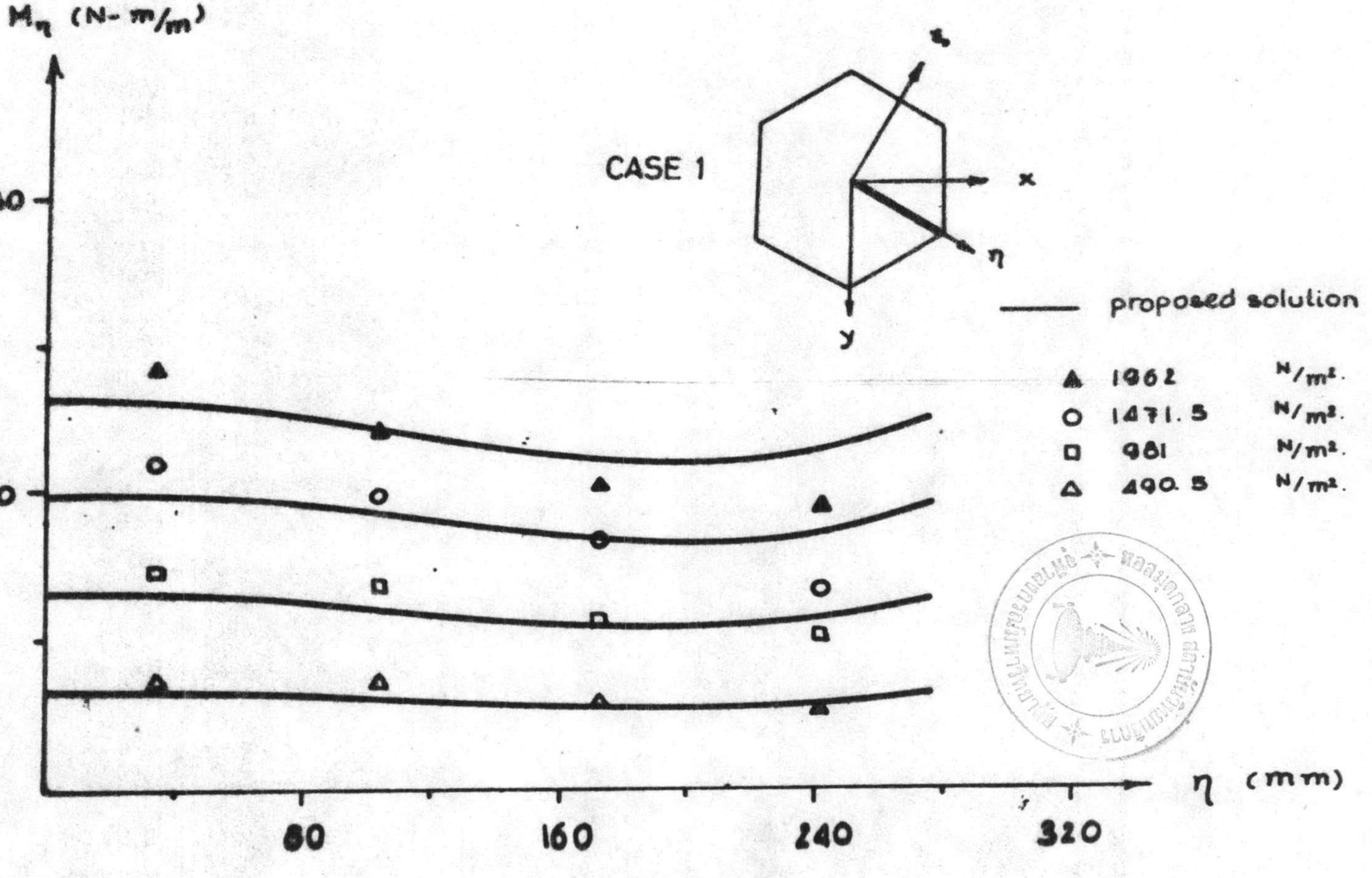

Fig. 17. Experimental moment (M_η) V.S. η, $\xi = 0$

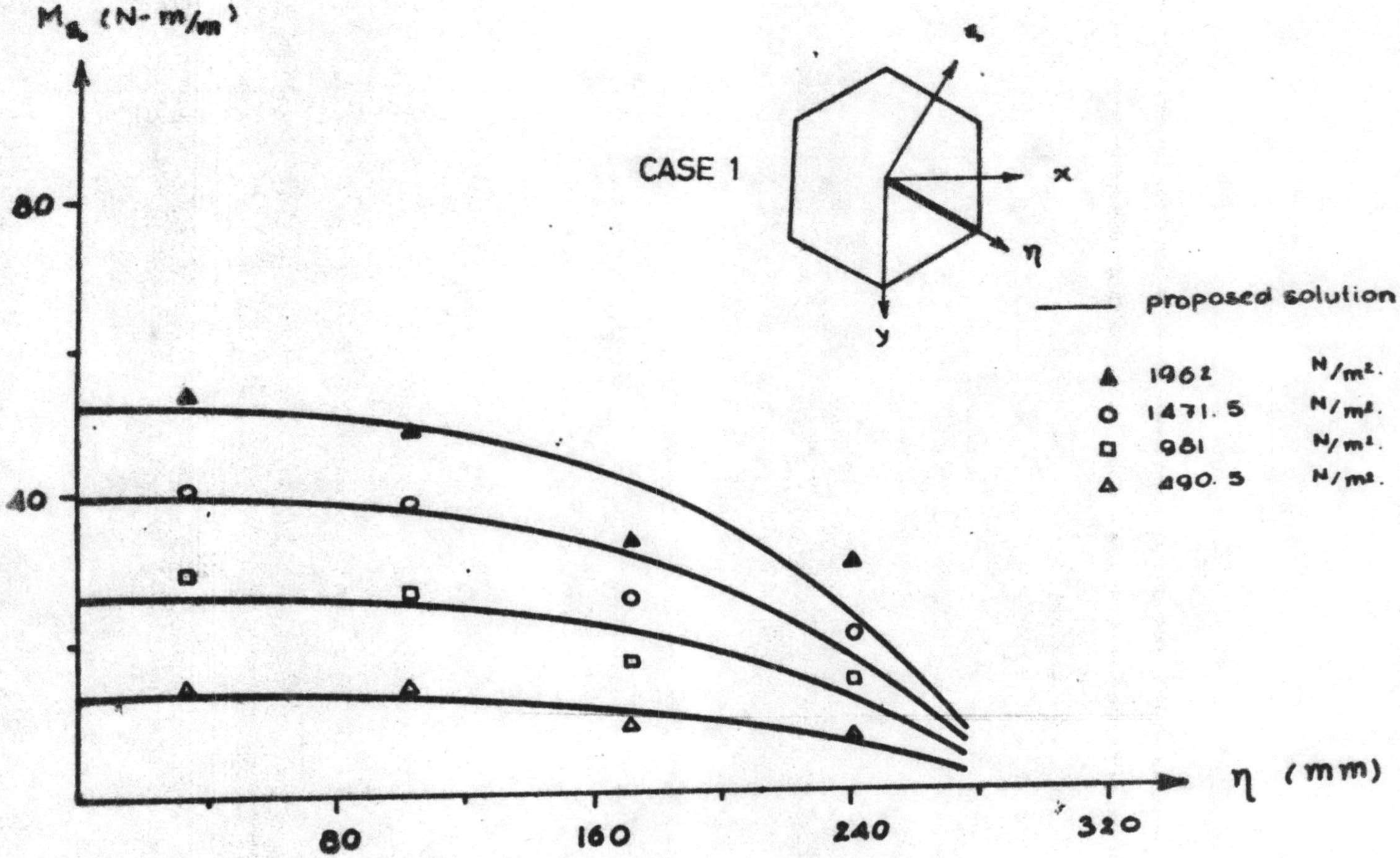

Fig. 18. Experimental moment (M_ξ) v.s. η, $\xi = 0$

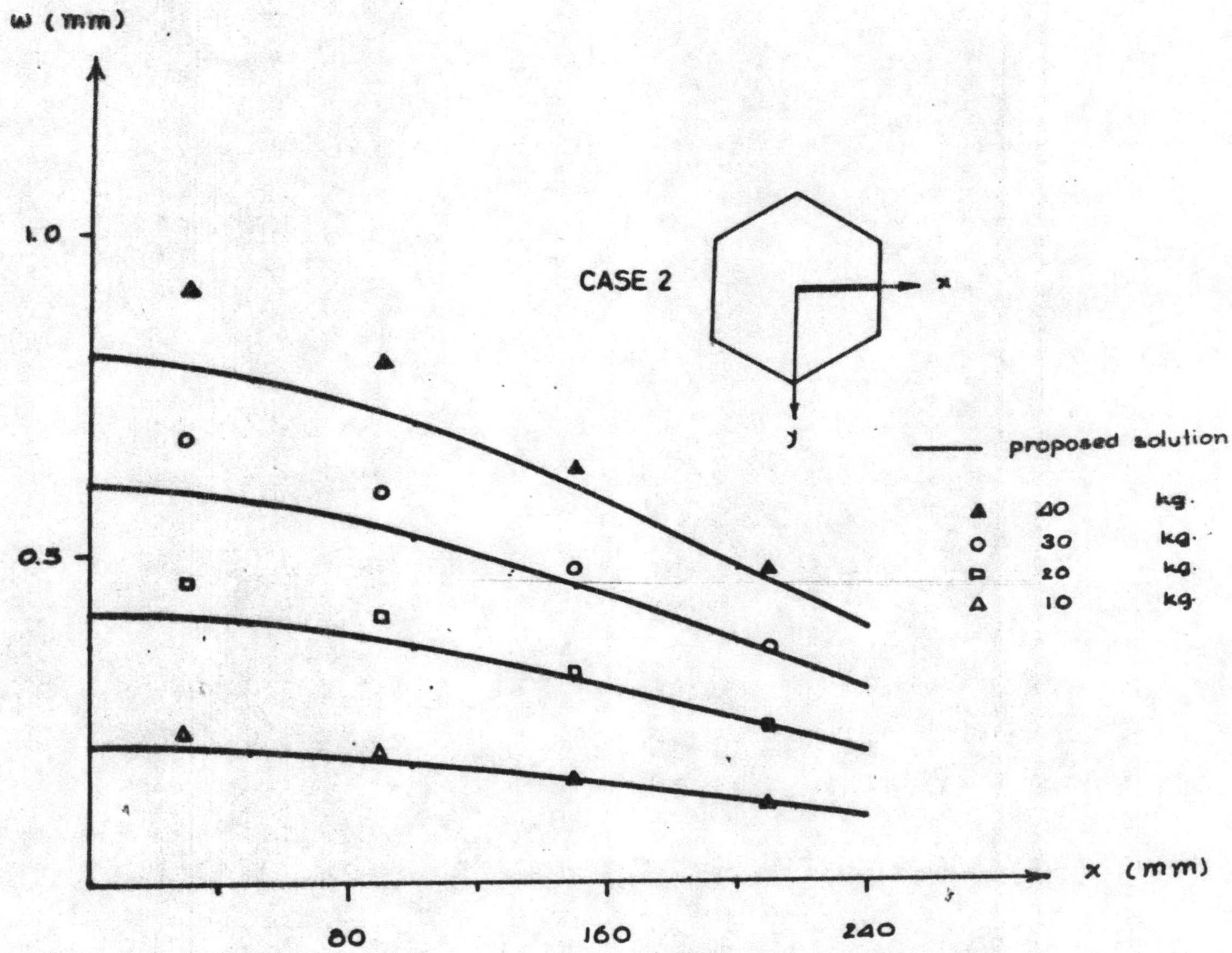

Fig. 19. Experimental deflection v.s. x, y = 0

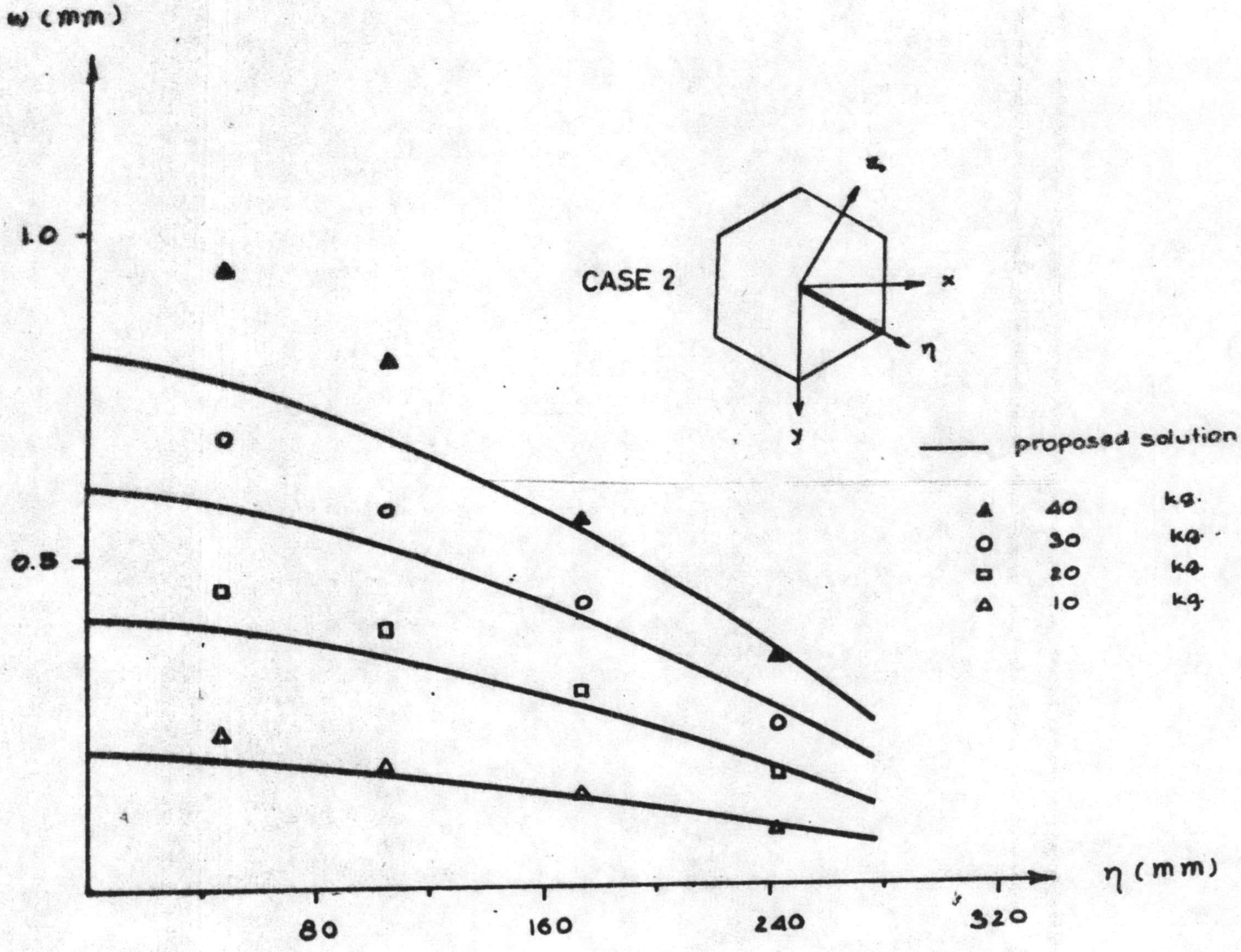

Fig. 20. Experimental deflection v.s η, $\xi = 0$

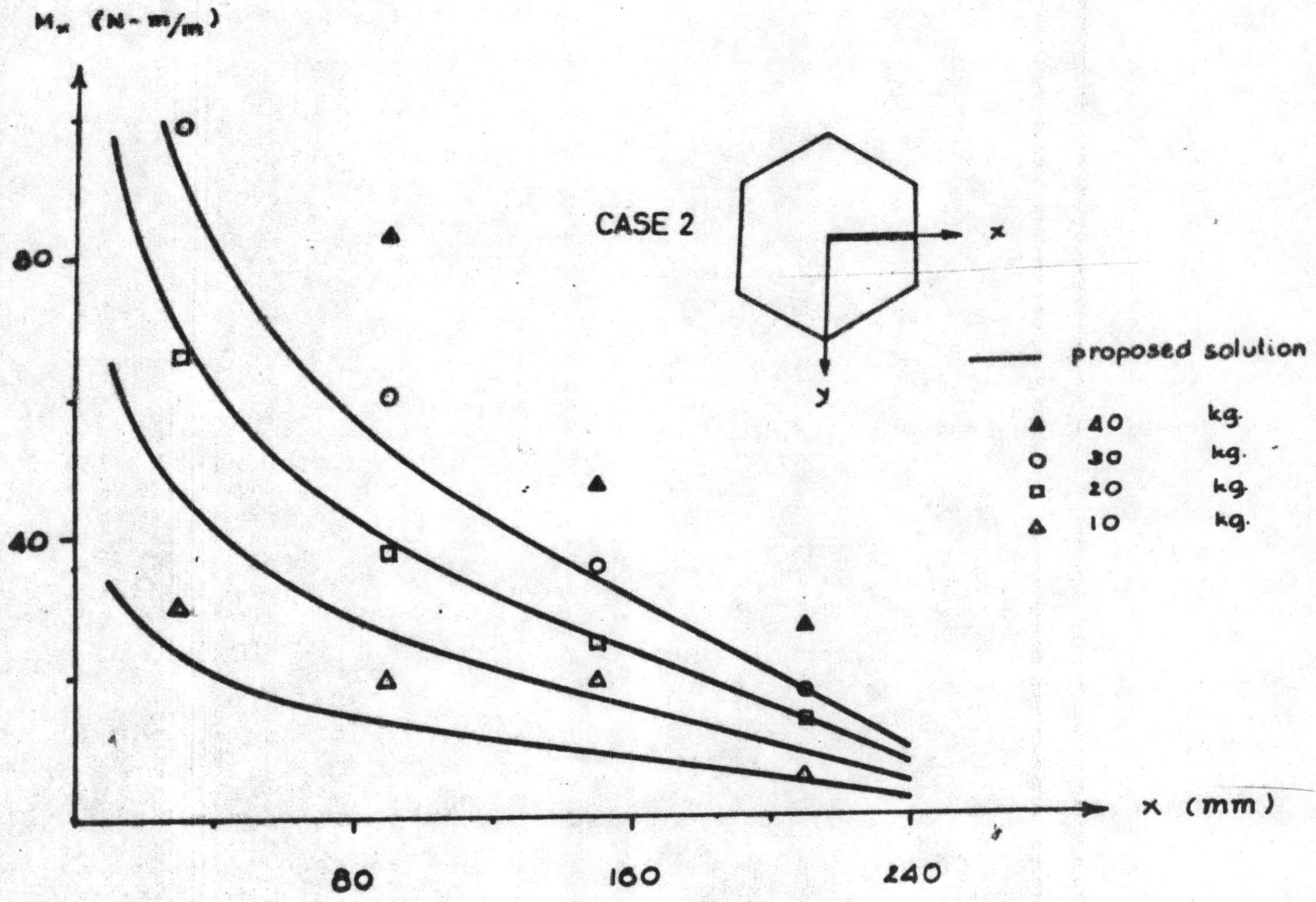

Fig. 21. Experimental moment (M_x) V.S. X, y = 0

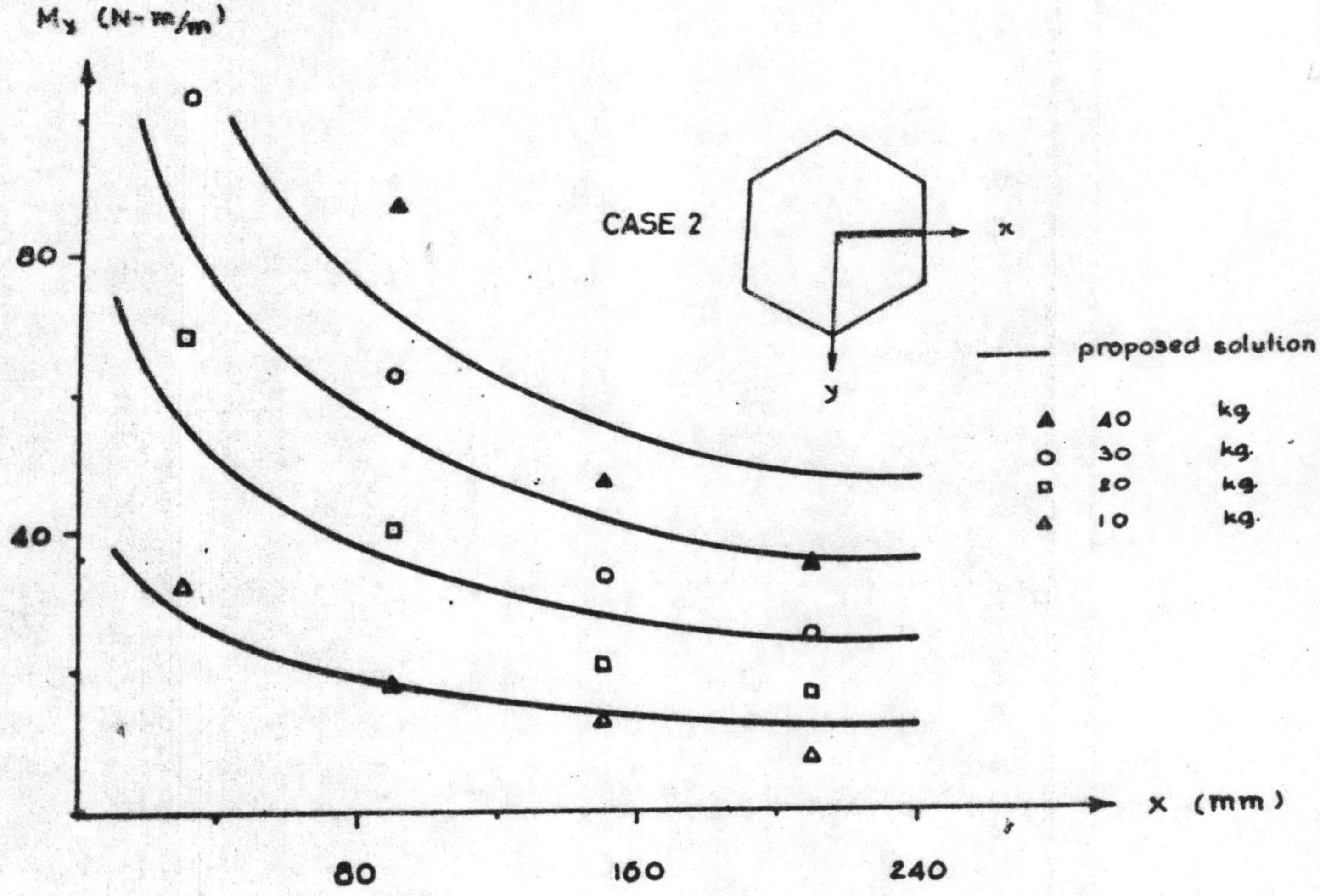

Fig. 22. Experimental moment (M_y) v.s. x, y = 0

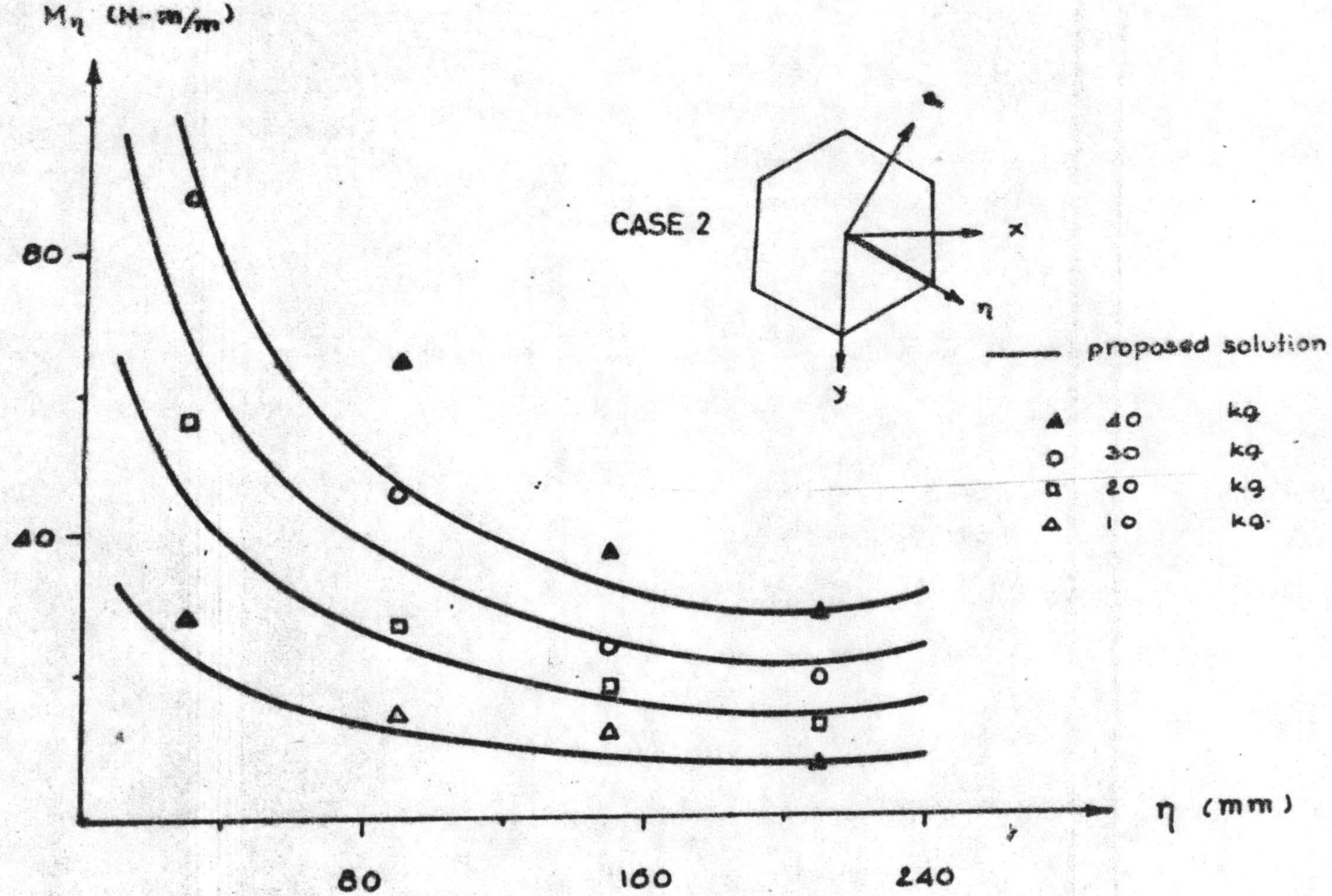

Fig. 23. Experimental moment (M_η) V.S. η, $\alpha = 0$

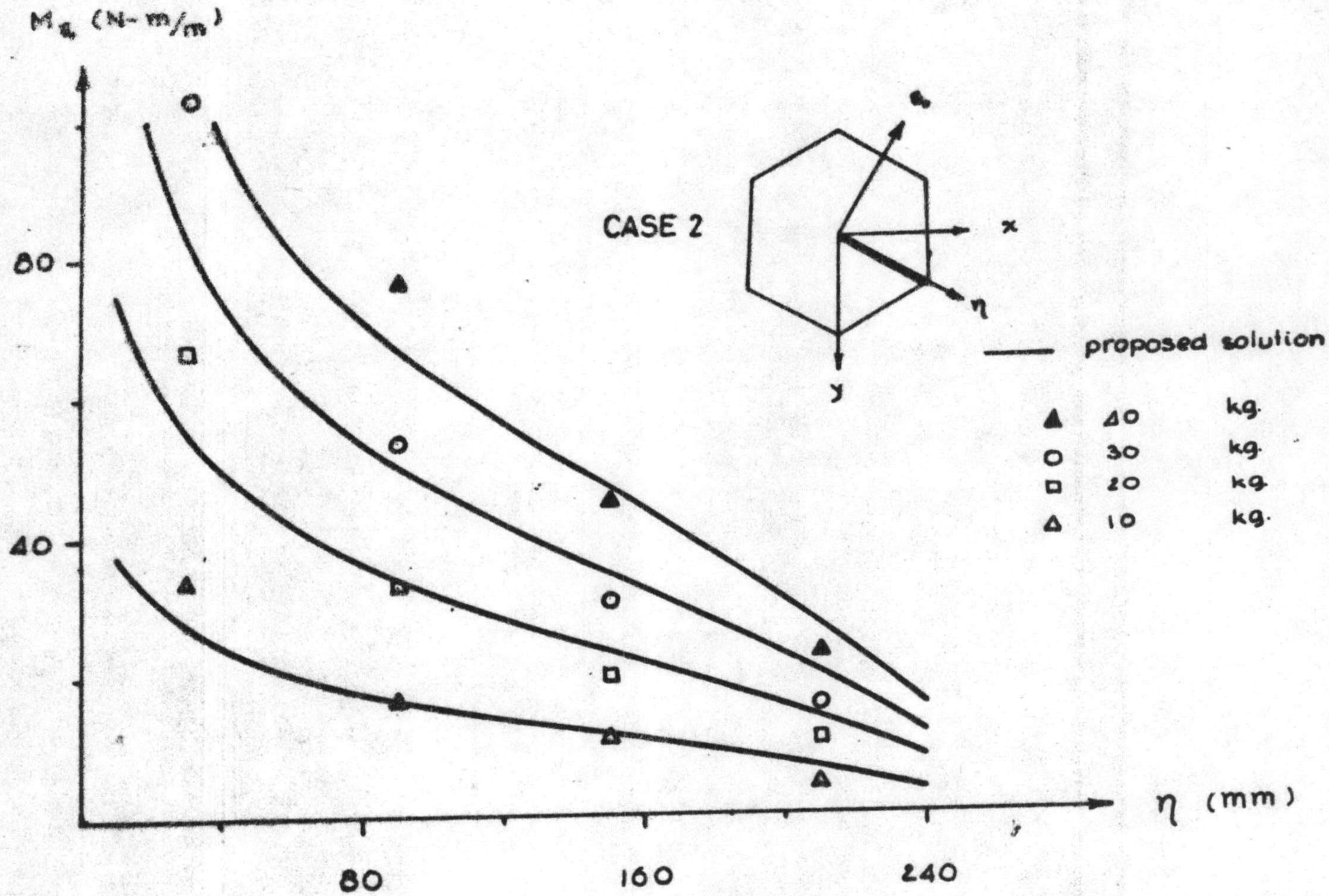

Fig.24. Experimental moment (Mξ) v.s. η, ξ = 0

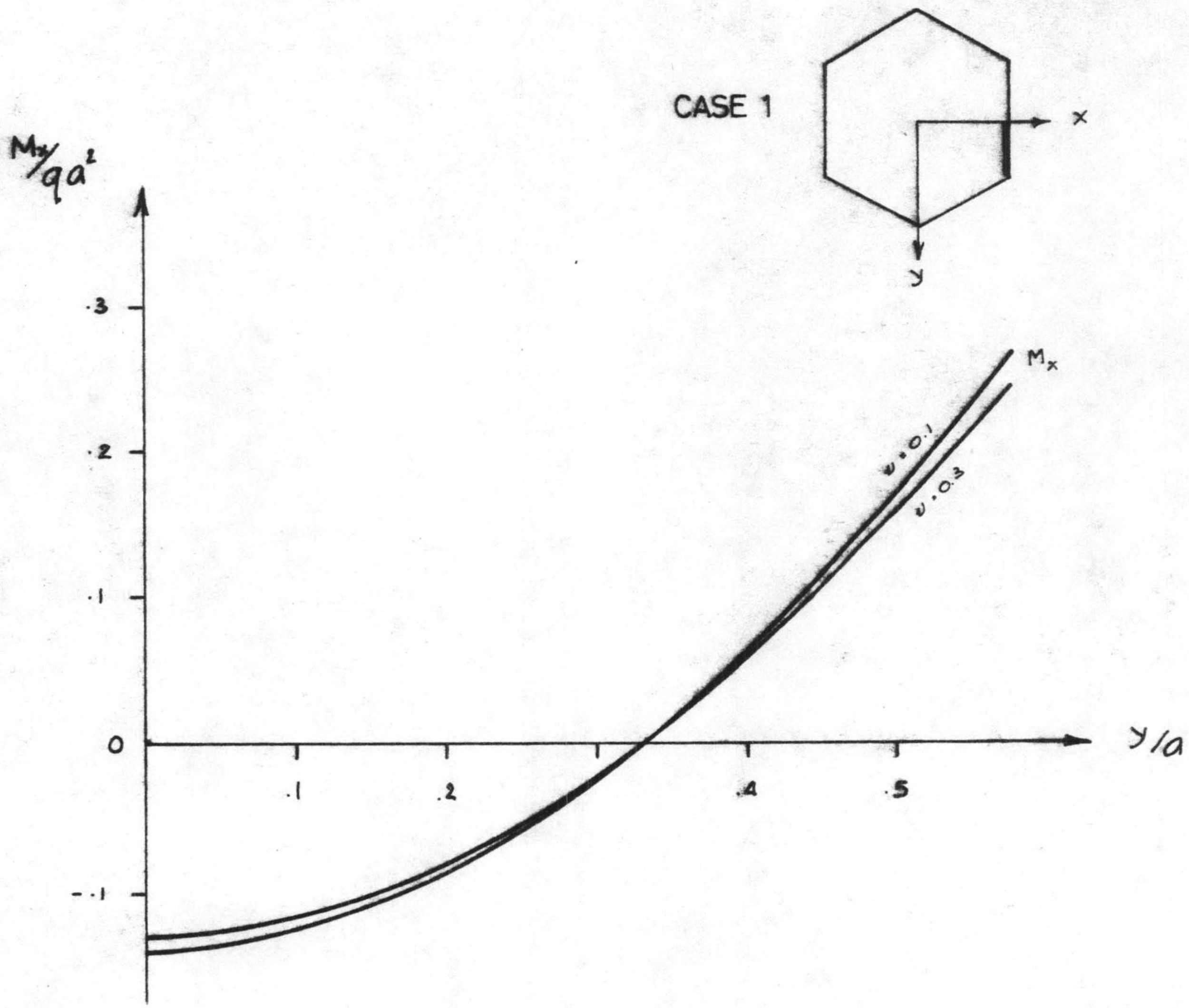

Fig. 25. Theoretical moment v.s. y/a, $x/a = 1$

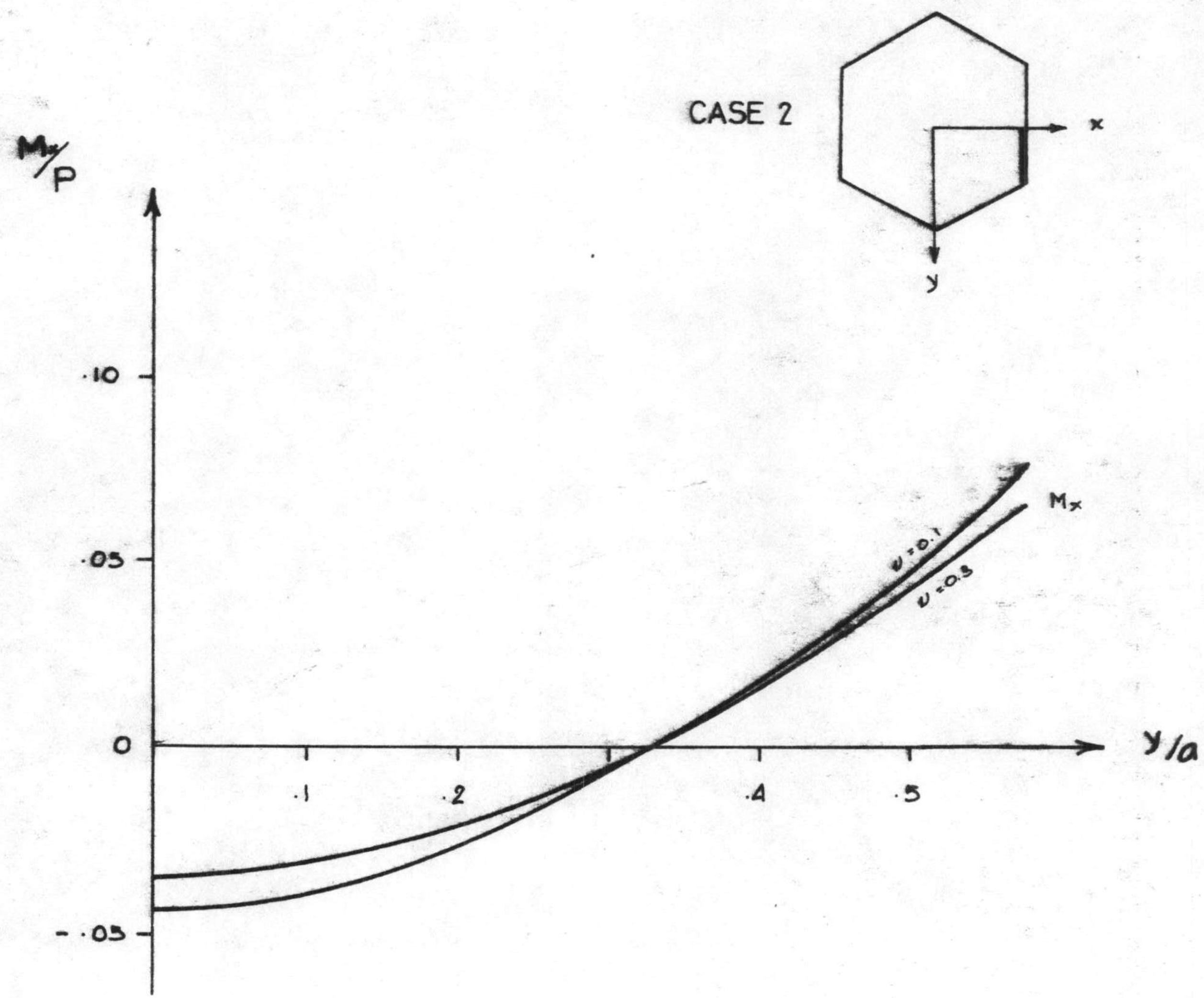

Fig. 26. Theoretical moment V.S. y/a, x/a = 1

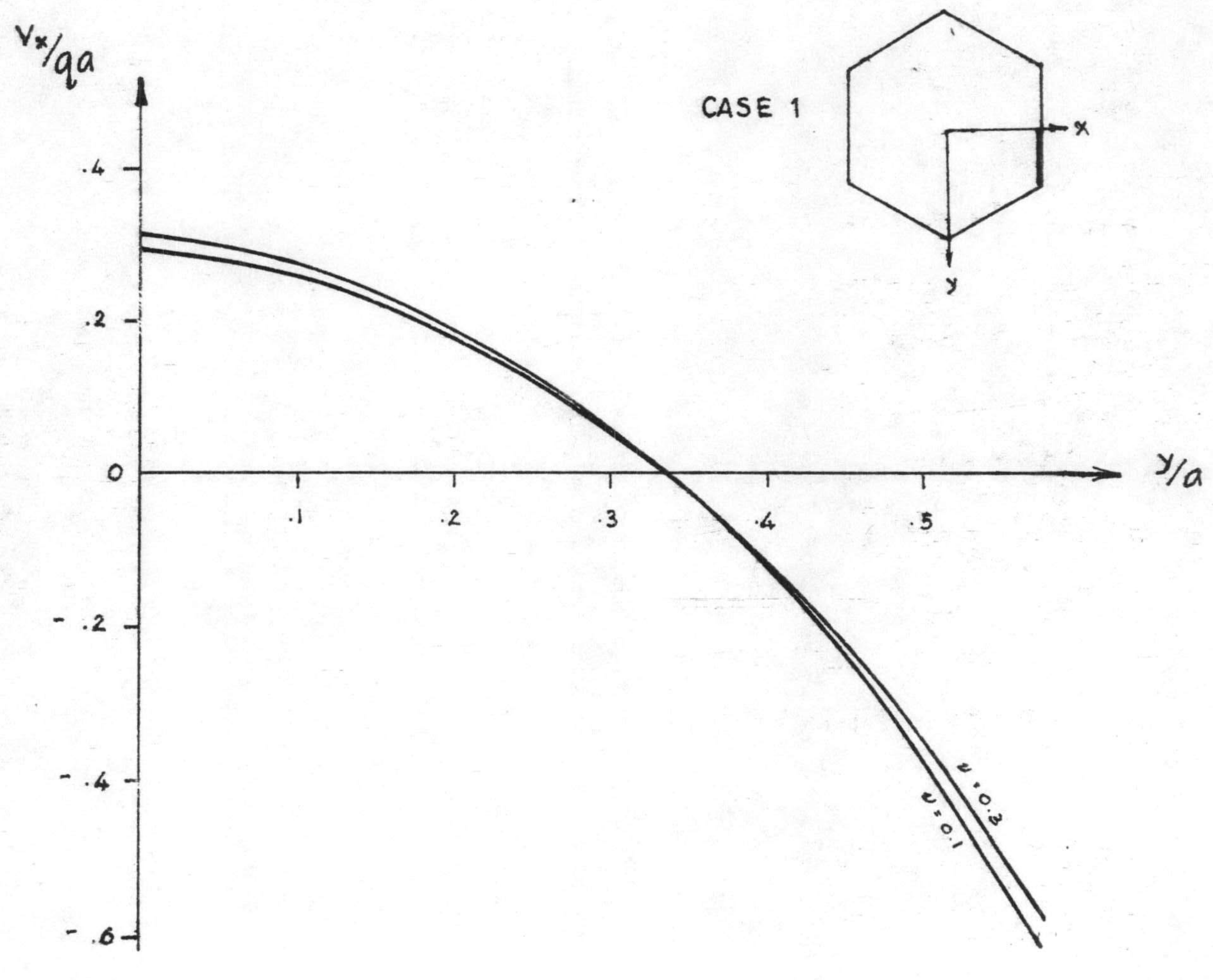

Fig. 27. Theoretical shear force v.s. y/a, $x/a = 1$

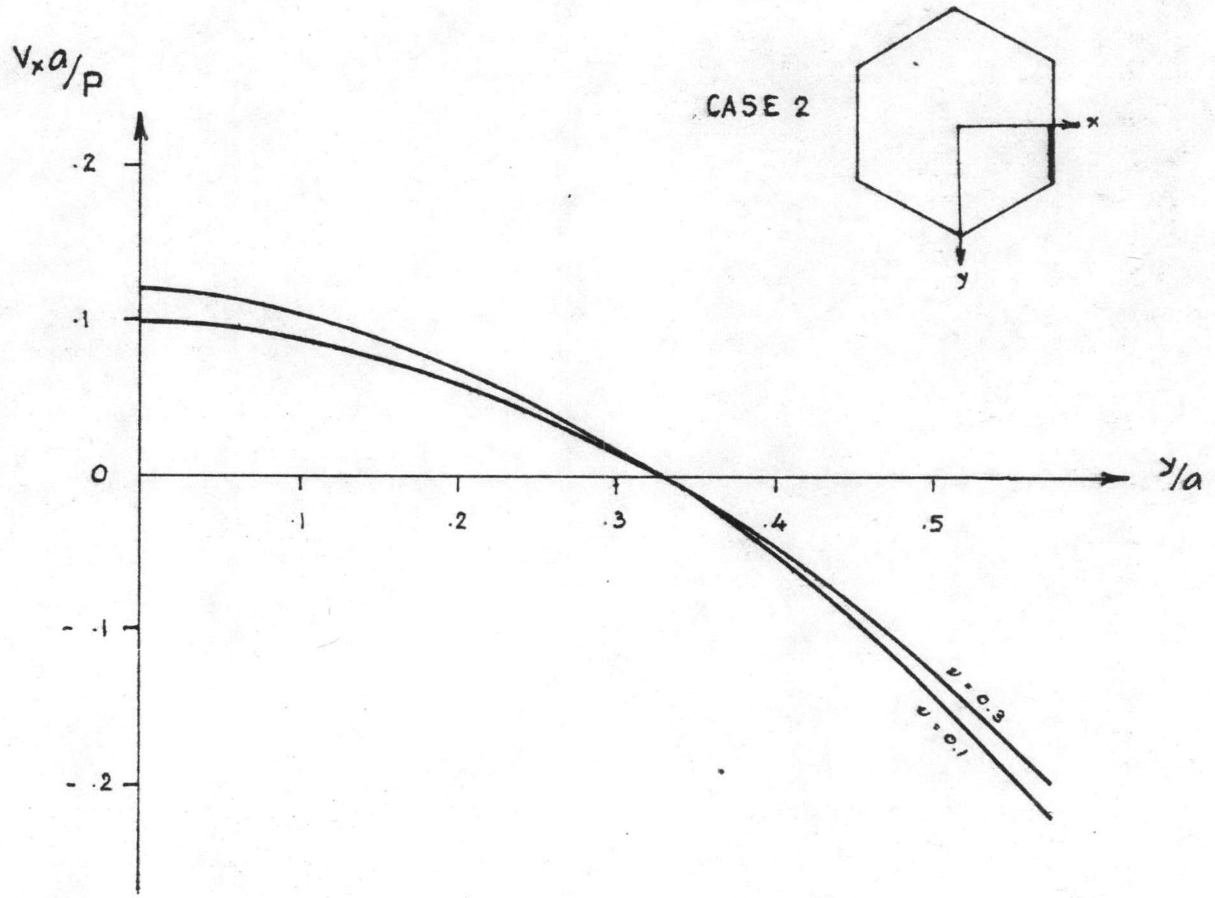

Fig. 28. Theoretical shear force v.s. y/a, x/a = 1

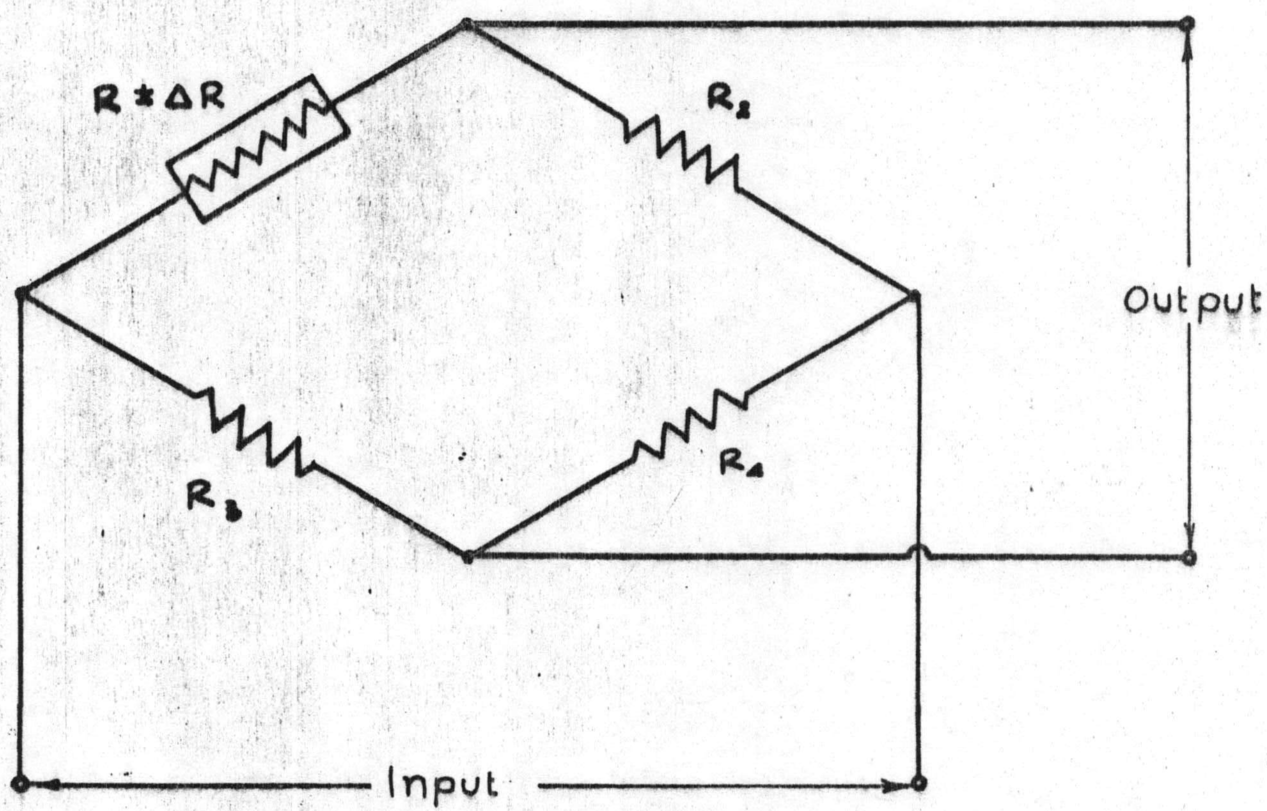

Fig. 29. Wheatstone bridge circuit

VITA

Mr. Prasong Ingsuwan was born on August 1950. He received the Bachelor's degree in Mechanical Engineering from Kasetsart University in the academic year of 1973. He is now working as lecturer at the Department of Mechanical Engineering, Chiang Mai University.