

1.

2
16X16 . 16X16
ZIRLO™ 3 ZIRLO™ 6 가

[1]. 16X16 , ,

3 ZIRLO™
가
(Transverse Direction)

1 16X16
가

1
(SSE, Safe Shutdown
Earthquake) (LOCA, Loss Of Coolant
Accident)

[2].

가

가

16X16
가

16X16 (Plate) (Cell) , 16X16
가 가

가 . , 16X16

가 .

2.

(Plate)

(Cell)

(Window) (Height) (Width) 가 (Slot) 가

가 , 가

가

가

가 16X16 1

2 .

2 0.0, 0.1, 0.2,

0.3, 0.4, 0.5 in. 가 .

2 0.0, 0.1, 0.2, 0.3, 0.4 in.

가 . , 1 ,

2 4 , 6 , 8 , 10

가 2

5가 ANSYS

8.0[3] (Plate)

(Cell) 2 3

2 (Cell)

3 (SHELL63) ,

4

(Plate)

1,930 1,810 ,

2,040 1,910 . ,

(Cell) Flat

Formed , Flat 3,195

2,875 Formed 3,195 2,875

가 , ,

4
5
6

7

Flat

Formed

8

3.

9

16X16

(without tubes)

(with tubes)

2,050 lbs

1,450 lbs

5,250 lbs

1,450 lbs

16X16

9

9

가

가

5,612 lbs

2,276 lbs

가

가

4.

4.1

가

4 (Plate)
(Height) (Width)
가 가

(Window)

가

5 가 (Slot) 가

가 가

(Cell) 가 가

6 , ,

7 (Flat) 8 (Formed

) 6(a) 1

1 Formed Flat

2 3 1

Formed 8 Formed

가 가 2 3

Formed

가 6(b)

2 1 Formed Flat

2 3 Formed

Flat 2

가

2 2 3

S

Formed Flat

6(c) 3 2

Formed Flat

2 1 가

가 1 3

Formed Flat

4.2 16X16

16X16 20 1 가

가

8

2 Cell 3 Cell 8

2 Cell 1 4,880 lbs

3 Cell 1

2,570 lbs

가

가

가

[4],

(15%)

2 Cell

1

4,150 lbs

8 3 Cell

1

2,180 lbs

16X16

2,050 lbs

16X16

17X17 OFA

17X17 OFA

16X16

가

17X17 STD

16X16

17X17

16X16 STD

16X16

16X16 STD

가

4,373 lbs

4,434 lbs

17X17 OFA

16X16

17X17

16X16

17X17 OFA

16X16

[5] 5,525 lbs

16X16

[1] 5,692 lbs

가

가

가

5.

16X16

(Plate)

(Window)

(Height)

(Width),

(Slot)

가

(Cell)

가

가 가

가

가

가 가

Formed

2 1

Formed Flat

가 ()

3 Cell 1

2,180 lbs 16X16

2,050 lbs , 17X17 OFA

5,525 lbs 16X16

5,692 lbs

가 가

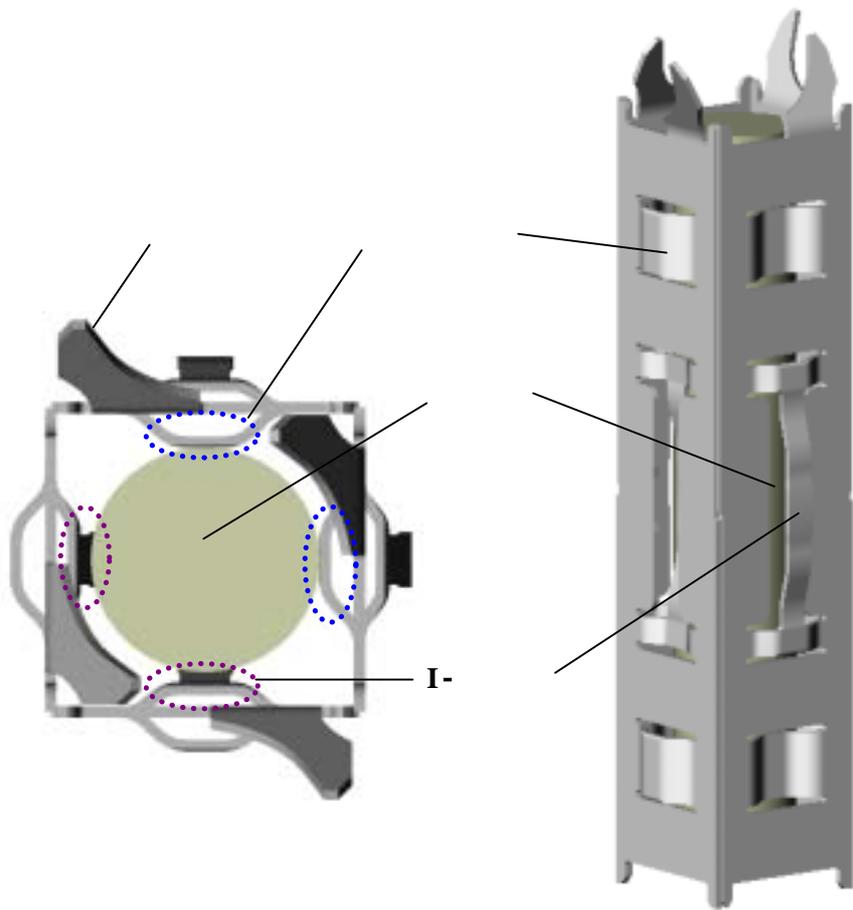
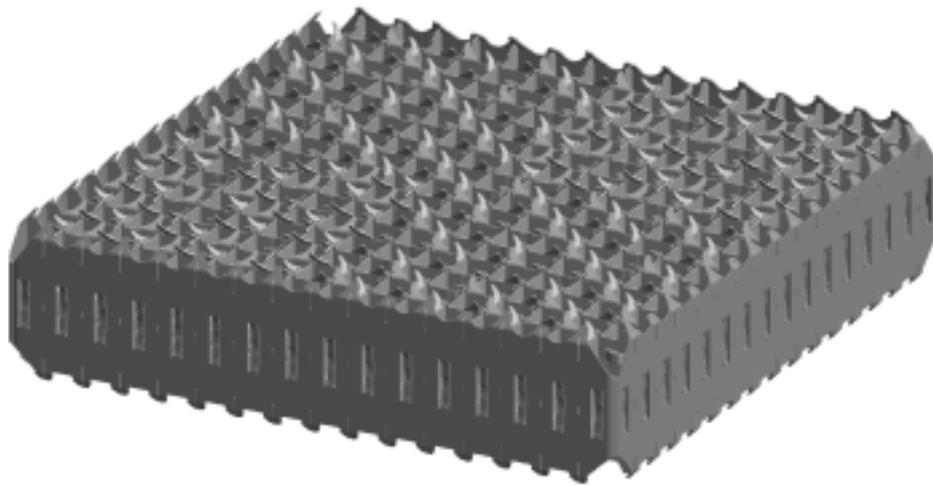
- [1] 16x16 Nest Generation Fuel (16NGF) Final Design Closeout Package, INB/KNFC/Westinghouse, November 2004
- [2] USNRC Standard Review Plan Section 4.2 Appendix A, " Evaluation of Fuel Assembly Structural Response to Externally Applied Forces" , USNRC, 1981
- [3] ANSYS Rev. 8.0, Swanson Analysis System Inc.
- [4] S. Y. Jeon, K. L. Jeon, K. T. Kim, " Experimental and Numerical Test for Buckling Characteristics of Spacer Grids in PWR Fuel Assembly" , Proc. Of the 16th International Conference on STRUCTURAL MECHANICS in REACTOR TECHNOLOGY, 2001
- [5] 16x16 Nest Generation Fuel (16NGF) Design and Manufacturability Review Package, INB/KNFC/Westinghouse, November 2002

1. 16X16

	(inch)	159.975
	(inch)	152.80
	(inch)	0.485
	(inch)	0.360
()		1
		1
		6
		3
		1
	(inch)	2.25
	(inch)	7.755

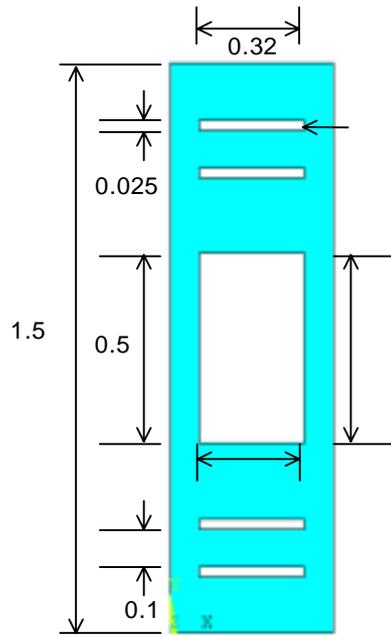
2.

Young' s Modulus (at 70°F, psi)	14.3 X 10 ⁶
Posion Ratio	0.3
Yield Strength, 0.2% (Minimum, psi)	43,000
Ultimate Tensile Strength (Minimum, psi)	55,000

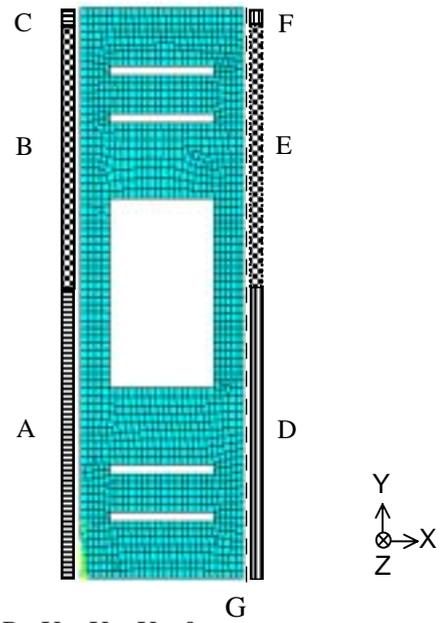


1. 16X16

/

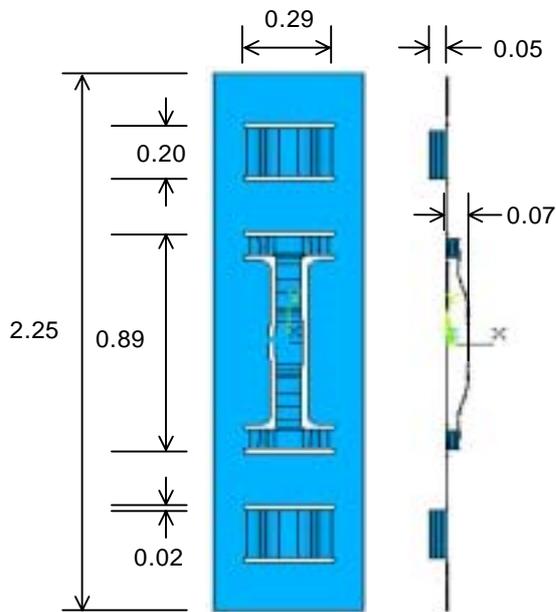


A : $U_x=U_y=U_z=R_x=R_y=R_z=0$,
 C : $U_x=U_y=U_z=R_x=R_y=R_z=0$,
 E : $U_y=U_z=0$,
 G : Displacement Coupling with U_x

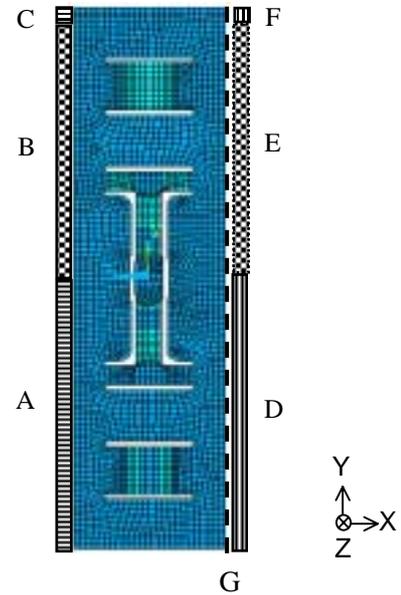


B : $U_x=U_y=U_z=0$,
 D : $U_y=U_z=R_x=R_y=R_z=0$,
 F : $U_y=U_z=R_x=R_y=R_z=0$

2. (Plate)

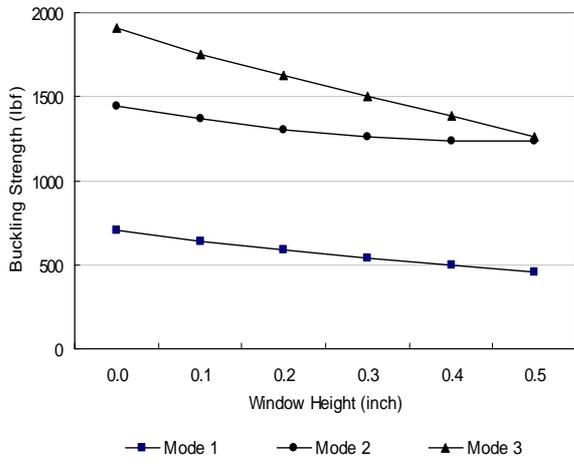


A : $U_x=U_y=U_z=R_x=R_y=R_z=0$,
 C : $U_x=U_y=U_z=R_x=R_y=R_z=0$,
 E : $U_y=U_z=0$,
 G : Displacement Coupling with U_x

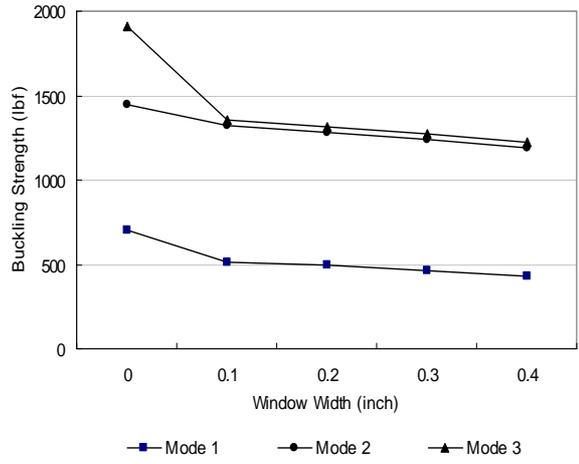


B : $U_x=U_y=U_z=0$,
 D : $U_y=U_z=R_x=R_y=R_z=0$,
 F : $U_y=U_z=R_x=R_y=R_z=0$

3. (Cell)



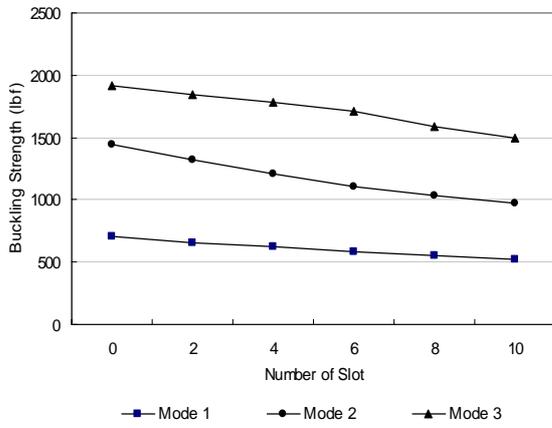
(a) (Window) (Height) 가



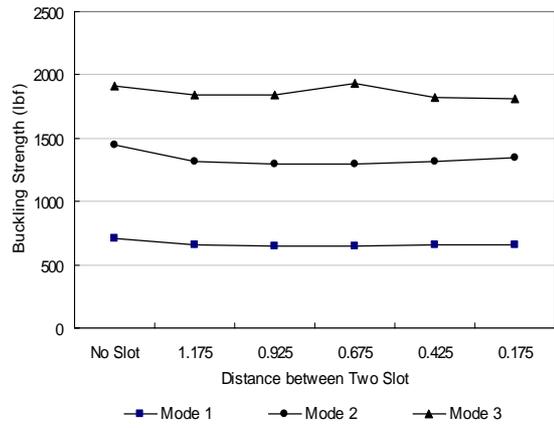
(b) (Window) (Width) 가

4.

가



(a) (Slot) 가

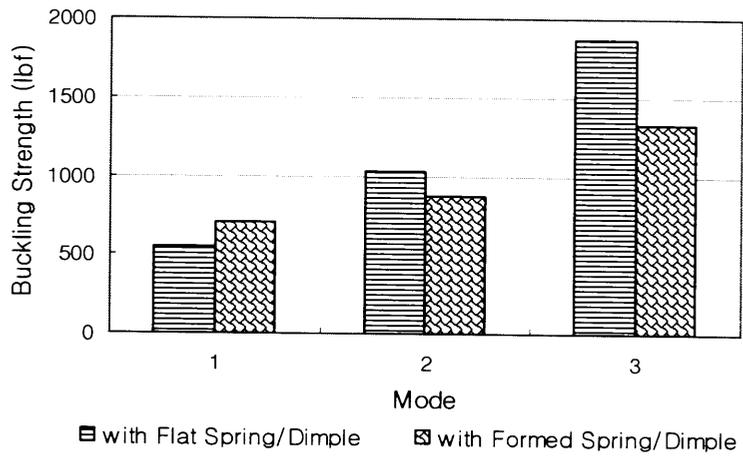


(b) (Slot)

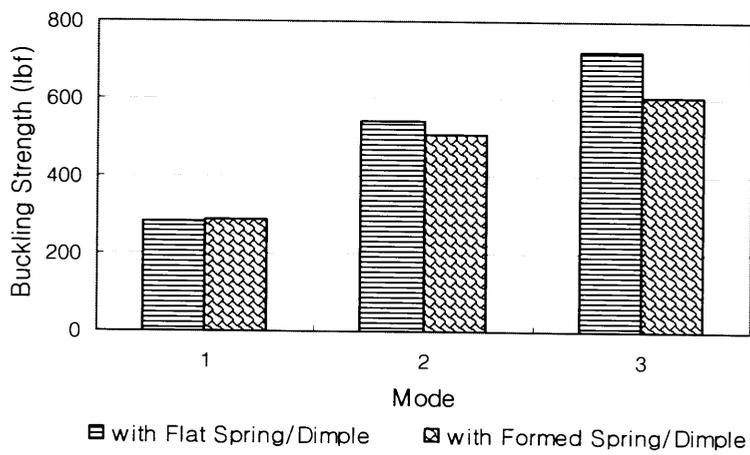
5.

(Slot)

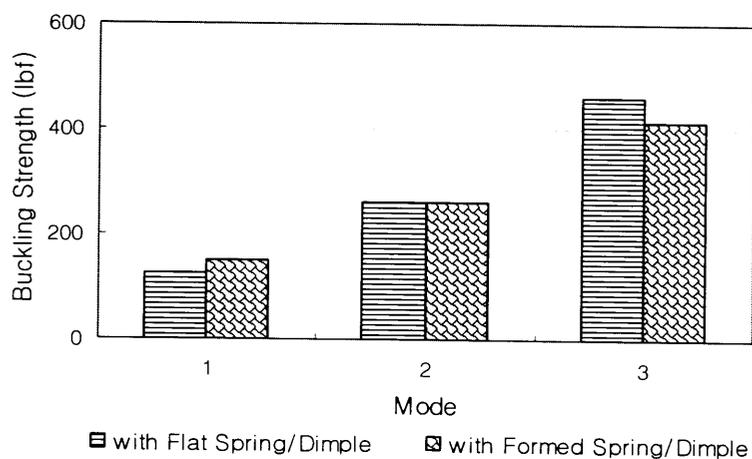
가



(a) 1 셀(Cell) 모델

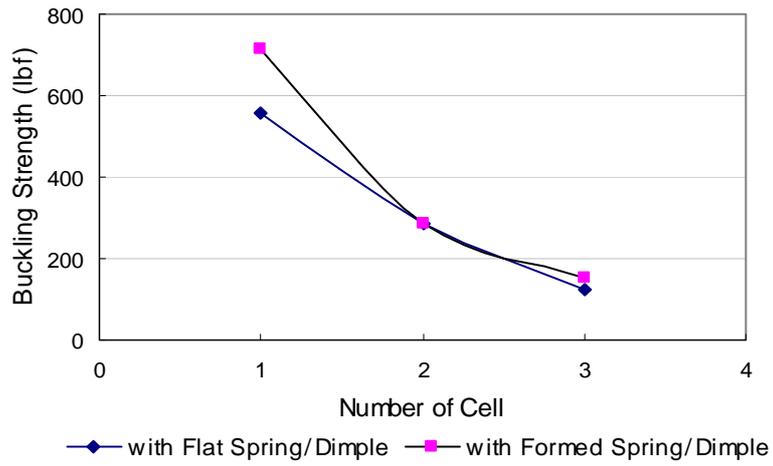


(b) 2 셀(Cell) 모델

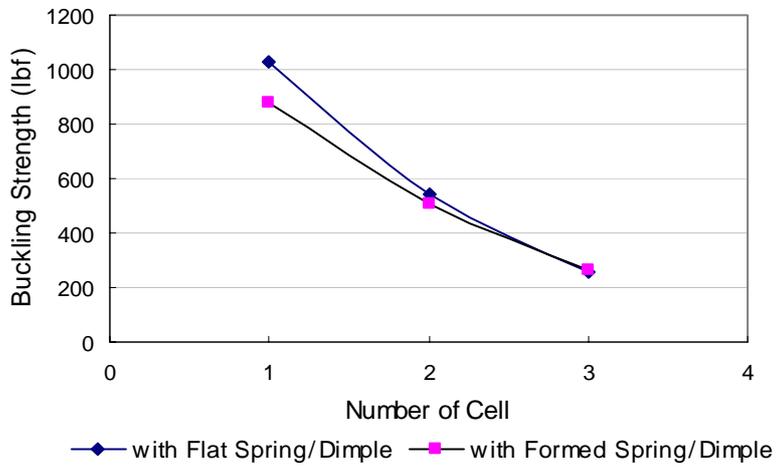


(c) 3 셀(Cell) 모델

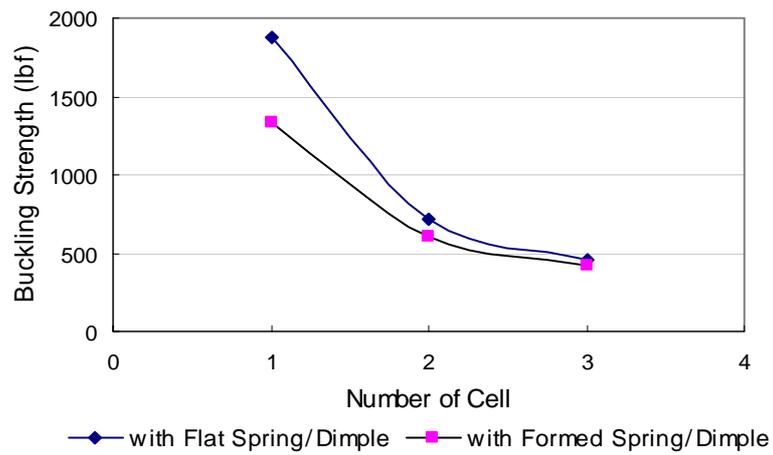
그림 6. 스프링과 딴플의 성형 여부에 따른 좌굴강도 영향



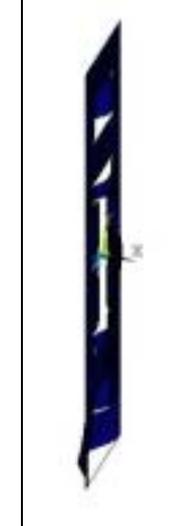
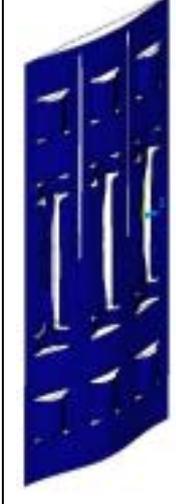
(a) Mode 1

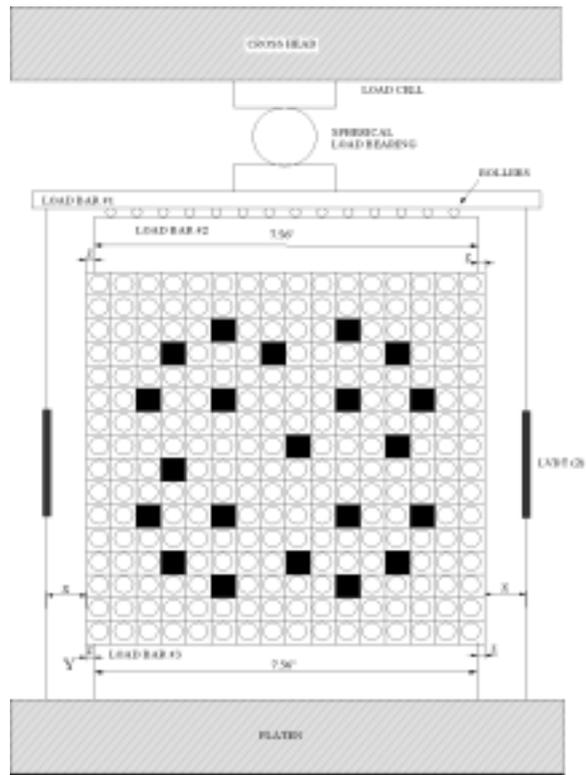


(b) Mode 2

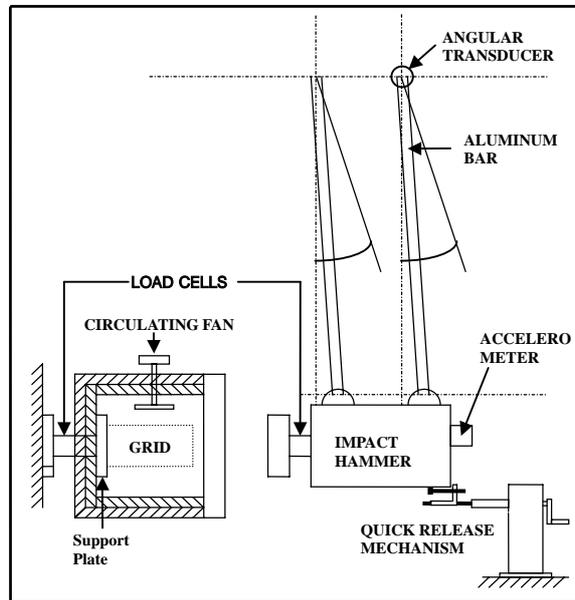


(c) Mode 3

	Mode 1		Mode 2		Mode 3	
	Flat	Formed	Flat	Formed	Flat	Formed
1 Cell						
2 Cell						
3 Cell						



(a)



(b)