

c.a.s.e

구조물 내진설계 경진대회



1 팀원소개 및 지원동기

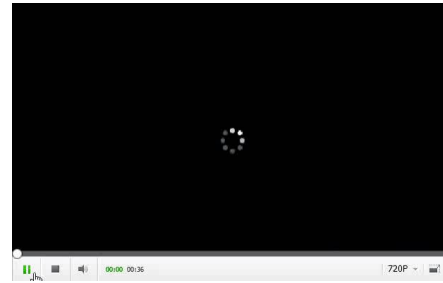
허광희
지도교수님

고병찬
: 총괄 및 구조해석

노희아
: 구조물제작 및 PPT작성

김가을
: 발표 및 PPT작성

박채린
: 설계 및 도면제작



<민간건축물 내진설계 현황>

(단위 : 동)

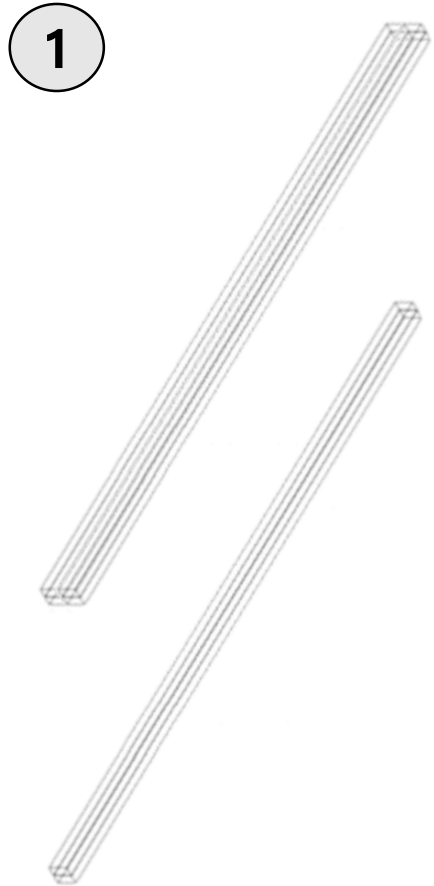
구분	전체건물(A) (사용승인)	내진대상(B) (사용승인)	내진확보(C)	전체건물 중 내진비율(C/A)	내진대상 중 내진비율(C/B)
전국	6,794,446	1,375,697	4	6.70%	33.1%
서울	616,141	284,216	1	12.47%	27.0%
부산	368,39		9	%	25.7%
	249			5.7%	27.0%
					40.2%
				0%	34.5%
					41.3%
				7.06%	51.5%
				%	36.3%
			8	3.16%	29.0%
				4.84%	37.2%
		21,766		4.42%	40.6%
전남	42,099	44,168	17,517	4.13%	39.7%
전남	601,734	38,365	12,675	2.11%	33.0%
경북	767,694	79,172	27,789	3.62%	35.1%
경남	678,860	84,128	35,010	5.16%	41.6%
제주	154,878	18,765	6,662	4.30%	35.5%

자료 제공: 국민안전처 이용호 의원실

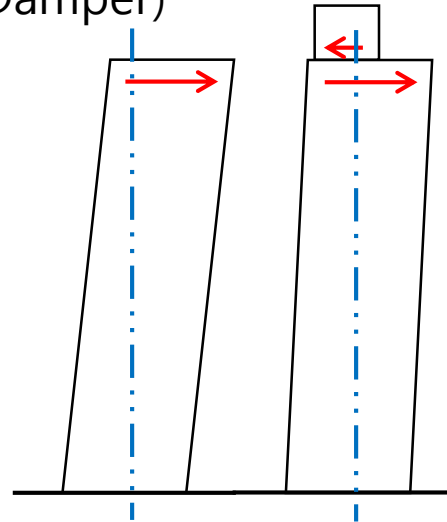
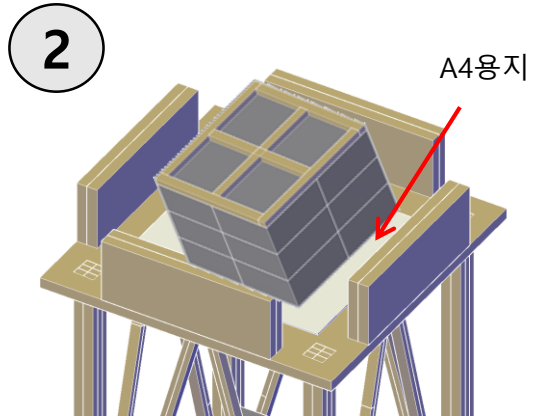
34.56%

2 내진설계

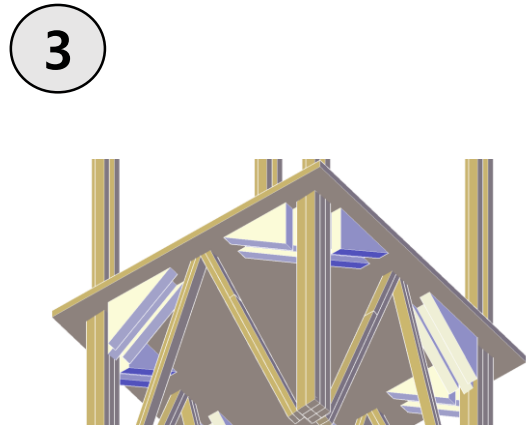
트러스



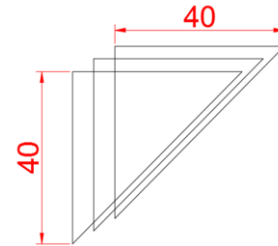
TMD(Tuned Mass Damper)



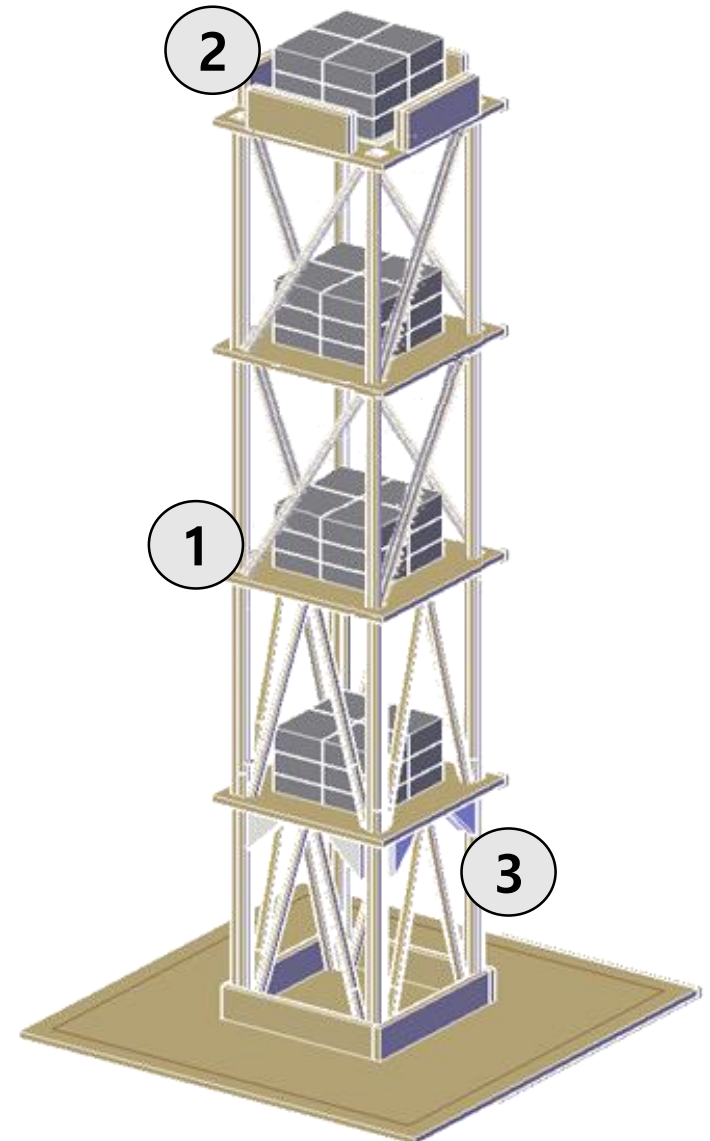
조인트 댐퍼



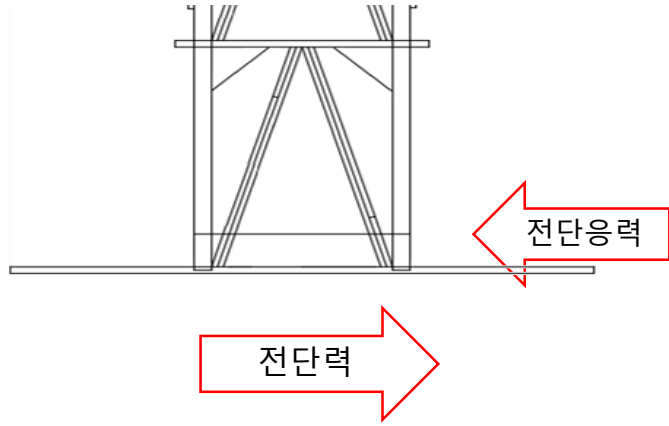
1번, 3번 Plate
하단부에 붙인다.



2번은 기둥에
붙인다.



3 구조해석 및 경제성

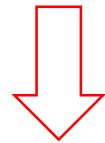


$A =$ 기둥의 단면적

$F = ma =$ 전단력 $a = 0.7g$

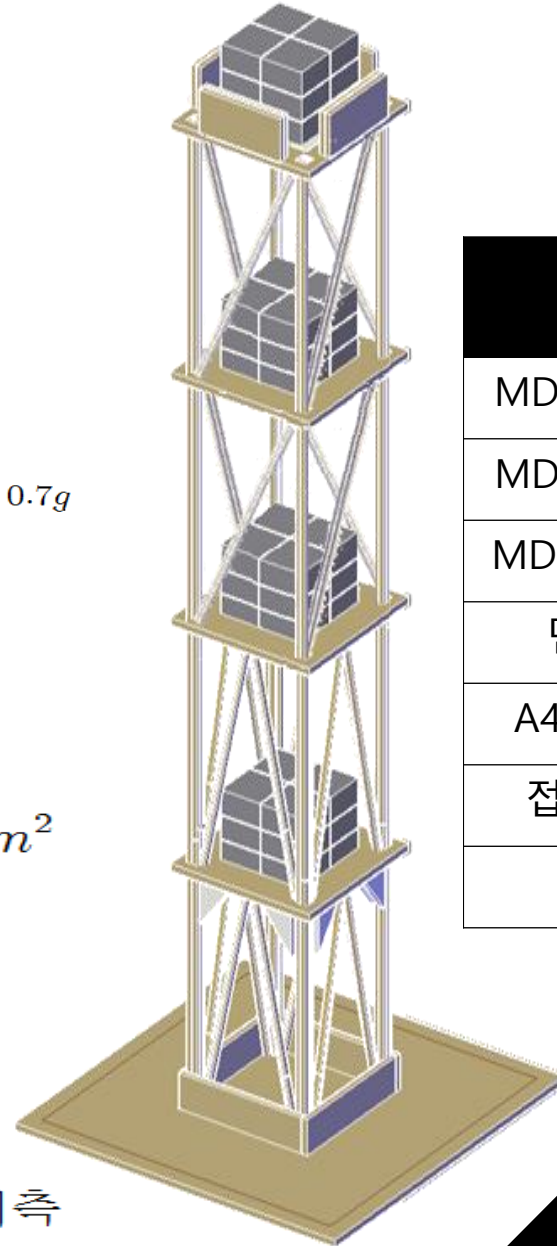
$\tau = \frac{F}{A} =$ 전단응력

$$\tau = \frac{F}{A} = \frac{24kg \times 0.7 \times 9.8m/s^2}{(12mm)^2} = 1.14N/mm^2$$



$\tau = 1.14N/mm^2 > 1N/mm^2$ (허용전단응력)

0.7g에서 파괴될 것으로 예측

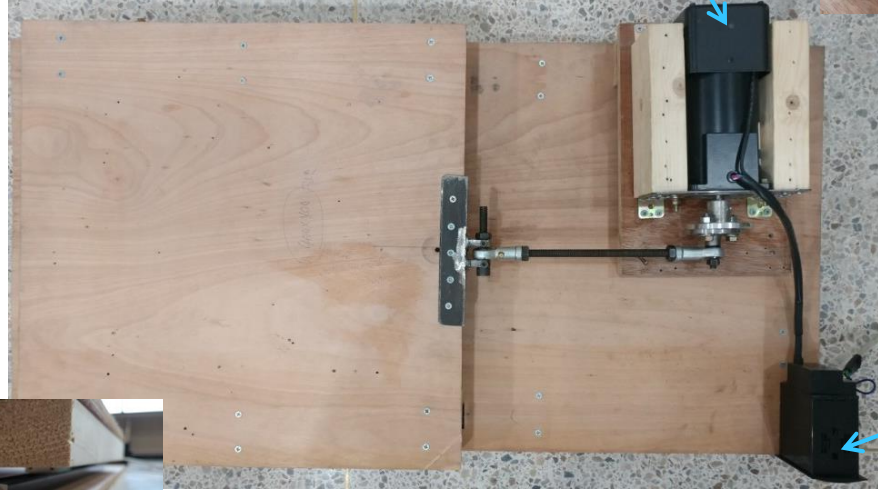


	단위수량 (개)	단가 (만원)	가격 (만원)
MDF Base	1	-	-
MDF Strip	53	10	530
MDF Plate	5	100	500
면줄	8	10	80
A4 용지	1	10	10
접착제	3	200	600
총합			1720

4 Shake Table



모터



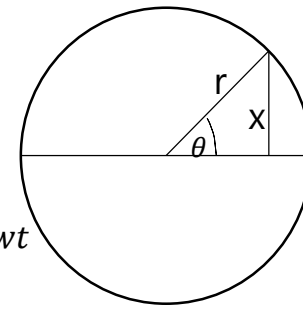
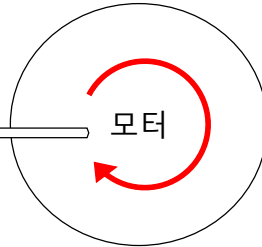
컨트롤러

LM Guide



합판

모터



$$\theta = \omega t$$

$$x = r \sin \theta = r \sin(\omega t)$$

$$x' = -\omega^2 r \cos(\omega t)$$

$$x'' = -\omega^2 r \sin(\omega t) = -\omega^2 x$$

$$a = -\omega^2 x = 0.7 \times 9.8 \text{ m/s}^2 = -\omega^2 \times 0.005 \text{ m}$$

$$\rightarrow \omega = 37.04 \text{ rad/s}$$

$$\omega = 2\pi f = 37.04 \text{ rad/s}$$

$$\rightarrow f = 5.895 \text{ Hz} = 353 \text{ rpm}$$

가속도 (g)	각속도 (rad/s)	주기 (Hz)	주기 (rpm)
0.1	14	2.23	134
0.2	19.8	3.15	189
0.3	24.3	3.86	232
0.4	28	4.46	267
0.5	31.3	4.98	299
0.6	34.3	5.46	327
0.7	37	5.895	353