3. 일광터널 안전성평가 자료

3.1 안전성평가 자료

구조물의 안전성 평가는 그 기능과 역할을 유지할 수 있는 구조적 및 사용상의 안전성에 대한 확보여부를 평가하는 것이므로 설계도서 검토 및 시공방법과 사용재료에 대한 검토, 부재별 상태평가 결과 및 각종 계측·측정·조사·시험 등을 통한 충분한 기초자료를 확보하여 이를 바탕으로 수치해석에 의해 안전성 여부를 판단하여야 한다.

상태평가 결과 및 각종 계측·측정·조사·시험 등을 실시한 결과, 전회(2019년) 정밀안전진단과 해당 구조물의 현황이 이전과 근소한 차이 외 변화가 없는 것으로 확인되어 구조계산서 및 터널해석보고서 등 기초 자료를 활용하여 안전성여부를 판단하였고, 일부 자료를 발췌하여 첨부하였다.

I. 개착식 터널

1) 터 널 본 체

목 차

1. 설계조건

1. 1 일반사항

1) 형식 : Precast Arch Box　　13.450 m * 5.429 m
지 간 : L = 13.450 m
총 연 장 : 140 m
토 피 고 : 3.000 m
지하수위 : 1.000 m
사각(skew) : 90 °
기초형식 : 전면기초

2) 사용재료 및 설계기준강도

① 콘크리트

- 본체 Precast Arch Box
f_{ck} = 400 kgf/㎠
E_c = 10,500 * √ f_{ck} + 70,000 = 280,000 kgf/㎠

- 기초 : 현장타설
f_{ck} = 270 kgf/㎠
E_c = 15,000 * √ f_{ck} = 246,475 kgf/㎠

② 철 근
* 본체 · Precast Arch Box
fy = 4000 kgf/㎠　　(Deformed Steel : 이형 철근)
Es = 2000000 kgf/㎠

* 기초 · 현 장 타 설
fy = 4000 kgf/㎠　　(Deformed Steel : 이형 철근)
Es = 2000000 kgf/㎠

3) 설 계 방 법

① P.A.B 본체 및 현장 타설 기초

* 단 면 검 토 : 극한 강도 설계법

* 사용성 검토 : 허용 응력 설계법
a) 처짐 검토
b) 균열 검토
c) 피로 응력 검토

② 배력근 (온도 철근) 규정

A. 도로교설계기준 4.7 바닥판 적용시.

4.7.5.7 배력철근

1) 주철근이 차량진행방향에 직각인 경우 (본 구조물의 기초 슬래브에 해당)

백분율 = $\frac{120}{\sqrt{L}}$ 과 67% 중 작은 값 이상

= 120 / $\sqrt{15.25}$ = 30.7 % (L = 30.5 / 2 = 15.25 m)

= MIN(30.7%, 67%) = 30.7% 이므로 As,req * 0.307을 배근함.

단, 온도철근 이상으로 배근함.

B. P.A.B 본체의 수축 및 온도 철근 (콘크리트 구조 설계 기준(1999) - 5.7 p103)

철근비 ρ = 0.0020

$\rho = \frac{A_s}{b * d}$ 에서, b = 100 cm, d = 50 cm

$A_s = \rho * b * d = 0.0020 * 100 * 50$

= 10.00 ㎠/m 이상으로 하여야 한다.

수축 및 온도철근 간격은 슬래브 두께의 5배 이하 40㎝이하로 하여야 한다.

C. 현장 타설 벽체의 최소수평철근비 (콘크리트 구조 설계 기준(1999) - 11.3 p221)

철근비 ρ = 0.002

$\rho = \frac{A_s}{b * d}$ 에서, b = 100 cm, d = 85 cm

$A_s = \rho * b * d = 0.0020 * 100 * 85$

= 17.00 ㎠/m 이상으로 하여야 한다.

철근 배근 간격은 벽두께의 3배 이하, 40㎝이하로 하여야 한다.

4) P.A.B 철근 덮개 기준 규정

: 콘크리트 구조 설계기준 5.4.2 프리캐스트 콘크리트 규정 참조

1.2 하중 조건

1) 고 정 하 중

① 철근Con'c : 2.50 t/㎥
② 토피 흙 : 1.90 t/㎥
③ γ sub : 0.90 t/㎥

2) 활하중 (한국 도로공사 교량 설계 기준 Ⅵ. 설계 일반사항 참조)

지중 RC RAHMEN교의 노면 활하중 적용

재하 방법

① 충격계수

토피두께 D(m)	충격계수 (i)
0.15 ≤ D ≤ 1	0.30
1 < D <2	0.20
2 < D < 3	0.10
3 < D	0.00

② 노면 활하중 (Pvl)
노면 활하중 Pvl은 라멘을 단순보로 가정하여 활하중이 라멘 전폭에 작용한 경우와 2D + 0.2 m의 분포폭에 재하되는 경우와 모멘트가 같다고 보아 등가 등분포 활하중 Pvl을 산출한 값임.

③ 활하중 영향 범위
활하중 분포폭이 라멘 전폭(B0)을 초과하는 부분의 활하중 영향은 무시.

④ 전륜하중 영향 범위
전륜하중은 무시하고 후륜하중에 대해서만 고려.

3) 토질 조건

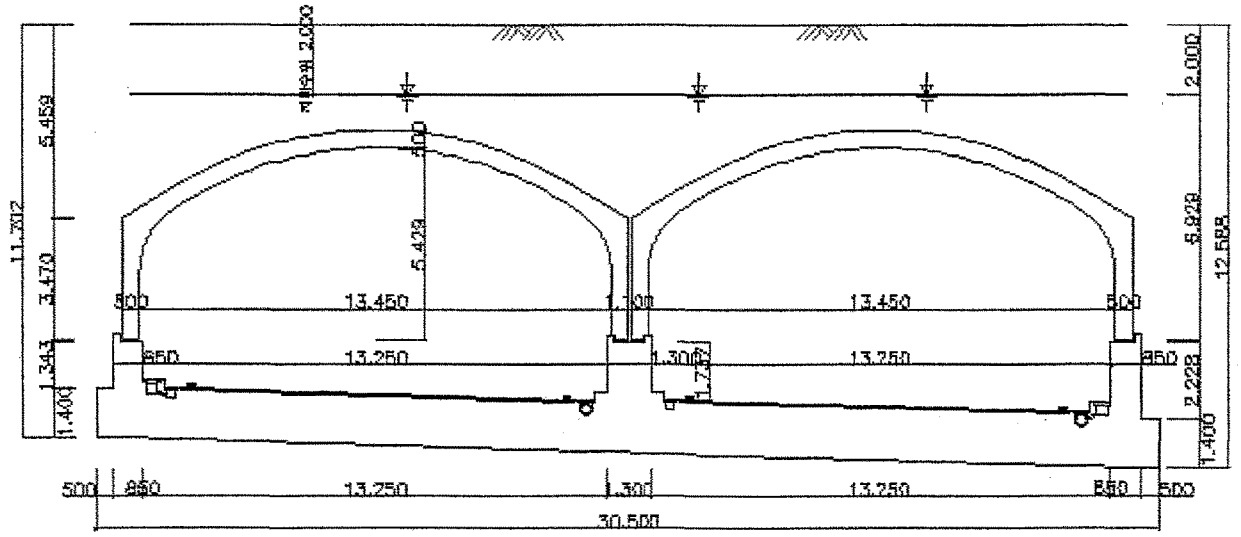
- 흙 내부 마찰각 Φ = 30 °
- 정지 토압 계수 $K_0 = 1 - \sin\Phi$ = 0.500
- 뒷채움, 토피 흙 γ_s = 1.9 t/㎥

1.3 참고 문헌

- 도로교 설계 기준 (2000) - 건설 교통부
- 콘크리트구조설계기준(1999)-건설교통부
- 콘크리트 표준 시방서 (1999) - 건설 교통부
- 고속도로 암거 표준도 설계 기준 (1999) - 한국 도로 공사
- AASHTO (16th Edition, 1996)
- 한국도로공사 설계 실무 자료집

2. 단면 가정

1) 설계 단면



P.A.B 본체 제원		기초 구조물 제원	
P.A.B Span	13.450 m	외측 P/W 두께	0.850 m
P.A.B 높이	5.429 m	중앙부 P/W 두께	1.300 m
토피고	3.000 m	기초내측거리	13.250 m
H.W.L	1.000 m	기초 두께	1.400 m
벽체 두께	0.500 m	기초 전폭	30.500 m
슬래브 두께	0.500 m	외측 P/W 높이	2.228 m
f_{ck} =	400 kg/㎠	중앙부 P/W 높이	1.737 m
f_y =	4000 kg/㎠	f_{ck} =	270 kg/㎠
1 Seg. 길이	1.500 m	f_y =	4000 kg/㎠

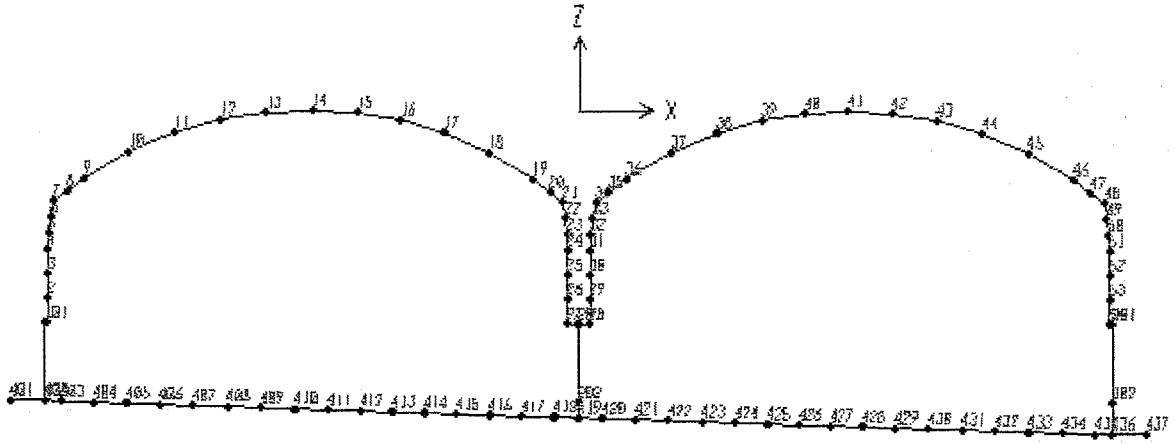
2) 단면특성

	부재 번호	단면적(A) (m^2)	단면2차모멘트(I) (m^4)	단면두께 (m)
P.A.B 본체	1	1.0 * 0.500 = 0.500	1 / 12 * 1.0 * 0.500^3 = 0.010	0.500
	2	1.0 * 0.500 = 0.500	1 / 12 * 1.0 * 0.500^3 = 0.010	0.500
	3	1.0 * 0.500 = 0.500	1 / 12 * 1.0 * 0.500^3 = 0.010	0.500
	4	1.0 * 0.500 = 0.500	1 / 12 * 1.0 * 0.500^3 = 0.010	0.500
	5	1.0 * 0.542 = 0.542	1 / 12 * 1.0 * 0.542^3 = 0.013	0.542
	6	1.0 * 0.675 = 0.675	1 / 12 * 1.0 * 0.675^3 = 0.026	0.675
	7	1.0 * 0.916 = 0.916	1 / 12 * 1.0 * 0.916^3 = 0.064	0.916
	8	1.0 * 0.680 = 0.680	1 / 12 * 1.0 * 0.680^3 = 0.026	0.680
	9	1.0 * 0.553 = 0.553	1 / 12 * 1.0 * 0.553^3 = 0.014	0.553
	10	1.0 * 0.511 = 0.511	1 / 12 * 1.0 * 0.511^3 = 0.011	0.511
	11	1.0 * 0.500 = 0.500	1 / 12 * 1.0 * 0.500^3 = 0.010	0.500
	12	1.0 * 0.500 = 0.500	1 / 12 * 1.0 * 0.500^3 = 0.010	0.500
	13	1.0 * 0.500 = 0.500	1 / 12 * 1.0 * 0.500^3 = 0.010	0.500
	14	1.0 * 0.500 = 0.500	1 / 12 * 1.0 * 0.500^3 = 0.010	0.500
	15	1.0 * 0.500 = 0.500	1 / 12 * 1.0 * 0.500^3 = 0.010	0.500
	16	1.0 * 0.500 = 0.500	1 / 12 * 1.0 * 0.500^3 = 0.010	0.500
	17	1.0 * 0.500 = 0.500	1 / 12 * 1.0 * 0.500^3 = 0.010	0.500
	18	1.0 * 0.511 = 0.511	1 / 12 * 1.0 * 0.511^3 = 0.011	0.511
	19	1.0 * 0.553 = 0.553	1 / 12 * 1.0 * 0.553^3 = 0.014	0.553
	20	1.0 * 0.680 = 0.680	1 / 12 * 1.0 * 0.680^3 = 0.026	0.680
	21	1.0 * 0.916 = 0.916	1 / 12 * 1.0 * 0.916^3 = 0.064	0.916
	22	1.0 * 0.675 = 0.675	1 / 12 * 1.0 * 0.675^3 = 0.026	0.675
	23	1.0 * 0.542 = 0.542	1 / 12 * 1.0 * 0.542^3 = 0.013	0.542
	24	1.0 * 0.500 = 0.500	1 / 12 * 1.0 * 0.500^3 = 0.010	0.500
	25	1.0 * 0.500 = 0.500	1 / 12 * 1.0 * 0.500^3 = 0.010	0.500
	26	1.0 * 0.500 = 0.500	1 / 12 * 1.0 * 0.500^3 = 0.010	0.500
	27	1.0 * 0.500 = 0.500	1 / 12 * 1.0 * 0.500^3 = 0.010	0.500
벽체	101	1.0 * 0.850 = 0.850	1 / 12 * 1.0 * 0.850^3 = 0.051	0.850
	102	1.0 * 0.850 = 0.850	1 / 12 * 1.0 * 0.850^3 = 0.051	0.850
	201	1.0 * 1.300 = 1.300	1 / 12 * 1.0 * 1.300^3 = 0.183	1.300
	202	1.0 * 1.300 = 1.300	1 / 12 * 1.0 * 1.300^3 = 0.183	1.300
기초슬래브	401	1.0 * 1.400 = 1.400	1 / 12 * 1.0 * 1.400^3 = 0.229	1.400
	402	1.0 * 1.400 = 1.400	1 / 12 * 1.0 * 1.400^3 = 0.229	1.400
	403	1.0 * 1.400 = 1.400	1 / 12 * 1.0 * 1.400^3 = 0.229	1.400
	404	1.0 * 1.400 = 1.400	1 / 12 * 1.0 * 1.400^3 = 0.229	1.400
	405	1.0 * 1.400 = 1.400	1 / 12 * 1.0 * 1.400^3 = 0.229	1.400
	406	1.0 * 1.400 = 1.400	1 / 12 * 1.0 * 1.400^3 = 0.229	1.400
	407	1.0 * 1.400 = 1.400	1 / 12 * 1.0 * 1.400^3 = 0.229	1.400
	408	1.0 * 1.400 = 1.400	1 / 12 * 1.0 * 1.400^3 = 0.229	1.400
	409	1.0 * 1.400 = 1.400	1 / 12 * 1.0 * 1.400^3 = 0.229	1.400
	410	1.0 * 1.400 = 1.400	1 / 12 * 1.0 * 1.400^3 = 0.229	1.400
	411	1.0 * 1.400 = 1.400	1 / 12 * 1.0 * 1.400^3 = 0.229	1.400
	412	1.0 * 1.400 = 1.400	1 / 12 * 1.0 * 1.400^3 = 0.229	1.400
	413	1.0 * 1.400 = 1.400	1 / 12 * 1.0 * 1.400^3 = 0.229	1.400
	414	1.0 * 1.400 = 1.400	1 / 12 * 1.0 * 1.400^3 = 0.229	1.400
	415	1.0 * 1.400 = 1.400	1 / 12 * 1.0 * 1.400^3 = 0.229	1.400
	416	1.0 * 1.400 = 1.400	1 / 12 * 1.0 * 1.400^3 = 0.229	1.400
	417	1.0 * 1.400 = 1.400	1 / 12 * 1.0 * 1.400^3 = 0.229	1.400
	418	1.0 * 1.400 = 1.400	1 / 12 * 1.0 * 1.400^3 = 0.229	1.400

3. 상시해석

3.1 해석 모델링

1) P.A.B 단면 모델링



2) 절점좌표

절점	X	Z	절점	X	Z	절점	X	Z	절점	X	Z
1	-14.250	-5.679	25	-0.300	-4.372	49	14.166	-2.860	413	-5.067	-8.042
2	-14.250	-5.026	26	-0.300	-5.026	50	14.230	-3.293	414	-4.184	-8.069
3	-14.250	-4.372	27	-0.300	-5.679	51	14.250	-3.719	415	-3.300	-8.098
4	-14.250	-3.719	28	0.300	-5.679	52	14.250	-4.372	416	-2.417	-8.122
5	-14.230	-3.293	29	0.300	-5.026	53	14.250	-5.026	417	-1.534	-8.148
6	-14.166	-2.860	30	0.300	-4.372	54	14.250	-5.679	418	-0.650	-8.175
7	-14.107	-2.444	31	0.300	-3.719	101	-14.325	-5.679	419	0.000	-8.194
8	-13.748	-2.165	32	0.318	-3.293	102	-14.325	-7.052	420	0.650	-8.214
9	-13.294	-1.832	33	0.369	-2.860	201	0.000	-5.679	421	1.534	-8.241
10	-12.092	-1.131	34	0.443	-2.444	202	0.000	-7.475	422	2.417	-8.267
11	-10.887	-0.608	35	0.795	-2.165	301	14.325	-5.679	423	3.300	-8.291
12	-9.683	-0.256	36	1.256	-1.832	302	14.325	-7.938	424	4.184	-8.320
13	-8.479	-0.057	37	2.458	-1.131	401	-15.250	-7.764	425	5.067	-8.347
14	-7.275	0.000	38	3.663	-0.608	402	-14.325	-7.764	426	5.950	-8.373
15	-6.071	-0.057	39	4.867	-0.256	403	-13.900	-7.777	427	6.834	-8.400
16	-4.867	-0.256	40	6.071	-0.057	404	-13.017	-7.804	428	7.717	-8.426
17	-3.663	-0.608	41	7.275	0.000	405	-12.133	-7.830	429	8.600	-8.453
18	-2.458	-1.131	42	8.479	-0.057	406	-11.250	-7.857	430	9.484	-8.479
19	-1.256	-1.832	43	9.683	-0.256	407	-10.367	-7.883	431	10.367	-8.506
20	-0.795	-2.165	44	10.887	-0.608	408	-9.484	-7.910	432	11.250	-8.532
21	-0.443	-2.444	45	12.092	-1.131	409	-8.600	-7.936	433	12.133	-8.559
22	-0.369	-2.860	46	13.294	-1.832	410	-7.717	-7.963	434	13.017	-8.585
23	-0.318	-3.293	47	13.748	-2.165	411	-6.834	-7.989	435	13.900	-8.612
24	-0.300	-3.719	48	14.107	-2.444	412	-5.950	-8.016	436	14.325	-8.625
									437	15.250	-8.625

3) SPRING 계수

BV = $\sqrt{Av}$ = $\sqrt{1500 \times 3050}$ = 2138.925 cm { 신축이음거리 : 1500 cm, 기초전폭:3050 cm

Kv = Kvo x (Bv / 30)^(-3/4)

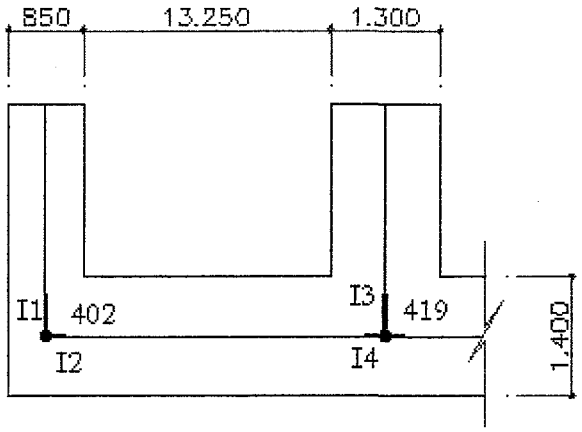
여기서,
Kv = 연직방향 지반 반력 계수 (kgf/㎠)
Kvo = 지름 30cm 의 강체윤판에 의한 평판재하 시험에 상당하는 연직 방향 지반반력 계수(kgf/㎠)
Bv = 기초의 환산재하 폭 (m)
Eo = 80,000 kgf/㎠
α = 4.0 (지반반력 추정계수)

Kv = 1/30 × 4 × 80000 × (2138.925/30)^(-3/4)= 434.7334 kgf/㎠
= 434733.4 t/㎡

절점	분담폭	스프링계수
401	0.463	201064.2
402	0.675	293445.0
403	0.654	284315.6
404	0.884	384087.0
405	0.884	384087.0
406	0.883	383869.6
407	0.883	383869.6
408	0.884	384087.0
409	0.884	384087.0
410	0.883	383869.6
411	0.884	384087.0
412	0.884	384087.0
413	0.883	383869.6
414	0.884	384087.0
415	0.884	384087.0
416	0.883	383869.6
417	0.884	384087.0
418	0.767	333440.5
419	0.650	282576.7

수평 지반 반력 계수 : Kh = 10000 ton/㎥

4) 기초 슬래브 절점부 강역 (도로교 설계 기준 (2000) ,라멘교 P377)



I 1 = 0.700 − 0.25 * 0.85 = 0.4875 m
I 2 = 0.425 − 0.25 * 1.40 = 0.075 m
I 3 = 0.700 − 0.25 * 1.30 = 0.375 m
I 4 = 0.650 − 0.25 * 1.40 = 0.3 m

3.2 하중의 산정

1) 구조물 자중 산정
구조해석 입력값(SAP2000 input file) 참조

2) 상부에 작용하는 활하중

* 활하중은 작용하지 않으므로 고려하지 않음.
* 단 가설시 하중으로 활하중을 고려하여 적용함.
안전측 검토를 위해 가설하중에 의한 수평 토압은 고려하지 않음.

① 부분 등분포 하중 작용시

토피고 D = 1.0 m
충격계수 I = 0.3 (0.15 ≤ D ≤ 1)
B0 = 14.45 m
W = (2D + 0.2 + 4 − 2D + D + 0.1) * 2
= (2 * 1 + 0.2 + 4 − 2 * 1 + 1 + 0.1) * 2 = 10.6 m
그러므로, B0 > W 일 경우
종방향 단위 길이당 하중(DB-18)
P1 = (2 x 7.2) / 3.0 = 4.8 tonf/m
전폭에 작용하는 노면활하중

$$Pvl = \frac{8*P1\,(1+I)\,(0.75\,B0 - 0.25D - 4.225)}{B0^{2}}$$

$$= \frac{8*4.8\,(1+0.3)\,(0.75*14.45 - 0.25*1.0 - 4.225)}{14.45^{2}} = 1.521$$

⊙ 연직 토압 + 활하중
= 2.0 * 1.0 * 1.5 + 1.521 * 2.15 = 6.27 t/m

② 등분포 하중 작용시

토피고 D = 3.0 m
충격계수 I = 0.1 (2.0 ≤ D ≤ 3.0)
B0 = 14.45 m
W = (4.2 + 2D − 4 + 4.1 − D) * 2
= (4.20 + 2 * 3.0 − 4 + 4.1 −3) * 2 = 14.6 m
그러므로, B0 < W 일 경우

종방향 단위 길이당 하중(DB-18)
P1 = (2 x 7.2) / 3.0 = 4.8 tonf/m

분포폭당 작용하는 하중 (접지폭 0.2m , 분포각45°)
Pvl1 = {P1(1+I)}/(2D+0.2) = { 4.8 * (1+0.1)}/(2*3+0.2) = 0.852
Pvl2 = {2P1(1+I)}/(2D+0.2) = { 2*4.8 * (1+0.1)}/(2*3+0.2) = 1.703

전폭(B0)에 작용하는 노면 노면 활하중

$$Pvl = \frac{8 * Pvl1 \{0.125\ B0^2 + 2*B0 - 8.4 - (B0 - 4.2)D\}}{B0^{\ 2}}$$

$$+ \frac{8 * Pvl2 \{8.4 - 2\ B0 + (B0 - 4.2)D\}}{B0^{\ 2}}$$

$$= \frac{0.852 \{0.125 * 14.45^2 + 2*14.45 - 8.4 - (14.45 - 4.2)*3}{14.45^{\ 2}}$$

$$+ \frac{8 * 1.703 * \{8.4 - 2 * 14.45 + (14.45 - 4.2) * 3.0\}}{14.45^{\ 2}}$$

$$= \frac{108.036 + 139.646}{208.803} = 1.186$$

⊙ 연직 토압 + 활하중
= 2.0 * 3.0 * 1.5 + 1.186 * 2.15 = 11.55 t/m

▣ 비교 결과

11.55 t/m > 6.27 t/m 이므로,

토피고 3.00m의 경우가 더 불리한 경우 이므로 가설시 활하중은 토피고 3m일 때를 고려하여 Pvl = 1.186 t/㎡ 을 적용함.

* Pvl = 1.186 t/m^2 (P.A.B 슬래브에 재하)

3) 연직토압(Pv) - 지하수 없을때

Pv = α * γ * D

γ : 상재토의 단위중량(t/m^3)

D : 암거상면의 토피 및 포장층 두께(m)

B_0 : 암거 외측 폭(m)

* 흙의 자중 및 연직토압

근입계수(α) : 암거 근입 특성에 따른 계수

α = 1.0 + 0.2(D / Bo) ≤ 1.15

= 1.0 + 0.2 * (3 / (13.45 + 0.5 * 2)) = 1.042 ≤ 1.15 α = 1.042

절점 번호		γ * D t/m^2				Pv = α * γ * D t/m^2				
5	23	1.9	*	6.293	=	11.957	1.042	*	11.957	= 12.459
6	22	1.9	*	5.860	=	11.134	1.042	*	11.134	= 11.602
7	21	1.9	*	5.444	=	10.344	1.042	*	10.344	= 10.778
8	20	1.9	*	5.165	=	9.814	1.042	*	9.814	= 10.226
9	19	1.9	*	4.832	=	9.181	1.042	*	9.181	= 9.566
10	18	1.9	*	4.131	=	7.849	1.042	*	7.849	= 8.179
11	17	1.9	*	3.608	=	6.855	1.042	*	6.855	= 7.143
12	16	1.9	*	3.256	=	6.186	1.042	*	6.186	= 6.446
13	15	1.9	*	3.057	=	5.808	1.042	*	5.808	= 6.052
14	-	1.9	*	3.000	=	5.700	1.042	*	5.700	= 5.939

4) 연직토압 (Pvw) - 지하수 있을때

Pv = α * γ * D

α = 1.042

γ t =1.9 t/m^3

γ sub = 0.9 t/m^3

절점 번호		지하수위	지하수 아래	α	∑ Pvw
5	23	3.80	3.864	1.042	7.986
6	22	3.80	3.474	1.042	7.580
7	21	3.80	3.100	1.042	7.189
8	20	3.80	2.849	1.042	6.928
9	19	3.80	2.549	1.042	6.615
10	18	3.80	1.918	1.042	5.958
11	17	3.80	1.447	1.042	5.468
12	16	3.80	1.130	1.042	5.137
13	15	3.80	0.951	1.042	4.951
14	-	3.80	0.900	1.042	4.897

ex) 5 번 절점

지하수 위 : γ * h = 1.9 * 2.0 = 3.8

지하수 아래 : γ * h = 0.9 * (3.293+1.0) = 3.864

Pvw = 1.042 * (3.8 + 3.864) = 7.986

5) 수평토압(Ph) - 지하수 없을때

절점 번호	수평토압 t/m^2
1 27	0.500 * 1.9 * 8.929 = 8.483
2 26	0.500 * 1.9 * 8.276 = 7.862
3 25	0.500 * 1.9 * 7.622 = 7.241
4 24	0.500 * 1.9 * 6.969 = 6.621
5 23	0.500 * 1.9 * 6.543 = 6.216
6 22	0.500 * 1.9 * 6.110 = 5.805
7 21	0.500 * 1.9 * 5.694 = 5.409
8 20	0.500 * 1.9 * 5.415 = 5.144
9 19	0.500 * 1.9 * 5.082 = 4.828
10 18	0.500 * 1.9 * 4.381 = 4.162
11 17	0.500 * 1.9 * 3.858 = 3.665
12 16	0.500 * 1.9 * 3.506 = 3.331
13 15	0.500 * 1.9 * 3.307 = 3.142
14	0.500 * 1.9 * 3.250 = 3.088
101	0.500 * 1.9 * 8.929 = 8.483
102	0.500 * 1.9 * 10.302 = 9.787
401	0.500 * 1.9 * 11.014 = 10.463
301	0.500 * 1.9 * 8.929 = 8.483
302	0.500 * 1.9 * 11.188 = 10.629
437	0.500 * 1.9 * 11.875 = 11.281

ex) 1 번 절점

Ko * ɣ * (h1 + h2 + t/2) = 0.5 * 1.9 * (5.679 + 3.0 + 0.5/2) = 8.483

h1 : 1번절점 z축좌표 (5.679 m), h2 : 토피고 (3.0 m), t : PAB 슬래브 두께 (0.5 m)

6) 수평토압(Phw) - 지하수 있을때

절점 번호	지하수 위	지하수 아래	∑ Phw
1 27	1.900	3.118	5.018
2 26	1.900	2.824	4.724
3 25	1.900	2.530	4.430
4 24	1.900	2.236	4.136
5 23	1.900	2.044	3.944
6 22	1.900	1.850	3.750
7 21	1.900	1.662	3.562
8 20	1.900	1.537	3.437
9 19	1.900	1.387	3.287
10 18	1.900	1.071	2.971
11 17	1.900	0.836	2.736
12 16	1.900	0.678	2.578
13 15	1.900	0.588	2.488
14	1.900	0.563	2.463
101	1.900	3.118	5.018
102	1.900	3.736	5.636
401	1.900	4.056	5.956
301	1.900	3.118	5.018
302	1.900	4.135	6.035
435	1.900	4.444	6.344

ex) 1 번 절점

지하수 위 : Ko * ɣ * h = 0.5 * 1.9 * 2.0 = 1.90

지하수 아래 : Ko * ɣ * (h1 + h2 + t/2) =

0.5 * 0.9 * (5.679 + 1 + 0.5/2) = 3.118

h1 : 1번절점 z축좌표 (6.679 m)

h2 : 구조물 상단에서의 지하수위 (1.0 m)

t : PAB 슬래브 두께 (0.5 m)

7) 수압 (Pw) (GL - 2.0 m)

① 상판과 측벽에 작용하는 수압

절점 번호	지하수위
1 ~ 27	6.929
2 ~ 26	6.276
3 ~ 25	5.622
4 ~ 24	4.969
5 ~ 23	4.543
6 ~ 22	4.110
7 ~ 21	3.694
8 ~ 20	3.415
9 ~ 19	3.082
10 ~ 18	2.381
11 ~ 17	1.858
12 ~ 16	1.506
13 ~ 15	1.307
14	1.250
101	6.929
102	8.302
401	9.014
301	6.929
302	9.188
435	9.875

ex) 1 번 절점

$Pw = \gamma * (h1 + h2 + t/2) = 1.0 * (5.679 + 1.0 + 0.5/2) = 6.929$

h1 : 1번절점 z축좌표 (5.679 m)

h2 : 구조물 상단에서의 지하수위 (1.0 m)

t : PAB 슬래브 두께 (0.5 m)

② 기초 슬래브 저판에 작용하는 수압

절점	γw * H	절점	γw * H
401	9.714	420	10.164
402	9.714	421	10.191
403	9.727	422	10.217
404	9.754	423	10.241
405	9.780	424	10.270
406	9.807	425	10.297
407	9.833	426	10.323
408	9.860	427	10.350
409	9.886	428	10.376
410	9.913	429	10.403
411	9.939	430	10.429
412	9.966	431	10.456
413	9.992	432	10.482
414	10.019	433	10.509
415	10.048	434	10.535
416	10.072	435	10.562
417	10.098	436	10.575
418	10.125	437	10.575
419	10.144		

H = 각절점의 Z축좌표 + 기초두께(1.4)/2 + PAB두께(0.5)/2 + HWL(1.0)

8) 기초 슬래브에 작용하는 활하중 (PL)

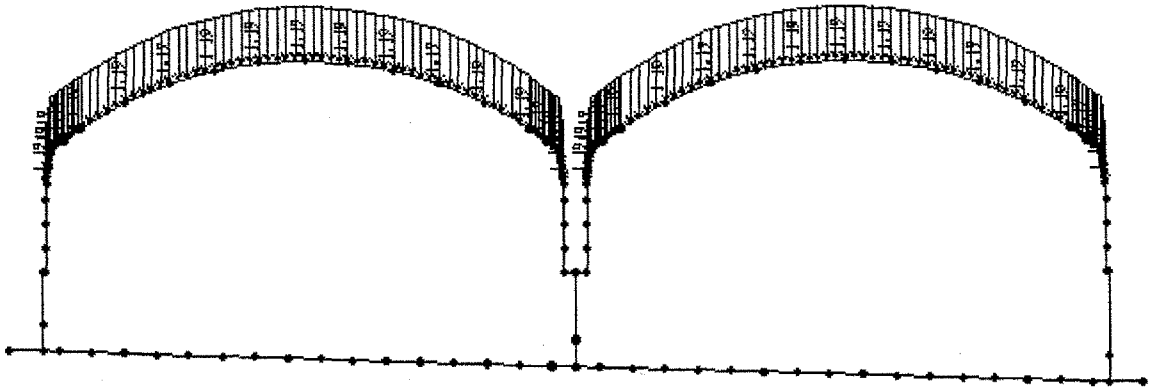
: 기초 슬래브에 작용하는 차량하중은 기초 부모멘트를 감소시키므로 설계시에는 고려할 필요가 없고 지지력 계산시에만 고려한다. 그러므로 재하 하중은 접지면의 분담폭을 고려할 필요 없이 9.6 ton을 그대로 사용한다.

3.3 하중재하

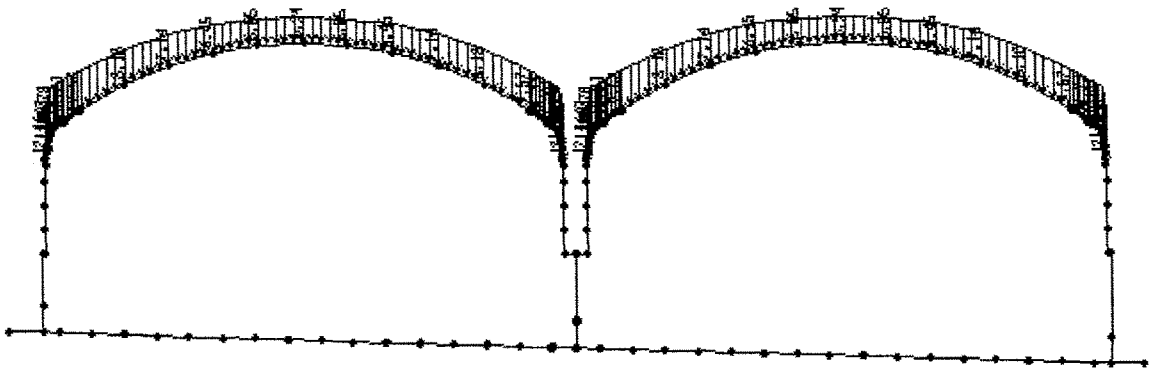
1) 구조물 자중

구조해석 PROGRAM내에 포함.

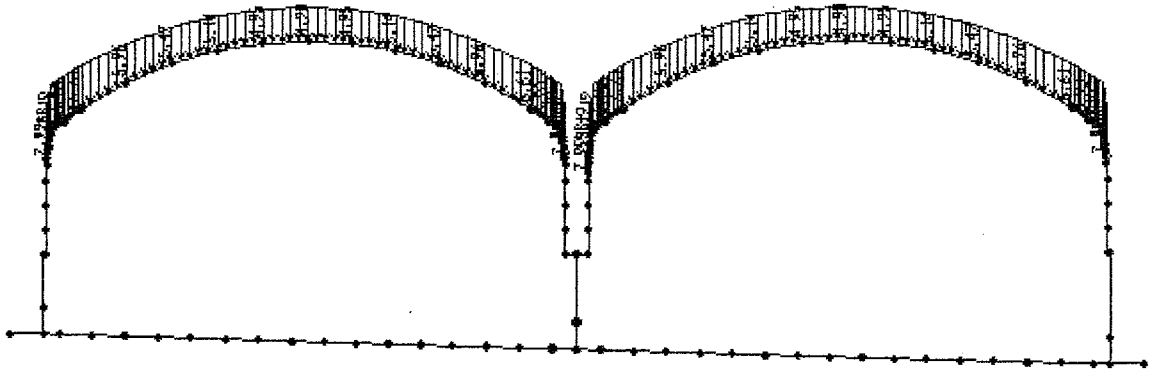
2) 상부에 작용하는 활하중 (가설 활하중 PVL)



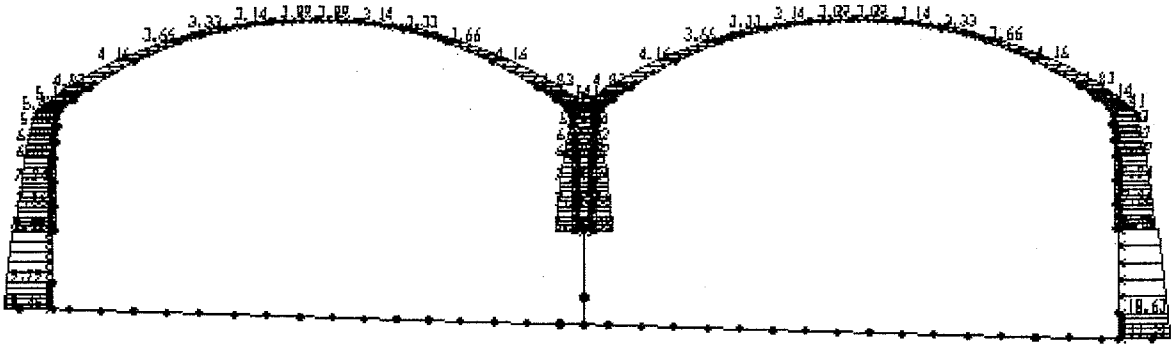
3) 연직토압(Pv) - 지하수 없을때



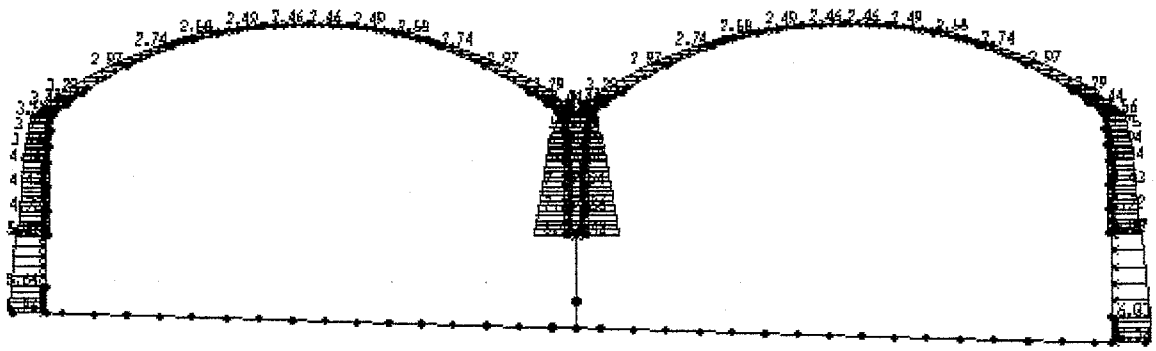
4) 연직토압 (Pvw) - 지하수 있을때



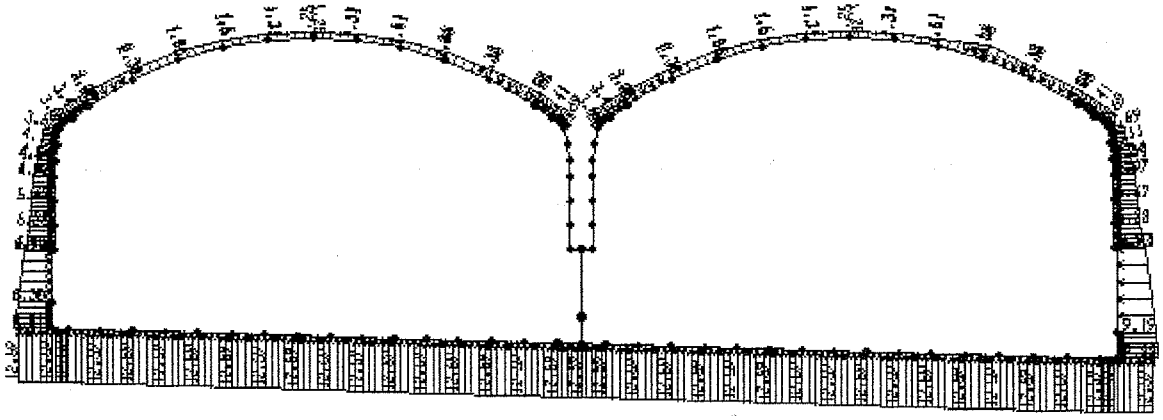
5) 수평토압(Ph) - 지하수 없을때



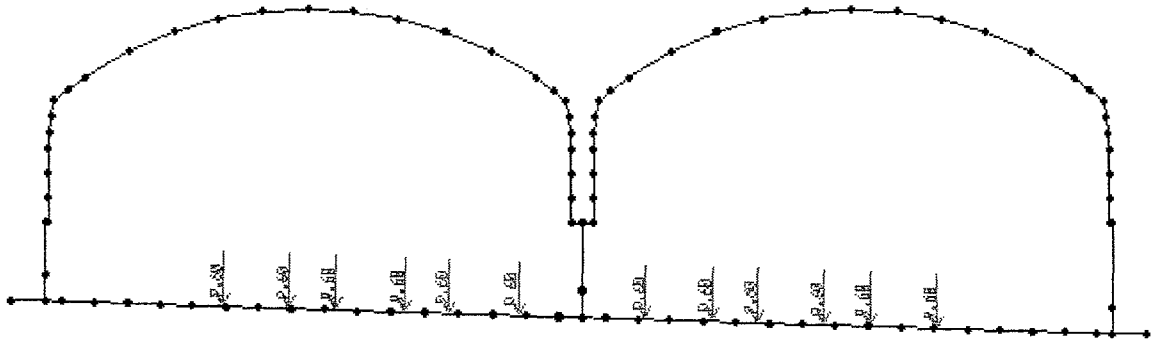
6) 수평토압(Phw) - 지하수 있을때



7) 수압 (Pw)



8) 기초 슬래브에 작용하는 활하중 (PL)



9) 온도 및 건조 수축의 영향

온도는 지하 50cm정도 까지 일변화가 있으나 지중의 온도 변화량은 깊이에 따라 급격히 감소하므로 토피가 1m 이상인 터널에 대해서는 온도 변화의 영향이 미소하여 무시할 수 있을 정도이며 터널 입출구부의 온도차에 의한 영향을 고려하여 별도로 검토하였음.

10) 내진 검토

부산 - 울산의 개착식 터널은 풍화암층 이상의 균질한 지반에 위치하고 있으며 최소 토피고가 3.00m 이상으로 지진발생시 구조물이 지반과 거의 같은 진동을 하므로 지진의 영향을 크게 받지 않는다. 그러므로 내진검토는 제외함.

3.4 하중조합

3.4.1 도로교설계기준

1) 극한하중 검토시

하중조합	구체자중 (SW)	연직토압(Pv) -수압 없을때	수평토압 (Ph) -수압 없을때	연직토압 (Pvw) -수압 있을때	수평토압 (Phw) -수압 있을때	수압 (PW)	활하중(가설시 PVL)
COMB.1	1.3	1.5	1.7				
COMB.2	1.3	1.5	0.65				
COMB.3	1.3			1.5	1.7	1.3	
COMB.4	1.3			1.5	0.65	1.3	
COMB.5	1.3	1.5	1.7				1.3
COMB.6	1.3	1.5	0.65				1.3

2) 사용하중 검토시

하중조합	구체자중 (SW)	연직토압(Pv) -수압 없을때	수평토압 (Ph) -수압 없을때	연직토압 (Pvw) -수압 있을때	수평토압 (Phw) -수압 있을때	수압 (PW)	활하중 (PL)
COMB.7	1	1	1				
COMB.8	1	1	1				1
COMB.9	1	1	0.5				
COMB.10	1	1	0.5				1
COMB.11	1			1	1	1	
COMB.12	1			1	1	1	1

* 참조 SAP2000 Input File

하중 조합	Input File	하중 조합	Input File
COMB.1	MAT1.$2K	COMB.7	MAT1.$2K
COMB.2	MAT1.$2K	COMB.8	MAT1.$2K
COMB.3	MAT3.$2K	COMB.9	MAT1.$2K
COMB.4	MAT4.$2K	COMB.10	MAT1.$2K
COMB.5	MAT1.$2K	COMB.11	MAT1.$3K
COMB.6	MAT6.$2K	COMB.12	MAT1.$4K

3.5 해석 결과

1) 모멘트 하중조합 결과

극한 하중 상태							
절점	COMB.1	COMB. 2	COMB. 3	COMB. 4	COMB. 5	COMB. 6	MAX
1	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2	10.69	21.64	6.71	12.73	14.33	25.27	25.27
3	27.11	45.50	20.36	30.28	34.39	52.77	52.77
4	48.76	71.33	40.31	52.15	59.67	82.24	82.24
5	63.21	86.89	54.35	66.45	76.24	99.92	99.92
6	75.19	98.78	66.58	78.21	89.83	113.42	113.42
7	89.23	111.64	81.03	91.50	105.50	127.91	127.91
8	70.46	91.39	63.72	73.26	84.30	105.23	105.23
9	51.20	69.45	45.94	53.79	62.24	80.49	80.49
10	13.99	23.21	11.09	13.28	18.39	27.61	27.61
11	6.94	7.57	8.89	12.85	7.69	8.32	12.85
12	18.40	27.41	20.01	29.04	22.86	31.87	31.87
13	24.07	38.69	25.37	37.44	30.79	45.41	45.41
14	26.30	42.76	26.90	39.21	33.82	50.27	50.27
15	24.07	38.68	23.43	33.23	30.78	45.40	45.40
16	18.38	27.39	16.14	20.62	22.84	31.84	31.84
17	6.91	7.53	3.09	0.22	7.66	8.28	8.28
18	14.03	23.27	18.83	30.13	18.44	27.67	30.13
19	51.29	69.55	55.65	74.88	62.34	80.60	80.60
20	71.18	92.12	74.78	96.57	85.12	106.06	106.06
21	89.35	111.78	92.08	115.46	105.63	128.05	128.05
22	76.83	100.43	79.03	103.52	91.66	115.26	115.26
23	63.43	87.12	65.05	89.53	76.49	100.17	100.17
24	48.75	71.32	49.97	73.21	59.66	82.23	82.23
25	27.11	45.50	27.92	46.75	34.38	52.77	52.77
26	10.69	21.64	11.10	22.27	14.32	25.27	25.27
27	0.00	0.00	0.00	0.00	0.00	0.00	0.00
28	0.00	0.00	0.00	0.00	0.00	0.00	0.00
29	10.74	21.57	11.91	23.00	14.35	25.19	25.19
30	27.20	45.36	29.55	48.21	34.44	52.60	52.60
31	48.89	71.12	52.41	75.40	59.75	81.98	81.98
32	63.60	86.87	68.05	92.22	76.59	99.86	99.86
33	77.03	100.13	82.76	106.88	91.78	114.89	114.89
34	89.58	111.44	96.41	119.38	105.77	127.63	127.63
35	71.44	91.77	79.12	100.45	85.28	105.61	105.61
36	14.40	22.84	22.79	33.51	18.68	27.12	33.51
37	6.51	8.01	0.28	2.50	7.39	8.89	8.89

38	17.97	27.92	13.58	18.75	22.57	32.52	32.52
39	23.65	39.25	21.87	32.39	30.52	46.12	46.12
40	25.90	43.34	26.52	39.56	33.57	51.01	51.01
41	23.69	39.29	26.30	39.09	30.56	46.16	46.16
42	18.05	28.00	22.44	32.16	22.65	32.60	32.60
43	6.62	8.13	12.42	17.03	7.51	9.02	17.03
44	14.27	22.70	8.75	10.36	18.54	26.97	26.97
45	51.45	69.03	45.41	52.76	62.38	79.96	79.96
46	51.45	69.03	45.41	52.76	62.38	79.96	79.96
47	70.69	91.01	63.85	72.94	84.45	104.77	104.77
48	89.47	111.32	81.69	91.75	105.65	127.50	127.50
49	75.39	98.49	67.22	78.49	89.96	113.06	113.06
50	63.38	86.64	54.98	66.77	76.34	99.61	99.61
51	48.90	71.12	40.85	52.44	59.75	81.98	81.98
52	27.20	45.36	20.72	30.47	34.44	52.60	52.60
53	10.74	21.57	6.89	12.83	14.35	25.19	25.19
54	0.00	0.00	0.00	0.00	0.00	0.00	0.00
101	8.84	8.84	8.21	8.14	9.79	9.79	9.79
102	6.96	28.79	19.18	1.03	0.27	35.47	35.47
301	8.84	8.84	8.33	8.26	9.79	9.79	9.79
302	21.97	46.57	45.80	7.05	10.41	58.12	58.12
401	0.00	0.00	0.00	0.00	0.00	0.00	0.00
402	36.43	38.49	85.29	56.26	31.23	44.05	85.29
403	16.36	20.07	67.26	39.35	10.67	25.76	67.26
404	6.46	24.17	26.18	1.11	10.69	28.41	28.41
405	10.60	16.66	8.63	30.83	12.89	18.95	30.83
406	8.00	8.64	37.00	56.36	8.92	9.56	56.36
407	4.46	3.33	59.00	75.50	4.66	3.53	75.50
408	1.86	0.68	74.55	88.21	1.78	0.60	88.21
409	0.44	0.35	83.69	94.48	0.30	0.50	94.48
410	0.16	0.54	86.30	94.26	0.29	0.67	94.26
411	0.14	0.28	82.45	87.54	0.21	0.36	87.54
412	0.61	0.60	72.01	74.27	0.64	0.63	74.27
413	2.60	2.60	55.06	54.46	2.84	2.84	55.06
414	6.36	6.37	31.50	28.05	6.99	7.00	31.50
415	11.75	11.84	1.21	5.03	12.95	13.05	13.05
416	16.25	16.26	35.51	44.65	17.90	17.92	44.65
417	11.50	11.54	78.96	90.97	12.67	12.70	90.97
418	20.11	20.01	129.20	144.05	22.19	22.09	144.05
419	51.85	51.97	159.48	175.49	57.19	57.37	175.49
420	20.01	20.17	126.84	144.75	22.13	22.30	144.75
421	11.50	11.49	76.25	90.23	12.66	12.65	90.23
422	16.23	16.27	32.46	42.53	17.88	17.92	42.53
423	11.84	11.80	4.64	1.59	13.03	12.99	13.03
424	6.32	6.40	34.65	32.41	6.96	7.04	34.65
425	2.55	2.63	57.87	59.56	2.80	2.87	59.56
426	0.62	0.59	74.25	79.84	0.65	0.60	79.84
427	0.10	0.31	83.67	93.19	0.18	0.45	93.19
428	0.00	0.63	86.18	99.60	0.15	0.91	99.60
429	0.76	0.51	81.66	99.01	0.56	0.87	99.01
430	2.42	0.43	70.18	91.43	2.24	0.16	91.43
431	5.05	3.14	51.63	76.81	5.15	3.50	76.81
432	8.05	8.84	26.07	55.16	8.99	10.38	55.16
433	8.54	18.07	6.61	26.40	11.25	20.82	26.40
434	0.39	28.04	46.40	9.49	5.16	33.47	46.40
435	31.57	27.75	93.34	52.49	23.07	36.16	93.34
436	55.49	42.09	113.92	71.52	46.83	48.81	113.92
437	0.00	0.00	0.00	0.00	0.00	0.00	0.00

사용 하중 상태							
절점	COMB. 7	COMB. 8	COMB. 9	COMB. 10	COMB. 11	COMB. 12	MAX
1	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2	8.92	8.92	14.13	14.13	9.92	9.92	14.13
3	21.21	21.21	29.97	29.97	21.87	21.87	29.97
4	36.57	36.57	47.32	47.32	35.70	35.70	47.32
5	46.58	46.58	57.86	57.86	44.45	44.45	57.86
6	54.73	54.73	65.96	65.96	51.57	51.57	65.96
7	64.11	64.11	74.79	74.79	59.46	59.46	74.79
8	51.13	51.13	61.09	61.09	49.15	49.15	61.09
9	37.64	37.64	46.33	46.33	38.13	38.13	46.33
10	10.97	10.97	15.36	15.36	14.98	14.98	15.36
11	4.79	4.79	5.09	5.09	0.21	0.21	5.09
12	13.89	13.89	18.18	18.18	10.06	10.06	18.18
13	18.63	18.63	25.59	25.59	15.95	15.95	25.59
14	20.43	20.43	28.27	28.27	18.83	18.83	28.27
15	18.62	18.62	25.58	25.58	18.12	18.12	25.58
16	13.88	13.88	18.17	18.17	14.39	14.39	18.17
17	4.77	4.77	5.07	5.07	6.71	6.71	6.71
18	10.99	10.99	15.39	15.39	6.32	6.32	15.39
19	37.70	37.70	46.40	46.40	27.34	27.34	46.40
20	51.62	51.62	61.60	61.60	37.89	37.89	61.60
21	64.20	64.20	74.88	74.88	47.23	47.23	74.88
22	55.84	55.84	67.08	67.08	40.20	40.20	67.08
23	46.73	46.73	58.01	58.01	32.79	32.79	58.01
24	36.57	36.57	47.32	47.32	24.84	24.84	47.32
25	21.21	21.21	29.96	29.96	13.39	13.39	29.96
26	8.92	8.92	14.13	14.13	5.01	5.01	14.13
27	0.00	0.00	0.00	0.00	0.00	0.00	0.00
28	0.00	0.00	0.00	0.00	0.00	0.00	0.00
29	8.93	8.93	14.09	14.09	4.97	4.97	14.09
30	21.24	21.24	29.89	29.89	13.32	13.32	29.89
31	36.61	36.61	47.20	47.20	24.74	24.74	47.20
32	46.79	46.79	57.87	57.87	32.69	32.69	57.87
33	55.90	55.90	66.91	66.91	40.24	40.24	66.91
34	64.26	64.26	74.67	74.67	47.36	47.36	74.67
35	51.71	51.71	61.39	61.39	38.00	38.00	61.39
36	11.13	11.13	15.15	15.15	6.38	6.38	15.15
37	4.63	4.63	5.34	5.34	6.71	6.71	6.71
38	13.74	13.74	18.48	18.48	14.45	14.45	18.48
39	18.49	18.49	25.91	25.91	18.22	18.22	25.91
40	20.31	20.31	28.61	28.61	18.98	18.98	28.61
41	18.52	18.52	25.94	25.94	16.13	16.13	25.94
42	13.79	13.79	18.53	18.53	10.27	10.27	18.53
43	4.71	4.71	5.43	5.43	0.44	0.44	5.43
44	11.03	11.03	15.05	15.05	14.75	14.75	15.05
45	37.71	37.71	46.08	46.08	37.93	37.93	46.08
46	37.71	37.71	46.08	46.08	37.93	37.93	46.08
47	51.20	51.20	60.87	60.87	48.97	48.97	60.87
48	64.19	64.19	74.60	74.60	59.30	59.30	74.60
49	54.79	54.79	65.79	65.79	51.43	51.43	65.79
50	46.63	46.63	57.71	57.71	44.33	44.33	57.71
51	36.62	36.62	47.20	47.20	35.59	35.59	47.20
52	21.24	21.24	29.89	29.89	21.80	21.80	29.89

53	8.93	8.93	14.09	14.09	9.88	9.88	14.09
54	0.00	0.00	0.00	0.00	0.00	0.00	0.00
101	6.04	6.04	6.04	6.04	4.79	4.79	6.04
102	0.60	0.60	17.62	17.62	8.94	8.94	17.62
301	6.04	6.04	6.04	6.04	4.78	4.78	6.04
302	4.71	4.71	27.93	27.93	12.11	12.11	27.93
401	0.00	0.00	0.00	0.00	0.00	0.00	0.00
402	18.34	18.25	25.49	25.41	18.10	18.02	25.49
403	5.71	5.55	11.63	11.79	3.93	4.09	11.79
404	7.13	7.58	15.57	16.02	9.90	10.34	16.02
405	8.22	9.04	11.10	11.93	8.06	8.88	11.93
406	5.62	6.69	5.92	6.99	4.71	5.78	6.99
407	2.92	3.45	2.38	2.91	2.13	2.66	3.45
408	1.13	0.33	0.56	0.89	0.67	0.78	1.13
409	0.21	0.73	0.17	0.35	0.03	0.55	0.73
410	0.15	1.46	0.33	1.64	0.16	1.47	1.64
411	0.09	0.40	0.16	0.47	0.06	0.37	0.47
412	0.44	1.58	0.44	1.57	0.39	1.52	1.58
413	1.81	2.30	1.81	2.30	1.46	1.96	2.30
414	4.39	4.14	4.40	4.15	3.49	3.23	4.40
415	8.11	7.69	8.15	7.74	6.41	5.99	8.15
416	11.18	11.73	11.19	11.74	8.80	9.34	11.74
417	7.92	7.58	7.94	7.60	6.26	5.91	7.94
418	13.77	11.99	13.73	11.94	10.67	8.89	13.77
419	35.59	33.59	35.67	33.68	27.89	25.89	35.67
420	13.74	11.97	13.82	12.04	10.77	8.99	13.82
421	7.92	7.56	7.91	7.56	6.22	5.86	7.92
422	11.17	11.71	11.19	11.73	8.79	9.33	11.73
423	8.15	7.77	8.13	7.75	6.41	6.04	8.15
424	4.38	4.26	4.41	4.30	3.49	3.38	4.41
425	1.79	2.12	1.82	2.15	1.46	1.79	2.15
426	0.45	1.52	0.43	1.51	0.39	1.47	1.52
427	0.08	0.39	0.17	0.49	0.06	0.38	0.49
428	0.07	1.37	0.37	1.67	0.15	1.45	1.67
429	0.35	0.88	0.25	0.28	0.04	0.57	0.88
430	1.39	0.05	0.44	1.00	0.71	0.73	1.39
431	3.21	3.74	2.30	2.83	2.20	2.73	3.74
432	5.69	6.76	6.07	7.13	4.82	5.89	7.13
433	7.36	8.18	11.90	12.72	8.18	9.01	12.72
434	4.10	4.54	17.64	18.08	9.91	10.35	18.08
435	12.65	12.49	15.60	15.76	3.51	3.67	15.76
436	27.13	27.04	27.49	27.42	18.36	18.29	27.49
437	0.00	0.00	0.00	0.00	0.00	0.00	0.00

2) 전단력 하중조합 결과

극한 하중 상태							
절점	COMB.1	COMB. 2	COMB. 3	COMB. 4	COMB. 5	COMB. 6	MAX
1	11.78	31.38	4.70	15.60	17.35	36.95	36.95
2	20.85	34.85	15.72	23.28	26.42	40.42	40.42
3	29.25	38.06	25.86	30.28	34.81	43.63	43.63
4	36.94	41.00	35.11	36.59	42.51	46.57	46.57
5	36.20	37.39	35.68	35.40	41.17	42.35	42.35
6	30.84	29.28	31.60	29.66	34.66	33.10	34.66
7	45.90	48.38	42.38	43.91	51.50	53.98	53.98
8	39.50	43.38	36.53	38.95	44.84	48.73	48.73
9	38.75	43.54	36.34	39.23	44.45	49.24	49.24
10	25.78	32.18	24.61	28.49	30.63	37.03	37.03
11	17.42	23.45	16.90	20.45	21.30	27.33	27.33
12	11.88	16.13	11.53	13.75	14.66	18.92	18.92
13	8.41	9.84	7.83	7.96	10.00	11.43	11.43
14	4.68	3.06	5.26	4.98	4.94	3.33	5.26
15	8.42	9.85	9.44	11.45	10.01	11.44	11.45
16	11.89	16.14	13.11	17.20	14.67	18.93	18.93
17	17.43	23.46	18.44	23.80	21.31	27.34	27.34
18	25.79	32.19	26.08	31.70	30.63	37.04	37.04
19	38.75	43.55	37.72	42.25	44.45	49.25	49.25
20	40.31	44.14	38.62	42.53	45.74	49.57	49.57
21	44.95	47.47	42.70	45.75	50.44	52.95	52.95
22	33.42	31.87	34.60	33.27	37.54	35.99	37.54
23	36.74	37.93	37.68	39.17	41.77	42.96	42.96
24	36.94	41.00	37.56	41.96	42.50	46.57	46.57
25	29.24	38.06	29.87	39.02	34.81	43.63	43.63
26	20.85	34.85	21.47	35.81	26.42	40.42	40.42
27	11.78	31.38	12.40	32.34	17.34	36.95	36.95
28	11.85	31.28	13.64	33.46	17.39	36.82	36.82
29	20.92	34.75	22.72	36.93	26.46	40.29	40.29
30	29.31	37.96	31.11	40.14	34.85	43.50	43.50
31	37.01	40.90	38.80	43.08	42.55	46.44	46.44
32	36.81	37.83	39.09	40.45	41.81	42.83	42.83
33	33.49	31.77	36.26	34.81	37.58	35.86	37.58
34	44.92	47.54	42.74	45.87	50.42	53.04	53.04
35	35.95	40.12	34.37	38.52	40.92	45.09	45.09
36	15.30	23.49	15.91	22.81	19.16	27.35	27.35
37	6.46	15.09	8.07	15.31	9.46	18.09	18.09
38	1.10	8.47	3.22	9.60	3.13	10.50	10.50
39	2.45	2.51	0.22	4.42	1.52	3.44	4.42
40	4.66	3.04	2.68	0.51	4.92	3.30	4.92
41	8.39	9.83	6.74	6.87	9.99	11.42	11.42
42	11.86	16.14	10.30	12.55	14.65	18.93	18.93
43	17.39	23.46	16.95	20.53	21.28	27.36	27.36
44	25.74	32.21	25.99	29.93	30.60	37.07	37.07
45	38.70	43.58	37.61	40.57	44.41	49.29	49.29
46	38.70	43.58	37.61	40.57	44.41	49.29	49.29
47	39.45	43.43	37.69	40.18	44.81	48.80	48.80
48	45.85	48.44	43.50	45.11	51.46	54.05	54.05
49	30.91	29.18	31.64	29.57	34.70	32.97	34.70
50	36.28	37.29	35.88	35.47	41.21	42.23	42.23

51	37.01	40.90	35.39	36.74	42.55	46.44	46.44
52	29.32	37.96	26.14	30.43	34.86	43.50	43.50
53	20.92	34.75	15.99	23.42	26.46	40.29	40.29
54	11.85	31.28	4.98	15.75	17.39	36.82	36.82
101	11.78	31.38	4.70	15.60	17.35	36.95	36.95
102	9.54	23.23	21.32	2.74	3.98	28.80	28.80
301	11.85	31.28	4.98	15.75	17.39	36.82	36.82
302	24.85	17.25	39.91	16.03	19.31	22.79	39.91
401	26.53	43.72	49.93	56.08	32.53	49.72	56.08
402	56.52	39.51	57.40	63.55	57.91	45.51	63.55
403	58.11	35.97	50.08	46.87	59.50	37.36	59.50
404	27.83	10.51	42.96	39.72	26.19	12.71	42.96
405	6.70	11.08	35.76	32.52	6.50	12.63	35.76
406	6.02	8.02	28.53	25.29	6.84	8.83	28.53
407	4.94	5.02	21.28	18.04	5.26	5.33	21.28
408	3.62	3.18	13.99	10.76	3.69	3.25	13.99
409	2.70	2.22	6.67	3.43	2.67	2.20	6.67
410	1.98	1.79	0.72	3.93	1.92	1.82	3.93
411	2.04	2.30	8.09	11.31	2.10	2.36	11.31
412	2.86	3.01	15.51	18.72	2.98	3.13	18.72
413	4.26	4.27	22.95	26.16	4.49	4.51	26.16
414	6.27	6.28	30.49	33.65	6.71	6.72	33.65
415	8.10	8.20	38.00	41.16	8.75	8.85	41.16
416	7.38	7.36	45.41	48.65	7.93	7.91	48.65
417	37.75	37.68	53.01	56.22	41.43	41.36	56.22
418	91.41	91.42	84.95	88.24	100.71	100.72	100.72
419	89.82	89.98	87.97	91.26	99.11	99.32	99.32
420	91.29	91.57	84.24	83.33	100.63	100.91	100.91
421	37.64	37.81	53.42	57.84	41.35	41.53	57.84
422	7.36	7.41	45.85	50.21	7.92	7.98	50.21
423	8.25	8.12	38.13	42.48	8.87	8.74	42.48
424	6.28	6.28	30.17	34.62	6.72	6.73	34.62
425	4.20	4.31	22.45	26.87	4.44	4.58	26.87
426	2.83	3.03	14.63	19.05	2.95	3.19	19.05
427	1.89	2.38	6.78	11.19	1.97	2.53	11.19
428	2.13	1.87	1.16	3.31	2.04	1.97	3.31
429	2.87	2.15	9.07	4.63	2.81	2.05	9.07
430	3.89	3.07	17.02	12.57	3.92	3.17	17.02
431	4.98	5.08	24.99	20.54	5.30	5.79	24.99
432	5.41	8.46	32.99	28.54	6.35	9.81	32.99
433	12.10	12.46	41.02	36.57	8.90	13.83	41.02
434	37.30	13.28	49.09	44.64	33.96	16.31	49.09
435	69.12	31.76	57.18	52.73	68.64	31.20	69.12
436	67.53	43.40	60.40	62.48	67.05	50.66	67.53
437	20.65	47.61	38.89	53.97	27.85	54.87	54.87

사용 하중 상태							
절점	COMB. 7	COMB. 8	COMB. 9	COMB. 10	COMB. 11	COMB. 12	MAX
1	10.96	10.96	20.29	20.29	13.58	13.58	20.29
2	16.29	16.29	22.96	22.96	16.76	16.76	22.96
3	21.23	21.23	25.43	25.43	19.76	19.76	25.43
4	25.76	25.76	27.69	27.69	22.55	22.55	27.69
5	24.83	24.83	25.39	25.39	21.40	21.40	25.39
6	20.77	20.77	20.03	20.03	17.74	17.74	20.77
7	31.58	31.58	32.76	32.76	24.82	24.82	32.76
8	27.43	27.43	29.28	29.28	22.05	22.05	29.28
9	27.07	27.07	29.35	29.35	22.40	22.40	29.35
10	18.52	18.52	21.57	21.57	16.58	16.58	21.57
11	12.80	12.80	15.67	15.67	12.30	12.30	15.67
12	8.76	8.76	10.79	10.79	8.89	8.89	10.79
13	5.96	5.96	6.64	6.64	6.18	6.18	6.64
14	2.94	2.94	2.17	2.17	3.19	3.19	3.19
15	5.96	5.96	6.64	6.64	4.38	4.38	6.64
16	8.76	8.76	10.79	10.79	7.12	7.12	10.79
17	12.80	12.80	15.67	15.67	10.57	10.57	15.67
18	18.53	18.53	21.58	21.58	14.93	14.93	21.58
19	27.07	27.07	29.35	29.35	20.85	20.85	29.35
20	27.97	27.97	29.79	29.79	21.02	21.02	29.79
21	30.94	30.94	32.14	32.14	22.89	22.89	32.14
22	22.53	22.53	21.79	21.79	18.53	18.53	22.53
23	25.20	25.20	25.76	25.76	20.00	20.00	25.76
24	25.76	25.76	27.69	27.69	19.77	19.77	27.69
25	21.23	21.23	25.43	25.43	15.24	15.24	25.43
26	16.29	16.29	22.96	22.96	10.31	10.31	22.96
27	10.95	10.95	20.29	20.29	4.97	4.97	20.29
28	10.98	10.98	20.23	20.23	4.92	4.92	20.23
29	16.31	16.31	22.90	22.90	10.25	10.25	22.90
30	21.25	21.25	25.37	25.37	15.19	15.19	25.37
31	25.78	25.78	27.63	27.63	19.72	19.72	27.63
32	25.22	25.22	25.70	25.70	20.08	20.08	25.70
33	22.55	22.55	21.73	21.73	18.84	18.84	22.55
34	30.93	30.93	32.18	32.18	22.94	22.94	32.18
35	25.06	25.06	27.05	27.05	18.78	18.78	27.05
36	11.65	11.65	15.55	15.55	9.56	9.56	15.55
37	5.72	5.72	9.83	9.83	5.08	5.08	9.83
38	1.89	1.89	5.39	5.39	1.79	1.79	5.39
39	0.90	0.90	1.46	1.46	0.93	0.93	1.46
40	2.93	2.93	2.16	2.16	3.16	3.16	3.16
41	5.95	5.95	6.63	6.63	6.15	6.15	6.63
42	8.75	8.75	10.79	10.79	8.87	8.87	10.79
43	12.78	12.78	15.67	15.67	12.29	12.29	15.67
44	18.51	18.51	21.59	21.59	16.57	16.57	21.59
45	27.05	27.05	29.37	29.37	22.40	22.40	29.37
46	27.05	27.05	29.37	29.37	22.40	22.40	29.37
47	27.41	27.41	29.31	29.31	22.06	22.06	29.31
48	31.56	31.56	32.79	32.79	24.83	24.83	32.79
49	20.79	20.79	19.97	19.97	17.69	17.69	20.79
50	24.85	24.85	25.33	25.33	21.35	21.35	25.33
51	25.78	25.78	27.63	27.63	22.50	22.50	27.63
52	21.25	21.25	25.37	25.37	19.70	19.70	25.37

53	16.31	16.31	22.90	22.90	16.71	16.71	22.90
54	10.98	10.98	20.23	20.23	13.53	13.53	20.23
101	10.96	10.96	20.29	20.29	13.58	13.58	20.29
102	1.59	1.59	14.02	14.02	6.27	6.27	14.02
301	10.98	10.98	20.23	20.23	13.53	13.53	20.23
302	10.61	10.61	9.44	9.44	1.05	1.05	10.61
401	20.99	20.91	29.18	29.09	21.19	21.10	29.18
402	35.44	35.64	25.94	25.86	23.23	23.43	35.64
403	36.66	36.86	26.12	26.32	24.45	24.66	36.86
404	16.09	16.41	6.60	6.32	8.30	8.62	16.41
405	4.49	4.22	7.41	7.14	5.34	5.06	7.41
406	4.60	5.21	5.55	6.16	4.47	5.07	6.16
407	3.57	6.54	3.61	6.57	3.19	6.16	6.57
408	2.58	6.15	2.37	6.11	2.28	6.53	6.53
409	1.95	4.38	1.72	4.15	1.76	4.19	4.38
410	1.48	8.31	1.37	8.53	1.44	8.50	8.53
411	1.61	5.82	1.73	5.75	1.65	5.92	5.92
412	2.15	6.87	2.22	6.94	2.06	6.77	6.94
413	3.09	5.08	3.10	5.07	2.76	5.71	5.71
414	4.47	7.61	4.48	7.61	3.84	6.97	7.61
415	5.74	12.44	5.79	12.49	4.85	11.55	12.49
416	5.23	8.59	5.22	8.58	4.42	7.78	8.59
417	26.08	23.67	26.05	23.64	20.69	18.29	26.08
418	62.89	62.29	62.90	62.30	49.40	48.79	62.90
419	61.67	61.06	61.76	61.15	48.25	47.64	61.76
420	62.85	62.24	62.99	62.37	49.48	48.87	62.99
421	26.04	23.63	26.12	23.71	20.76	18.34	26.12
422	5.23	8.60	5.25	8.62	4.45	7.82	8.62
423	5.81	12.40	5.75	12.33	4.85	11.43	12.40
424	4.48	7.41	4.48	7.41	3.84	6.77	7.41
425	3.06	5.28	3.12	5.27	2.76	5.91	5.91
426	2.14	6.80	2.23	6.89	2.06	6.72	6.89
427	1.54	5.89	1.77	5.80	1.65	5.97	5.97
428	1.55	8.23	1.41	8.57	1.44	8.49	8.57
429	2.03	4.46	1.68	4.12	1.77	4.20	4.46
430	2.72	6.11	2.33	6.07	2.30	6.49	6.49
431	3.61	6.57	3.66	6.62	3.23	6.20	6.62
432	4.35	4.96	5.81	6.41	4.52	5.12	6.41
433	5.23	5.66	8.15	7.87	5.35	5.08	8.15
434	20.50	20.82	8.03	7.60	8.79	9.11	20.82
435	41.96	42.16	24.17	24.37	25.41	25.61	42.16
436	40.74	40.94	28.10	28.02	24.19	24.39	40.94
437	18.50	18.42	31.34	31.26	21.47	21.39	31.34

3) 설계 단면력 산정

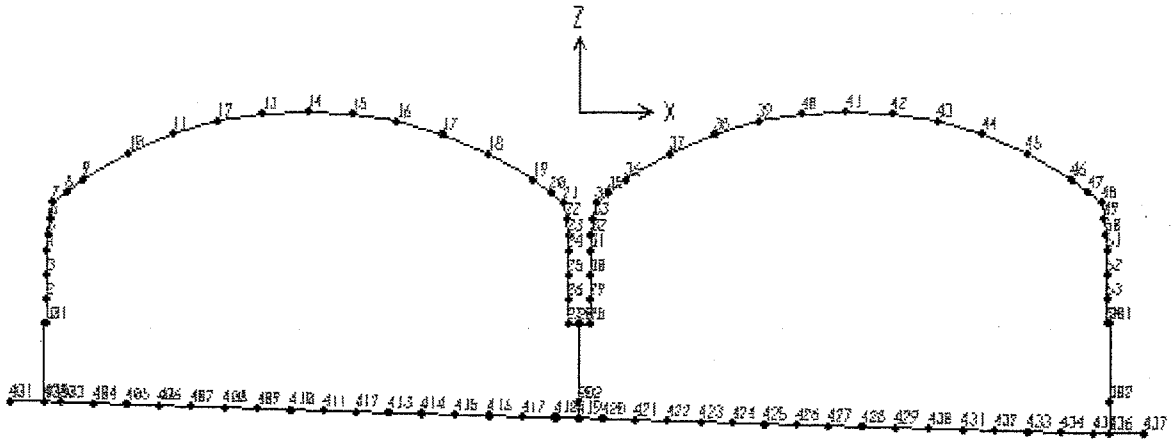
절점	모멘트		전단력	
	극한 하중 상태	사용하중 상태	극한 하중 상태	사용하중 상태
1	0.00	0.00	36.95	20.29
2	25.27	14.13	40.42	22.96
3	52.77	29.97	43.63	25.43
4	82.24	47.32	46.57	27.69
5	99.92	57.86	42.35	25.39
6	113.42	65.96	34.66	20.77
7	127.91	74.79	53.98	32.76
8	105.23	61.09	48.73	29.28
9	80.49	46.33	49.24	29.35
10	27.61	15.36	37.03	21.57
11	12.85	5.09	27.33	15.67
12	31.87	18.18	18.92	10.79
13	45.41	25.59	11.43	6.64
14	50.27	28.27	5.26	3.19
15	45.40	25.58	11.45	6.64
16	31.84	18.17	18.93	10.79
17	8.28	6.71	27.34	15.67
18	30.13	15.39	37.04	21.58
19	80.60	46.40	49.25	29.35
20	106.06	61.60	49.57	29.79
21	128.05	74.88	52.95	32.14
22	115.26	67.08	37.54	22.53
23	100.17	58.01	42.96	25.76
24	82.23	47.32	46.57	27.69
25	52.77	29.96	43.63	25.43
26	25.27	14.13	40.42	22.96
27	0.00	0.00	36.95	20.29
28	0.00	0.00	36.82	20.23
29	25.19	14.09	40.29	22.90
30	52.60	29.89	43.50	25.37
31	81.98	47.20	46.44	27.63
32	99.86	57.87	42.83	25.70
33	114.89	66.91	37.58	22.55
34	127.63	74.67	53.04	32.18
35	105.61	61.39	45.09	27.05
36	33.51	15.15	27.35	15.55
37	8.89	6.71	18.09	9.83
38	32.52	18.48	10.50	5.39
39	46.12	25.91	4.42	1.46
40	51.01	28.61	4.92	3.16
41	46.16	25.94	11.42	6.63
42	32.60	18.53	18.93	10.79
43	17.03	5.43	27.36	15.67
44	26.97	15.05	37.07	21.59
45	79.96	46.08	49.29	29.37
46	79.96	46.08	49.29	29.37
47	104.77	60.87	48.80	29.31
48	127.50	74.60	54.05	32.79
49	113.06	65.79	34.70	20.79

50	99.61	57.71	42.23	25.33
51	81.98	47.20	46.44	27.63
52	52.60	29.89	43.50	25.37
53	25.19	14.09	40.29	22.90
54	0.00	0.00	36.82	20.23
101	9.79	6.04	36.95	20.29
102	35.47	17.62	28.80	14.02
301	9.79	6.04	36.82	20.23
302	58.12	27.93	39.91	10.61
401	0.00	0.00	56.08	29.18
402	85.29	25.49	63.55	35.64
403	67.26	11.79	59.50	36.86
404	28.41	16.02	42.96	16.41
405	30.83	11.93	35.76	7.41
406	56.36	6.99	28.53	6.16
407	75.50	3.45	21.28	6.57
408	88.21	1.13	13.99	6.53
409	94.48	0.73	6.67	4.38
410	94.26	1.64	3.93	8.53
411	87.54	0.47	11.31	5.92
412	74.27	1.58	18.72	6.94
413	55.06	2.30	26.16	5.71
414	31.50	4.40	33.65	7.61
415	13.05	8.15	41.16	12.49
416	44.65	11.74	48.65	8.59
417	90.97	7.94	56.22	26.08
418	144.05	13.77	100.72	62.90
419	175.49	35.67	99.32	61.76
420	144.75	13.82	100.91	62.99
421	90.23	7.92	57.84	26.12
422	42.53	11.73	50.21	8.62
423	13.03	8.15	42.48	12.40
424	34.65	4.41	34.62	7.41
425	59.56	2.15	26.87	5.91
426	79.84	1.52	19.05	6.89
427	93.19	0.49	11.19	5.97
428	99.60	1.67	3.31	8.57
429	99.01	0.88	9.07	4.46
430	91.43	1.39	17.02	6.49
431	76.81	3.74	24.99	6.62
432	55.16	7.13	32.99	6.41
433	26.40	12.72	41.02	8.15
434	46.40	18.08	49.09	20.82
435	93.34	15.76	69.12	42.16
436	113.92	27.49	67.53	40.94
437	0.00	0.00	54.87	31.34

4. 단 면 검 토

4.1 Precast Arch Box 본체 검토

1) 단면력 집계



구분		극한 하중		사용 하중		비 고
	절점 위치	모멘트 t-m/m	전단력 t/m	모멘트 t-m/m	전단력 t/m	
PAB	5 번	100.17	42.96	58.01	25.76	벽체변화부
	7 번	128.05	54.05	74.88	32.79	헌치부
	14 번	50.27	11.42	28.27	6.63	슬래브중앙
기초	403 번	93.34	69.12	15.76	42.16	기초
	428 번	99.60	3.31	1.67	8.57	기초
	418 번	144.75	100.91	13.82	62.99	기초
	102 번	58.12	39.91	27.93	14.02	기초벽체

* 위의 각절점과 공통으로 검토해야하는 절점

5 번 : 23 32 50 번

7 번 : 21 34 48 번

14 번 : 41 번

403 번 : 435 번

428 번 : 기초슬래브구간 중 최대 정모멘트가 발생하는 절점

418 번 : 420 번

102 번 : 302 번

* 설계에 필요한 값들은 위의 공통된 절점에서 최대값을 설계에 반영함.

2) 극한강 검토　　극한 강도 설계법 검토

(1) P.A.B 검토

① 상부 슬래브 (정모멘트)　　(14 번 절점)

M_u = 50.270 t-m / m,	V_u = 11.420 t/m

d = 40.82 cm, d_c = 9.18 cm, b = 100 cm

f_{ck} = 400 kgf/㎠ f_y = 4000 kgf/㎠ β_1 = 0.766

$\Phi M_n = 0.9 * f_y * A_s * (d - a/2)$ 에서　　Φ = 0.9 (Precast)

$$A_{s,req} = \frac{M_u}{0.90 * f_y * (d - a/2)}$$ 로 부터

$$a = \frac{A_s * f_y}{0.85 * f_{ck} * b} = 4.245$$　　$A_{s,req}$ = 36.08 ㎠

∴ H 19 @ 100 = 2.865 * 10.00

H 19 @ 100 = 2.865 * 10.00 (2단배근)

= 57.30 ㎠를 배근함.　　OK!

단면 철근비　$$\rho = \frac{A_s}{b \cdot d} = 0.0140$$

최대 철근비　$$\rho_{max} = 0.64 * \beta_1 * \frac{f_{ck}}{f_y} * \frac{6000}{(6000 + f_y)} = 0.0294$$

최소 철근비　$$\rho_{min} = \frac{0.8 \cdot \sqrt{f_{ck}}}{f_y} = 0.0040 > \frac{14}{f_y} = 0.0035$$

∴ 최대 철근비 규정 만족!

∴ 최소 철근비 규정 만족!

$\Phi V_c = 0.8 * 0.53 * \sqrt{f_{ck}} * b_w * d$

= 34.62 t/m > V_u = 11.42 t/m

$\Phi V_c / 2$ = 17.31 t/m > V_u = 11.42 t/m

∴ 전단 철근을 배근하지 않아도 된다.

② 헌치부 (부모멘트)　　(7 번 절점)

M_u = 128.050 t-m / m,	V_u = 54.050 t/m

d = 82.11 cm, d_c = 9.49 cm, b = 100 cm

f_{ck} = 400 kgf/㎠ f_y = 4000 kgf/㎠ β_1 = 0.766

$\Phi M_n = 0.9 * f_y * A_s * (d - a/2)$ 에서　　Φ = 0.9 (Precast)

$$A_{s,req} = \frac{M_u}{0.90 * f_y * (d - a/2)}$$ 로 부터

$$a = \frac{A_s * f_y}{0.85 * f_{ck} * b} = 5.265$$　　$A_{s,req}$ = 44.75 ㎠

∴ H 22 @ 100 = 3.871 * 10.00

H 22 @ 100 = 3.871 * 10.00 (2단배근)

= 77.42 ㎠를 배근함.　　OK!

단면 철근비　$\rho = \frac{A_s}{b \cdot d} = 0.0094$

최대 철근비　$\rho_{max} = 0.64 * \beta_1 * \frac{f_{ck}}{f_y} * \frac{6000}{(6000 + f_y)} = 0.0294$

최소 철근비　$\rho_{min} = \frac{0.8 \cdot \sqrt{f_{ck}}}{f_y} = 0.0040 > \frac{14}{f_y} = 0.0035$

∴ 최대 철근비 규정 만족!

∴ 최소 철근비 규정 만족!

$\Phi V_c = 0.8 * 0.53 * \sqrt{f_{ck}} * b_w * d$

= 69.63 t/m > V_u = 54.05 t/m

$\Phi V_c / 2$ = 34.81 t/m < V_u = 54.05 t/m

∴ 전단철근을 배근해야 한다.

③ 벽체 변화부 (5 번 절점)

M_u = 100.170 t-m / m, V_u = 42.960 t/m

d = 44.71 cm, d_c = 9.49 cm, b = 100 cm

f_{ck} = 400 kgf/㎠ f_y = 4000 kgf/㎠ β_1 = 0.766

$\Phi M_n = 0.9 * f_y * A_s * (d - a/2)$ 에서 Φ = 0.9 (Precast)

$$A_{s,req} = \frac{M_u}{0.90 * f_y * (d - a/2)}$$ 로 부터

$$a = \frac{A_s * f_y}{0.85 * f_{ck} * b} = 8.046$$ $A_{s,req}$ = 68.39 ㎠

∴ H 22 @ 100 = 3.871 * 10.00

H 22 @ 100 = 3.871 * 10.00 (2단배근)

= 77.42 ㎠를 배근함. OK!

단면 철근비 $\rho = \frac{A_s}{b \cdot d} = 0.0173$

최대 철근비 $\rho_{max} = 0.64 * \beta_1 * \frac{f_{ck}}{f_y} * \frac{6000}{(6000 + f_y)} = 0.0294$

최소 철근비 $\rho_{min} = \frac{0.8 \cdot \sqrt{f_{ck}}}{f_y} = 0.0040 > \frac{14}{f_y} = 0.0035$

∴ 최대 철근비 규정 만족!

∴ 최소 철근비 규정 만족!

$\Phi V_c = 0.8 * 0.53 * \sqrt{f_{ck}} * b_w * d$

= 37.91 t/m < V_u = 42.96 t/m

$\Phi V_c / 2$ = 18.96 t/m < V_u = 42.96 t/m

∴ 전단철근을 배근해야 한다.

☒ 본체 전단면에 대한 단면력 검토

f_{ck} = 400 kgf/㎠, f_y = 4000 kgf/㎠, K_1 = 0.766 b = 100 cm

Node	사용 주철근				극한모멘트	두께	d	d_c	a	$A_{s,req}$	공칭모멘트	철근비		결과
	①	②	간격	단	t-m / m	cm	cm	cm		㎠	t-m / m	최대	최소	
1	22	22	100	2	0.000	50.0	40.5	9.49	0.000	0.00	100.183	만족	만족	OK
2	22	22	100	2	25.270	50.0	40.5	9.49	2.406	20.45	100.183	만족	만족	OK
3	22	22	100	2	52.770	50.0	40.5	9.49	5.160	43.86	100.183	만족	만족	OK
4	22	22	100	2	82.240	50.0	40.5	9.49	8.325	70.76	100.183	만족	만족	OK
5	22	22	100	2	99.920	54.2	44.7	9.49	8.853	75.25	111.893	만족	만족	OK
6	22	22	100	2	113.420	67.5	58.0	9.49	7.629	64.85	148.994	만족	만족	OK
7	22	22	100	2	127.910	91.6	82.1	9.49	5.875	49.94	216.158	만족	만족	OK
8	22	22	100	2	105.230	68.0	58.5	9.49	6.911	58.74	150.374	만족	만족	OK
9	22	22	100	2	80.490	55.3	45.8	9.49	6.825	58.01	114.947	만족	만족	OK
10	22	22	100	2	27.610	51.1	41.6	9.49	2.309	19.63	103.245	만족	만족	OK
11	19	19	100	2	12.850	50.0	40.8	9.18	1.387	11.79	77.248	만족	만족	OK
12	19	19	100	2	31.870	50.0	40.8	9.18	3.539	30.08	77.248	만족	만족	OK
13	19	19	100	2	45.410	50.0	40.8	9.18	4.991	42.42	77.248	만족	만족	OK
14	19	19	100	2	50.270	50.0	40.8	9.18	5.524	46.95	77.248	만족	만족	OK
15	19	19	100	2	45.400	50.0	40.8	9.18	4.995	42.46	77.248	만족	만족	OK
16	19	19	100	2	31.840	50.0	40.8	9.18	3.538	30.07	77.248	만족	만족	OK
17	19	19	100	2	8.280	50.0	40.8	9.18	1.160	9.86	77.248	만족	만족	OK
18	22	22	100	2	30.130	51.1	41.6	9.49	2.578	21.91	103.245	만족	만족	OK
19	22	22	100	2	80.600	55.3	45.8	9.49	6.826	58.02	114.947	만족	만족	OK
20	22	22	100	2	106.060	68.0	58.5	9.49	6.913	58.76	150.374	만족	만족	OK
21	22	22	100	2	128.050	91.6	82.1	9.49	5.876	49.95	216.158	만족	만족	OK
22	22	22	100	2	115.260	67.5	58.0	9.49	7.632	64.87	148.994	만족	만족	OK
23	22	22	100	2	100.170	54.2	44.7	9.49	8.941	76.00	111.893	만족	만족	OK
24	22	22	100	2	82.230	50.0	40.5	9.49	8.324	70.75	100.183	만족	만족	OK
25	22	22	100	2	52.770	50.0	40.5	9.49	5.160	43.86	100.183	만족	만족	OK
26	22	22	100	2	25.270	50.0	40.5	9.49	2.406	20.45	100.183	만족	만족	OK
27	22	22	100	2	0.000	50.0	40.5	9.49	0.000	0.00	100.183	만족	만족	OK
28	22	22	100	2	0.000	50.0	40.5	9.5	0.000	0.00	100.183	만족	만족	OK
29	22	22	100	2	25.190	50.0	40.5	9.49	0.000	0.00	100.183	만족	만족	OK
30	22	22	100	2	52.600	50.0	40.5	9.49	0.000	0.00	100.183	만족	만족	OK
31	22	22	100	2	81.980	50.0	40.5	9.49	0.000	0.00	100.183	만족	만족	OK
32	22	22	100	2	99.860	54.2	44.7	9.49	0.000	0.00	111.893	만족	만족	OK
33	22	22	100	2	114.890	67.5	58.0	9.49	0.000	0.00	148.994	만족	만족	OK

34	22	22	100	2	127.630	91.6	82.1	9.49	0.000	0.00	216.158	만족	만족	OK
35	22	22	100	2	105.610	68.0	58.5	9.49	0.000	0.00	150.374	만족	만족	OK
36	22	22	100	2	33.510	55.3	45.8	9.49	0.000	0.00	114.947	만족	만족	OK
37	22	22	100	2	8.890	51.1	41.6	9.49	0.000	0.00	103.245	만족	만족	OK
38	19	19	100	2	32.520	50.0	40.8	9.18	0.000	0.00	77.248	만족	만족	OK
39	19	19	100	2	46.120	50.0	40.8	9.18	0.000	0.00	77.248	만족	만족	OK
40	19	19	100	2	51.010	50.0	40.8	9.18	0.000	0.00	77.248	만족	만족	OK
41	19	19	100	2	46.160	50.0	40.8	9.18	0.000	0.00	77.248	만족	만족	OK
42	19	19	100	2	32.600	50.0	40.8	9.18	0.000	0.00	77.248	만족	만족	OK
43	19	19	100	2	17.030	50.0	40.8	9.18	0.000	0.00	77.248	만족	만족	OK
44	19	19	100	2	26.970	50.0	40.8	9.18	0.000	0.00	77.248	만족	만족	OK
45	22	22	100	2	79.960	51.1	41.6	9.49	0.000	0.00	103.245	만족	만족	OK
46	22	22	100	2	79.960	55.3	45.8	9.49	0.000	0.00	114.947	만족	만족	OK
47	22	22	100	2	104.770	68.0	58.5	9.49	0.000	0.00	150.374	만족	만족	OK
48	22	22	100	2	127.500	91.6	82.1	9.49	0.000	0.00	216.158	만족	만족	OK
49	22	22	100	2	113.060	67.5	58.0	9.49	0.000	0.00	148.994	만족	만족	OK
50	22	22	100	2	99.610	54.2	44.7	9.49	0.000	0.00	111.893	만족	만족	OK
51	22	22	100	2	81.980	50.0	40.5	9.49	0.000	0.00	100.183	만족	만족	OK
52	22	22	100	2	52.600	50.0	40.5	9.49	0.000	0.00	100.183	만족	만족	OK
53	22	22	100	2	25.190	50.0	40.5	9.49	0.000	0.00	100.183	만족	만족	OK
54	22	22	100	2	0.000	50.0	40.5	9.49	0.000	0.00	100.183	만족	만족	OK

④ 전단에 대한 검토 (5 번 절점)

V_u = 64.440 t/m <--42.96*1.5=64.44 PAB전체폭으로 계산함.

d = 44.71 cm, d_c = 9.49 cm, b = 150 cm

f_{ck} = 400 kgf/㎠ f_y = 4000 kgf/㎠ β_1 = 0.766

$\Phi V_c = 0.8 * 0.53 * \sqrt{f_{ck}} * b_w * d$

= 56.87 t/m < V_u = 64.44 t/m

$\Phi V_c / 2$ = 28.44 t/m < V_u = 64.44 t/m

∴ 전단 보강 철근을 배근해야 한다.

$\frac{A_v}{s} > \frac{V_u - \Phi V_c}{\Phi f_y d}$ 에서, 철근의 간격 s = 20 cm

전단철근량 A_v = 1.06 ㎠

∴ H 16 - 2 leg @ 200

= 1.986 * 2 = 3.972 ㎠를 배근.

* Precast Arch Box 본체 전단면 전단 철근 검토

	V_u	d_c(cm)	d(cm)	ΦV_c	$\frac{1}{2}\Phi V_c$	결과	간격	필요철근량	사용철근량	ΦVs	결과
1	55.43	9.49	40.5	51.53	25.76	전단보강	20	0.601	3.972	25.74	O.K
2	60.63	9.49	40.5	51.53	25.76	전단보강	20	1.404	3.972	25.74	O.K
3	65.45	9.49	40.5	51.53	25.76	전단보강	20	2.147	3.972	25.74	O.K
4	69.86	9.49	40.5	51.53	25.76	전단보강	20	2.827	3.972	25.74	O.K
5	63.53	9.49	44.7	56.87	28.44	전단보강	20	0.930	3.972	28.41	O.K
6	51.99	9.49	58.0	73.79	36.89	최소전단	20	1.750	3.972	36.87	O.K
7	80.97	9.49	82.1	104.44	52.22	최소전단	20	1.750	3.972	52.18	O.K
8	73.10	9.49	58.5	74.42	37.21	최소전단	20	1.750	3.972	37.18	O.K
9	73.86	9.49	45.8	58.27	29.14	전단보강	20	2.127	3.972	29.11	O.K
10	55.55	9.49	41.6	52.93	26.46	전단보강	20	0.393	3.972	26.44	O.K
11	41.00	9.18	40.8	51.92	25.96	최소전단	20	1.750	3.972	25.94	O.K
12	28.38	9.18	40.8	51.92	25.96	최소전단	20	1.750	3.972	25.94	O.K
13	17.15	9.18	40.8	51.92	25.96	필요없음	20	0.000	3.972	25.94	O.K
14	7.89	9.18	40.8	51.92	25.96	필요없음	20	0.000	3.972	25.94	O.K
15	17.18	9.18	40.8	51.92	25.96	필요없음	20	0.000	3.972	25.94	O.K
16	28.40	9.18	40.8	51.92	25.96	최소전단	20	1.750	3.972	25.94	O.K
17	41.01	9.18	40.8	51.92	25.96	최소전단	20	1.750	3.972	25.94	O.K
18	55.56	9.49	41.6	52.93	26.46	전단보강	20	0.395	3.972	26.44	O.K
19	73.88	9.49	45.8	58.27	29.14	전단보강	20	2.129	3.972	29.11	O.K
20	74.36	9.49	58.5	74.42	37.21	최소전단	20	1.750	3.972	37.18	O.K
21	79.43	9.49	82.1	104.44	52.22	최소전단	20	1.750	3.972	52.18	O.K
22	56.31	9.49	58.0	73.79	36.89	최소전단	20	1.750	3.972	36.87	O.K
23	64.44	9.49	44.7	56.87	28.44	전단보강	20	1.058	3.972	28.41	O.K
24	69.86	9.49	40.5	51.53	25.76	전단보강	20	2.827	3.972	25.74	O.K
25	65.45	9.49	40.5	51.53	25.76	전단보강	20	2.147	3.972	25.74	O.K
26	60.63	9.49	40.5	51.53	25.76	전단보강	20	1.404	3.972	25.74	O.K
27	55.43	9.49	40.5	51.53	25.76	전단보강	20	0.601	3.972	25.74	O.K
28	55.23	9.49	40.5	51.53	25.76	전단보강	20	0.571	3.972	25.74	O.K
29	60.44	9.49	40.5	51.53	25.76	전단보강	20	1.374	3.972	25.74	O.K
30	65.25	9.49	40.5	51.53	25.76	전단보강	20	2.117	3.972	25.74	O.K
31	69.66	9.49	40.5	51.53	25.76	전단보강	20	2.797	3.972	25.74	O.K
32	64.25	9.49	44.7	56.87	28.44	전단보강	20	1.031	3.972	28.41	O.K

33	56.37	9.49	58.0	73.79	36.89	최소전단	20	1.750	3.972	36.87	O.K
34	79.56	9.49	82.1	104.44	52.22	최소전단	20	1.750	3.972	52.18	O.K
35	67.64	9.49	58.5	74.42	37.21	최소전단	20	1.750	3.972	37.18	O.K
36	41.03	9.49	45.8	58.27	29.14	최소전단	20	1.750	3.972	29.11	O.K
37	27.14	9.49	41.6	52.93	26.46	최소전단	20	1.750	3.972	26.44	O.K
38	15.75	9.18	40.8	51.92	25.96	필요없음	20	0.000	3.972	25.94	O.K
39	6.63	9.18	40.8	51.92	25.96	필요없음	20	0.000	3.972	25.94	O.K
40	7.38	9.18	40.8	51.92	25.96	필요없음	20	0.000	3.972	25.94	O.K
41	17.13	9.18	40.8	51.92	25.96	필요없음	20	0.000	3.972	25.94	O.K
42	28.40	9.18	40.8	51.92	25.96	최소전단	20	1.750	3.972	25.94	O.K
43	41.04	9.18	40.8	51.92	25.96	최소전단	20	1.750	3.972	25.94	O.K
44	55.61	9.18	40.8	51.92	25.96	전단보강	20	0.564	3.972	25.94	O.K
45	73.94	9.49	41.6	52.93	26.46	전단보강	20	3.155	3.972	26.44	O.K
46	73.94	9.49	45.8	58.27	29.14	전단보강	20	2.137	3.972	29.11	O.K
47	73.20	9.49	58.5	74.42	37.21	최소전단	20	1.750	3.972	37.18	O.K
48	81.08	9.49	82.1	104.44	52.22	최소전단	20	1.750	3.972	52.18	O.K
49	52.05	9.49	58.0	73.79	36.89	최소전단	20	1.750	3.972	36.87	O.K
50	63.35	9.49	44.7	56.87	28.44	전단보강	20	0.905	3.972	28.41	O.K
51	69.66	9.49	40.5	51.53	25.76	전단보강	20	2.797	3.972	25.74	O.K
52	65.25	9.49	40.5	51.53	25.76	전단보강	20	2.117	3.972	25.74	O.K
53	60.44	9.49	40.5	51.53	25.76	전단보강	20	1.374	3.972	25.74	O.K
54	55.23	9.49	40.5	51.53	25.76	전단보강	20	0.571	3.972	25.74	O.K

3.5절에서 계산된 극한전단력에 1.5를 곱해서 검토함. B=150cm

배근 전단 철근	16 - 2 LEG @ 20

Used Av = H16 ×2 ea/m = 3.972 ㎠ (간격 s = 20.0 cm)

øs·Vs = øs·Av·fy·D / (s ×1000) = 25.739 tf (D = 40.5 cm 기준)

øs·Vn = øs·Vc + øs·Vs = 77.255 tf

⑤ 배력 철근량 검토 (1.1 일반사항 참조)

P.A.B 본체의 수축 및 온도 철근

$A_s = \rho * b * d$ 0.002 * 100 * 50 = 10.00 ㎠

$A_{s(헌치부)} =$ 0.002 * 100 * 91.6 = 18.32 ㎠

배근된 배력 철근 : H19 @ 200(2단)= 28.66 ㎠

⑥ 우각부 검토　　**허용응력 설계**　　(7 번 절점)

(도로교 설계 기준 (2000) - p380)

M_0 = 74.880 t-m / m

$$f_{t.max} = \frac{5 \cdot M_0}{R^2 \cdot \omega}$$

R = 91.60 cm

ω = 100 cm

$$= \frac{5 * 7488000.00}{91.60^2 * 100}$$

= 44.62 kgf/㎠ > 21.20 kgf/㎠ ($1.06 * \sqrt{f_{ck}}$)

(콘크리트 구조설계 기준 (1999) - 15.3 p243)

∴ **보강 철근을 배근 하여야 한다.**

$$A_{s.req} = \frac{2 \cdot M_0}{R \cdot 1800}$$

$$= \frac{2 * 7488000.00}{91.60 * 1800}$$

= 90.83 ㎠/m

보강 철근량

H 25 @ 100 = 5.067 * 10.00

H 25 @ 100 = 5.067 * 10.00

= 101.34 ㎠를 배근.

* P.A.B는 우각부에 정모멘트가 발생하지 않으므로 내측 인장 검토는 불필요함.

3) 사용성 검토 **허용 응력 설계법 검토**

(1) 균열 검토

① 슬래브 중앙 (14 번 절점)

M_{Slab} = 28.270 ton-m/m

- 인장 철근의 제원

A_s =	57.30	㎠, d =	40.82	cm b =	100 cm
$\rho = A_s / (b * d)$	=	0.0140	$n = E_s / E_c$	=	7

$$k = -n\cdot\rho+\sqrt{((n\cdot\rho)^2 + 2\cdot n\cdot\rho)}$$
$$= 0.356$$

$$j = 1 - k / 3$$
$$= 0.881$$

$$f_{s.Slab} = \frac{M_{Slab}}{A_s * d * j} = 1371 \text{ kg/㎠}$$

β_c = 1.35 d_c = 6.96 A = 91.80

$$w = 1.08 \cdot \beta_c \cdot f_s \cdot \sqrt[3]{(d_c \cdot A)} * 10^{-5} \text{ mm}$$

콘크리트 구조 설계 기준 (1999) 4.2.4

∴ w = 0.172 mm

허용 균열 폭 = 0.005 * 덮개 (해당 절점에서 최외곽주철근 기준 피복)

0.005 * 60 = 0.3 mm ∴ O.K

(콘크리트 구조 설계 기준 표 4.2.2)

② 헌 치 부 (7 번 절점)

M_{Slab} = 74.880 ton-m/m

- 인장 철근의 제원

A_s =	77.42 ㎠,	d =	82.11 cm	b =	100 cm
$\rho = A_s / (b * d)$	=	0.0094	$n = E_s / E_c$	=	7

$$k = -n\cdot\rho+\sqrt{((n\cdot\rho)^2 + 2\cdot n\cdot\rho)}$$

$$= 0.303$$

$$j = 1 - k / 3$$

$$= 0.899$$

$$f_{s.Slab} = \frac{M_{Slab}}{A_s * d * j} = 1310 \text{ kg/㎠}$$

β_c = 1.35 d_c = 7.11 A = 94.90

$$w = 1.08 \cdot \beta_c \cdot f_s \cdot \sqrt[3]{(d_c \cdot A)} * 10^{-5} \text{ mm}$$

콘크리트 구조 설계 기준 (1999) 4.2.4

$$\therefore w = 0.168 \text{ mm}$$

허용 균열 폭 = 0.005 * 덮개 (해당 절점에서 최외곽철근 기준 피복)

0.005 * 60 = 0.3 mm ∴ O.K

(콘크리트 구조 설계 기준 표 4.2.2)

③ 벽체 변화부 (5 번 절점)

M_{Slab} = 58.010 ton-m/m

- 인장 철근의 제원

A_s =	77.42	㎠,	d =	44.71 cm	b = 100 cm
$\rho = A_s / (b * d)$	=	0.0173	$n = E_s / E_c$	=	7

$$k = -n\cdot\rho+\sqrt{(n\cdot\rho)^2 + 2\cdot n\cdot\rho)}$$

$$= 0.386$$

$$j = 1 - k / 3$$

$$= 0.871$$

$$f_{s.Slab} = \frac{M_{Slab}}{A_s * d * j} = 1923 \ kg/㎠$$

β_c = 1.35 d_c = 7.11 A = 94.90

$$w = 1.08 \cdot \beta_c \cdot f_s \cdot \sqrt[3]{(d_c \cdot A)} * 10^{-5} \ mm$$

콘크리트 구조 설계 기준 (1999) 4.2.4

$\therefore$ w = 0.246 mm

허용 균열 폭 = 0.005 * 덮개 (해당 절점에서 최외곽철근 기준 피복)

0.005 * 60 = 0.3 mm $\therefore$ O.K

(콘크리트 구조 설계 기준 표 4.2.2)

본체 전체 균열 검토					균열제한폭 = 0.005 * 60 mm (덮개) = 0.3 mm													
	모멘트합	A_s 철근량	d_c cm	d cm	ρ	k	j	f_s kgf/cm²	인장철근 H	H	간격	덮개	개수	d_c cm	A	균열 mm	결과
1	0.00	77.42	9.49	40.51	0.019	0.401	0.866	0.00	22	22	100	60	20	7.11	94.9	0.00	Ok!
2	14.13	77.42	9.49	40.51	0.019	0.401	0.866	519.95	22	22	100	60	20	7.11	94.9	0.07	Ok!
3	29.97	77.42	9.49	40.51	0.019	0.401	0.866	1102.82	22	22	100	60	20	7.11	94.9	0.14	Ok!
4	47.32	77.42	9.49	40.51	0.019	0.401	0.866	1741.25	22	22	100	60	20	7.11	94.9	0.22	Ok!
5	57.86	77.42	9.49	44.71	0.017	0.386	0.871	1918.28	22	22	100	60	20	7.11	94.9	0.25	Ok!
6	65.96	77.42	9.49	58.01	0.013	0.349	0.884	1661.90	22	22	100	60	20	7.11	94.9	0.21	Ok!
7	74.79	77.42	9.49	82.11	0.009	0.303	0.899	1308.81	22	22	100	60	20	7.11	94.9	0.17	Ok!
8	61.09	77.42	9.49	58.51	0.013	0.348	0.884	1525.37	22	22	100	60	20	7.11	94.9	0.20	Ok!
9	46.33	77.42	9.49	45.81	0.017	0.382	0.873	1497.10	22	22	100	60	20	7.11	94.9	0.19	Ok!
10	15.36	77.42	9.49	41.61	0.019	0.396	0.868	549.42	22	22	100	60	20	7.11	94.9	0.07	Ok!
11	5.09	57.30	9.18	40.82	0.014	0.356	0.881	246.90	19	19	100	60	20	6.96	91.8	0.03	Ok!
12	18.18	57.30	9.18	40.82	0.014	0.356	0.881	881.85	19	19	100	60	20	6.96	91.8	0.11	Ok!
13	25.59	57.30	9.18	40.82	0.014	0.356	0.881	1241.28	19	19	100	60	20	6.96	91.8	0.16	Ok!
14	28.27	57.30	9.18	40.82	0.014	0.356	0.881	1371.28	19	19	100	60	20	6.96	91.8	0.17	Ok!
15	25.58	57.30	9.18	40.82	0.014	0.356	0.881	1240.80	19	19	100	60	20	6.96	91.8	0.16	Ok!
16	18.17	57.30	9.18	40.82	0.014	0.356	0.881	881.36	19	19	100	60	20	6.96	91.8	0.11	Ok!
17	6.71	57.30	9.18	40.82	0.014	0.356	0.881	325.48	19	19	100	60	20	6.96	91.8	0.04	Ok!
18	15.39	77.42	9.49	41.61	0.019	0.396	0.868	550.49	22	22	100	60	20	7.11	94.9	0.07	Ok!
19	46.40	77.42	9.49	45.81	0.017	0.382	0.873	1499.36	22	22	100	60	20	7.11	94.9	0.19	Ok!
20	61.60	77.42	9.49	58.51	0.013	0.348	0.884	1538.10	22	22	100	60	20	7.11	94.9	0.20	Ok!
21	74.88	77.42	9.49	82.11	0.009	0.303	0.899	1310.39	22	22	100	60	20	7.11	94.9	0.17	Ok!
22	67.08	77.42	9.49	58.01	0.013	0.349	0.884	1690.12	22	22	100	60	20	7.11	94.9	0.22	Ok!
23	58.01	77.42	9.49	44.71	0.017	0.386	0.871	1923.25	22	22	100	60	20	7.11	94.9	0.25	Ok!
24	47.32	77.42	9.49	40.51	0.019	0.401	0.866	1741.25	22	22	100	60	20	7.11	94.9	0.22	Ok!
25	29.96	77.42	9.49	40.51	0.019	0.401	0.866	1102.45	22	22	100	60	20	7.11	94.9	0.14	Ok!
26	14.13	77.42	9.49	40.51	0.019	0.401	0.866	519.95	22	22	100	60	20	7.11	94.9	0.07	Ok!
27	0.00	77.42	9.49	40.51	0.019	0.401	0.866	0.00	22	22	100	60	20	7.11	94.9	0.00	Ok!
28	0.00	77.42	9.49	40.51	0.019	0.401	0.866	0.00	22	22	100	60	20	7.11	94.9	0.00	Ok!
29	14.09	77.42	9.49	40.51	0.019	0.401	0.866	518.47	22	22	100	60	20	7.11	94.9	0.07	Ok!
30	29.89	77.42	9.49	40.51	0.019	0.401	0.866	1099.87	22	22	100	60	20	7.11	94.9	0.14	Ok!

31	47.20	77.42	9.49	40.51	0.019	0.401	0.866	1736.83	22	22	100	60	20	7.11	94.9	0.22	Ok!
32	57.87	77.42	9.49	44.71	0.017	0.386	0.871	1918.61	22	22	100	60	20	7.11	94.9	0.25	Ok!
33	66.91	77.42	9.49	58.01	0.013	0.349	0.884	1685.84	22	22	100	60	20	7.11	94.9	0.22	Ok!
34	74.67	77.42	9.49	82.11	0.009	0.303	0.899	1306.71	22	22	100	60	20	7.11	94.9	0.17	Ok!
35	61.39	77.42	9.49	58.51	0.013	0.348	0.884	1532.86	22	22	100	60	20	7.11	94.9	0.20	Ok!
36	15.15	77.42	9.49	45.81	0.017	0.382	0.873	489.55	22	22	100	60	20	7.11	94.9	0.06	Ok!
37	6.71	77.42	9.49	41.61	0.019	0.396	0.868	240.01	22	22	100	60	20	7.11	94.9	0.03	Ok!
38	18.48	57.30	9.18	40.82	0.014	0.356	0.881	896.40	19	19	100	60	20	6.96	91.8	0.11	Ok!
39	25.91	57.30	9.18	40.82	0.014	0.356	0.881	1256.80	19	19	100	60	20	6.96	91.8	0.16	Ok!
40	28.61	57.30	9.18	40.82	0.014	0.356	0.881	1387.77	19	19	100	60	20	6.96	91.8	0.17	Ok!
41	25.94	57.30	9.18	40.82	0.014	0.356	0.881	1258.26	19	19	100	60	20	6.96	91.8	0.16	Ok!
42	18.53	57.30	9.18	40.82	0.014	0.356	0.881	898.83	19	19	100	60	20	6.96	91.8	0.11	Ok!
43	5.43	57.30	9.18	40.82	0.014	0.356	0.881	263.39	19	19	100	60	20	6.96	91.8	0.03	Ok!
44	15.05	57.30	9.18	40.82	0.014	0.356	0.881	730.02	19	19	100	60	20	6.96	91.8	0.09	Ok!
45	46.08	77.42	9.49	41.61	0.019	0.396	0.868	1648.25	22	22	100	60	20	7.11	94.9	0.21	Ok!
46	46.08	77.42	9.49	45.81	0.017	0.382	0.873	1489.02	22	22	100	60	20	7.11	94.9	0.19	Ok!
47	60.87	77.42	9.49	58.51	0.013	0.348	0.884	1519.87	22	22	100	60	20	7.11	94.9	0.19	Ok!
48	74.60	77.42	9.49	82.11	0.009	0.303	0.899	1305.49	22	22	100	60	20	7.11	94.9	0.17	Ok!
49	65.79	77.42	9.49	58.01	0.013	0.349	0.884	1657.62	22	22	100	60	20	7.11	94.9	0.21	Ok!
50	57.71	77.42	9.49	44.71	0.017	0.386	0.871	1913.31	22	22	100	60	20	7.11	94.9	0.24	Ok!
51	47.20	77.42	9.49	40.51	0.019	0.401	0.866	1736.83	22	22	100	60	20	7.11	94.9	0.22	Ok!
52	29.89	77.42	9.49	40.51	0.019	0.401	0.866	1099.87	22	22	100	60	20	7.11	94.9	0.14	Ok!
53	14.09	77.42	9.49	40.51	0.019	0.401	0.866	518.47	22	22	100	60	20	7.11	94.9	0.07	Ok!
54	0.00	77.42	9.49	40.51	0.019	0.401	0.866	0.00	22	22	100	60	20	7.11	94.9	0.00	Ok!

(2) 상부 처짐 검토 (도로교 설계 기준 (2000) 4.4.9.5)

: 사용시 활하중이 작용하지 않으므로 고려하지 않음.

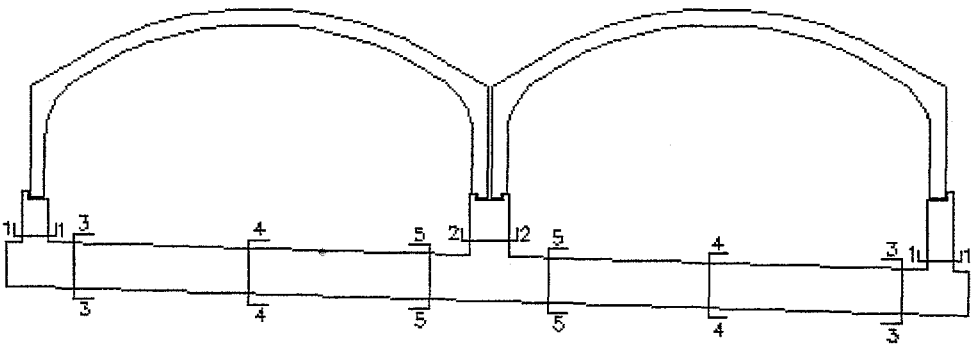
(3) 피로 검토

: P.A.B는 사용시 활하중이 작용하지 않으므로 고려하지 않고,

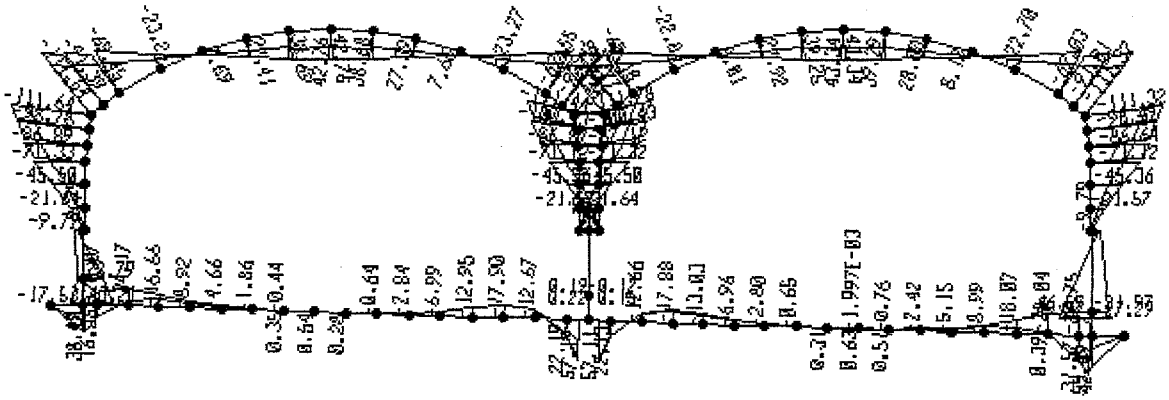
기초 슬래브에 작용하는 활하중(PL)에 의한 피로만 검토함.

4.2 (8) 기초 슬래브 피로 검토 참조

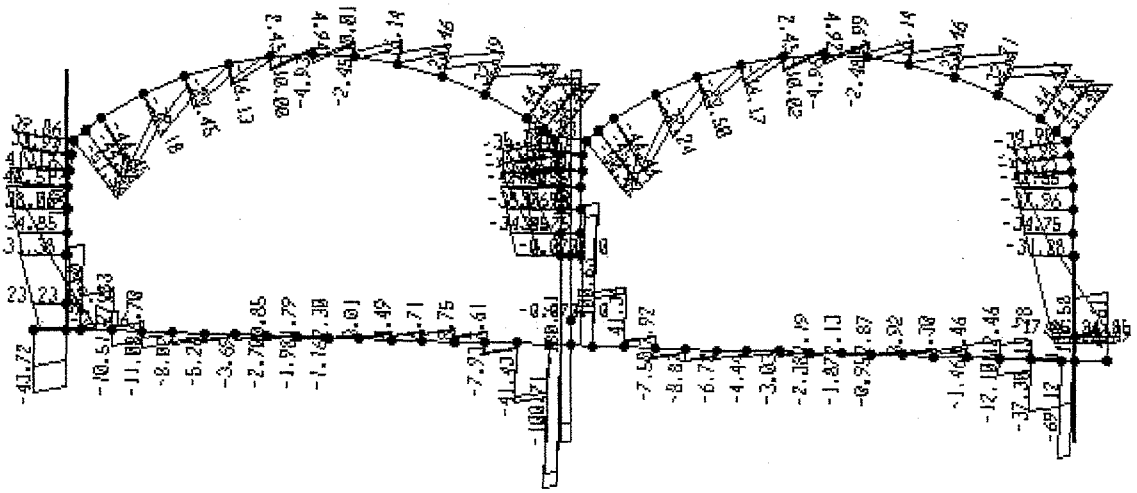
4.2 현장타설 벽체 및 기초 검토



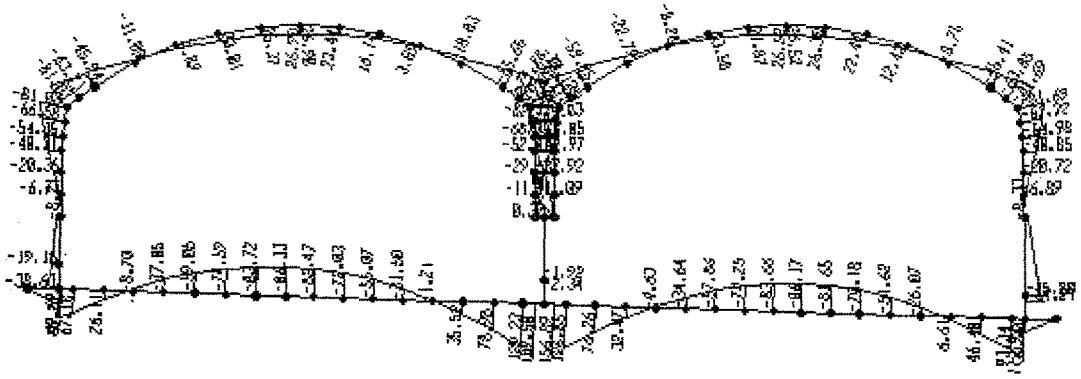
검토 단면



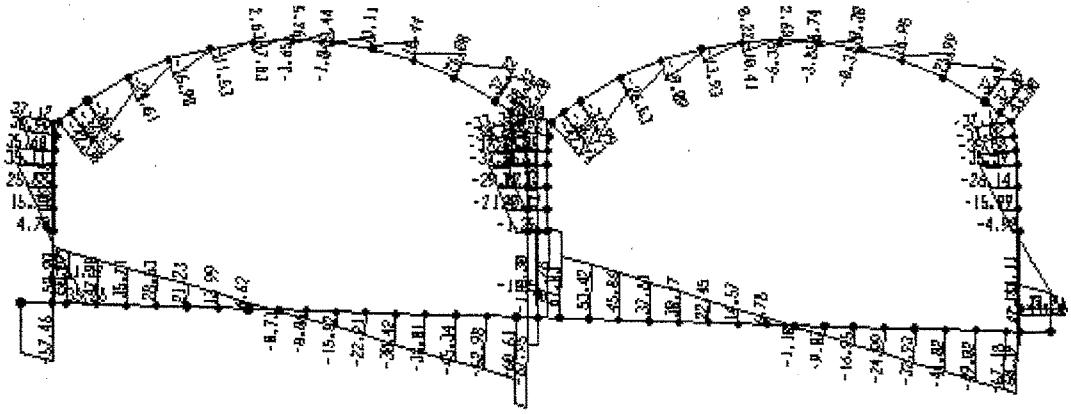
MAT1(COMB1,2,5) 모멘트 ENVE



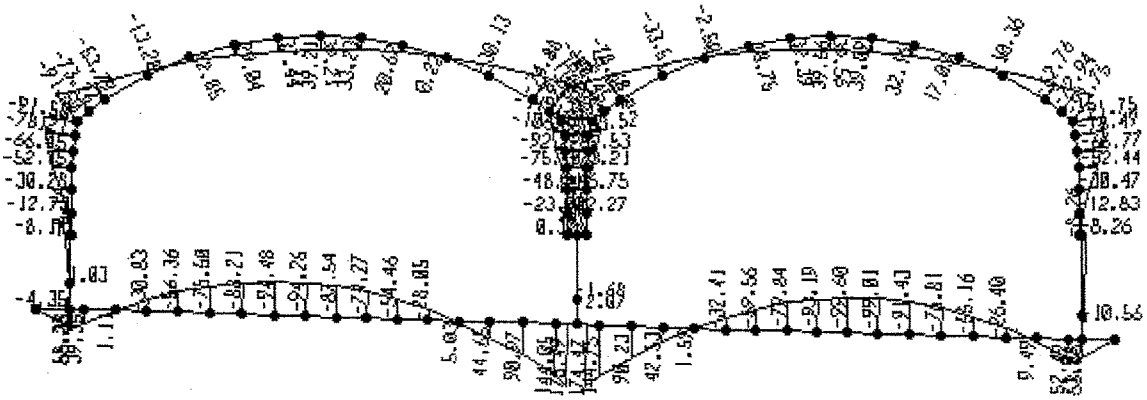
MAT1(COMB1,2,5) 전단력 ENVE



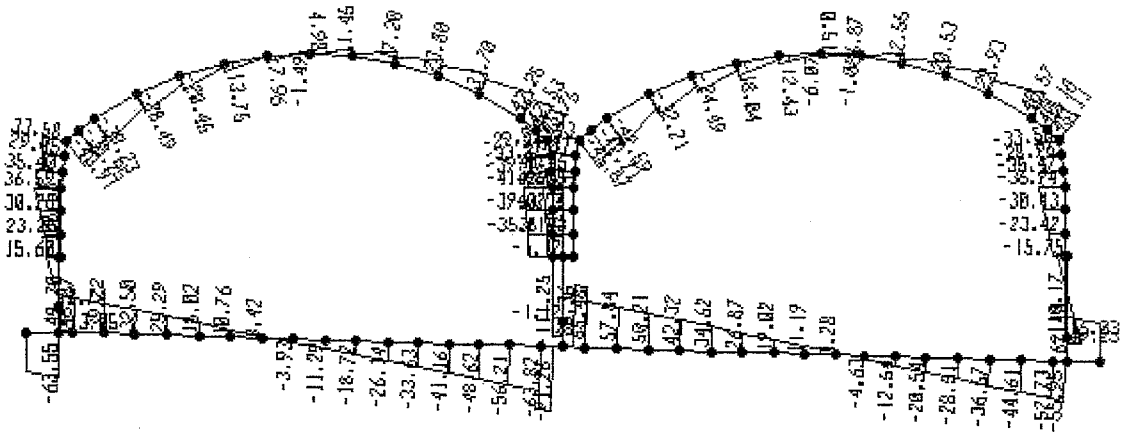
MAT3(COMB3) 모멘트 ENVE



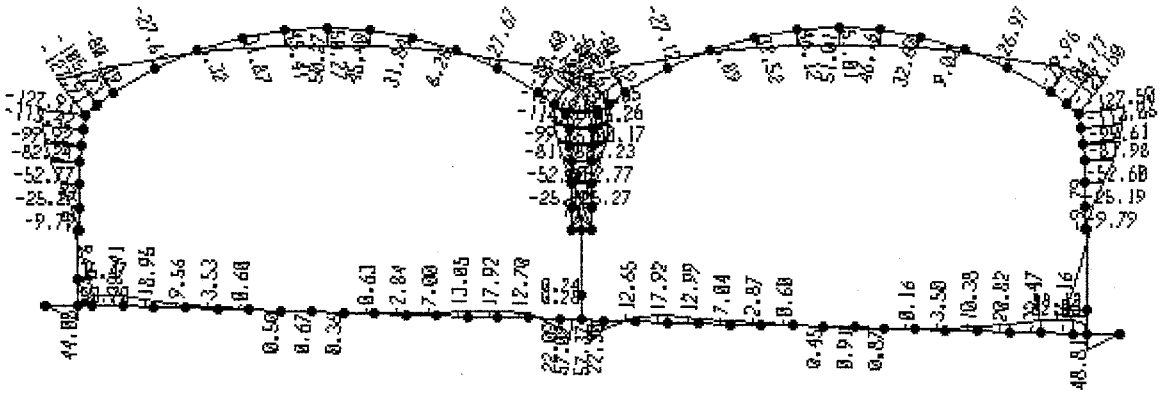
MAT3(COMB3) 전단력 ENVE



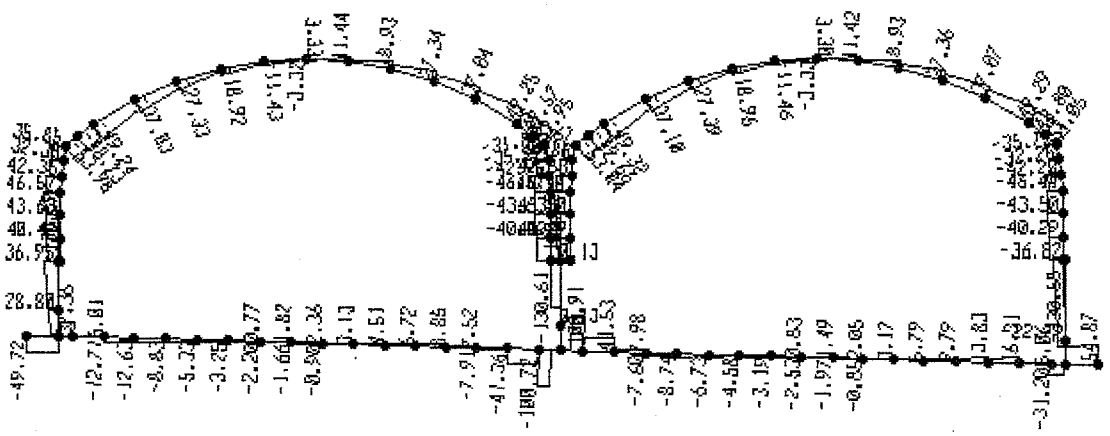
MAT4(COMB4) 모멘트 ENVE



MAT4(COMB4) 전단력 ENVE



MAT6(COMB6) 모멘트 ENVE



MAT6(COMB6) 전단력 ENVE

(1) 외측 벽체 검토 (절점102, 302번, 단면 1 - 1)

① 휨강도 검토

ㄴ 검 토 조 건

fck = 270.0kgf/㎠ fy = 4000.0kgf/㎠

β1 = 0.850 øb = 0.85 øs = 0.80

pb = (0.85 ×β1 ×fck / fy) * [6000/(6000+fy)] = 0.02926

pmax = 0.75 ×pb = 0.02195

pmin = max(0.80√(fck)/fy,14/fy) = 0.00350

계수 모멘트 Mu = 58.120 tf.m 계수 전단력 Vu = 39.910 tonf

단면의 두께 H = 85.000 cm 단 면 폭 B = 100.000 cm

유 효 깊 이 D = 75.000 cm 피 복 두 께 Dc = 10.000 cm

소요등가응력깊이 a = 4.084 cm로 가정

As = Mu /{øb·fy·(D-a/2)} = 23.430 ㎠

a = (As·fy) / (0.85·fck·B) = 4.084 cm ∴ 가정과 비슷함 O.K

Preq = [Mu /{øb·fy·(D-a/2)}] / (B·D) = 0.00312 ⇒ 4/3 Preq = 0.00417

∴ 필요철근량 req.As = Preq × (B·D) = 23.430 ㎠

Used As = H22 @ 12.50 cm (Dc = 10.00 cm)

= 30.968 ㎠ ∴ P = As/(B·D) = 0.00413

Pmin ≤ P ≤ Pmax ..... ∴ O.K

a = (As·fy) / (0.85·fck·B) = 5.397 cm

øMn = øb·fy·As·(D - a/2) = 7612687.000 kgf·cm

= 76.127 tf·m ≥ Mu = 58.120 tf·m ..... ∴ O.K

ㄴ 전단력 검토

øs·Vc = øs·0.53·√fck·B·d / 1000 = 52.253 tf

øs·Vc = 52.253 tf > Vu ∴전단철근 필요없음.

② 벽체 검토

ㄴ 벽 체 검 토 조 건

fck = 270.0kgf/㎠ fy = 4000.0kgf/㎠

øc = 0.70 øv = 0.80 α = 0.80

극한 모멘트 Mu = 58.120 tf·m 극 한 축 력 Pu = 136.820 tonf

단면의 두께 H = 85.000 cm 단 위 폭 B = 100.000 cm

유 효 깊 이 D = 75.000 cm 피 복 두 께 Dc = 10.000 cm

작 용 편 심 e = 42.479 cm

인장측 철근 Ast = 30.968㎠

1단 (dc = 10cm) : H 22 @ 12.5 cm

압축측 철근 Asc = 0.000㎠

ㄴ 평형상태 검토

c = 6000/(6000+fy)*d = 45.000 cm

k1 = 0.850 a = k1·c = 38.25 cm

Cck = 0.85·fck·B·H = 1950750.0 kgf

소성중심 x = (Cck·H/2 + fy·Asc·dc + fy·Ast·d)/(Cck + fy·Asc + fy·Ast)

= 44.44 cm

콘크리트 Cc = 0.85·fck·a·b = 877837.5 kgf

압축철근 Cs = (fs-0.85·fck)·Asc = 0.0 kgf

(εsc > εy --> fs = fy = 4000.00 kgf/㎠)

인장철근 Ts = fy·Ast = 123872.0 kgf

평형축력 Pb = Cc + Cs - Ts = 753965.5 kgf

평형모멘트 Mb = Cc(x-a/2) + Cs(x-dc) + Ts(d-x) = 26008370.0 kgf·m

평형편심 eb = Mb / Pb = 34.50 cm

e ≥eb --------> 인장파괴영역

ㄴ 기둥 강도 검토

철근의 응력을 Trial & Error Method로 계산한다.

c = 35.42 cm로 가정하면.. a = k1·c = 30.11 cm

εsc = 0.0020 fs = 4000.00 kgf/㎠

Pn = 0.85·fck·a·b + Asc·(fsc-0.85·fck) - Ast·fy

= 567125.0 kgf

Mn = 0.85·fck·a·b·(x-a/2) + Asc·fsc·(x-dc) + Ast·fst·(d-x)

= 24091180.0kgf·cm

e' = Mn/Pn = 42.480 cm ≒ e = 42.479 cm ---> say O.K.

øPn > 0.1·fck·B·H = 229500.0 kgf ... ø = 0.70

øPn = 396.988 tonf ≥ Pu = 136.820 tonf ∴O.K

øMn = 168.638 tf·m ≥ Mu = 58.120 tf·m ∴O.K

③ 배력철근 검토 (1.1 일반사항 참조)

A. 수축 및 온도 철근

$A_s = \rho * b * d$ 0.002 * 100 * 75

= 15.00 ㎠

배력 철근 : H19 @ 150 (2단)= 38.2 ㎠

(2) 중앙부벽체 (절점 202번, 단면 2 - 2) - 가설시 검토

: P.A.B 가설중(한쪽에만 P.A.B를 설치하였을경우) 발생하는 모멘트에 대한 검토.

INPUTDATA : 가설.$2K 참조

① 휨강도 검토

fck = 270.0kgf/㎠ fy = 4000.0kgf/㎠

β1 = 0.850 øb = 0.85 øs = 0.80

pb = (0.85 ×β1 ×fck / fy) * [6000/(6000+fy)] = 0.02926

pmax = 0.75 ×pb = 0.02195

pmin = max(0.80√(fck)/fy,14/fy) = 0.00350

계수 모멘트 Mu = 5.122 tf.m 계수 전단력 Vu = 5.980 tonf

단면의 두께 H = 130.000 cm 단 면 폭 B = 100.000 cm

유 효 깊 이 D = 120.000 cm 피 복 두 께 Dc = 10.000 cm

ㄹ 휨모멘트 검토

소요등가응력깊이 a = 0.219 cm로 가정

As = Mu /{øb·fy·(D-a/2)} = 1.257 ㎠

a = (As·fy) / (0.85·fck·B) = 0.219 cm ∴ 가정과 비슷함 O.K

Preq = [Mu /{øb·fy·(D-a/2)}] / (B·D) = 0.00010 ⇒ 4/3 Preq = 0.00014

∴ 필요철근량 req.As = Preq × (B·D) = 1.257 ㎠

Used As = H16 @ 12.50 cm (Dc = 10.00 cm)

= 15.888 ㎠ ∴ P = As/(B·D) = 0.00132

4/3 Preq ≤ P ≤ Pmin ..... ∴ O.K

a = (As·fy) / (0.85·fck·B) = 2.769 cm

øMn = øb·fy·As·(D - a/2) = 6407511.000 kgf·cm

= 64.075 tf·m ≥ Mu = 5.122 tf·m ..... ∴ O.K

▷ 전단력 검토

øs·Vc = øs·0.53·√fck·B·d / 1000 = 83.604 tf

øs·Vc = 83.604 tf > Vu ∴전단철근 필요없음.

② 벽체 검토

fck = 270.0kgf/㎠ fy = 4000.0kgf/㎠

øc = 0.70 øv = 0.80 α = 0.80

극한 모멘트 Mu = 5.122 tf·m 극 한 축 력 Pu = 26.299 tonf

단면의 두께 H = 130.000 cm 단 위 폭 B = 100.000 cm

유 효 깊 이 D = 120.000 cm 피 복 두 께 Dc = 10.000 cm

작 용 편 심 e = 19.476 cm

인장측 철근 Ast = 15.888㎠

1단 (dc = 10cm) : H 16 @ 12.5 cm

압축측 철근 Asc = 0.000㎠

▷ 평형상태 검토

c = 6000/(6000+fy)*d = 72.000 cm

k1 = 0.850 a = k1·c = 61.20 cm

Cck = 0.85·fck·B·H = 2983500.0 kgf

소성중심 x = (Cck·H/2 + fy·Asc·dc + fy·Ast·d)/(Cck + fy·Asc + fy·Ast)

= 66.15 cm

콘크리트 Cc = 0.85·fck·a·b = 1404540.0 kgf

압축철근 Cs = (fs-0.85·fck)·Asc = 0.0 kgf

(εsc > εy --> fs = fy = 4000.00 kgf/㎠)

인장철근 Ts = fy·Ast = 63552.0 kgf

평형축력 Pb = Cc + Cs - Ts = 1340988.0 kgf

평형모멘트 Mb = Cc(x-a/2) + Cs(x-dc) + Ts(d-x) = 53349830.0 kgf·m

평형편심 eb = Mb / Pb = 39.78 cm

e < eb --------> 압축파괴영역

ㄴ 기둥 강도 검토

e_min = 13.10 cm < e = 19.48 cm

----> 철근의 응력을 Trial & Error Method로 계산한다.

c = 110.47 cm로 가정하면.. a = k1·c = 93.90 cm

fsc = 4000.00 kgf/㎠, fst = 517.4 kgf/㎠

Pn = 0.85 fck·a·B + Asc·fsc - Ast·fst = 2146834.0 kgf

Mn = 0.85 fck·a·B·(x-a/2) + Asc·fsc·(x-dcc) - Ast·fst·(d-x)

= 41811240.0 kgf·cm

e' = Mn/Pn = 19.476 cm ≒ e = 19.476 cm ---> say O.K.

ø = 0.700

øPn = 1502.784 tonf ≥ Pu = 26.299 tonf ∴O.K

øMn = 292.679 tf·m ≥ Mu = 5.122 tf·m ∴O.K

ㄴ 전단력 검토

Vu = 5.980 tonf

øVc =øs·0.53·(1+0.0071·Pu/Ag)·√(fck)·B·D/1000 = 84.805 tf

øs·Vc = 84.805 tf > Vu ∴전단철근 필요없음.

(3) 중앙부벽체 (절점 202번, 단면 2 - 2) - 완공후 검토

: 완공 후엔 좌우가 대칭인 구조물이므로 모멘트와 전단력은 발생하지 않고 축력만 발생한다.
그러므로 휨검토는 생략함.

해석 결과 COMB6.에서 Pu=268.82 tonf 가 최대값임.

① 벽체 검토

fck = 270.0kgf/㎠ fy = 4000.0kgf/㎠

øc = 0.70 øv = 0.80 α = 0.80

극한 모멘트 Mu = 0.000 tf·m 극 한 축 력 Pu = 268.820 tonf

단면의 두께 H = 130.000 cm 단 위 폭 B = 100.000 cm

유 효 깊 이 D = 120.000 cm 피 복 두 께 Dc = 10.000 cm

작 용 편 심 e = 0.000 cm

인장측 철근 Ast = 15.888㎠

1단 (dc = 10cm) : H 16 @ 12.5 cm

압축측 철근 Asc = 0.000㎠

▷ 평형상태 검토

c = 6000/(6000+fy)*d = 72.000 cm

k1 = 0.850 a = k1·c = 61.20 cm

Cck = 0.85·fck·B·H = 2983500.0 kgf

소성중심 x = (Cck·H/2 + fy·Asc·dc + fy·Ast·d)/(Cck + fy·Asc + fy·Ast)

= 66.15 cm

콘크리트 Cc = 0.85·fck·a·b = 1404540.0 kgf

압축철근 Cs = (fs-0.85·fck)·Asc = 0.0 kgf

(εsc > εy --> fs = fy = 4000.00 kgf/㎠)

인장철근 Ts = fy·Ast = 63552.0 kgf

평형축력 Pb = Cc + Cs - Ts = 1340988.0 kgf

평형모멘트 Mb = Cc(x-a/2) + Cs(x-dc) + Ts(d-x) = 53349830.0 kgf·m

평형편심 eb = Mb / Pb = 39.78 cm

e < eb --------> 압축파괴영역

▷ 기둥 강도 검토

e_min = 13.10 cm ≥e = 0.00 cm

편심이 최소편심보다 작으므로..

Pn = 0.85·fck·(Ag - As) + fy·As = 3043406.0 kgf

Mn = Pn · e_min = 39877350.0 kgf·cm

ø = 0.700 α = 0.800

αøPn = 1704.307 tonf ≥ Pu = 268.820 tonf ∴O.K

øMn = 223.313 tf·m ≥ Mu = 0.000 tf·m ∴O.K

② 배력 철근 검토

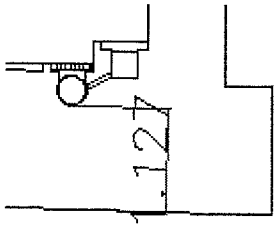
A. 수축 및 온도 철근

$A_s = \rho * b * d$ 0.002 * 100 * 130

= 26.00 ㎠

배력 철근 : H19 @ 150 (2단)= 38.2 ㎠

(4) 바닥 슬래브 (절점403, 435번, 단면 3 - 3)



단면 3 - 3 형상

M_u = 93.340 t - m / m, V_u = 69.120 t/m

d = 102.70 cm, d_c = 10.00 cm, b = 100 cm

f_{ck} = 270 kgf/㎠ f_y = 4000 kgf/㎠ β_1 = 0.857

$\Phi M_n = 0.85 * f_y * A_s * (d - a/2)$ 에서

$$A_{s,req} = \frac{M_u}{0.85 * f_y * (d - a/2)}$$ 로 부터

$$a = \frac{A_s * f_y}{0.85 * f_{ck} * b} = 4.770$$ $A_{s,req}$ = 27.37 ㎠

∴ H 25 @ 125 = 5.067 * 8.00

= 40.54 ㎠를 배근함. OK!

단면 철근비 $\rho = \frac{A_s}{b \cdot d} = 0.0039$

최대 철근비 $\rho_{max} = 0.64 * \beta_1 * \frac{f_{ck}}{f_y} * \frac{6000}{(6000 + f_y)} = 0.0222$

최소 철근비 $\rho_{min} = \frac{0.8 \cdot \sqrt{f_{ck}}}{f_y} = 0.0033 < \frac{14}{f_y} = 0.0035$

∴ 최대 철근비 규정 만족!

∴ 최소 철근비 규정 만족!

$\Phi V_c = 0.8 * 0.53 * \sqrt{f_{ck}} * b_w * d$

= 71.55 t/m > V_u = 69.12 t/m

$\Phi V_c / 2$ = 35.78 t/m < V_u = 69.12 t/m

∴ 전단철근을 배근해야 한다.

(5) 바닥 슬래브 (절점 428번, 단면 4 - 4)

M_u = 99.600 t-m / m,	V_u = 3.310 t/m

d = 130.00 cm, d_c = 10.00 cm, b = 100 cm

f_{ck} = 270 kgf/cm², f_y = 4000 kgf/cm², β_1 = 0.857

$\Phi M_n = 0.85 * f_y * A_s * (d - a/2)$ 에서

$$A_{s,req} = \frac{M_u}{0.85 * f_y * (d - a/2)}$$ 로 부터

$$a = \frac{A_s * f_y}{0.85 * f_{ck} * b} = 3.988$$ $A_{s,req}$ = 22.88 cm²

∴ H 25 @ 125 = 5.067 * 8.00

= 40.54 cm²를 배근함. OK!

단면 철근비 $\rho = \frac{A_s}{b \cdot d} = 0.0031$

최대 철근비 $\rho_{max} = 0.64 * \beta_1 * \frac{f_{ck}}{f_y} * \frac{6000}{(6000 + f_y)} = 0.0222$

최소 철근비 $\rho_{min} = \frac{0.8 \cdot \sqrt{f_{ck}}}{f_y} = 0.0033 < \frac{14}{f_y} = 0.0035$

∴ 최대 철근비 규정 만족!

∴ 최소 철근비 규정 불만족!

* 배근된 철근량(40.54㎠)이 필요한 철근량(22.88㎠)의 4/3이상이므로 최소철근비를 따르지 않아도 됨.

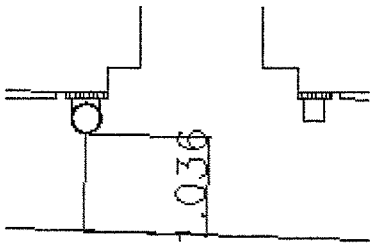
$\Phi V_c = 0.8 * 0.53 * \sqrt{f_{ck}} * b_w * d$

= 90.57 t/m > V_u = 3.31 t/m

$\Phi V_c / 2$ = 45.29 t/m > V_u = 3.31 t/m

∴ 전단 철근을 배근하지 않아도 된다.

(6) 바닥 슬래브 (절점 418, 420번, 단면 5 - 5)



단면 5 - 5 형상

M_u = 144.750 t - m / m,	V_u = 100.910 t/m

d = 93.60 cm, d_c = 10.00 cm, b = 100 cm

f_{ck} = 270 kgf/㎠ f_y = 4000 kgf/㎠ β_1 = 0.857

$\Phi M_n = 0.85 * f_y * A_s * (d - a/2)$ 에서

$$A_{s,req} = \frac{M_u}{0.85 * f_y * (d - a/2)}$$ 로 부터

$$a = \frac{A_s * f_y}{0.85 * f_{ck} * b} = 8.295$$ $A_{s,req}$ = 47.59 ㎠

∴ H 29 @ 125 = 6.424 * 8.00

= 51.39 ㎠를 배근함. OK!

단면 철근비 $\rho = \frac{A_s}{b \cdot d} = 0.0055$

최대 철근비 $\rho_{max} = 0.64 * \beta_1 * \frac{f_{ck}}{f_y} * \frac{6000}{(6000 + f_y)} = 0.0222$

최소 철근비 $\rho_{min} = \frac{0.8 \cdot \sqrt{f_{ck}}}{f_y} = 0.0033 < \frac{14}{f_y} = 0.0035$

∴ 최대 철근비 규정 만족!

∴ 최소 철근비 규정 만족!

$\Phi V_c = 0.8 * 0.53 * \sqrt{f_{ck}} * b_w * d$

= 65.21 t/m < V_u = 100.91 t/m

$\Phi V_c / 2$ = 32.61 t/m < V_u = 100.91 t/m

∴ 전단철근을 배근해야 한다.

* 현장타설 기초 바닥 전단면 전단 철근 검토

	V_u	d_c(cm)	d(cm)	ΦV_c	$\frac{1}{2}\Phi V_c$	결과	간격	필요철근량	사용철근량	ΦV_s	결과
403	42.83	10.0	130.0	90.57	45.29	필요없음	40	0.000	3.972	41.31	O.K
404	37.58	10.0	130.0	90.57	45.29	필요없음	40	0.000	3.972	41.31	O.K
405	53.04	10.0	130.0	90.57	45.29	최소전단	40	3.500	3.972	41.31	O.K
406	45.09	10.0	130.0	90.57	45.29	필요없음	40	0.000	3.972	41.31	O.K
407	27.35	10.0	130.0	90.57	45.29	필요없음	40	0.000	3.972	41.31	O.K
408	18.09	10.0	130.0	90.57	45.29	필요없음	40	0.000	3.972	41.31	O.K
409	10.50	10.0	130.0	90.57	45.29	필요없음	40	0.000	3.972	41.31	O.K
410	4.42	10.0	130.0	90.57	45.29	필요없음	40	0.000	3.972	41.31	O.K
411	4.92	10.0	130.0	90.57	45.29	필요없음	40	0.000	3.972	41.31	O.K
412	11.42	10.0	130.0	90.57	45.29	필요없음	40	0.000	3.972	41.31	O.K
413	18.93	10.0	130.0	90.57	45.29	필요없음	40	0.000	3.972	41.31	O.K
414	27.36	10.0	130.0	90.57	45.29	필요없음	40	0.000	3.972	41.31	O.K
415	37.07	10.0	130.0	90.57	45.29	필요없음	40	0.000	3.972	41.31	O.K
416	49.29	10.0	130.0	90.57	45.29	최소전단	40	3.500	3.972	41.31	O.K
417	49.29	10.0	130.0	90.57	45.29	최소전단	40	3.500	3.972	41.31	O.K
418	48.80	10.0	130.0	90.57	45.29	최소전단	40	3.500	3.972	41.31	O.K
420	34.70	10.0	130.0	90.57	45.29	필요없음	40	0.000	3.972	41.31	O.K
421	42.23	10.0	130.0	90.57	45.29	필요없음	40	0.000	3.972	41.31	O.K
422	46.44	10.0	130.0	90.57	45.29	최소전단	40	3.500	3.972	41.31	O.K
423	43.50	10.0	130.0	90.57	45.29	필요없음	40	0.000	3.972	41.31	O.K
424	40.29	10.0	130.0	90.57	45.29	필요없음	40	0.000	3.972	41.31	O.K
425	36.82	10.0	130.0	90.57	45.29	필요없음	40	0.000	3.972	41.31	O.K
426	36.95	10.0	130.0	90.57	45.29	필요없음	40	0.000	3.972	41.31	O.K
427	28.80	10.0	130.0	90.57	45.29	필요없음	40	0.000	3.972	41.31	O.K
428	36.82	10.0	130.0	90.57	45.29	필요없음	40	0.000	3.972	41.31	O.K
429	39.91	10.0	130.0	90.57	45.29	필요없음	40	0.000	3.972	41.31	O.K
430	56.08	10.0	130.0	90.57	45.29	최소전단	40	3.500	3.972	41.31	O.K
431	63.55	10.0	130.0	90.57	45.29	최소전단	40	3.500	3.972	41.31	O.K
432	59.50	10.0	130.0	90.57	45.29	최소전단	40	3.500	3.972	41.31	O.K
433	42.96	10.0	130.0	90.57	45.29	필요없음	40	0.000	3.972	41.31	O.K
434	35.76	10.0	130.0	90.57	45.29	필요없음	40	0.000	3.972	41.31	O.K
435	28.53	10.0	130.0	90.57	45.29	필요없음	40	0.000	3.972	41.31	O.K

* 배근된 전단철근

16	-	2	LEG	@	40

Used Av = H16 ×2 ea/m = 3.972 ㎠ (간격 s = 40.0 cm) (øs = 0.80)

øs·Vs = øs·Av·fy·D / (s ×1000) = 41.309 tf

øs·Vn = øs·Vc + øs·Vs = 90.57 + 41.309 = 131.880 tf

* 현장 타설 기초 슬래브 배력 철근량 검토 (1.1 일반사항 참조)

A. 도로교설계기준 4.7 바닥판 적용시.

= 0.307 * 47.59 = 14.62 ㎠

(As,req = 36.42 ㎠ 가 최대,절점 418번)

B. P.A.B 본체의 수축 및 온도 철근

$A_s = \rho * b * d$ 0.002 * 100 * 140

= 28.00 ㎠

배근된 배력 철근 : H19 @ 150(2단) = 38.2 ㎠

(7) 기초 우각부 검토 (402, 436 번 절점)

① 외측 인장 검토

콘크리트 기준강도 fck = 270 kg/cm^2

콘크리트 허용인장응력 fta = 1.06 √fck

= 17.42 kg/cm^2

철근항복강도 fy = 4000 kg/cm^2

철근허용응력 fsa = 1800 kg/cm^2

설계단면력 : 사용하중 모멘트 Mo= 27.49 t.m

구조물단면 : 슬라브 두께 A = 140.0 cm 벽 두 께 B = 85.0 cm

헌치수직거리 C = 0.0 cm 수평거리 D = 0.0 cm

사용철근 : 2 - D19@125 (Ag = 45.84 cm^2)

a = B = 85.0 cm b = A = 140.0 cm

R = √(a²+ b²) = 163.8 cm

최대인장응력 σmax = 5*Mo/(R²*B) = 5.12 kg/cm^2 < σta ... 철근보강 필요없음

② 내측 인장 검토 (절점 403, 435번) (참고도서 : 구조물 설계 기준 - 교량편 , P.4-26)

* 435번 절점에서 내측인장을 발생시키는 모멘트가 15.76 t-m (COMB.10) 가 발생하며,
해석에 필요한 단면은 불리한 경우인 벽체를 기준으로 해석함.

Ast = T / Fsa , T = √2 x Th

Ast = 스트럽 필요 단면적

T = 대각선 방향의 인장응력의 합력 (kgf)

Th = 수평 부재 또는 연직부재에 작용하는 인장으력의 합력 (kgf)

Th = fs x As

fs = M / (As (d - x/3)) M : 수평 또는 연직 부재에 발생한 모멘트 (tf - m)

x = k d

k = -np + √{(np)^2 + 2np}

p = As / (bd)

As = H22 - 8EA = 30.97 ㎠

d = 85 - 10 = 75 cm

b = 100 cm

p = 30.97 / (100 x 75) = 0.00413

n = Es / Ec = 2000000 / 246475 = 8.11 = 8 (가장 가까운 정수 적용)

k = -np + √{(np)^2 + 2np} = 8 x 0.00413 + √ {(8 x 0.00413)^2 + 2 x 8 x 0.00413} = 0.2922

x = k d = 0.2922 x 75 = 21.915

fs = M / (As (d - x/3)) = 15.76 x 10^5 / (30.97 (75 - 21.915/3)) = 751.724 kg/㎠

Th = fs x As = 751.724 x 30.97 = 23280.89 kgf

T = √2 x Th = √2 x 19927.65 = 32924.15 kgf

Ast = T / fsa = 31963.05 / 1500 = 21.95 ㎠

∴ 사용 스트럽 H19 - 8EA = 22.92 ㎠

(8) 기초 슬래브 피로 검토

① 기초 슬래브에 작용하는 활하중에 의한 피로 검토

* 피로에 대한 안전성을 검토 할 경우, 충격을 포함한 사용 활하중에 의한 철근의 응력 범위가 피로를 고려하지 않아도 되는 철근의 응력 범위 이내에 들면 피로에 대하여 검토 할 필요가 없다.

(콘크리트 구조 설계 기준 4.4.2 (1) 참조)

* 피로를 고려하지 않아도 되는 철근의 인장 및 압축 범위

SD 40 (1500 kg/㎠)

	기초슬래브	단위
$f_{s,max}$	194	kg/㎠
$f_{s,min}$	223	kg/㎠
Δf	-29	kg/㎠
검토 여부	필요없음	

(콘크리트 구조 설계 기준 4.4.2 '피로에 대한 검토' 참조)

기초 슬래브에 작용하는 활하중에 의한 모멘트의 변화량이 가장 많은 418번 절점을 기준으로 검토함.

Mcomb7. =	11.99 ton-m/m	Mcomb8. =	13.77 ton-m/m

- 인장 철근의 제원

A_s =	51.39 ㎠,	d =	130.00 cm	b =	100 cm
ρ = A_s / (b * d)	=	0.0040	n = E_s / E_c	=	8

$k = -n\cdot\rho+\sqrt{((n\cdot\rho)^2 + 2\cdot n\cdot\rho)}$ = 0.222

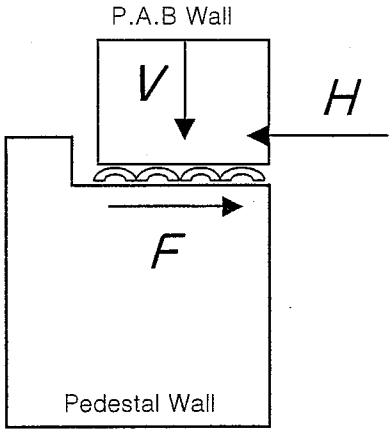
$j = 1 - k / 3$ = 0.926

$$f_{s.max} = \frac{M_{max}}{A_s * d * j} = 194 \text{ kg/㎠}$$

$$f_{s.min} = \frac{M_{min}}{A_s * d * j} = 223 \text{ kg/㎠}$$

4.3 P.A.B 벽체 연결부 검토

① P.A.B & 현장 타설 벽체 연결부 SLIDING검토



마찰 계수 = 0.6

		Max		S.F
		연직력	수평력	
설치시		14.40	4.59	1.88
완성시	COMB. 7	80.49	10.96	4.41
	COMB. 8	80.49	10.96	4.41
	COMB. 9	80.49	20.29	2.38
	COMB. 10	80.49	20.29	2.38
	COMB. 11	63.82	13.58	2.82
	COMB. 12	63.82	13.58	2.82

* 5. SAP2000 OUTPUT 참조

P.A.B 벽체로 부터 전달되는 수평력에 비해 마찰력이 커 SLIDING에 안전함!

② P.A.B & 현장 타설 벽체 연결부 전단마찰 검토

f_{ck} = 270 kg/㎠

f_y = 4000 kg/㎠

수평력	마찰저항력
$H_u' = H_u / 0.8$	$F = \mu \cdot V$
(t/m)	(t/m)
25.36	48.29

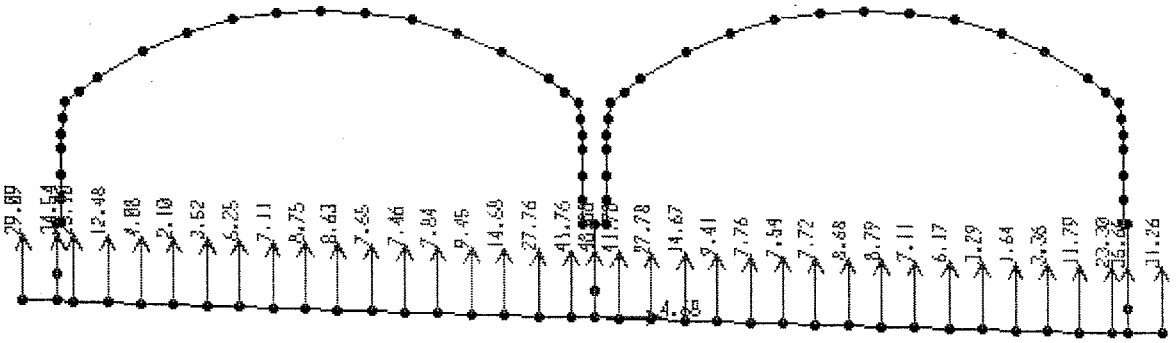
Φ_v = 0.8

마찰계수 = 0.6

$\mu = 1.0 \cdot \lambda$, $\lambda = 1.0$

∴ 마찰저항력 > 수평력 이므로 전단마찰 철근 필요 없음.

4.4 지지력 검토



COMB 10. Spring force

기초 저면에서의 최대반력은 COMB.10 (활하중 고려시)에서 중앙부 벽체 하면에서 약 48.88 ton/㎡의 결과를 보이고 있음.

(q max = 48.88 tonf/㎡ < qa = 85 tonf/㎡) ∴ O.K

* 허용지지력은 "암반에 지지되는 직접기초의 허용지지력" 참조

4.5 부력에 대한 안정성 검토

1) 조건

기초저면의 깊이(지표로 부터) : 12.145 m
지하수위(지표하 m) : 2.000 m
기초의 저판 폭 : 30.500 m (부력의 작용폭 - 부력방지용 Key 길이 포함)
기초의 저판 두께 : 1.400 m
흙과흙의마찰력 고려깊이 : 10.745 m
포장두께 t = 0.08 m 포장 폭 : B= 11.280
기초저판의 부력방지용 Key 길이 : 0.5 m

2) 단위중량

γt = 1.9 φ = 30
γsub = 0.9
γcon = 2.5
γascon = 2.3

3) 하중계산

PAB자중 :	2.5 x 11.400 x 2 ea	=	57.000
연직토압 :	1.9 x 59.000 + 0.9 x 56.341	=	162.807
	1.9 x 2.000 + 0.9 x 8.745 (기초저판 Key 상단)	=	11.671
기초중량:	2.5 x 47.850 + 1.750 (기초저판 Key)	=	121.375
흙의마찰력:	Ka = tan^2(45-φ/2) = 0.333		
	Pf = 1/2 * Ka * γsub * H^2 * tanδ * 2ea		
	= 0.5 x 0.333 x 0.9 x 10.745 ^2 x tan φ x 2 ea	=	19.965
벽면 마찰력 :	= 0.5 x 0.333 x 0.9 x 1.400 ^2 x tan(φ*2/3) x 2 ea	=	0.214
Ascon :	11.280 x 0.08 x 2.3 x 2 ea	=	4.151
부가하중 :		=	0.000
		Σ W =	377.183

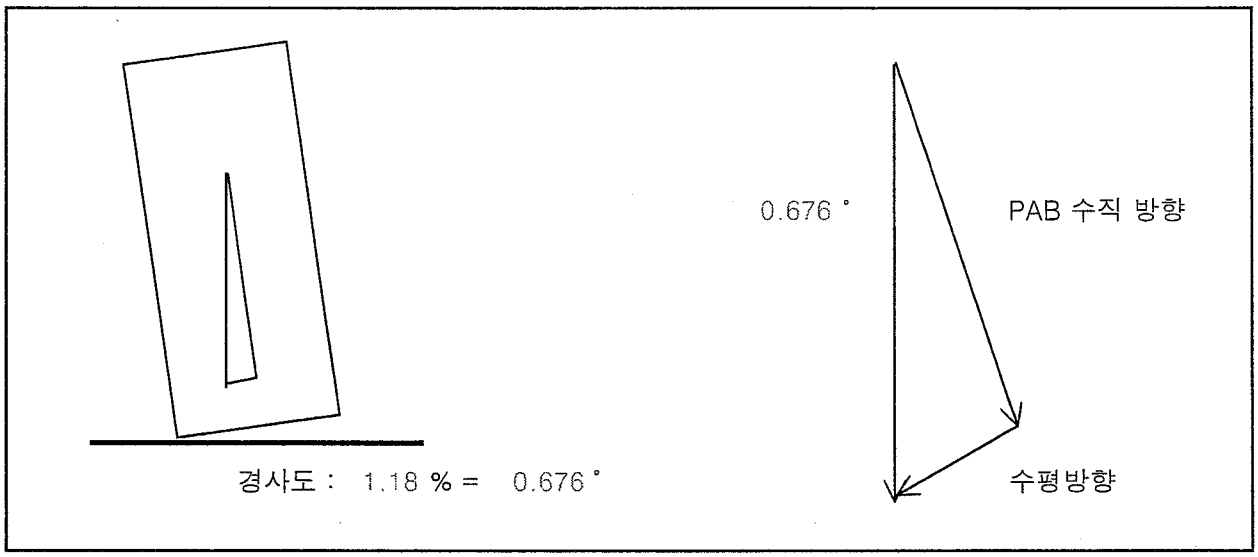
4) 부력

부력 : U = 1 x 10.145 x 30.500 = 309.423

5) 안정성 검토

안전율 : FS = W / U = 377.183 / 309.423 = 1.219 > 1.2 O.K !

4.6 가설시 전도에 대한 안정성 검토



$\Theta = \tan^{-1}(1.1792) = 0.6756\ °$

수직분력 = Weight * cos(Θ)

수평분력 = Weight * sin(Θ)

Mo = 11.4 x 1.5 x 2.5 x cos(0.6756) = 42.75 ton

Mr = 11.4 x 1.5 x 2.5 x sin(0.6756) = 0.50 ton

S.F = 42.75 / 0.50 = 85.5 ∴ 가설시 전도에 대해 안정함.

* 시공완료 후에는 마감벽과 현장 타설 벽체 및 PAB가 일체로 연결되어 토압을 지지하므로 전도가 발생하지 않음.

5. SAP2000 OUTPUT

	COMB1			COMB2		
	P	V	M	P	V	M
1	-117.86	11.78	0.00	-117.85	31.38	0.00
2	-116.79	20.85	10.69	-116.79	34.85	21.64
3	-115.73	29.25	27.11	-115.73	38.06	45.50
4	-114.67	36.94	48.76	-114.67	41.00	71.33
5	-115.77	36.20	63.21	-115.83	37.39	86.89
6	-110.79	30.84	75.19	-110.56	29.28	98.78
7	-103.11	45.90	89.23	-102.55	48.38	111.64
8	-97.19	39.50	70.46	-92.00	43.38	91.39
9	-94.36	38.75	51.20	-86.69	43.54	69.45
10	-89.45	25.78	13.99	-75.56	32.18	23.21
11	-88.16	17.42	6.94	-68.46	23.45	7.57
12	-89.67	11.88	18.40	-64.63	16.13	27.41
13	-93.32	8.41	24.07	-63.49	9.84	38.69
14	-98.74	4.68	26.30	-64.60	3.06	42.76
15	-93.32	8.42	24.07	-63.49	9.85	38.68
16	-89.67	11.89	18.38	-64.63	16.14	27.39
17	-88.16	17.43	6.91	-68.46	23.46	7.53
18	-89.45	25.79	14.03	-75.56	32.19	23.27
19	-94.16	38.75	51.29	-86.44	43.55	69.55
20	-97.56	40.31	71.18	-92.44	44.14	92.12
21	-104.32	44.95	89.35	-103.61	47.47	111.78
22	-109.89	33.42	76.83	-109.71	31.87	100.43
23	-115.62	36.74	63.43	-115.67	37.93	87.12
24	-114.68	36.94	48.75	-114.68	41.00	71.32
25	-115.74	29.24	27.11	-115.75	38.06	45.50
26	-116.81	20.85	10.69	-116.81	34.85	21.64
27	-117.88	11.78	0.00	-117.88	31.38	0.00
28	-117.88	11.85	0.00	-117.88	31.28	0.00
29	-116.82	20.92	10.74	-116.82	34.75	21.57
30	-115.76	29.31	27.20	-115.76	37.96	45.36
31	-114.69	37.01	48.89	-114.70	40.90	71.12
32	-115.63	36.81	63.60	-115.67	37.83	86.87
33	-109.91	33.49	77.03	-109.71	31.77	100.13
34	-104.34	44.92	89.58	-103.60	47.54	111.44
35	-97.62	35.95	71.44	-92.37	40.12	91.77
36	-94.22	15.30	14.40	-86.37	23.49	22.84
37	-89.52	6.46	6.51	-75.48	15.09	8.01
38	-88.23	1.10	17.97	-68.37	8.47	27.92
39	-89.74	2.45	23.65	-64.53	2.51	39.25
40	-93.39	4.66	25.90	-63.39	3.04	43.34
41	-98.81	8.39	23.69	-64.50	9.83	39.29
42	-93.39	11.86	18.05	-63.38	16.14	28.00
43	-89.73	17.39	6.62	-64.52	23.46	8.13
44	-88.22	25.74	14.27	-68.36	32.21	22.70
45	-89.51	38.70	51.45	-75.46	43.58	69.03
46	-94.42	38.70	51.45	-86.60	43.58	69.03
47	-97.24	39.45	70.69	-91.91	43.43	91.01
48	-103.11	45.85	89.47	-102.52	48.44	111.32

49	-110.79	30.91	75.39	-110.53	29.18	98.49
50	-115.77	36.28	63.38	-115.81	37.29	86.64
51	-114.66	37.01	48.90	-114.66	40.90	71.12
52	-115.72	29.32	27.20	-115.72	37.96	45.36
53	-116.78	20.92	10.74	-116.78	34.75	21.57
54	-117.84	11.85	0.00	-117.84	31.28	0.00
101	-117.86	11.78	8.84	-117.85	31.38	8.84
102	-121.65	9.54	6.96	-121.65	23.23	28.79
301	-117.84	11.85	8.84	-117.84	31.28	8.84
302	-124.08	24.85	21.97	-124.08	17.25	46.57
401	0.00	26.53	0.00	0.00	43.72	0.00
402	-23.54	56.52	36.43	17.50	39.51	38.49
403	-22.54	58.11	16.36	18.47	35.97	20.07
404	-21.89	27.83	6.46	18.86	10.51	24.17
405	-21.66	6.70	10.60	18.89	11.08	16.66
406	-21.63	6.02	8.00	18.79	8.02	8.64
407	-21.66	4.94	4.46	18.71	5.02	3.33
408	-21.70	3.62	1.86	18.65	3.18	0.68
409	-21.73	2.70	0.44	18.62	2.22	0.35
410	-21.75	1.98	0.16	18.60	1.79	0.54
411	-21.77	2.04	0.14	18.58	2.30	0.28
412	-21.81	2.86	0.61	18.54	3.01	0.60
413	-21.88	4.26	2.60	18.48	4.27	2.60
414	-21.94	6.27	6.36	18.42	6.28	6.37
415	-21.89	8.10	11.75	18.47	8.20	11.84
416	-21.59	7.38	16.25	18.77	7.36	16.26
417	-20.66	37.75	11.50	19.70	37.68	11.54
418	-19.14	91.41	20.11	21.22	91.42	20.01
419	-40.42	89.82	51.85	9.59	89.98	51.97
420	-38.69	91.29	20.01	11.33	91.57	20.17
421	-37.76	37.64	11.50	12.26	37.81	11.49
422	-37.47	7.36	16.23	12.55	7.41	16.27
423	-37.39	8.25	11.84	12.63	8.12	11.80
424	-37.47	6.28	6.32	12.55	6.28	6.40
425	-37.54	4.20	2.55	12.49	4.31	2.63
426	-37.57	2.83	0.62	12.45	3.03	0.59
427	-37.60	1.89	0.10	12.43	2.38	0.31
428	-37.63	2.13	0.00	12.42	1.87	0.63
429	-37.66 -	2.87	0.76	12.39 -	2.15	0.51
430	-37.69	3.89	2.42	12.33	3.07	0.43
431	-37.70	4.98	5.05	12.23	5.08	3.14
432	-37.62	5.41	8.05	12.10	8.46	8.84
433	-37.30	12.10	8.54	12.09	12.46	18.07
434	-36.52	37.30	0.39	12.43	13.28	28.04
435	-35.55	69.12	31.57	13.33	31.76	27.75
436	0.00	67.53	55.49	0.00	43.40	42.09
437	0.00	20.65	0.00	0.00	47.61	0.00

	COMB3			COMB4		
	P	V	M	P	V	M
1	-109.48	4.70	0.00	-108.53	15.60	0.00
2	-108.42	15.72	6.71	-107.47	23.28	12.73
3	-107.35	25.86	20.36	-106.41	30.28	30.28
4	-106.29	35.11	40.31	-105.35	36.59	52.15
5	-107.24	35.68	54.35	-106.28	35.40	66.45
6	-104.77	31.60	66.58	-103.53	29.66	78.21
7	-99.27	42.38	81.03	-97.81	43.91	91.50
8	-95.60	36.53	63.72	-90.77	38.95	73.26
9	-93.16	36.34	45.94	-86.66	39.23	53.79
10	-88.43	24.61	11.09	-77.64	28.49	13.28
11	-86.62	16.90	8.89	-71.69	20.45	12.85
12	-87.25	11.53	20.01	-68.39	13.75	29.04
13	-89.85	7.83	25.37	-67.37	7.96	37.44
14	-94.09	5.26	26.90	-68.33	4.98	39.21
15	-90.11	9.44	23.43	-67.94	11.45	33.23
16	-87.70	13.11	16.14	-69.37	17.20	20.62
17	-87.26	18.44	3.09	-73.08	23.80	0.22
18	-89.23	26.08	18.83	-79.40	31.70	30.13
19	-93.91	37.72	55.65	-88.49	42.25	74.88
20	-96.95	38.62	74.78	-93.34	42.53	96.57
21	-102.09	42.70	92.08	-102.37	45.75	115.46
22	-105.21	34.60	79.03	-106.01	33.27	103.52
23	-108.08	37.68	65.05	-109.09	39.17	89.53
24	-107.12	37.56	49.97	-108.06	41.96	73.21
25	-108.18	29.87	27.92	-109.12	39.02	46.75
26	-109.24	21.47	11.10	-110.19	35.81	22.27
27	-111.38	12.40	0.00	-112.32	32.34	0.00
28	-111.38	13.64	0.00	-112.32	33.46	0.00
29	-110.32	22.72	11.91	-111.26	36.93	23.00
30	-109.25	31.11	29.55	-110.20	40.14	48.21
31	-108.19	38.80	52.41	-109.14	43.08	75.40
32	-104.24	39.09	68.05	-105.24	40.45	92.22
33	-101.74	36.26	82.76	-102.52	34.81	106.88
34	-103.33	42.74	96.41	-103.58	45.87	119.38
35	-98.57	34.37	79.12	-94.86	38.52	100.45
36	-95.52	15.91	22.79	-90.00	22.81	33.51
37	-90.83	8.07	0.28	-80.88	15.31	2.50
38	-88.82	3.22	13.58	-74.52	9.60	18.75
39	-89.19	0.22	21.87	-70.73	4.42	32.39
40	-91.50	2.68	26.52	-69.22	0.51	39.56
41	-95.46	6.74	26.30	-69.66	6.87	39.09
42	-90.90	10.30	22.44	-68.31	12.55	32.16
43	-88.15	16.95	12.42	-69.17	20.53	17.03
44	-87.53	25.99	8.75	-72.47	29.93	10.36
45	-89.49	37.61	45.41	-78.59	40.57	52.76
46	-94.35	37.61	45.41	-87.75	40.57	52.76
47	-96.82	37.69	63.85	-91.89	40.18	72.94
48	-100.92	43.50	81.69	-99.45	45.11	91.75
49	-106.42	31.64	67.22	-105.16	29.57	78.49

50	-108.88	35.88	54.98	-107.92	35.47	66.77
51	-107.93	35.39	40.85	-106.98	36.74	52.44
52	-108.99	26.14	20.72	-108.04	30.43	30.47
53	-110.05	15.99	6.89	-109.10	23.42	12.83
54	-111.11	4.98	0.00	-110.17	15.75	0.00
101	-109.48	4.70	8.21	-108.53	15.60	8.14
102	-113.27	21.32	19.18	-112.33	2.74	1.03
301	-111.11	4.98	8.33	-110.17	15.75	8.26
302	-117.35	39.91	45.80	-116.41	16.03	7.05
401	0.00	49.93	0.00	0.00	56.08	0.00
402	-37.99	57.40	85.29	-14.97	63.55	56.26
403	-37.90	50.08	67.26	-14.88	46.87	39.35
404	-37.63	42.96	26.18	-14.61	39.72	1.11
405	-37.46	35.76	8.63	-14.44	32.52	30.83
406	-37.21	28.53	37.00	-14.19	25.29	56.36
407	-37.02	21.28	59.00	-14.00	18.04	75.50
408	-36.78	13.99	74.55	-13.76	10.76	88.21
409	-36.57	6.67	83.69	-13.55	3.43	94.48
410	-36.35	0.72	86.30	-13.33	3.93	94.26
411	-36.12	8.09	82.45	-13.10	11.31	87.54
412	-35.91	15.51	72.01	-12.90	18.72	74.27
413	-35.67	22.95	55.06	-12.65	26.16	54.46
414	-35.37	30.49	31.50	-12.34	33.65	28.05
415	-35.34	38.00	1.21	-12.33	41.16	5.03
416	-35.03	45.41	35.51	-12.01	48.65	44.65
417	-34.75	53.01	78.96	-11.73	56.22	90.97
418	-33.89	84.95	129.20	-10.87	88.24	144.05
419	-58.36	87.97	159.48	-29.98	91.26	175.49
420	-57.54	84.24	126.84	-29.32	83.33	144.75
421	-57.25	53.42	76.25	-29.02	57.84	90.23
422	-56.92	45.85	32.46	-28.68	50.21	42.53
423	-56.92	38.13	4.64	-28.71	42.48	1.59
424	-56.60	30.17	34.65	-28.38	34.62	32.41
425	-56.34	22.45	57.87	-28.11	26.87	59.56
426	-56.12	14.63	74.25	-27.90	19.05	79.84
427	-55.87	6.78	83.67	-27.65	11.19	93.19
428	-55.64	1.16	86.18	-27.42	3.31	99.60
429	-55.41	9.07	81.66	-27.18	4.63	99.01
430	-55.16	17.02	70.18	-26.93	12.57	91.43
431	-54.94	24.99	51.63	-26.71	20.54	76.81
432	-54.67	32.99	26.07	-26.45	28.54	55.16
433	-54.47	41.02	6.61	-26.24	36.57	26.40
434	-54.18	49.09	46.40	-25.95	44.64	9.49
435	-53.93	57.18	93.34	-25.71	52.73	52.49
436	0.00	60.40	113.92	0.00	62.48	71.52
437	0.00	38.89	0.00	0.00	53.97	0.00

	COMB5			COMB6		
	P	V	M	P	V	M
1	-130.59	17.35	0.00	-130.59	36.95	0.00
2	-129.53	26.42	14.33	-129.53	40.42	25.27
3	-128.47	34.81	34.39	-128.47	43.63	52.77
4	-127.41	42.51	59.67	-127.40	46.57	82.24
5	-128.76	41.17	76.24	-128.81	42.35	99.92
6	-123.53	34.66	89.83	-123.30	33.10	113.42
7	-115.20	51.50	105.50	-114.63	53.98	127.91
8	-108.16	44.84	84.30	-102.97	48.73	105.23
9	-104.68	44.45	62.24	-97.00	49.24	80.49
10	-98.14	30.63	18.39	-84.25	37.03	27.61
11	-95.53	21.30	7.69	-75.82	27.33	8.32
12	-96.06	14.66	22.86	-71.02	18.92	31.87
13	-99.11	10.00	30.79	-69.28	11.43	45.41
14	-104.30	4.94	33.82	-70.16	3.33	50.27
15	-99.11	10.01	30.78	-69.28	11.44	45.40
16	-96.06	14.67	22.84	-71.02	18.93	31.84
17	-95.53	21.31	7.66	-75.83	27.34	8.28
18	-98.14	30.63	18.44	-84.25	37.04	27.67
19	-104.43	44.45	62.34	-96.72	49.25	80.60
20	-108.58	45.74	85.12	-103.46	49.57	106.06
21	-116.53	50.44	105.63	-115.82	52.95	128.05
22	-122.53	37.54	91.66	-122.35	35.99	115.26
23	-128.58	41.77	76.49	-128.63	42.96	100.17
24	-127.42	42.50	59.66	-127.42	46.57	82.23
25	-128.48	34.81	34.38	-128.48	43.63	52.77
26	-129.55	26.42	14.32	-129.55	40.42	25.27
27	-130.62	17.34	0.00	-130.62	36.95	0.00
28	-130.62	17.39	0.00	-130.62	36.82	0.00
29	-129.56	26.46	14.35	-129.56	40.29	25.19
30	-128.49	34.85	34.44	-128.50	43.50	52.60
31	-127.43	42.55	59.75	-127.43	46.44	81.98
32	-128.59	41.81	76.59	-128.64	42.83	99.86
33	-122.55	37.58	91.78	-122.34	35.86	114.89
34	-116.55	50.42	105.77	-115.81	53.04	127.63
35	-108.63	40.92	85.28	-103.37	45.09	105.61
36	-104.47	19.16	18.68	-96.62	27.35	27.12
37	-98.19	9.46	7.39	-84.14	18.09	8.89
38	-95.57	3.13	22.57	-75.71	10.50	32.52
39	-96.11	1.52	30.52	-70.90	3.44	46.12
40	-99.16	4.92	33.57	-69.16	3.30	51.01
41	-104.35	9.99	30.56	-70.03	11.42	46.16
42	-99.15	14.65	22.65	-69.15	18.93	32.60
43	-96.10	21.28	7.51	-70.89	27.36	9.02
44	-95.56	30.60	18.54	-75.70	37.07	26.97
45	-98.17	44.41	62.38	-84.13	49.29	79.96
46	-104.70	44.41	62.38	-96.89	49.29	79.96
47	-108.18	44.81	84.45	-102.86	48.80	104.77
48	-115.19	51.46	105.65	-114.60	54.05	127.50
49	-123.53	34.70	89.96	-123.27	32.97	113.06

50	-128.75	41.21	76.34	-128.79	42.23	99.61
51	-127.39	42.55	59.75	-127.39	46.44	81.98
52	-128.46	34.86	34.44	-128.45	43.50	52.60
53	-129.52	26.46	14.35	-129.52	40.29	25.19
54	-130.58	17.39	0.00	-130.58	36.82	0.00
101	-130.59	17.35	9.79	-130.59	36.95	9.79
102	-134.38	3.98	0.27	-134.38	28.80	35.47
301	-130.58	17.39	9.79	-130.58	36.82	9.79
302	-136.82	19.31	10.41	-136.82	22.79	58.12
401	0.00	32.53	0.00	0.00	49.72	0.00
402	-18.01	57.91	31.23	23.03	45.51	44.05
403	-16.92	59.50	10.67	24.09	37.36	25.76
404	-16.25	26.19	10.69	24.49	12.71	28.41
405	-16.04	6.50	12.89	24.51	12.63	18.95
406	-16.04	6.84	8.92	24.38	8.83	9.56
407	-16.08	5.26	4.66	24.28	5.33	3.53
408	-16.13	3.69	1.78	24.22	3.25	0.60
409	-16.16	2.67	0.30	24.19	2.20	0.50
410	-16.18	1.92	0.29	24.17	1.82	0.67
411	-16.21	2.10	0.21	24.15	2.36	0.36
412	-16.25	2.98	0.64	24.11	3.13	0.63
413	-16.32	4.49	2.84	24.04	4.51	2.84
414	-16.40	6.71	6.99	23.97	6.72	7.00
415	-16.34	8.75	12.95	24.02	8.85	13.05
416	-16.01	7.93	17.90	24.35	7.91	17.92
417	-14.97	41.43	12.67	25.38	41.36	12.70
418	-13.30	100.71	22.19	27.06	100.72	22.09
419	-35.17	99.11	57.19	14.85	99.32	57.37
420	-33.26	100.63	22.13	16.76	100.91	22.30
421	-32.23	41.35	12.66	17.79	41.53	12.65
422	-31.91	7.92	17.88	18.11	7.98	17.92
423	-31.83	8.87	13.03	18.19	8.74	12.99
424	-31.91	6.72	6.96	18.11	6.73	7.04
425	-31.99	4.44	2.80	18.04	4.58	2.87
426	-32.03	2.95	0.65	18.00	3.19	0.60
427	-32.06	1.97	0.18	17.98	2.53	0.45
428	-32.08	2.04	0.15	17.96	1.97	0.91
429	-32.11	2.81	0.56	17.93	2.05	0.87
430	-32.16	3.92	2.24	17.85	3.17	0.16
431	-32.19	5.30	5.15	17.73	5.79	3.50
432	-32.14	6.35	8.99	17.60	9.81	10.38
433	-31.86	8.90	11.25	17.54	13.83	20.82
434	-31.08	33.96	5.16	17.87	16.31	33.47
435	-30.02	68.64	23.07	18.86	31.20	36.16
436	0.00	67.05	46.83	0.00	50.66	48.81
437	0.00	27.85	0.00	0.00	54.87	0.00

	COMB7			COMB8		
	P	V	M	P	V	M
1	-80.49	10.96	0.00	-80.49	10.96	0.00
2	-79.67	16.29	8.92	-79.67	16.29	8.92
3	-78.86	21.23	21.21	-78.86	21.23	21.21
4	-78.04	25.76	36.57	-78.04	25.76	36.57
5	-78.74	24.83	46.58	-78.74	24.83	46.58
6	-75.33	20.77	54.73	-75.33	20.77	54.73
7	-70.06	31.58	64.11	-70.06	31.58	64.11
8	-65.35	27.43	51.13	-65.35	27.43	51.13
9	-63.07	27.07	37.64	-63.07	27.07	37.64
10	-58.82	18.52	10.97	-58.82	18.52	10.97
11	-57.08	12.80	4.79	-57.08	12.80	4.79
12	-57.30	8.76	13.89	-57.30	8.76	13.89
13	-59.06	5.96	18.63	-59.06	5.96	18.63
14	-62.11	2.94	20.43	-62.11	2.94	20.43
15	-59.06	5.96	18.62	-59.06	5.96	18.62
16	-57.30	8.76	13.88	-57.30	8.76	13.88
17	-57.08	12.80	4.77	-57.08	12.80	4.77
18	-58.82	18.53	10.99	-58.82	18.53	10.99
19	-62.92	27.07	37.70	-62.92	27.07	37.70
20	-65.62	27.97	51.62	-65.62	27.97	51.62
21	-70.86	30.94	64.20	-70.86	30.94	64.20
22	-74.73	22.53	55.84	-74.73	22.53	55.84
23	-78.63	25.20	46.73	-78.63	25.20	46.73
24	-78.05	25.76	36.57	-78.05	25.76	36.57
25	-78.86	21.23	21.21	-78.86	21.23	21.21
26	-79.68	16.29	8.92	-79.68	16.29	8.92
27	-80.51	10.95	0.00	-80.51	10.95	0.00
28	-80.51	10.98	0.00	-80.51	10.98	0.00
29	-79.69	16.31	8.93	-79.69	16.31	8.93
30	-78.87	21.25	21.24	-78.87	21.25	21.24
31	-78.06	25.78	36.61	-78.06	25.78	36.61
32	-78.64	25.22	46.79	-78.64	25.22	46.79
33	-74.74	22.55	55.90	-74.74	22.55	55.90
34	-70.87	30.93	64.26	-70.87	30.93	64.26
35	-65.64	25.06	51.71	-65.64	25.06	51.71
36	-62.94	11.65	11.13	-62.94	11.65	11.13
37	-58.85	5.72	4.63	-58.85	5.72	4.63
38	-57.11	1.89	13.74	-57.11	1.89	13.74
39	-57.33	0.90	18.49	-57.33	0.90	18.49
40	-59.09	2.93	20.31	-59.09	2.93	20.31
41	-62.13	5.95	18.52	-62.13	5.95	18.52
42	-59.08	8.75	13.79	-59.08	8.75	13.79
43	-57.32	12.78	4.71	-57.32	12.78	4.71
44	-57.10	18.51	11.03	-57.10	18.51	11.03
45	-58.84	27.05	37.71	-58.84	27.05	37.71
46	-63.08	27.05	37.71	-63.08	27.05	37.71
47	-65.37	27.41	51.20	-65.37	27.41	51.20
48	-70.06	31.56	64.19	-70.06	31.56	64.19
49	-75.33	20.79	54.79	-75.33	20.79	54.79

50	-78.73	24.85	46.63	-78.73	24.85	46.63
51	-78.03	25.78	36.62	-78.03	25.78	36.62
52	-78.85	21.25	21.24	-78.85	21.25	21.24
53	-79.66	16.31	8.93	-79.66	16.31	8.93
54	-80.48	10.98	0.00	-80.48	10.98	0.00
101	-80.49	10.96	6.04	-80.49	10.96	6.04
102	-83.41	1.59	0.60	-83.41	1.59	0.60
301	-80.48	10.98	6.04	-80.48	10.98	6.04
302	-85.28	10.61	4.71	-85.28	10.61	4.71
401	0.00	20.99	0.00	0.00	20.91	0.00
402	-9.88	35.44	18.34	-9.89	35.64	18.25
403	-9.20	36.66	5.71	-9.21	36.86	5.55
404	-8.79	16.09	7.13	-8.80	16.41	7.58
405	-8.66	4.49	8.22	-8.67	4.22	9.04
406	-8.66	4.60	5.62	-8.65	5.21	6.69
407	-8.69	3.57	2.92	-8.60	6.54	3.45
408	-8.72	2.58	1.13	-8.79	6.15	0.33
409	-8.74	1.95	0.21	-8.67	4.38	0.73
410	-8.76	1.48	0.15	-8.79	8.31	1.46
411	-8.77	1.61	0.09	-8.62	5.82	0.40
412	-8.80	2.15	0.44	-8.78	6.87	1.58
413	-8.84	3.09	1.81	-8.64	5.08	2.30
414	-8.89	4.47	4.39	-8.79	7.61	4.14
415	-8.85	5.74	8.11	-8.88	12.44	7.69
416	-8.65	5.23	11.18	-8.55	8.59	11.73
417	-8.00	26.08	7.92	-8.08	23.67	7.58
418	-6.96	62.89	13.77	-6.98	62.29	11.99
419	-20.04	61.67	35.59	-20.02	61.06	33.59
420	-18.84	62.85	13.74	-18.77	62.24	11.97
421	-18.21	26.04	7.92	-18.02	23.63	7.56
422	-18.01	5.23	11.17	-17.98	8.60	11.71
423	-17.95	5.81	8.15	-17.74	12.40	7.77
424	-18.01	4.48	4.38	-17.92	7.41	4.26
425	-18.05	3.06	1.79	-18.08	5.28	2.12
426	-18.08	2.14	0.45	-17.94	6.80	1.52
427	-18.10	1.54	0.08	-18.06	5.89	0.39
428	-18.11	1.55	0.07	-17.89	8.23	1.37
429	-18.13	2.03	0.35	-18.07	4.46	0.88
430	-18.16	2.72	1.39	-17.96	6.11	0.05
431	-18.18	3.61	3.21	-18.20	6.57	3.74
432	-18.15	4.35	5.69	-18.15	4.96	6.76
433	-17.99	5.23	7.36	-17.98	5.66	8.18
434	-17.52	20.50	4.10	-17.51	20.82	4.54
435	-16.86	41.96	12.65	-16.85	42.16	12.49
436	0.00	40.74	27.13	0.00	40.94	27.04
437	0.00	18.50	0.00	0.00	18.42	0.00

	COMB9			COMB10		
	P	V	M	P	V	M
1	-80.49	20.29	0.00	-80.49	20.29	0.00
2	-79.67	22.96	14.13	-79.67	22.96	14.13
3	-78.86	25.43	29.97	-78.86	25.43	29.97
4	-78.04	27.69	47.32	-78.04	27.69	47.32
5	-78.76	25.39	57.86	-78.76	25.39	57.86
6	-75.22	20.03	65.96	-75.22	20.03	65.96
7	-69.79	32.76	74.79	-69.79	32.76	74.79
8	-62.88	29.28	61.09	-62.88	29.28	61.09
9	-59.42	29.35	46.33	-59.42	29.35	46.33
10	-52.21	21.57	15.36	-52.21	21.57	15.36
11	-47.70	15.67	5.09	-47.70	15.67	5.09
12	-45.38	10.79	18.18	-45.38	10.79	18.18
13	-44.86	6.64	25.59	-44.86	6.64	25.59
14	-45.85	2.17	28.27	-45.85	2.17	28.27
15	-44.86	6.64	25.58	-44.86	6.64	25.58
16	-45.38	10.79	18.17	-45.38	10.79	18.17
17	-47.70	15.67	5.07	-47.70	15.67	5.07
18	-52.21	21.58	15.39	-52.21	21.58	15.39
19	-59.25	29.35	46.40	-59.25	29.35	46.40
20	-63.18	29.79	61.60	-63.18	29.79	61.60
21	-70.52	32.14	74.88	-70.52	32.14	74.88
22	-74.65	21.79	67.08	-74.65	21.79	67.08
23	-78.65	25.76	58.01	-78.65	25.76	58.01
24	-78.05	27.69	47.32	-78.05	27.69	47.32
25	-78.86	25.43	29.96	-78.86	25.43	29.96
26	-79.68	22.96	14.13	-79.68	22.96	14.13
27	-80.51	20.29	0.00	-80.51	20.29	0.00
28	-80.51	20.23	0.00	-80.51	20.23	0.00
29	-79.69	22.90	14.09	-79.69	22.90	14.09
30	-78.87	25.37	29.89	-78.87	25.37	29.89
31	-78.06	27.63	47.20	-78.06	27.63	47.20
32	-78.66	25.70	57.87	-78.66	25.70	57.87
33	-74.65	21.73	66.91	-74.65	21.73	66.91
34	-70.52	32.18	74.67	-70.52	32.18	74.67
35	-63.13	27.05	61.39	-63.13	27.05	61.39
36	-59.21	15.55	15.15	-59.21	15.55	15.15
37	-52.16	9.83	5.34	-52.16	9.83	5.34
38	-47.65	5.39	18.48	-47.65	5.39	18.48
39	-45.32	1.46	25.91	-45.32	1.46	25.91
40	-44.80	2.16	28.61	-44.80	2.16	28.61
41	-45.79	6.63	25.94	-45.79	6.63	25.94
42	-44.80	10.79	18.53	-44.80	10.79	18.53
43	-45.32	15.67	5.43	-45.32	15.67	5.43
44	-47.64	21.59	15.05	-47.64	21.59	15.05
45	-52.15	29.37	46.08	-52.15	29.37	46.08
46	-59.36	29.37	46.08	-59.36	29.37	46.08
47	-62.83	29.31	60.87	-62.83	29.31	60.87
48	-69.77	32.79	74.60	-69.77	32.79	74.60
49	-75.21	19.97	65.79	-75.21	19.97	65.79

50	-78.75	25.33	57.71	-78.75	25.33	57.71
51	-78.03	27.63	47.20	-78.03	27.63	47.20
52	-78.85	25.37	29.89	-78.85	25.37	29.89
53	-79.66	22.90	14.09	-79.66	22.90	14.09
54	-80.48	20.23	0.00	-80.48	20.23	0.00
101	-80.49	20.29	6.04	-80.49	20.29	6.04
102	-83.41	14.02	17.62	-83.41	14.02	17.62
301	-80.48	20.23	6.04	-80.48	20.23	6.04
302	-85.28	9.44	27.93	-85.28	9.44	27.93
401	0.00	29.18	0.00	0.00	29.09	0.00
402	9.66	25.94	25.49	9.65	25.86	25.41
403	10.33	26.12	11.63	10.32	26.32	11.79
404	10.61	6.60	15.57	10.60	6.32	16.02
405	10.65	7.41	11.10	10.64	7.14	11.93
406	10.58	5.55	5.92	10.60	6.16	6.99
407	10.53	3.61	2.38	10.62	6.57	2.91
408	10.49	2.37	0.56	10.42	6.11	0.89
409	10.47	1.72	0.17	10.55	4.15	0.35
410	10.46	1.37	0.33	10.43	8.53	1.64
411	10.45	1.73	0.16	10.60	5.75	0.47
412	10.42	2.22	0.44	10.44	6.94	1.57
413	10.38	3.10	1.81	10.58	5.07	2.30
414	10.33	4.48	4.40	10.43	7.61	4.15
415	10.37	5.79	8.15	10.34	12.49	7.74
416	10.57	5.22	11.19	10.67	8.58	11.74
417	11.22	26.05	7.94	11.14	23.64	7.60
418	12.26	62.90	13.73	12.24	62.30	11.94
419	3.78	61.76	35.67	3.79	61.15	33.68
420	4.97	62.99	13.82	5.05	62.37	12.04
421	5.61	26.12	7.91	5.80	23.71	7.56
422	5.81	5.25	11.19	5.84	8.62	11.73
423	5.87	5.75	8.13	6.08	12.33	7.75
424	5.81	4.48	4.41	5.90	7.41	4.30
425	5.77	3.12	1.82	5.74	5.27	2.15
426	5.74	2.23	0.43	5.89	6.89	1.51
427	5.73	1.77	0.17	5.76	5.80	0.49
428	5.72	1.41	0.37	5.94	8.57	1.67
429	5.70	1.68	0.25	5.76	4.12	0.28
430	5.66	2.33	0.44	5.86	6.07	1.00
431	5.60	3.66	2.30	5.58	6.62	2.83
432	5.52	5.81	6.07	5.53	6.41	7.13
433	5.53	8.15	11.90	5.54	7.87	12.72
434	5.79	8.03	17.64	5.80	7.60	18.08
435	6.42	24.17	15.60	6.42	24.37	15.76
436	0.00	28.10	27.49	0.00	28.02	27.42
437	0.00	31.34	0.00	0.00	31.26	0.00

	COMB11			COMB12		
	P	V	M	P	V	M
1	-63.82	13.58	0.00	-63.82	13.58	0.00
2	-63.00	16.76	9.92	-63.00	16.76	9.92
3	-62.18	19.76	21.87	-62.18	19.76	21.87
4	-61.37	22.55	35.70	-61.37	22.55	35.70
5	-61.88	21.40	44.45	-61.88	21.40	44.45
6	-59.93	17.74	51.57	-59.93	17.74	51.57
7	-56.14	24.82	59.46	-56.14	24.82	59.46
8	-52.84	22.05	49.15	-52.84	22.05	49.15
9	-51.01	22.40	38.13	-51.01	22.40	38.13
10	-47.35	16.58	14.98	-47.35	16.58	14.98
11	-45.50	12.30	0.21	-45.50	12.30	0.21
12	-45.21	8.89	10.06	-45.21	8.89	10.06
13	-46.26	6.18	15.95	-46.26	6.18	15.95
14	-48.48	3.19	18.83	-48.48	3.19	18.83
15	-45.96	4.38	18.12	-45.97	4.38	18.12
16	-44.70	7.12	14.39	-44.70	7.12	14.39
17	-44.79	10.57	6.71	-44.79	10.57	6.71
18	-46.45	14.93	6.32	-46.45	14.93	6.32
19	-49.83	20.85	27.34	-49.83	20.85	27.34
20	-51.93	21.02	37.89	-51.93	21.02	37.89
21	-55.03	22.89	47.23	-55.03	22.89	47.23
22	-57.52	18.53	40.20	-57.52	18.53	40.20
23	-59.91	20.00	32.79	-59.91	20.00	32.79
24	-59.57	19.77	24.84	-59.57	19.77	24.84
25	-60.39	15.24	13.39	-60.39	15.24	13.39
26	-61.21	10.31	5.01	-61.21	10.31	5.01
27	-62.08	4.97	0.00	-62.08	4.97	0.00
28	-62.08	4.92	0.00	-62.08	4.92	0.00
29	-61.26	10.25	4.97	-61.26	10.25	4.97
30	-60.44	15.19	13.32	-60.44	15.19	13.32
31	-59.63	19.72	24.74	-59.63	19.72	24.74
32	-56.65	20.08	32.69	-56.65	20.08	32.69
33	-54.45	18.84	40.24	-54.45	18.84	40.24
34	-55.05	22.94	47.36	-55.05	22.94	47.36
35	-51.91	18.78	38.00	-51.91	18.78	38.00
36	-49.80	9.56	6.38	-49.80	9.56	6.38
37	-46.42	5.08	6.71	-46.42	5.08	6.71
38	-44.75	1.79	14.45	-44.75	1.79	14.45
39	-44.66	0.93	18.22	-44.66	0.93	18.22
40	-45.92	3.16	18.98	-45.92	3.16	18.98
41	-48.34	6.15	16.13	-48.34	6.15	16.13
42	-46.20	8.87	10.27	-46.20	8.87	10.27
43	-45.15	12.29	0.44	-45.15	12.29	0.44
44	-45.44	16.57	14.75	-45.44	16.57	14.75
45	-47.29	22.40	37.93	-47.29	22.40	37.93
46	-50.95	22.40	37.93	-50.95	22.40	37.93
47	-52.78	22.06	48.97	-52.78	22.06	48.97
48	-56.10	24.83	59.30	-56.10	24.83	59.30
49	-59.89	17.69	51.43	-59.89	17.69	51.43

50	-61.85	21.35	44.33	-61.85	21.35	44.33
51	-61.34	22.50	35.59	-61.34	22.50	35.59
52	-62.15	19.70	21.80	-62.15	19.70	21.80
53	-62.97	16.71	9.88	-62.97	16.71	9.88
54	-63.79	13.53	0.00	-63.79	13.53	0.00
101	-63.82	13.58	4.79	-63.82	13.58	4.79
102	-66.73	6.27	8.94	-66.73	6.27	8.94
301	-63.79	13.53	4.78	-63.79	13.53	4.78
302	-68.59	1.05	12.11	-68.59	1.05	12.11
401	0.00	21.19	0.00	0.00	21.10	0.00
402	1.43	23.23	18.10	1.43	23.43	18.02
403	1.98	24.45	3.93	1.97	24.66	4.09
404	2.25	8.30	9.90	2.24	8.62	10.34
405	2.31	5.34	8.06	2.30	5.06	8.88
406	2.27	4.47	4.71	2.29	5.07	5.78
407	2.24	3.19	2.13	2.33	6.16	2.66
408	2.21	2.28	0.67	2.14	6.53	0.78
409	2.20	1.76	0.03	2.27	4.19	0.55
410	2.19	1.44	0.16	2.15	8.50	1.47
411	2.18	1.65	0.06	2.32	5.92	0.37
412	2.15	2.06	0.39	2.17	6.77	1.52
413	2.12	2.76	1.46	2.32	5.71	1.96
414	2.09	3.84	3.49	2.18	6.97	3.23
415	2.11	4.85	6.41	2.08	11.55	5.99
416	2.27	4.42	8.80	2.37	7.78	9.34
417	2.78	20.69	6.26	2.70	18.29	5.91
418	3.59	49.40	10.67	3.57	48.79	8.89
419	-4.69	48.25	27.89	-4.67	47.64	25.89
420	-3.75	49.48	10.77	-3.67	48.87	8.99
421	-3.25	20.76	6.22	-3.06	18.34	5.86
422	-3.09	4.45	8.79	-3.06	7.82	9.33
423	-3.05	4.85	6.41	-2.83	11.43	6.04
424	-3.09	3.84	3.49	-3.00	6.77	3.38
425	-3.13	2.76	1.46	-3.15	5.91	1.79
426	-3.15	2.06	0.39	-3.00	6.72	1.47
427	-3.16	1.65	0.06	-3.13	5.97	0.38
428	-3.17	1.44	0.15	-2.95	8.49	1.45
429	-3.18	1.77	0.04	-3.12	4.20	0.57
430	-3.21	2.30	0.71	-3.01	6.49	0.73
431	-3.25	3.23	2.20	-3.27	6.20	2.73
432	-3.28	4.52	4.82	-3.27	5.12	5.89
433	-3.22	5.35	8.18	-3.21	5.08	9.01
434	-2.94	8.79	9.91	-2.93	9.11	10.35
435	-2.43	25.41	3.51	-2.42	25.61	3.67
436	0.00	24.19	18.36	0.00	24.39	18.29
437	0.00	21.47	0.00	0.00	21.39	0.00

2) 시공중 P.A.B 안정성 검토

1. 검토 내용

부산-울산 개착식 터널(4공구)의 시공과 관련하여 P.A.B 구조물 설치 후 P.A.B 벽체부까지 성토가 완료되었을 때의 구조적 안정성에 대해 검토하고자 함.

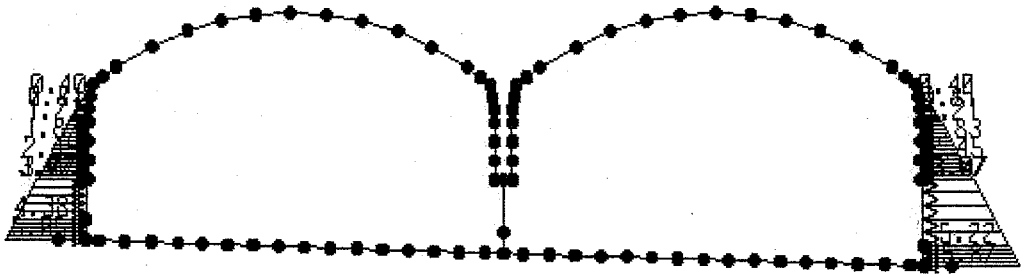
2. 검토 방법

2.1 모델링

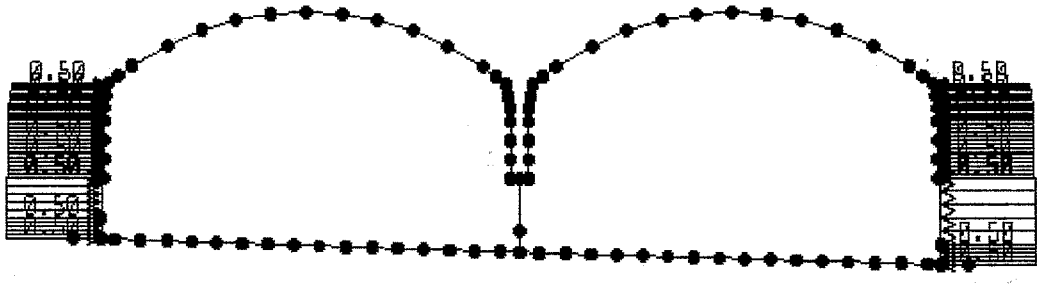
- 개착식 터널의 상시 검토와 동일

2.2 하중조건

1) 사하중 ; 구조물 사하중은 SAP2000에서 자동 고려.
2) 토압 ; P.A.B 벽체부까지 성토가 완료되었다고 가정하여 검토함.



3) 활하중 ; 벽체 성토부 차량 활하중으로 Pvl=1.0t/m2를 가정하고 활하중의 수평토압으로 0.5t/m2을 가정.



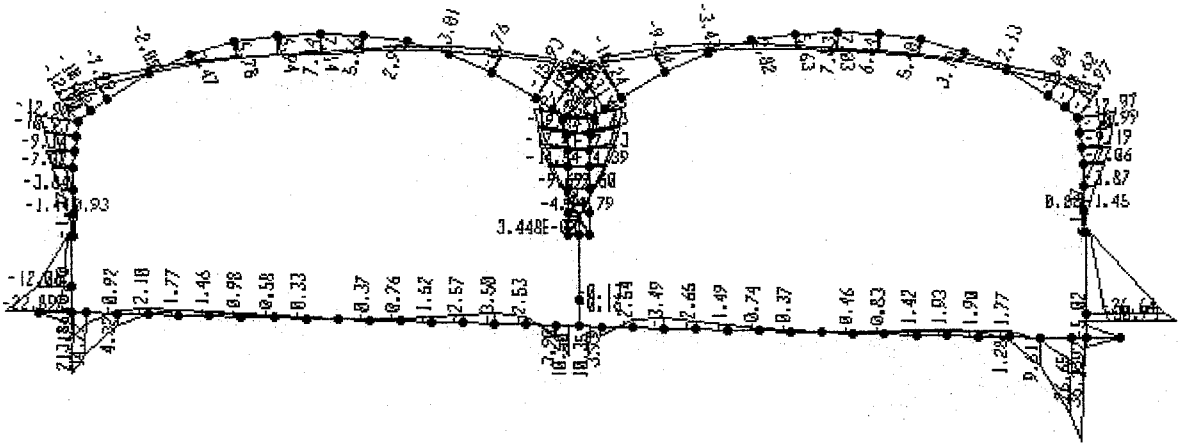
2.3 하중조합

- 도로교설계기준(p32) ; 가설시하중 참조

	사하중	토압	활하중의 토압	비고
Comb 1.	1.3	1.7	1.3	강도설계법
Comb 2.	1.3	0.65	1.3	
Comb 3.	1.0	1.0	1.0	허용응력설계법
Comb 4.	1.0	0.5	1.0	

3. 검토 결과

3.1 극한강 검토결과



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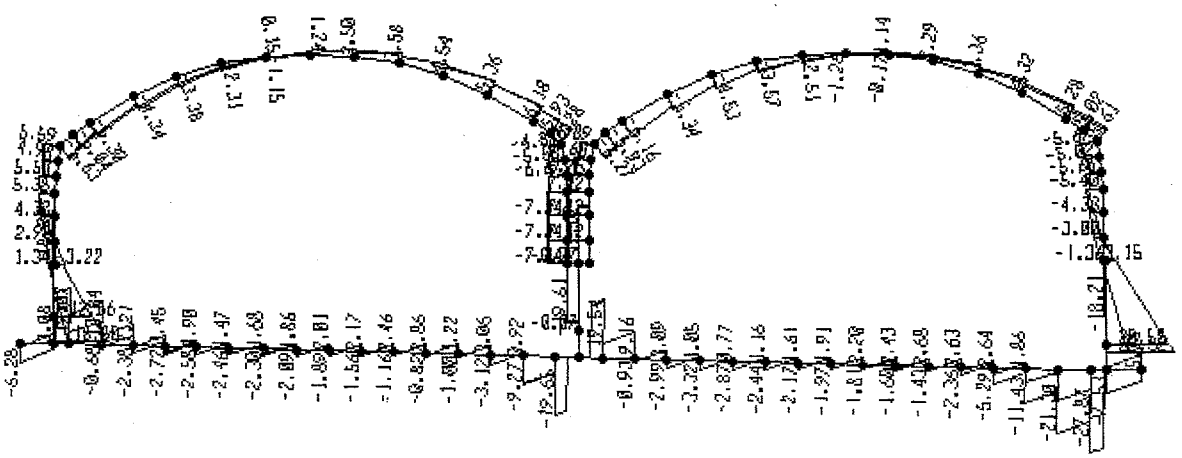


< Shear Envelop >

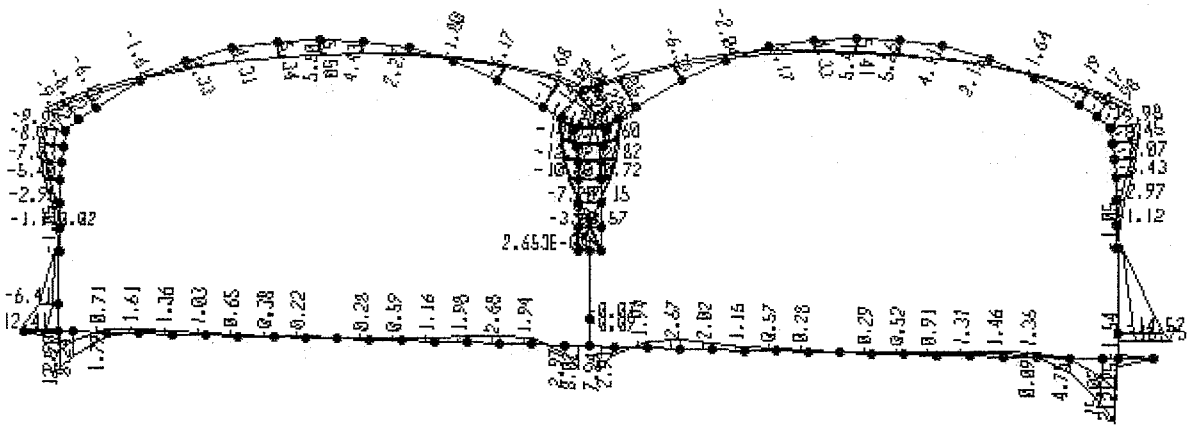
- 극한강 검토결과에 따르면,

1) 헌치부(절점 7) : Mu = -21.86t-m/m, Vu = 6.28t/m

2) 슬래브(절점 14) : Mu = 7.14t-m/m로서 완성시 P.A.B 단면력 검토시 적용된 하중에 비해 작아 시공중에 발생되는 하중은 구조적으로 문제없는 것으로 계산되었음.

3) 벽체부에 발생되는 하중은 벽체외측에 Mu = -30.94t-m/m, Vu = 22.52t/m로서 마찬가지로 완성시 현장타설 벽체부 단면력 검토시 적용된 하중에 비해 작아 구조적으로 문제없는 것으로 계산되었음.

3.2 허용응력 검토 결과



< Moment Envelop >

1) 헌치부(절점 7) ; M = -16.20t-m/m

2) 슬래브(절점 14) ; M= 5.50t-m/m로서 완성시 성토 완료후 검토된 하중에 비해 작아 사용성 검토 결과는 문제없는 것으로 판단됨.

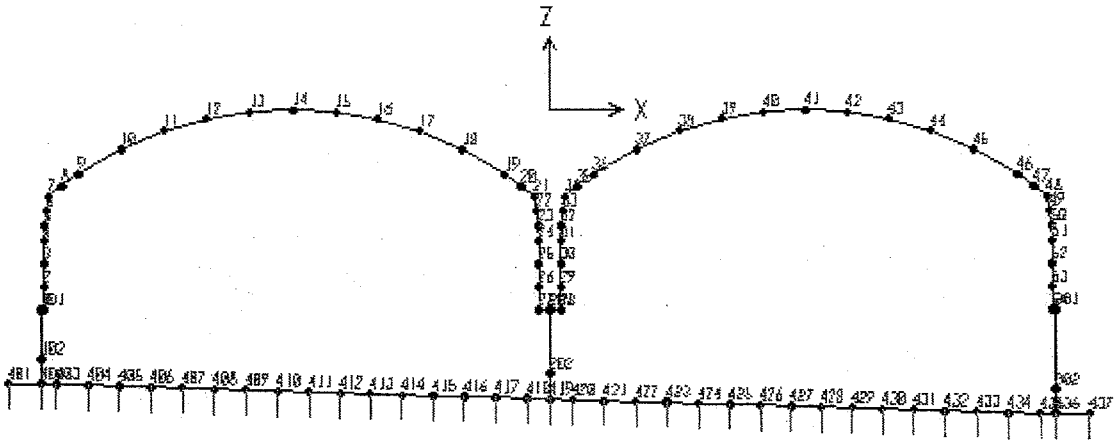
3) 온도하중 및 건조수축의 영향 검토

1. 검토 내용

부산-울산 개착식 터널(4공구)은 Precast Arch 크라운부에서의 토피고가 3m이고 Arch 면을 따라서 5.271m로 토피고가 증가하는 지중구조물이다. 따라서 대기에 노출된 구조물과 달라 온도하중의 영향이 작을 것으로 예상되나 본 검토에서는 온도하중의 영향을 고려하여 구조적 안정성을 확인하고자 함.

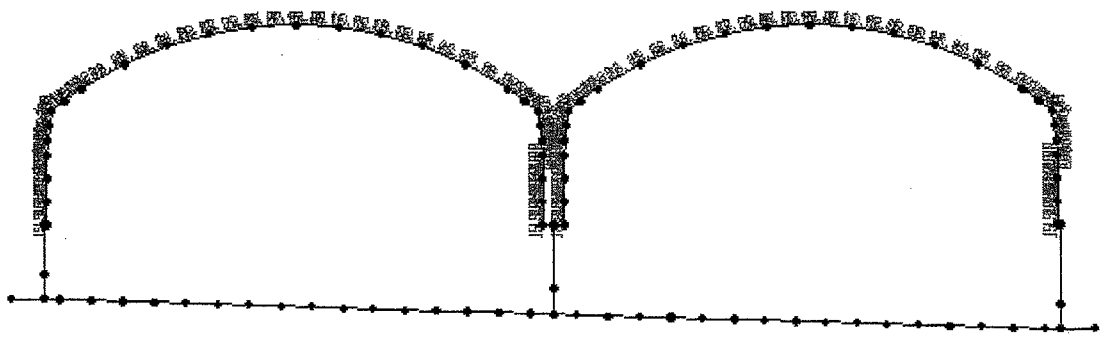
2. 검토 방법

2.1 모델링



2.2 하중조건

1) Comb 1. : 온도하중(+15℃) 작용시
2) Comb 2. : 온도하중(-15℃) 및 건조수축(-15℃의 온도하중으로 환산) 작용시

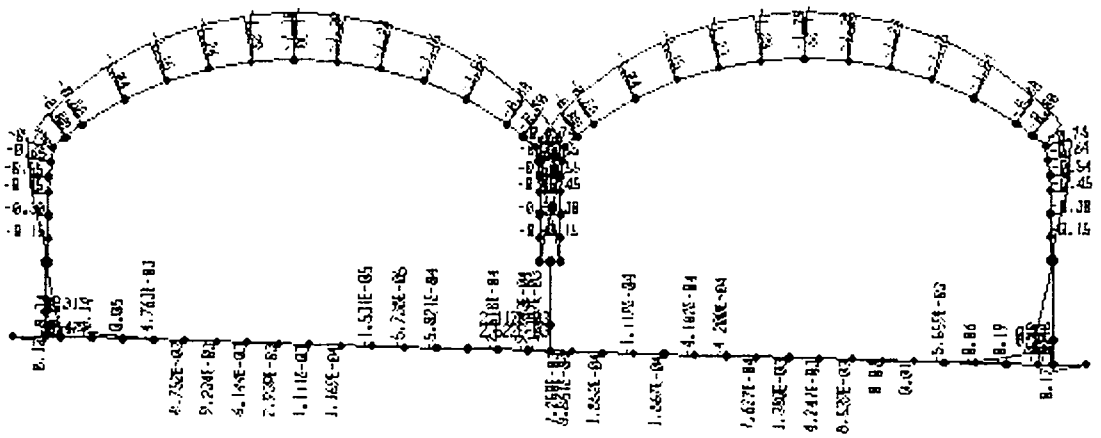


- 온도하중(+15℃)과 건조수축(-15℃의 온도하중으로 환산)을 모두 고려하면 결과적으로 온도가 " 0" 이되므로 온도하중(-15℃)와 건조수축(-15℃)만 고려함.

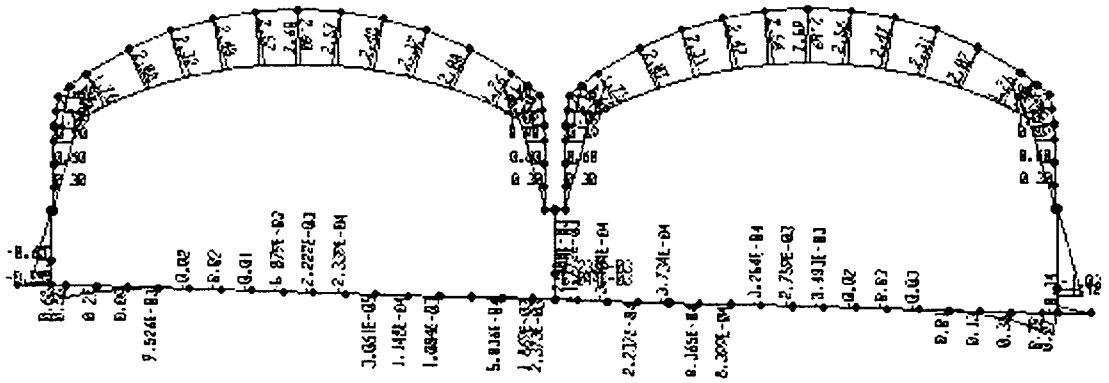
2.3 하중조합

- 극한모멘트 + 1.3 온도하중, 건조수축

3 검토 결과



<Comb1 모멘트도>



<Comb2 모멘트도>

- 고산터널 구조계산서에서 해석한 극한모멘트값에 온도 및 건조수축에 의해 발행한 모멘트값을 더해서 공칭모멘트와 비교 검토

절점번호	Mu	COMB1	COMB2	Mu+comb1	Mu+comb2	공칭모멘트	결과
1	0	0	0	0	0	100.183	O.K
2	-25.27	-0.15	0.30	-25.42	-24.97	100.183	O.K
3	-52.77	-0.30	0.6	-53.07	-52.17	100.183	O.K
4	-82.24	-0.45	0.90	-82.69	-81.34	100.183	O.K
5	-99.92	-0.55	1.09	-100.47	-98.83	111.893	O.K
6	-113.42	-0.65	1.29	-114.07	-112.13	148.994	O.K
7	-127.91	-0.74	1.48	-128.65	-126.43	216.158	O.K
8	-105.23	-0.80	1.61	-106.03	-103.62	150.374	O.K
9	-80.49	-0.88	1.76	-81.37	-78.73	114.947	O.K
10	-27.61	-1.04	2.08	-28.65	-25.53	103.245	O.K
11	12.85	-1.16	2.32	11.69	15.17	77.248	O.K
12	31.87	-1.24	2.48	30.63	34.35	77.248	O.K
13	45.41	-1.29	2.57	44.12	47.98	77.248	O.K
14	50.27	-1.3	2.60	48.97	52.87	77.248	O.K
15	45.4	-1.29	2.57	44.11	47.97	77.248	O.K
16	31.84	-1.24	2.48	30.60	34.32	77.248	O.K
17	8.28	-1.16	2.32	7.12	10.60	77.248	O.K
18	-30.13	-1.04	2.08	-31.17	-28.05	103.245	O.K
19	-80.60	-0.88	1.76	-81.48	-78.84	114.947	O.K
20	-106.06	-0.80	1.61	-106.86	-104.45	150.374	O.K
21	-128.05	-0.74	1.48	-128.79	-126.57	216.158	O.K
22	-115.26	-0.65	1.29	-115.91	-113.97	148.994	O.K
23	-100.17	-0.55	1.09	-100.72	-99.08	111.893	O.K
24	-82.23	-0.45	0.90	-82.68	-81.33	100.183	O.K
25	-52.77	-0.30	0.60	-53.07	-52.17	100.183	O.K
26	-25.27	-0.15	0.30	-25.42	-24.97	100.183	O.K
27	0	0	0	0	0	100.183	O.K

4) 기초슬래브에 작용하는 노면활하중의 영향 검토

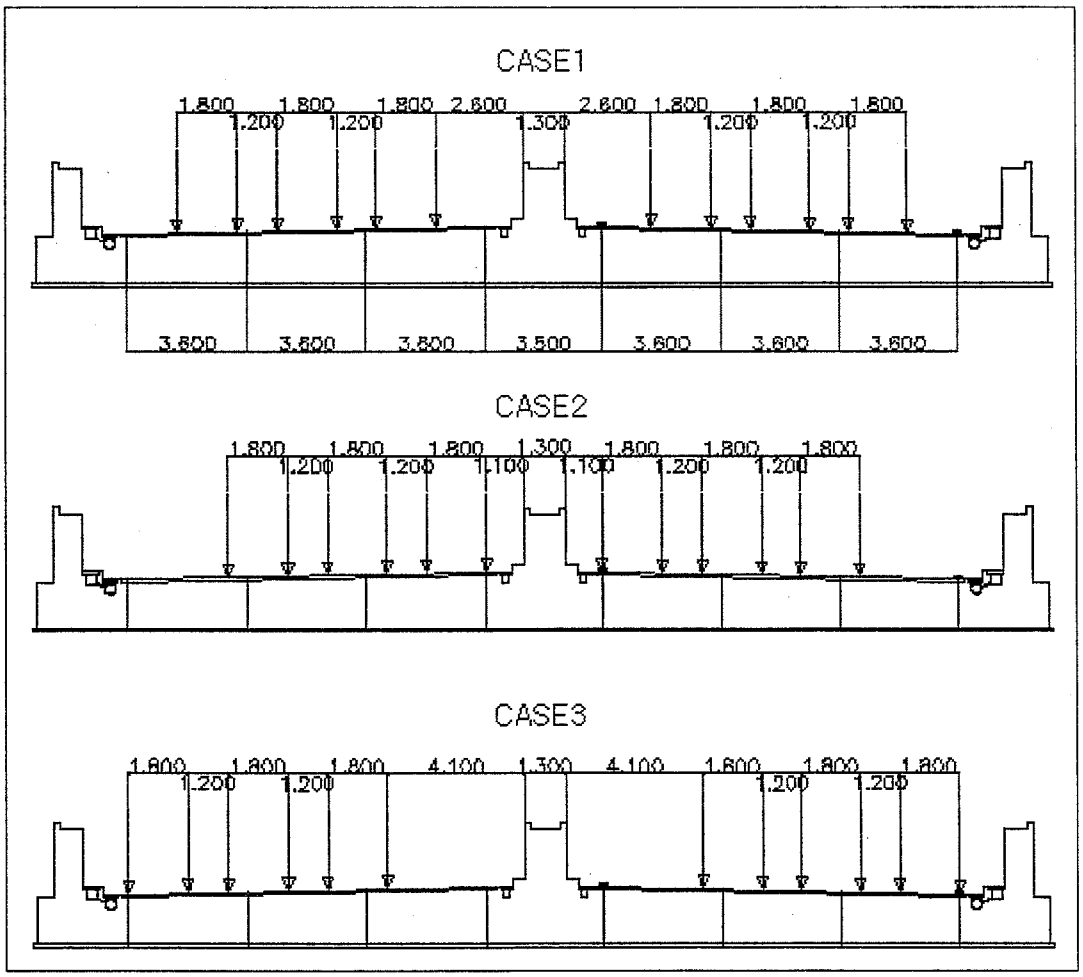
1. 검토내용

기초슬래브 상면에 노면 활하중이 작용하는 경우에 대해 검토하여 P.A.R 및 바닥슬래브에 하중의 증감을 확인하여 구조적으로 미치는 영향에 대해 확인하도록 함.

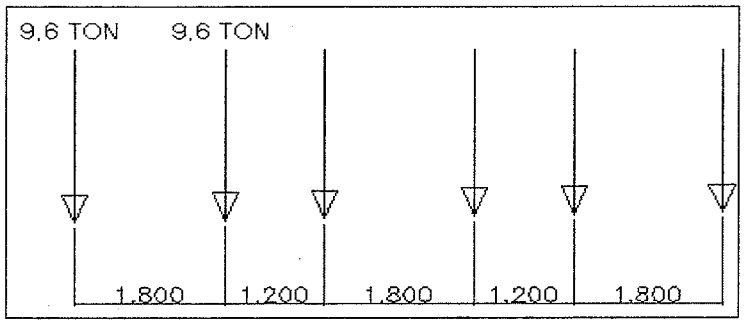
2. 검토 방법

바닥 슬래브에 작용하는 활하중의 종류는 하중의 재하위치를 고려하여 다음과 같이 구분하여 작용하도록 함.

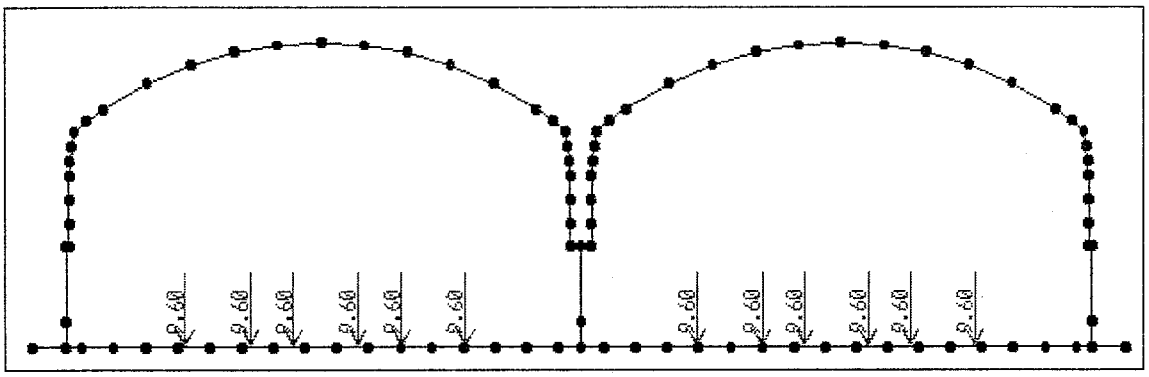
CASE1 : 차량이 슬래브 중앙에 배치된 경우
CASE2 : 차량이 슬래브 우측으로 배치된 경우
CASE3 : 차량이 슬래브 좌측으로 배치된 경우



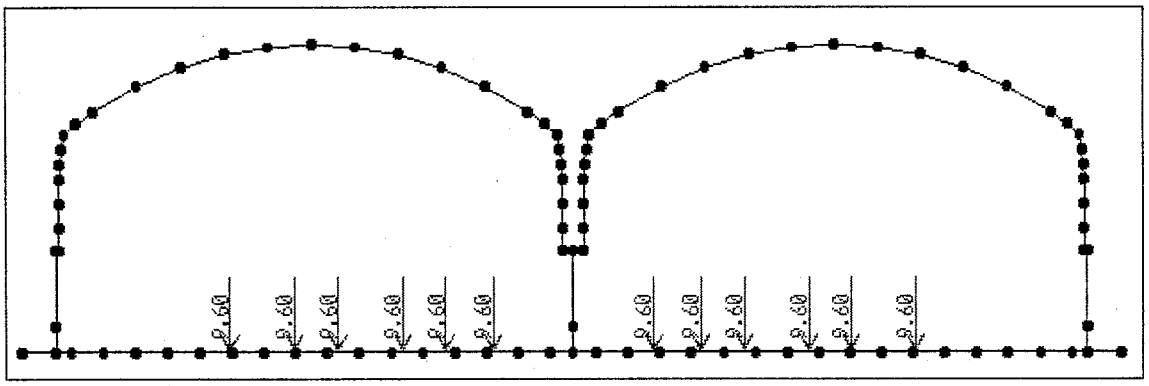
<CASE>



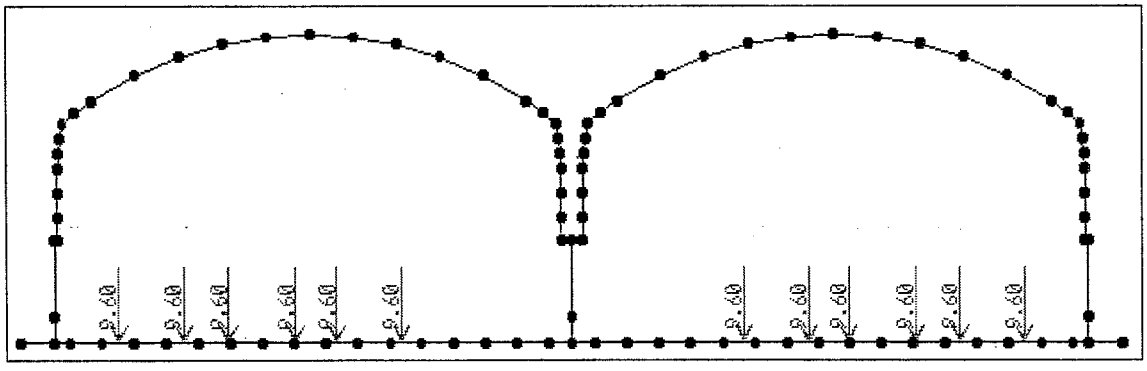
<차량 폭 및 간격>



<CASE1 SAP2000모델링>



<CASE2 SAP2000모델링>

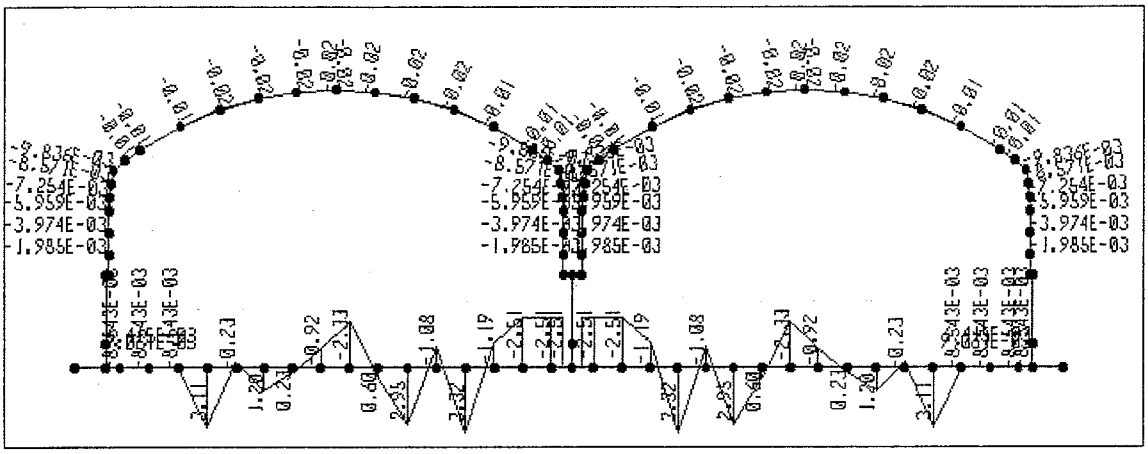


<CASE3 SAP2000모델링>

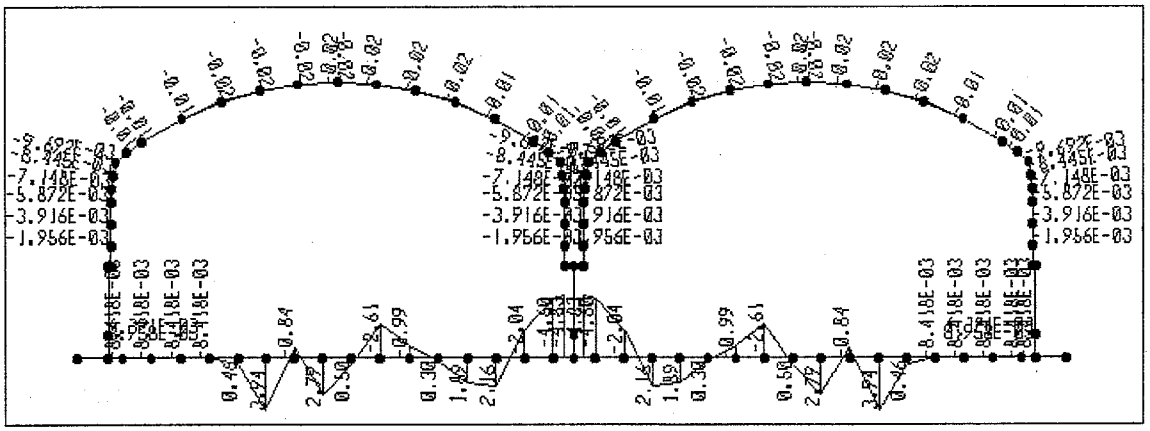
3. 해석결과

3.1 모멘트 검토결과(극한강도)

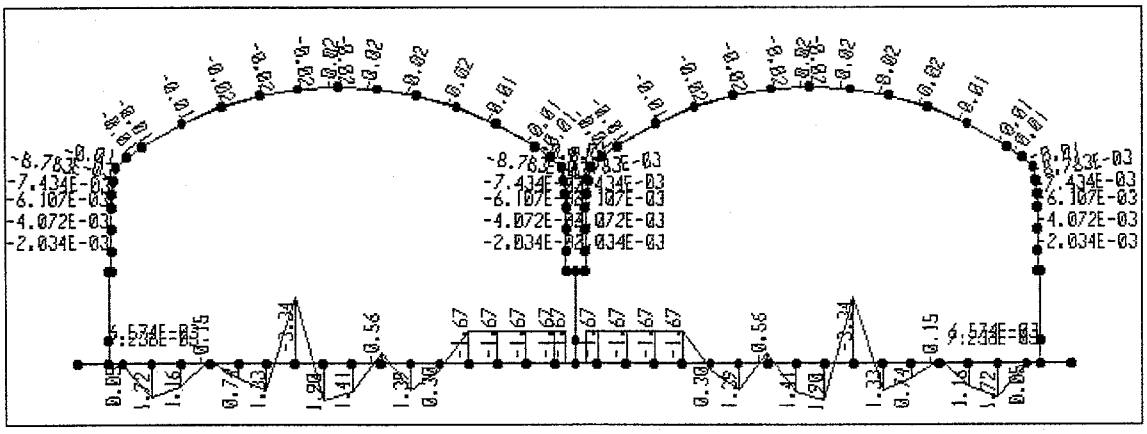
절점	상시MAX	CASE1	CASE2	CASE3	상시MAX +CASE1	상시MAX +CASE2	상시MAX +CASE3	비고
1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2	-25.21	0.00	0.00	0.00	-25.21	-25.21	-25.21	25.21
3	-52.63	0.00	0.00	0.00	-52.63	-52.63	-52.63	52.63
4	-82.03	-0.01	-0.01	-0.01	-82.04	-82.04	-82.04	82.04
5	-99.67	-0.01	-0.01	-0.01	-99.68	-99.68	-99.68	99.68
6	-113.13	-0.01	-0.01	-0.01	-113.14	-113.14	-113.14	113.14
7	-127.57	-0.01	-0.01	-0.01	-127.58	-127.58	-127.58	127.58
8	-104.86	-0.01	-0.01	-0.01	-104.87	-104.87	-104.87	104.87
9	-80.08	-0.01	-0.01	-0.01	-80.09	-80.09	-80.09	80.09
10	-27.13	-0.01	-0.01	-0.01	-27.14	-27.14	-27.14	27.14
11	12.91	-0.02	-0.02	-0.02	12.89	12.89	12.89	12.91
12	32.44	-0.02	-0.02	-0.02	32.42	32.42	32.42	32.44
13	46.00	-0.02	-0.02	-0.02	45.98	45.98	45.98	46.00
14	50.87	-0.02	-0.02	-0.02	50.85	50.85	50.85	50.87
15	45.99	-0.02	-0.02	-0.02	45.97	45.97	45.97	45.99
16	32.41	-0.02	-0.02	-0.02	32.39	32.39	32.39	32.41
17	8.81	-0.02	-0.02	-0.02	8.79	8.79	8.79	8.81
18	-30.07	-0.01	-0.01	-0.01	-30.08	-30.08	-30.08	30.08
19	-80.20	-0.01	-0.01	-0.01	-80.21	-80.21	-80.21	80.21
20	-105.69	-0.01	-0.01	-0.01	-105.70	-105.70	-105.70	105.70
21	-127.71	-0.01	-0.01	-0.01	-127.72	-127.72	-127.72	127.72
22	-114.96	-0.01	-0.01	-0.01	-114.97	-114.97	-114.97	114.97
23	-99.92	-0.01	-0.01	-0.01	-99.93	-99.93	-99.93	99.93
24	-82.03	-0.01	-0.01	-0.01	-82.04	-82.04	-82.04	82.04
25	-52.63	0.00	0.00	0.00	-52.63	-52.63	-52.63	52.63
26	-25.21	0.00	0.00	0.00	-25.21	-25.21	-25.21	25.21
27	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
101	9.79	0.00	0.00	0.00	9.79	9.79	9.79	9.79
102	54.71	0.01	0.01	0.01	54.72	54.72	54.72	54.72
401	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
402	52.13	-0.01	0.00	0.00	52.12	52.13	52.13	52.13
403	88.54	-0.01	0.00	0.05	88.53	88.54	88.59	88.59
404	42.20	-0.01	0.00	1.72	42.19	42.20	43.92	43.92
405	-29.79	-0.01	0.00	1.16	-29.80	-29.79	-28.63	29.80
406	-58.06	3.11	0.00	-0.15	-54.95	-58.06	-58.21	58.21
407	-79.29	-0.23	0.46	0.74	-79.52	-78.83	-78.55	79.52
408	-93.49	1.20	3.94	1.33	-92.29	-89.55	-92.16	93.49
409	-100.67	0.23	-0.84	-3.34	-100.44	-101.51	-104.01	104.01
410	-100.79	-0.92	2.79	1.90	-101.71	-98.00	-98.89	101.71
411	-93.89	-2.33	0.50	1.41	-96.22	-93.39	-92.48	96.22
412	-79.93	0.60	-2.61	-0.56	-79.33	-82.54	-80.49	82.54
413	-58.95	2.95	-0.99	1.39	-56.00	-59.94	-57.56	59.94
414	-34.29	-1.08	0.30	0.30	-35.37	-33.99	-33.99	35.37
415	-13.08	3.30	1.89	-1.67	-9.78	-11.19	-14.75	14.75
416	46.24	-1.19	2.16	-1.67	45.05	48.40	44.57	48.40
417	95.37	-2.51	-2.04	-1.67	92.86	93.33	93.70	95.37
418	151.59	-2.51	-4.60	-1.67	149.08	146.99	149.92	151.59



<CASE1>



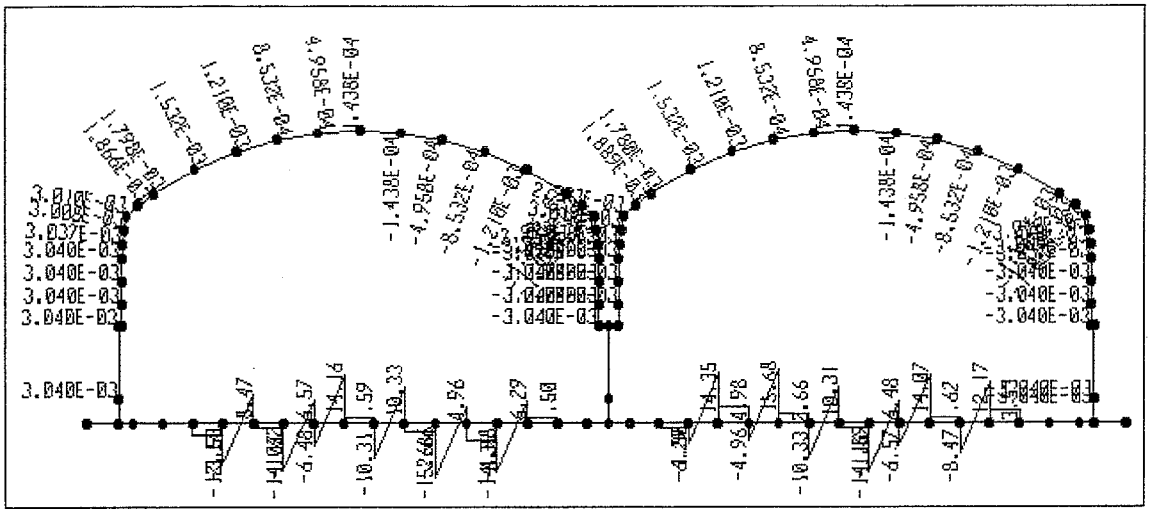
<CASE2>



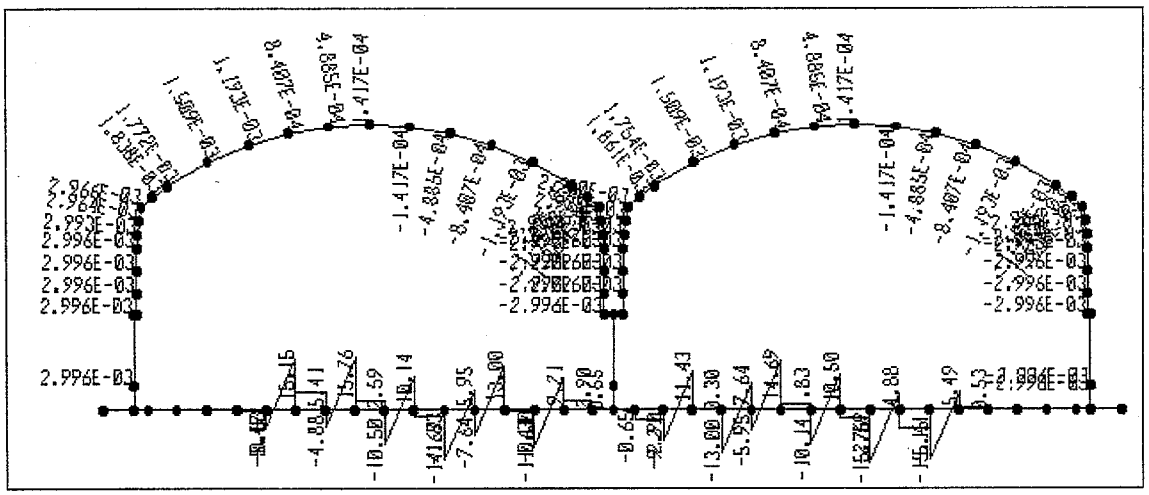
<CASE3>

3.2 전단력 검토결과(극한강도)

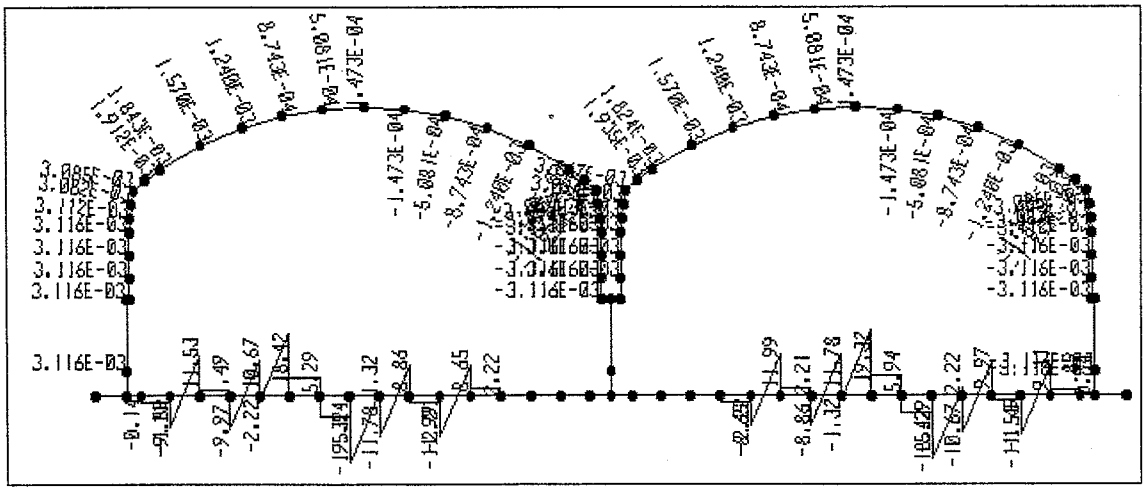
절점	상시MAX	CASE1	CASE2	CASE3	상시MAX +CASE1	상시MAX +CASE2	상시MAX +CASE3	비고
1	36.84	0.00	0.00	0.00	36.84	36.84	36.84	36.84
2	40.31	0.00	0.00	0.00	40.31	40.31	40.31	40.31
3	43.52	0.00	0.00	0.00	43.52	43.52	43.52	43.52
4	46.46	0.00	0.00	0.00	46.46	46.46	46.46	46.46
5	42.25	0.00	0.00	0.00	42.25	42.25	42.25	42.25
6	34.69	0.00	0.00	0.00	34.69	34.69	34.69	34.69
7	54.04	0.00	0.00	0.00	54.04	54.04	54.04	54.04
8	48.79	0.00	0.00	0.00	48.79	48.79	48.79	48.79
9	49.29	0.00	0.00	0.00	49.29	49.29	49.29	49.29
10	37.07	0.00	0.00	0.00	37.07	37.07	37.07	37.07
11	27.36	0.00	0.00	0.00	27.36	27.36	27.36	27.36
12	18.93	0.00	0.00	0.00	18.93	18.93	18.93	18.93
13	11.43	0.00	0.00	0.00	11.43	11.43	11.43	11.43
14	5.26	0.00	0.00	0.00	5.26	5.26	5.26	5.26
15	11.45	0.00	0.00	0.00	11.45	11.45	11.45	11.45
16	18.94	0.00	0.00	0.00	18.94	18.94	18.94	18.94
17	27.37	0.00	0.00	0.00	27.37	27.37	27.37	27.37
18	37.08	0.00	0.00	0.00	37.08	37.08	37.08	37.08
19	49.30	0.00	0.00	0.00	49.30	49.30	49.30	49.30
20	49.63	0.00	0.00	0.00	49.63	49.63	49.63	49.63
21	53.02	0.00	0.00	0.00	53.02	53.02	53.02	53.02
22	37.57	0.00	0.00	0.00	37.57	37.57	37.57	37.57
23	42.85	0.00	0.00	0.00	42.85	42.85	42.85	42.85
24	46.46	0.00	0.00	0.00	46.46	46.46	46.46	46.46
25	43.52	0.00	0.00	0.00	43.52	43.52	43.52	43.52
26	40.31	0.00	0.00	0.00	40.31	40.31	40.31	40.31
27	36.84	0.00	0.00	0.00	36.84	36.84	36.84	36.84
101	36.84	0.00	0.00	0.00	36.84	36.84	36.84	36.84
102	36.81	0.00	0.00	0.00	36.81	36.81	36.81	36.81
401	-54.25	0.00	0.00	0.00	-54.25	-54.25	-54.25	54.25
402	-60.53	0.00	0.00	0.00	-60.53	-60.53	-60.53	60.53
403	56.46	0.00	0.00	-1.89	56.46	56.46	54.57	56.46
404	48.50	0.00	0.00	-9.11	48.50	48.50	39.39	48.50
405	40.52	-3.53	0.00	11.53	36.99	40.52	52.05	52.05
406	32.56	-12.17	-0.53	-9.97	20.39	32.03	22.59	32.56
407	24.59	8.47	-5.49	10.67	33.06	19.10	35.26	35.26
408	16.63	-14.07	15.15	18.35	2.56	31.78	34.98	34.98
409	8.65	6.57	5.41	5.29	15.22	14.06	13.94	15.22
410	-3.84	14.16	15.76	-19.32	10.32	11.92	-23.16	23.16
411	-11.80	-10.31	-10.50	-11.78	-22.11	-22.30	-23.58	23.58
412	-19.78	10.33	10.14	8.86	-9.45	-9.64	-10.92	19.78
413	-27.74	-15.68	-14.69	-11.99	-43.42	-42.43	-39.73	43.42
414	-35.71	4.96	-7.64	8.65	-30.75	-43.35	-27.06	43.35
415	-43.68	-14.35	13.00	2.22	-58.03	-30.68	-41.46	58.03
416	-51.65	6.29	-11.43	0.00	-45.36	-63.08	-51.65	63.08
417	-59.61	1.50	9.21	0.00	-58.11	-50.40	-59.61	59.61
418	-101.37	0.00	2.90	0.00	-101.37	-98.47	-101.37	101.37



<CASE1>



<CASE2>



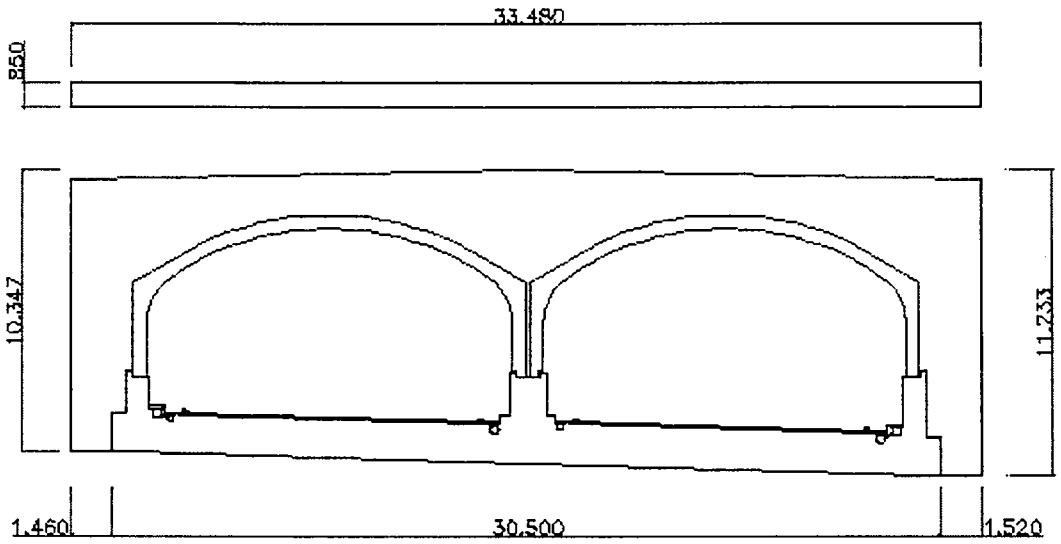
<CASE3>

5) 마 감 벽

1. 검토 내용

- P.A.B를 적용하여 복개 아치 시공 후 복개 아치 라멘의 전, 후면에 마감벽을 시공하도록함.
- 마감벽은 독립기초 벽체와 P.A.B에 커플러로 연결한다.

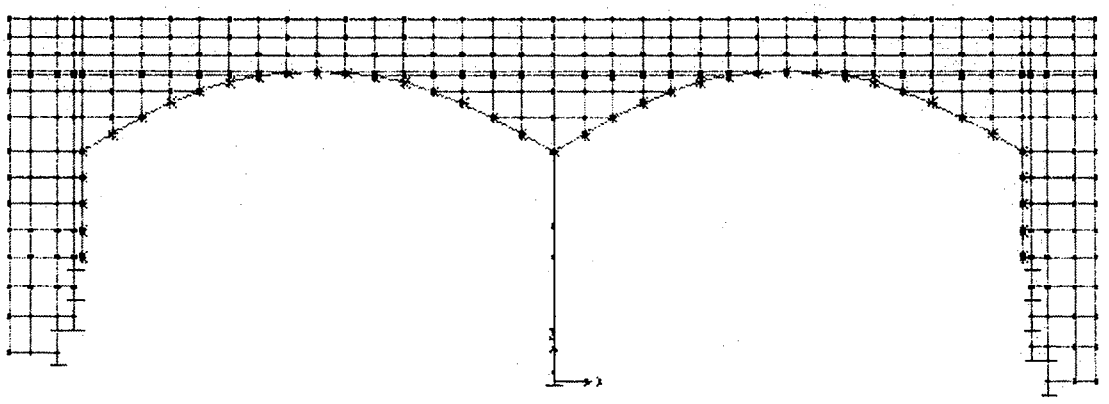
2.마감벽 단면



3.검토 방법

- 마감벽을 Sap2000을 이용하여 Shell(Thick)으로 모델링하여 검토함.

1) 모델링



① P.A.B 연결부

P.A.B와 마감벽이 커플러에 의해 연결되므로 P.A.B의 거동이 마감벽에 영향을 미치는 것을 구속조건에 고려하여야한다. 마감벽 설계에 필요한 결과는 Z축 방향의 처짐과 X,Z축의 회전이므로 U2,R2,R3를 고정시켜서 입력함.

② 기초 연결부

P.A.B와 마감벽이 커플러에 의해 연결되고 기초가 고정이므로 고정단

2) 구조물 및 토질 설계 제원

① 콘크리트 & 철근 제원

- f_{ck} = 270 kg/㎠
- f_y = 4000 kg/㎠

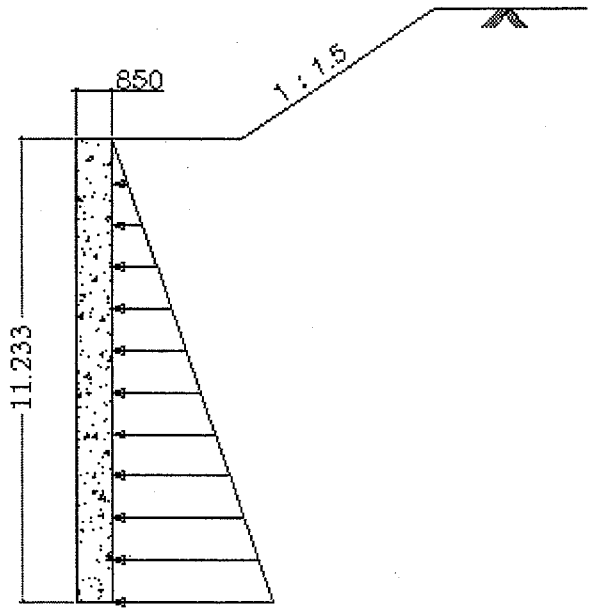
② 토질 정수

- 뒷채움, 토피 흙 γ_s = 1.9 t/㎥
- 흙 내부 마찰각 Φ = 30 °
- 성토구배각도 $\beta = \tan^{-1}(1/1.5) = 33.69°$
- 정지토압 : $K_0 = (1 - \sin\Phi)(1+\sin\beta) = (1-\sin30)(1+\sin33.69) = 0.777$

3)절점구속조건

- 현장타설 마감벽과 P.A.B의 현장타설 벽체부는 커플러를 이용하여 상호간 체결하도록 함.
- P.A.B 상부슬래부와 마감벽의 이음부는 P.A.B로부터 커플러를 이용하여 마감벽과 이음함

4)작용하중산정



높이 : 11.233 m
두께 : 0.85 m

① 사하중 : SAP2000 입력 데이터 참조

② 토압 Ph = x 1.9 x 11.233 = 0.000

5) 하중조합

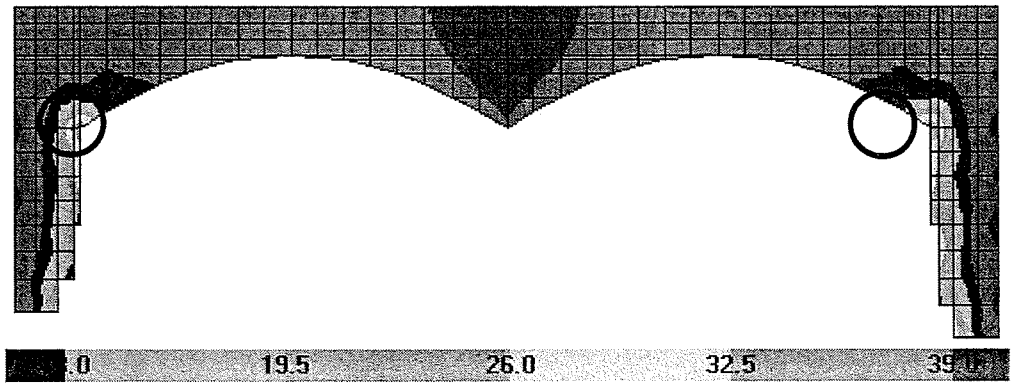
CASE1 = 사하중 + 수평토압

CASE2 = 1.3 사하중 + 1.7수평토압 (도로교 설계 기준 적용)

4.검토결과

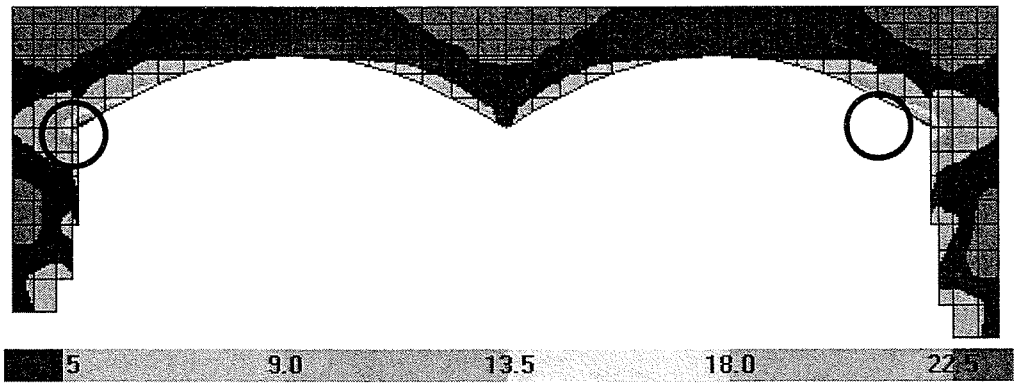
- 단면 설계시에는 CASE2 , 처짐검토시에는 CASE1을 활용함.

1) Mu_{11}(수평방향 모멘트 검토)



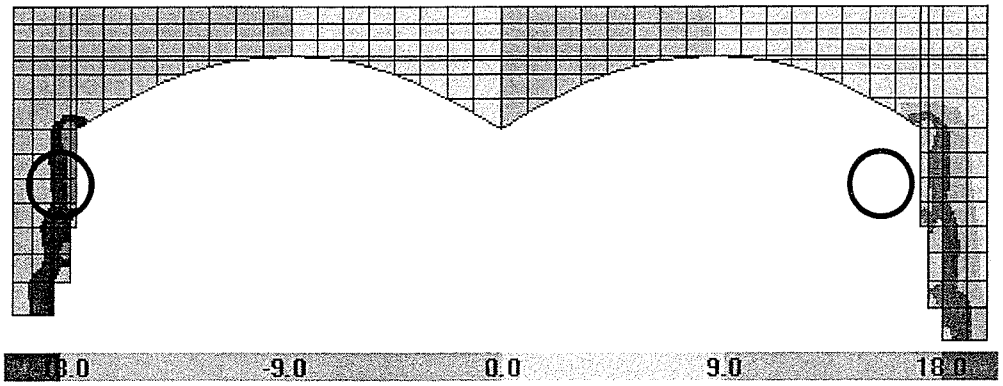
MAX Mu11 = 38.0 t-m

2) Mu_{22}(연직방향 모멘트 검토)



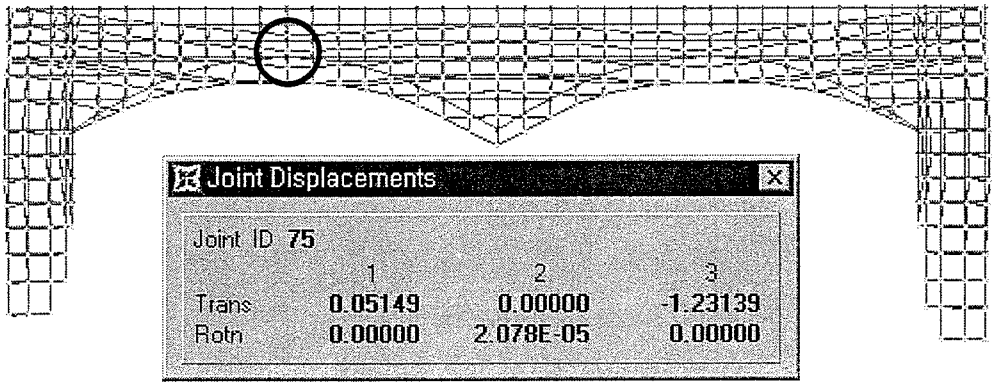
MAX Mu22 = 24.00 t-m

3) V13 (수평방향 전단력)

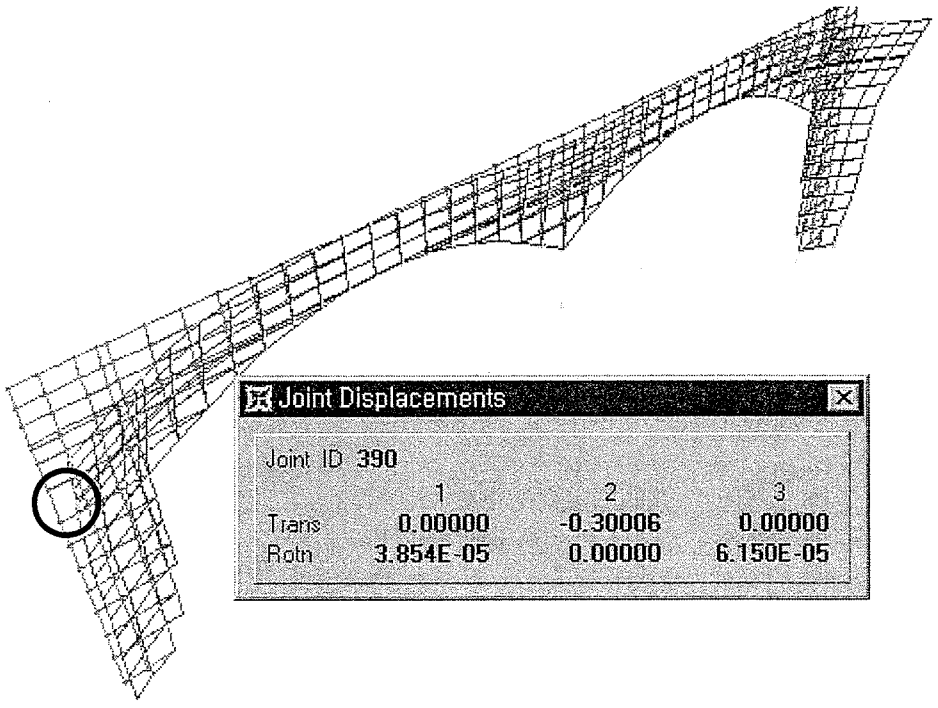


V13 = 31.00 t

3) 처짐량 검토



연직 처짐량 : P.A.R Arch 슬래브 상단에서의 연직 방향 처짐량은 1.230mm



마감벽의 수평 변위 : 마감벽 배면에서 토압으로 인해 발생하는 변위량은 구조물 전면으로 0.300mm가 발생되는 것으로 검토되었음.

4) 철근량 계산

① 수평방향 검토 (Mu11)

▷ 검 토 조 건

fck = 270.0kgf/㎠ fy = 4000.0kgf/㎠
β1 = 0.850 øb = 0.85 øs = 0.80
pb = (0.85 ×β1 ×fck / fy) * [6000/(6000+fy)] = 0.02926
pmax = 0.75 ×pb = 0.02195
pmin = max(0.80√(fck)/fy,14/fy) = 0.00350

계수 모멘트 Mu = 38.000 tf.m
단면의 두께 H = 85.000 cm 단 면 폭 B = 100.000 cm
유 효 깊 이 D = 75.000 cm 피 복 두 께 Dc = 10.000 cm

▷ 휨모멘트 검토

소요등가응력깊이 a = 2.644 cm로 가정
As = Mu /{øb·fy·(D-a/2)} = 15.169 ㎠
a = (As·fy) / (0.85·fck·B) = 2.644 cm ∴ 가정과 비슷함 O.K

Preq = [Mu /{øb·fy·(D-a/2)}] / (B·D) = 0.00202 ⇒ 4/3 Preq = 0.00270
∴ 필요철근량 req.As = Preq × (B·D) = 15.169 ㎠

Used As = H22 @ 15.00 cm (Dc = 10.00 cm)
= 25.807 ㎠ ∴ P = As/(B·D) = 0.00344

4/3 Preq ≤ P ≤ Pmin ..... ∴ O.K

a = (As·fy) / (0.85·fck·B) = 4.498 cm
øMn = øb·fy·As·(D - a/2) = 6383371.000 kgf·cm
= 63.834 tf·m ≥ Mu = 38.000 tf·m ..... ∴ O.K

② 수직방향 검토 (Mu22)

▷ 검 토 조 건

fck = 270.0kgf/㎠ fy = 4000.0kgf/㎠
β1 = 0.850 øb = 0.85 øs = 0.80
pb = (0.85 ×β1 ×fck / fy) * [6000/(6000+fy)] = 0.02926
pmax = 0.75 ×pb = 0.02195
pmin = max(0.80√(fck)/fy,14/fy) = 0.00350

계수 모멘트 Mu = 24.000 tf.m
단면의 두께 H = 85.000 cm 단 면 폭 B = 100.000 cm
유 효 깊 이 D = 75.000 cm 피 복 두 께 Dc = 10.000 cm

▷ 휨모멘트 검토

소요등가응력깊이 a = 1.659 cm로 가정
As = Mu /{øb·fy·(D-a/2)} = 9.517 ㎠
a = (As·fy) / (0.85·fck·B) = 1.659 cm ∴ 가정과 비슷함 O.K

Preq = [Mu /{øb·fy·(D-a/2)}] / (B·D) = 0.00127 ⇒ 4/3 Preq = 0.00169
∴ 필요철근량 req.As = Preq × (B·D) = 9.517 ㎠

Used As = H19 @ 15.00 cm (Dc = 10.00 cm)
= 19.100 ㎠ ∴ P = As/(B·D) = 0.00255

4/3 Preq ≤ P ≤ Pmin ..... ∴ O.K

a = (As·fy) / (0.85·fck·B) = 3.329 cm
øMn = øb·fy·As·(D - a/2) = 4762408.000 kgf·cm
= 47.624 tf·m ≥ Mu = 24.000 tf·m ..... ∴ O.K

③ 수평방향 전단 검토 (V13)

▷ 검 토 조 건

fck = 270.0kgf/㎠ fy = 4000.0kgf/㎠
β1 = 0.850 øb = 0.85 øs = 0.80
pb = (0.85 ×β1 ×fck / fy) * [6000/(6000+fy)] = 0.02926
pmax = 0.75 ×pb = 0.02195
pmin = max(0.80√(fck)/fy,14/fy) = 0.00350

계수 전단력 Vu = 31.000 tonf
단면의 두께 H = 85.000 cm 단 면 폭 B = 100.000 cm
유 효 깊 이 D = 75.000 cm 피 복 두 께 Dc = 10.000 cm

▷ 전단력 검토

콘크리트 설계전단강도 Φv*Vc = Φv*0.53*√(fck)*B*D/1000 = 52.25 ton
0.5*Φv*Vc < Vu ≤ Φv*Sc ... 최소 전단보강철근 필요
소요 Av/s = 최소 Av/s = (3.5*B)/fy = 0.09 cm²/cm

사용전단철근 : 철근(Ds)=H16 다리수(Ns)= 2 EA 간격(s)= 45.0 cm

사용철근량 Av = 철근면적*Ns = 3.97 cm2 > 소요철근량 Av = 3.94 cm2 .. 만족
철근 설계전단강도 Φv*Vs = Φv*Av*fy*D/(s*1000) = 21.18 ton
설계전단강도 Φv*Vn = Φv*Vc + Φv*Vs = 73.44 ton
> 설계전단력 Vu = 31.00 ton ... 만족

6) LIFTING 안정검토

P.C Arch Box Segment의 시공중 안정성(인양 및 설치) 검토

가. 검토 목적

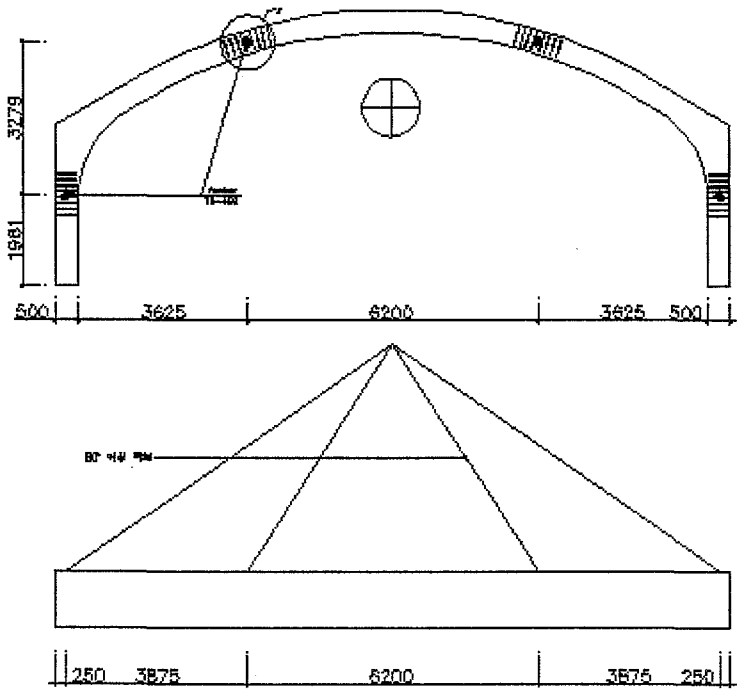
제작장에서 P.A.B를 바닥 거푸집에서 인양하여 야적장으로 옮기는 경우 케이블 연결부에서의 콘크리트 인장력 및 P.A.B 본체에서의 인장력 발생량을 검토하여 인양시 구조적으로 안정한지 확인하고자 한다.

제작된 P.A.B를 현장에서 조립 설치하기 위한 연결부의 위치가 적정하고 또한 P.A.B 본체에 미치는 영향을 확인함.

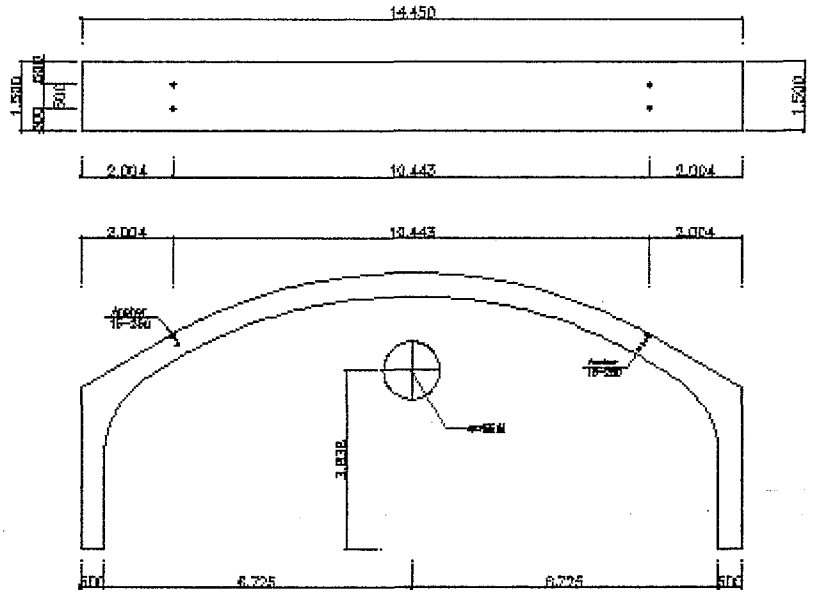
나. 검토 내용 및 결과

Cable의 길이 : 각 약 11m로 가정.

위치 : 그림 1, 2 참조



< 그림-1 탈형시 Anchor 위치도 >



< 그림-2 설치시 Anchor 위치도 >

1) P.A.B 구조물 본체 인양시

① 구조물 본체 응력

탈형시 강도 : fck = 200 kg/㎠ (가정)

허용휨인장응력 : fta = 1.06 √fck = 15.0 kg/㎠

(콘크리트 구조 설계 기준 15.3 (3) ① p243쪽)

P.A.B 구조물 본체에 걸쳐 전 구간이 허용휨인장응력이하 이므로 P.A.B 본체는 인양 중 구조적으로 안정함.

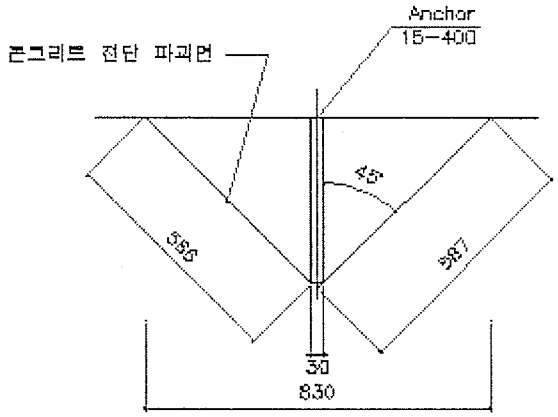
Anchor는 둘레에 철근을 보강하여 설치함. (그림 3, 4 참조)

② 구조물 본체 처짐

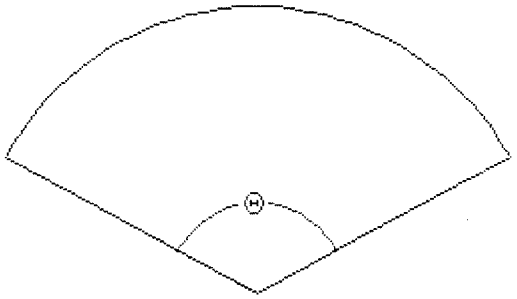
탈형시 상단부 변위는 내측으로 0.0676㎜, 하단부 변위는 내측으로0.00225㎜이며 운용 및 탈형시 구조물은 안전함. (그림 - 5, 6 참조)

③ 구조물 인양시 인양고리에 대한 전단파괴 검토

PAB 1SEG 중량 : 42.75 ton
한개의 인양고리에 걸리는 하중 : 42.75/4 = 10.69 ton (인양시 하중이 한쪽으로만 걸리는 경우)



< 콘크리트 전단 파괴형상 >



< 전단 파괴면 전개도 >

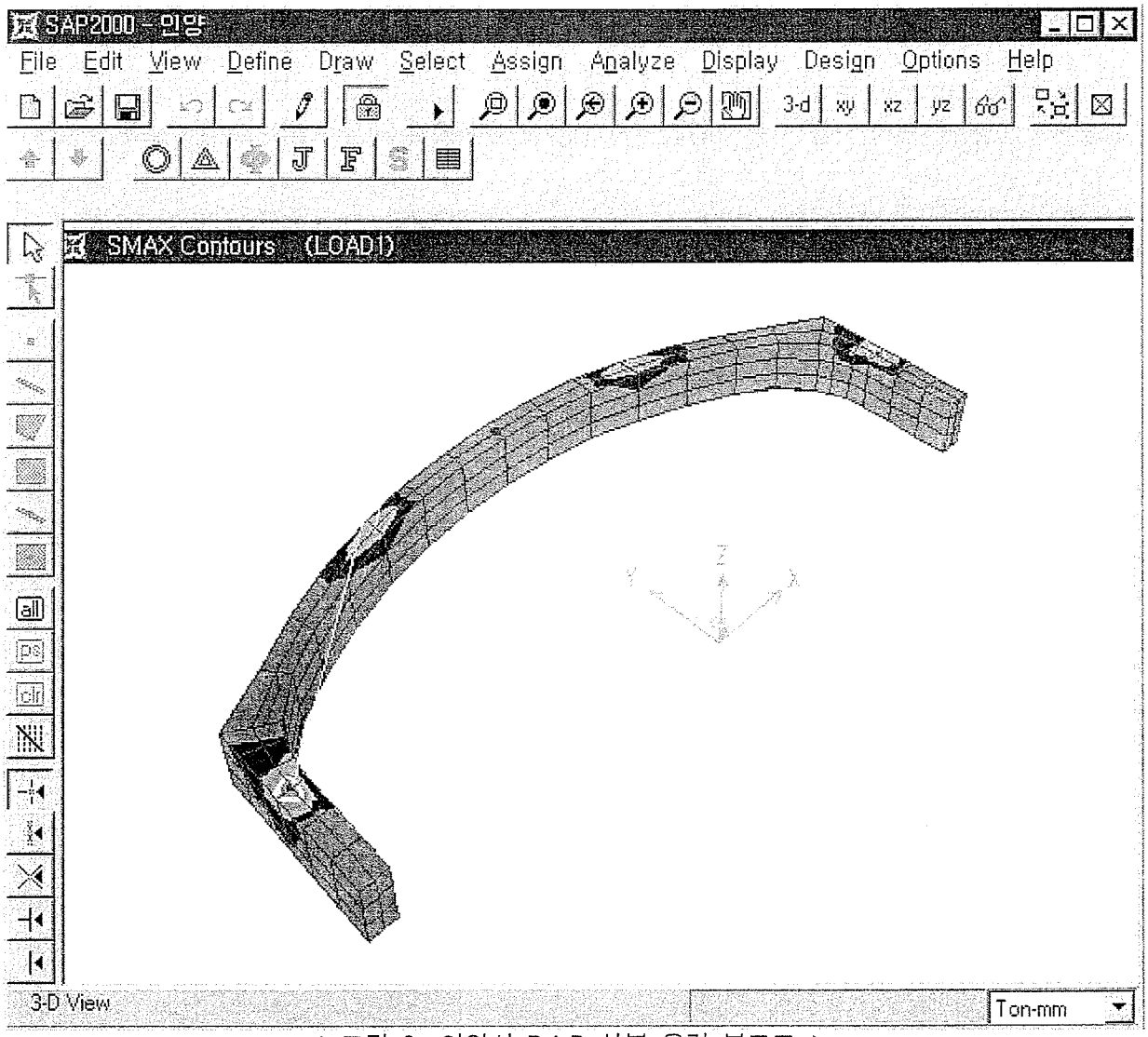
콘크리트 허용전단강도 = 0.25 $\sqrt{}$fck bd (도로교 설계기준 2000 p.28)
bd : 콘크리트 전단 파괴면의 넓이

전단 파괴면 전개도에서
2 x π x 587 x θ / 360 = 2 x π x 830 / 2
θ = 254.5°

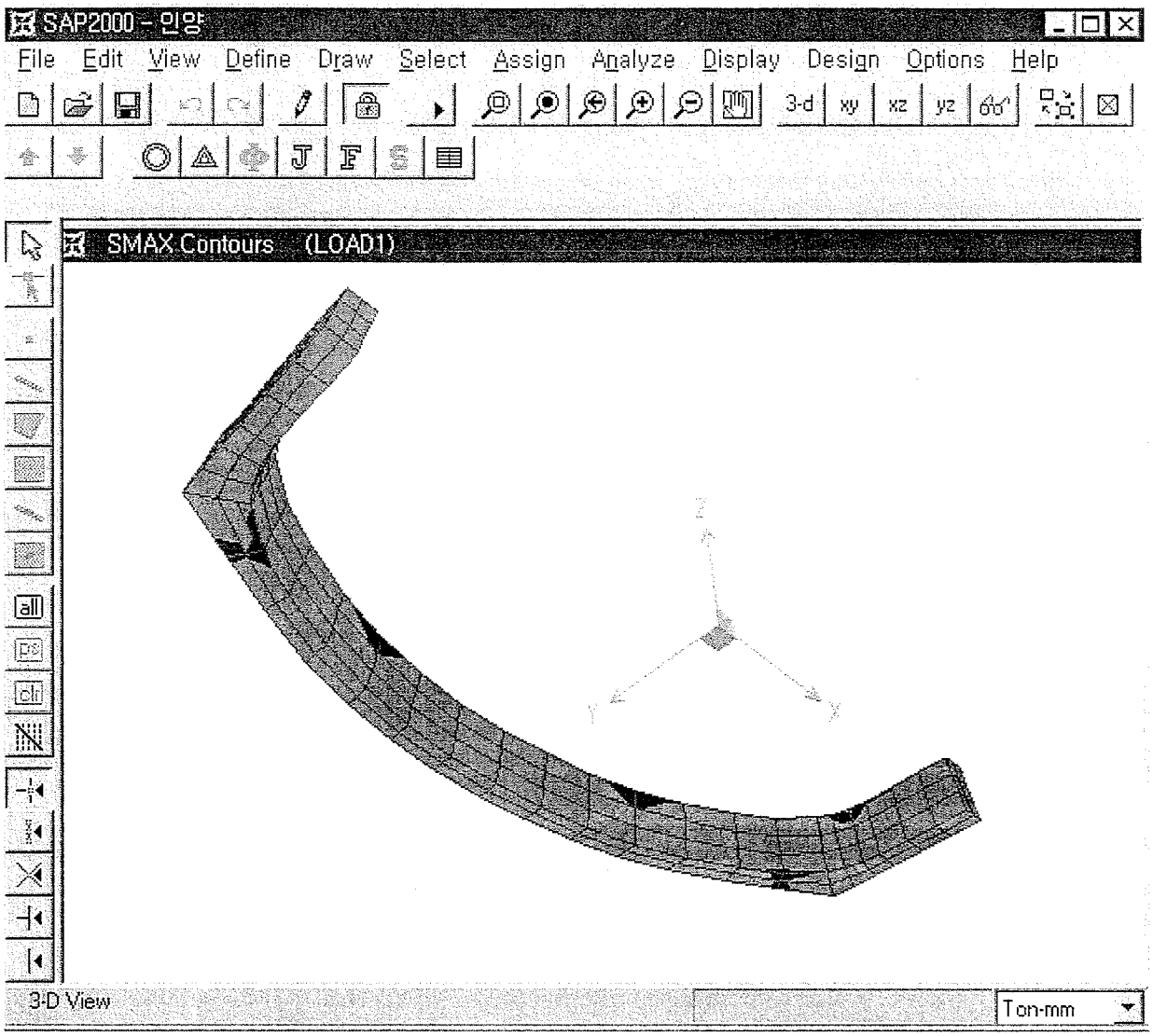
bd = π x (587^2 - $(587-566)^2$) x 254.5 / 360 = 764285 mm^2 = 7642.85 cm^2

콘크리트 허용 전단강도 = 0.25 $\sqrt{}$fck bd = 0.25 $\sqrt{}$200 x 7642.85 = 27021.67 kg = 27.021 ton

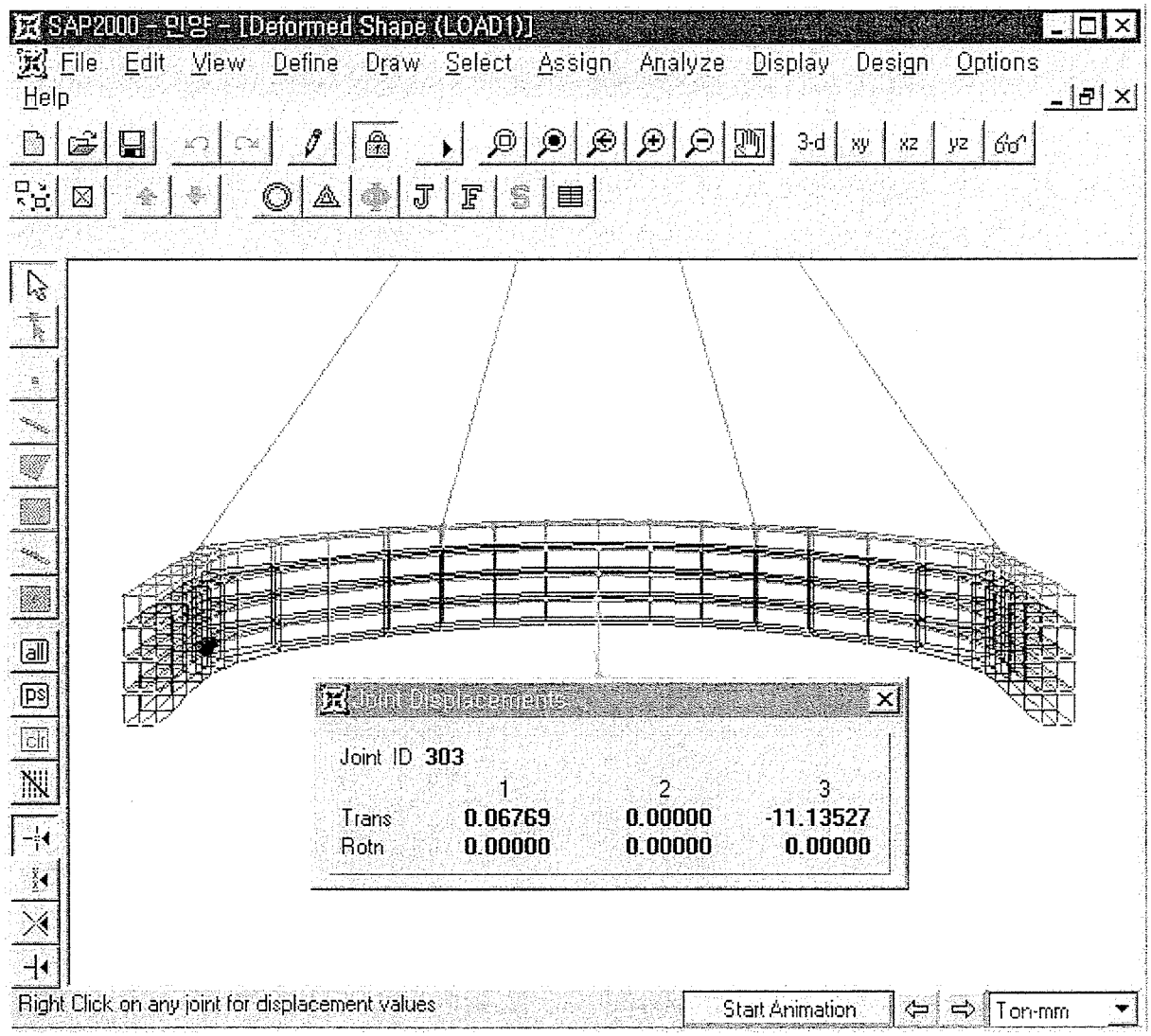
27.021 > 10.69 ton 이므로 전단파괴에 대해 안전함.



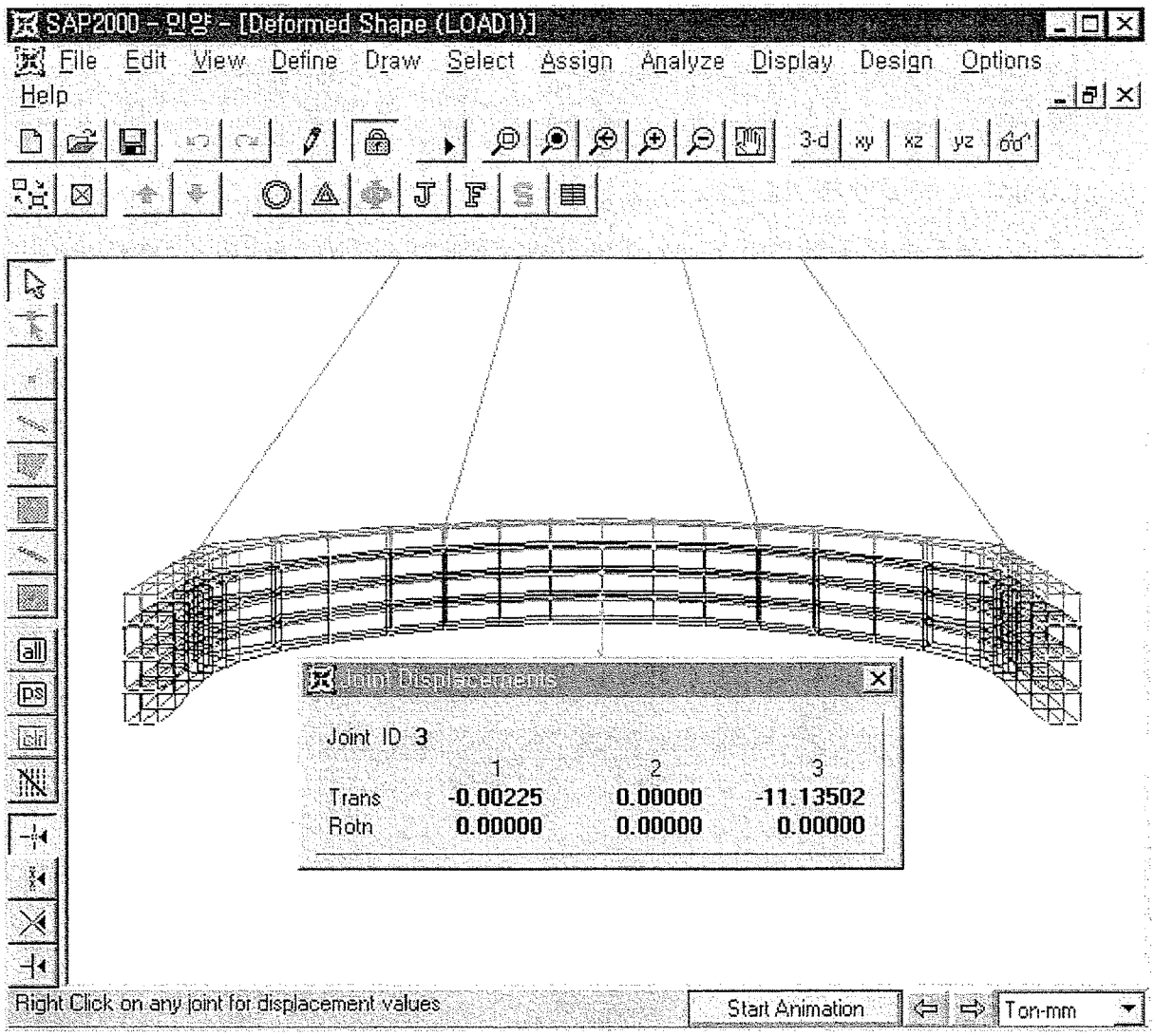
< 그림-3 인양시 P.A.B 상부 응력 분포도 >



< 그림-4 인양시 P.A.B 하부 응력 분포도 >



< 그림-5 인양시 P.A.B 상단에서의 변위 >



< 그림-6 인양시 P.A.B 하단에서의 변위 >

3) P.A.B구조물 본체 설치시

① 구조물 본체 응력

설치시 강도 : fck = 400 ㎏/㎠ (가정)

허용휨인장응력 : fta = 1.06 √fck = 21.2 ㎏/㎠

(콘크리트 구조 설계 기준 15.3 (3) ① p243쪽)

P.A.R 구조물 본체 및 Lifting Anchor 둘레에서의 발생인장 응력이 허용휨인장응력이하로 구조적으로 안정함. (그림 7, 8 참조)

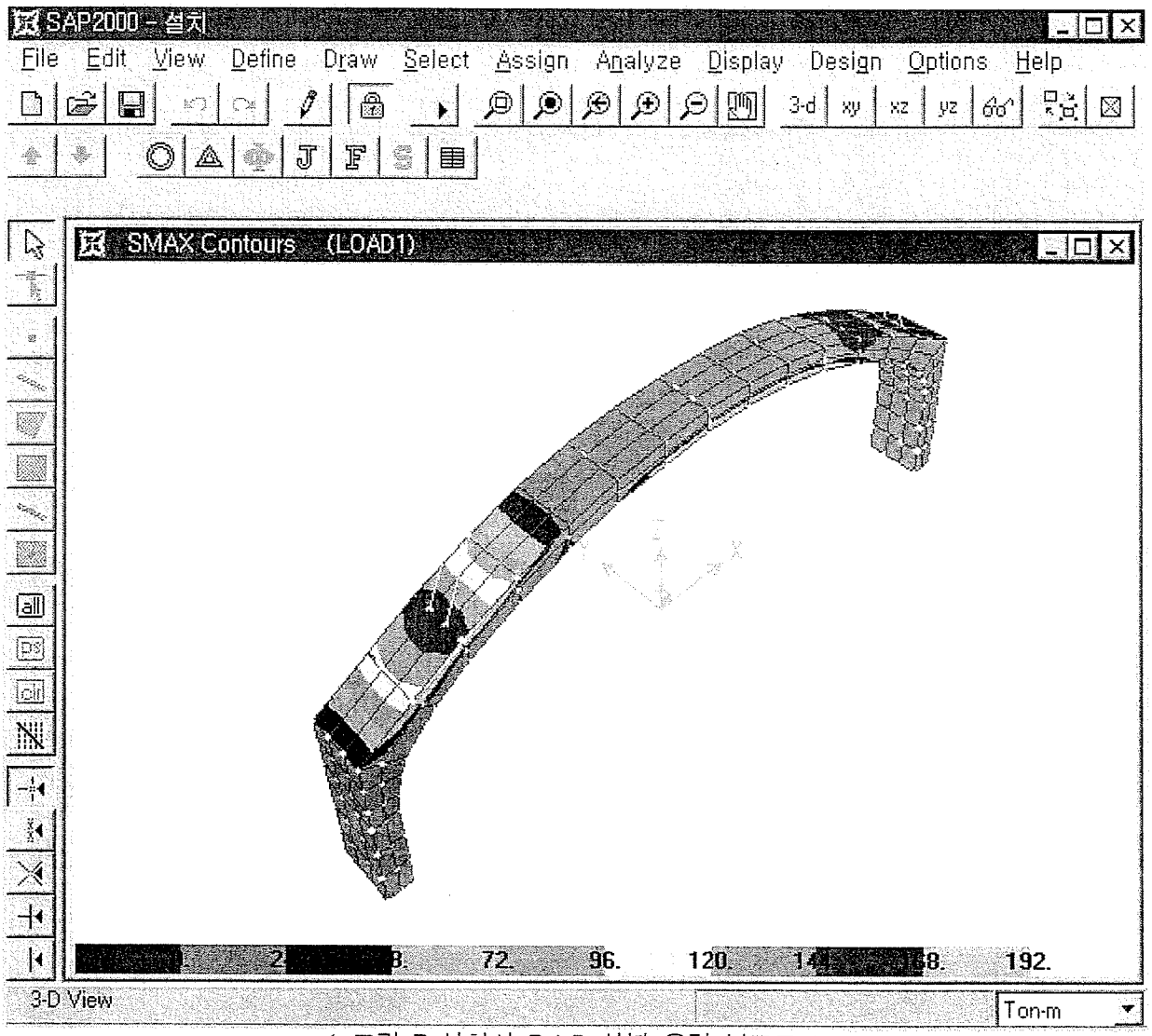
② 구조물 본체 처짐

설치시 P.A.B 벽체 하단부 변위는 내측으로0.0958㎜이며 변위량이 미소함.

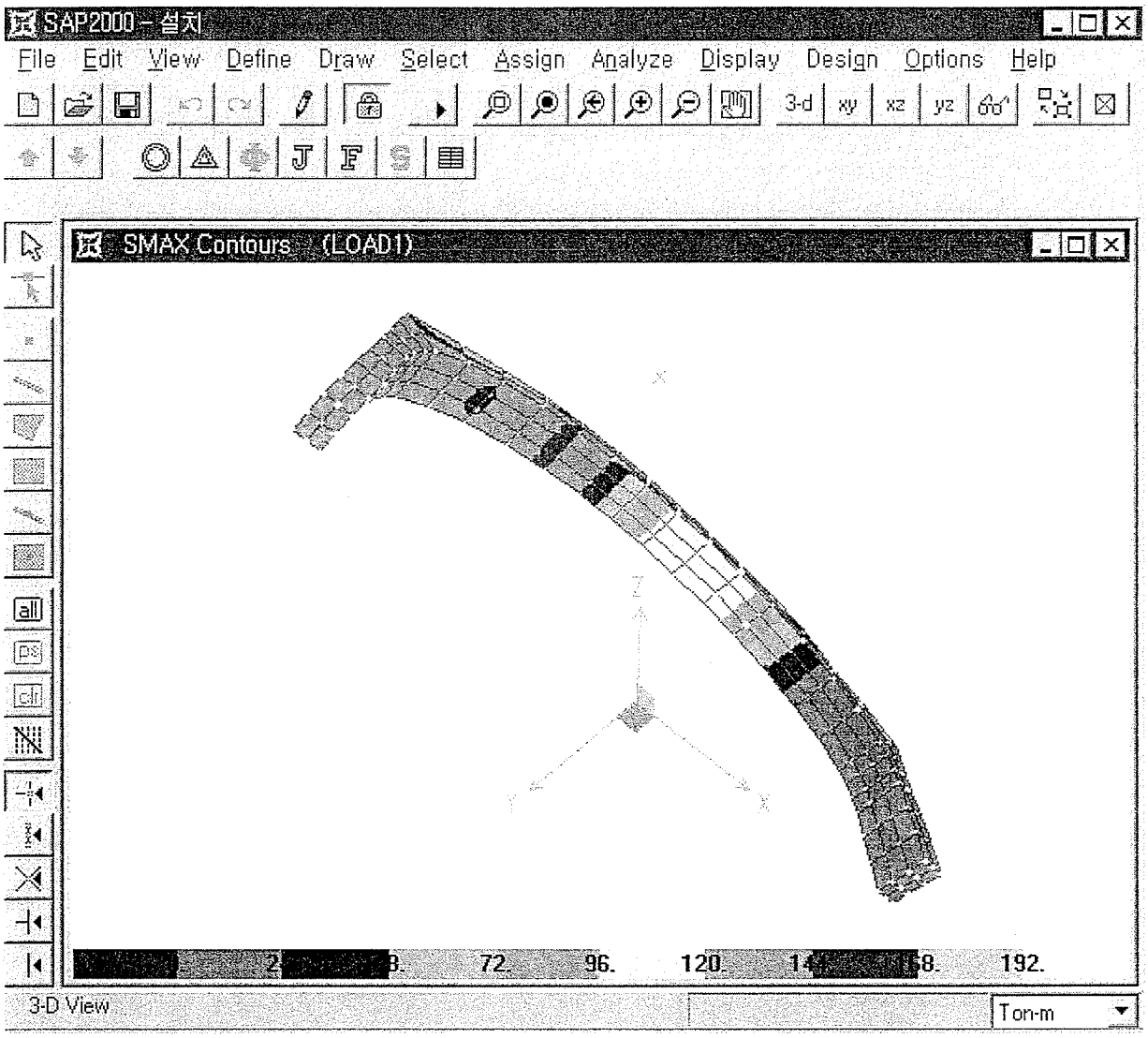
(그림 - 9 참조)

③ 구조물 설치시 인양고리에 대한 전단파괴 검토

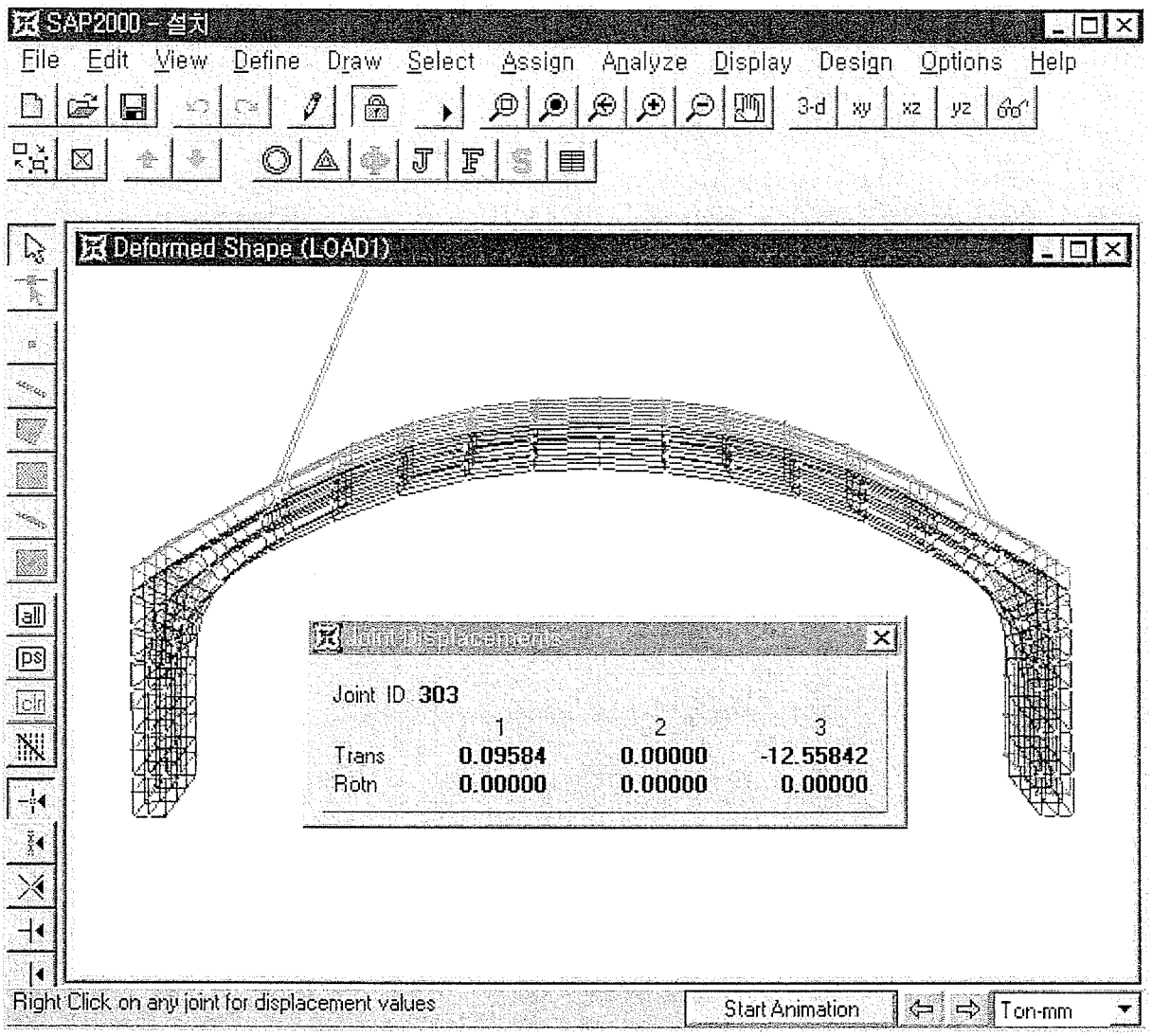
인양시와 같은 형상의 앵커를 사용하므로 인양시와 동일함.



< 그림-7 설치시 P.A.B 상부 응력 분포도 >



< 그림-8 설치시 P.A.B 하부 응력 분포도 >



< 그림-9 설치시 P.A.B 하단에서의 변위 >

7) 허용지지력 계산근거

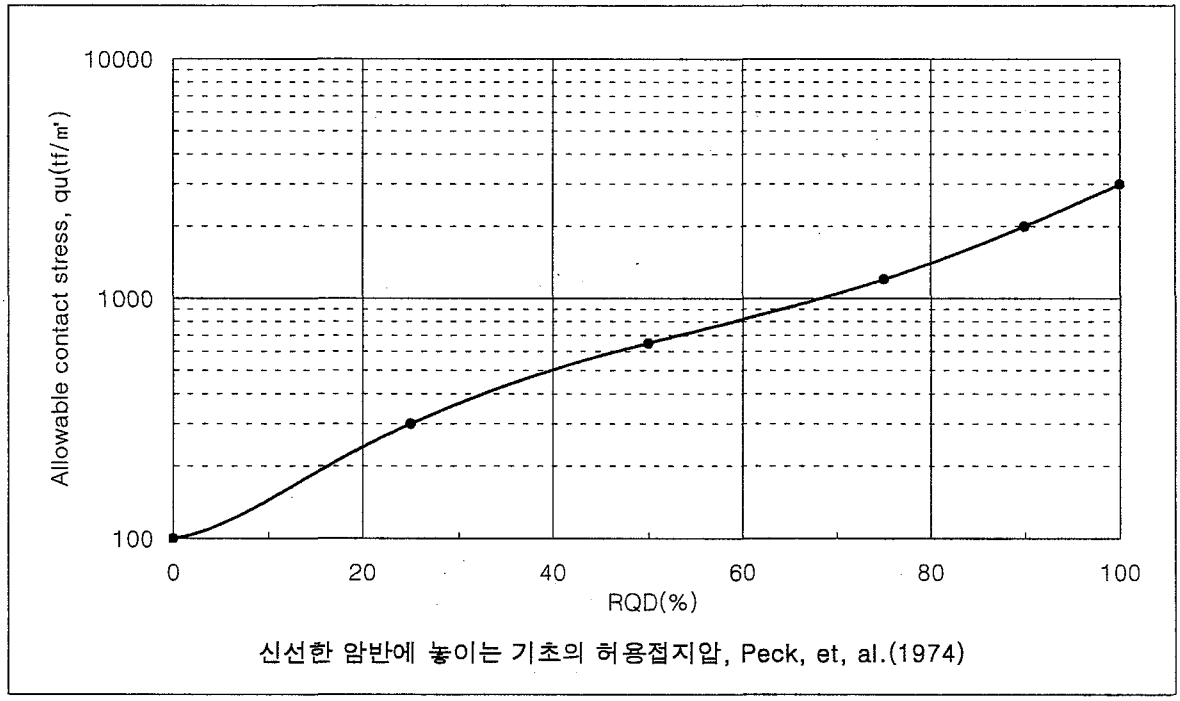
■ 암반에 지지되는 직접기초의 허용지지력

1. 지지층의 암반특성

위 치	공번	TCR/RQD (%)	일축압축강도 (kg/㎠)	절리간격 (cm)	절리틈새 (mm)	비 고
터널부	CB-7	50 / 0	2,090	< 6	> 5	

2. Peck et. al.의 방법(1974) - 도로교설계기준해설(하부구조편, 2001. 9)

- 불연속면의 틈새가 치밀하게 밀착되었을 경우 적용(<3mm)
- RQD와 허용접지압과의 관계로부터 산정(RQD는 기초바닥면 아래 0.25B 이내의 암질을 적용)
- 단, 허용접지압(qa)이 무결암의 일축압축강도(qu)보다 크면 qa=qu로 간주한다.



신선한 암반에 놓이는 기초의 허용접지압, Peck, et, al.(1974)

- 허용지지력 산정

위 치	공번	TCR/RQD (%)	일축압축강도 (kg/㎠)	절리틈새 (mm)	적용여부	qa (tf/㎡)	비 고
터널부	CB-7	50 / 0	2090	< 5	NG	-	

3. C.G.S(Canadian Geotechnical Society, 1985) 방법 - 도로교설계기준해설(하부구조편, 2001. 9)

- 파쇄나 절리가 발달한 암반(불연속면간격≥30cm, 틈새≥5mm인 경우, 수평하중이 없는 경우 적용)
- 단, 퇴적암반의 경우, 층리가 수평하여야 함.

$q_a = K_{sp} \times q_u$

여기서, qa : 허용지지력(kg/㎠)

$K_{sp} = (3+C/Bf)/(10\sqrt{(1+300\delta/C)})$

적용조건 : $0.05 < C/Bf < 2.0$

$0 < \delta/C < 0.02$

qu : 코아의 평균일축압축강도(kg/㎠)

C : 불연속면의 간격(mm)

Bf : 기초폭(mm)

δ : 불연속면의 틈새(mm)

• 허용지지력 산정

위 치	공번	TCR/RQD (%)	일축강도 (kg/㎠)	절리간격 (C,mm)	절리틈새 (δ, mm)	기초폭 (Bf,mm)	C/Bf	δ/C	적용 여부	Ksp	qa (tf/㎡)
터널부	CB-7	50 / 0	2090	< 60	> 5	#####	0.002	0.083	NG	-	-

4. AASHTO(1996) 방법 - 도로교설계기준해설(하부구조편, 2001. 9)

• 공학적 분류에 의해 암반의 상태를 정량적으로 평가할수 있는 경우 적용(최소안전율 3적용)

$q_u = N_{ms} \times C_0$

여기서, N_{ms} : 암석의 종류에 따라 정해지는 값

C_0 : 암석의 일축압축강도(kg/㎠)

• 파쇄나 절리가 발달한 암반에 놓인 기초의 극한지지력 산정을 위한 N_{ms}계수(Hoek, 1983 의 자료 수정)

암반 등급	일반사항	RMR 등급	NGI 등급	RQD (%)	N_{ms}				
					A	B	C	D	E
우수	절리간격 3m이상의 신선암	100	500	95~100	3.8	4.3	5.0	5.2	6.1
매우 양호	절리간격0.9~3m이며, 절리면이 거칠며 치밀하게 밀착되어 있고 풍화되어 있	85	100	90~95	1.4	1.6	1.9	2	2.3
양호	절리간격 0.9~3.0m이며, 절리면이 약간 교란되고 풍화된 신선암	65	10	75~90	0.28	0.32	0.38	0.4	0.46
보통	절리간격 0.9~3.0m의 여러 세트의 적당히 풍화된 절리를 가진 암석	44	1	50~75	0.049	0.056	0.066	0.069	0.081
불량	절리간격이 2~50cm의 약간의 충전물이 있으며 풍화된 절리를 가진 암석	23	0.1	25~50	0.015	0.016	0.019	0.02	0.024
매우 불량	5cm보다 작은 간격의 수없이 많은 풍화된 절리를 가진 암석	3	0.01	<25	상응하는 사질토의 극한지지력을 사용				

㈜ RMR : Geomechanics Rock Mass Rating System - Bieniawski(1989)
NGI : Norwegian Geotechnical Institute Rock Mass Classification System, Barton(1974)
RQD : Rock Quality Designation
Nms : 암석의 종류에 따라 정해지는 값으로, 다음표에 따른다(해설표5.6.5)

• 해설 표 5.6.5 암석의 종류에 따른 일축압축강도의 대표적인 범위

암석분류	일 반 사 항	암 석 명	C_0(kg/㎠)
A	잘발달된 결정질 벽개를 가진 탄산염암	돌로마이트	336 ~ 3,150
		석회암	245 ~ 2,940
		대리석	385 ~ 2,450
B	점토질암	규질점토암	294 ~ 1,470
		점토암	14 ~ 84
		이회암	532 ~ 1,960
		천매암	245 ~ 2,450
		미사암	98 ~ 1,190
		셰일	70 ~ 357
		점판암	1,470 ~ 2,100
C	강한결정과 약한 벽개를 가진 사질 암석	역암	336 ~ 2,240
		사암	679 ~ 1,750
		규암	630 ~ 3,850
D	세립질의 화성암 결정질 암석	안산암	980 ~ 1,820
		휘록암	217 ~ 5,810
E	조립질의 화성암과 변성암의 결정질 암	각섬암	1,190 ~ 2,800
		반려암	1,260 ~ 3,150
		편마암	245 ~ 3,150
		화강암	147 ~ 3,430
		석영섬록암	98 ~ 980
		편암	98 ~ 1,470
		섬장암	1,820 ~ 4,340

• **허용지지력 산정**

위 치	공번	TCR/RQD (%)	일축압축강도 (kg/㎠)	N_{ms}	적용여부	qu (tf/㎡)	qa (tf/㎡)
터널부	CB-7	50 / 0	2,090	0.016	NG	-	-

5. 확대기초의 지지력 경험치(NAVFAC DM7, 1982)에 의한 방법 - 구조물기초 설계기준(1997)

지 지 층	현장연경도 상태	허용지지력(tf/㎡)			
		범 위			추천값
괴상의 결정질 화강암, 변성암 : 화강암, 섬록암, 현무암, 환전히 고결된 역암	경질의 신선한 암	650	~	1070	860
엽리성 변성암 : 슬레이트, 편암	중간 경질의 신선한 암	320	~	430	375
퇴적암 : 시멘트화된 경질의 셰일, 실트암, 사암, 동공이 없는 석회암	중간 경질의 신선한 암	160	~	270	215
풍화되거나 파쇄된 모암, 이질암(셰일) 이외의 모든암, RQD<25	연암	85	~	130	85
컴팩션 셰일(Compaction shale)이나 신선한 이질암	연암	85	~	160	105
입도분포가 양호한 세립토 모래자갈의 혼합물 : 빙하퇴적물, 하드팬(Hardpan), 점성토 섞인 자갈(GW-GC, GC, SC)	매우조밀함	85	~	130	105
자갈, 자갈-모래 혼합물, 호박돌-자갈 혼합물(GW, GP, SW, SP)	매우조밀함	65	~	105	75
	중간정도 조밀	40	~	75	50
	느슨함	20	~	65	30
입자가 굵거나 중간정도의 모래, 자갈이 약간섞인 모래(SW, SP)	매우조밀함	40	~	65	40
	중간정도 조밀	20	~	40	30
	느슨함	10	~	30	15
가는 모래, 실트질이나 점토질 중간정도 입도나 굵은 모래(SW, SM, SC)	매우조밀함	30	~	50	30
	중간정도 조밀	20	~	40	25
	느슨함	10	~	30	15
균질한 점토, 모래질이나 실트질 점토(CL, CH)	굳음	30	~	60	40
	중간정도 굳음	10	~	30	20
	느슨함	5	~	10	5
실트, 모래질 실트, 점토질 실트, 교호된(varved) 실트-점토-세사층	매우굳음	20	~	40	30
	중간정도 굳음	10	~	30	15
	연함	5	~	10	5

※ ① 일반활하중 및 영구 횡하중을 포함한 편심하중에 의한 후팅의 최대 접지압력이 위 표의 공칭 경험값을 초과해서는 않된다.

② 바람이나 지진같은 일시적인 하중에 의한 접지압은 공칭 경험값의 1/3을 초과할수 없다.

③ 연한 암반이나 토층 지반에서 기초는 인접 최저 지표고로 부터 최소 0.5m는 근입되어야 한다.

④ 연한 암반이나 사질토 지반에서는 ③에서 규정한 초소 근입깊이(0.5m)로 부터 근입깊이가 0.3m 증가할때마다 공칭 경험값의 5%를 할증하여 사용한다.

⑤ 경질 또는 중간정도 경질인 암에서는 기초가 암표면에 놓일 경우 표에 제시된 경험값을 사용하고, 근입깊이가 암표면으로부터 0.3m 증가할때마다 공칭 경험값의 10%를 할증한다.

• 허용지지력 산정

위 치	공번	TCR/RQD (%)	일축압축강도 (kg/㎠)	qa (tf/㎡)
터널부	CB-7	50 / 0	2,090	85

6. 허용지지력의 결정

위 치	공번	TCR/RQD (%)	일축강도 (kg/㎠)	기초폭 (Bf,mm)	Peck의 방법(tf/㎡)	C.G.S 방법(tf/㎡)	AASHTO 방법(tf/㎡)	NAVFAC의 경험치(tf/㎡)	적용 (tf/㎡)
터널부	CB-7	50 / 0	2,090	30,500	-	-	-	85	85

8) 전산 INPUT DATA

```
; File D:\SAP2000DATA\만영개착식터널\가설.$2k
saved 9-18-02 10:36:02 in Ton-m

SYSTEM
  DOF=UX,UZ,RY  LENGTH=m  FORCE=Ton  LINES=59

JOINT
  1  X=-14.25  Y=0  Z=-5.679
  2  X=-14.25  Y=0  Z=-5.026
  3  X=-14.25  Y=0  Z=-4.372
  4  X=-14.25  Y=0  Z=-3.719
  5  X=-14.23  Y=0  Z=-3.293
  6  X=-14.166  Y=0  Z=-2.86
  7  X=-14.107  Y=0  Z=-2.444
  8  X=-13.748  Y=0  Z=-2.165
  9  X=-13.294  Y=0  Z=-1.832
  10  X=-12.092  Y=0  Z=-1.131
  11  X=-10.887  Y=0  Z=-.608
  12  X=-9.683  Y=0  Z=-.256
  13  X=-8.479  Y=0  Z=-.057
  14  X=-7.275  Y=0  Z=0
  15  X=-6.071  Y=0  Z=-.057
  16  X=-4.867  Y=0  Z=-.256
  17  X=-3.663  Y=0  Z=-.608
  18  X=-2.458  Y=0  Z=-1.131
  19  X=-1.256  Y=0  Z=-1.832
  20  X=-.795  Y=0  Z=-2.165
  21  X=-.443  Y=0  Z=-2.444
  22  X=-.369  Y=0  Z=-2.86
  23  X=-.318  Y=0  Z=-3.293
  24  X=-.3  Y=0  Z=-3.719
  25  X=-.3  Y=0  Z=-4.372
  26  X=-.3  Y=0  Z=-5.026
  27  X=-.3  Y=0  Z=-5.679
  101  X=-14.325  Y=0  Z=-5.679
  102  X=-14.325  Y=0  Z=-7.052
  201  X=0  Y=0  Z=-5.679
  202  X=0  Y=0  Z=-7.475
  301  X=14.325  Y=0  Z=-5.679
  302  X=14.325  Y=0  Z=-7.938
  401  X=-15.25  Y=0  Z=-7.764
  402  X=-14.325  Y=0  Z=-7.764
  403  X=-13.9  Y=0  Z=-7.777
  404  X=-13.017  Y=0  Z=-7.804
  405  X=-12.133  Y=0  Z=-7.83
  406  X=-11.25  Y=0  Z=-7.857
  407  X=-10.367  Y=0  Z=-7.883
  408  X=-9.484  Y=0  Z=-7.91
  409  X=-8.6  Y=0  Z=-7.936
  410  X=-7.717  Y=0  Z=-7.963
  411  X=-6.834  Y=0  Z=-7.989
  412  X=-5.95  Y=0  Z=-8.016
  413  X=-5.067  Y=0  Z=-8.042
  414  X=-4.184  Y=0  Z=-8.069
  415  X=-3.3  Y=0  Z=-8.098
  416  X=-2.417  Y=0  Z=-8.122
  417  X=-1.534  Y=0  Z=-8.148
  418  X=-.65  Y=0  Z=-8.175
  419  X=0  Y=0  Z=-8.194
  420  X=.65  Y=0  Z=-8.214
  421  X=1.534  Y=0  Z=-8.241
  422  X=2.417  Y=0  Z=-8.267
  423  X=3.3  Y=0  Z=-8.291
  424  X=4.184  Y=0  Z=-8.32
  425  X=5.067  Y=0  Z=-8.347
  426  X=5.95  Y=0  Z=-8.373
  427  X=6.834  Y=0  Z=-8.4
  428  X=7.717  Y=0  Z=-8.426
  429  X=8.6  Y=0  Z=-8.453
  430  X=9.484  Y=0  Z=-8.479
  431  X=10.367  Y=0  Z=-8.506
  432  X=11.25  Y=0  Z=-8.532
  433  X=12.133  Y=0  Z=-8.559
  434  X=13.017  Y=0  Z=-8.585
  435  X=13.9  Y=0  Z=-8.612
  436  X=14.325  Y=0  Z=-8.625
  437  X=15.25  Y=0  Z=-8.625

PATTERN
  NAME=TEMP
  NAME=PRES

SPRING
  ADD=401  U3=201064.2
  ADD=402  U3=293445
  ADD=403  U3=284315.6
  ADD=404  U3=384087
  ADD=405  U3=384087
```



```
  ADD=406  U3=383869.6
  ADD=407  U3=383869.6
  ADD=408  U3=384087
  ADD=409  U3=384087
  ADD=410  U3=383869.6
  ADD=411  U3=384087
  ADD=412  U3=384087
  ADD=413  U3=383869.6
  ADD=414  U3=384087
  ADD=415  U3=384087
  ADD=416  U3=383869.6
  ADD=417  U3=384087
  ADD=418  U3=333440.5
  ADD=419  U1=10000  U3=282576.7
  ADD=420  U3=333440.5
  ADD=421  U3=384087
  ADD=422  U3=383869.6
  ADD=423  U3=384087
  ADD=424  U3=384087
  ADD=425  U3=383869.6
  ADD=426  U3=384087
  ADD=427  U3=384087
  ADD=428  U3=383869.6
  ADD=429  U3=384087
  ADD=430  U3=384087
  ADD=431  U3=383869.6
  ADD=432  U3=383869.6
  ADD=433  U3=384087
  ADD=434  U3=384087
  ADD=435  U3=284315.6
  ADD=436  U3=293445
  ADD=437  U3=201064.2

MATERIAL
  NAME=CONC  IDES=C  M=.2448  W=2.5
    T=0  E=2800000  U=.2  A=.00001
  NAME=STEEL  IDES=S
    T=0  E=2E+10  U=.3  A=.0000117  FY=25310.51
  NAME=RIGID  IDES=C
    T=0  E=2464750  U=.3  A=.00001
  NAME=CONC1  IDES=C  M=.2448  W=2.5
    T=0  E=2464750  U=.2  A=.00001

FRAME SECTION
  NAME=T1 MAT=CONC SH=R T=.5,1 A=.5
J=2.861003E-02 I=1.041667E-02,4.897667E-02
AS=.4166667,.4166667
  NAME=T2 MAT=CONC SH=R T=.542,1 A=.542
J=3.508126E-02 I=1.326834E-02,4.516667E-02
AS=.4516667,.4516667
  NAME=T3 MAT=CONC SH=R T=.675,1 A=.675
J=5.967503E-02 I=2.562891E-02,.05625
AS=.5625,.5625
  NAME=T4 MAT=CONC SH=R T=.916,1 A=.916
J=.1170223 I=6.404794E-02,7.633334E-02
AS=.7633333,.7633333
  NAME=T5 MAT=CONC SH=R T=.68,1 A=.68
J=6.070982E-02 I=2.620267E-02,5.666667E-02
AS=.5666667,.5666667
  NAME=T6 MAT=CONC SH=R T=.553,1 A=.553
J=3.688483E-02 I=.0140927,4.608333E-02
AS=.4608333,.4608333
  NAME=T7 MAT=CONC SH=R T=.511,1 A=.511
J=3.024029E-02 I=.0111194,4.258334E-02
AS=.4258333,.4258333
  NAME=T8 MAT=CONC SH=R T=.5,1 A=.5
J=2.861003E-02 I=1.041667E-02,4.897667E-02
AS=.4166667,.4166667
  NAME=FOOT MAT=CONC1 SH=R T=1.4,1 A=1.4
J=.2612221 I=.2286666,.1166667
AS=1.166667,1.166667
  NAME=WALL MAT=CONC1 SH=R T=.85,1 A=.85
J=9.985562E-02 I=4.117709E-02,7.083333E-02
AS=.7083334,.7083334
  NAME=RIGID MAT=RIGID SH=R T=10,10 A=100
J=1408.333 I=833.5623,833.5623
AS=83.56233,83.56233
  NAME=WALL1 MAT=CONC1 SH=R T=1.3,1 A=1.3
J=.2294606 I=.1830833,.1083333
AS=1.083333,1.083333
  NAME=VAR1 TYPE=NONPR
    SEC=T1,T2 EIVAR=1,1 L=.426
  NAME=VAR2 TYPE=NONPR
    SEC=T2,T3 EIVAR=1,1 L=.436
  NAME=VAR3 TYPE=NONPR
    SEC=T3,T4 EIVAR=1,1 L=.422
  NAME=VAR4 TYPE=NONPR
    SEC=T4,T5 EIVAR=1,1 L=.455
  NAME=VAR5 TYPE=NONPR
    SEC=T5,T6 EIVAR=1,1 L=.563
```

```
  NAME=VAR6 TYPE=NONPR
    SEC=T6,T7 EIVAR=1,1 L=1.392
  NAME=VAR7 TYPE=NONPR
    SEC=T7,T8 EIVAR=1,1 L=1.313

FRAME
  1  J=1,2  SEC=T1  NSEG=1  ANG=180  IREL=R3
  2  J=2,3  SEC=T1  NSEG=1  ANG=180
  3  J=3,4  SEC=T1  NSEG=1  ANG=180
  4  J=4,5  SEC=VAR1  NSEG=1  ANG=0
  5  J=5,6  SEC=VAR2  NSEG=1  ANG=0
  6  J=6,7  SEC=VAR3  NSEG=1  ANG=0
  7  J=7,8  SEC=VAR4  NSEG=1  ANG=0
  8  J=8,9  SEC=VAR5  NSEG=1  ANG=0
  9  J=9,10  SEC=VAR6  NSEG=1  ANG=0
  10  J=10,11  SEC=VAR7  NSEG=1  ANG=0
  11  J=11,12  SEC=T8  NSEG=1  ANG=0
  12  J=12,13  SEC=T8  NSEG=1  ANG=0
  13  J=13,14  SEC=T8  NSEG=1  ANG=0
  14  J=14,15  SEC=T8  NSEG=1  ANG=0
  15  J=15,16  SEC=T8  NSEG=1  ANG=0
  16  J=16,17  SEC=T8  NSEG=1  ANG=0
  17  J=17,18  SEC=VAR7  NSEG=1  ANG=0
  18  J=18,19  SEC=VAR6  NSEG=1  ANG=0
  19  J=19,20  SEC=VAR5  NSEG=1  ANG=0
  20  J=20,21  SEC=VAR4  NSEG=1  ANG=0
  21  J=21,22  SEC=VAR3  NSEG=1  ANG=0
  22  J=22,23  SEC=VAR2  NSEG=1  ANG=0
  23  J=23,24  SEC=VAR1  NSEG=1  ANG=0
  24  J=24,25  SEC=T1  NSEG=1  ANG=0
  25  J=25,26  SEC=T1  NSEG=1  ANG=0
  26  J=26,27  SEC=T1  NSEG=1  ANG=0  JREL=R3
  86  J=201,27  SEC=RIGID  NSEG=1  ANG=0
  88  J=1,101  SEC=RIGID  NSEG=1  ANG=0
  101  J=102,101  SEC=WALL  NSEG=1  ANG=180
  102  J=402,102  SEC=WALL  NSEG=1  ANG=180
IOFF=.02475  RIGID=0
  201  J=202,201  SEC=WALL1  NSEG=1  ANG=0
  202  J=419,202  SEC=WALL1  NSEG=1  ANG=0
IOFF=.375  RIGID=0
  301  J=301,302  SEC=WALL  NSEG=1  ANG=0
  302  J=302,436  SEC=WALL  NSEG=1  ANG=0
JOFF=.4875  RIGID=0
  400  J=401,402  SEC=FOOT  NSEG=1  ANG=0
  401  J=402,403  SEC=FOOT  NSEG=1  ANG=0
IOFF=.075  RIGID=0
  402  J=403,404  SEC=FOOT  NSEG=1  ANG=0
  403  J=404,405  SEC=FOOT  NSEG=1  ANG=0
  404  J=405,406  SEC=FOOT  NSEG=1  ANG=0
  405  J=406,407  SEC=FOOT  NSEG=1  ANG=0
  406  J=407,408  SEC=FOOT  NSEG=1  ANG=0
  407  J=408,409  SEC=FOOT  NSEG=1  ANG=0
  408  J=409,410  SEC=FOOT  NSEG=1  ANG=0
  409  J=410,411  SEC=FOOT  NSEG=1  ANG=0
  410  J=411,412  SEC=FOOT  NSEG=1  ANG=0
  411  J=412,413  SEC=FOOT  NSEG=1  ANG=0
  412  J=413,414  SEC=FOOT  NSEG=1  ANG=0
  413  J=414,415  SEC=FOOT  NSEG=1  ANG=0
  414  J=415,416  SEC=FOOT  NSEG=1  ANG=0
  415  J=416,417  SEC=FOOT  NSEG=1  ANG=0
  416  J=417,418  SEC=FOOT  NSEG=1  ANG=0
  417  J=418,419  SEC=FOOT  NSEG=1  ANG=0
JOFF=.3  RIGID=0
  418  J=419,420  SEC=FOOT  NSEG=1  ANG=0
IOFF=.3  RIGID=0
  419  J=420,421  SEC=FOOT  NSEG=1  ANG=0
  420  J=421,422  SEC=FOOT  NSEG=1  ANG=0
  421  J=422,423  SEC=FOOT  NSEG=1  ANG=0
  422  J=423,424  SEC=FOOT  NSEG=1  ANG=0
  423  J=424,425  SEC=FOOT  NSEG=1  ANG=0
  424  J=425,426  SEC=FOOT  NSEG=1  ANG=0
  425  J=426,427  SEC=FOOT  NSEG=1  ANG=0
  426  J=427,428  SEC=FOOT  NSEG=1  ANG=0
  427  J=428,429  SEC=FOOT  NSEG=1  ANG=0
  428  J=429,430  SEC=FOOT  NSEG=1  ANG=0
  429  J=430,431  SEC=FOOT  NSEG=1  ANG=0
  430  J=431,432  SEC=FOOT  NSEG=1  ANG=0
  431  J=432,433  SEC=FOOT  NSEG=1  ANG=0
  432  J=433,434  SEC=FOOT  NSEG=1  ANG=0
  433  J=434,435  SEC=FOOT  NSEG=1  ANG=0
  434  J=435,436  SEC=FOOT  NSEG=1  ANG=0
JOFF=.075  RIGID=0
  435  J=436,437  SEC=FOOT  NSEG=1  ANG=0

LOAD
  NAME=SW  SW=1  CSYS=0

OUTPUT
; No Output Requested
```



```
END

; The following data is used for graphics, design
and pushover analysis.
; If changes are made to the analysis data above,
then the following data
; should be checked for consistency.
SAP2000 V7.40 SUPPLEMENTAL DATA
  GRID GLOBAL  X "1"  -15.925
  GRID GLOBAL  Y "2"  0
  GRID GLOBAL  Z "3"  -9.116
  GRID GLOBAL  X "4"  0
  GRID GLOBAL  Z "5"  0
  GRID GLOBAL  X "6"  15.925
  MATERIAL STEEL FY 25310.51
  MATERIAL CONC FYREBAR 42184.18 FYSHEAR 28122.79
FC 2812.579 FCSHEAR 2812.579
  MATERIAL RIGID FYREBAR 42184.18 FYSHEAR
28122.79 FC 2812.579 FCSHEAR 2812.579
  MATERIAL CONC1 FYREBAR 42184.18 FYSHEAR
28122.79 FC 2812.579 FCSHEAR 2812.579
  CONCRETESECTION T1 COLUMN  COVER .055 REBAR
RR-3-3
  CONCRETESECTION T2 COLUMN  COVER .0574 REBAR
RR-3-3
  CONCRETESECTION T3 COLUMN  COVER .0672 REBAR
RR-3-3
  CONCRETESECTION T4 COLUMN  COVER .0871 REBAR
RR-3-3
  CONCRETESECTION T5 COLUMN  COVER .0863 REBAR
RR-3-3
  CONCRETESECTION T6 COLUMN  COVER .0644 REBAR
RR-3-3
  CONCRETESECTION T7 COLUMN  COVER .0529 REBAR
RR-3-3
  CONCRETESECTION T8 COLUMN  COVER .05 REBAR
RR-3-3
  CONCRETESECTION FOOT COLUMN  COVER .14 REBAR
RR-3-3
  CONCRETESECTION WALL COLUMN  COVER .057 REBAR
RR-3-3
  CONCRETESECTION RIGID COLUMN  COVER 1 REBAR
RR-3-3
  CONCRETESECTION WALL1 COLUMN  COVER .14 REBAR
RR-3-3
  STATICLOAD SW TYPE DEAD
END SUPPLEMENTAL DATA
```

```
; File D:\SAP2000DATA\반영계착식터널\MAT1.$2k
saved 10-9-02 9:58:52 in Ton-m

SYSTEM
  DOF=UX,UZ,RY  LENGTH=m  FORCE=Ton  LINES=59

JOINT
  1  X=-14.25  Y=0  Z=-5.679
  2  X=-14.25  Y=0  Z=-5.026
  3  X=-14.25  Y=0  Z=-4.372
  4  X=-14.25  Y=0  Z=-3.719
  5  X=-14.23  Y=0  Z=-3.293
  6  X=-14.166  Y=0  Z=-2.86
  7  X=-14.107  Y=0  Z=-2.444
  8  X=-13.748  Y=0  Z=-2.165
  9  X=-13.294  Y=0  Z=-1.832
  10  X=-12.092  Y=0  Z=-1.131
  11  X=-10.887  Y=0  Z=-.608
  12  X=-9.683  Y=0  Z=-.256
  13  X=-8.479  Y=0  Z=-.057
  14  X=-7.275  Y=0  Z=0
  15  X=-6.071  Y=0  Z=-.057
  16  X=-4.867  Y=0  Z=-.256
  17  X=-3.663  Y=0  Z=-.608
  18  X=-2.458  Y=0  Z=-1.131
  19  X=-1.256  Y=0  Z=-1.832
  20  X=-.795  Y=0  Z=-2.165
  21  X=-.443  Y=0  Z=-2.444
  22  X=-.369  Y=0  Z=-2.86
  23  X=-.318  Y=0  Z=-3.293
  24  X=-.3  Y=0  Z=-3.719
  25  X=-.3  Y=0  Z=-4.372
  26  X=-.3  Y=0  Z=-5.026
  27  X=-.3  Y=0  Z=-5.679
  28  X=.3  Y=0  Z=-5.679
  29  X=.3  Y=0  Z=-5.026
  30  X=.3  Y=0  Z=-4.372
  31  X=.3  Y=0  Z=-3.719
  32  X=.318  Y=0  Z=-3.293
  33  X=.369  Y=0  Z=-2.86
  34  X=.443  Y=0  Z=-2.444
  35  X=.795  Y=0  Z=-2.165
  36  X=1.256  Y=0  Z=-1.832
  37  X=2.458  Y=0  Z=-1.131
  38  X=3.663  Y=0  Z=-.608
  39  X=4.867  Y=0  Z=-.256
  40  X=6.071  Y=0  Z=-.057
  41  X=7.275  Y=0  Z=0
  42  X=8.479  Y=0  Z=-.057
  43  X=9.683  Y=0  Z=-.256
  44  X=10.887  Y=0  Z=-.608
  45  X=12.092  Y=0  Z=-1.131
  46  X=13.294  Y=0  Z=-1.832
  47  X=13.748  Y=0  Z=-2.165
  48  X=14.107  Y=0  Z=-2.444
  49  X=14.166  Y=0  Z=-2.86
  50  X=14.23  Y=0  Z=-3.293
  51  X=14.25  Y=0  Z=-3.719
  52  X=14.25  Y=0  Z=-4.372
  53  X=14.25  Y=0  Z=-5.026
  54  X=14.25  Y=0  Z=-5.679
  101  X=-14.325  Y=0  Z=-5.679
  102  X=-14.325  Y=0  Z=-7.052
  201  X=0  Y=0  Z=-5.679
  202  X=0  Y=0  Z=-7.475
  301  X=14.325  Y=0  Z=-5.679
  302  X=14.325  Y=0  Z=-7.938
  401  X=-15.25  Y=0  Z=-7.764
  402  X=-14.325  Y=0  Z=-7.764
  403  X=-13.9  Y=0  Z=-7.777
  404  X=-13.017  Y=0  Z=-7.804
  405  X=-12.133  Y=0  Z=-7.83
  406  X=-11.25  Y=0  Z=-7.857
  407  X=-10.367  Y=0  Z=-7.883
  408  X=-9.484  Y=0  Z=-7.91
  409  X=-8.6  Y=0  Z=-7.936
  410  X=-7.717  Y=0  Z=-7.963
  411  X=-6.834  Y=0  Z=-7.989
  412  X=-5.95  Y=0  Z=-8.016
  413  X=-5.067  Y=0  Z=-8.042
  414  X=-4.184  Y=0  Z=-8.069
  415  X=-3.3  Y=0  Z=-8.098
  416  X=-2.417  Y=0  Z=-8.122
  417  X=-1.534  Y=0  Z=-8.148
  418  X=-.65  Y=0  Z=-8.175
  419  X=0  Y=0  Z=-8.194
  420  X=.65  Y=0  Z=-8.214
  421  X=1.534  Y=0  Z=-8.241
```



```
  422  X=2.417  Y=0  Z=-8.267
  423  X=3.3  Y=0  Z=-8.291
  424  X=4.184  Y=0  Z=-8.32
  425  X=5.067  Y=0  Z=-8.347
  426  X=5.95  Y=0  Z=-8.373
  427  X=6.834  Y=0  Z=-8.4
  428  X=7.717  Y=0  Z=-8.426
  429  X=8.6  Y=0  Z=-8.453
  430  X=9.484  Y=0  Z=-8.479
  431  X=10.367  Y=0  Z=-8.506
  432  X=11.25  Y=0  Z=-8.532
  433  X=12.133  Y=0  Z=-8.559
  434  X=13.017  Y=0  Z=-8.585
  435  X=13.9  Y=0  Z=-8.612
  436  X=14.325  Y=0  Z=-8.625
  437  X=15.25  Y=0  Z=-8.625

PATTERN
  NAME=TEMP
  NAME=PRES

SPRING
  ADD=401  U3=201064.2
  ADD=402  U3=293445
  ADD=403  U3=284315.6
  ADD=404  U3=384087
  ADD=405  U3=384087
  ADD=406  U3=383869.6
  ADD=407  U3=383869.6
  ADD=408  U3=384087
  ADD=409  U3=384087
  ADD=410  U3=383869.6
  ADD=411  U3=384087
  ADD=412  U3=384087
  ADD=413  U3=383869.6
  ADD=414  U3=384087
  ADD=415  U3=384087
  ADD=416  U3=383869.6
  ADD=417  U3=384087
  ADD=418  U3=333440.5
  ADD=419  U1=10000  U3=282576.7
  ADD=420  U3=333440.5
  ADD=421  U3=384087
  ADD=422  U3=383869.6
  ADD=423  U3=384087
  ADD=424  U3=384087
  ADD=425  U3=383869.6
  ADD=426  U3=384087
  ADD=427  U3=384087
  ADD=428  U3=383869.6
  ADD=429  U3=384087
  ADD=430  U3=384087
  ADD=431  U3=383869.6
  ADD=432  U3=383869.6
  ADD=433  U3=384087
  ADD=434  U3=384087
  ADD=435  U3=284315.6
  ADD=436  U3=293445
  ADD=437  U3=201064.2

MATERIAL
  NAME=CONC  IDES=C  M=.2448  W=2.5
    T=0  E=2800000  U=.2  A=.00001
  NAME=STEEL  IDES=S
    T=0  E=2E+10  U=.3  A=.0000117  FY=25310.51
  NAME=RIGID  IDES=C
    T=0  E=2464750  U=.3  A=.00001
  NAME=CONC1  IDES=C  M=.2448  W=2.5
    T=0  E=2464750  U=.2  A=.00001

FRAME SECTION
  NAME=T1 MAT=CONC SH=R T=.5,1 A=.5
J=2.861003E-02 I=1.041667E-02,4.897667E-02
AS=.4166667,.4166667
  NAME=T2 MAT=CONC SH=R T=.542,1 A=.542
J=3.508126E-02 I=1.326834E-02,4.516667E-02
AS=.4516667,.4516667
  NAME=T3 MAT=CONC SH=R T=.675,1 A=.675
J=5.967503E-02 I=2.562891E-02,.05625
AS=.5625,.5625
  NAME=T4 MAT=CONC SH=R T=.916,1 A=.916
J=.1170223 I=6.404794E-02,7.633334E-02
AS=.7633333,.7633333
  NAME=T5 MAT=CONC SH=R T=.68,1 A=.68
J=6.070982E-02 I=2.620267E-02,5.666667E-02
AS=.5666667,.5666667
  NAME=T6 MAT=CONC SH=R T=.553,1 A=.553
J=3.688483E-02 I=.0140927,4.608333E-02
AS=.4608333,.4608333
  NAME=T7 MAT=CONC SH=R T=.511,1 A=.511
```

```
J=3.024029E-02 I=.0111194,4.258334E-02
AS=.4258333,.4258333
  NAME=T8 MAT=CONC SH=R T=.5,1 A=.5
J=2.861003E-02 I=1.041667E-02,4.897667E-02
AS=.4166667,.4166667
  NAME=FOOT MAT=CONC1 SH=R T=1.4,1 A=1.4
J=.2612221 I=.2286666,.1166667
AS=1.166667,1.166667
  NAME=WALL MAT=CONC1 SH=R T=.85,1 A=.85
J=9.985562E-02 I=4.117709E-02,7.083333E-02
AS=.7083334,.7083334
  NAME=RIGID MAT=RIGID SH=R T=10,10 A=100
J=1408.333 I=833.5623,833.5623
AS=83.56233,83.56233
  NAME=WALL1 MAT=CONC1 SH=R T=1.3,1 A=1.3
J=.2294606 I=.1830833,.1083333
AS=1.083333,1.083333
  NAME=VAR1 TYPE=NONPR
    SEC=T1,T2 EIVAR=1,1 L=.426
  NAME=VAR2 TYPE=NONPR
    SEC=T2,T3 EIVAR=1,1 L=.436
  NAME=VAR3 TYPE=NONPR
    SEC=T3,T4 EIVAR=1,1 L=.422
  NAME=VAR4 TYPE=NONPR
    SEC=T4,T5 EIVAR=1,1 L=.455
  NAME=VAR5 TYPE=NONPR
    SEC=T5,T6 EIVAR=1,1 L=.563
  NAME=VAR6 TYPE=NONPR
    SEC=T6,T7 EIVAR=1,1 L=1.392
  NAME=VAR7 TYPE=NONPR
    SEC=T7,T8 EIVAR=1,1 L=1.313

FRAME
  1  J=1,2   SEC=T1   NSEG=1  ANG=180  IREL=R3
  2  J=2,3   SEC=T1   NSEG=1  ANG=180
  3  J=3,4   SEC=T1   NSEG=1  ANG=180
  4  J=4,5   SEC=VAR1  NSEG=1  ANG=0
  5  J=5,6   SEC=VAR2  NSEG=1  ANG=0
  6  J=6,7   SEC=VAR3  NSEG=1  ANG=0
  7  J=7,8   SEC=VAR4  NSEG=1  ANG=0
  8  J=8,9   SEC=VAR5  NSEG=1  ANG=0
  9  J=9,10  SEC=VAR6  NSEG=1  ANG=0
  10  J=10,11  SEC=VAR7  NSEG=1  ANG=0
  11  J=11,12  SEC=T8  NSEG=1  ANG=0
  12  J=12,13  SEC=T8  NSEG=1  ANG=0
  13  J=13,14  SEC=T8  NSEG=1  ANG=0
  14  J=14,15  SEC=T8  NSEG=1  ANG=0
  15  J=15,16  SEC=T8  NSEG=1  ANG=0
  16  J=16,17  SEC=T8  NSEG=1  ANG=0
  17  J=17,18  SEC=VAR7  NSEG=1  ANG=0
  18  J=18,19  SEC=VAR6  NSEG=1  ANG=0
  19  J=19,20  SEC=VAR5  NSEG=1  ANG=0
  20  J=20,21  SEC=VAR4  NSEG=1  ANG=0
  21  J=21,22  SEC=VAR3  NSEG=1  ANG=0
  22  J=22,23  SEC=VAR2  NSEG=1  ANG=0
  23  J=23,24  SEC=VAR1  NSEG=1  ANG=0
  24  J=24,25  SEC=T1  NSEG=1  ANG=0
  25  J=25,26  SEC=T1  NSEG=1  ANG=0
  26  J=26,27  SEC=T1  NSEG=1  ANG=0  JREL=R3
  27  J=28,29  SEC=T1  NSEG=1  ANG=180  IREL=R3
  28  J=29,30  SEC=T1  NSEG=1  ANG=180
  29  J=30,31  SEC=T1  NSEG=1  ANG=180
  30  J=31,32  SEC=VAR1  NSEG=1  ANG=0
  31  J=32,33  SEC=VAR2  NSEG=1  ANG=0
  32  J=33,34  SEC=VAR3  NSEG=1  ANG=0
  33  J=34,35  SEC=VAR4  NSEG=1  ANG=0
  34  J=35,36  SEC=VAR5  NSEG=1  ANG=0
  35  J=36,37  SEC=VAR6  NSEG=1  ANG=0
  36  J=37,38  SEC=VAR7  NSEG=1  ANG=0
  37  J=38,39  SEC=T8  NSEG=1  ANG=0
  38  J=39,40  SEC=T8  NSEG=1  ANG=0
  39  J=40,41  SEC=T8  NSEG=1  ANG=0
  40  J=41,42  SEC=T8  NSEG=1  ANG=0
  41  J=42,43  SEC=T8  NSEG=1  ANG=0
  42  J=43,44  SEC=T8  NSEG=1  ANG=0
  43  J=44,45  SEC=VAR7  NSEG=1  ANG=0
  44  J=45,46  SEC=VAR6  NSEG=1  ANG=0
  45  J=46,47  SEC=VAR5  NSEG=1  ANG=0
  46  J=47,48  SEC=VAR4  NSEG=1  ANG=0
  47  J=48,49  SEC=VAR3  NSEG=1  ANG=0
  48  J=49,50  SEC=VAR2  NSEG=1  ANG=0
  49  J=50,51  SEC=VAR1  NSEG=1  ANG=0
  50  J=51,52  SEC=T1  NSEG=1  ANG=0
  52  J=52,53  SEC=T1  NSEG=1  ANG=0
  53  J=53,54  SEC=T1  NSEG=1  ANG=0  JREL=R3
  85  J=28,201  SEC=RIGID  NSEG=1  ANG=0
  86  J=201,27  SEC=RIGID  NSEG=1  ANG=0
  87  J=301,54  SEC=RIGID  NSEG=1  ANG=0
  88  J=1,101  SEC=RIGID  NSEG=1  ANG=0
  101  J=102,101  SEC=WALL  NSEG=1  ANG=180
```



```
  102  J=402,102  SEC=WALL  NSEG=1  ANG=180
IOFF=.02475  RIGID=0
  201  J=202,201  SEC=WALL1  NSEG=1  ANG=0
  202  J=419,202  SEC=WALL1  NSEG=1  ANG=0
IOFF=.375  RIGID=0
  301  J=301,302  SEC=WALL  NSEG=1  ANG=0
  302  J=302,436  SEC=WALL  NSEG=1  ANG=0
JOFF=.4875  RIGID=0
  400  J=401,402  SEC=FOOT  NSEG=1  ANG=0
  401  J=402,403  SEC=FOOT  NSEG=1  ANG=0
IOFF=.075  RIGID=0
  402  J=403,404  SEC=FOOT  NSEG=1  ANG=0
  403  J=404,405  SEC=FOOT  NSEG=1  ANG=0
  404  J=405,406  SEC=FOOT  NSEG=1  ANG=0
  405  J=406,407  SEC=FOOT  NSEG=1  ANG=0
  406  J=407,408  SEC=FOOT  NSEG=1  ANG=0
  407  J=408,409  SEC=FOOT  NSEG=1  ANG=0
  408  J=409,410  SEC=FOOT  NSEG=1  ANG=0
  409  J=410,411  SEC=FOOT  NSEG=1  ANG=0
  410  J=411,412  SEC=FOOT  NSEG=1  ANG=0
  411  J=412,413  SEC=FOOT  NSEG=1  ANG=0
  412  J=413,414  SEC=FOOT  NSEG=1  ANG=0
  413  J=414,415  SEC=FOOT  NSEG=1  ANG=0
  414  J=415,416  SEC=FOOT  NSEG=1  ANG=0
  415  J=416,417  SEC=FOOT  NSEG=1  ANG=0
  416  J=417,418  SEC=FOOT  NSEG=1  ANG=0
  417  J=418,419  SEC=FOOT  NSEG=1  ANG=0
JOFF=.3  RIGID=0
  418  J=419,420  SEC=FOOT  NSEG=1  ANG=0
IOFF=.3  RIGID=0
  419  J=420,421  SEC=FOOT  NSEG=1  ANG=0
  420  J=421,422  SEC=FOOT  NSEG=1  ANG=0
  421  J=422,423  SEC=FOOT  NSEG=1  ANG=0
  422  J=423,424  SEC=FOOT  NSEG=1  ANG=0
  423  J=424,425  SEC=FOOT  NSEG=1  ANG=0
  424  J=425,426  SEC=FOOT  NSEG=1  ANG=0
  425  J=426,427  SEC=FOOT  NSEG=1  ANG=0
  426  J=427,428  SEC=FOOT  NSEG=1  ANG=0
  427  J=428,429  SEC=FOOT  NSEG=1  ANG=0
  428  J=429,430  SEC=FOOT  NSEG=1  ANG=0
  429  J=430,431  SEC=FOOT  NSEG=1  ANG=0
  430  J=431,432  SEC=FOOT  NSEG=1  ANG=0
  431  J=432,433  SEC=FOOT  NSEG=1  ANG=0
  432  J=433,434  SEC=FOOT  NSEG=1  ANG=0
  433  J=434,435  SEC=FOOT  NSEG=1  ANG=0
  434  J=435,436  SEC=FOOT  NSEG=1  ANG=0
JOFF=.075  RIGID=0
  435  J=436,437  SEC=FOOT  NSEG=1  ANG=0

LOAD
  NAME=SW  SW=1
  NAME=PV
    TYPE=DISTRIBUTED SPAN
      ADD=5  RD=0,1  UZ=-12.459,-11.602
      ADD=6  RD=0,1  UZ=-11.602,-10.778
      ADD=7  RD=0,1  UZ=-10.778,-10.226
      ADD=8  RD=0,1  UZ=-10.226,-9.566
      ADD=9  RD=0,1  UZ=-9.566,-8.179
      ADD=10  RD=0,1  UZ=-8.179,-7.143
      ADD=11  RD=0,1  UZ=-7.143,-6.446
      ADD=12  RD=0,1  UZ=-6.446,-6.052
      ADD=13  RD=0,1  UZ=-6.052,-5.939
      ADD=14  RD=0,1  UZ=-5.939,-6.052
      ADD=15  RD=0,1  UZ=-6.052,-6.446
      ADD=16  RD=0,1  UZ=-6.446,-7.143
      ADD=17  RD=0,1  UZ=-7.143,-8.179
      ADD=18  RD=0,1  UZ=-8.179,-9.566
      ADD=19  RD=0,1  UZ=-9.566,-10.226
      ADD=20  RD=0,1  UZ=-10.226,-10.778
      ADD=21  RD=0,1  UZ=-10.778,-11.602
      ADD=22  RD=0,1  UZ=-11.602,-12.459
      ADD=31  RD=0,1  UZ=-12.459,-11.602
      ADD=32  RD=0,1  UZ=-11.602,-10.778
      ADD=33  RD=0,1  UZ=-10.778,-10.226
      ADD=34  RD=0,1  UZ=-10.226,-9.566
      ADD=35  RD=0,1  UZ=-9.566,-8.179
      ADD=36  RD=0,1  UZ=-8.179,-7.143
      ADD=37  RD=0,1  UZ=-7.143,-6.446
      ADD=38  RD=0,1  UZ=-6.446,-6.052
      ADD=39  RD=0,1  UZ=-6.052,-5.939
      ADD=40  RD=0,1  UZ=-5.939,-6.052
      ADD=41  RD=0,1  UZ=-6.052,-6.446
      ADD=42  RD=0,1  UZ=-6.446,-7.143
      ADD=43  RD=0,1  UZ=-7.143,-8.179
      ADD=44  RD=0,1  UZ=-8.179,-9.566
      ADD=45  RD=0,1  UZ=-9.566,-10.226
      ADD=46  RD=0,1  UZ=-10.226,-10.778
      ADD=47  RD=0,1  UZ=-10.778,-11.602
      ADD=48  RD=0,1  UZ=-11.602,-12.459
  NAME=PH
```

```
    TYPE=DISTRIBUTED SPAN
      ADD=102  RD=0,1  UX=10.463,9.787
      ADD=101  RD=0,1  UX=9.787,8.483
      ADD=1  RD=0,1  UX=8.483,7.862
      ADD=2  RD=0,1  UX=7.862,7.241
      ADD=3  RD=0,1  UX=7.241,6.621
      ADD=4  RD=0,1  UX=6.621,6.216
      ADD=5  RD=0,1  UX=6.216,5.805
      ADD=6  RD=0,1  UX=5.805,5.409
      ADD=7  RD=0,1  UX=5.409,5.144
      ADD=8  RD=0,1  UX=5.144,4.828
      ADD=9  RD=0,1  UX=4.828,4.162
      ADD=10  RD=0,1  UX=4.162,3.665
      ADD=11  RD=0,1  UX=3.665,3.331
      ADD=12  RD=0,1  UX=3.331,3.142
      ADD=13  RD=0,1  UX=3.142,3.088
      ADD=14  RD=0,1  UX=-3.088,-3.142
      ADD=15  RD=0,1  UX=-3.142,-3.331
      ADD=16  RD=0,1  UX=-3.331,-3.665
      ADD=17  RD=0,1  UX=-3.665,-4.162
      ADD=18  RD=0,1  UX=-4.162,-4.828
      ADD=19  RD=0,1  UX=-4.828,-5.144
      ADD=20  RD=0,1  UX=-5.144,-5.409
      ADD=21  RD=0,1  UX=-5.409,-5.805
      ADD=22  RD=0,1  UX=-5.805,-6.216
      ADD=23  RD=0,1  UX=-6.216,-6.621
      ADD=24  RD=0,1  UX=-6.621,-7.241
      ADD=25  RD=0,1  UX=-7.241,-7.862
      ADD=26  RD=0,1  UX=-7.862,-8.483
      ADD=27  RD=0,1  UX=8.483,7.862
      ADD=28  RD=0,1  UX=7.862,7.241
      ADD=29  RD=0,1  UX=7.241,6.621
      ADD=30  RD=0,1  UX=6.621,6.216
      ADD=31  RD=0,1  UX=6.216,5.805
      ADD=32  RD=0,1  UX=5.805,5.409
      ADD=33  RD=0,1  UX=5.409,5.144
      ADD=34  RD=0,1  UX=5.144,4.828
      ADD=35  RD=0,1  UX=4.828,4.162
      ADD=36  RD=0,1  UX=4.162,3.665
      ADD=37  RD=0,1  UX=3.665,3.331
      ADD=38  RD=0,1  UX=3.331,3.142
      ADD=39  RD=0,1  UX=3.142,3.088
      ADD=40  RD=0,1  UX=-3.088,-3.142
      ADD=41  RD=0,1  UX=-3.142,-3.331
      ADD=42  RD=0,1  UX=-3.331,-3.665
      ADD=43  RD=0,1  UX=-3.665,-4.162
      ADD=44  RD=0,1  UX=-4.162,-4.828
      ADD=45  RD=0,1  UX=-4.828,-5.144
      ADD=46  RD=0,1  UX=-5.144,-5.409
      ADD=47  RD=0,1  UX=-5.409,-5.805
      ADD=48  RD=0,1  UX=-5.805,-6.216
      ADD=49  RD=0,1  UX=-6.216,-6.621
      ADD=50  RD=0,1  UX=-6.621,-7.241
      ADD=52  RD=0,1  UX=-7.241,-7.862
      ADD=53  RD=0,1  UX=-7.862,-8.483
      ADD=301  RD=0,1  UX=-8.483,-10.629
      ADD=302  RD=0,1  UX=-10.629,-11.281
  NAME=PVW
    TYPE=DISTRIBUTED SPAN
      ADD=5  RD=0,1  UZ=-7.986,-7.58
      ADD=6  RD=0,1  UZ=-7.58,-7.189
      ADD=7  RD=0,1  UZ=-7.189,-6.928
      ADD=8  RD=0,1  UZ=-6.928,-6.615
      ADD=9  RD=0,1  UZ=-6.615,-5.958
      ADD=10  RD=0,1  UZ=-5.958,-5.468
      ADD=11  RD=0,1  UZ=-5.468,-5.137
      ADD=12  RD=0,1  UZ=-5.137,-4.951
      ADD=13  RD=0,1  UZ=-4.951,-4.897
      ADD=14  RD=0,1  UZ=-4.897,-4.951
      ADD=15  RD=0,1  UZ=-4.951,-5.137
      ADD=16  RD=0,1  UZ=-5.137,-5.468
      ADD=17  RD=0,1  UZ=-5.468,-5.958
      ADD=18  RD=0,1  UZ=-5.958,-6.615
      ADD=19  RD=0,1  UZ=-6.615,-6.928
      ADD=20  RD=0,1  UZ=-6.928,-7.189
      ADD=21  RD=0,1  UZ=-7.189,-7.58
      ADD=22  RD=0,1  UZ=-7.58,-7.986
      ADD=30  RD=0,1  UZ=-7.986,-7.58
      ADD=31  RD=0,1  UZ=-7.58,-7.189
      ADD=33  RD=0,1  UZ=-7.189,-6.928
      ADD=34  RD=0,1  UZ=-6.928,-6.615
      ADD=35  RD=0,1  UZ=-6.615,-5.958
      ADD=36  RD=0,1  UZ=-5.958,-5.468
      ADD=37  RD=0,1  UZ=-5.468,-5.137
      ADD=38  RD=0,1  UZ=-5.137,-4.951
      ADD=39  RD=0,1  UZ=-4.951,-4.897
      ADD=40  RD=0,1  UZ=-4.897,-4.951
      ADD=41  RD=0,1  UZ=-4.951,-5.137
      ADD=42  RD=0,1  UZ=-5.137,-5.468
      ADD=43  RD=0,1  UZ=-5.468,-5.958
```



```
      ADD=44  RD=0,1  UZ=-5.958,-6.615
      ADD=45  RD=0,1  UZ=-6.615,-6.928
      ADD=46  RD=0,1  UZ=-6.928,-7.189
      ADD=47  RD=0,1  UZ=-7.189,-7.58
      ADD=48  RD=0,1  UZ=-7.58,-7.986
  NAME=PHW
    TYPE=DISTRIBUTED SPAN
      ADD=1  RD=0,1  UX=5.018,4.724
      ADD=2  RD=0,1  UX=4.724,4.43
      ADD=3  RD=0,1  UX=4.43,4.136
      ADD=4  RD=0,1  UX=4.136,3.944
      ADD=5  RD=0,1  UX=3.944,3.75
      ADD=6  RD=0,1  UX=3.75,3.562
      ADD=7  RD=0,1  UX=3.562,3.437
      ADD=8  RD=0,1  UX=3.437,3.287
      ADD=9  RD=0,1  UX=3.287,2.971
      ADD=10  RD=0,1  UX=2.971,2.736
      ADD=11  RD=0,1  UX=2.736,2.578
      ADD=12  RD=0,1  UX=2.578,2.488
      ADD=13  RD=0,1  UX=2.488,2.463
      ADD=14  RD=0,1  UX=-2.463,-2.488
      ADD=15  RD=0,1  UX=-2.488,-2.578
      ADD=16  RD=0,1  UX=-2.578,-2.736
      ADD=17  RD=0,1  UX=-2.736,-2.971
      ADD=18  RD=0,1  UX=-2.971,-3.287
      ADD=19  RD=0,1  UX=-3.287,-3.437
      ADD=20  RD=0,1  UX=-3.437,-3.562
      ADD=21  RD=0,1  UX=-5.409,-5.805
      ADD=22  RD=0,1  UX=-5.805,-6.216
      ADD=23  RD=0,1  UX=-6.216,-6.621
      ADD=24  RD=0,1  UX=-6.621,-7.241
      ADD=25  RD=0,1  UX=-7.241,-7.862
      ADD=26  RD=0,1  UX=-7.862,-8.483
      ADD=27  RD=0,1  UX=8.483,7.862
      ADD=28  RD=0,1  UX=7.862,7.241
      ADD=29  RD=0,1  UX=7.241,6.621
      ADD=30  RD=0,1  UX=6.621,6.216
      ADD=31  RD=0,1  UX=6.216,5.805
      ADD=32  RD=0,1  UX=5.805,5.409
      ADD=33  RD=0,1  UX=3.562,3.437
      ADD=34  RD=0,1  UX=3.437,3.287
      ADD=35  RD=0,1  UX=3.287,2.971
      ADD=36  RD=0,1  UX=2.971,2.736
      ADD=37  RD=0,1  UX=2.736,2.578
      ADD=38  RD=0,1  UX=2.578,2.488
      ADD=39  RD=0,1  UX=2.488,2.463
      ADD=40  RD=0,1  UX=-2.463,-2.488
      ADD=41  RD=0,1  UX=-2.488,-2.578
      ADD=42  RD=0,1  UX=-2.578,-2.736
      ADD=43  RD=0,1  UX=-2.736,-2.971
      ADD=44  RD=0,1  UX=-2.971,-3.287
      ADD=45  RD=0,1  UX=-3.287,-3.437
      ADD=46  RD=0,1  UX=-3.437,-3.562
      ADD=47  RD=0,1  UX=-3.562,-3.75
      ADD=48  RD=0,1  UX=-3.75,-3.944
      ADD=49  RD=0,1  UX=-3.944,-4.136
      ADD=50  RD=0,1  UX=-4.136,-4.43
      ADD=52  RD=0,1  UX=-4.43,-4.724
      ADD=53  RD=0,1  UX=-4.724,-5.018
      ADD=102  RD=0,1  UX=5.956,5.636
      ADD=302  RD=0,1  UX=-6.035,-6.344
      ADD=101  RD=0,1  UX=5.636,5.018
      ADD=301  RD=0,1  UX=-5.018,-6.035
  NAME=PW
    TYPE=DISTRIBUTED SPAN
      ADD=1  RD=0,1  U2=-6.929,-6.276
      ADD=2  RD=0,1  U2=-6.276,-5.622
      ADD=3  RD=0,1  U2=-5.622,-4.969
      ADD=4  RD=0,1  U2=-4.969,-4.543
      ADD=5  RD=0,1  U2=-4.543,-4.11
      ADD=6  RD=0,1  U2=-4.11,-3.694
      ADD=7  RD=0,1  U2=-3.694,-3.415
      ADD=8  RD=0,1  U2=-3.415,-3.082
      ADD=9  RD=0,1  U2=-3.082,-2.381
      ADD=10  RD=0,1  U2=-2.381,-1.858
      ADD=11  RD=0,1  U2=-1.858,-1.506
      ADD=12  RD=0,1  U2=-1.506,-1.307
      ADD=13  RD=0,1  U2=-1.307,-1.25
      ADD=14  RD=0,1  U2=-1.25,-1.307
      ADD=15  RD=0,1  U2=-1.307,-1.506
      ADD=16  RD=0,1  U2=-1.506,-1.858
      ADD=17  RD=0,1  U2=-1.858,-2.381
      ADD=18  RD=0,1  U2=-2.381,-3.082
      ADD=19  RD=0,1  U2=-3.082,-3.415
      ADD=20  RD=0,1  U2=-3.415,-3.694
      ADD=33  RD=0,1  U2=-3.694,-3.415
      ADD=34  RD=0,1  U2=-3.415,-3.082
      ADD=35  RD=0,1  U2=-3.082,-2.381
      ADD=36  RD=0,1  U2=-2.381,-1.858
      ADD=37  RD=0,1  U2=-1.858,-1.506
```

```
      ADD=38  RD=0,1  U2=-1.506,-1.307
      ADD=39  RD=0,1  U2=-1.307,-1.25
      ADD=40  RD=0,1  U2=-1.25,-1.307
      ADD=41  RD=0,1  U2=-1.307,-1.506
      ADD=42  RD=0,1  U2=-1.506,-3.5628
      ADD=43  RD=0,1  U2=-3.5628,-2.381
      ADD=44  RD=0,1  U2=-2.381,-3.082
      ADD=45  RD=0,1  U2=-3.082,-3.415
      ADD=46  RD=0,1  U2=-3.415,-3.694
      ADD=47  RD=0,1  U2=-3.694,-4.11
      ADD=48  RD=0,1  U2=-4.11,-4.543
      ADD=49  RD=0,1  U2=-4.543,-4.969
      ADD=50  RD=0,1  U2=-4.969,-5.622
      ADD=52  RD=0,1  U2=-5.622,-6.276
      ADD=53  RD=0,1  U2=-6.276,-6.929
      ADD=102  RD=0,1  U2=-9.014,-8.302
      ADD=101  RD=0,1  U2=-8.302,-6.929
      ADD=302  RD=0,1  U2=-9.188,-9.875
      ADD=301  RD=0,1  U2=-6.929,-9.188
      ADD=400  RD=0,1  UZ=9.714,9.714
      ADD=401  RD=0,1  UZ=9.714,9.727
      ADD=402  RD=0,1  UZ=9.727,9.754
      ADD=403  RD=0,1  UZ=9.754,9.78
      ADD=404  RD=0,1  UZ=9.78,9.807
      ADD=405  RD=0,1  UZ=9.807,9.833
      ADD=406  RD=0,1  UZ=9.833,9.86
      ADD=407  RD=0,1  UZ=9.86,9.886
      ADD=408  RD=0,1  UZ=9.886,9.913
      ADD=409  RD=0,1  UZ=9.913,9.939
      ADD=410  RD=0,1  UZ=9.939,9.966
      ADD=411  RD=0,1  UZ=9.966,9.992
      ADD=412  RD=0,1  UZ=9.992,10.019
      ADD=413  RD=0,1  UZ=10.019,10.048
      ADD=414  RD=0,1  UZ=10.048,10.072
      ADD=415  RD=0,1  UZ=10.072,10.098
      ADD=416  RD=0,1  UZ=10.098,10.125
      ADD=417  RD=0,1  UZ=10.125,10.144
      ADD=418  RD=0,1  UZ=10.144,10.164
      ADD=419  RD=0,1  UZ=10.164,10.191
      ADD=420  RD=0,1  UZ=10.191,10.217
      ADD=421  RD=0,1  UZ=10.217,10.241
      ADD=422  RD=0,1  UZ=10.241,10.27
      ADD=423  RD=0,1  UZ=10.27,10.297
      ADD=424  RD=0,1  UZ=10.297,10.323
      ADD=425  RD=0,1  UZ=10.323,10.35
      ADD=426  RD=0,1  UZ=10.35,10.376
      ADD=427  RD=0,1  UZ=10.376,10.403
      ADD=428  RD=0,1  UZ=10.403,10.429
      ADD=429  RD=0,1  UZ=10.429,10.456
      ADD=430  RD=0,1  UZ=10.456,10.482
      ADD=431  RD=0,1  UZ=10.482,10.509
      ADD=432  RD=0,1  UZ=10.509,10.535
      ADD=433  RD=0,1  UZ=10.535,10.562
      ADD=434  RD=0,1  UZ=10.562,10.575
      ADD=435  RD=0,1  UZ=10.575,10.575
  NAME=PL
    TYPE=CONCENTRATED SPAN
      ADD=415  RD=.755  UZ=-9.6
      ADD=413  RD=.717  UZ=-9.6
      ADD=412  RD=.415  UZ=-9.6
      ADD=410  RD=.321  UZ=-9.6
      ADD=408  RD=.962  UZ=-9.6
      ADD=406  RD=.925  UZ=-9.6
      ADD=420  RD=.245  UZ=-9.6
      ADD=422  RD=.283  UZ=-9.6
      ADD=423  RD=.642  UZ=-9.6
      ADD=425  RD=.679  UZ=-9.6
      ADD=427  RD=.038  UZ=-9.6
      ADD=429  RD=.076  UZ=-9.6
  NAME=PVL
    TYPE=DISTRIBUTED SPAN
      ADD=5  RD=0,1  UZ=-1.186,-1.186
      ADD=6  RD=0,1  UZ=-1.186,-1.186
      ADD=7  RD=0,1  UZ=-1.186,-1.186
      ADD=8  RD=0,1  UZ=-1.186,-1.186
      ADD=9  RD=0,1  UZ=-1.186,-1.186
      ADD=10  RD=0,1  UZ=-1.186,-1.186
      ADD=11  RD=0,1  UZ=-1.186,-1.186
      ADD=12  RD=0,1  UZ=-1.186,-1.186
      ADD=13  RD=0,1  UZ=-1.186,-1.186
      ADD=14  RD=0,1  UZ=-1.186,-1.186
      ADD=15  RD=0,1  UZ=-1.186,-1.186
      ADD=16  RD=0,1  UZ=-1.186,-1.186
      ADD=17  RD=0,1  UZ=-1.186,-1.186
      ADD=18  RD=0,1  UZ=-1.186,-1.186
      ADD=19  RD=0,1  UZ=-1.186,-1.186
      ADD=20  RD=0,1  UZ=-1.186,-1.186
      ADD=21  RD=0,1  UZ=-1.186,-1.186
      ADD=22  RD=0,1  UZ=-1.186,-1.186
      ADD=31  RD=0,1  UZ=-1.186,-1.186
```



```
      ADD=32  RD=0,1  UZ=-1.186,-1.186
      ADD=33  RD=0,1  UZ=-1.186,-1.186
      ADD=34  RD=0,1  UZ=-1.186,-1.186
      ADD=35  RD=0,1  UZ=-1.186,-1.186
      ADD=36  RD=0,1  UZ=-1.186,-1.186
      ADD=37  RD=0,1  UZ=-1.186,-1.186
      ADD=38  RD=0,1  UZ=-1.186,-1.186
      ADD=39  RD=0,1  UZ=-1.186,-1.186
      ADD=40  RD=0,1  UZ=-1.186,-1.186
      ADD=41  RD=0,1  UZ=-1.186,-1.186
      ADD=42  RD=0,1  UZ=-1.186,-1.186
      ADD=43  RD=0,1  UZ=-1.186,-1.186
      ADD=44  RD=0,1  UZ=-1.186,-1.186
      ADD=45  RD=0,1  UZ=-1.186,-1.186
      ADD=46  RD=0,1  UZ=-1.186,-1.186
      ADD=47  RD=0,1  UZ=-1.186,-1.186
      ADD=48  RD=0,1  UZ=-1.186,-1.186

COMBO
  NAME=COMB1
    LOAD=SW  SF=1.3
    LOAD=PV  SF=1.5
    LOAD=PH  SF=1.7
  NAME=COMB2
    LOAD=SW  SF=1.3
    LOAD=PV  SF=1.5
    LOAD=PH  SF=.65
  NAME=COMB3
    LOAD=SW  SF=1.3
    LOAD=PVW  SF=1.5
    LOAD=PHW  SF=1.7
    LOAD=PW  SF=1.3
  NAME=COMB4
    LOAD=SW  SF=1.3
    LOAD=PVW  SF=1.5
    LOAD=PHW  SF=.65
    LOAD=PW  SF=1.3
  NAME=COMB5
    LOAD=SW  SF=1.3
    LOAD=PV  SF=1.5
    LOAD=PH  SF=1.7
    LOAD=PVL  SF=1.3
  NAME=COMB6
    LOAD=SW  SF=1.3
    LOAD=PV  SF=1.5
    LOAD=PH  SF=.65
    LOAD=PVL  SF=1.3
  NAME=COMB7
    LOAD=SW  SF=1
    LOAD=PV  SF=1
    LOAD=PH  SF=1
  NAME=COMB8
    LOAD=SW  SF=1
    LOAD=PV  SF=1
    LOAD=PH  SF=1
    LOAD=PL  SF=1
  NAME=COMB9
    LOAD=SW  SF=1
    LOAD=PV  SF=1
    LOAD=PH  SF=.5
  NAME=COMB10
    LOAD=SW  SF=1
    LOAD=PV  SF=1
    LOAD=PH  SF=.5
    LOAD=PL  SF=1
  NAME=COMB11
    LOAD=SW  SF=1
    LOAD=PVW  SF=1
    LOAD=PHW  SF=1
  NAME=COMB12
    LOAD=SW  SF=1
    LOAD=PVW  SF=1
    LOAD=PHW  SF=1
    LOAD=PL  SF=1
  NAME=ENVE  TYPE=ENVE
    COMB=COMB1  SF=1
    COMB=COMB2  SF=1
    COMB=COMB5  SF=1

OUTPUT
; No Output Requested

END

; The following data is used for graphics, design
and pushover analysis.
; If changes are made to the analysis data above,
then the following data
; should be checked for consistency.
SAP2000 V7.10 SUPPLEMENTAL DATA
```

```
  GRID GLOBAL  X "1"  -15.25
  GRID GLOBAL  Y "2"  0
  GRID GLOBAL  Z "3"  -8.625
  GRID GLOBAL  X "4"  0
  GRID GLOBAL  Z "5"  0
  GRID GLOBAL  X "6"  15.25
  MATERIAL STEEL FY 25310.51
  MATERIAL CONC FYREBAR 40000 FYSHEAR 28122.79 FC
4000 FCSHEAR 2812.279
  MATERIAL RIGID FYREBAR 40000 FYSHEAR 28122.79
FC 4000 FCSHEAR 2812.279
  MATERIAL CONC1 FYREBAR 40000 FYSHEAR 28122.79
FC 4000 FCSHEAR 2812.279
  CONCRETESECTION T1 COLUMN  COVER .05 REBAR
RR-3-3
  CONCRETESECTION T2 COLUMN  COVER .0542 REBAR
RR-3-3
  CONCRETESECTION T3 COLUMN  COVER .0675 REBAR
RR-3-3
  CONCRETESECTION T4 COLUMN  COVER .0916 REBAR
RR-3-3
  CONCRETESECTION T5 COLUMN  COVER .068 REBAR
RR-3-3
  CONCRETESECTION T6 COLUMN  COVER .0553 REBAR
RR-3-3
  CONCRETESECTION T7 COLUMN  COVER .0511 REBAR
RR-3-3
  CONCRETESECTION T8 COLUMN  COVER .05 REBAR
RR-3-3
  CONCRETESECTION FOOT COLUMN  COVER .14 REBAR
RR-3-3
  CONCRETESECTION WALL COLUMN  COVER .085 REBAR
RR-3-3
  CONCRETESECTION RIGID COLUMN  COVER 1 REBAR
RR-3-3
  CONCRETESECTION WALL1 COLUMN  COVER .13 REBAR
RR-3-3
  STATICLOAD SW TYPE DEAD
  STATICLOAD PV TYPE DEAD
  STATICLOAD PH TYPE DEAD
  STATICLOAD PVW TYPE DEAD
  STATICLOAD PHW TYPE DEAD
  STATICLOAD PW TYPE DEAD
  STATICLOAD PL TYPE DEAD
  STATICLOAD PVL TYPE DEAD
END SUPPLEMENTAL DATA
```

```
; File D:\SAP2000DATA\만영게착식터널\MAT3.$2k
saved 10-9-02 9:59:57 in Ton-m

SYSTEM
  DOF=UX,UZ,RY  LENGTH=m  FORCE=Ton  LINES=59

JOINT
  1  X=-14.25  Y=0  Z=-5.679
  2  X=-14.25  Y=0  Z=-5.026
  3  X=-14.25  Y=0  Z=-4.372
  4  X=-14.25  Y=0  Z=-3.719
  5  X=-14.23  Y=0  Z=-3.293
  6  X=-14.166  Y=0  Z=-2.86
  7  X=-14.107  Y=0  Z=-2.444
  8  X=-13.748  Y=0  Z=-2.165
  9  X=-13.294  Y=0  Z=-1.832
  10  X=-12.092  Y=0  Z=-1.131
  11  X=-10.887  Y=0  Z=-.608
  12  X=-9.683  Y=0  Z=-.256
  13  X=-8.479  Y=0  Z=-.057
  14  X=-7.275  Y=0  Z=0
  15  X=-6.071  Y=0  Z=-.057
  16  X=-4.867  Y=0  Z=-.256
  17  X=-3.663  Y=0  Z=-.608
  18  X=-2.458  Y=0  Z=-1.131
  19  X=-1.256  Y=0  Z=-1.832
  20  X=-.795  Y=0  Z=-2.165
  21  X=-.443  Y=0  Z=-2.444
  22  X=-.369  Y=0  Z=-2.86
  23  X=-.318  Y=0  Z=-3.293
  24  X=-.3  Y=0  Z=-3.719
  25  X=-.3  Y=0  Z=-4.372
  26  X=-.3  Y=0  Z=-5.026
  27  X=-.3  Y=0  Z=-5.679
  28  X=.3  Y=0  Z=-5.679
  29  X=.3  Y=0  Z=-5.026
  30  X=.3  Y=0  Z=-4.372
  31  X=.3  Y=0  Z=-3.719
  32  X=.318  Y=0  Z=-3.293
  33  X=.369  Y=0  Z=-2.86
  34  X=.443  Y=0  Z=-2.444
  35  X=.795  Y=0  Z=-2.165
  36  X=1.256  Y=0  Z=-1.832
  37  X=2.458  Y=0  Z=-1.131
  38  X=3.663  Y=0  Z=-.608
  39  X=4.867  Y=0  Z=-.256
  40  X=6.071  Y=0  Z=-.057
  41  X=7.275  Y=0  Z=0
  42  X=8.479  Y=0  Z=-.057
  43  X=9.683  Y=0  Z=-.256
  44  X=10.887  Y=0  Z=-.608
  45  X=12.092  Y=0  Z=-1.131
  46  X=13.294  Y=0  Z=-1.832
  47  X=13.748  Y=0  Z=-2.165
  48  X=14.107  Y=0  Z=-2.444
  49  X=14.166  Y=0  Z=-2.86
  50  X=14.23  Y=0  Z=-3.293
  51  X=14.25  Y=0  Z=-3.719
  52  X=14.25  Y=0  Z=-4.372
  53  X=14.25  Y=0  Z=-5.026
  54  X=14.25  Y=0  Z=-5.679
  101  X=-14.325  Y=0  Z=-5.679
  102  X=-14.325  Y=0  Z=-7.052
  201  X=0  Y=0  Z=-5.679
  202  X=0  Y=0  Z=-7.475
  301  X=14.325  Y=0  Z=-5.679
  302  X=14.325  Y=0  Z=-7.938
  401  X=-15.25  Y=0  Z=-7.764
  402  X=-14.325  Y=0  Z=-7.764
  403  X=-13.9  Y=0  Z=-7.777
  404  X=-13.017  Y=0  Z=-7.804
  405  X=-12.133  Y=0  Z=-7.83
  406  X=-11.25  Y=0  Z=-7.857
  407  X=-10.367  Y=0  Z=-7.883
  408  X=-9.484  Y=0  Z=-7.91
  409  X=-8.6  Y=0  Z=-7.936
  410  X=-7.717  Y=0  Z=-7.963
  411  X=-6.834  Y=0  Z=-7.989
  412  X=-5.95  Y=0  Z=-8.016
  413  X=-5.067  Y=0  Z=-8.042
  414  X=-4.184  Y=0  Z=-8.069
  415  X=-3.3  Y=0  Z=-8.098
  416  X=-2.417  Y=0  Z=-8.122
  417  X=-1.534  Y=0  Z=-8.148
  418  X=-.65  Y=0  Z=-8.175
  419  X=0  Y=0  Z=-8.194
  420  X=.65  Y=0  Z=-8.214
  421  X=1.534  Y=0  Z=-8.241
```



```
  422  X=2.417  Y=0  Z=-8.267
  423  X=3.3  Y=0  Z=-8.291
  424  X=4.184  Y=0  Z=-8.32
  425  X=5.067  Y=0  Z=-8.347
  426  X=5.95  Y=0  Z=-8.373
  427  X=6.834  Y=0  Z=-8.4
  428  X=7.717  Y=0  Z=-8.426
  429  X=8.6  Y=0  Z=-8.453
  430  X=9.484  Y=0  Z=-8.479
  431  X=10.367  Y=0  Z=-8.506
  432  X=11.25  Y=0  Z=-8.532
  433  X=12.133  Y=0  Z=-8.559
  434  X=13.017  Y=0  Z=-8.585
  435  X=13.9  Y=0  Z=-8.612
  436  X=14.325  Y=0  Z=-8.625
  437  X=15.25  Y=0  Z=-8.625

PATTERN
  NAME=TEMP
  NAME=PRES

SPRING
  ADD=401  U3=201064.2
  ADD=402  U3=293445
  ADD=418  U3=333440.5
  ADD=419  U1=10000  U3=282576.7
  ADD=420  U3=333440.5
  ADD=436  U3=293445
  ADD=437  U3=201064.2

MATERIAL
  NAME=CONC  IDES=C  M=.2448  W=2.5
    T=0  E=2800000  U=.2  A=.00001
  NAME=STEEL  IDES=S
    T=0  E=2E+10  U=.3  A=.0000117  FY=25310.51
  NAME=RIGID  IDES=C
    T=0  E=2464750  U=.3  A=.00001
  NAME=CONC1  IDES=C  M=.2448  W=2.5
    T=0  E=2464750  U=.2  A=.00001

FRAME SECTION
  NAME=T1 MAT=CONC SH=R T=.5,1 A=.5
J=2.861003E-02 I=1.041667E-02,4.897667E-02
AS=.4166667,.4166667
  NAME=T2 MAT=CONC SH=R T=.542,1 A=.542
J=3.508126E-02 I=1.326834E-02,4.516667E-02
AS=.4516667,.4516667
  NAME=T3 MAT=CONC SH=R T=.675,1 A=.675
J=5.967503E-02 I=2.562891E-02,.05625
AS=.5625,.5625
  NAME=T4 MAT=CONC SH=R T=.916,1 A=.916
J=.1170223 I=6.404794E-02,7.633334E-02
AS=.7633333,.7633333
  NAME=T5 MAT=CONC SH=R T=.68,1 A=.68
J=6.070982E-02 I=2.620267E-02,5.666667E-02
AS=.5666667,.5666667
  NAME=T6 MAT=CONC SH=R T=.553,1 A=.553
J=3.688483E-02 I=.0140927,4.608333E-02
AS=.4608333,.4608333
  NAME=T7 MAT=CONC SH=R T=.511,1 A=.511
J=3.024029E-02 I=.0111194,4.258334E-02
AS=.4258333,.4258333
  NAME=T8 MAT=CONC SH=R T=.5,1 A=.5
J=2.861003E-02 I=1.041667E-02,4.897667E-02
AS=.4166667,.4166667
  NAME=FOOT MAT=CONC1 SH=R T=1.4,1 A=1.4
J=.2612221 I=.2286666,.1166667
AS=1.166667,1.166667
  NAME=WALL MAT=CONC1 SH=R T=.85,1 A=.85
J=9.985562E-02 I=4.117709E-02,7.083333E-02
AS=.7083334,.7083334
  NAME=RIGID MAT=RIGID SH=R T=10,10 A=100
J=1408.333 I=833.5623,833.5623
AS=83.56233,83.56233
  NAME=WALL1 MAT=CONC1 SH=R T=1.3,1 A=1.3
J=.2294606 I=.1830833,.1083333
AS=1.083333,1.083333
  NAME=VAR1 TYPE=NONPR
    SEC=T1,T2 EIVAR=1,1 L=.426
  NAME=VAR2 TYPE=NONPR
    SEC=T2,T3 EIVAR=1,1 L=.436
  NAME=VAR3 TYPE=NONPR
    SEC=T3,T4 EIVAR=1,1 L=.422
  NAME=VAR4 TYPE=NONPR
    SEC=T4,T5 EIVAR=1,1 L=.455
  NAME=VAR5 TYPE=NONPR
    SEC=T5,T6 EIVAR=1,1 L=.563
  NAME=VAR6 TYPE=NONPR
    SEC=T6,T7 EIVAR=1,1 L=1.392
  NAME=VAR7 TYPE=NONPR
```

```
    SEC=T7,T8 EIVAR=1,1 L=1.313

FRAME
  1  J=1,2  SEC=T1  NSEG=1  ANG=180  IREL=R3
  2  J=2,3  SEC=T1  NSEG=1  ANG=180
  3  J=3,4  SEC=T1  NSEG=1  ANG=180
  4  J=4,5  SEC=VAR1  NSEG=1  ANG=0
  5  J=5,6  SEC=VAR2  NSEG=1  ANG=0
  6  J=6,7  SEC=VAR3  NSEG=1  ANG=0
  7  J=7,8  SEC=VAR4  NSEG=1  ANG=0
  8  J=8,9  SEC=VAR5  NSEG=1  ANG=0
  9  J=9,10  SEC=VAR6  NSEG=1  ANG=0
  10  J=10,11  SEC=VAR7  NSEG=1  ANG=0
  11  J=11,12  SEC=T8  NSEG=1  ANG=0
  12  J=12,13  SEC=T8  NSEG=1  ANG=0
  13  J=13,14  SEC=T8  NSEG=1  ANG=0
  14  J=14,15  SEC=T8  NSEG=1  ANG=0
  15  J=15,16  SEC=T8  NSEG=1  ANG=0
  16  J=16,17  SEC=T8  NSEG=1  ANG=0
  17  J=17,18  SEC=VAR7  NSEG=1  ANG=0
  18  J=18,19  SEC=VAR6  NSEG=1  ANG=0
  19  J=19,20  SEC=VAR5  NSEG=1  ANG=0
  20  J=20,21  SEC=VAR4  NSEG=1  ANG=0
  21  J=21,22  SEC=VAR3  NSEG=1  ANG=0
  22  J=22,23  SEC=VAR2  NSEG=1  ANG=0
  23  J=23,24  SEC=VAR1  NSEG=1  ANG=0
  24  J=24,25  SEC=T1  NSEG=1  ANG=0
  25  J=25,26  SEC=T1  NSEG=1  ANG=0
  26  J=26,27  SEC=T1  NSEG=1  ANG=0  JREL=R3
  27  J=28,29  SEC=T1  NSEG=1  ANG=180  IREL=R3
  28  J=29,30  SEC=T1  NSEG=1  ANG=180
  29  J=30,31  SEC=T1  NSEG=1  ANG=180
  30  J=31,32  SEC=VAR1  NSEG=1  ANG=0
  31  J=32,33  SEC=VAR2  NSEG=1  ANG=0
  32  J=33,34  SEC=VAR3  NSEG=1  ANG=0
  33  J=34,35  SEC=VAR4  NSEG=1  ANG=0
  34  J=35,36  SEC=VAR5  NSEG=1  ANG=0
  35  J=36,37  SEC=VAR6  NSEG=1  ANG=0
  36  J=37,38  SEC=VAR7  NSEG=1  ANG=0
  37  J=38,39  SEC=T8  NSEG=1  ANG=0
  38  J=39,40  SEC=T8  NSEG=1  ANG=0
  39  J=40,41  SEC=T8  NSEG=1  ANG=0
  40  J=41,42  SEC=T8  NSEG=1  ANG=0
  41  J=42,43  SEC=T8  NSEG=1  ANG=0
  42  J=43,44  SEC=T8  NSEG=1  ANG=0
  43  J=44,45  SEC=VAR7  NSEG=1  ANG=0
  44  J=45,46  SEC=VAR6  NSEG=1  ANG=0
  45  J=46,47  SEC=VAR5  NSEG=1  ANG=0
  46  J=47,48  SEC=VAR4  NSEG=1  ANG=0
  47  J=48,49  SEC=VAR3  NSEG=1  ANG=0
  48  J=49,50  SEC=VAR2  NSEG=1  ANG=0
  49  J=50,51  SEC=VAR1  NSEG=1  ANG=0
  50  J=51,52  SEC=T1  NSEG=1  ANG=0
  52  J=52,53  SEC=T1  NSEG=1  ANG=0
  53  J=53,54  SEC=T1  NSEG=1  ANG=0  JREL=R3
  85  J=28,201  SEC=RIGID  NSEG=1  ANG=0
  86  J=201,27  SEC=RIGID  NSEG=1  ANG=0
  87  J=301,54  SEC=RIGID  NSEG=1  ANG=0
  88  J=1,101  SEC=RIGID  NSEG=1  ANG=0
  101  J=102,101  SEC=WALL  NSEG=1  ANG=180
  102  J=402,102  SEC=WALL  NSEG=1  ANG=180
IOFF=.02475  RIGID=0
  201  J=202,201  SEC=WALL1  NSEG=1  ANG=0
  202  J=419,202  SEC=WALL1  NSEG=1  ANG=0
IOFF=.375  RIGID=0
  301  J=301,302  SEC=WALL  NSEG=1  ANG=0
  302  J=302,436  SEC=WALL  NSEG=1  ANG=0
JOFF=.4875  RIGID=0
  400  J=401,402  SEC=FOOT  NSEG=1  ANG=0
  401  J=402,403  SEC=FOOT  NSEG=1  ANG=0
IOFF=.075  RIGID=0
  402  J=403,404  SEC=FOOT  NSEG=1  ANG=0
  403  J=404,405  SEC=FOOT  NSEG=1  ANG=0
  404  J=405,406  SEC=FOOT  NSEG=1  ANG=0
  405  J=406,407  SEC=FOOT  NSEG=1  ANG=0
  406  J=407,408  SEC=FOOT  NSEG=1  ANG=0
  407  J=408,409  SEC=FOOT  NSEG=1  ANG=0
  408  J=409,410  SEC=FOOT  NSEG=1  ANG=0
  409  J=410,411  SEC=FOOT  NSEG=1  ANG=0
  410  J=411,412  SEC=FOOT  NSEG=1  ANG=0
  411  J=412,413  SEC=FOOT  NSEG=1  ANG=0
  412  J=413,414  SEC=FOOT  NSEG=1  ANG=0
  413  J=414,415  SEC=FOOT  NSEG=1  ANG=0
  414  J=415,416  SEC=FOOT  NSEG=1  ANG=0
  415  J=416,417  SEC=FOOT  NSEG=1  ANG=0
  416  J=417,418  SEC=FOOT  NSEG=1  ANG=0
  417  J=418,419  SEC=FOOT  NSEG=1  ANG=0
JOFF=.3  RIGID=0
  418  J=419,420  SEC=FOOT  NSEG=1  ANG=0
IOFF=.3  RIGID=0
```



```
  419  J=420,421  SEC=FOOT  NSEG=1  ANG=0
  420  J=421,422  SEC=FOOT  NSEG=1  ANG=0
  421  J=422,423  SEC=FOOT  NSEG=1  ANG=0
  422  J=423,424  SEC=FOOT  NSEG=1  ANG=0
  423  J=424,425  SEC=FOOT  NSEG=1  ANG=0
  424  J=425,426  SEC=FOOT  NSEG=1  ANG=0
  425  J=426,427  SEC=FOOT  NSEG=1  ANG=0
  426  J=427,428  SEC=FOOT  NSEG=1  ANG=0
  427  J=428,429  SEC=FOOT  NSEG=1  ANG=0
  428  J=429,430  SEC=FOOT  NSEG=1  ANG=0
  429  J=430,431  SEC=FOOT  NSEG=1  ANG=0
  430  J=431,432  SEC=FOOT  NSEG=1  ANG=0
  431  J=432,433  SEC=FOOT  NSEG=1  ANG=0
  432  J=433,434  SEC=FOOT  NSEG=1  ANG=0
  433  J=434,435  SEC=FOOT  NSEG=1  ANG=0
  434  J=435,436  SEC=FOOT  NSEG=1  ANG=0
JOFF=.075  RIGID=0
  435  J=436,437  SEC=FOOT  NSEG=1  ANG=0

LOAD
  NAME=SW  SW=1
  NAME=PV
    TYPE=DISTRIBUTED SPAN
      ADD=5  RD=0,1  UZ=-12.459,-11.602
      ADD=6  RD=0,1  UZ=-11.602,-10.778
      ADD=7  RD=0,1  UZ=-10.778,-10.226
      ADD=8  RD=0,1  UZ=-10.226,-9.566
      ADD=9  RD=0,1  UZ=-9.566,-8.179
      ADD=10  RD=0,1  UZ=-8.179,-7.143
      ADD=11  RD=0,1  UZ=-7.143,-6.446
      ADD=12  RD=0,1  UZ=-6.446,-6.052
      ADD=13  RD=0,1  UZ=-6.052,-5.939
      ADD=14  RD=0,1  UZ=-5.939,-6.052
      ADD=15  RD=0,1  UZ=-6.052,-6.446
      ADD=16  RD=0,1  UZ=-6.446,-7.143
      ADD=17  RD=0,1  UZ=-7.143,-8.179
      ADD=18  RD=0,1  UZ=-8.179,-9.566
      ADD=19  RD=0,1  UZ=-9.566,-10.226
      ADD=20  RD=0,1  UZ=-10.226,-10.778
      ADD=21  RD=0,1  UZ=-10.778,-11.602
      ADD=22  RD=0,1  UZ=-11.602,-12.459
      ADD=31  RD=0,1  UZ=-12.459,-11.602
      ADD=32  RD=0,1  UZ=-11.602,-10.778
      ADD=33  RD=0,1  UZ=-10.778,-10.226
      ADD=34  RD=0,1  UZ=-10.226,-9.566
      ADD=35  RD=0,1  UZ=-9.566,-8.179
      ADD=36  RD=0,1  UZ=-8.179,-7.143
      ADD=37  RD=0,1  UZ=-7.143,-6.446
      ADD=38  RD=0,1  UZ=-6.446,-6.052
      ADD=39  RD=0,1  UZ=-6.052,-5.939
      ADD=40  RD=0,1  UZ=-5.939,-6.052
      ADD=41  RD=0,1  UZ=-6.052,-6.446
      ADD=42  RD=0,1  UZ=-6.446,-7.143
      ADD=43  RD=0,1  UZ=-7.143,-8.179
      ADD=44  RD=0,1  UZ=-8.179,-9.566
      ADD=45  RD=0,1  UZ=-9.566,-10.226
      ADD=46  RD=0,1  UZ=-10.226,-10.778
      ADD=47  RD=0,1  UZ=-10.778,-11.602
      ADD=48  RD=0,1  UZ=-11.602,-12.459
  NAME=PH
    TYPE=DISTRIBUTED SPAN
      ADD=102  RD=0,1  UX=10.463,9.787
      ADD=101  RD=0,1  UX=9.787,8.483
      ADD=1  RD=0,1  UX=8.483,7.862
      ADD=2  RD=0,1  UX=7.862,7.241
      ADD=3  RD=0,1  UX=7.241,6.621
      ADD=4  RD=0,1  UX=6.621,6.216
      ADD=5  RD=0,1  UX=6.216,5.805
      ADD=6  RD=0,1  UX=5.805,5.409
      ADD=7  RD=0,1  UX=5.409,5.144
      ADD=8  RD=0,1  UX=5.144,4.828
      ADD=9  RD=0,1  UX=4.828,4.162
      ADD=10  RD=0,1  UX=4.162,3.665
      ADD=11  RD=0,1  UX=3.665,3.331
      ADD=12  RD=0,1  UX=3.331,3.142
      ADD=13  RD=0,1  UX=3.142,3.088
      ADD=14  RD=0,1  UX=-3.088,-3.142
      ADD=15  RD=0,1  UX=-3.142,-3.331
      ADD=16  RD=0,1  UX=-3.331,-3.665
      ADD=17  RD=0,1  UX=-3.665,-4.162
      ADD=18  RD=0,1  UX=-4.162,-4.828
      ADD=19  RD=0,1  UX=-4.828,-5.144
      ADD=20  RD=0,1  UX=-5.144,-5.409
      ADD=21  RD=0,1  UX=-5.409,-5.805
      ADD=22  RD=0,1  UX=-5.805,-6.216
      ADD=23  RD=0,1  UX=-6.216,-6.621
      ADD=24  RD=0,1  UX=-6.621,-7.241
      ADD=25  RD=0,1  UX=-7.241,-7.862
      ADD=26  RD=0,1  UX=-7.862,-8.483
      ADD=27  RD=0,1  UX=8.483,7.862
```

```
      ADD=28  RD=0,1  UX=7.862,7.241
      ADD=29  RD=0,1  UX=7.241,6.621
      ADD=30  RD=0,1  UX=6.621,6.216
      ADD=31  RD=0,1  UX=6.216,5.805
      ADD=32  RD=0,1  UX=5.805,5.409
      ADD=33  RD=0,1  UX=5.409,5.144
      ADD=34  RD=0,1  UX=5.144,4.828
      ADD=35  RD=0,1  UX=4.828,4.162
      ADD=36  RD=0,1  UX=4.162,3.665
      ADD=37  RD=0,1  UX=3.665,3.331
      ADD=38  RD=0,1  UX=3.331,3.142
      ADD=39  RD=0,1  UX=3.142,3.088
      ADD=40  RD=0,1  UX=-3.088,-3.142
      ADD=41  RD=0,1  UX=-3.142,-3.331
      ADD=42  RD=0,1  UX=-3.331,-3.665
      ADD=43  RD=0,1  UX=-3.665,-4.162
      ADD=44  RD=0,1  UX=-4.162,-4.828
      ADD=45  RD=0,1  UX=-4.828,-5.144
      ADD=46  RD=0,1  UX=-5.144,-5.409
      ADD=47  RD=0,1  UX=-5.409,-5.805
      ADD=48  RD=0,1  UX=-5.805,-6.216
      ADD=49  RD=0,1  UX=-6.216,-6.621
      ADD=50  RD=0,1  UX=-6.621,-7.241
      ADD=52  RD=0,1  UX=-7.241,-7.862
      ADD=53  RD=0,1  UX=-7.862,-8.483
      ADD=301  RD=0,1  UX=-8.483,-10.629
      ADD=302  RD=0,1  UX=-10.629,-11.281
  NAME=PVW
    TYPE=DISTRIBUTED SPAN
      ADD=5  RD=0,1  UZ=-7.986,-7.58
      ADD=6  RD=0,1  UZ=-7.58,-7.189
      ADD=7  RD=0,1  UZ=-7.189,-6.928
      ADD=8  RD=0,1  UZ=-6.928,-6.615
      ADD=9  RD=0,1  UZ=-6.615,-5.958
      ADD=10  RD=0,1  UZ=-5.958,-5.468
      ADD=11  RD=0,1  UZ=-5.468,-5.137
      ADD=12  RD=0,1  UZ=-5.137,-4.951
      ADD=13  RD=0,1  UZ=-4.951,-4.897
      ADD=14  RD=0,1  UZ=-4.897,-4.951
      ADD=15  RD=0,1  UZ=-4.951,-5.137
      ADD=16  RD=0,1  UZ=-5.137,-5.468
      ADD=17  RD=0,1  UZ=-5.468,-5.958
      ADD=18  RD=0,1  UZ=-5.958,-6.615
      ADD=19  RD=0,1  UZ=-6.615,-6.928
      ADD=20  RD=0,1  UZ=-6.928,-7.189
      ADD=21  RD=0,1  UZ=-7.189,-7.58
      ADD=22  RD=0,1  UZ=-7.58,-7.986
      ADD=30  RD=0,1  UZ=-7.986,-7.58
      ADD=31  RD=0,1  UZ=-7.58,-7.189
      ADD=33  RD=0,1  UZ=-7.189,-6.928
      ADD=34  RD=0,1  UZ=-6.928,-6.615
      ADD=35  RD=0,1  UZ=-6.615,-5.958
      ADD=36  RD=0,1  UZ=-5.958,-5.468
      ADD=37  RD=0,1  UZ=-5.468,-5.137
      ADD=38  RD=0,1  UZ=-5.137,-4.951
      ADD=39  RD=0,1  UZ=-4.951,-4.897
      ADD=40  RD=0,1  UZ=-4.897,-4.951
      ADD=41  RD=0,1  UZ=-4.951,-5.137
      ADD=42  RD=0,1  UZ=-5.137,-5.468
      ADD=43  RD=0,1  UZ=-5.468,-5.958
      ADD=44  RD=0,1  UZ=-5.958,-6.615
      ADD=45  RD=0,1  UZ=-6.615,-6.928
      ADD=46  RD=0,1  UZ=-6.928,-7.189
      ADD=47  RD=0,1  UZ=-7.189,-7.58
      ADD=48  RD=0,1  UZ=-7.58,-7.986
  NAME=PHW
    TYPE=DISTRIBUTED SPAN
      ADD=1  RD=0,1  UX=5.018,4.724
      ADD=2  RD=0,1  UX=4.724,4.43
      ADD=3  RD=0,1  UX=4.43,4.136
      ADD=4  RD=0,1  UX=4.136,3.944
      ADD=5  RD=0,1  UX=3.944,3.75
      ADD=6  RD=0,1  UX=3.75,3.562
      ADD=7  RD=0,1  UX=3.562,3.437
      ADD=8  RD=0,1  UX=3.437,3.287
      ADD=9  RD=0,1  UX=3.287,2.971
      ADD=10  RD=0,1  UX=2.971,2.736
      ADD=11  RD=0,1  UX=2.736,2.578
      ADD=12  RD=0,1  UX=2.578,2.488
      ADD=13  RD=0,1  UX=2.488,2.463
      ADD=14  RD=0,1  UX=-2.463,-2.488
      ADD=15  RD=0,1  UX=-2.488,-2.578
      ADD=16  RD=0,1  UX=-2.578,-2.736
      ADD=17  RD=0,1  UX=-2.736,-2.971
      ADD=18  RD=0,1  UX=-2.971,-3.287
      ADD=19  RD=0,1  UX=-3.287,-3.437
      ADD=20  RD=0,1  UX=-3.437,-3.562
      ADD=21  RD=0,1  UX=-5.409,-5.805
      ADD=22  RD=0,1  UX=-5.805,-6.216
      ADD=23  RD=0,1  UX=-6.216,-6.621
```



```
      ADD=24  RD=0,1  UX=-6.621,-7.241
      ADD=25  RD=0,1  UX=-7.241,-7.862
      ADD=26  RD=0,1  UX=-7.862,-8.483
      ADD=27  RD=0,1  UX=8.483,7.862
      ADD=28  RD=0,1  UX=7.862,7.241
      ADD=29  RD=0,1  UX=7.241,6.621
      ADD=30  RD=0,1  UX=6.621,6.216
      ADD=31  RD=0,1  UX=6.216,5.805
      ADD=32  RD=0,1  UX=5.805,5.409
      ADD=33  RD=0,1  UX=3.562,3.437
      ADD=34  RD=0,1  UX=3.437,3.287
      ADD=35  RD=0,1  UX=3.287,2.971
      ADD=36  RD=0,1  UX=2.971,2.736
      ADD=37  RD=0,1  UX=2.736,2.578
      ADD=38  RD=0,1  UX=2.578,2.488
      ADD=39  RD=0,1  UX=2.488,2.463
      ADD=40  RD=0,1  UX=-2.463,-2.488
      ADD=41  RD=0,1  UX=-2.488,-2.578
      ADD=42  RD=0,1  UX=-2.578,-2.736
      ADD=43  RD=0,1  UX=-2.736,-2.971
      ADD=44  RD=0,1  UX=-2.971,-3.287
      ADD=45  RD=0,1  UX=-3.287,-3.437
      ADD=46  RD=0,1  UX=-3.437,-3.562
      ADD=47  RD=0,1  UX=-3.562,-3.75
      ADD=48  RD=0,1  UX=-3.75,-3.944
      ADD=49  RD=0,1  UX=-3.944,-4.136
      ADD=50  RD=0,1  UX=-4.136,-4.43
      ADD=52  RD=0,1  UX=-4.43,-4.724
      ADD=53  RD=0,1  UX=-4.724,-5.018
      ADD=102  RD=0,1  UX=5.956,5.636
      ADD=302  RD=0,1  UX=-6.035,-6.344
      ADD=101  RD=0,1  UX=5.636,5.018
      ADD=301  RD=0,1  UX=-5.018,-6.035
  NAME=PW
    TYPE=DISTRIBUTED SPAN
      ADD=1  RD=0,1  U2=-6.929,-6.276
      ADD=2  RD=0,1  U2=-6.276,-5.622
      ADD=3  RD=0,1  U2=-5.622,-4.969
      ADD=4  RD=0,1  U2=-4.969,-4.543
      ADD=5  RD=0,1  U2=-4.543,-4.11
      ADD=6  RD=0,1  U2=-4.11,-3.694
      ADD=7  RD=0,1  U2=-3.694,-3.415
      ADD=8  RD=0,1  U2=-3.415,-3.082
      ADD=9  RD=0,1  U2=-3.082,-2.381
      ADD=10  RD=0,1  U2=-2.381,-1.858
      ADD=11  RD=0,1  U2=-1.858,-1.506
      ADD=12  RD=0,1  U2=-1.506,-1.307
      ADD=13  RD=0,1  U2=-1.307,-1.25
      ADD=14  RD=0,1  U2=-1.25,-1.307
      ADD=15  RD=0,1  U2=-1.307,-1.506
      ADD=16  RD=0,1  U2=-1.506,-1.858
      ADD=17  RD=0,1  U2=-1.858,-2.381
      ADD=18  RD=0,1  U2=-2.381,-3.082
      ADD=19  RD=0,1  U2=-3.082,-3.415
      ADD=20  RD=0,1  U2=-3.415,-3.694
      ADD=33  RD=0,1  U2=-3.694,-3.415
      ADD=34  RD=0,1  U2=-3.415,-3.082
      ADD=35  RD=0,1  U2=-3.082,-2.381
      ADD=36  RD=0,1  U2=-2.381,-1.858
      ADD=37  RD=0,1  U2=-1.858,-1.506
      ADD=38  RD=0,1  U2=-1.506,-1.307
      ADD=39  RD=0,1  U2=-1.307,-1.25
      ADD=40  RD=0,1  U2=-1.25,-1.307
      ADD=41  RD=0,1  U2=-1.307,-1.506
      ADD=42  RD=0,1  U2=-1.506,-3.5628
      ADD=43  RD=0,1  U2=-3.5628,-2.381
      ADD=44  RD=0,1  U2=-2.381,-3.082
      ADD=45  RD=0,1  U2=-3.082,-3.415
      ADD=46  RD=0,1  U2=-3.415,-3.694
      ADD=47  RD=0,1  U2=-3.694,-4.11
      ADD=48  RD=0,1  U2=-4.11,-4.543
      ADD=49  RD=0,1  U2=-4.543,-4.969
      ADD=50  RD=0,1  U2=-4.969,-5.622
      ADD=52  RD=0,1  U2=-5.622,-6.276
      ADD=53  RD=0,1  U2=-6.276,-6.929
      ADD=102  RD=0,1  U2=-9.014,-8.302
      ADD=101  RD=0,1  U2=-8.302,-6.929
      ADD=302  RD=0,1  U2=-9.188,-9.875
      ADD=301  RD=0,1  U2=-6.929,-9.188
      ADD=400  RD=0,1  UZ=9.714,9.714
      ADD=401  RD=0,1  UZ=9.714,9.727
      ADD=402  RD=0,1  UZ=9.727,9.754
      ADD=403  RD=0,1  UZ=9.754,9.78
      ADD=404  RD=0,1  UZ=9.78,9.807
      ADD=405  RD=0,1  UZ=9.807,9.833
      ADD=406  RD=0,1  UZ=9.833,9.86
      ADD=407  RD=0,1  UZ=9.86,9.886
      ADD=408  RD=0,1  UZ=9.886,9.913
      ADD=409  RD=0,1  UZ=9.913,9.939
      ADD=410  RD=0,1  UZ=9.939,9.966
```

```
      ADD=411  RD=0,1  UZ=9.966,9.992
      ADD=412  RD=0,1  UZ=9.992,10.019
      ADD=413  RD=0,1  UZ=10.019,10.048
      ADD=414  RD=0,1  UZ=10.048,10.072
      ADD=415  RD=0,1  UZ=10.072,10.098
      ADD=416  RD=0,1  UZ=10.098,10.125
      ADD=417  RD=0,1  UZ=10.125,10.144
      ADD=418  RD=0,1  UZ=10.144,10.164
      ADD=419  RD=0,1  UZ=10.164,10.191
      ADD=420  RD=0,1  UZ=10.191,10.217
      ADD=421  RD=0,1  UZ=10.217,10.241
      ADD=422  RD=0,1  UZ=10.241,10.27
      ADD=423  RD=0,1  UZ=10.27,10.297
      ADD=424  RD=0,1  UZ=10.297,10.323
      ADD=425  RD=0,1  UZ=10.323,10.35
      ADD=426  RD=0,1  UZ=10.35,10.376
      ADD=427  RD=0,1  UZ=10.376,10.403
      ADD=428  RD=0,1  UZ=10.403,10.429
      ADD=429  RD=0,1  UZ=10.429,10.456
      ADD=430  RD=0,1  UZ=10.456,10.482
      ADD=431  RD=0,1  UZ=10.482,10.509
      ADD=432  RD=0,1  UZ=10.509,10.535
      ADD=433  RD=0,1  UZ=10.535,10.562
      ADD=434  RD=0,1  UZ=10.562,10.575
      ADD=435  RD=0,1  UZ=10.575,10.575
  NAME=PL
    TYPE=CONCENTRATED SPAN
      ADD=415  RD=.755  UZ=-9.6
      ADD=413  RD=.717  UZ=-9.6
      ADD=412  RD=.415  UZ=-9.6
      ADD=410  RD=.321  UZ=-9.6
      ADD=408  RD=.962  UZ=-9.6
      ADD=406  RD=.925  UZ=-9.6
      ADD=420  RD=.245  UZ=-9.6
      ADD=422  RD=.283  UZ=-9.6
      ADD=423  RD=.642  UZ=-9.6
      ADD=425  RD=.679  UZ=-9.6
      ADD=427  RD=.038  UZ=-9.6
      ADD=429  RD=.076  UZ=-9.6
  NAME=PVL
    TYPE=DISTRIBUTED SPAN
      ADD=5  RD=0,1  UZ=-1.186,-1.186
      ADD=6  RD=0,1  UZ=-1.186,-1.186
      ADD=7  RD=0,1  UZ=-1.186,-1.186
      ADD=8  RD=0,1  UZ=-1.186,-1.186
      ADD=9  RD=0,1  UZ=-1.186,-1.186
      ADD=10  RD=0,1  UZ=-1.186,-1.186
      ADD=11  RD=0,1  UZ=-1.186,-1.186
      ADD=12  RD=0,1  UZ=-1.186,-1.186
      ADD=13  RD=0,1  UZ=-1.186,-1.186
      ADD=14  RD=0,1  UZ=-1.186,-1.186
      ADD=15  RD=0,1  UZ=-1.186,-1.186
      ADD=16  RD=0,1  UZ=-1.186,-1.186
      ADD=17  RD=0,1  UZ=-1.186,-1.186
      ADD=18  RD=0,1  UZ=-1.186,-1.186
      ADD=19  RD=0,1  UZ=-1.186,-1.186
      ADD=20  RD=0,1  UZ=-1.186,-1.186
      ADD=21  RD=0,1  UZ=-1.186,-1.186
      ADD=22  RD=0,1  UZ=-1.186,-1.186
      ADD=31  RD=0,1  UZ=-1.186,-1.186
      ADD=32  RD=0,1  UZ=-1.186,-1.186
      ADD=33  RD=0,1  UZ=-1.186,-1.186
      ADD=34  RD=0,1  UZ=-1.186,-1.186
      ADD=35  RD=0,1  UZ=-1.186,-1.186
      ADD=36  RD=0,1  UZ=-1.186,-1.186
      ADD=37  RD=0,1  UZ=-1.186,-1.186
      ADD=38  RD=0,1  UZ=-1.186,-1.186
      ADD=39  RD=0,1  UZ=-1.186,-1.186
      ADD=40  RD=0,1  UZ=-1.186,-1.186
      ADD=41  RD=0,1  UZ=-1.186,-1.186
      ADD=42  RD=0,1  UZ=-1.186,-1.186
      ADD=43  RD=0,1  UZ=-1.186,-1.186
      ADD=44  RD=0,1  UZ=-1.186,-1.186
      ADD=45  RD=0,1  UZ=-1.186,-1.186
      ADD=46  RD=0,1  UZ=-1.186,-1.186
      ADD=47  RD=0,1  UZ=-1.186,-1.186
      ADD=48  RD=0,1  UZ=-1.186,-1.186

COMBO
  NAME=COMB1
    LOAD=SW  SF=1.3
    LOAD=PV  SF=1.5
    LOAD=PH  SF=1.7
  NAME=COMB2
    LOAD=SW  SF=1.3
    LOAD=PV  SF=1.5
    LOAD=PH  SF=.65
  NAME=COMB3
    LOAD=SW  SF=1.3
    LOAD=PVW  SF=1.5
```



```
    LOAD=PHW  SF=1.7
    LOAD=PW  SF=1.3
  NAME=COMB4
    LOAD=SW  SF=1.3
    LOAD=PVW  SF=1.5
    LOAD=PHW  SF=.65
    LOAD=PW  SF=1.3
  NAME=COMB5
    LOAD=SW  SF=1.3
    LOAD=PV  SF=1.5
    LOAD=PH  SF=1.7
    LOAD=PVL  SF=1.3
  NAME=COMB6
    LOAD=SW  SF=1.3
    LOAD=PV  SF=1.5
    LOAD=PH  SF=.65
    LOAD=PVL  SF=1.3
  NAME=COMB7
    LOAD=SW  SF=1
    LOAD=PV  SF=1
    LOAD=PH  SF=1
  NAME=COMB8
    LOAD=SW  SF=1
    LOAD=PV  SF=1
    LOAD=PH  SF=1
    LOAD=PL  SF=1
  NAME=COMB9
    LOAD=SW  SF=1
    LOAD=PV  SF=1
    LOAD=PH  SF=.5
  NAME=COMB10
    LOAD=SW  SF=1
    LOAD=PV  SF=1
    LOAD=PH  SF=.5
    LOAD=PL  SF=1
  NAME=COMB11
    LOAD=SW  SF=1
    LOAD=PVW  SF=1
    LOAD=PHW  SF=1
  NAME=COMB12
    LOAD=SW  SF=1
    LOAD=PVW  SF=1
    LOAD=PHW  SF=1
    LOAD=PL  SF=1

OUTPUT
; No Output Requested

END

; The following data is used for graphics, design
and pushover analysis.
; If changes are made to the analysis data above,
then the following data
; should be checked for consistency.
SAP2000 V7.10 SUPPLEMENTAL DATA
  GRID GLOBAL  X "1"  -15.25
  GRID GLOBAL  Y "2"  0
  GRID GLOBAL  Z "3"  -8.625
  GRID GLOBAL  X "4"  0
  GRID GLOBAL  Z "5"  0
  GRID GLOBAL  X "6"  15.25
  MATERIAL STEEL FY 25310.51
  MATERIAL CONC FYREBAR 40000 FYSHEAR 28122.79 FC
4000 FCSHEAR 2812.279
  MATERIAL RIGID FYREBAR 40000 FYSHEAR 28122.79
FC 4000 FCSHEAR 2812.279
  MATERIAL CONC1 FYREBAR 40000 FYSHEAR 28122.79
FC 4000 FCSHEAR 2812.279
  CONCRETESECTION T1 COLUMN  COVER .05 REBAR
RR-3-3
  CONCRETESECTION T2 COLUMN  COVER .0542 REBAR
RR-3-3
  CONCRETESECTION T3 COLUMN  COVER .0675 REBAR
RR-3-3
  CONCRETESECTION T4 COLUMN  COVER .0916 REBAR
RR-3-3
  CONCRETESECTION T5 COLUMN  COVER .068 REBAR
RR-3-3
  CONCRETESECTION T6 COLUMN  COVER .0553 REBAR
RR-3-3
  CONCRETESECTION T7 COLUMN  COVER .0511 REBAR
RR-3-3
  CONCRETESECTION T8 COLUMN  COVER .05 REBAR
RR-3-3
  CONCRETESECTION FOOT COLUMN  COVER .14 REBAR
RR-3-3
  CONCRETESECTION WALL COLUMN  COVER .085 REBAR
RR-3-3
  CONCRETESECTION RIGID COLUMN  COVER 1 REBAR
```

```
RR-3-3
  CONCRETESECTION WALL1 COLUMN  COVER .13 REBAR
RR-3-3
  STATICLOAD SW TYPE DEAD
  STATICLOAD PV TYPE DEAD
  STATICLOAD PH TYPE DEAD
  STATICLOAD PVW TYPE DEAD
  STATICLOAD PHW TYPE DEAD
  STATICLOAD PW TYPE DEAD
  STATICLOAD PL TYPE DEAD
  STATICLOAD PVL TYPE DEAD
END SUPPLEMENTAL DATA
```

```
; File D:\SAP2000DATA\반영개착식터널\MAT4.$2k
saved 10-9-02 10:03:10 in Ton-m

SYSTEM
  DOF=UX,UZ,RY  LENGTH=m  FORCE=Ton  LINES=59

JOINT
  1  X=-14.25  Y=0  Z=-5.679
  2  X=-14.25  Y=0  Z=-5.026
  3  X=-14.25  Y=0  Z=-4.372
  4  X=-14.25  Y=0  Z=-3.719
  5  X=-14.23  Y=0  Z=-3.293
  6  X=-14.166  Y=0  Z=-2.86
  7  X=-14.107  Y=0  Z=-2.444
  8  X=-13.748  Y=0  Z=-2.165
  9  X=-13.294  Y=0  Z=-1.832
  10  X=-12.092  Y=0  Z=-1.131
  11  X=-10.887  Y=0  Z=-.608
  12  X=-9.683  Y=0  Z=-.256
  13  X=-8.479  Y=0  Z=-.057
  14  X=-7.275  Y=0  Z=0
  15  X=-6.071  Y=0  Z=-.057
  16  X=-4.867  Y=0  Z=-.256
  17  X=-3.663  Y=0  Z=-.608
  18  X=-2.458  Y=0  Z=-1.131
  19  X=-1.256  Y=0  Z=-1.832
  20  X=-.795  Y=0  Z=-2.165
  21  X=-.443  Y=0  Z=-2.444
  22  X=-.369  Y=0  Z=-2.86
  23  X=-.318  Y=0  Z=-3.293
  24  X=-.3  Y=0  Z=-3.719
  25  X=-.3  Y=0  Z=-4.372
  26  X=-.3  Y=0  Z=-5.026
  27  X=-.3  Y=0  Z=-5.679
  28  X=.3  Y=0  Z=-5.679
  29  X=.3  Y=0  Z=-5.026
  30  X=.3  Y=0  Z=-4.372
  31  X=.3  Y=0  Z=-3.719
  32  X=.318  Y=0  Z=-3.293
  33  X=.369  Y=0  Z=-2.86
  34  X=.443  Y=0  Z=-2.444
  35  X=.795  Y=0  Z=-2.165
  36  X=1.256  Y=0  Z=-1.832
  37  X=2.458  Y=0  Z=-1.131
  38  X=3.663  Y=0  Z=-.608
  39  X=4.867  Y=0  Z=-.256
  40  X=6.071  Y=0  Z=-.057
  41  X=7.275  Y=0  Z=0
  42  X=8.479  Y=0  Z=-.057
  43  X=9.683  Y=0  Z=-.256
  44  X=10.887  Y=0  Z=-.608
  45  X=12.092  Y=0  Z=-1.131
  46  X=13.294  Y=0  Z=-1.832
  47  X=13.748  Y=0  Z=-2.165
  48  X=14.107  Y=0  Z=-2.444
  49  X=14.166  Y=0  Z=-2.86
  50  X=14.23  Y=0  Z=-3.293
  51  X=14.25  Y=0  Z=-3.719
  52  X=14.25  Y=0  Z=-4.372
  53  X=14.25  Y=0  Z=-5.026
  54  X=14.25  Y=0  Z=-5.679
  101  X=-14.325  Y=0  Z=-5.679
  102  X=-14.325  Y=0  Z=-7.052
  201  X=0  Y=0  Z=-5.679
  202  X=0  Y=0  Z=-7.475
  301  X=14.325  Y=0  Z=-5.679
  302  X=14.325  Y=0  Z=-7.938
  401  X=-15.25  Y=0  Z=-7.764
  402  X=-14.325  Y=0  Z=-7.764
  403  X=-13.9  Y=0  Z=-7.777
  404  X=-13.017  Y=0  Z=-7.804
  405  X=-12.133  Y=0  Z=-7.83
  406  X=-11.25  Y=0  Z=-7.857
  407  X=-10.367  Y=0  Z=-7.883
  408  X=-9.484  Y=0  Z=-7.91
  409  X=-8.6  Y=0  Z=-7.936
  410  X=-7.717  Y=0  Z=-7.963
  411  X=-6.834  Y=0  Z=-7.989
  412  X=-5.95  Y=0  Z=-8.016
  413  X=-5.067  Y=0  Z=-8.042
  414  X=-4.184  Y=0  Z=-8.069
  415  X=-3.3  Y=0  Z=-8.098
  416  X=-2.417  Y=0  Z=-8.122
  417  X=-1.534  Y=0  Z=-8.148
  418  X=-.65  Y=0  Z=-8.175
  419  X=0  Y=0  Z=-8.194
  420  X=.65  Y=0  Z=-8.214
  421  X=1.534  Y=0  Z=-8.241
```



```
  422  X=2.417  Y=0  Z=-8.267
  423  X=3.3  Y=0  Z=-8.291
  424  X=4.184  Y=0  Z=-8.32
  425  X=5.067  Y=0  Z=-8.347
  426  X=5.95  Y=0  Z=-8.373
  427  X=6.834  Y=0  Z=-8.4
  428  X=7.717  Y=0  Z=-8.426
  429  X=8.6  Y=0  Z=-8.453
  430  X=9.484  Y=0  Z=-8.479
  431  X=10.367  Y=0  Z=-8.506
  432  X=11.25  Y=0  Z=-8.532
  433  X=12.133  Y=0  Z=-8.559
  434  X=13.017  Y=0  Z=-8.585
  435  X=13.9  Y=0  Z=-8.612
  436  X=14.325  Y=0  Z=-8.625
  437  X=15.25  Y=0  Z=-8.625

PATTERN
  NAME=TEMP
  NAME=PRES

SPRING
  ADD=401  U3=201064.2
  ADD=418  U3=333440.5
  ADD=419  U1=10000  U3=282576.7
  ADD=420  U3=333440.5
  ADD=437  U3=201064.2

MATERIAL
  NAME=CONC  IDES=C  M=.2448  W=2.5
    T=0  E=2800000  U=.2  A=.00001
  NAME=STEEL  IDES=S
    T=0  E=2E+10  U=.3  A=.0000117  FY=25310.51
  NAME=RIGID  IDES=C
    T=0  E=2464750  U=.3  A=.00001
  NAME=CONC1  IDES=C  M=.2448  W=2.5
    T=0  E=2464750  U=.2  A=.00001

FRAME SECTION
  NAME=T1 MAT=CONC SH=R T=.5,1 A=.5
J=2.861003E-02 I=1.041667E-02,4.897667E-02
AS=.4166667,.4166667
  NAME=T2 MAT=CONC SH=R T=.542,1 A=.542
J=3.508126E-02 I=1.326834E-02,4.516667E-02
AS=.4516667,.4516667
  NAME=T3 MAT=CONC SH=R T=.675,1 A=.675
J=5.967503E-02 I=2.562891E-02,.05625
AS=.5625,.5625
  NAME=T4 MAT=CONC SH=R T=.916,1 A=.916
J=.1170223 I=6.404794E-02,7.633334E-02
AS=.7633333,.7633333
  NAME=T5 MAT=CONC SH=R T=.68,1 A=.68
J=6.070982E-02 I=2.620267E-02,5.666667E-02
AS=.5666667,.5666667
  NAME=T6 MAT=CONC SH=R T=.553,1 A=.553
J=3.688483E-02 I=.0140927,4.608333E-02
AS=.4608333,.4608333
  NAME=T7 MAT=CONC SH=R T=.511,1 A=.511
J=3.024029E-02 I=.0111194,4.258334E-02
AS=.4258333,.4258333
  NAME=T8 MAT=CONC SH=R T=.5,1 A=.5
J=2.861003E-02 I=1.041667E-02,4.897667E-02
AS=.4166667,.4166667
  NAME=FOOT MAT=CONC1 SH=R T=1.4,1 A=1.4
J=.2612221 I=.2286666,.1166667
AS=1.166667,1.166667
  NAME=WALL MAT=CONC1 SH=R T=.85,1 A=.85
J=9.985562E-02 I=4.117709E-02,7.083333E-02
AS=.7083334,.7083334
  NAME=RIGID MAT=RIGID SH=R T=10,10 A=100
J=1408.333 I=833.5623,833.5623
AS=83.56233,83.56233
  NAME=WALL1 MAT=CONC1 SH=R T=1.3,1 A=1.3
J=.2294606 I=.1830833,.1083333
AS=1.083333,1.083333
  NAME=VAR1 TYPE=NONPR
    SEC=T1,T2 EIVAR=1,1 L=.426
  NAME=VAR2 TYPE=NONPR
    SEC=T2,T3 EIVAR=1,1 L=.436
  NAME=VAR3 TYPE=NONPR
    SEC=T3,T4 EIVAR=1,1 L=.422
  NAME=VAR4 TYPE=NONPR
    SEC=T4,T5 EIVAR=1,1 L=.455
  NAME=VAR5 TYPE=NONPR
    SEC=T5,T6 EIVAR=1,1 L=.563
  NAME=VAR6 TYPE=NONPR
    SEC=T6,T7 EIVAR=1,1 L=1.392
  NAME=VAR7 TYPE=NONPR
    SEC=T7,T8 EIVAR=1,1 L=1.313
```

```
FRAME
  1  J=1,2  SEC=T1  NSEG=1  ANG=180  IREL=R3
  2  J=2,3  SEC=T1  NSEG=1  ANG=180
  3  J=3,4  SEC=T1  NSEG=1  ANG=180
  4  J=4,5  SEC=VAR1  NSEG=1  ANG=0
  5  J=5,6  SEC=VAR2  NSEG=1  ANG=0
  6  J=6,7  SEC=VAR3  NSEG=1  ANG=0
  7  J=7,8  SEC=VAR4  NSEG=1  ANG=0
  8  J=8,9  SEC=VAR5  NSEG=1  ANG=0
  9  J=9,10  SEC=VAR6  NSEG=1  ANG=0
  10  J=10,11  SEC=VAR7  NSEG=1  ANG=0
  11  J=11,12  SEC=T8  NSEG=1  ANG=0
  12  J=12,13  SEC=T8  NSEG=1  ANG=0
  13  J=13,14  SEC=T8  NSEG=1  ANG=0
  14  J=14,15  SEC=T8  NSEG=1  ANG=0
  15  J=15,16  SEC=T8  NSEG=1  ANG=0
  16  J=16,17  SEC=T8  NSEG=1  ANG=0
  17  J=17,18  SEC=VAR7  NSEG=1  ANG=0
  18  J=18,19  SEC=VAR6  NSEG=1  ANG=0
  19  J=19,20  SEC=VAR5  NSEG=1  ANG=0
  20  J=20,21  SEC=VAR4  NSEG=1  ANG=0
  21  J=21,22  SEC=VAR3  NSEG=1  ANG=0
  22  J=22,23  SEC=VAR2  NSEG=1  ANG=0
  23  J=23,24  SEC=VAR1  NSEG=1  ANG=0
  24  J=24,25  SEC=T1  NSEG=1  ANG=0
  25  J=25,26  SEC=T1  NSEG=1  ANG=0
  26  J=26,27  SEC=T1  NSEG=1  ANG=0  JREL=R3
  27  J=28,29  SEC=T1  NSEG=1  ANG=180  IREL=R3
  28  J=29,30  SEC=T1  NSEG=1  ANG=180
  29  J=30,31  SEC=T1  NSEG=1  ANG=180
  30  J=31,32  SEC=VAR1  NSEG=1  ANG=0
  31  J=32,33  SEC=VAR2  NSEG=1  ANG=0
  32  J=33,34  SEC=VAR3  NSEG=1  ANG=0
  33  J=34,35  SEC=VAR4  NSEG=1  ANG=0
  34  J=35,36  SEC=VAR5  NSEG=1  ANG=0
  35  J=36,37  SEC=VAR6  NSEG=1  ANG=0
  36  J=37,38  SEC=VAR7  NSEG=1  ANG=0
  37  J=38,39  SEC=T8  NSEG=1  ANG=0
  38  J=39,40  SEC=T8  NSEG=1  ANG=0
  39  J=40,41  SEC=T8  NSEG=1  ANG=0
  40  J=41,42  SEC=T8  NSEG=1  ANG=0
  41  J=42,43  SEC=T8  NSEG=1  ANG=0
  42  J=43,44  SEC=T8  NSEG=1  ANG=0
  43  J=44,45  SEC=VAR7  NSEG=1  ANG=0
  44  J=45,46  SEC=VAR6  NSEG=1  ANG=0
  45  J=46,47  SEC=VAR5  NSEG=1  ANG=0
  46  J=47,48  SEC=VAR4  NSEG=1  ANG=0
  47  J=48,49  SEC=VAR3  NSEG=1  ANG=0
  48  J=49,50  SEC=VAR2  NSEG=1  ANG=0
  49  J=50,51  SEC=VAR1  NSEG=1  ANG=0
  50  J=51,52  SEC=T1  NSEG=1  ANG=0
  52  J=52,53  SEC=T1  NSEG=1  ANG=0
  53  J=53,54  SEC=T1  NSEG=1  ANG=0  JREL=R3
  85  J=28,201  SEC=RIGID  NSEG=1  ANG=0
  86  J=201,27  SEC=RIGID  NSEG=1  ANG=0
  87  J=301,54  SEC=RIGID  NSEG=1  ANG=0
  88  J=1,101  SEC=RIGID  NSEG=1  ANG=0
  101  J=102,101  SEC=WALL  NSEG=1  ANG=180
  102  J=402,102  SEC=WALL  NSEG=1  ANG=180
IOFF=.02475  RIGID=0
  201  J=202,201  SEC=WALL1  NSEG=1  ANG=0
  202  J=419,202  SEC=WALL1  NSEG=1  ANG=0
IOFF=.375  RIGID=0
  301  J=301,302  SEC=WALL  NSEG=1  ANG=0
  302  J=302,436  SEC=WALL  NSEG=1  ANG=0
JOFF=.4875  RIGID=0
  400  J=401,402  SEC=FOOT  NSEG=1  ANG=0
  401  J=402,403  SEC=FOOT  NSEG=1  ANG=0
IOFF=.075  RIGID=0
  402  J=403,404  SEC=FOOT  NSEG=1  ANG=0
  403  J=404,405  SEC=FOOT  NSEG=1  ANG=0
  404  J=405,406  SEC=FOOT  NSEG=1  ANG=0
  405  J=406,407  SEC=FOOT  NSEG=1  ANG=0
  406  J=407,408  SEC=FOOT  NSEG=1  ANG=0
  407  J=408,409  SEC=FOOT  NSEG=1  ANG=0
  408  J=409,410  SEC=FOOT  NSEG=1  ANG=0
  409  J=410,411  SEC=FOOT  NSEG=1  ANG=0
  410  J=411,412  SEC=FOOT  NSEG=1  ANG=0
  411  J=412,413  SEC=FOOT  NSEG=1  ANG=0
  412  J=413,414  SEC=FOOT  NSEG=1  ANG=0
  413  J=414,415  SEC=FOOT  NSEG=1  ANG=0
  414  J=415,416  SEC=FOOT  NSEG=1  ANG=0
  415  J=416,417  SEC=FOOT  NSEG=1  ANG=0
  416  J=417,418  SEC=FOOT  NSEG=1  ANG=0
  417  J=418,419  SEC=FOOT  NSEG=1  ANG=0
JOFF=.3  RIGID=0
  418  J=419,420  SEC=FOOT  NSEG=1  ANG=0
IOFF=.3  RIGID=0
  419  J=420,421  SEC=FOOT  NSEG=1  ANG=0
  420  J=421,422  SEC=FOOT  NSEG=1  ANG=0
```



```
  421  J=422,423  SEC=FOOT  NSEG=1  ANG=0
  422  J=423,424  SEC=FOOT  NSEG=1  ANG=0
  423  J=424,425  SEC=FOOT  NSEG=1  ANG=0
  424  J=425,426  SEC=FOOT  NSEG=1  ANG=0
  425  J=426,427  SEC=FOOT  NSEG=1  ANG=0
  426  J=427,428  SEC=FOOT  NSEG=1  ANG=0
  427  J=428,429  SEC=FOOT  NSEG=1  ANG=0
  428  J=429,430  SEC=FOOT  NSEG=1  ANG=0
  429  J=430,431  SEC=FOOT  NSEG=1  ANG=0
  430  J=431,432  SEC=FOOT  NSEG=1  ANG=0
  431  J=432,433  SEC=FOOT  NSEG=1  ANG=0
  432  J=433,434  SEC=FOOT  NSEG=1  ANG=0
  433  J=434,435  SEC=FOOT  NSEG=1  ANG=0
  434  J=435,436  SEC=FOOT  NSEG=1  ANG=0
JOFF=.075  RIGID=0
  435  J=436,437  SEC=FOOT  NSEG=1  ANG=0

LOAD
  NAME=SW  SW=1
  NAME=PV
    TYPE=DISTRIBUTED SPAN
      ADD=5  RD=0,1  UZ=-12.459,-11.602
      ADD=6  RD=0,1  UZ=-11.602,-10.778
      ADD=7  RD=0,1  UZ=-10.778,-10.226
      ADD=8  RD=0,1  UZ=-10.226,-9.566
      ADD=9  RD=0,1  UZ=-9.566,-8.179
      ADD=10  RD=0,1  UZ=-8.179,-7.143
      ADD=11  RD=0,1  UZ=-7.143,-6.446
      ADD=12  RD=0,1  UZ=-6.446,-6.052
      ADD=13  RD=0,1  UZ=-6.052,-5.939
      ADD=14  RD=0,1  UZ=-5.939,-6.052
      ADD=15  RD=0,1  UZ=-6.052,-6.446
      ADD=16  RD=0,1  UZ=-6.446,-7.143
      ADD=17  RD=0,1  UZ=-7.143,-8.179
      ADD=18  RD=0,1  UZ=-8.179,-9.566
      ADD=19  RD=0,1  UZ=-9.566,-10.226
      ADD=20  RD=0,1  UZ=-10.226,-10.778
      ADD=21  RD=0,1  UZ=-10.778,-11.602
      ADD=22  RD=0,1  UZ=-11.602,-12.459
      ADD=31  RD=0,1  UZ=-12.459,-11.602
      ADD=32  RD=0,1  UZ=-11.602,-10.778
      ADD=33  RD=0,1  UZ=-10.778,-10.226
      ADD=34  RD=0,1  UZ=-10.226,-9.566
      ADD=35  RD=0,1  UZ=-9.566,-8.179
      ADD=36  RD=0,1  UZ=-8.179,-7.143
      ADD=37  RD=0,1  UZ=-7.143,-6.446
      ADD=38  RD=0,1  UZ=-6.446,-6.052
      ADD=39  RD=0,1  UZ=-6.052,-5.939
      ADD=40  RD=0,1  UZ=-5.939,-6.052
      ADD=41  RD=0,1  UZ=-6.052,-6.446
      ADD=42  RD=0,1  UZ=-6.446,-7.143
      ADD=43  RD=0,1  UZ=-7.143,-8.179
      ADD=44  RD=0,1  UZ=-8.179,-9.566
      ADD=45  RD=0,1  UZ=-9.566,-10.226
      ADD=46  RD=0,1  UZ=-10.226,-10.778
      ADD=47  RD=0,1  UZ=-10.778,-11.602
      ADD=48  RD=0,1  UZ=-11.602,-12.459
  NAME=PH
    TYPE=DISTRIBUTED SPAN
      ADD=102  RD=0,1  UX=10.463,9.787
      ADD=101  RD=0,1  UX=9.787,8.483
      ADD=1  RD=0,1  UX=8.483,7.862
      ADD=2  RD=0,1  UX=7.862,7.241
      ADD=3  RD=0,1  UX=7.241,6.621
      ADD=4  RD=0,1  UX=6.621,6.216
      ADD=5  RD=0,1  UX=6.216,5.805
      ADD=6  RD=0,1  UX=5.805,5.409
      ADD=7  RD=0,1  UX=5.409,5.144
      ADD=8  RD=0,1  UX=5.144,4.828
      ADD=9  RD=0,1  UX=4.828,4.162
      ADD=10  RD=0,1  UX=4.162,3.665
      ADD=11  RD=0,1  UX=3.665,3.331
      ADD=12  RD=0,1  UX=3.331,3.142
      ADD=13  RD=0,1  UX=3.142,3.088
      ADD=14  RD=0,1  UX=-3.088,-3.142
      ADD=15  RD=0,1  UX=-3.142,-3.331
      ADD=16  RD=0,1  UX=-3.331,-3.665
      ADD=17  RD=0,1  UX=-3.665,-4.162
      ADD=18  RD=0,1  UX=-4.162,-4.828
      ADD=19  RD=0,1  UX=-4.828,-5.144
      ADD=20  RD=0,1  UX=-5.144,-5.409
      ADD=21  RD=0,1  UX=-5.409,-5.805
      ADD=22  RD=0,1  UX=-5.805,-6.216
      ADD=23  RD=0,1  UX=-6.216,-6.621
      ADD=24  RD=0,1  UX=-6.621,-7.241
      ADD=25  RD=0,1  UX=-7.241,-7.862
      ADD=26  RD=0,1  UX=-7.862,-8.483
      ADD=27  RD=0,1  UX=8.483,7.862
      ADD=28  RD=0,1  UX=7.862,7.241
      ADD=29  RD=0,1  UX=7.241,6.621
```

```
      ADD=30  RD=0,1  UX=6.621,6.216
      ADD=31  RD=0,1  UX=6.216,5.805
      ADD=32  RD=0,1  UX=5.805,5.409
      ADD=33  RD=0,1  UX=5.409,5.144
      ADD=34  RD=0,1  UX=5.144,4.828
      ADD=35  RD=0,1  UX=4.828,4.162
      ADD=36  RD=0,1  UX=4.162,3.665
      ADD=37  RD=0,1  UX=3.665,3.331
      ADD=38  RD=0,1  UX=3.331,3.142
      ADD=39  RD=0,1  UX=3.142,3.088
      ADD=40  RD=0,1  UX=-3.088,-3.142
      ADD=41  RD=0,1  UX=-3.142,-3.331
      ADD=42  RD=0,1  UX=-3.331,-3.665
      ADD=43  RD=0,1  UX=-3.665,-4.162
      ADD=44  RD=0,1  UX=-4.162,-4.828
      ADD=45  RD=0,1  UX=-4.828,-5.144
      ADD=46  RD=0,1  UX=-5.144,-5.409
      ADD=47  RD=0,1  UX=-5.409,-5.805
      ADD=48  RD=0,1  UX=-5.805,-6.216
      ADD=49  RD=0,1  UX=-6.216,-6.621
      ADD=50  RD=0,1  UX=-6.621,-7.241
      ADD=52  RD=0,1  UX=-7.241,-7.862
      ADD=53  RD=0,1  UX=-7.862,-8.483
      ADD=301  RD=0,1  UX=-8.483,-10.629
      ADD=302  RD=0,1  UX=-10.629,-11.281
  NAME=PVW
    TYPE=DISTRIBUTED SPAN
      ADD=5  RD=0,1  UZ=-7.986,-7.58
      ADD=6  RD=0,1  UZ=-7.58,-7.189
      ADD=7  RD=0,1  UZ=-7.189,-6.928
      ADD=8  RD=0,1  UZ=-6.928,-6.615
      ADD=9  RD=0,1  UZ=-6.615,-5.958
      ADD=10  RD=0,1  UZ=-5.958,-5.468
      ADD=11  RD=0,1  UZ=-5.468,-5.137
      ADD=12  RD=0,1  UZ=-5.137,-4.951
      ADD=13  RD=0,1  UZ=-4.951,-4.897
      ADD=14  RD=0,1  UZ=-4.897,-4.951
      ADD=15  RD=0,1  UZ=-4.951,-5.137
      ADD=16  RD=0,1  UZ=-5.137,-5.468
      ADD=17  RD=0,1  UZ=-5.468,-5.958
      ADD=18  RD=0,1  UZ=-5.958,-6.615
      ADD=19  RD=0,1  UZ=-6.615,-6.928
      ADD=20  RD=0,1  UZ=-6.928,-7.189
      ADD=21  RD=0,1  UZ=-7.189,-7.58
      ADD=22  RD=0,1  UZ=-7.58,-7.986
      ADD=30  RD=0,1  UZ=-7.986,-7.58
      ADD=31  RD=0,1  UZ=-7.58,-7.189
      ADD=33  RD=0,1  UZ=-7.189,-6.928
      ADD=34  RD=0,1  UZ=-6.928,-6.615
      ADD=35  RD=0,1  UZ=-6.615,-5.958
      ADD=36  RD=0,1  UZ=-5.958,-5.468
      ADD=37  RD=0,1  UZ=-5.468,-5.137
      ADD=38  RD=0,1  UZ=-5.137,-4.951
      ADD=39  RD=0,1  UZ=-4.951,-4.897
      ADD=40  RD=0,1  UZ=-4.897,-4.951
      ADD=41  RD=0,1  UZ=-4.951,-5.137
      ADD=42  RD=0,1  UZ=-5.137,-5.468
      ADD=43  RD=0,1  UZ=-5.468,-5.958
      ADD=44  RD=0,1  UZ=-5.958,-6.615
      ADD=45  RD=0,1  UZ=-6.615,-6.928
      ADD=46  RD=0,1  UZ=-6.928,-7.189
      ADD=47  RD=0,1  UZ=-7.189,-7.58
      ADD=48  RD=0,1  UZ=-7.58,-7.986
  NAME=PHW
    TYPE=DISTRIBUTED SPAN
      ADD=1  RD=0,1  UX=5.018,4.724
      ADD=2  RD=0,1  UX=4.724,4.43
      ADD=3  RD=0,1  UX=4.43,4.136
      ADD=4  RD=0,1  UX=4.136,3.944
      ADD=5  RD=0,1  UX=3.944,3.75
      ADD=6  RD=0,1  UX=3.75,3.562
      ADD=7  RD=0,1  UX=3.562,3.437
      ADD=8  RD=0,1  UX=3.437,3.287
      ADD=9  RD=0,1  UX=3.287,2.971
      ADD=10  RD=0,1  UX=2.971,2.736
      ADD=11  RD=0,1  UX=2.736,2.578
      ADD=12  RD=0,1  UX=2.578,2.488
      ADD=13  RD=0,1  UX=2.488,2.463
      ADD=14  RD=0,1  UX=-2.463,-2.488
      ADD=15  RD=0,1  UX=-2.488,-2.578
      ADD=16  RD=0,1  UX=-2.578,-2.736
      ADD=17  RD=0,1  UX=-2.736,-2.971
      ADD=18  RD=0,1  UX=-2.971,-3.287
      ADD=19  RD=0,1  UX=-3.287,-3.437
      ADD=20  RD=0,1  UX=-3.437,-3.562
      ADD=21  RD=0,1  UX=-5.409,-5.805
      ADD=22  RD=0,1  UX=-5.805,-6.216
      ADD=23  RD=0,1  UX=-6.216,-6.621
      ADD=24  RD=0,1  UX=-6.621,-7.241
      ADD=25  RD=0,1  UX=-7.241,-7.862
```



```
      ADD=26  RD=0,1  UX=-7.862,-8.483
      ADD=27  RD=0,1  UX=8.483,7.862
      ADD=28  RD=0,1  UX=7.862,7.241
      ADD=29  RD=0,1  UX=7.241,6.621
      ADD=30  RD=0,1  UX=6.621,6.216
      ADD=31  RD=0,1  UX=6.216,5.805
      ADD=32  RD=0,1  UX=5.805,5.409
      ADD=33  RD=0,1  UX=3.562,3.437
      ADD=34  RD=0,1  UX=3.437,3.287
      ADD=35  RD=0,1  UX=3.287,2.971
      ADD=36  RD=0,1  UX=2.971,2.736
      ADD=37  RD=0,1  UX=2.736,2.578
      ADD=38  RD=0,1  UX=2.578,2.488
      ADD=39  RD=0,1  UX=2.488,2.463
      ADD=40  RD=0,1  UX=-2.463,-2.488
      ADD=41  RD=0,1  UX=-2.488,-2.578
      ADD=42  RD=0,1  UX=-2.578,-2.736
      ADD=43  RD=0,1  UX=-2.736,-2.971
      ADD=44  RD=0,1  UX=-2.971,-3.287
      ADD=45  RD=0,1  UX=-3.287,-3.437
      ADD=46  RD=0,1  UX=-3.437,-3.562
      ADD=47  RD=0,1  UX=-3.562,-3.75
      ADD=48  RD=0,1  UX=-3.75,-3.944
      ADD=49  RD=0,1  UX=-3.944,-4.136
      ADD=50  RD=0,1  UX=-4.136,-4.43
      ADD=52  RD=0,1  UX=-4.43,-4.724
      ADD=53  RD=0,1  UX=-4.724,-5.018
      ADD=102  RD=0,1  UX=5.956,5.636
      ADD=302  RD=0,1  UX=-6.035,-6.344
      ADD=101  RD=0,1  UX=5.636,5.018
      ADD=301  RD=0,1  UX=-5.018,-6.035
  NAME=PW
    TYPE=DISTRIBUTED SPAN
      ADD=1  RD=0,1  U2=-6.929,-6.276
      ADD=2  RD=0,1  U2=-6.276,-5.622
      ADD=3  RD=0,1  U2=-5.622,-4.969
      ADD=4  RD=0,1  U2=-4.969,-4.543
      ADD=5  RD=0,1  U2=-4.543,-4.11
      ADD=6  RD=0,1  U2=-4.11,-3.694
      ADD=7  RD=0,1  U2=-3.694,-3.415
      ADD=8  RD=0,1  U2=-3.415,-3.082
      ADD=9  RD=0,1  U2=-3.082,-2.381
      ADD=10  RD=0,1  U2=-2.381,-1.858
      ADD=11  RD=0,1  U2=-1.858,-1.506
      ADD=12  RD=0,1  U2=-1.506,-1.307
      ADD=13  RD=0,1  U2=-1.307,-1.25
      ADD=14  RD=0,1  U2=-1.25,-1.307
      ADD=15  RD=0,1  U2=-1.307,-1.506
      ADD=16  RD=0,1  U2=-1.506,-1.858
      ADD=17  RD=0,1  U2=-1.858,-2.381
      ADD=18  RD=0,1  U2=-2.381,-3.082
      ADD=19  RD=0,1  U2=-3.082,-3.415
      ADD=20  RD=0,1  U2=-3.415,-3.694
      ADD=33  RD=0,1  U2=-3.694,-3.415
      ADD=34  RD=0,1  U2=-3.415,-3.082
      ADD=35  RD=0,1  U2=-3.082,-2.381
      ADD=36  RD=0,1  U2=-2.381,-1.858
      ADD=37  RD=0,1  U2=-1.858,-1.506
      ADD=38  RD=0,1  U2=-1.506,-1.307
      ADD=39  RD=0,1  U2=-1.307,-1.25
      ADD=40  RD=0,1  U2=-1.25,-1.307
      ADD=41  RD=0,1  U2=-1.307,-1.506
      ADD=42  RD=0,1  U2=-1.506,-3.5628
      ADD=43  RD=0,1  U2=-3.5628,-2.381
      ADD=44  RD=0,1  U2=-2.381,-3.082
      ADD=45  RD=0,1  U2=-3.082,-3.415
      ADD=46  RD=0,1  U2=-3.415,-3.694
      ADD=47  RD=0,1  U2=-3.694,-4.11
      ADD=48  RD=0,1  U2=-4.11,-4.543
      ADD=49  RD=0,1  U2=-4.543,-4.969
      ADD=50  RD=0,1  U2=-4.969,-5.622
      ADD=52  RD=0,1  U2=-5.622,-6.276
      ADD=53  RD=0,1  U2=-6.276,-6.929
      ADD=102  RD=0,1  U2=-9.014,-8.302
      ADD=101  RD=0,1  U2=-8.302,-6.929
      ADD=302  RD=0,1  U2=-9.188,-9.875
      ADD=301  RD=0,1  U2=-6.929,-9.188
      ADD=400  RD=0,1  UZ=9.714,9.714
      ADD=401  RD=0,1  UZ=9.714,9.727
      ADD=402  RD=0,1  UZ=9.727,9.754
      ADD=403  RD=0,1  UZ=9.754,9.78
      ADD=404  RD=0,1  UZ=9.78,9.807
      ADD=405  RD=0,1  UZ=9.807,9.833
      ADD=406  RD=0,1  UZ=9.833,9.86
      ADD=407  RD=0,1  UZ=9.86,9.886
      ADD=408  RD=0,1  UZ=9.886,9.913
      ADD=409  RD=0,1  UZ=9.913,9.939
      ADD=410  RD=0,1  UZ=9.939,9.966
      ADD=411  RD=0,1  UZ=9.966,9.992
      ADD=412  RD=0,1  UZ=9.992,10.019
```

```
      ADD=413   RD=0,1  UZ=10.019,10.048
      ADD=414   RD=0,1  UZ=10.048,10.072
      ADD=415   RD=0,1  UZ=10.072,10.098
      ADD=416   RD=0,1  UZ=10.098,10.125
      ADD=417   RD=0,1  UZ=10.125,10.144
      ADD=418   RD=0,1  UZ=10.144,10.164
      ADD=419   RD=0,1  UZ=10.164,10.191
      ADD=420   RD=0,1  UZ=10.191,10.217
      ADD=421   RD=0,1  UZ=10.217,10.241
      ADD=422   RD=0,1  UZ=10.241,10.27
      ADD=423   RD=0,1  UZ=10.27,10.297
      ADD=424   RD=0,1  UZ=10.297,10.323
      ADD=425   RD=0,1  UZ=10.323,10.35
      ADD=426   RD=0,1  UZ=10.35,10.376
      ADD=427   RD=0,1  UZ=10.376,10.403
      ADD=428   RD=0,1  UZ=10.403,10.429
      ADD=429   RD=0,1  UZ=10.429,10.456
      ADD=430   RD=0,1  UZ=10.456,10.482
      ADD=431   RD=0,1  UZ=10.482,10.509
      ADD=432   RD=0,1  UZ=10.509,10.535
      ADD=433   RD=0,1  UZ=10.535,10.562
      ADD=434   RD=0,1  UZ=10.562,10.575
      ADD=435   RD=0,1  UZ=10.575,10.575
  NAME=PL
    TYPE=CONCENTRATED SPAN
      ADD=415   RD=.755  UZ=-9.6
      ADD=413   RD=.717  UZ=-9.6
      ADD=412   RD=.415  UZ=-9.6
      ADD=410   RD=.321  UZ=-9.6
      ADD=408   RD=.962  UZ=-9.6
      ADD=406   RD=.925  UZ=-9.6
      ADD=420   RD=.245  UZ=-9.6
      ADD=422   RD=.283  UZ=-9.6
      ADD=423   RD=.642  UZ=-9.6
      ADD=425   RD=.679  UZ=-9.6
      ADD=427   RD=.038  UZ=-9.6
      ADD=429   RD=.076  UZ=-9.6
  NAME=PVL
    TYPE=DISTRIBUTED SPAN
      ADD=5   RD=0,1  UZ=-1.186,-1.186
      ADD=6   RD=0,1  UZ=-1.186,-1.186
      ADD=7   RD=0,1  UZ=-1.186,-1.186
      ADD=8   RD=0,1  UZ=-1.186,-1.186
      ADD=9   RD=0,1  UZ=-1.186,-1.186
      ADD=10  RD=0,1  UZ=-1.186,-1.186
      ADD=11  RD=0,1  UZ=-1.186,-1.186
      ADD=12  RD=0,1  UZ=-1.186,-1.186
      ADD=13  RD=0,1  UZ=-1.186,-1.186
      ADD=14  RD=0,1  UZ=-1.186,-1.186
      ADD=15  RD=0,1  UZ=-1.186,-1.186
      ADD=16  RD=0,1  UZ=-1.186,-1.186
      ADD=17  RD=0,1  UZ=-1.186,-1.186
      ADD=18  RD=0,1  UZ=-1.186,-1.186
      ADD=19  RD=0,1  UZ=-1.186,-1.186
      ADD=20  RD=0,1  UZ=-1.186,-1.186
      ADD=21  RD=0,1  UZ=-1.186,-1.186
      ADD=22  RD=0,1  UZ=-1.186,-1.186
      ADD=31  RD=0,1  UZ=-1.186,-1.186
      ADD=32  RD=0,1  UZ=-1.186,-1.186
      ADD=33  RD=0,1  UZ=-1.186,-1.186
      ADD=34  RD=0,1  UZ=-1.186,-1.186
      ADD=35  RD=0,1  UZ=-1.186,-1.186
      ADD=36  RD=0,1  UZ=-1.186,-1.186
      ADD=37  RD=0,1  UZ=-1.186,-1.186
      ADD=38  RD=0,1  UZ=-1.186,-1.186
      ADD=39  RD=0,1  UZ=-1.186,-1.186
      ADD=40  RD=0,1  UZ=-1.186,-1.186
      ADD=41  RD=0,1  UZ=-1.186,-1.186
      ADD=42  RD=0,1  UZ=-1.186,-1.186
      ADD=43  RD=0,1  UZ=-1.186,-1.186
      ADD=44  RD=0,1  UZ=-1.186,-1.186
      ADD=45  RD=0,1  UZ=-1.186,-1.186
      ADD=46  RD=0,1  UZ=-1.186,-1.186
      ADD=47  RD=0,1  UZ=-1.186,-1.186
      ADD=48  RD=0,1  UZ=-1.186,-1.186

COMBO
  NAME=COMB1
    LOAD=SW  SF=1.3
    LOAD=PV  SF=1.5
    LOAD=PH  SF=1.7
  NAME=COMB2
    LOAD=SW  SF=1.3
    LOAD=PV  SF=1.5
    LOAD=PH  SF=.65
  NAME=COMB3
    LOAD=SW  SF=1.3
    LOAD=PVW  SF=1.5
    LOAD=PHW  SF=1.7
    LOAD=PW  SF=1.3
```



```
  NAME=COMB4
    LOAD=SW  SF=1.3
    LOAD=PVW  SF=1.5
    LOAD=PHW  SF=.65
    LOAD=PW  SF=1.3
  NAME=COMB5
    LOAD=SW  SF=1.3
    LOAD=PV  SF=1.5
    LOAD=PH  SF=1.7
    LOAD=PVL  SF=1.3
  NAME=COMB6
    LOAD=SW  SF=1.3
    LOAD=PV  SF=1.5
    LOAD=PH  SF=.65
    LOAD=PVL  SF=1.3
  NAME=COMB7
    LOAD=SW  SF=1
    LOAD=PV  SF=1
    LOAD=PH  SF=1
  NAME=COMB8
    LOAD=SW  SF=1
    LOAD=PV  SF=1
    LOAD=PH  SF=1
    LOAD=PL  SF=1
  NAME=COMB9
    LOAD=SW  SF=1
    LOAD=PV  SF=1
    LOAD=PH  SF=.5
  NAME=COMB10
    LOAD=SW  SF=1
    LOAD=PV  SF=1
    LOAD=PH  SF=.5
    LOAD=PL  SF=1
  NAME=COMB11
    LOAD=SW  SF=1
    LOAD=PVW  SF=1
    LOAD=PHW  SF=1
  NAME=COMB12
    LOAD=SW  SF=1
    LOAD=PVW  SF=1
    LOAD=PHW  SF=1
    LOAD=PL  SF=1

OUTPUT
; No Output Requested

END

; The following data is used for graphics, design
and pushover analysis.
; If changes are made to the analysis data above,
then the following data
; should be checked for consistency.
SAP2000 V7.10 SUPPLEMENTAL DATA
  GRID GLOBAL  X "1"  -15.25
  GRID GLOBAL  Y "2"  0
  GRID GLOBAL  Z "3"  -8.625
  GRID GLOBAL  X "4"  0
  GRID GLOBAL  Z "5"  0
  GRID GLOBAL  X "6"  15.25
  MATERIAL STEEL FY 25310.51
  MATERIAL CONC FYREBAR 40000 FYSHEAR 28122.79 FC
4000 FCSHEAR 2812.279
  MATERIAL RIGID FYREBAR 40000 FYSHEAR 28122.79
FC 4000 FCSHEAR 2812.279
  MATERIAL CONC1 FYREBAR 40000 FYSHEAR 28122.79
FC 4000 FCSHEAR 2812.279
  CONCRETESECTION T1 COLUMN  COVER .05 REBAR
RR-3-3
  CONCRETESECTION T2 COLUMN  COVER .0542 REBAR
RR-3-3
  CONCRETESECTION T3 COLUMN  COVER .0675 REBAR
RR-3-3
  CONCRETESECTION T4 COLUMN  COVER .0916 REBAR
RR-3-3
  CONCRETESECTION T5 COLUMN  COVER .068 REBAR
RR-3-3
  CONCRETESECTION T6 COLUMN  COVER .0553 REBAR
RR-3-3
  CONCRETESECTION T7 COLUMN  COVER .0511 REBAR
RR-3-3
  CONCRETESECTION T8 COLUMN  COVER .05 REBAR
RR-3-3
  CONCRETESECTION FOOT COLUMN  COVER .14 REBAR
RR-3-3
  CONCRETESECTION WALL COLUMN  COVER .085 REBAR
RR-3-3
  CONCRETESECTION RIGID COLUMN  COVER 1 REBAR
RR-3-3
  CONCRETESECTION WALL1 COLUMN  COVER .13 REBAR
```

```
RR-3-3
  STATICLOAD SW TYPE DEAD
  STATICLOAD PV TYPE DEAD
  STATICLOAD PH TYPE DEAD
  STATICLOAD PVW TYPE DEAD
  STATICLOAD PHW TYPE DEAD
  STATICLOAD PW TYPE DEAD
  STATICLOAD PL TYPE DEAD
  STATICLOAD PVL TYPE DEAD
END SUPPLEMENTAL DATA
```

```
; File D:\SAP2000DATA\만영개착식터널\MAT6.$2k
saved 10-9-02 10:17:26 in Ton-m

SYSTEM
  DOF=UX,UZ,RY  LENGTH=m  FORCE=Ton  LINES=59

JOINT
  1  X=-14.25  Y=0  Z=-5.679
  2  X=-14.25  Y=0  Z=-5.026
  3  X=-14.25  Y=0  Z=-4.372
  4  X=-14.25  Y=0  Z=-3.719
  5  X=-14.23  Y=0  Z=-3.293
  6  X=-14.166  Y=0  Z=-2.86
  7  X=-14.107  Y=0  Z=-2.444
  8  X=-13.748  Y=0  Z=-2.165
  9  X=-13.294  Y=0  Z=-1.832
  10  X=-12.092  Y=0  Z=-1.131
  11  X=-10.887  Y=0  Z=-.608
  12  X=-9.683  Y=0  Z=-.256
  13  X=-8.479  Y=0  Z=-.057
  14  X=-7.275  Y=0  Z=0
  15  X=-6.071  Y=0  Z=-.057
  16  X=-4.867  Y=0  Z=-.256
  17  X=-3.663  Y=0  Z=-.608
  18  X=-2.458  Y=0  Z=-1.131
  19  X=-1.256  Y=0  Z=-1.832
  20  X=-.795  Y=0  Z=-2.165
  21  X=-.443  Y=0  Z=-2.444
  22  X=-.369  Y=0  Z=-2.86
  23  X=-.318  Y=0  Z=-3.293
  24  X=-.3  Y=0  Z=-3.719
  25  X=-.3  Y=0  Z=-4.372
  26  X=-.3  Y=0  Z=-5.026
  27  X=-.3  Y=0  Z=-5.679
  28  X=.3  Y=0  Z=-5.679
  29  X=.3  Y=0  Z=-5.026
  30  X=.3  Y=0  Z=-4.372
  31  X=.3  Y=0  Z=-3.719
  32  X=.318  Y=0  Z=-3.293
  33  X=.369  Y=0  Z=-2.86
  34  X=.443  Y=0  Z=-2.444
  35  X=.795  Y=0  Z=-2.165
  36  X=1.256  Y=0  Z=-1.832
  37  X=2.458  Y=0  Z=-1.131
  38  X=3.663  Y=0  Z=-.608
  39  X=4.867  Y=0  Z=-.256
  40  X=6.071  Y=0  Z=-.057
  41  X=7.275  Y=0  Z=0
  42  X=8.479  Y=0  Z=-.057
  43  X=9.683  Y=0  Z=-.256
  44  X=10.887  Y=0  Z=-.608
  45  X=12.092  Y=0  Z=-1.131
  46  X=13.294  Y=0  Z=-1.832
  47  X=13.748  Y=0  Z=-2.165
  48  X=14.107  Y=0  Z=-2.444
  49  X=14.166  Y=0  Z=-2.86
  50  X=14.23  Y=0  Z=-3.293
  51  X=14.25  Y=0  Z=-3.719
  52  X=14.25  Y=0  Z=-4.372
  53  X=14.25  Y=0  Z=-5.026
  54  X=14.25  Y=0  Z=-5.679
  101  X=-14.325  Y=0  Z=-5.679
  102  X=-14.325  Y=0  Z=-7.052
  201  X=0  Y=0  Z=-5.679
  202  X=0  Y=0  Z=-7.475
  301  X=14.325  Y=0  Z=-5.679
  302  X=14.325  Y=0  Z=-7.938
  401  X=-15.25  Y=0  Z=-7.764
  402  X=-14.325  Y=0  Z=-7.764
  403  X=-13.9  Y=0  Z=-7.777
  404  X=-13.017  Y=0  Z=-7.804
  405  X=-12.133  Y=0  Z=-7.83
  406  X=-11.25  Y=0  Z=-7.857
  407  X=-10.367  Y=0  Z=-7.883
  408  X=-9.484  Y=0  Z=-7.91
  409  X=-8.6  Y=0  Z=-7.936
  410  X=-7.717  Y=0  Z=-7.963
  411  X=-6.834  Y=0  Z=-7.989
  412  X=-5.95  Y=0  Z=-8.016
  413  X=-5.067  Y=0  Z=-8.042
  414  X=-4.184  Y=0  Z=-8.069
  415  X=-3.3  Y=0  Z=-8.098
  416  X=-2.417  Y=0  Z=-8.122
  417  X=-1.534  Y=0  Z=-8.148
  418  X=-.65  Y=0  Z=-8.175
  419  X=0  Y=0  Z=-8.194
  420  X=.65  Y=0  Z=-8.214
  421  X=1.534  Y=0  Z=-8.241
```



```
  422  X=2.417  Y=0  Z=-8.267
  423  X=3.3  Y=0  Z=-8.291
  424  X=4.184  Y=0  Z=-8.32
  425  X=5.067  Y=0  Z=-8.347
  426  X=5.95  Y=0  Z=-8.373
  427  X=6.834  Y=0  Z=-8.4
  428  X=7.717  Y=0  Z=-8.426
  429  X=8.6  Y=0  Z=-8.453
  430  X=9.484  Y=0  Z=-8.479
  431  X=10.367  Y=0  Z=-8.506
  432  X=11.25  Y=0  Z=-8.532
  433  X=12.133  Y=0  Z=-8.559
  434  X=13.017  Y=0  Z=-8.585
  435  X=13.9  Y=0  Z=-8.612
  436  X=14.325  Y=0  Z=-8.625
  437  X=15.25  Y=0  Z=-8.625

PATTERN
  NAME=TEMP
  NAME=PRES

SPRING
  ADD=401  U3=201064.2
  ADD=402  U3=293445
  ADD=403  U3=284315.6
  ADD=404  U3=384087
  ADD=405  U3=384087
  ADD=406  U3=383869.6
  ADD=407  U3=383869.6
  ADD=408  U3=384087
  ADD=409  U3=384087
  ADD=410  U3=383869.6
  ADD=411  U3=384087
  ADD=412  U3=384087
  ADD=413  U3=383869.6
  ADD=414  U3=384087
  ADD=415  U3=384087
  ADD=416  U3=383869.6
  ADD=417  U3=384087
  ADD=418  U3=333440.5
  ADD=419  U1=10000  U3=282576.7
  ADD=420  U3=333440.5
  ADD=421  U3=384087
  ADD=422  U3=383869.6
  ADD=423  U3=384087
  ADD=424  U3=384087
  ADD=425  U3=383869.6
  ADD=426  U3=384087
  ADD=427  U3=384087
  ADD=428  U3=383869.6
  ADD=429  U3=384087
  ADD=430  U3=384087
  ADD=433  U3=384087
  ADD=434  U3=384087
  ADD=435  U3=284315.6
  ADD=436  U3=293445
  ADD=437  U3=201064.2

MATERIAL
  NAME=CONC  IDES=C  M=.2448  W=2.5
    T=0  E=2800000  U=.2  A=.00001
  NAME=STEEL  IDES=S
    T=0  E=2E+10  U=.3  A=.0000117  FY=25310.51
  NAME=RIGID  IDES=C
    T=0  E=2464750  U=.3  A=.00001
  NAME=CONC1  IDES=C  M=.2448  W=2.5
    T=0  E=2464750  U=.2  A=.00001

FRAME SECTION
  NAME=T1 MAT=CONC SH=R T=.5,1 A=.5
J=2.861003E-02 I=1.041667E-02,4.897667E-02
AS=.4166667,.4166667
  NAME=T2 MAT=CONC SH=R T=.542,1 A=.542
J=3.508126E-02 I=1.326834E-02,4.516667E-02
AS=.4516667,.4516667
  NAME=T3 MAT=CONC SH=R T=.675,1 A=.675
J=5.967503E-02 I=2.562891E-02,.05625
AS=.5625,.5625
  NAME=T4 MAT=CONC SH=R T=.916,1 A=.916
J=.1170223 I=6.404794E-02,7.633334E-02
AS=.7633333,.7633333
  NAME=T5 MAT=CONC SH=R T=.68,1 A=.68
J=6.070982E-02 I=2.620267E-02,5.666667E-02
AS=.5666667,.5666667
  NAME=T6 MAT=CONC SH=R T=.553,1 A=.553
J=3.688483E-02 I=.0140927,4.608333E-02
AS=.4608333,.4608333
  NAME=T7 MAT=CONC SH=R T=.511,1 A=.511
J=3.024029E-02 I=.0111194,4.258334E-02
AS=.4258333,.4258333
```

```
  NAME=T8 MAT=CONC SH=R T=.5,1 A=.5
J=2.861003E-02 I=1.041667E-02,4.897667E-02
AS=.4166667,.4166667
  NAME=FOOT MAT=CONC1 SH=R T=1.4,1 A=1.4
J=.2612221 I=.2286666,.1166667
AS=1.166667,1.166667
  NAME=WALL MAT=CONC1 SH=R T=.85,1 A=.85
J=9.985562E-02 I=4.117709E-02,7.083333E-02
AS=.7083334,.7083334
  NAME=RIGID MAT=RIGID SH=R T=10,10 A=100
J=1408.333 I=833.5623,833.5623
AS=83.56233,83.56233
  NAME=WALL1 MAT=CONC1 SH=R T=1.3,1 A=1.3
J=.2294606 I=.1830833,.1083333
AS=1.083333,1.083333
  NAME=VAR1 TYPE=NONPR
    SEC=T1,T2 EIVAR=1,1 L=.426
  NAME=VAR2 TYPE=NONPR
    SEC=T2,T3 EIVAR=1,1 L=.436
  NAME=VAR3 TYPE=NONPR
    SEC=T3,T4 EIVAR=1,1 L=.422
  NAME=VAR4 TYPE=NONPR
    SEC=T4,T5 EIVAR=1,1 L=.455
  NAME=VAR5 TYPE=NONPR
    SEC=T5,T6 EIVAR=1,1 L=.563
  NAME=VAR6 TYPE=NONPR
    SEC=T6,T7 EIVAR=1,1 L=1.392
  NAME=VAR7 TYPE=NONPR
    SEC=T7,T8 EIVAR=1,1 L=1.313

FRAME
  1  J=1,2  SEC=T1  NSEG=1  ANG=180  IREL=R3
  2  J=2,3  SEC=T1  NSEG=1  ANG=180
  3  J=3,4  SEC=T1  NSEG=1  ANG=180
  4  J=4,5  SEC=VAR1  NSEG=1  ANG=0
  5  J=5,6  SEC=VAR2  NSEG=1  ANG=0
  6  J=6,7  SEC=VAR3  NSEG=1  ANG=0
  7  J=7,8  SEC=VAR4  NSEG=1  ANG=0
  8  J=8,9  SEC=VAR5  NSEG=1  ANG=0
  9  J=9,10  SEC=VAR6  NSEG=1  ANG=0
  10  J=10,11  SEC=VAR7  NSEG=1  ANG=0
  11  J=11,12  SEC=T8  NSEG=1  ANG=0
  12  J=12,13  SEC=T8  NSEG=1  ANG=0
  13  J=13,14  SEC=T8  NSEG=1  ANG=0
  14  J=14,15  SEC=T8  NSEG=1  ANG=0
  15  J=15,16  SEC=T8  NSEG=1  ANG=0
  16  J=16,17  SEC=T8  NSEG=1  ANG=0
  17  J=17,18  SEC=VAR7  NSEG=1  ANG=0
  18  J=18,19  SEC=VAR6  NSEG=1  ANG=0
  19  J=19,20  SEC=VAR5  NSEG=1  ANG=0
  20  J=20,21  SEC=VAR4  NSEG=1  ANG=0
  21  J=21,22  SEC=VAR3  NSEG=1  ANG=0
  22  J=22,23  SEC=VAR2  NSEG=1  ANG=0
  23  J=23,24  SEC=VAR1  NSEG=1  ANG=0
  24  J=24,25  SEC=T1  NSEG=1  ANG=0
  25  J=25,26  SEC=T1  NSEG=1  ANG=0
  26  J=26,27  SEC=T1  NSEG=1  ANG=0  JREL=R3
  27  J=28,29  SEC=T1  NSEG=1  ANG=180  IREL=R3
  28  J=29,30  SEC=T1  NSEG=1  ANG=180
  29  J=30,31  SEC=T1  NSEG=1  ANG=180
  30  J=31,32  SEC=VAR1  NSEG=1  ANG=0
  31  J=32,33  SEC=VAR2  NSEG=1  ANG=0
  32  J=33,34  SEC=VAR3  NSEG=1  ANG=0
  33  J=34,35  SEC=VAR4  NSEG=1  ANG=0
  34  J=35,36  SEC=VAR5  NSEG=1  ANG=0
  35  J=36,37  SEC=VAR6  NSEG=1  ANG=0
  36  J=37,38  SEC=VAR7  NSEG=1  ANG=0
  37  J=38,39  SEC=T8  NSEG=1  ANG=0
  38  J=39,40  SEC=T8  NSEG=1  ANG=0
  39  J=40,41  SEC=T8  NSEG=1  ANG=0
  40  J=41,42  SEC=T8  NSEG=1  ANG=0
  41  J=42,43  SEC=T8  NSEG=1  ANG=0
  42  J=43,44  SEC=T8  NSEG=1  ANG=0
  43  J=44,45  SEC=VAR7  NSEG=1  ANG=0
  44  J=45,46  SEC=VAR6  NSEG=1  ANG=0
  45  J=46,47  SEC=VAR5  NSEG=1  ANG=0
  46  J=47,48  SEC=VAR4  NSEG=1  ANG=0
  47  J=48,49  SEC=VAR3  NSEG=1  ANG=0
  48  J=49,50  SEC=VAR2  NSEG=1  ANG=0
  49  J=50,51  SEC=VAR1  NSEG=1  ANG=0
  50  J=51,52  SEC=T1  NSEG=1  ANG=0
  52  J=52,53  SEC=T1  NSEG=1  ANG=0
  53  J=53,54  SEC=T1  NSEG=1  ANG=0  JREL=R3
  85  J=28,201  SEC=RIGID  NSEG=1  ANG=0
  86  J=201,27  SEC=RIGID  NSEG=1  ANG=0
  87  J=301,54  SEC=RIGID  NSEG=1  ANG=0
  88  J=1,101  SEC=RIGID  NSEG=1  ANG=0
  101  J=102,101  SEC=WALL  NSEG=1  ANG=180
  102  J=402,102  SEC=WALL  NSEG=1  ANG=180
IOFF=.02475  RIGID=0
```



```
  201  J=202,201  SEC=WALL1  NSEG=1  ANG=0
  202  J=419,202  SEC=WALL1  NSEG=1  ANG=0
IOFF=.375  RIGID=0
  301  J=301,302  SEC=WALL  NSEG=1  ANG=0
  302  J=302,436  SEC=WALL  NSEG=1  ANG=0
JOFF=.4875  RIGID=0
  400  J=401,402  SEC=FOOT  NSEG=1  ANG=0
  401  J=402,403  SEC=FOOT  NSEG=1  ANG=0
IOFF=.075  RIGID=0
  402  J=403,404  SEC=FOOT  NSEG=1  ANG=0
  403  J=404,405  SEC=FOOT  NSEG=1  ANG=0
  404  J=405,406  SEC=FOOT  NSEG=1  ANG=0
  405  J=406,407  SEC=FOOT  NSEG=1  ANG=0
  406  J=407,408  SEC=FOOT  NSEG=1  ANG=0
  407  J=408,409  SEC=FOOT  NSEG=1  ANG=0
  408  J=409,410  SEC=FOOT  NSEG=1  ANG=0
  409  J=410,411  SEC=FOOT  NSEG=1  ANG=0
  410  J=411,412  SEC=FOOT  NSEG=1  ANG=0
  411  J=412,413  SEC=FOOT  NSEG=1  ANG=0
  412  J=413,414  SEC=FOOT  NSEG=1  ANG=0
  413  J=414,415  SEC=FOOT  NSEG=1  ANG=0
  414  J=415,416  SEC=FOOT  NSEG=1  ANG=0
  415  J=416,417  SEC=FOOT  NSEG=1  ANG=0
  416  J=417,418  SEC=FOOT  NSEG=1  ANG=0
  417  J=418,419  SEC=FOOT  NSEG=1  ANG=0
JOFF=.3  RIGID=0
  418  J=419,420  SEC=FOOT  NSEG=1  ANG=0
IOFF=.3  RIGID=0
  419  J=420,421  SEC=FOOT  NSEG=1  ANG=0
  420  J=421,422  SEC=FOOT  NSEG=1  ANG=0
  421  J=422,423  SEC=FOOT  NSEG=1  ANG=0
  422  J=423,424  SEC=FOOT  NSEG=1  ANG=0
  423  J=424,425  SEC=FOOT  NSEG=1  ANG=0
  424  J=425,426  SEC=FOOT  NSEG=1  ANG=0
  425  J=426,427  SEC=FOOT  NSEG=1  ANG=0
  426  J=427,428  SEC=FOOT  NSEG=1  ANG=0
  427  J=428,429  SEC=FOOT  NSEG=1  ANG=0
  428  J=429,430  SEC=FOOT  NSEG=1  ANG=0
  429  J=430,431  SEC=FOOT  NSEG=1  ANG=0
  430  J=431,432  SEC=FOOT  NSEG=1  ANG=0
  431  J=432,433  SEC=FOOT  NSEG=1  ANG=0
  432  J=433,434  SEC=FOOT  NSEG=1  ANG=0
  433  J=434,435  SEC=FOOT  NSEG=1  ANG=0
  434  J=435,436  SEC=FOOT  NSEG=1  ANG=0
JOFF=.075  RIGID=0
  435  J=436,437  SEC=FOOT  NSEG=1  ANG=0

LOAD
  NAME=SW  SW=1
  NAME=PV
    TYPE=DISTRIBUTED SPAN
      ADD=5  RD=0,1  UZ=-12.459,-11.602
      ADD=6  RD=0,1  UZ=-11.602,-10.778
      ADD=7  RD=0,1  UZ=-10.778,-10.226
      ADD=8  RD=0,1  UZ=-10.226,-9.566
      ADD=9  RD=0,1  UZ=-9.566,-8.179
      ADD=10  RD=0,1  UZ=-8.179,-7.143
      ADD=11  RD=0,1  UZ=-7.143,-6.446
      ADD=12  RD=0,1  UZ=-6.446,-6.052
      ADD=13  RD=0,1  UZ=-6.052,-5.939
      ADD=14  RD=0,1  UZ=-5.939,-6.052
      ADD=15  RD=0,1  UZ=-6.052,-6.446
      ADD=16  RD=0,1  UZ=-6.446,-7.143
      ADD=17  RD=0,1  UZ=-7.143,-8.179
      ADD=18  RD=0,1  UZ=-8.179,-9.566
      ADD=19  RD=0,1  UZ=-9.566,-10.226
      ADD=20  RD=0,1  UZ=-10.226,-10.778
      ADD=21  RD=0,1  UZ=-10.778,-11.602
      ADD=22  RD=0,1  UZ=-11.602,-12.459
      ADD=31  RD=0,1  UZ=-12.459,-11.602
      ADD=32  RD=0,1  UZ=-11.602,-10.778
      ADD=33  RD=0,1  UZ=-10.778,-10.226
      ADD=34  RD=0,1  UZ=-10.226,-9.566
      ADD=35  RD=0,1  UZ=-9.566,-8.179
      ADD=36  RD=0,1  UZ=-8.179,-7.143
      ADD=37  RD=0,1  UZ=-7.143,-6.446
      ADD=38  RD=0,1  UZ=-6.446,-6.052
      ADD=39  RD=0,1  UZ=-6.052,-5.939
      ADD=40  RD=0,1  UZ=-5.939,-6.052
      ADD=41  RD=0,1  UZ=-6.052,-6.446
      ADD=42  RD=0,1  UZ=-6.446,-7.143
      ADD=43  RD=0,1  UZ=-7.143,-8.179
      ADD=44  RD=0,1  UZ=-8.179,-9.566
      ADD=45  RD=0,1  UZ=-9.566,-10.226
      ADD=46  RD=0,1  UZ=-10.226,-10.778
      ADD=47  RD=0,1  UZ=-10.778,-11.602
      ADD=48  RD=0,1  UZ=-11.602,-12.459
  NAME=PH
    TYPE=DISTRIBUTED SPAN
      ADD=102  RD=0,1  UX=10.463,9.787
```

```
      ADD=101  RD=0,1  UX=9.787,8.483
      ADD=1  RD=0,1  UX=8.483,7.862
      ADD=2  RD=0,1  UX=7.862,7.241
      ADD=3  RD=0,1  UX=7.241,6.621
      ADD=4  RD=0,1  UX=6.621,6.216
      ADD=5  RD=0,1  UX=6.216,5.805
      ADD=6  RD=0,1  UX=5.805,5.409
      ADD=7  RD=0,1  UX=5.409,5.144
      ADD=8  RD=0,1  UX=5.144,4.828
      ADD=9  RD=0,1  UX=4.828,4.162
      ADD=10  RD=0,1  UX=4.162,3.665
      ADD=11  RD=0,1  UX=3.665,3.331
      ADD=12  RD=0,1  UX=3.331,3.142
      ADD=13  RD=0,1  UX=3.142,3.088
      ADD=14  RD=0,1  UX=-3.088,-3.142
      ADD=15  RD=0,1  UX=-3.142,-3.331
      ADD=16  RD=0,1  UX=-3.331,-3.665
      ADD=17  RD=0,1  UX=-3.665,-4.162
      ADD=18  RD=0,1  UX=-4.162,-4.828
      ADD=19  RD=0,1  UX=-4.828,-5.144
      ADD=20  RD=0,1  UX=-5.144,-5.409
      ADD=21  RD=0,1  UX=-5.409,-5.805
      ADD=22  RD=0,1  UX=-5.805,-6.216
      ADD=23  RD=0,1  UX=-6.216,-6.621
      ADD=24  RD=0,1  UX=-6.621,-7.241
      ADD=25  RD=0,1  UX=-7.241,-7.862
      ADD=26  RD=0,1  UX=-7.862,-8.483
      ADD=27  RD=0,1  UX=8.483,7.862
      ADD=28  RD=0,1  UX=7.862,7.241
      ADD=29  RD=0,1  UX=7.241,6.621
      ADD=30  RD=0,1  UX=6.621,6.216
      ADD=31  RD=0,1  UX=6.216,5.805
      ADD=32  RD=0,1  UX=5.805,5.409
      ADD=33  RD=0,1  UX=5.409,5.144
      ADD=34  RD=0,1  UX=5.144,4.828
      ADD=35  RD=0,1  UX=4.828,4.162
      ADD=36  RD=0,1  UX=4.162,3.665
      ADD=37  RD=0,1  UX=3.665,3.331
      ADD=38  RD=0,1  UX=3.331,3.142
      ADD=39  RD=0,1  UX=3.142,3.088
      ADD=40  RD=0,1  UX=-3.088,-3.142
      ADD=41  RD=0,1  UX=-3.142,-3.331
      ADD=42  RD=0,1  UX=-3.331,-3.665
      ADD=43  RD=0,1  UX=-3.665,-4.162
      ADD=44  RD=0,1  UX=-4.162,-4.828
      ADD=45  RD=0,1  UX=-4.828,-5.144
      ADD=46  RD=0,1  UX=-5.144,-5.409
      ADD=47  RD=0,1  UX=-5.409,-5.805
      ADD=48  RD=0,1  UX=-5.805,-6.216
      ADD=49  RD=0,1  UX=-6.216,-6.621
      ADD=50  RD=0,1  UX=-6.621,-7.241
      ADD=52  RD=0,1  UX=-7.241,-7.862
      ADD=53  RD=0,1  UX=-7.862,-8.483
      ADD=301  RD=0,1  UX=-8.483,-10.629
      ADD=302  RD=0,1  UX=-10.629,-11.281
  NAME=PVW
    TYPE=DISTRIBUTED SPAN
      ADD=5  RD=0,1  UZ=-7.986,-7.58
      ADD=6  RD=0,1  UZ=-7.58,-7.189
      ADD=7  RD=0,1  UZ=-7.189,-6.928
      ADD=8  RD=0,1  UZ=-6.928,-6.615
      ADD=9  RD=0,1  UZ=-6.615,-5.958
      ADD=10  RD=0,1  UZ=-5.958,-5.468
      ADD=11  RD=0,1  UZ=-5.468,-5.137
      ADD=12  RD=0,1  UZ=-5.137,-4.951
      ADD=13  RD=0,1  UZ=-4.951,-4.897
      ADD=14  RD=0,1  UZ=-4.897,-4.951
      ADD=15  RD=0,1  UZ=-4.951,-5.137
      ADD=16  RD=0,1  UZ=-5.137,-5.468
      ADD=17  RD=0,1  UZ=-5.468,-5.958
      ADD=18  RD=0,1  UZ=-5.958,-6.615
      ADD=19  RD=0,1  UZ=-6.615,-6.928
      ADD=20  RD=0,1  UZ=-6.928,-7.189
      ADD=21  RD=0,1  UZ=-7.189,-7.58
      ADD=22  RD=0,1  UZ=-7.58,-7.986
      ADD=30  RD=0,1  UZ=-7.986,-7.58
      ADD=31  RD=0,1  UZ=-7.58,-7.189
      ADD=33  RD=0,1  UZ=-7.189,-6.928
      ADD=34  RD=0,1  UZ=-6.928,-6.615
      ADD=35  RD=0,1  UZ=-6.615,-5.958
      ADD=36  RD=0,1  UZ=-5.958,-5.468
      ADD=37  RD=0,1  UZ=-5.468,-5.137
      ADD=38  RD=0,1  UZ=-5.137,-4.951
      ADD=39  RD=0,1  UZ=-4.951,-4.897
      ADD=40  RD=0,1  UZ=-4.897,-4.951
      ADD=41  RD=0,1  UZ=-4.951,-5.137
      ADD=42  RD=0,1  UZ=-5.137,-5.468
      ADD=43  RD=0,1  UZ=-5.468,-5.958
      ADD=44  RD=0,1  UZ=-5.958,-6.615
      ADD=45  RD=0,1  UZ=-6.615,-6.928
```



```
      ADD=46  RD=0,1  UZ=-6.928,-7.189
      ADD=47  RD=0,1  UZ=-7.189,-7.58
      ADD=48  RD=0,1  UZ=-7.58,-7.986
  NAME=PHW
    TYPE=DISTRIBUTED SPAN
      ADD=1  RD=0,1  UX=5.018,4.724
      ADD=2  RD=0,1  UX=4.724,4.43
      ADD=3  RD=0,1  UX=4.43,4.136
      ADD=4  RD=0,1  UX=4.136,3.944
      ADD=5  RD=0,1  UX=3.944,3.75
      ADD=6  RD=0,1  UX=3.75,3.562
      ADD=7  RD=0,1  UX=3.562,3.437
      ADD=8  RD=0,1  UX=3.437,3.287
      ADD=9  RD=0,1  UX=3.287,2.971
      ADD=10  RD=0,1  UX=2.971,2.736
      ADD=11  RD=0,1  UX=2.736,2.578
      ADD=12  RD=0,1  UX=2.578,2.488
      ADD=13  RD=0,1  UX=2.488,2.463
      ADD=14  RD=0,1  UX=-2.463,-2.488
      ADD=15  RD=0,1  UX=-2.488,-2.578
      ADD=16  RD=0,1  UX=-2.578,-2.736
      ADD=17  RD=0,1  UX=-2.736,-2.971
      ADD=18  RD=0,1  UX=-2.971,-3.287
      ADD=19  RD=0,1  UX=-3.287,-3.437
      ADD=20  RD=0,1  UX=-3.437,-3.562
      ADD=21  RD=0,1  UX=-5.409,-5.805
      ADD=22  RD=0,1  UX=-5.805,-6.216
      ADD=23  RD=0,1  UX=-6.216,-6.621
      ADD=24  RD=0,1  UX=-6.621,-7.241
      ADD=25  RD=0,1  UX=-7.241,-7.862
      ADD=26  RD=0,1  UX=-7.862,-8.483
      ADD=27  RD=0,1  UX=8.483,7.862
      ADD=28  RD=0,1  UX=7.862,7.241
      ADD=29  RD=0,1  UX=7.241,6.621
      ADD=30  RD=0,1  UX=6.621,6.216
      ADD=31  RD=0,1  UX=6.216,5.805
      ADD=32  RD=0,1  UX=5.805,5.409
      ADD=33  RD=0,1  UX=3.562,3.437
      ADD=34  RD=0,1  UX=3.437,3.287
      ADD=35  RD=0,1  UX=3.287,2.971
      ADD=36  RD=0,1  UX=2.971,2.736
      ADD=37  RD=0,1  UX=2.736,2.578
      ADD=38  RD=0,1  UX=2.578,2.488
      ADD=39  RD=0,1  UX=2.488,2.463
      ADD=40  RD=0,1  UX=-2.463,-2.488
      ADD=41  RD=0,1  UX=-2.488,-2.578
      ADD=42  RD=0,1  UX=-2.578,-2.736
      ADD=43  RD=0,1  UX=-2.736,-2.971
      ADD=44  RD=0,1  UX=-2.971,-3.287
      ADD=45  RD=0,1  UX=-3.287,-3.437
      ADD=46  RD=0,1  UX=-3.437,-3.562
      ADD=47  RD=0,1  UX=-3.562,-3.75
      ADD=48  RD=0,1  UX=-3.75,-3.944
      ADD=49  RD=0,1  UX=-3.944,-4.136
      ADD=50  RD=0,1  UX=-4.136,-4.43
      ADD=52  RD=0,1  UX=-4.43,-4.724
      ADD=53  RD=0,1  UX=-4.724,-5.018
      ADD=102  RD=0,1  UX=5.956,5.636
      ADD=302  RD=0,1  UX=-6.035,-6.344
      ADD=101  RD=0,1  UX=5.636,5.018
      ADD=301  RD=0,1  UX=-5.018,-6.035
  NAME=PW
    TYPE=DISTRIBUTED SPAN
      ADD=1  RD=0,1  U2=-6.929,-6.276
      ADD=2  RD=0,1  U2=-6.276,-5.622
      ADD=3  RD=0,1  U2=-5.622,-4.969
      ADD=4  RD=0,1  U2=-4.969,-4.543
      ADD=5  RD=0,1  U2=-4.543,-4.11
      ADD=6  RD=0,1  U2=-4.11,-3.694
      ADD=7  RD=0,1  U2=-3.694,-3.415
      ADD=8  RD=0,1  U2=-3.415,-3.082
      ADD=9  RD=0,1  U2=-3.082,-2.381
      ADD=10  RD=0,1  U2=-2.381,-1.858
      ADD=11  RD=0,1  U2=-1.858,-1.506
      ADD=12  RD=0,1  U2=-1.506,-1.307
      ADD=13  RD=0,1  U2=-1.307,-1.25
      ADD=14  RD=0,1  U2=-1.25,-1.307
      ADD=15  RD=0,1  U2=-1.307,-1.506
      ADD=16  RD=0,1  U2=-1.506,-1.858
      ADD=17  RD=0,1  U2=-1.858,-2.381
      ADD=18  RD=0,1  U2=-2.381,-3.082
      ADD=19  RD=0,1  U2=-3.082,-3.415
      ADD=20  RD=0,1  U2=-3.415,-3.694
      ADD=33  RD=0,1  U2=-3.694,-3.415
      ADD=34  RD=0,1  U2=-3.415,-3.082
      ADD=35  RD=0,1  U2=-3.082,-2.381
      ADD=36  RD=0,1  U2=-2.381,-1.858
      ADD=37  RD=0,1  U2=-1.858,-1.506
      ADD=38  RD=0,1  U2=-1.506,-1.307
      ADD=39  RD=0,1  U2=-1.307,-1.25
```

```
      ADD=40  RD=0,1  U2=-1.25,-1.307
      ADD=41  RD=0,1  U2=-1.307,-1.506
      ADD=42  RD=0,1  U2=-1.506,-3.5628
      ADD=43  RD=0,1  U2=-3.5628,-2.381
      ADD=44  RD=0,1  U2=-2.381,-3.082
      ADD=45  RD=0,1  U2=-3.082,-3.415
      ADD=46  RD=0,1  U2=-3.415,-3.694
      ADD=47  RD=0,1  U2=-3.694,-4.11
      ADD=48  RD=0,1  U2=-4.11,-4.543
      ADD=49  RD=0,1  U2=-4.543,-4.969
      ADD=50  RD=0,1  U2=-4.969,-5.622
      ADD=52  RD=0,1  U2=-5.622,-6.276
      ADD=53  RD=0,1  U2=-6.276,-6.929
      ADD=102  RD=0,1  U2=-9.014,-8.302
      ADD=101  RD=0,1  U2=-8.302,-6.929
      ADD=302  RD=0,1  U2=-9.188,-9.875
      ADD=301  RD=0,1  U2=-6.929,-9.188
      ADD=400  RD=0,1  UZ=9.714,9.714
      ADD=401  RD=0,1  UZ=9.714,9.727
      ADD=402  RD=0,1  UZ=9.727,9.754
      ADD=403  RD=0,1  UZ=9.754,9.78
      ADD=404  RD=0,1  UZ=9.78,9.807
      ADD=405  RD=0,1  UZ=9.807,9.833
      ADD=406  RD=0,1  UZ=9.833,9.86
      ADD=407  RD=0,1  UZ=9.86,9.886
      ADD=408  RD=0,1  UZ=9.886,9.913
      ADD=409  RD=0,1  UZ=9.913,9.939
      ADD=410  RD=0,1  UZ=9.939,9.966
      ADD=411  RD=0,1  UZ=9.966,9.992
      ADD=412  RD=0,1  UZ=9.992,10.019
      ADD=413  RD=0,1  UZ=10.019,10.048
      ADD=414  RD=0,1  UZ=10.048,10.072
      ADD=415  RD=0,1  UZ=10.072,10.098
      ADD=416  RD=0,1  UZ=10.098,10.125
      ADD=417  RD=0,1  UZ=10.125,10.144
      ADD=418  RD=0,1  UZ=10.144,10.164
      ADD=419  RD=0,1  UZ=10.164,10.191
      ADD=420  RD=0,1  UZ=10.191,10.217
      ADD=421  RD=0,1  UZ=10.217,10.241
      ADD=422  RD=0,1  UZ=10.241,10.27
      ADD=423  RD=0,1  UZ=10.27,10.297
      ADD=424  RD=0,1  UZ=10.297,10.323
      ADD=425  RD=0,1  UZ=10.323,10.35
      ADD=426  RD=0,1  UZ=10.35,10.376
      ADD=427  RD=0,1  UZ=10.376,10.403
      ADD=428  RD=0,1  UZ=10.403,10.429
      ADD=429  RD=0,1  UZ=10.429,10.456
      ADD=430  RD=0,1  UZ=10.456,10.482
      ADD=431  RD=0,1  UZ=10.482,10.509
      ADD=432  RD=0,1  UZ=10.509,10.535
      ADD=433  RD=0,1  UZ=10.535,10.562
      ADD=434  RD=0,1  UZ=10.562,10.575
      ADD=435  RD=0,1  UZ=10.575,10.575
  NAME=PL
    TYPE=CONCENTRATED SPAN
      ADD=415  RD=.755  UZ=-9.6
      ADD=413  RD=.717  UZ=-9.6
      ADD=412  RD=.415  UZ=-9.6
      ADD=410  RD=.321  UZ=-9.6
      ADD=408  RD=.962  UZ=-9.6
      ADD=406  RD=.925  UZ=-9.6
      ADD=420  RD=.245  UZ=-9.6
      ADD=422  RD=.283  UZ=-9.6
      ADD=423  RD=.642  UZ=-9.6
      ADD=425  RD=.679  UZ=-9.6
      ADD=427  RD=.038  UZ=-9.6
      ADD=429  RD=.076  UZ=-9.6
  NAME=PVL
    TYPE=DISTRIBUTED SPAN
      ADD=5  RD=0,1  UZ=-1.186,-1.186
      ADD=6  RD=0,1  UZ=-1.186,-1.186
      ADD=7  RD=0,1  UZ=-1.186,-1.186
      ADD=8  RD=0,1  UZ=-1.186,-1.186
      ADD=9  RD=0,1  UZ=-1.186,-1.186
      ADD=10  RD=0,1  UZ=-1.186,-1.186
      ADD=11  RD=0,1  UZ=-1.186,-1.186
      ADD=12  RD=0,1  UZ=-1.186,-1.186
      ADD=13  RD=0,1  UZ=-1.186,-1.186
      ADD=14  RD=0,1  UZ=-1.186,-1.186
      ADD=15  RD=0,1  UZ=-1.186,-1.186
      ADD=16  RD=0,1  UZ=-1.186,-1.186
      ADD=17  RD=0,1  UZ=-1.186,-1.186
      ADD=18  RD=0,1  UZ=-1.186,-1.186
      ADD=19  RD=0,1  UZ=-1.186,-1.186
      ADD=20  RD=0,1  UZ=-1.186,-1.186
      ADD=21  RD=0,1  UZ=-1.186,-1.186
      ADD=22  RD=0,1  UZ=-1.186,-1.186
      ADD=31  RD=0,1  UZ=-1.186,-1.186
      ADD=32  RD=0,1  UZ=-1.186,-1.186
      ADD=33  RD=0,1  UZ=-1.186,-1.186
```



```
      ADD=34  RD=0,1  UZ=-1.186,-1.186
      ADD=35  RD=0,1  UZ=-1.186,-1.186
      ADD=36  RD=0,1  UZ=-1.186,-1.186
      ADD=37  RD=0,1  UZ=-1.186,-1.186
      ADD=38  RD=0,1  UZ=-1.186,-1.186
      ADD=39  RD=0,1  UZ=-1.186,-1.186
      ADD=40  RD=0,1  UZ=-1.186,-1.186
      ADD=41  RD=0,1  UZ=-1.186,-1.186
      ADD=42  RD=0,1  UZ=-1.186,-1.186
      ADD=43  RD=0,1  UZ=-1.186,-1.186
      ADD=44  RD=0,1  UZ=-1.186,-1.186
      ADD=45  RD=0,1  UZ=-1.186,-1.186
      ADD=46  RD=0,1  UZ=-1.186,-1.186
      ADD=47  RD=0,1  UZ=-1.186,-1.186
      ADD=48  RD=0,1  UZ=-1.186,-1.186

COMBO
  NAME=COMB1
    LOAD=SW  SF=1.3
    LOAD=PV  SF=1.5
    LOAD=PH  SF=1.7
  NAME=COMB2
    LOAD=SW  SF=1.3
    LOAD=PV  SF=1.5
    LOAD=PH  SF=.65
  NAME=COMB3
    LOAD=SW  SF=1.3
    LOAD=PVW  SF=1.5
    LOAD=PHW  SF=1.7
    LOAD=PW  SF=1.3
  NAME=COMB4
    LOAD=SW  SF=1.3
    LOAD=PVW  SF=1.5
    LOAD=PHW  SF=.65
    LOAD=PW  SF=1.3
  NAME=COMB5
    LOAD=SW  SF=1.3
    LOAD=PV  SF=1.5
    LOAD=PH  SF=1.7
    LOAD=PVL  SF=1.3
  NAME=COMB6
    LOAD=SW  SF=1.3
    LOAD=PV  SF=1.5
    LOAD=PH  SF=.65
    LOAD=PVL  SF=1.3
  NAME=COMB7
    LOAD=SW  SF=1
    LOAD=PV  SF=1
    LOAD=PH  SF=1
  NAME=COMB8
    LOAD=SW  SF=1
    LOAD=PV  SF=1
    LOAD=PH  SF=1
    LOAD=PL  SF=1
  NAME=COMB9
    LOAD=SW  SF=1
    LOAD=PV  SF=1
    LOAD=PH  SF=.5
  NAME=COMB10
    LOAD=SW  SF=1
    LOAD=PV  SF=1
    LOAD=PH  SF=.5
    LOAD=PL  SF=1
  NAME=COMB11
    LOAD=SW  SF=1
    LOAD=PVW  SF=1
    LOAD=PHW  SF=1
  NAME=COMB12
    LOAD=SW  SF=1
    LOAD=PVW  SF=1
    LOAD=PHW  SF=1
    LOAD=PL  SF=1

OUTPUT
; No Output Requested

END

; The following data is used for graphics, design
and pushover analysis.
; If changes are made to the analysis data above,
then the following data
; should be checked for consistency.
SAP2000 V7.10 SUPPLEMENTAL DATA
  GRID GLOBAL  X "1"  -15.25
  GRID GLOBAL  Y "2"  0
  GRID GLOBAL  Z "3"  -8.625
  GRID GLOBAL  X "4"  0
  GRID GLOBAL  Z "5"  0
  GRID GLOBAL  X "6"  15.25
```

```
  MATERIAL STEEL FY 25310.51
  MATERIAL CONC FYREBAR 40000 FYSHEAR 28122.79 FC
4000 FCSHEAR 2812.279
  MATERIAL RIGID FYREBAR 40000 FYSHEAR 28122.79
FC 4000 FCSHEAR 2812.279
  MATERIAL CONC1 FYREBAR 40000 FYSHEAR 28122.79
FC 4000 FCSHEAR 2812.279
  CONCRETESECTION T1 COLUMN  COVER .05 REBAR
RR-3-3
  CONCRETESECTION T2 COLUMN  COVER .0542 REBAR
RR-3-3
  CONCRETESECTION T3 COLUMN  COVER .0675 REBAR
RR-3-3
  CONCRETESECTION T4 COLUMN  COVER .0916 REBAR
RR-3-3
  CONCRETESECTION T5 COLUMN  COVER .068 REBAR
RR-3-3
  CONCRETESECTION T6 COLUMN  COVER .0553 REBAR
RR-3-3
  CONCRETESECTION T7 COLUMN  COVER .0511 REBAR
RR-3-3
  CONCRETESECTION T8 COLUMN  COVER .05 REBAR
RR-3-3
  CONCRETESECTION FOOT COLUMN  COVER .14 REBAR
RR-3-3
  CONCRETESECTION WALL COLUMN  COVER .085 REBAR
RR-3-3
  CONCRETESECTION RIGID COLUMN  COVER 1 REBAR
RR-3-3
  CONCRETESECTION WALL1 COLUMN  COVER .13 REBAR
RR-3-3
  STATICLOAD SW TYPE DEAD
  STATICLOAD PV TYPE DEAD
  STATICLOAD PH TYPE DEAD
  STATICLOAD PVW TYPE DEAD
  STATICLOAD PHW TYPE DEAD
  STATICLOAD PW TYPE DEAD
  STATICLOAD PL TYPE DEAD
  STATICLOAD PVL TYPE DEAD
END SUPPLEMENTAL DATA
```

```
; File D:₩SAP2000DATA₩만영개착식터널₩시공중.$2k saved 10-9-02 15:45:28 in Ton-m

SYSTEM
  DOF=UX,UZ,RY  LENGTH=m  FORCE=Ton  LINES=59

JOINT
  1  X=-14.25  Y=0  Z=-5.679
  2  X=-14.25  Y=0  Z=-5.026
  3  X=-14.25  Y=0  Z=-4.372
  4  X=-14.25  Y=0  Z=-3.719
  5  X=-14.23  Y=0  Z=-3.293
  6  X=-14.166  Y=0  Z=-2.86
  7  X=-14.107  Y=0  Z=-2.444
  8  X=-13.748  Y=0  Z=-2.165
  9  X=-13.294  Y=0  Z=-1.832
  10  X=-12.092  Y=0  Z=-1.131
  11  X=-10.887  Y=0  Z=-.608
  12  X=-9.683  Y=0  Z=-.256
  13  X=-8.479  Y=0  Z=-.057
  14  X=-7.275  Y=0  Z=0
  15  X=-6.071  Y=0  Z=-.057
  16  X=-4.867  Y=0  Z=-.256
  17  X=-3.663  Y=0  Z=-.608
  18  X=-2.458  Y=0  Z=-1.131
  19  X=-1.256  Y=0  Z=-1.832
  20  X=-.795  Y=0  Z=-2.165
  21  X=-.443  Y=0  Z=-2.444
  22  X=-.369  Y=0  Z=-2.86
  23  X=-.318  Y=0  Z=-3.293
  24  X=-.3  Y=0  Z=-3.719
  25  X=-.3  Y=0  Z=-4.372
  26  X=-.3  Y=0  Z=-5.026
  27  X=-.3  Y=0  Z=-5.679
  28  X=.3  Y=0  Z=-5.679
  29  X=.3  Y=0  Z=-5.026
  30  X=.3  Y=0  Z=-4.372
  31  X=.3  Y=0  Z=-3.719
  32  X=.318  Y=0  Z=-3.293
  33  X=.369  Y=0  Z=-2.86
  34  X=.443  Y=0  Z=-2.444
  35  X=.795  Y=0  Z=-2.165
  36  X=1.256  Y=0  Z=-1.832
  37  X=2.458  Y=0  Z=-1.131
  38  X=3.663  Y=0  Z=-.608
  39  X=4.867  Y=0  Z=-.256
  40  X=6.071  Y=0  Z=-.057
  41  X=7.275  Y=0  Z=0
  42  X=8.479  Y=0  Z=-.057
  43  X=9.683  Y=0  Z=-.256
  44  X=10.887  Y=0  Z=-.608
```

45 X=12.092 Y=0 Z=-1.131
46 X=13.294 Y=0 Z=-1.832
47 X=13.748 Y=0 Z=-2.165
48 X=14.107 Y=0 Z=-2.444
49 X=14.166 Y=0 Z=-2.86
50 X=14.23 Y=0 Z=-3.293
51 X=14.25 Y=0 Z=-3.719
52 X=14.25 Y=0 Z=-4.372
53 X=14.25 Y=0 Z=-5.026
54 X=14.25 Y=0 Z=-5.679
101 X=-14.325 Y=0 Z=-5.679
102 X=-14.325 Y=0 Z=-7.052
201 X=0 Y=0 Z=-5.679
202 X=0 Y=0 Z=-7.475
301 X=14.325 Y=0 Z=-5.679
302 X=14.325 Y=0 Z=-7.938
401 X=-15.25 Y=0 Z=-7.764
402 X=-14.325 Y=0 Z=-7.764
403 X=-13.9 Y=0 Z=-7.777
404 X=-13.017 Y=0 Z=-7.804
405 X=-12.133 Y=0 Z=-7.83
406 X=-11.25 Y=0 Z=-7.857
407 X=-10.367 Y=0 Z=-7.883
408 X=-9.484 Y=0 Z=-7.91
409 X=-8.6 Y=0 Z=-7.936
410 X=-7.717 Y=0 Z=-7.963
411 X=-6.834 Y=0 Z=-7.989
412 X=-5.95 Y=0 Z=-8.016
413 X=-5.067 Y=0 Z=-8.042
414 X=-4.184 Y=0 Z=-8.069
415 X=-3.3 Y=0 Z=-8.098
416 X=-2.417 Y=0 Z=-8.122
417 X=-1.534 Y=0 Z=-8.148
418 X=- 65 Y=0 Z=-8.175
419 X=0 Y=0 Z=-8.194
420 X=.65 Y=0 Z=-8.214
421 X=1.534 Y=0 Z=-8.241
422 X=2.417 Y=0 Z=-8.267
423 X=3.3 Y=0 Z=-8.291
424 X=4.184 Y=0 Z=-8.32
425 X=5.067 Y=0 Z=-8.347
426 X=5.95 Y=0 Z=-8.373
427 X=6.834 Y=0 Z=-8.4
428 X=7.717 Y=0 Z=-8.426
429 X=8.6 Y=0 Z=-8.453
430 X=9.484 Y=0 Z=-8.479
431 X=10.367 Y=0 Z=-8.506
432 X=11.25 Y=0 Z=-8.532
433 X=12.133 Y=0 Z=-8.559
434 X=13.017 Y=0 Z=-8.585

```
  435  X=13.9  Y=0  Z=-8.612
  436  X=14.325  Y=0  Z=-8.625
  437  X=15.25  Y=0  Z=-8.625

PATTERN
  NAME=TEMP
  NAME=PRES

SPRING
  ADD=401  U3=201064.2
  ADD=402  U3=293445
  ADD=403  U3=284315.6
  ADD=404  U3=384087
  ADD=405  U3=384087
  ADD=406  U3=383869.6
  ADD=407  U3=383869.6
  ADD=408  U3=384087
  ADD=409  U3=384087
  ADD=410  U3=383869.6
  ADD=411  U3=384087
  ADD=412  U3=384087
  ADD=413  U3=383869.6
  ADD=414  U3=384087
  ADD=415  U3=384087
  ADD=416  U3=383869.6
  ADD=417  U3=384087
  ADD=418  U3=333440.5
  ADD=419  U1=10000  U3=282576.7
  ADD=420  U3=333440.5
  ADD=421  U3=384087
  ADD=422  U3=383869.6
  ADD=423  U3=384087
  ADD=424  U3=384087
  ADD=425  U3=383869.6
  ADD=426  U3=384087
  ADD=427  U3=384087
  ADD=428  U3=383869.6
  ADD=429  U3=384087
  ADD=430  U3=384087
  ADD=431  U3=383869.6
  ADD=432  U3=383869.6
  ADD=433  U3=384087
  ADD=434  U3=384087
  ADD=435  U3=284315.6
  ADD=436  U3=293445
  ADD=437  U3=201064.2

MATERIAL
  NAME=CONC  IDES=C  M=.2448  W=2.5
    T=0  E=2800000  U=.2  A=.00001
```

```
  NAME=STEEL  IDES=S
    T=0  E=2E+10  U=.3  A=.0000117  FY=25310.51
  NAME=RIGID  IDES=C
    T=0  E=2464750  U=.3  A=.00001
  NAME=CONC1  IDES=C  M=.2448  W=2.5
    T=0  E=2464750  U=.2  A=.00001

FRAME SECTION
  NAME=T1     MAT=CONC     SH=R     T=.5,1     A=.5     J=2.861003E-02     I=1.041667E-02,4.897667E-02
AS=.4166667,.4166667
  NAME=T2     MAT=CONC     SH=R     T=.542,1     A=.542     J=3.508126E-02     I=1.326834E-02,4.516667E-02
AS=.4516667,.4516667
  NAME=T3 MAT=CONC SH=R T=.675,1 A=.675 J=5.967503E-02 I=2.562891E-02,.05625 AS=.5625,.5625
  NAME=T4     MAT=CONC     SH=R     T=.916,1     A=.916     J=.1170223     I=6.404794E-02,7.633334E-02
AS=.7633333,.7633333
  NAME=T5     MAT=CONC     SH=R     T=.68,1     A=.68     J=6.070982E-02     I=2.620267E-02,5.666667E-02
AS=.5666667,.5666667
  NAME=T6     MAT=CONC     SH=R     T=.553,1     A=.553     J=3.688483E-02     I=.0140927,4.608333E-02
AS=.4608333,.4608333
  NAME=T7     MAT=CONC     SH=R     T=.511,1     A=.511     J=3.024029E-02     I=.0111194,4.258334E-02
AS=.4258333,.4258333
  NAME=T8     MAT=CONC     SH=R     T=.5,1     A=.5     J=2.861003E-02     I=1.041667E-02,4.897667E-02
AS=.4166667,.4166667
  NAME=FOOT MAT=CONC1 SH=R T=1.4,1 A=1.4 J=.2612221 I=.2286666,.1166667 AS=1.166667,1.166667
  NAME=WALL     MAT=CONC1     SH=R     T=.85,1     A=.85     J=9.985562E-02     I=4.117709E-02,7.083333E-02
AS=.7083334,.7083334
  NAME=RIGID MAT=RIGID SH=R T=10,10 A=100 J=1408.333 I=833.5623,833.5623 AS=83.56233,83.56233
  NAME=WALL1 MAT=CONC1 SH=R T=1.3,1 A=1.3 J=.2294606 I=.1830833,.1083333 AS=1.083333,1.083333
  NAME=VAR1 TYPE=NONPR
    SEC=T1,T2 EIVAR=1,1 L=.426
  NAME=VAR2 TYPE=NONPR
    SEC=T2,T3 EIVAR=1,1 L=.436
  NAME=VAR3 TYPE=NONPR
    SEC=T3,T4 EIVAR=1,1 L=.422
  NAME=VAR4 TYPE=NONPR
    SEC=T4,T5 EIVAR=1,1 L=.455
  NAME=VAR5 TYPE=NONPR
    SEC=T5,T6 EIVAR=1,1 L=.563
  NAME=VAR6 TYPE=NONPR
    SEC=T6,T7 EIVAR=1,1 L=1.392
  NAME=VAR7 TYPE=NONPR
    SEC=T7,T8 EIVAR=1,1 L=1.313

FRAME
  1  J=1,2  SEC=T1  NSEG=1  ANG=180  IREL=R3
  2  J=2,3  SEC=T1  NSEG=1  ANG=180
  3  J=3,4  SEC=T1  NSEG=1  ANG=180
  4  J=4,5  SEC=VAR1  NSEG=1  ANG=0
  5  J=5,6  SEC=VAR2  NSEG=1  ANG=0
  6  J=6,7  SEC=VAR3  NSEG=1  ANG=0
```

```
7  J=7,8  SEC=VAR4  NSEG=1  ANG=0
8  J=8,9  SEC=VAR5  NSEG=1  ANG=0
9  J=9,10  SEC=VAR6  NSEG=1  ANG=0
10  J=10,11  SEC=VAR7  NSEG=1  ANG=0
11  J=11,12  SEC=T8  NSEG=1  ANG=0
12  J=12,13  SEC=T8  NSEG=1  ANG=0
13  J=13,14  SEC=T8  NSEG=1  ANG=0
14  J=14,15  SEC=T8  NSEG=1  ANG=0
15  J=15,16  SEC=T8  NSEG=1  ANG=0
16  J=16,17  SEC=T8  NSEG=1  ANG=0
17  J=17,18  SEC=VAR7  NSEG=1  ANG=0
18  J=18,19  SEC=VAR6  NSEG=1  ANG=0
19  J=19,20  SEC=VAR5  NSEG=1  ANG=0
20  J=20,21  SEC=VAR4  NSEG=1  ANG=0
21  J=21,22  SEC=VAR3  NSEG=1  ANG=0
22  J=22,23  SEC=VAR2  NSEG=1  ANG=0
23  J=23,24  SEC=VAR1  NSEG=1  ANG=0
24  J=24,25  SEC=T1  NSEG=1  ANG=0
25  J=25,26  SEC=T1  NSEG=1  ANG=0
26  J=26,27  SEC=T1  NSEG=1  ANG=0  JREL=R3
27  J=28,29  SEC=T1  NSEG=1  ANG=180  IREL=R3
28  J=29,30  SEC=T1  NSEG=1  ANG=180
29  J=30,31  SEC=T1  NSEG=1  ANG=180
30  J=31,32  SEC=VAR1  NSEG=1  ANG=0
31  J=32,33  SEC=VAR2  NSEG=1  ANG=0
32  J=33,34  SEC=VAR3  NSEG=1  ANG=0
33  J=34,35  SEC=VAR4  NSEG=1  ANG=0
34  J=35,36  SEC=VAR5  NSEG=1  ANG=0
35  J=36,37  SEC=VAR6  NSEG=1  ANG=0
36  J=37,38  SEC=VAR7  NSEG=1  ANG=0
37  J=38,39  SEC=T8  NSEG=1  ANG=0
38  J=39,40  SEC=T8  NSEG=1  ANG=0
39  J=40,41  SEC=T8  NSEG=1  ANG=0
40  J=41,42  SEC=T8  NSEG=1  ANG=0
41  J=42,43  SEC=T8  NSEG=1  ANG=0
42  J=43,44  SEC=T8  NSEG=1  ANG=0
43  J=44,45  SEC=VAR7  NSEG=1  ANG=0
44  J=45,46  SEC=VAR6  NSEG=1  ANG=0
45  J=46,47  SEC=VAR5  NSEG=1  ANG=0
46  J=47,48  SEC=VAR4  NSEG=1  ANG=0
47  J=48,49  SEC=VAR3  NSEG=1  ANG=0
48  J=49,50  SEC=VAR2  NSEG=1  ANG=0
49  J=50,51  SEC=VAR1  NSEG=1  ANG=0
50  J=51,52  SEC=T1  NSEG=1  ANG=0
52  J=52,53  SEC=T1  NSEG=1  ANG=0
53  J=53,54  SEC=T1  NSEG=1  ANG=0  JREL=R3
85  J=28,201  SEC=RIGID  NSEG=1  ANG=0
86  J=201,27  SEC=RIGID  NSEG=1  ANG=0
87  J=301,54  SEC=RIGID  NSEG=1  ANG=0
88  J=1,101  SEC=RIGID  NSEG=1  ANG=0
```

```
  101  J=102,101  SEC=WALL  NSEG=1  ANG=180
  102  J=402,102  SEC=WALL  NSEG=1  ANG=180  IOFF=.02475  RIGID=0
  201  J=202,201  SEC=WALL1  NSEG=1  ANG=0
  202  J=419,202  SEC=WALL1  NSEG=1  ANG=0  IOFF=.375  RIGID=0
  301  J=301,302  SEC=WALL  NSEG=1  ANG=0
  302  J=302,436  SEC=WALL  NSEG=1  ANG=0  JOFF=.4875  RIGID=0
  400  J=401,402  SEC=FOOT  NSEG=1  ANG=0
  401  J=402,403  SEC=FOOT  NSEG=1  ANG=0  IOFF=.075  RIGID=0
  402  J=403,404  SEC=FOOT  NSEG=1  ANG=0
  403  J=404,405  SEC=FOOT  NSEG=1  ANG=0
  404  J=405,406  SEC=FOOT  NSEG=1  ANG=0
  405  J=406,407  SEC=FOOT  NSEG=1  ANG=0
  406  J=407,408  SEC=FOOT  NSEG=1  ANG=0
  407  J=408,409  SEC=FOOT  NSEG=1  ANG=0
  408  J=409,410  SEC=FOOT  NSEG=1  ANG=0
  409  J=410,411  SEC=FOOT  NSEG=1  ANG=0
  410  J=411,412  SEC=FOOT  NSEG=1  ANG=0
  411  J=412,413  SEC=FOOT  NSEG=1  ANG=0
  412  J=413,414  SEC=FOOT  NSEG=1  ANG=0
  413  J=414,415  SEC=FOOT  NSEG=1  ANG=0
  414  J=415,416  SEC=FOOT  NSEG=1  ANG=0
  415  J=416,417  SEC=FOOT  NSEG=1  ANG=0
  416  J=417,418  SEC=FOOT  NSEG=1  ANG=0
  417  J=418,419  SEC=FOOT  NSEG=1  ANG=0  JOFF=.3  RIGID=0
  418  J=419,420  SEC=FOOT  NSEG=1  ANG=0  IOFF=.3  RIGID=0
  419  J=420,421  SEC=FOOT  NSEG=1  ANG=0
  420  J=421,422  SEC=FOOT  NSEG=1  ANG=0
  421  J=422,423  SEC=FOOT  NSEG=1  ANG=0
  422  J=423,424  SEC=FOOT  NSEG=1  ANG=0
  423  J=424,425  SEC=FOOT  NSEG=1  ANG=0
  424  J=425,426  SEC=FOOT  NSEG=1  ANG=0
  425  J=426,427  SEC=FOOT  NSEG=1  ANG=0
  426  J=427,428  SEC=FOOT  NSEG=1  ANG=0
  427  J=428,429  SEC=FOOT  NSEG=1  ANG=0
  428  J=429,430  SEC=FOOT  NSEG=1  ANG=0
  429  J=430,431  SEC=FOOT  NSEG=1  ANG=0
  430  J=431,432  SEC=FOOT  NSEG=1  ANG=0
  431  J=432,433  SEC=FOOT  NSEG=1  ANG=0
  432  J=433,434  SEC=FOOT  NSEG=1  ANG=0
  433  J=434,435  SEC=FOOT  NSEG=1  ANG=0
  434  J=435,436  SEC=FOOT  NSEG=1  ANG=0  JOFF=.075  RIGID=0
  435  J=436,437  SEC=FOOT  NSEG=1  ANG=0

LOAD
  NAME=SW  SW=1
  NAME=PH
    TYPE=DISTRIBUTED SPAN
      ADD=1  RD=0,1  UX=3.07,2.45
      ADD=2  RD=0,1  UX=2.45,1.83
      ADD=3  RD=0,1  UX=1.83,1.21
```

```
      ADD=4   RD=0,1   UX=1.21,.81
      ADD=5   RD=0,1   UX=.81,.4
      ADD=6   RD=0,1   UX=.4,0
      ADD=53   RD=0,1   UX=-2.45,-3.07
      ADD=52   RD=0,1   UX=-1.83,-2.45
      ADD=50   RD=0,1   UX=-1.21,-1.83
      ADD=49   RD=0,1   UX=-.81,-1.21
      ADD=48   RD=0,1   UX=-.4,-.81
      ADD=47   RD=0,1   UX=0,-.4
      ADD=102   RD=0,1   UX=5.05,4.38
      ADD=101   RD=0,1   UX=4.38,3.07
      ADD=302   RD=0,1   UX=-5.22,-5.87
      ADD=301   RD=0,1   UX=-3.07,-5.22
  NAME=PVL
    TYPE=DISTRIBUTED SPAN
      ADD=1   RD=0,1   UX=.5,.5
      ADD=2   RD=0,1   UX=.5,.5
      ADD=3   RD=0,1   UX=.5,.5
      ADD=4   RD=0,1   UX=.5,.5
      ADD=5   RD=0,1   UX=.5,.5
      ADD=6   RD=0,1   UX=.5,.5
      ADD=88   RD=0,1   UX=.5,.5
      ADD=101   RD=0,1   UX=.5,.5
      ADD=102   RD=0,1   UX=.5,.5
      ADD=47   RD=0,1   UX=-.5,-.5
      ADD=48   RD=0,1   UX=-.5,-.5
      ADD=49   RD=0,1   UX=-.5,-.5
      ADD=50   RD=0,1   UX=-.5,-.5
      ADD=52   RD=0,1   UX=-.5,-.5
      ADD=53   RD=0,1   UX=-.5,-.5
      ADD=87   RD=0,1   UX=-.5,-.5
      ADD=301   RD=0,1   UX=-.5,-.5
      ADD=302   RD=0,1   UX=-.5,-.5

COMBO
  NAME=COMB1
    LOAD=SW   SF=1.3
    LOAD=PH   SF=1.7
    LOAD=PVL   SF=1.3
  NAME=COMB2
    LOAD=SW   SF=1.3
    LOAD=PH   SF=.65
    LOAD=PVL   SF=1.3
  NAME=COMB3
    LOAD=SW   SF=1
    LOAD=PH   SF=1
    LOAD=PVL   SF=1
  NAME=COMB4
    LOAD=SW   SF=1
    LOAD=PH   SF=.5
```

```
    LOAD=PVL   SF=1
  NAME=COMB5   TYPE=ENVE
    COMB=COMB1   SF=1
    COMB=COMB2   SF=1
  NAME=COMB6   TYPE=ENVE
    COMB=COMB3   SF=1
    COMB=COMB4   SF=1

OUTPUT
; No Output Requested

END

; The following data is used for graphics, design and pushover analysis.
; If changes are made to the analysis data above, then the following data
; should be checked for consistency.
SAP2000 V7.10 SUPPLEMENTAL DATA
  GRID GLOBAL  X "1"  -15.25
  GRID GLOBAL  Y "2"  0
  GRID GLOBAL  Z "3"  -8.625
  GRID GLOBAL  X "4"  0
  GRID GLOBAL  Z "5"  0
  GRID GLOBAL  X "6"  15.25
  MATERIAL STEEL FY 25310.51
  MATERIAL CONC FYREBAR 40000 FYSHEAR 28122.79 FC 4000 FCSHEAR 2812.279
  MATERIAL RIGID FYREBAR 40000 FYSHEAR 28122.79 FC 4000 FCSHEAR 2812.279
  MATERIAL CONC1 FYREBAR 40000 FYSHEAR 28122.79 FC 4000 FCSHEAR 2812.279
  CONCRETESECTION T1 COLUMN  COVER .05 REBAR RR-3-3
  CONCRETESECTION T2 COLUMN  COVER .0542 REBAR RR-3-3
  CONCRETESECTION T3 COLUMN  COVER .0675 REBAR RR-3-3
  CONCRETESECTION T4 COLUMN  COVER .0916 REBAR RR-3-3
  CONCRETESECTION T5 COLUMN  COVER .068 REBAR RR-3-3
  CONCRETESECTION T6 COLUMN  COVER .0553 REBAR RR-3-3
  CONCRETESECTION T7 COLUMN  COVER .0511 REBAR RR-3-3
  CONCRETESECTION T8 COLUMN  COVER .05 REBAR RR-3-3
  CONCRETESECTION FOOT COLUMN  COVER .14 REBAR RR-3-3
  CONCRETESECTION WALL COLUMN  COVER .085 REBAR RR-3-3
  CONCRETESECTION RIGID COLUMN  COVER 1 REBAR RR-3-3
  CONCRETESECTION WALL1 COLUMN  COVER .13 REBAR RR-3-3
  STATICLOAD SW TYPE DEAD
  STATICLOAD PH TYPE DEAD
  STATICLOAD PVL TYPE DEAD
END SUPPLEMENTAL DATA
```

4. SAP2000 INPUT DATA 첨부

CASE1	활하중영향검토1.$2K
CASE2	활하중영향검토2.$2K
CASE3	활하중영향검토3.$2K

```
; File D:₩SAP2000DATA₩개착식터널₩활하중영향검토1.$2k saved 11-25-02 13:32:32 in Ton-m

SYSTEM
  DOF=UX,UZ,RY  LENGTH=m  FORCE=Ton  LINES=59

JOINT
  1  X=-14.25  Y=0  Z=-5.679
  2  X=-14.25  Y=0  Z=-5.026
  3  X=-14.25  Y=0  Z=-4.372
  4  X=-14.25  Y=0  Z=-3.719
  5  X=-14.23  Y=0  Z=-3.293
  6  X=-14.166  Y=0  Z=-2.86
  7  X=-14.107  Y=0  Z=-2.444
  8  X=-13.748  Y=0  Z=-2.165
  9  X=-13.294  Y=0  Z=-1.832
  10  X=-12.092  Y=0  Z=-1.131
  11  X=-10.887  Y=0  Z=-.608
  12  X=-9.683  Y=0  Z=-.256
  13  X=-8.479  Y=0  Z=-.057
  14  X=-7.275  Y=0  Z=0
  15  X=-6.071  Y=0  Z=-.057
  16  X=-4.867  Y=0  Z=-.256
  17  X=-3.663  Y=0  Z=-.608
  18  X=-2.458  Y=0  Z=-1.131
  19  X=-1.256  Y=0  Z=-1.832
  20  X=-.795  Y=0  Z=-2.165
  21  X=-.443  Y=0  Z=-2.444
  22  X=-.369  Y=0  Z=-2.86
  23  X=-.318  Y=0  Z=-3.293
  24  X=-.3  Y=0  Z=-3.719
  25  X=-.3  Y=0  Z=-4.372
  26  X=-.3  Y=0  Z=-5.026
  27  X=-.3  Y=0  Z=-5.679
  28  X=.3  Y=0  Z=-5.679
  29  X=.3  Y=0  Z=-5.026
  30  X=.3  Y=0  Z=-4.372
  31  X=.3  Y=0  Z=-3.719
  32  X=.318  Y=0  Z=-3.293
  33  X=.369  Y=0  Z=-2.86
  34  X=.443  Y=0  Z=-2.444
  35  X=.795  Y=0  Z=-2.165
  36  X=1.256  Y=0  Z=-1.832


  37  X=2.458  Y=0  Z=-1.131
```

38 X=3.663 Y=0 Z=-.608
39 X=4.867 Y=0 Z=-.256
40 X=6.071 Y=0 Z=-.057
41 X=7.275 Y=0 Z=0
42 X=8.479 Y=0 Z=-.057
43 X=9.683 Y=0 Z=-.256
44 X=10.887 Y=0 Z=-.608
45 X=12.092 Y=0 Z=-1.131
46 X=13.294 Y=0 Z=-1.832
47 X=13.748 Y=0 Z=-2.165
48 X=14.107 Y=0 Z=-2.444
49 X=14.166 Y=0 Z=-2.86
50 X=14.23 Y=0 Z=-3.293
51 X=14.25 Y=0 Z=-3.719
52 X=14.25 Y=0 Z=-4.372
53 X=14.25 Y=0 Z=-5.026
54 X=14.25 Y=0 Z=-5.679
101 X=-14.325 Y=0 Z=-5.679
102 X=-14.325 Y=0 Z=-7.789
201 X=0 Y=0 Z=-5.679
202 X=0 Y=0 Z=-7.789
301 X=14.325 Y=0 Z=-5.679
302 X=14.325 Y=0 Z=-7.789
401 X=-15.25 Y=0 Z=-8.489
402 X=-14.325 Y=0 Z=-8.489
403 X=-13.9 Y=0 Z=-8.489
404 X=-13.017 Y=0 Z=-8.489
405 X=-12.133 Y=0 Z=-8.489
406 X=-11.25 Y=0 Z=-8.489
407 X=-10.367 Y=0 Z=-8.489
408 X=-9.484 Y=0 Z=-8.489
409 X=-8.6 Y=0 Z=-8.489
410 X=-7.717 Y=0 Z=-8.489
411 X=-6.834 Y=0 Z=-8.489
412 X=-5.95 Y=0 Z=-8.489
413 X=-5.067 Y=0 Z=-8.489
414 X=-4.184 Y=0 Z=-8.489
415 X=-3.3 Y=0 Z=-8.489
416 X=-2.417 Y=0 Z=-8.489
417 X=-1.534 Y=0 Z=-8.489
418 X=-.65 Y=0 Z=-8.489
419 X=0 Y=0 Z=-8.489
420 X=.65 Y=0 Z=-8.489
421 X=1.534 Y=0 Z=-8.489
422 X=2.417 Y=0 Z=-8.489
423 X=3.3 Y=0 Z=-8.489
424 X=4.184 Y=0 Z=-8.489
425 X=5.067 Y=0 Z=-8.489
426 X=5.95 Y=0 Z=-8.489
427 X=6.834 Y=0 Z=-8.489
428 X=7.717 Y=0 Z=-8.489
429 X=8.6 Y=0 Z=-8.489
430 X=9.484 Y=0 Z=-8.489
431 X=10.367 Y=0 Z=-8.489
432 X=11.25 Y=0 Z=-8.489
433 X=12.133 Y=0 Z=-8.489

```
  434  X=13.017  Y=0  Z=-8.489
  435  X=13.9  Y=0  Z=-8.489
  436  X=14.325  Y=0  Z=-8.489
  437  X=15.25  Y=0  Z=-8.489

PATTERN
  NAME=TEMP
  NAME=PRES

SPRING
  ADD=405  U3=384087
  ADD=406  U3=383869.6
  ADD=407  U3=383869.6
  ADD=408  U3=384087
  ADD=409  U3=384087
  ADD=410  U3=383869.6
  ADD=411  U3=384087
  ADD=412  U3=384087
  ADD=413  U3=383869.6
  ADD=414  U3=384087
  ADD=415  U3=384087
  ADD=416  U3=383869.6
  ADD=417  U3=384087
  ADD=419  U1=10000
  ADD=421  U3=384087
  ADD=422  U3=383869.6
  ADD=423  U3=384087
  ADD=424  U3=384087
  ADD=425  U3=383869.6
  ADD=426  U3=384087
  ADD=427  U3=384087
  ADD=428  U3=383869.6
  ADD=429  U3=384087
  ADD=430  U3=384087
  ADD=431  U3=383869.6
  ADD=432  U3=383869.6
  ADD=433  U3=384087

MATERIAL
  NAME=CONC  IDES=C  M=.2448  W=2.5
    T=0  E=2800000  U=.2  A=.00001
  NAME=STEEL  IDES=S
    T=0  E=2E+10  U=.3  A=.0000117  FY=25310.51
  NAME=RIGID  IDES=C
    T=0  E=2464750  U=.3  A=.00001
  NAME=CONC1  IDES=C  M=.2448  W=2.5
    T=0  E=2464750  U=.2  A=.00001

FRAME SECTION
  NAME=T1  MAT=CONC  SH=R  T=.5,1  A=.5  J=2.861003E-02  I=1.041667E-02,4.897667E-02
AS=.4166667,.4166667
  NAME=T2  MAT=CONC  SH=R  T=.542,1  A=.542  J=3.508126E-02  I=1.326834E-02,4.516667E-02
AS=.4516667,.4516667
  NAME=T3 MAT=CONC SH=R T=.675,1 A=.675 J=5.967503E-02 I=2.562891E-02,.05625 AS=.5625,.5625
  NAME=T4  MAT=CONC  SH=R  T=.916,1  A=.916  J=.1170223  I=6.404794E-02,7.633334E-02
AS=.7633333,.7633333
```

```
  NAME=T5    MAT=CONC    SH=R    T=.68,1    A=.68    J=6.070982E-02    I=2.620267E-02,5.666667E-02
AS=.5666667,.5666667
  NAME=T6    MAT=CONC    SH=R    T=.553,1    A=.553    J=3.688483E-02    I=.0140927,4.608333E-02
AS=.4608333,.4608333
  NAME=T7    MAT=CONC    SH=R    T=.511,1    A=.511    J=3.024029E-02    I=.0111194,4.258334E-02
AS=.4258333,.4258333
  NAME=T8    MAT=CONC    SH=R    T=.5,1    A=.5    J=2.861003E-02    I=1.041667E-02,4.897667E-02
AS=.4166667,.4166667
  NAME=FOOT MAT=CONC1 SH=R T=1.4,1 A=1.4 J=.2612221 I=.2286666,.1166667 AS=1.166667,1.166667
  NAME=WALL    MAT=CONC1    SH=R    T=.85,1    A=.85    J=9.985562E-02    I=4.117709E-02,7.083333E-02
AS=.7083334,.7083334
  NAME=RIGID MAT=RIGID SH=R T=10,10 A=100 J=1408.333 I=833.5623,833.5623 AS=83.56233,83.56233
  NAME=WALL1    MAT=CONC1    SH=R    T=1.3,1    A=1.3    J=.2294606    I=.1830833,.1083333
AS=1.083333,1.083333
  NAME=VAR1 TYPE=NONPR
    SEC=T1,T2 EIVAR=1,1 L=.426
  NAME=VAR2 TYPE=NONPR
    SEC=T2,T3 EIVAR=1,1 L=.436
  NAME=VAR3 TYPE=NONPR
    SEC=T3,T4 EIVAR=1,1 L=.422
  NAME=VAR4 TYPE=NONPR
    SEC=T4,T5 EIVAR=1,1 L=.455
  NAME=VAR5 TYPE=NONPR
    SEC=T5,T6 EIVAR=1,1 L=.563
  NAME=VAR6 TYPE=NONPR
    SEC=T6,T7 EIVAR=1,1 L=1.392
  NAME=VAR7 TYPE=NONPR
    SEC=T7,T8 EIVAR=1,1 L=1.313

FRAME
  1  J=1,2  SEC=T1  NSEG=1  ANG=180  IREL=R3
  2  J=2,3  SEC=T1  NSEG=1  ANG=180
  3  J=3,4  SEC=T1  NSEG=1  ANG=180
  4  J=4,5  SEC=VAR1  NSEG=1  ANG=0
  5  J=5,6  SEC=VAR2  NSEG=1  ANG=0
  6  J=6,7  SEC=VAR3  NSEG=1  ANG=0
  7  J=7,8  SEC=VAR4  NSEG=1  ANG=0
  8  J=8,9  SEC=VAR5  NSEG=1  ANG=0
  9  J=9,10  SEC=VAR6  NSEG=1  ANG=0
  10  J=10,11  SEC=VAR7  NSEG=1  ANG=0
  11  J=11,12  SEC=T8  NSEG=1  ANG=0
  12  J=12,13  SEC=T8  NSEG=1  ANG=0
  13  J=13,14  SEC=T8  NSEG=1  ANG=0
  14  J=14,15  SEC=T8  NSEG=1  ANG=0
  15  J=15,16  SEC=T8  NSEG=1  ANG=0
  16  J=16,17  SEC=T8  NSEG=1  ANG=0
  17  J=17,18  SEC=VAR7  NSEG=1  ANG=0
  18  J=18,19  SEC=VAR6  NSEG=1  ANG=0
  19  J=19,20  SEC=VAR5  NSEG=1  ANG=0
  20  J=20,21  SEC=VAR4  NSEG=1  ANG=0
  21  J=21,22  SEC=VAR3  NSEG=1  ANG=0
  22  J=22,23  SEC=VAR2  NSEG=1  ANG=0
  23  J=23,24  SEC=VAR1  NSEG=1  ANG=0
  24  J=24,25  SEC=T1  NSEG=1  ANG=0
  25  J=25,26  SEC=T1  NSEG=1  ANG=0
  26  J=26,27  SEC=T1  NSEG=1  ANG=0  JREL=R3
```

```
27  J=28,29  SEC=T1  NSEG=1  ANG=180  IREL=R3
28  J=29,30  SEC=T1  NSEG=1  ANG=180
29  J=30,31  SEC=T1  NSEG=1  ANG=180
30  J=31,32  SEC=VAR1  NSEG=1  ANG=0
31  J=32,33  SEC=VAR2  NSEG=1  ANG=0
32  J=33,34  SEC=VAR3  NSEG=1  ANG=0
33  J=34,35  SEC=VAR4  NSEG=1  ANG=0
34  J=35,36  SEC=VAR5  NSEG=1  ANG=0
35  J=36,37  SEC=VAR6  NSEG=1  ANG=0
36  J=37,38  SEC=VAR7  NSEG=1  ANG=0
37  J=38,39  SEC=T8  NSEG=1  ANG=0
38  J=39,40  SEC=T8  NSEG=1  ANG=0
39  J=40,41  SEC=T8  NSEG=1  ANG=0
40  J=41,42  SEC=T8  NSEG=1  ANG=0
41  J=42,43  SEC=T8  NSEG=1  ANG=0
42  J=43,44  SEC=T8  NSEG=1  ANG=0
43  J=44,45  SEC=VAR7  NSEG=1  ANG=0
44  J=45,46  SEC=VAR6  NSEG=1  ANG=0
45  J=46,47  SEC=VAR5  NSEG=1  ANG=0
46  J=47,48  SEC=VAR4  NSEG=1  ANG=0
47  J=48,49  SEC=VAR3  NSEG=1  ANG=0
48  J=49,50  SEC=VAR2  NSEG=1  ANG=0
49  J=50,51  SEC=VAR1  NSEG=1  ANG=0
50  J=51,52  SEC=T1  NSEG=1  ANG=0
52  J=52,53  SEC=T1  NSEG=1  ANG=0
53  J=53,54  SEC=T1  NSEG=1  ANG=0  JREL=R3
85  J=28,201  SEC=RIGID  NSEG=1  ANG=0
86  J=201,27  SEC=RIGID  NSEG=1  ANG=0
87  J=301,54  SEC=RIGID  NSEG=1  ANG=0
88  J=1,101  SEC=RIGID  NSEG=1  ANG=0
101  J=102,101  SEC=WALL  NSEG=1  ANG=180
102  J=402,102  SEC=WALL  NSEG=1  ANG=180  IOFF=.4875  RIGID=0
201  J=202,201  SEC=WALL1  NSEG=1  ANG=0
202  J=419,202  SEC=WALL1  NSEG=1  ANG=0  IOFF=.375  RIGID=0
301  J=301,302  SEC=WALL  NSEG=1  ANG=0
302  J=302,436  SEC=WALL  NSEG=1  ANG=0  JOFF=.4875  RIGID=0
400  J=401,402  SEC=FOOT  NSEG=1  ANG=0
401  J=402,403  SEC=FOOT  NSEG=1  ANG=0  IOFF=.075  RIGID=0
402  J=403,404  SEC=FOOT  NSEG=1  ANG=0
403  J=404,405  SEC=FOOT  NSEG=1  ANG=0
404  J=405,406  SEC=FOOT  NSEG=1  ANG=0
405  J=406,407  SEC=FOOT  NSEG=1  ANG=0
406  J=407,408  SEC=FOOT  NSEG=1  ANG=0
407  J=408,409  SEC=FOOT  NSEG=1  ANG=0
408  J=409,410  SEC=FOOT  NSEG=1  ANG=0
409  J=410,411  SEC=FOOT  NSEG=1  ANG=0
410  J=411,412  SEC=FOOT  NSEG=1  ANG=0
411  J=412,413  SEC=FOOT  NSEG=1  ANG=0
412  J=413,414  SEC=FOOT  NSEG=1  ANG=0
413  J=414,415  SEC=FOOT  NSEG=1  ANG=0
414  J=415,416  SEC=FOOT  NSEG=1  ANG=0
415  J=416,417  SEC=FOOT  NSEG=1  ANG=0
416  J=417,418  SEC=FOOT  NSEG=1  ANG=0
417  J=418,419  SEC=FOOT  NSEG=1  ANG=0  JOFF=.3  RIGID=0
418  J=419,420  SEC=FOOT  NSEG=1  ANG=0  IOFF=.3  RIGID=0
419  J=420,421  SEC=FOOT  NSEG=1  ANG=0
```

```
  420  J=421,422  SEC=FOOT  NSEG=1  ANG=0
  421  J=422,423  SEC=FOOT  NSEG=1  ANG=0
  422  J=423,424  SEC=FOOT  NSEG=1  ANG=0
  423  J=424,425  SEC=FOOT  NSEG=1  ANG=0
  424  J=425,426  SEC=FOOT  NSEG=1  ANG=0
  425  J=426,427  SEC=FOOT  NSEG=1  ANG=0
  426  J=427,428  SEC=FOOT  NSEG=1  ANG=0
  427  J=428,429  SEC=FOOT  NSEG=1  ANG=0
  428  J=429,430  SEC=FOOT  NSEG=1  ANG=0
  429  J=430,431  SEC=FOOT  NSEG=1  ANG=0
  430  J=431,432  SEC=FOOT  NSEG=1  ANG=0
  431  J=432,433  SEC=FOOT  NSEG=1  ANG=0
  432  J=433,434  SEC=FOOT  NSEG=1  ANG=0
  433  J=434,435  SEC=FOOT  NSEG=1  ANG=0
  434  J=435,436  SEC=FOOT  NSEG=1  ANG=0  JOFF=.075  RIGID=0
  435  J=436,437  SEC=FOOT  NSEG=1  ANG=0

LOAD
  NAME=PVL1
    TYPE=CONCENTRATED SPAN
      ADD=414  RD=.057  UZ=-9.6
      ADD=412  RD=.019  UZ=-9.6
      ADD=410  RD=.661  UZ=-9.6
      ADD=408  RD=.623  UZ=-9.6
      ADD=407  RD=.265  UZ=-9.6
      ADD=405  RD=.227  UZ=-9.6
      ADD=421  RD=.943  UZ=-9.6
      ADD=423  RD=.981  UZ=-9.6
      ADD=425  RD=.339  UZ=-9.6
      ADD=427  RD=.377  UZ=-9.6
      ADD=428  RD=.735  UZ=-9.6
      ADD=430  RD=.773  UZ=-9.6

COMBO
  NAME=COMB1
    LOAD=PVL1  SF=2.15

OUTPUT
; No Output Requested

END



; File D:₩SAP2000DATA₩개착식터널₩활하중영향검토2.$2k saved 11-25-02 13:22:43 in Ton-m

SYSTEM
  DOF=UX,UZ,RY  LENGTH=m  FORCE=Ton  LINES=59

JOINT
  1  X=-14.25  Y=0  Z=-5.679
  2  X=-14.25  Y=0  Z=-5.026
  3  X=-14.25  Y=0  Z=-4.372
  4  X=-14.25  Y=0  Z=-3.719
  5  X=-14.23  Y=0  Z=-3.293
  6  X=-14.166  Y=0  Z=-2.86
```

7 X=-14.107 Y=0 Z=-2.444
8 X=-13.748 Y=0 Z=-2.165
9 X=-13.294 Y=0 Z=-1.832
10 X=-12.092 Y=0 Z=-1.131
11 X=-10.887 Y=0 Z=-.608
12 X=-9.683 Y=0 Z=-.256
13 X=-8.479 Y=0 Z=-.057
14 X=-7.275 Y=0 Z=0
15 X=-6.071 Y=0 Z=-.057
16 X=-4.867 Y=0 Z=-.256
17 X=-3.663 Y=0 Z=-.608
18 X=-2.458 Y=0 Z=-1.131
19 X=-1.256 Y=0 Z=-1.832
20 X=-.795 Y=0 Z=-2.165
21 X=-.443 Y=0 Z=-2.444
22 X=-.369 Y=0 Z=-2.86
23 X=-.318 Y=0 Z=-3.293
24 X=-.3 Y=0 Z=-3.719
25 X=-.3 Y=0 Z=-4.372
26 X=-.3 Y=0 Z=-5.026
27 X=-.3 Y=0 Z=-5.679
28 X=.3 Y=0 Z=-5.679
29 X=.3 Y=0 Z=-5.026
30 X=.3 Y=0 Z=-4.372
31 X=.3 Y=0 Z=-3.719
32 X=.318 Y=0 Z=-3.293
33 X=.369 Y=0 Z=-2.86
34 X=.443 Y=0 Z=-2.444
35 X=.795 Y=0 Z=-2.165
36 X=1.256 Y=0 Z=-1.832
37 X=2.458 Y=0 Z=-1.131
38 X=3.663 Y=0 Z=-.608
39 X=4.867 Y=0 Z=-.256
40 X=6.071 Y=0 Z=-.057
41 X=7.275 Y=0 Z=0
42 X=8.479 Y=0 Z=-.057
43 X=9.683 Y=0 Z=-.256
44 X=10.887 Y=0 Z=-.608
45 X=12.092 Y=0 Z=-1.131
46 X=13.294 Y=0 Z=-1.832
47 X=13.748 Y=0 Z=-2.165
48 X=14.107 Y=0 Z=-2.444
49 X=14.166 Y=0 Z=-2.86
50 X=14.23 Y=0 Z=-3.293
51 X=14.25 Y=0 Z=-3.719
52 X=14.25 Y=0 Z=-4.372
53 X=14.25 Y=0 Z=-5.026
54 X=14.25 Y=0 Z=-5.679
101 X=-14.325 Y=0 Z=-5.679
102 X=-14.325 Y=0 Z=-7.789
201 X=0 Y=0 Z=-5.679
202 X=0 Y=0 Z=-7.789
301 X=14.325 Y=0 Z=-5.679
302 X=14.325 Y=0 Z=-7.789
401 X=-15.25 Y=0 Z=-8.489
402 X=-14.325 Y=0 Z=-8.489

```
  403  X=-13.9  Y=0  Z=-8.489
  404  X=-13.017  Y=0  Z=-8.489
  405  X=-12.133  Y=0  Z=-8.489
  406  X=-11.25  Y=0  Z=-8.489
  407  X=-10.367  Y=0  Z=-8.489
  408  X=-9.484  Y=0  Z=-8.489
  409  X=-8.6  Y=0  Z=-8.489
  410  X=-7.717  Y=0  Z=-8.489
  411  X=-6.834  Y=0  Z=-8.489
  412  X=-5.95  Y=0  Z=-8.489
  413  X=-5.067  Y=0  Z=-8.489
  414  X=-4.184  Y=0  Z=-8.489
  415  X=-3.3  Y=0  Z=-8.489
  416  X=-2.417  Y=0  Z=-8.489
  417  X=-1.534  Y=0  Z=-8.489
  418  X=-.65  Y=0  Z=-8.489
  419  X=0  Y=0  Z=-8.489
  420  X=.65  Y=0  Z=-8.489
  421  X=1.534  Y=0  Z=-8.489
  422  X=2.417  Y=0  Z=-8.489
  423  X=3.3  Y=0  Z=-8.489
  424  X=4.184  Y=0  Z=-8.489
  425  X=5.067  Y=0  Z=-8.489
  426  X=5.95  Y=0  Z=-8.489
  427  X=6.834  Y=0  Z=-8.489
  428  X=7.717  Y=0  Z=-8.489
  429  X=8.6  Y=0  Z=-8.489
  430  X=9.484  Y=0  Z=-8.489
  431  X=10.367  Y=0  Z=-8.489
  432  X=11.25  Y=0  Z=-8.489
  433  X=12.133  Y=0  Z=-8.489
  434  X=13.017  Y=0  Z=-8.489
  435  X=13.9  Y=0  Z=-8.489
  436  X=14.325  Y=0  Z=-8.489
  437  X=15.25  Y=0  Z=-8.489

PATTERN
  NAME=TEMP
  NAME=PRES

SPRING
  ADD=406  U3=383869.6
  ADD=407  U3=383869.6
  ADD=408  U3=384087
  ADD=409  U3=384087
  ADD=410  U3=383869.6
  ADD=411  U3=384087
  ADD=412  U3=384087
  ADD=413  U3=383869.6
  ADD=414  U3=384087
  ADD=415  U3=384087
  ADD=416  U3=383869.6
  ADD=417  U3=384087
  ADD=418  U3=333440.5
  ADD=419  U1=10000  U3=282576.7
  ADD=420  U3=333440.5
```

```
  ADD=421  U3=384087
  ADD=422  U3=383869.6
  ADD=423  U3=384087
  ADD=424  U3=384087
  ADD=425  U3=383869.6
  ADD=426  U3=384087
  ADD=427  U3=384087
  ADD=428  U3=383869.6
  ADD=429  U3=384087
  ADD=430  U3=384087
  ADD=431  U3=383869.6
  ADD=432  U3=383869.6

MATERIAL
  NAME=CONC  IDES=C  M=.2448  W=2.5
    T=0  E=2800000  U=.2  A=.00001
  NAME=STEEL  IDES=S
    T=0  E=2E+10  U=.3  A=.0000117  FY=25310.51
  NAME=RIGID  IDES=C
    T=0  E=2464750  U=.3  A=.00001
  NAME=CONC1  IDES=C  M=.2448  W=2.5
    T=0  E=2464750  U=.2  A=.00001

FRAME SECTION
  NAME=T1  MAT=CONC  SH=R  T=.5,1  A=.5  J=2.861003E-02  I=1.041667E-02,4.897667E-02
AS=.4166667,.4166667
  NAME=T2  MAT=CONC  SH=R  T=.542,1  A=.542  J=3.508126E-02  I=1.326834E-02,4.516667E-02
AS=.4516667,.4516667
  NAME=T3 MAT=CONC SH=R T=.675,1 A=.675 J=5.967503E-02 I=2.562891E-02,.05625 AS=.5625,.5625
  NAME=T4  MAT=CONC  SH=R  T=.916,1  A=.916  J=.1170223  I=6.404794E-02,7.633334E-02
AS=.7633333,.7633333
  NAME=T5  MAT=CONC  SH=R  T=.68,1  A=.68  J=6.070982E-02  I=2.620267E-02,5.666667E-02
AS=.5666667,.5666667
  NAME=T6  MAT=CONC  SH=R  T=.553,1  A=.553  J=3.688483E-02  I=.0140927,4.608333E-02
AS=.4608333,.4608333
  NAME=T7  MAT=CONC  SH=R  T=.511,1  A=.511  J=3.024029E-02  I=.0111194,4.258334E-02
AS=.4258333,.4258333
  NAME=T8  MAT=CONC  SH=R  T=.5,1  A=.5  J=2.861003E-02  I=1.041667E-02,4.897667E-02
AS=.4166667,.4166667
  NAME=FOOT MAT=CONC1 SH=R T=1.4,1 A=1.4 J=.2612221 I=.2286666,.1166667 AS=1.166667,1.166667
  NAME=WALL  MAT=CONC1  SH=R  T=.85,1  A=.85  J=9.985562E-02  I=4.117709E-02,7.083333E-02
AS=.7083334,.7083334
  NAME=RIGID MAT=RIGID SH=R T=10,10 A=100 J=1408.333 I=833.5623,833.5623 AS=83.56233,83.56233
  NAME=WALL1  MAT=CONC1  SH=R  T=1.3,1  A=1.3  J=.2294606  I=.1830833,.1083333
AS=1.083333,1.083333
  NAME=VAR1 TYPE=NONPR
    SEC=T1,T2 EIVAR=1,1 L=.426
  NAME=VAR2 TYPE=NONPR
    SEC=T2,T3 EIVAR=1,1 L=.436
  NAME=VAR3 TYPE=NONPR
    SEC=T3,T4 EIVAR=1,1 L=.422
  NAME=VAR4 TYPE=NONPR
    SEC=T4,T5 EIVAR=1,1 L=.455
  NAME=VAR5 TYPE=NONPR
    SEC=T5,T6 EIVAR=1,1 L=.563
  NAME=VAR6 TYPE=NONPR
```

```
   SEC=T6,T7 EIVAR=1,1 L=1.392
 NAME=VAR7 TYPE=NONPR
   SEC=T7,T8 EIVAR=1,1 L=1.313

FRAME
  1  J=1,2  SEC=T1  NSEG=1  ANG=180  IREL=R3
  2  J=2,3  SEC=T1  NSEG=1  ANG=180
  3  J=3,4  SEC=T1  NSEG=1  ANG=180
  4  J=4,5  SEC=VAR1  NSEG=1  ANG=0
  5  J=5,6  SEC=VAR2  NSEG=1  ANG=0
  6  J=6,7  SEC=VAR3  NSEG=1  ANG=0
  7  J=7,8  SEC=VAR4  NSEG=1  ANG=0
  8  J=8,9  SEC=VAR5  NSEG=1  ANG=0
  9  J=9,10  SEC=VAR6  NSEG=1  ANG=0
  10  J=10,11  SEC=VAR7  NSEG=1  ANG=0
  11  J=11,12  SEC=T8  NSEG=1  ANG=0
  12  J=12,13  SEC=T8  NSEG=1  ANG=0
  13  J=13,14  SEC=T8  NSEG=1  ANG=0
  14  J=14,15  SEC=T8  NSEG=1  ANG=0
  15  J=15,16  SEC=T8  NSEG=1  ANG=0
  16  J=16,17  SEC=T8  NSEG=1  ANG=0
  17  J=17,18  SEC=VAR7  NSEG=1  ANG=0
  18  J=18,19  SEC=VAR6  NSEG=1  ANG=0
  19  J=19,20  SEC=VAR5  NSEG=1  ANG=0
  20  J=20,21  SEC=VAR4  NSEG=1  ANG=0
  21  J=21,22  SEC=VAR3  NSEG=1  ANG=0
  22  J=22,23  SEC=VAR2  NSEG=1  ANG=0
  23  J=23,24  SEC=VAR1  NSEG=1  ANG=0
  24  J=24,25  SEC=T1  NSEG=1  ANG=0
  25  J=25,26  SEC=T1  NSEG=1  ANG=0
  26  J=26,27  SEC=T1  NSEG=1  ANG=0  JREL=R3
  27  J=28,29  SEC=T1  NSEG=1  ANG=180  IREL=R3
  28  J=29,30  SEC=T1  NSEG=1  ANG=180
  29  J=30,31  SEC=T1  NSEG=1  ANG=180
  30  J=31,32  SEC=VAR1  NSEG=1  ANG=0
  31  J=32,33  SEC=VAR2  NSEG=1  ANG=0
  32  J=33,34  SEC=VAR3  NSEG=1  ANG=0
  33  J=34,35  SEC=VAR4  NSEG=1  ANG=0
  34  J=35,36  SEC=VAR5  NSEG=1  ANG=0
  35  J=36,37  SEC=VAR6  NSEG=1  ANG=0
  36  J=37,38  SEC=VAR7  NSEG=1  ANG=0
  37  J=38,39  SEC=T8  NSEG=1  ANG=0
  38  J=39,40  SEC=T8  NSEG=1  ANG=0
  39  J=40,41  SEC=T8  NSEG=1  ANG=0
  40  J=41,42  SEC=T8  NSEG=1  ANG=0
  41  J=42,43  SEC=T8  NSEG=1  ANG=0
  42  J=43,44  SEC=T8  NSEG=1  ANG=0
  43  J=44,45  SEC=VAR7  NSEG=1  ANG=0
  44  J=45,46  SEC=VAR6  NSEG=1  ANG=0
  45  J=46,47  SEC=VAR5  NSEG=1  ANG=0
  46  J=47,48  SEC=VAR4  NSEG=1  ANG=0
  47  J=48,49  SEC=VAR3  NSEG=1  ANG=0
  48  J=49,50  SEC=VAR2  NSEG=1  ANG=0
  49  J=50,51  SEC=VAR1  NSEG=1  ANG=0
  50  J=51,52  SEC=T1  NSEG=1  ANG=0
  52  J=52,53  SEC=T1  NSEG=1  ANG=0
```

```
  53  J=53,54  SEC=T1  NSEG=1  ANG=0  JREL=R3
  85  J=28,201  SEC=RIGID  NSEG=1  ANG=0
  86  J=201,27  SEC=RIGID  NSEG=1  ANG=0
  87  J=301,54  SEC=RIGID  NSEG=1  ANG=0
  88  J=1,101  SEC=RIGID  NSEG=1  ANG=0
 101  J=102,101  SEC=WALL  NSEG=1  ANG=180
 102  J=402,102  SEC=WALL  NSEG=1  ANG=180  IOFF=.4875  RIGID=0
 201  J=202,201  SEC=WALL1  NSEG=1  ANG=0
 202  J=419,202  SEC=WALL1  NSEG=1  ANG=0  IOFF=.375  RIGID=0
 301  J=301,302  SEC=WALL  NSEG=1  ANG=0
 302  J=302,436  SEC=WALL  NSEG=1  ANG=0  JOFF=.4875  RIGID=0
 400  J=401,402  SEC=FOOT  NSEG=1  ANG=0
 401  J=402,403  SEC=FOOT  NSEG=1  ANG=0  IOFF=.075  RIGID=0
 402  J=403,404  SEC=FOOT  NSEG=1  ANG=0
 403  J=404,405  SEC=FOOT  NSEG=1  ANG=0
 404  J=405,406  SEC=FOOT  NSEG=1  ANG=0
 405  J=406,407  SEC=FOOT  NSEG=1  ANG=0
 406  J=407,408  SEC=FOOT  NSEG=1  ANG=0
 407  J=408,409  SEC=FOOT  NSEG=1  ANG=0
 408  J=409,410  SEC=FOOT  NSEG=1  ANG=0
 409  J=410,411  SEC=FOOT  NSEG=1  ANG=0
 410  J=411,412  SEC=FOOT  NSEG=1  ANG=0
 411  J=412,413  SEC=FOOT  NSEG=1  ANG=0
 412  J=413,414  SEC=FOOT  NSEG=1  ANG=0
 413  J=414,415  SEC=FOOT  NSEG=1  ANG=0
 414  J=415,416  SEC=FOOT  NSEG=1  ANG=0
 415  J=416,417  SEC=FOOT  NSEG=1  ANG=0
 416  J=417,418  SEC=FOOT  NSEG=1  ANG=0
 417  J=418,419  SEC=FOOT  NSEG=1  ANG=0  JOFF=.3  RIGID=0
 418  J=419,420  SEC=FOOT  NSEG=1  ANG=0  IOFF=.3  RIGID=0
 419  J=420,421  SEC=FOOT  NSEG=1  ANG=0
 420  J=421,422  SEC=FOOT  NSEG=1  ANG=0
 421  J=422,423  SEC=FOOT  NSEG=1  ANG=0
 422  J=423,424  SEC=FOOT  NSEG=1  ANG=0
 423  J=424,425  SEC=FOOT  NSEG=1  ANG=0
 424  J=425,426  SEC=FOOT  NSEG=1  ANG=0
 425  J=426,427  SEC=FOOT  NSEG=1  ANG=0
 426  J=427,428  SEC=FOOT  NSEG=1  ANG=0
 427  J=428,429  SEC=FOOT  NSEG=1  ANG=0
 428  J=429,430  SEC=FOOT  NSEG=1  ANG=0
 429  J=430,431  SEC=FOOT  NSEG=1  ANG=0
 430  J=431,432  SEC=FOOT  NSEG=1  ANG=0
 431  J=432,433  SEC=FOOT  NSEG=1  ANG=0
 432  J=433,434  SEC=FOOT  NSEG=1  ANG=0
 433  J=434,435  SEC=FOOT  NSEG=1  ANG=0
 434  J=435,436  SEC=FOOT  NSEG=1  ANG=0  JOFF=.075  RIGID=0
 435  J=436,437  SEC=FOOT  NSEG=1  ANG=0

LOAD
  NAME=PVL2
    TYPE=CONCENTRATED SPAN
      ADD=415  RD=.216  UZ=-9.6
      ADD=413  RD=.717  UZ=-9.6
      ADD=412  RD=.359  UZ=-9.6
      ADD=410  RD=.321  UZ=-9.6
      ADD=408  RD=.963  UZ=-9.6
```

```
      ADD=406   RD=.925   UZ=-9.6
      ADD=420   RD=.784   UZ=-9.6
      ADD=422   RD=.283   UZ=-9.6
      ADD=423   RD=.641   UZ=-9.6
      ADD=425   RD=.679   UZ=-9.6
      ADD=427   RD=.037   UZ=-9.6
      ADD=429   RD=.075   UZ=-9.6

COMBO
  NAME=COMB1
    LOAD=PVL2   SF=2.15

OUTPUT
; No Output Requested

END



; File D:₩SAP2000DATA₩개착식터널₩활하중영향검토3.$2k saved 11-25-02 13:22:56 in Ton-m

SYSTEM
  DOF=UX,UZ,RY   LENGTH=m   FORCE=Ton   LINES=59

JOINT
  1   X=-14.25   Y=0   Z=-5.679
  2   X=-14.25   Y=0   Z=-5.026
  3   X=-14.25   Y=0   Z=-4.372
  4   X=-14.25   Y=0   Z=-3.719
  5   X=-14.23   Y=0   Z=-3.293
  6   X=-14.166   Y=0   Z=-2.86
  7   X=-14.107   Y=0   Z=-2.444
  8   X=-13.748   Y=0   Z=-2.165
  9   X=-13.294   Y=0   Z=-1.832
  10   X=-12.092   Y=0   Z=-1.131
  11   X=-10.887   Y=0   Z=-.608
  12   X=-9.683   Y=0   Z=-.256
  13   X=-8.479   Y=0   Z=-.057
  14   X=-7.275   Y=0   Z=0
  15   X=-6.071   Y=0   Z=-.057
  16   X=-4.867   Y=0   Z=-.256
  17   X=-3.663   Y=0   Z=-.608
  18   X=-2.458   Y=0   Z=-1.131
  19   X=-1.256   Y=0   Z=-1.832
  20   X=-.795   Y=0   Z=-2.165
  21   X=-.443   Y=0   Z=-2.444
  22   X=-.369   Y=0   Z=-2.86
  23   X=-.318   Y=0   Z=-3.293
  24   X=-.3   Y=0   Z=-3.719
  25   X=-.3   Y=0   Z=-4.372
  26   X=-.3   Y=0   Z=-5.026
  27   X=-.3   Y=0   Z=-5.679
  28   X=.3   Y=0   Z=-5.679
  29   X=.3   Y=0   Z=-5.026
  30   X=.3   Y=0   Z=-4.372
  31   X=.3   Y=0   Z=-3.719
```

32 X=.318 Y=0 Z=-3.293
33 X=.369 Y=0 Z=-2.86
34 X=.443 Y=0 Z=-2.444
35 X=.795 Y=0 Z=-2.165
36 X=1.256 Y=0 Z=-1.832
37 X=2.458 Y=0 Z=-1.131
38 X=3.663 Y=0 Z=-.608
39 X=4.867 Y=0 Z=-.256
40 X=6.071 Y=0 Z=-.057
41 X=7.275 Y=0 Z=0
42 X=8.479 Y=0 Z=-.057
43 X=9.683 Y=0 Z=-.256
44 X=10.887 Y=0 Z=-.608
45 X=12.092 Y=0 Z=-1.131
46 X=13.294 Y=0 Z=-1.832
47 X=13.748 Y=0 Z=-2.165
48 X=14.107 Y=0 Z=-2.444
49 X=14.166 Y=0 Z=-2.86
50 X=14.23 Y=0 Z=-3.293
51 X=14.25 Y=0 Z=-3.719
52 X=14.25 Y=0 Z=-4.372
53 X=14.25 Y=0 Z=-5.026
54 X=14.25 Y=0 Z=-5.679
101 X=-14.325 Y=0 Z=-5.679
102 X=-14.325 Y=0 Z=-7.789
201 X=0 Y=0 Z=-5.679
202 X=0 Y=0 Z=-7.789
301 X=14.325 Y=0 Z=-5.679
302 X=14.325 Y=0 Z=-7.789
401 X=-15.25 Y=0 Z=-8.489
402 X=-14.325 Y=0 Z=-8.489
403 X=-13.9 Y=0 Z=-8.489
404 X=-13.017 Y=0 Z=-8.489
405 X=-12.133 Y=0 Z=-8.489
406 X=-11.25 Y=0 Z=-8.489
407 X=-10.367 Y=0 Z=-8.489
408 X=-9.484 Y=0 Z=-8.489
409 X=-8.6 Y=0 Z=-8.489
410 X=-7.717 Y=0 Z=-8.489
411 X=-6.834 Y=0 Z=-8.489
412 X=-5.95 Y=0 Z=-8.489
413 X=-5.067 Y=0 Z=-8.489
414 X=-4.184 Y=0 Z=-8.489
415 X=-3.3 Y=0 Z=-8.489
416 X=-2.417 Y=0 Z=-8.489
417 X=-1.534 Y=0 Z=-8.489
418 X=-.65 Y=0 Z=-8.489
419 X=0 Y=0 Z=-8.489
420 X=.65 Y=0 Z=-8.489
421 X=1.534 Y=0 Z=-8.489
422 X=2.417 Y=0 Z=-8.489
423 X=3.3 Y=0 Z=-8.489
424 X=4.184 Y=0 Z=-8.489
425 X=5.067 Y=0 Z=-8.489
426 X=5.95 Y=0 Z=-8.489
427 X=6.834 Y=0 Z=-8.489

```
  428  X=7.717  Y=0  Z=-8.489
  429  X=8.6  Y=0  Z=-8.489
  430  X=9.484  Y=0  Z=-8.489
  431  X=10.367  Y=0  Z=-8.489
  432  X=11.25  Y=0  Z=-8.489
  433  X=12.133  Y=0  Z=-8.489
  434  X=13.017  Y=0  Z=-8.489
  435  X=13.9  Y=0  Z=-8.489
  436  X=14.325  Y=0  Z=-8.489
  437  X=15.25  Y=0  Z=-8.489

PATTERN
  NAME=TEMP
  NAME=PRES

SPRING
  ADD=402  U3=293445
  ADD=403  U3=284315.6
  ADD=404  U3=384087
  ADD=405  U3=384087
  ADD=406  U3=383869.6
  ADD=407  U3=383869.6
  ADD=408  U3=384087
  ADD=409  U3=384087
  ADD=410  U3=383869.6
  ADD=411  U3=384087
  ADD=412  U3=384087
  ADD=413  U3=383869.6
  ADD=414  U3=384087
  ADD=415  U3=384087
  ADD=419  U1=10000
  ADD=423  U3=384087
  ADD=424  U3=384087
  ADD=425  U3=383869.6
  ADD=426  U3=384087
  ADD=427  U3=384087
  ADD=428  U3=383869.6
  ADD=429  U3=384087
  ADD=430  U3=384087
  ADD=431  U3=383869.6
  ADD=432  U3=383869.6
  ADD=433  U3=384087
  ADD=434  U3=384087
  ADD=435  U3=284315.6
  ADD=436  U3=293445

MATERIAL
  NAME=CONC  IDES=C  M=.2448  W=2.5
    T=0  E=2800000  U=.2  A=.00001
  NAME=STEEL  IDES=S
    T=0  E=2E+10  U=.3  A=.0000117  FY=25310.51
  NAME=RIGID  IDES=C
    T=0  E=2464750  U=.3  A=.00001
  NAME=CONC1  IDES=C  M=.2448  W=2.5
    T=0  E=2464750  U=.2  A=.00001
```

```
FRAME SECTION
  NAME=T1    MAT=CONC    SH=R    T=.5,1    A=.5    J=2.861003E-02    I=1.041667E-02,4.897667E-02
AS=.4166667,.4166667
  NAME=T2    MAT=CONC    SH=R    T=.542,1    A=.542    J=3.508126E-02    I=1.326834E-02,4.516667E-02
AS=.4516667,.4516667
  NAME=T3 MAT=CONC SH=R T=.675,1 A=.675 J=5.967503E-02 I=2.562891E-02,.05625 AS=.5625,.5625
  NAME=T4    MAT=CONC    SH=R    T=.916,1    A=.916    J=.1170223    I=6.404794E-02,7.633334E-02
AS=.7633333,.7633333
  NAME=T5    MAT=CONC    SH=R    T=.68,1    A=.68    J=6.070982E-02    I=2.620267E-02,5.666667E-02
AS=.5666667,.5666667
  NAME=T6    MAT=CONC    SH=R    T=.553,1    A=.553    J=3.688483E-02    I=.0140927,4.608333E-02
AS=.4608333,.4608333
  NAME=T7    MAT=CONC    SH=R    T=.511,1    A=.511    J=3.024029E-02    I=.0111194,4.258334E-02
AS=.4258333,.4258333
  NAME=T8    MAT=CONC    SH=R    T=.5,1    A=.5    J=2.861003E-02    I=1.041667E-02,4.897667E-02
AS=.4166667,.4166667
  NAME=FOOT MAT=CONC1 SH=R T=1.4,1 A=1.4 J=.2612221 I=.2286666,.1166667 AS=1.166667,1.166667
  NAME=WALL    MAT=CONC1    SH=R    T=.85,1    A=.85    J=9.985562E-02    I=4.117709E-02,7.083333E-02
AS=.7083334,.7083334
  NAME=RIGID MAT=RIGID SH=R T=10,10 A=100 J=1408.333 I=833.5623,833.5623 AS=83.56233,83.56233
  NAME=WALL1    MAT=CONC1    SH=R    T=1.3,1    A=1.3    J=.2294606    I=.1830833,.1083333
AS=1.083333,1.083333
  NAME=VAR1 TYPE=NONPR
    SEC=T1,T2 EIVAR=1,1 L=.426
  NAME=VAR2 TYPE=NONPR
    SEC=T2,T3 EIVAR=1,1 L=.436
  NAME=VAR3 TYPE=NONPR
    SEC=T3,T4 EIVAR=1,1 L=.422
  NAME=VAR4 TYPE=NONPR
    SEC=T4,T5 EIVAR=1,1 L=.455
  NAME=VAR5 TYPE=NONPR
    SEC=T5,T6 EIVAR=1,1 L=.563
  NAME=VAR6 TYPE=NONPR
    SEC=T6,T7 EIVAR=1,1 L=1.392
  NAME=VAR7 TYPE=NONPR
    SEC=T7,T8 EIVAR=1,1 L=1.313

FRAME
  1  J=1,2  SEC=T1  NSEG=1  ANG=180  IREL=R3
  2  J=2,3  SEC=T1  NSEG=1  ANG=180
  3  J=3,4  SEC=T1  NSEG=1  ANG=180
  4  J=4,5  SEC=VAR1  NSEG=1  ANG=0
  5  J=5,6  SEC=VAR2  NSEG=1  ANG=0
  6  J=6,7  SEC=VAR3  NSEG=1  ANG=0
  7  J=7,8  SEC=VAR4  NSEG=1  ANG=0
  8  J=8,9  SEC=VAR5  NSEG=1  ANG=0
  9  J=9,10  SEC=VAR6  NSEG=1  ANG=0
  10  J=10,11  SEC=VAR7  NSEG=1  ANG=0
  11  J=11,12  SEC=T8  NSEG=1  ANG=0
  12  J=12,13  SEC=T8  NSEG=1  ANG=0
  13  J=13,14  SEC=T8  NSEG=1  ANG=0
  14  J=14,15  SEC=T8  NSEG=1  ANG=0
  15  J=15,16  SEC=T8  NSEG=1  ANG=0
  16  J=16,17  SEC=T8  NSEG=1  ANG=0
  17  J=17,18  SEC=VAR7  NSEG=1  ANG=0
  18  J=18,19  SEC=VAR6  NSEG=1  ANG=0
```

```
19  J=19,20  SEC=VAR5  NSEG=1  ANG=0
20  J=20,21  SEC=VAR4  NSEG=1  ANG=0
21  J=21,22  SEC=VAR3  NSEG=1  ANG=0
22  J=22,23  SEC=VAR2  NSEG=1  ANG=0
23  J=23,24  SEC=VAR1  NSEG=1  ANG=0
24  J=24,25  SEC=T1  NSEG=1  ANG=0
25  J=25,26  SEC=T1  NSEG=1  ANG=0
26  J=26,27  SEC=T1  NSEG=1  ANG=0  JREL=R3
27  J=28,29  SEC=T1  NSEG=1  ANG=180  IREL=R3
28  J=29,30  SEC=T1  NSEG=1  ANG=180
29  J=30,31  SEC=T1  NSEG=1  ANG=180
30  J=31,32  SEC=VAR1  NSEG=1  ANG=0
31  J=32,33  SEC=VAR2  NSEG=1  ANG=0
32  J=33,34  SEC=VAR3  NSEG=1  ANG=0
33  J=34,35  SEC=VAR4  NSEG=1  ANG=0
34  J=35,36  SEC=VAR5  NSEG=1  ANG=0
35  J=36,37  SEC=VAR6  NSEG=1  ANG=0
36  J=37,38  SEC=VAR7  NSEG=1  ANG=0
37  J=38,39  SEC=T8  NSEG=1  ANG=0
38  J=39,40  SEC=T8  NSEG=1  ANG=0
39  J=40,41  SEC=T8  NSEG=1  ANG=0
40  J=41,42  SEC=T8  NSEG=1  ANG=0
41  J=42,43  SEC=T8  NSEG=1  ANG=0
42  J=43,44  SEC=T8  NSEG=1  ANG=0
43  J=44,45  SEC=VAR7  NSEG=1  ANG=0
44  J=45,46  SEC=VAR6  NSEG=1  ANG=0
45  J=46,47  SEC=VAR5  NSEG=1  ANG=0
46  J=47,48  SEC=VAR4  NSEG=1  ANG=0
47  J=48,49  SEC=VAR3  NSEG=1  ANG=0
48  J=49,50  SEC=VAR2  NSEG=1  ANG=0
49  J=50,51  SEC=VAR1  NSEG=1  ANG=0
50  J=51,52  SEC=T1  NSEG=1  ANG=0
52  J=52,53  SEC=T1  NSEG=1  ANG=0
53  J=53,54  SEC=T1  NSEG=1  ANG=0  JREL=R3
85  J=28,201  SEC=RIGID  NSEG=1  ANG=0
86  J=201,27  SEC=RIGID  NSEG=1  ANG=0
87  J=301,54  SEC=RIGID  NSEG=1  ANG=0
88  J=1,101  SEC=RIGID  NSEG=1  ANG=0
101  J=102,101  SEC=WALL  NSEG=1  ANG=180
102  J=402,102  SEC=WALL  NSEG=1  ANG=180  IOFF=.4875  RIGID=0
201  J=202,201  SEC=WALL1  NSEG=1  ANG=0
202  J=419,202  SEC=WALL1  NSEG=1  ANG=0  IOFF=.375  RIGID=0
301  J=301,302  SEC=WALL  NSEG=1  ANG=0
302  J=302,436  SEC=WALL  NSEG=1  ANG=0  JOFF=.4875  RIGID=0
400  J=401,402  SEC=FOOT  NSEG=1  ANG=0
401  J=402,403  SEC=FOOT  NSEG=1  ANG=0  IOFF=.075  RIGID=0
402  J=403,404  SEC=FOOT  NSEG=1  ANG=0
403  J=404,405  SEC=FOOT  NSEG=1  ANG=0
404  J=405,406  SEC=FOOT  NSEG=1  ANG=0
405  J=406,407  SEC=FOOT  NSEG=1  ANG=0
406  J=407,408  SEC=FOOT  NSEG=1  ANG=0
407  J=408,409  SEC=FOOT  NSEG=1  ANG=0
408  J=409,410  SEC=FOOT  NSEG=1  ANG=0
409  J=410,411  SEC=FOOT  NSEG=1  ANG=0
410  J=411,412  SEC=FOOT  NSEG=1  ANG=0
411  J=412,413  SEC=FOOT  NSEG=1  ANG=0
```

```
  412  J=413,414  SEC=FOOT  NSEG=1  ANG=0
  413  J=414,415  SEC=FOOT  NSEG=1  ANG=0
  414  J=415,416  SEC=FOOT  NSEG=1  ANG=0
  415  J=416,417  SEC=FOOT  NSEG=1  ANG=0
  416  J=417,418  SEC=FOOT  NSEG=1  ANG=0
  417  J=418,419  SEC=FOOT  NSEG=1  ANG=0  JOFF=.3  RIGID=0
  418  J=419,420  SEC=FOOT  NSEG=1  ANG=0  IOFF=.3  RIGID=0
  419  J=420,421  SEC=FOOT  NSEG=1  ANG=0
  420  J=421,422  SEC=FOOT  NSEG=1  ANG=0
  421  J=422,423  SEC=FOOT  NSEG=1  ANG=0
  422  J=423,424  SEC=FOOT  NSEG=1  ANG=0
  423  J=424,425  SEC=FOOT  NSEG=1  ANG=0
  424  J=425,426  SEC=FOOT  NSEG=1  ANG=0
  425  J=426,427  SEC=FOOT  NSEG=1  ANG=0
  426  J=427,428  SEC=FOOT  NSEG=1  ANG=0
  427  J=428,429  SEC=FOOT  NSEG=1  ANG=0
  428  J=429,430  SEC=FOOT  NSEG=1  ANG=0
  429  J=430,431  SEC=FOOT  NSEG=1  ANG=0
  430  J=431,432  SEC=FOOT  NSEG=1  ANG=0
  431  J=432,433  SEC=FOOT  NSEG=1  ANG=0
  432  J=433,434  SEC=FOOT  NSEG=1  ANG=0
  433  J=434,435  SEC=FOOT  NSEG=1  ANG=0
  434  J=435,436  SEC=FOOT  NSEG=1  ANG=0  JOFF=.075  RIGID=0
  435  J=436,437  SEC=FOOT  NSEG=1  ANG=0

LOAD
  NAME=PVL3
    TYPE=CONCENTRATED SPAN
      ADD=412  RD=.359  UZ=-9.6
      ADD=410  RD=.321  UZ=-9.6
      ADD=409  RD=.037  UZ=-9.6
      ADD=406  RD=.925  UZ=-9.6
      ADD=405  RD=.566  UZ=-9.6
      ADD=403  RD=.528  UZ=-9.6
      ADD=423  RD=.641  UZ=-9.6
      ADD=425  RD=.679  UZ=-9.6
      ADD=426  RD=.963  UZ=-9.6
      ADD=429  RD=.075  UZ=-9.6
      ADD=430  RD=.434  UZ=-9.6
      ADD=432  RD=.472  UZ=-9.6

COMBO
  NAME=COMB1
    LOAD=PVL3  SF=2.15

OUTPUT
; No Output Requested

END
```

```
; File D:\PAB
BAK\SAP2000(FEM)\개착식터널마감벽\WING1.$2k saved
9-27-02 9:05:21 in Ton-mm

SYSTEM
  DOF=UX,UY,UZ,RX,RY,RZ  LENGTH=mm  FORCE=Ton
LINES=59

JOINT
  1  X=-3663  Y=0  Z=9456
  2  X=-2759  Y=0  Z=9456
  3  X=-1856  Y=0  Z=9456
  4  X=-953  Y=0  Z=9456
  5  X=0  Y=0  Z=9456
  6  X=953  Y=0  Z=9456
  7  X=1856  Y=0  Z=9456
  8  X=2759  Y=0  Z=9456
  9  X=3663  Y=0  Z=9456
  10  X=4566  Y=0  Z=9456
  11  X=9984  Y=0  Z=9456
  12  X=14749  Y=0  Z=9456
  13  X=14500  Y=0  Z=9456
  14  X=-16056.33  Y=0  Z=889
  15  X=-16056.33  Y=0  Z=1991
  16  X=-15249  Y=0  Z=889
  17  X=10888  Y=0  Z=9456
  18  X=11791  Y=0  Z=9456
  19  X=-15249  Y=0  Z=1991
  20  X=-16056.33  Y=0  Z=2911
  21  X=-14749  Y=0  Z=7131
  22  X=-15249  Y=0  Z=2911
  23  X=-16056.33  Y=0  Z=3831
  24  X=-14749  Y=0  Z=9590
  26  X=-15249  Y=0  Z=3831
  27  X=-14749  Y=0  Z=11236
  28  X=-16056.33  Y=0  Z=9456
  29  X=-16056.33  Y=0  Z=9590
  30  X=-15249  Y=0  Z=9456
  31  X=-14749  Y=0  Z=1991
  32  X=-15249  Y=0  Z=9590
  33  X=-16056.33  Y=0  Z=4656
  34  X=-14749  Y=0  Z=9456
  35  X=-14500  Y=0  Z=9456
  36  X=-13597  Y=0  Z=9456
  37  X=14749  Y=0  Z=7131
  38  X=-15249  Y=0  Z=4656
  39  X=-14749  Y=0  Z=2911
  40  X=14749  Y=0  Z=9590
  41  X=-16056.33  Y=0  Z=5481
  42  X=-15249  Y=0  Z=5481
  43  X=14749  Y=0  Z=11236
  44  X=-16056.33  Y=0  Z=6306
  45  X=-15249  Y=0  Z=6306
  46  X=-16056.33  Y=0  Z=9000
  47  X=-15249  Y=0  Z=9000
  48  X=14749  Y=0  Z=1071
  49  X=-12694  Y=0  Z=9456
  50  X=-11791  Y=0  Z=9456
  51  X=-10888  Y=0  Z=9456
  52  X=-16056.33  Y=0  Z=7131
  53  X=14749  Y=0  Z=1991
  54  X=-15249  Y=0  Z=7131
  55  X=14749  Y=0  Z=2911
  56  X=-4566  Y=0  Z=9456
  57  X=12694  Y=0  Z=9456
  58  X=-14500  Y=0  Z=7131
  59  X=-14500  Y=0  Z=9590
  60  X=-14500  Y=0  Z=11236
  61  X=-16056.33  Y=0  Z=8174
  62  X=-12694  Y=0  Z=8174
  63  X=-12694  Y=0  Z=9590
  64  X=-12694  Y=0  Z=11236
  65  X=-15249  Y=0  Z=8174
  66  X=-10888  Y=0  Z=9000
  67  X=-10888  Y=0  Z=9590
  68  X=-10888  Y=0  Z=11236
  69  X=-16056.33  Y=0  Z=10138.67
  70  X=-9081  Y=0  Z=9456
  71  X=-9081  Y=0  Z=9590
  72  X=-9081  Y=0  Z=11236
  73  X=-15249  Y=0  Z=10138.67
  74  X=-7275  Y=0  Z=9590
  75  X=-7275  Y=0  Z=11236
  76  X=-16056.33  Y=0  Z=10687.33
  77  X=-5469  Y=0  Z=9456
  78  X=-5469  Y=0  Z=9590
  79  X=-5469  Y=0  Z=11236
  80  X=-15249  Y=0  Z=10687.33
```



```
  81  X=-3663  Y=0  Z=9000
  82  X=-3663  Y=0  Z=9590
  83  X=-3663  Y=0  Z=11236
  84  X=-16056.33  Y=0  Z=11236
  85  X=-1856  Y=0  Z=8174
  86  X=-1856  Y=0  Z=9590
  87  X=-1856  Y=0  Z=11236
  88  X=-15249  Y=0  Z=11236
  89  X=0  Y=0  Z=7107
  90  X=0  Y=0  Z=9590
  91  X=0  Y=0  Z=11236
  92  X=15249  Y=0  Z=9000
  93  X=1856  Y=0  Z=8174
  94  X=1856  Y=0  Z=9590
  95  X=1856  Y=0  Z=11236
  96  X=15249  Y=0  Z=9456
  97  X=3663  Y=0  Z=9000
  98  X=3663  Y=0  Z=9590
  99  X=3663  Y=0  Z=11236
  100  X=16096.33  Y=0  Z=9000
  101  X=5469  Y=0  Z=9456
  102  X=5469  Y=0  Z=9590
  103  X=5469  Y=0  Z=11236
  104  X=16096.33  Y=0  Z=9456
  105  X=7275  Y=0  Z=9590
  106  X=7275  Y=0  Z=11236
  107  X=15249  Y=0  Z=0
  108  X=9081  Y=0  Z=9456
  109  X=9081  Y=0  Z=9590
  110  X=9081  Y=0  Z=11236
  111  X=15249  Y=0  Z=1071
  112  X=10888  Y=0  Z=9000
  113  X=10888  Y=0  Z=9590
  114  X=10888  Y=0  Z=11236
  115  X=16096.33  Y=0  Z=0
  116  X=12694  Y=0  Z=8174
  117  X=12694  Y=0  Z=9590
  118  X=12694  Y=0  Z=11236
  119  X=16096.33  Y=0  Z=1071
  120  X=13597  Y=0  Z=9456
  121  X=15249  Y=0  Z=1991
  122  X=14500  Y=0  Z=7131
  123  X=14500  Y=0  Z=9590
  124  X=14500  Y=0  Z=11236
  125  X=16096.33  Y=0  Z=1991
  126  X=-11791  Y=0  Z=9000
  127  X=15249  Y=0  Z=2911
  128  X=16096.33  Y=0  Z=2911
  129  X=15249  Y=0  Z=3831
  130  X=16096.33  Y=0  Z=3831
  131  X=15249  Y=0  Z=9590
  132  X=16096.33  Y=0  Z=9590
  133  X=-14749  Y=0  Z=9000
  134  X=-14500  Y=0  Z=9000
  135  X=-13597  Y=0  Z=9000
  136  X=-12694  Y=0  Z=9000
  137  X=-2759  Y=0  Z=9000
  138  X=-1856  Y=0  Z=9000
  139  X=-953  Y=0  Z=9000
  140  X=0  Y=0  Z=9000
  141  X=953  Y=0  Z=9000
  142  X=1856  Y=0  Z=9000
  143  X=2759  Y=0  Z=9000
  144  X=14749  Y=0  Z=9000
  145  X=14500  Y=0  Z=9000
  146  X=15249  Y=0  Z=7131
  147  X=15249  Y=0  Z=8174
  148  X=16096.33  Y=0  Z=7131
  149  X=16096.33  Y=0  Z=8174
  150  X=15249  Y=0  Z=4656
  151  X=16096.33  Y=0  Z=4656
  152  X=15249  Y=0  Z=5481
  153  X=16096.33  Y=0  Z=5481
  154  X=15249  Y=0  Z=6306
  155  X=16096.33  Y=0  Z=6306
  156  X=15249  Y=0  Z=10138.68
  157  X=-14749  Y=0  Z=3831
  158  X=16096.33  Y=0  Z=10138.69
  159  X=15249  Y=0  Z=10687.32
  160  X=-14500  Y=0  Z=3831
  161  X=11791  Y=0  Z=9000
  162  X=14749  Y=0  Z=8174
  163  X=12694  Y=0  Z=9000
  164  X=13597  Y=0  Z=9000
  165  X=-9984  Y=0  Z=9456
  166  X=14500  Y=0  Z=8174
  167  X=16096.33  Y=0  Z=10687.31
  168  X=15249  Y=0  Z=11236
  169  X=16096.33  Y=0  Z=11236
  170  X=-953  Y=0  Z=8174
```

```
  172  X=0  Y=0  Z=8174
  173  X=953  Y=0  Z=8174
  176  X=13597  Y=0  Z=8174
  177  X=12694  Y=0  Z=9392
  180  X=14749  Y=0  Z=3831
  181  X=14500  Y=0  Z=3831
  183  X=0  Y=0  Z=295
  184  X=0  Y=0  Z=3831
  187  X=0  Y=0  Z=4805
  188  X=0  Y=0  Z=1603.5
  195  X=-13597  Y=0  Z=7651
  196  X=-13597  Y=0  Z=9590
  197  X=-13597  Y=0  Z=11236
  199  X=-11791  Y=0  Z=8638
  200  X=-11791  Y=0  Z=9590
  201  X=-11791  Y=0  Z=11236
  203  X=-9984  Y=0  Z=9270
  204  X=-9984  Y=0  Z=9590
  205  X=-9984  Y=0  Z=11236
  207  X=-8178  Y=0  Z=9562
  208  X=-8178  Y=0  Z=9590
  209  X=-8178  Y=0  Z=11236
  211  X=-6372  Y=0  Z=9562
  212  X=-6372  Y=0  Z=9590
  213  X=-6372  Y=0  Z=11236
  215  X=-4566  Y=0  Z=9270
  216  X=-4566  Y=0  Z=9590
  217  X=-4566  Y=0  Z=11236
  219  X=-2759  Y=0  Z=8638
  220  X=-2759  Y=0  Z=9590
  221  X=-2759  Y=0  Z=11236
  223  X=-953  Y=0  Z=7651
  224  X=-953  Y=0  Z=9590
  225  X=-953  Y=0  Z=11236
  227  X=953  Y=0  Z=7651
  228  X=953  Y=0  Z=9590
  229  X=953  Y=0  Z=11236
  231  X=2759  Y=0  Z=8638
  232  X=2759  Y=0  Z=9590
  233  X=2759  Y=0  Z=11236
  235  X=4566  Y=0  Z=9270
  236  X=4566  Y=0  Z=9590
  237  X=4566  Y=0  Z=11236
  239  X=6372  Y=0  Z=9562
  240  X=6372  Y=0  Z=9590
  241  X=6372  Y=0  Z=11236
  243  X=8178  Y=0  Z=9562
  244  X=8178  Y=0  Z=9590
  245  X=8178  Y=0  Z=11236
  247  X=9984  Y=0  Z=9270
  248  X=9984  Y=0  Z=9590
  249  X=9984  Y=0  Z=11236
  251  X=11791  Y=0  Z=8638
  252  X=11791  Y=0  Z=9590
  253  X=11791  Y=0  Z=11236
  255  X=13597  Y=0  Z=7651
  256  X=13597  Y=0  Z=9590
  257  X=13597  Y=0  Z=11236
  259  X=-14749  Y=0  Z=8174
  260  X=-14500  Y=0  Z=8174
  261  X=-13597  Y=0  Z=8174
  263  X=1856  Y=0  Z=9392
  271  X=-14749  Y=0  Z=4656
  272  X=-14749  Y=0  Z=5481
  273  X=-14749  Y=0  Z=6306
  274  X=-14500  Y=0  Z=4656
  275  X=-14500  Y=0  Z=5481
  276  X=-14500  Y=0  Z=6306
  277  X=14749  Y=0  Z=4656
  278  X=14500  Y=0  Z=4656
  279  X=14749  Y=0  Z=5481
  280  X=14500  Y=0  Z=5481
  281  X=14749  Y=0  Z=6306
  282  X=14500  Y=0  Z=6306
  333  X=16770  Y=0  Z=9000
  334  X=16770  Y=0  Z=9456
  340  X=-16710  Y=0  Z=889
  342  X=-16710  Y=0  Z=1991
  344  X=-16710  Y=0  Z=2911
  346  X=-16710  Y=0  Z=3831
  349  X=-16710  Y=0  Z=9456
  350  X=-16710  Y=0  Z=9590
  351  X=16770  Y=0  Z=0
  352  X=16770  Y=0  Z=1071
  355  X=16770  Y=0  Z=1991
  357  X=16770  Y=0  Z=2911
  359  X=16770  Y=0  Z=3831
  361  X=16770  Y=0  Z=9590
  364  X=-16710  Y=0  Z=4656
  366  X=-16710  Y=0  Z=5481
```



```
  368  X=-16710  Y=0  Z=6306
  370  X=-16710  Y=0  Z=9000
  372  X=-16710  Y=0  Z=7131
  373  X=16770  Y=0  Z=7131
  374  X=16770  Y=0  Z=8174
  378  X=-16710  Y=0  Z=8174
  379  X=16770  Y=0  Z=4656
  381  X=16770  Y=0  Z=5481
  383  X=16770  Y=0  Z=6306
  386  X=-16710  Y=0  Z=10138.67
  388  X=-16710  Y=0  Z=10687.33
  390  X=-16710  Y=0  Z=11236
  391  X=16770  Y=0  Z=10138.7
  393  X=16770  Y=0  Z=10687.3
  395  X=16770  Y=0  Z=11236
  469  X=-14500  Y=0  Z=10138.67
  470  X=-14749  Y=0  Z=10138.67
  471  X=-14500  Y=0  Z=10687.33
  472  X=-14749  Y=0  Z=10687.33
  473  X=14749  Y=0  Z=10138.67
  474  X=14500  Y=0  Z=10138.67
  475  X=14749  Y=0  Z=10687.33
  476  X=14500  Y=0  Z=10687.33
  481  X=-13597  Y=0  Z=10138.67
  482  X=-13597  Y=0  Z=10687.33
  483  X=-12694  Y=0  Z=10138.67
  484  X=-12694  Y=0  Z=10687.33
  485  X=-11791  Y=0  Z=10138.67
  486  X=-11791  Y=0  Z=10687.33
  487  X=-10888  Y=0  Z=10138.67
  488  X=-10888  Y=0  Z=10687.33
  489  X=-9984  Y=0  Z=10138.67
  490  X=-9984  Y=0  Z=10687.33
  491  X=-9081  Y=0  Z=10138.67
  492  X=-9081  Y=0  Z=10687.33
  493  X=-8178  Y=0  Z=10138.67
  494  X=-8178  Y=0  Z=10687.33
  495  X=-7275  Y=0  Z=10138.67
  496  X=-7275  Y=0  Z=10687.33
  497  X=-6372  Y=0  Z=10138.67
  498  X=-6372  Y=0  Z=10687.33
  499  X=-5469  Y=0  Z=10138.67
  500  X=-5469  Y=0  Z=10687.33
  501  X=-4566  Y=0  Z=10138.67
  502  X=-4566  Y=0  Z=10687.33
  503  X=-3663  Y=0  Z=10138.67
  504  X=-3663  Y=0  Z=10687.33
  505  X=-2759  Y=0  Z=10138.67
  506  X=-2759  Y=0  Z=10687.33
  507  X=-1856  Y=0  Z=10138.67
  508  X=-1856  Y=0  Z=10687.33
  509  X=-953  Y=0  Z=10138.67
  510  X=-953  Y=0  Z=10687.33
  511  X=0  Y=0  Z=10138.67
  512  X=0  Y=0  Z=10687.33
  513  X=953  Y=0  Z=10138.67
  514  X=953  Y=0  Z=10687.33
  515  X=1856  Y=0  Z=10138.67
  516  X=1856  Y=0  Z=10687.33
  517  X=2759  Y=0  Z=10138.67
  518  X=2759  Y=0  Z=10687.33
  519  X=3663  Y=0  Z=10138.67
  520  X=3663  Y=0  Z=10687.33
  521  X=4566  Y=0  Z=10138.67
  522  X=4566  Y=0  Z=10687.33
  523  X=5469  Y=0  Z=10138.67
  524  X=5469  Y=0  Z=10687.33
  525  X=6372  Y=0  Z=10138.67
  526  X=6372  Y=0  Z=10687.33
  527  X=7275  Y=0  Z=10138.67
  528  X=7275  Y=0  Z=10687.33
  529  X=8178  Y=0  Z=10138.67
  530  X=8178  Y=0  Z=10687.33
  531  X=9081  Y=0  Z=10138.67
  532  X=9081  Y=0  Z=10687.33
  533  X=9984  Y=0  Z=10138.67
  534  X=9984  Y=0  Z=10687.33
  535  X=10888  Y=0  Z=10138.67
  536  X=10888  Y=0  Z=10687.33
  541  X=11791  Y=0  Z=10138.67
  542  X=11791  Y=0  Z=10687.33
  543  X=12694  Y=0  Z=10138.67
  544  X=12694  Y=0  Z=10687.33
  545  X=13597  Y=0  Z=10138.67
  546  X=13597  Y=0  Z=10687.33

RESTRAINT
  ADD=16  DOF=U1,U2,U3,R1,R2,R3
  ADD=19  DOF=U1,U2,U3,R1,R2,R3
  ADD=31  DOF=U1,U2,U3,R1,R2,R3
```

```
  ADD=39  DOF=U1,U2,U3,R1,R2,R3
  ADD=48  DOF=U1,U2,U3,R1,R2,R3
  ADD=53  DOF=U1,U2,U3,R1,R2,R3
  ADD=55  DOF=U1,U2,U3,R1,R2,R3
  ADD=58  DOF=U2,R1,R3
  ADD=62  DOF=U2,R1,R3
  ADD=66  DOF=U2,R1,R3
  ADD=70  DOF=U2,R1,R3
  ADD=74  DOF=U2,R1,R3
  ADD=77  DOF=U2,R1,R3
  ADD=81  DOF=U2,R1,R3
  ADD=85  DOF=U2,R1,R3
  ADD=89  DOF=U2,R1,R3
  ADD=93  DOF=U2,R1,R3
  ADD=97  DOF=U2,R1,R3
  ADD=101  DOF=U2,R1,R3
  ADD=105  DOF=U2,R1,R3
  ADD=107  DOF=U1,U2,U3,R1,R2,R3
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    ADD=529  V=1.666667
    ADD=530  V=1.333333
    ADD=531  V=1.666667
    ADD=532  V=1.333333
    ADD=533  V=1.666667
    ADD=534  V=1.333333
    ADD=535  V=1.666667
    ADD=536  V=1.333333
    ADD=541  V=1.666667
    ADD=542  V=1.333333
    ADD=543  V=1.666667
    ADD=544  V=1.333333
    ADD=545  V=1.666667
    ADD=546  V=1.333333

MATERIAL
  NAME=1FR  IDES=N
    T=0  E=2.46475  U=.3  A=0
  NAME=STEEL  IDES=S  M=7.98142E-13
W=7.833414E-09
    T=0  E=20.38902  U=.3  A=.0000117
FY=2.531051E-02
  NAME=CONC  IDES=C  M=2.448E-13  W=2.4026E-09
    T=0  E=2.46475  U=.2  A=.0000099

FRAME SECTION
  NAME=1 MAT=CONC WPL=.0025 SH=R T=500,1000
A=500000 J=2.861003E+10
I=1.041667E+10,4.166667E+10 AS=416666.7,416666.7
  NAME=2 MAT=CONC WPL=.0025 SH=R T=500,1000
A=500000 J=2.861003E+10
I=1.041667E+10,4.166667E+10 AS=416666.7,416666.7
  NAME=3 MAT=CONC WPL=.0025 SH=R T=1000,1000
A=1000000 J=1.408333E+11
I=8.333334E+10,8.333334E+10 AS=833333.3,833333.3
  NAME=4 MAT=CONC SH=R T=1300,1000 A=1300000
J=2.294606E+11 I=1.830833E+11,1.083333E+11
AS=1083333,1083333

SHELL SECTION
  NAME=1  MAT=CONC    TYPE=Shell,Thick  TH=850
THB=1000

FRAME
  1  J=58,195  SEC=2  NSEG=4  ANG=0
  2  J=195,62  SEC=2  NSEG=4  ANG=0
  3  J=62,199  SEC=2  NSEG=4  ANG=0
  4  J=199,66  SEC=2  NSEG=4  ANG=0
  5  J=66,203  SEC=2  NSEG=4  ANG=0
  6  J=203,70  SEC=2  NSEG=4  ANG=0
  7  J=70,207  SEC=2  NSEG=4  ANG=0
  8  J=207,74  SEC=2  NSEG=4  ANG=0
  9  J=74,211  SEC=2  NSEG=4  ANG=0
  10  J=211,77  SEC=2  NSEG=4  ANG=0
  11  J=77,215  SEC=2  NSEG=4  ANG=0
  12  J=215,81  SEC=2  NSEG=4  ANG=0
  14  J=81,219  SEC=2  NSEG=4  ANG=0
  15  J=219,85  SEC=2  NSEG=4  ANG=0
  16  J=85,223  SEC=2  NSEG=4  ANG=0
  17  J=223,89  SEC=2  NSEG=4  ANG=0
  18  J=89,227  SEC=2  NSEG=4  ANG=0
  19  J=227,93  SEC=2  NSEG=4  ANG=0
  20  J=93,231  SEC=2  NSEG=4  ANG=0
  21  J=231,97  SEC=2  NSEG=4  ANG=0
  22  J=97,235  SEC=2  NSEG=4  ANG=0
  23  J=235,101  SEC=2  NSEG=4  ANG=0
  24  J=101,239  SEC=2  NSEG=4  ANG=0
  25  J=239,105  SEC=2  NSEG=4  ANG=0
  26  J=105,243  SEC=2  NSEG=4  ANG=0
  27  J=243,108  SEC=2  NSEG=4  ANG=0
  28  J=108,247  SEC=2  NSEG=4  ANG=0
  29  J=160,274  SEC=1  NSEG=4  ANG=180  IREL=R3
  30  J=274,275  SEC=1  NSEG=4  ANG=180
  31  J=275,276  SEC=1  NSEG=4  ANG=180
  33  J=247,112  SEC=2  NSEG=4  ANG=0
  34  J=112,251  SEC=2  NSEG=4  ANG=0
  35  J=251,116  SEC=2  NSEG=4  ANG=0
  36  J=116,255  SEC=2  NSEG=4  ANG=0
  37  J=255,122  SEC=2  NSEG=4  ANG=0
  38  J=276,58  SEC=1  NSEG=4  ANG=180
  39  J=122,282  SEC=1  NSEG=4  ANG=0
  40  J=282,280  SEC=1  NSEG=4  ANG=0
  41  J=280,278  SEC=1  NSEG=4  ANG=0
  42  J=278,181  SEC=1  NSEG=4  ANG=0  JREL=R3
  45  J=187,184  SEC=3  NSEG=4  ANG=0  JREL=R3
  46  J=89,187  SEC=3  NSEG=4  ANG=0
```



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  47  J=188,183  SEC=4  NSEG=4  ANG=0
  48  J=184,188  SEC=4  NSEG=4  ANG=0

SHELL
  1  J=215,81,56,1  SEC=1
  2  J=56,1,216,82  SEC=1
  3  J=219,85,137,138  SEC=1
  4  J=1,2,82,220  SEC=1
  5  J=340,14,342,15  SEC=1
  6  J=2,3,220,86  SEC=1
  7  J=145,144,13,12  SEC=1
  8  J=3,4,86,224  SEC=1
  9  J=14,16,15,19  SEC=1
  10  J=4,5,224,90  SEC=1
  12  J=5,6,90,228  SEC=1
  13  J=342,15,344,20  SEC=1
  14  J=6,7,228,94  SEC=1
  15  J=15,19,20,22  SEC=1
  16  J=7,8,94,232  SEC=1
  17  J=19,31,22,39  SEC=1
  18  J=8,9,232,98  SEC=1
  19  J=137,138,2,3  SEC=1
  20  J=344,20,346,23  SEC=1
  21  J=20,22,23,26  SEC=1
  22  J=22,39,26,157  SEC=1
  23  J=138,139,3,4  SEC=1
  24  J=349,28,350,29  SEC=1
  25  J=28,30,29,32  SEC=1
  26  J=34,35,24,59  SEC=1
  27  J=139,140,4,5  SEC=1
  28  J=35,36,59,196  SEC=1
  29  J=30,34,32,24  SEC=1
  30  J=36,49,196,63  SEC=1
  31  J=140,141,5,6  SEC=1
  32  J=49,50,63,200  SEC=1
  33  J=346,23,364,33  SEC=1
  34  J=23,26,33,38  SEC=1
  35  J=26,157,38,271  SEC=1
  36  J=364,33,366,41  SEC=1
  37  J=33,38,41,42  SEC=1
  38  J=38,271,42,272  SEC=1
  39  J=366,41,368,44  SEC=1
  40  J=41,42,44,45  SEC=1
  41  J=42,272,45,273  SEC=1
  42  J=50,51,200,67  SEC=1
  43  J=66,203,51,165  SEC=1
  44  J=51,165,67,204  SEC=1
  45  J=215,56,77  SEC=1
  46  J=77,56,78,216  SEC=1
  47  J=97,235,9,10  SEC=1
  48  J=9,10,98,236  SEC=1
  49  J=235,101,10  SEC=1
  50  J=10,101,236,102  SEC=1
  51  J=108,247,11  SEC=1
  52  J=108,11,109,248  SEC=1
  53  J=370,46,349,28  SEC=1
  54  J=13,12,123,40  SEC=1
  55  J=112,251,161  SEC=1
  56  J=46,47,28,30  SEC=1
  57  J=112,161,17,18  SEC=1
  58  J=47,133,30,34  SEC=1
  59  J=251,116,161,163  SEC=1
  60  J=368,44,372,52  SEC=1
  61  J=247,112,11,17  SEC=1
  62  J=11,17,248,113  SEC=1
  63  J=161,163,18,57  SEC=1
  64  J=17,18,113,252  SEC=1
  65  J=44,45,52,54  SEC=1
  66  J=18,57,252,117  SEC=1
  67  J=122,37,166,162  SEC=1
  68  J=57,120,117,256  SEC=1
  69  J=166,162,145,144  SEC=1
  70  J=120,13,256,123  SEC=1
  71  J=199,66,126  SEC=1
  72  J=126,66,50,51  SEC=1
  73  J=45,273,54,21  SEC=1
  74  J=372,52,378,61  SEC=1
  75  J=52,54,61,65  SEC=1
  76  J=54,21,65,259  SEC=1
  77  J=378,61,370,46  SEC=1
  78  J=61,65,46,47  SEC=1
  79  J=133,134,34,35  SEC=1
  80  J=157,160,271,274  SEC=1
  81  J=134,135,35,36  SEC=1
  82  J=271,274,272,275  SEC=1
  83  J=135,136,36,49  SEC=1
  84  J=62,199,136,126  SEC=1
  85  J=136,126,49,50  SEC=1
  86  J=81,219,137  SEC=1
  87  J=81,137,1,2  SEC=1
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  89  J=141,142,6,7  SEC=1
  90  J=93,231,142,143  SEC=1
  91  J=142,143,7,8  SEC=1
  92  J=231,97,143  SEC=1
  93  J=203,70,165  SEC=1
  94  J=165,70,204,71  SEC=1
  95  J=143,97,8,9  SEC=1
  96  J=163,164,57,120  SEC=1
  97  J=273,276,21,58  SEC=1
  98  J=164,145,120,13  SEC=1
  99  J=65,259,47,133  SEC=1
 100  J=350,29,386,69  SEC=1
 101  J=29,32,69,73  SEC=1
 102  J=32,24,73,470  SEC=1
 103  J=386,69,388,76  SEC=1
 104  J=69,73,76,80  SEC=1
 105  J=73,470,80,472  SEC=1
 106  J=388,76,390,84  SEC=1
 107  J=76,80,84,88  SEC=1
 108  J=80,472,88,27  SEC=1
 109  J=144,92,12,96  SEC=1
 110  J=92,100,96,104  SEC=1
 111  J=100,333,104,334  SEC=1
 113  J=85,223,170  SEC=1
 114  J=85,170,138,139  SEC=1
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 117  J=89,227,172,173  SEC=1
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 122  J=116,176,163,164  SEC=1
 123  J=48,111,53,121  SEC=1
 124  J=111,119,121,125  SEC=1
 125  J=119,352,125,355  SEC=1
 126  J=53,121,55,127  SEC=1
 127  J=21,58,259,260  SEC=1
 128  J=259,260,133,134  SEC=1
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 131  J=125,355,128,357  SEC=1
 132  J=181,180,278,277  SEC=1
 133  J=260,261,134,135  SEC=1
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 135  J=127,128,129,130  SEC=1
 136  J=278,277,280,279  SEC=1
 137  J=195,62,261  SEC=1
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 142  J=173,93,141,142  SEC=1
 143  J=255,122,176,166  SEC=1
 144  J=282,281,122,37  SEC=1
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 148  J=104,334,132,361  SEC=1
 149  J=37,146,162,147  SEC=1
 150  J=146,148,147,149  SEC=1
 151  J=148,373,149,374  SEC=1
 152  J=162,147,144,92  SEC=1
 153  J=147,149,92,100  SEC=1
 154  J=149,374,100,333  SEC=1
 155  J=180,129,277,150  SEC=1
 156  J=129,130,150,151  SEC=1
 157  J=130,359,151,379  SEC=1
 158  J=277,150,279,152  SEC=1
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 161  J=279,152,281,154  SEC=1
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 164  J=281,154,37,146  SEC=1
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 166  J=155,383,148,373  SEC=1
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 169  J=132,361,158,391  SEC=1
 170  J=473,156,475,159  SEC=1
 171  J=156,158,159,167  SEC=1
 172  J=158,391,167,393  SEC=1
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 175  J=167,393,169,395  SEC=1
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 196  J=207,74,208  SEC=1
 201  J=74,211,212  SEC=1
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 202  J=211,77,212,78  SEC=1
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 244  J=239,105,240  SEC=1
 249  J=105,243,244  SEC=1
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 307  J=123,40,474,473  SEC=1
 308  J=474,473,476,475  SEC=1
 309  J=476,475,124,43  SEC=1
 316  J=59,196,469,481  SEC=1
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 318  J=471,482,60,197  SEC=1
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 321  J=482,484,197,64  SEC=1
 322  J=63,200,483,485  SEC=1
 323  J=483,485,484,486  SEC=1
 324  J=484,486,64,201  SEC=1
 325  J=200,67,485,487  SEC=1
 326  J=485,487,486,488  SEC=1
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 328  J=67,204,487,489  SEC=1
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 336  J=492,494,72,209  SEC=1
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 345  J=498,500,213,79  SEC=1
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 366  J=512,514,91,229  SEC=1
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 390  J=528,530,106,245  SEC=1
 391  J=244,109,529,531  SEC=1
 392  J=529,531,530,532  SEC=1
 393  J=530,532,245,110  SEC=1
 394  J=109,248,531,533  SEC=1
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  396  J=532,534,110,249  SEC=1
  397  J=248,113,533,535  SEC=1
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  408  J=536,542,114,253  SEC=1
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  412  J=117,256,543,545  SEC=1
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  414  J=544,546,118,257  SEC=1
  415  J=256,123,545,474  SEC=1
  416  J=545,474,546,476  SEC=1
  417  J=546,476,257,124  SEC=1

LOAD
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      ADD=2  UZ=-1
      ADD=3  UZ=-1
      ADD=4  UZ=-1
      ADD=5  UZ=-1
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      ADD=46  UZ=-1
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      ADD=23  UZ=-1
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      ADD=25  UZ=-1
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      ADD=114  UZ=-1
      ADD=115  UZ=-1
      ADD=116  UZ=-1
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      ADD=332  UZ=-1
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  NAME=2
    TYPE=SURFACE PRESSURE  ELEM=SHELL  FACE=5
      ADD=1  P=.000001  PAT=EARTH
      ADD=2  P=.000001  PAT=EARTH
      ADD=3  P=.000001  PAT=EARTH
      ADD=4  P=.000001  PAT=EARTH
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      ADD=9  P=.000001  PAT=EARTH
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ADD=10 P=.000001 PAT=EARTH
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      ADD=410  P=.000001  PAT=EARTH
      ADD=411  P=.000001  PAT=EARTH
      ADD=412  P=.000001  PAT=EARTH
      ADD=413  P=.000001  PAT=EARTH
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      ADD=414  P=.000001  PAT=EARTH
      ADD=415  P=.000001  PAT=EARTH
      ADD=416  P=.000001  PAT=EARTH
      ADD=417  P=.000001  PAT=EARTH

COMBO
  NAME=1
    LOAD=1  SF=1
    LOAD=2  SF=1
  NAME=2
    LOAD=1  SF=1.3
    LOAD=2  SF=1.7

OUTPUT
  ELEM=JOINT  TYPE=DISP  LOAD=1
  ELEM=JOINT  TYPE=DISP  LOAD=2
  ELEM=JOINT  TYPE=DISP  COMB=1
  ELEM=JOINT  TYPE=DISP  COMB=2
  ELEM=JOINT  TYPE=REAC  LOAD=1
  ELEM=JOINT  TYPE=REAC  LOAD=2
  ELEM=JOINT  TYPE=REAC  COMB=1
  ELEM=JOINT  TYPE=REAC  COMB=2
  ELEM=JOINT  TYPE=APPL  LOAD=1
  ELEM=JOINT  TYPE=APPL  LOAD=2
  ELEM=JOINT  TYPE=APPL  COMB=1
  ELEM=JOINT  TYPE=APPL  COMB=2
  ELEM=FRAME  TYPE=FORCE  LOAD=1
  ELEM=FRAME  TYPE=FORCE  LOAD=2
  ELEM=FRAME  TYPE=FORCE  COMB=1
  ELEM=FRAME  TYPE=FORCE  COMB=2
  ELEM=SHELL  TYPE=FORCE  LOAD=1
  ELEM=SHELL  TYPE=FORCE  LOAD=2
  ELEM=SHELL  TYPE=FORCE  COMB=1
  ELEM=SHELL  TYPE=FORCE  COMB=2
  ELEM=SHELL  TYPE=STRESS  LOAD=1
  ELEM=SHELL  TYPE=STRESS  LOAD=2
  ELEM=SHELL  TYPE=STRESS  COMB=1
  ELEM=SHELL  TYPE=STRESS  COMB=2

END

; The following data is used for graphics, design
and pushover analysis.
; If changes are made to the analysis data above,
then the following data
; should be checked for consistency.
SAP2000 V7.10 SUPPLEMENTAL DATA
  GRID GLOBAL  X "1"  -12950
  GRID GLOBAL  Y "2"  0
  GRID GLOBAL  Z "3"  0
  GRID GLOBAL  X "4"  0
  GRID GLOBAL  X "5"  12950
  GRID GLOBAL  Z "6"  9739
  MATERIAL STEEL FY 2.531051E-02
  MATERIAL CONC FYREBAR 4.218418E-02 FYSHEAR
2.812279E-02 FC 2.812279E-03 FCSHEAR 2.812279E-03
  CONCRETESECTION 1 COLUMN  COVER 100 REBAR
RR-3-3
  CONCRETESECTION 2 COLUMN  COVER 206.2 REBAR
RR-3-3
  CONCRETESECTION 3 COLUMN  COVER 150 REBAR
RR-3-3
  CONCRETESECTION 4 COLUMN  COVER 140 REBAR
RR-3-3
  STATICLOAD 1 TYPE DEAD
  STATICLOAD 2 TYPE DEAD
END SUPPLEMENTAL DATA
```

```
; File D:\SAP2000DATA\게착식터널\설치.$2k saved
9-14-02 14:26:33 in Ton-mm

SYSTEM
  DOF=UX,UZ  LENGTH=mm  FORCE=Ton  LINES=59

JOINT
  1  X=-7225  Y=0  Z=0
  2  X=-6975  Y=0  Z=0
  3  X=-6725  Y=0  Z=0
  4  X=-7225  Y=0  Z=653
  5  X=-6975  Y=0  Z=653
  6  X=-6725  Y=0  Z=653
  7  X=-7225  Y=0  Z=1307
  8  X=-6975  Y=0  Z=1307
  9  X=-6725  Y=0  Z=1307
  10  X=-7225  Y=0  Z=1961
  11  X=-6975  Y=0  Z=1961
  12  X=-6725  Y=0  Z=1961
  13  X=-7225  Y=0  Z=2437
  14  X=-6957  Y=0  Z=2386
  15  X=-6690  Y=0  Z=2336
  16  X=-7225  Y=0  Z=2944
  17  X=-6906  Y=0  Z=2820
  18  X=-6587  Y=0  Z=2695
  19  X=-7225  Y=0  Z=3470
  20  X=-6832  Y=0  Z=3235
  21  X=-6438  Y=0  Z=3000
  22  X=-6178  Y=0  Z=4074
  23  X=-6020  Y=0  Z=3848
  24  X=-5861  Y=0  Z=3621
  25  X=-5221  Y=0  Z=4624
  26  X=-5169  Y=0  Z=4359
  27  X=-5117  Y=0  Z=4094
  28  X=-4134  Y=0  Z=5142
  29  X=-4134  Y=0  Z=4866
  30  X=-4134  Y=0  Z=4591
  31  X=-3100  Y=0  Z=5503
  32  X=-3100  Y=0  Z=5240
  33  X=-3100  Y=0  Z=4977
  34  X=-2067  Y=0  Z=5750
  35  X=-2067  Y=0  Z=5495
  36  X=-2067  Y=0  Z=5239
  37  X=-1033  Y=0  Z=5890
  38  X=-1033  Y=0  Z=5639
  39  X=-1033  Y=0  Z=5388
  40  X=0  Y=0  Z=5929
  41  X=0  Y=0  Z=5679
  42  X=0  Y=0  Z=5429
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  44  X=1033  Y=0  Z=5639
  45  X=1033  Y=0  Z=5388
  46  X=2067  Y=0  Z=5750
  47  X=2067  Y=0  Z=5495
  48  X=2067  Y=0  Z=5239
  49  X=3100  Y=0  Z=5503
  50  X=3100  Y=0  Z=5240
  51  X=3100  Y=0  Z=4977
  52  X=4134  Y=0  Z=5142
  53  X=4134  Y=0  Z=4866
  54  X=4134  Y=0  Z=4591
  55  X=5221  Y=0  Z=4624
  56  X=5169  Y=0  Z=4359
  57  X=5117  Y=0  Z=4094
  58  X=6178  Y=0  Z=4074
  59  X=6020  Y=0  Z=3848
  60  X=5861  Y=0  Z=3621
  61  X=7225  Y=0  Z=3470
  62  X=6832  Y=0  Z=3235
  63  X=6438  Y=0  Z=3000
  64  X=7225  Y=0  Z=2944
  65  X=6906  Y=0  Z=2820
  66  X=6587  Y=0  Z=2695
  67  X=7225  Y=0  Z=2437
  68  X=6957  Y=0  Z=2386
  69  X=6690  Y=0  Z=2336
  70  X=7225  Y=0  Z=1961
  71  X=6975  Y=0  Z=1961
  72  X=6725  Y=0  Z=1961
  73  X=7225  Y=0  Z=1307
  74  X=6975  Y=0  Z=1307
  75  X=6725  Y=0  Z=1307
  76  X=7225  Y=0  Z=653
  77  X=6975  Y=0  Z=653
  78  X=6725  Y=0  Z=653
  79  X=7225  Y=0  Z=0
  80  X=6975  Y=0  Z=0
  81  X=6725  Y=0  Z=0
```



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  101  X=-7225  Y=-500  Z=0
  102  X=-6975  Y=-500  Z=0
  103  X=-6725  Y=-500  Z=0
  104  X=-7225  Y=-500  Z=653
  105  X=-6975  Y=-500  Z=653
  106  X=-6725  Y=-500  Z=653
  107  X=-7225  Y=-500  Z=1307
  108  X=-6975  Y=-500  Z=1307
  109  X=-6725  Y=-500  Z=1307
  110  X=-7225  Y=-500  Z=1961
  111  X=-6975  Y=-500  Z=1961
  112  X=-6725  Y=-500  Z=1961
  113  X=-7225  Y=-500  Z=2437
  114  X=-6957  Y=-500  Z=2386
  115  X=-6690  Y=-500  Z=2336
  116  X=-7225  Y=-500  Z=2944
  117  X=-6906  Y=-500  Z=2820
  118  X=-6587  Y=-500  Z=2695
  119  X=-7225  Y=-500  Z=3470
  120  X=-6832  Y=-500  Z=3235
  121  X=-6438  Y=-500  Z=3000
  122  X=-6178  Y=-500  Z=4074
  123  X=-6020  Y=-500  Z=3848
  124  X=-5861  Y=-500  Z=3621
  125  X=-5221  Y=-500  Z=4624
  126  X=-5169  Y=-500  Z=4359
  127  X=-5117  Y=-500  Z=4094
  128  X=-4134  Y=-500  Z=5142
  129  X=-4134  Y=-500  Z=4866
  130  X=-4134  Y=-500  Z=4591
  131  X=-3100  Y=-500  Z=5503
  132  X=-3100  Y=-500  Z=5240
  133  X=-3100  Y=-500  Z=4977
  134  X=-2067  Y=-500  Z=5750
  135  X=-2067  Y=-500  Z=5495
  136  X=-2067  Y=-500  Z=5239
  137  X=-1033  Y=-500  Z=5890
  138  X=-1033  Y=-500  Z=5639
  139  X=-1033  Y=-500  Z=5388
  140  X=0  Y=-500  Z=5929
  141  X=0  Y=-500  Z=5679
  142  X=0  Y=-500  Z=5429
  143  X=1033  Y=-500  Z=5890
  144  X=1033  Y=-500  Z=5639
  145  X=1033  Y=-500  Z=5388
  146  X=2067  Y=-500  Z=5750
  147  X=2067  Y=-500  Z=5495
  148  X=2067  Y=-500  Z=5239
  149  X=3100  Y=-500  Z=5503
  150  X=3100  Y=-500  Z=5240
  151  X=3100  Y=-500  Z=4977
  152  X=4134  Y=-500  Z=5142
  153  X=4134  Y=-500  Z=4866
  154  X=4134  Y=-500  Z=4591
  155  X=5221  Y=-500  Z=4624
  156  X=5169  Y=-500  Z=4359
  157  X=5117  Y=-500  Z=4094
  158  X=6178  Y=-500  Z=4074
  159  X=6020  Y=-500  Z=3848
  160  X=5861  Y=-500  Z=3621
  161  X=7225  Y=-500  Z=3470
  162  X=6832  Y=-500  Z=3235
  163  X=6438  Y=-500  Z=3000
  164  X=7225  Y=-500  Z=2944
  165  X=6906  Y=-500  Z=2820
  166  X=6587  Y=-500  Z=2695
  167  X=7225  Y=-500  Z=2437
  168  X=6957  Y=-500  Z=2386
  169  X=6690  Y=-500  Z=2336
  170  X=7225  Y=-500  Z=1961
  171  X=6975  Y=-500  Z=1961
  172  X=6725  Y=-500  Z=1961
  173  X=7225  Y=-500  Z=1307
  174  X=6975  Y=-500  Z=1307
  175  X=6725  Y=-500  Z=1307
  176  X=7225  Y=-500  Z=653
  177  X=6975  Y=-500  Z=653
  178  X=6725  Y=-500  Z=653
  179  X=7225  Y=-500  Z=0
  180  X=6975  Y=-500  Z=0
  181  X=6725  Y=-500  Z=0
  201  X=-7225  Y=-1000  Z=0
  202  X=-6975  Y=-1000  Z=0
  203  X=-6725  Y=-1000  Z=0
  204  X=-7225  Y=-1000  Z=653
  205  X=-6975  Y=-1000  Z=653
  206  X=-6725  Y=-1000  Z=653
  207  X=-7225  Y=-1000  Z=1307
  208  X=-6975  Y=-1000  Z=1307
  209  X=-6725  Y=-1000  Z=1307
```

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  211  X=-6975  Y=-1000  Z=1961
  212  X=-6725  Y=-1000  Z=1961
  213  X=-7225  Y=-1000  Z=2437
  214  X=-6957  Y=-1000  Z=2386
  215  X=-6690  Y=-1000  Z=2336
  216  X=-7225  Y=-1000  Z=2944
  217  X=-6906  Y=-1000  Z=2820
  218  X=-6587  Y=-1000  Z=2695
  219  X=-7225  Y=-1000  Z=3470
  220  X=-6832  Y=-1000  Z=3235
  221  X=-6438  Y=-1000  Z=3000
  222  X=-6178  Y=-1000  Z=4074
  223  X=-6020  Y=-1000  Z=3848
  224  X=-5861  Y=-1000  Z=3621
  225  X=-5221  Y=-1000  Z=4624
  226  X=-5169  Y=-1000  Z=4359
  227  X=-5117  Y=-1000  Z=4094
  228  X=-4134  Y=-1000  Z=5142
  229  X=-4134  Y=-1000  Z=4866
  230  X=-4134  Y=-1000  Z=4591
  231  X=-3100  Y=-1000  Z=5503
  232  X=-3100  Y=-1000  Z=5240
  233  X=-3100  Y=-1000  Z=4977
  234  X=-2067  Y=-1000  Z=5750
  235  X=-2067  Y=-1000  Z=5495
  236  X=-2067  Y=-1000  Z=5239
  237  X=-1033  Y=-1000  Z=5890
  238  X=-1033  Y=-1000  Z=5639
  239  X=-1033  Y=-1000  Z=5388
  240  X=0  Y=-1000  Z=5929
  241  X=0  Y=-1000  Z=5679
  242  X=0  Y=-1000  Z=5429
  243  X=1033  Y=-1000  Z=5890
  244  X=1033  Y=-1000  Z=5639
  245  X=1033  Y=-1000  Z=5388
  246  X=2067  Y=-1000  Z=5750
  247  X=2067  Y=-1000  Z=5495
  248  X=2067  Y=-1000  Z=5239
  249  X=3100  Y=-1000  Z=5503
  250  X=3100  Y=-1000  Z=5240
  251  X=3100  Y=-1000  Z=4977
  252  X=4134  Y=-1000  Z=5142
  253  X=4134  Y=-1000  Z=4866
  254  X=4134  Y=-1000  Z=4591
  255  X=5221  Y=-1000  Z=4624
  256  X=5169  Y=-1000  Z=4359
  257  X=5117  Y=-1000  Z=4094
  258  X=6178  Y=-1000  Z=4074
  259  X=6020  Y=-1000  Z=3848
  260  X=5861  Y=-1000  Z=3621
  261  X=7225  Y=-1000  Z=3470
  262  X=6832  Y=-1000  Z=3235
  263  X=6438  Y=-1000  Z=3000
  264  X=7225  Y=-1000  Z=2944
  265  X=6906  Y=-1000  Z=2820
  266  X=6587  Y=-1000  Z=2695
  267  X=7225  Y=-1000  Z=2437
  268  X=6957  Y=-1000  Z=2386
  269  X=6690  Y=-1000  Z=2336
  270  X=7225  Y=-1000  Z=1961
  271  X=6975  Y=-1000  Z=1961
  272  X=6725  Y=-1000  Z=1961
  273  X=7225  Y=-1000  Z=1307
  274  X=6975  Y=-1000  Z=1307
  275  X=6725  Y=-1000  Z=1307
  276  X=7225  Y=-1000  Z=653
  277  X=6975  Y=-1000  Z=653
  278  X=6725  Y=-1000  Z=653
  279  X=7225  Y=-1000  Z=0
  280  X=6975  Y=-1000  Z=0
  281  X=6725  Y=-1000  Z=0
  301  X=-7225  Y=-1500  Z=0
  302  X=-6975  Y=-1500  Z=0
  303  X=-6725  Y=-1500  Z=0
  304  X=-7225  Y=-1500  Z=653
  305  X=-6975  Y=-1500  Z=653
  306  X=-6725  Y=-1500  Z=653
  307  X=-7225  Y=-1500  Z=1307
  308  X=-6975  Y=-1500  Z=1307
  309  X=-6725  Y=-1500  Z=1307
  310  X=-7225  Y=-1500  Z=1961
  311  X=-6975  Y=-1500  Z=1961
  312  X=-6725  Y=-1500  Z=1961
  313  X=-7225  Y=-1500  Z=2437
  314  X=-6957  Y=-1500  Z=2386
  315  X=-6690  Y=-1500  Z=2336
  316  X=-7225  Y=-1500  Z=2944
  317  X=-6906  Y=-1500  Z=2820
  318  X=-6587  Y=-1500  Z=2695
```



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  319  X=-7225  Y=-1500  Z=3470
  320  X=-6832  Y=-1500  Z=3235
  321  X=-6438  Y=-1500  Z=3000
  322  X=-6178  Y=-1500  Z=4074
  323  X=-6020  Y=-1500  Z=3848
  324  X=-5861  Y=-1500  Z=3621
  325  X=-5221  Y=-1500  Z=4624
  326  X=-5169  Y=-1500  Z=4359
  327  X=-5117  Y=-1500  Z=4094
  328  X=-4134  Y=-1500  Z=5142
  329  X=-4134  Y=-1500  Z=4866
  330  X=-4134  Y=-1500  Z=4591
  331  X=-3100  Y=-1500  Z=5503
  332  X=-3100  Y=-1500  Z=5240
  333  X=-3100  Y=-1500  Z=4977
  334  X=-2067  Y=-1500  Z=5750
  335  X=-2067  Y=-1500  Z=5495
  336  X=-2067  Y=-1500  Z=5239
  337  X=-1033  Y=-1500  Z=5890
  338  X=-1033  Y=-1500  Z=5639
  339  X=-1033  Y=-1500  Z=5388
  340  X=0  Y=-1500  Z=5929
  341  X=0  Y=-1500  Z=5679
  342  X=0  Y=-1500  Z=5429
  343  X=1033  Y=-1500  Z=5890
  344  X=1033  Y=-1500  Z=5639
  345  X=1033  Y=-1500  Z=5388
  346  X=2067  Y=-1500  Z=5750
  347  X=2067  Y=-1500  Z=5495
  348  X=2067  Y=-1500  Z=5239
  349  X=3100  Y=-1500  Z=5503
  350  X=3100  Y=-1500  Z=5240
  351  X=3100  Y=-1500  Z=4977
  352  X=4134  Y=-1500  Z=5142
  353  X=4134  Y=-1500  Z=4866
  354  X=4134  Y=-1500  Z=4591
  355  X=5221  Y=-1500  Z=4624
  356  X=5169  Y=-1500  Z=4359
  357  X=5117  Y=-1500  Z=4094
  358  X=6178  Y=-1500  Z=4074
  359  X=6020  Y=-1500  Z=3848
  360  X=5861  Y=-1500  Z=3621
  361  X=7225  Y=-1500  Z=3470
  362  X=6832  Y=-1500  Z=3235
  363  X=6438  Y=-1500  Z=3000
  364  X=7225  Y=-1500  Z=2944
  365  X=6906  Y=-1500  Z=2820
  366  X=6587  Y=-1500  Z=2695
  367  X=7225  Y=-1500  Z=2437
  368  X=6957  Y=-1500  Z=2386
  369  X=6690  Y=-1500  Z=2336
  370  X=7225  Y=-1500  Z=1961
  371  X=6975  Y=-1500  Z=1961
  372  X=6725  Y=-1500  Z=1961
  373  X=7225  Y=-1500  Z=1307
  374  X=6975  Y=-1500  Z=1307
  375  X=6725  Y=-1500  Z=1307
  376  X=7225  Y=-1500  Z=653
  377  X=6975  Y=-1500  Z=653
  378  X=6725  Y=-1500  Z=653
  379  X=7225  Y=-1500  Z=0
  380  X=6975  Y=-1500  Z=0
  381  X=6725  Y=-1500  Z=0
  400  X=0  Y=-750  Z=17000

RESTRAINT
  ADD=400  DOF=U1,U2,U3,R1,R2,R3

PATTERN
  NAME=TEMP
  NAME=PRES

MATERIAL
  NAME=STEEL  IDES=S  M=7.981E-13
    T=0  E=20.38902  U=.3  A=.0000117
FY=2.531051E-02
  NAME=CONC  IDES=C  M=2.448E-13  W=2.5E-09
    T=0  E=3  U=.2  A=.0000099

FRAME SECTION
  NAME=FSEC1 MAT=CONC SH=R T=500,300 A=672500
J=2.817371E+09 I=3.125E+09,1.125E+09
AS=125000,125000
  NAME=CABLE MAT=STEEL SH=P T=30,14 A=703.7167
J=79519.99 I=39759.99,39759.99
AS=614.5792,614.5792

FRAME
  1  J=400,125  SEC=CABLE  NSEG=2  ANG=-44.34524
IREL=R2,R3
```

```
  2  J=400,225  SEC=CABLE  NSEG=2  ANG=44.34524
IREL=R2,R3
  3  J=400,158  SEC=CABLE  NSEG=2  ANG=-73.48468
IREL=R2,R3
  4  J=400,258  SEC=CABLE  NSEG=2  ANG=73.48468
IREL=R2,R3

SOLID
  1  J=1,2,4,5,101,102,104,105  MAT=CONC  I=Y
  2  J=2,3,5,6,102,103,105,106  MAT=CONC  I=Y
  3  J=4,5,7,8,104,105,107,108  MAT=CONC  I=Y
  4  J=5,6,8,9,105,106,108,109  MAT=CONC  I=Y
  5  J=7,8,10,11,107,108,110,111  MAT=CONC  I=Y
  6  J=8,9,11,12,108,109,111,112  MAT=CONC  I=Y
  7  J=10,11,13,14,110,111,113,114  MAT=CONC  I=Y
  8  J=11,12,14,15,111,112,114,115  MAT=CONC  I=Y
  9  J=13,14,16,17,113,114,116,117  MAT=CONC  I=Y
  10  J=14,15,17,18,114,115,117,118  MAT=CONC
I=Y
  11  J=16,17,19,20,116,117,119,120  MAT=CONC
I=Y
  12  J=17,18,20,21,117,118,120,121  MAT=CONC
I=Y
  13  J=19,20,22,23,119,120,122,123  MAT=CONC
I=Y
  14  J=20,21,23,24,120,121,123,124  MAT=CONC
I=Y
  15  J=22,23,25,26,122,123,125,126  MAT=CONC
I=Y
  16  J=23,24,26,27,123,124,126,127  MAT=CONC
I=Y
  17  J=25,26,28,29,125,126,128,129  MAT=CONC
I=Y
  18  J=26,27,29,30,126,127,129,130  MAT=CONC
I=Y
  19  J=28,29,31,32,128,129,131,132  MAT=CONC
I=Y
  20  J=29,30,32,33,129,130,132,133  MAT=CONC
I=Y
  21  J=31,32,34,35,131,132,134,135  MAT=CONC
I=Y
  22  J=32,33,35,36,132,133,135,136  MAT=CONC
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  23  J=34,35,37,38,134,135,137,138  MAT=CONC
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  24  J=35,36,38,39,135,136,138,139  MAT=CONC
I=Y
  25  J=37,38,40,41,137,138,140,141  MAT=CONC
I=Y
  26  J=38,39,41,42,138,139,141,142  MAT=CONC
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  27  J=40,41,43,44,140,141,143,144  MAT=CONC
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  28  J=41,42,44,45,141,142,144,145  MAT=CONC
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  34  J=50,51,53,54,150,151,153,154  MAT=CONC
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  38  J=56,57,59,60,156,157,159,160  MAT=CONC
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  39  J=58,59,61,62,158,159,161,162  MAT=CONC
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  40  J=59,60,62,63,159,160,162,163  MAT=CONC
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  41  J=61,62,64,65,161,162,164,165  MAT=CONC
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  42  J=62,63,65,66,162,163,165,166  MAT=CONC
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  43  J=64,65,67,68,164,165,167,168  MAT=CONC
I=Y
  44  J=65,66,68,69,165,166,168,169  MAT=CONC
I=Y
  45  J=67,68,70,71,167,168,170,171  MAT=CONC
I=Y
  46  J=68,69,71,72,168,169,171,172  MAT=CONC
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  47  J=70,71,73,74,170,171,173,174  MAT=CONC
I=Y
  48  J=71,72,74,75,171,172,174,175  MAT=CONC
I=Y
  49  J=73,74,76,77,173,174,176,177  MAT=CONC
I=Y
  50  J=74,75,77,78,174,175,177,178  MAT=CONC
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  51  J=76,77,79,80,176,177,179,180  MAT=CONC
I=Y
  52  J=77,78,80,81,177,178,180,181  MAT=CONC
I=Y
  53  J=101,102,104,105,201,202,204,205  MAT=CONC
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  54  J=102,103,105,106,202,203,205,206  MAT=CONC
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  55  J=104,105,107,108,204,205,207,208  MAT=CONC
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  76  J=135,136,138,139,235,236,238,239  MAT=CONC
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  84  J=147,148,150,151,247,248,250,251  MAT=CONC
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  85  J=149,150,152,153,249,250,252,253  MAT=CONC
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  86  J=150,151,153,154,250,251,253,254  MAT=CONC
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  88  J=153,154,156,157,253,254,256,257  MAT=CONC
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  89  J=155,156,158,159,255,256,258,259  MAT=CONC
I=Y
  90  J=156,157,159,160,256,257,259,260  MAT=CONC
I=Y
  91  J=158,159,161,162,258,259,261,262  MAT=CONC
```

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I=Y
  92  J=159,160,162,163,259,260,262,263  MAT=CONC
I=Y
  93  J=161,162,164,165,261,262,264,265  MAT=CONC
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  95  J=164,165,167,168,264,265,267,268  MAT=CONC
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  122  J=226,227,229,230,326,327,329,330
MAT=CONC  I=Y
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  124  J=229,230,232,233,329,330,332,333
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  136  J=247,248,250,251,347,348,350,351
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  150  J=268,269,271,272,368,369,371,372
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  152  J=271,272,274,275,371,372,374,375
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MAT=CONC  I=Y
  154  J=274,275,277,278,374,375,377,378
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  155  J=276,277,279,280,376,377,379,380
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  156  J=277,278,280,281,377,378,380,381
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LOAD
  NAME=LOAD1  SW=1

OUTPUT
; No Output Requested

END

; The following data is used for graphics, design
and pushover analysis.
; If changes are made to the analysis data above,
then the following data
; should be checked for consistency.
SAP2000 V7.10 SUPPLEMENTAL DATA
  GRID GLOBAL  X "1"  -2790
  GRID GLOBAL  X "2"  0
  GRID GLOBAL  X "3"  2790
  GRID GLOBAL  Y "4"  -1200
  GRID GLOBAL  Y "5"  -819
  GRID GLOBAL  Y "6"  -381
  GRID GLOBAL  Y "7"  0
  GRID GLOBAL  Z "8"  0
  GRID GLOBAL  Z "9"  1200
  MATERIAL STEEL FY 2.531051E-02
  MATERIAL CONC FYREBAR .04 FYSHEAR 2.812279E-02
FC .004 FCSHEAR 2.812279E-03
  CONCRETESECTION FSEC1 COLUMN  COVER 50 REBAR
RR-3-3
  STATICLOAD LOAD1 TYPE DEAD
END SUPPLEMENTAL DATA
```

```
; File D:\SAP2000DATA\개착식터널\인양.$2k saved
9-27-02 9:12:46 in Kgf-cm

SYSTEM
  DOF=UX,UZ  LENGTH=cm  FORCE=Kgf  LINES=59

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  3  X=-672.5  Y=0  Z=0
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  6  X=-672.5  Y=65.3  Z=0
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  17  X=-690.6  Y=282  Z=0
  18  X=-658.7  Y=269.5  Z=0
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  30  X=-413.4  Y=459.1  Z=0
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  322  X=-617.8  Y=407.4  Z=150
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  336  X=-206.7  Y=523.9  Z=150
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  354  X=413.4  Y=459.1  Z=150
  355  X=522.1  Y=462.4  Z=150
  356  X=516.9  Y=435.9  Z=150
  357  X=511.7  Y=409.4  Z=150
  358  X=617.8  Y=407.4  Z=150
  359  X=602  Y=384.8  Z=150
  360  X=586.1  Y=362.1  Z=150
  361  X=722.5  Y=347  Z=150
  362  X=683.2  Y=323.5  Z=150
  363  X=643.8  Y=300  Z=150
  364  X=722.5  Y=294.4  Z=150
  365  X=690.6  Y=282  Z=150
  366  X=658.7  Y=269.5  Z=150
  367  X=722.5  Y=243.7  Z=150
  368  X=695.7  Y=238.6  Z=150
  369  X=669  Y=233.6  Z=150
  370  X=722.5  Y=196.1  Z=150
  371  X=697.5  Y=196.1  Z=150
  372  X=672.5  Y=196.1  Z=150
  373  X=722.5  Y=130.7  Z=150
  374  X=697.5  Y=130.7  Z=150
  375  X=672.5  Y=130.7  Z=150
  376  X=722.5  Y=65.3  Z=150
  377  X=697.5  Y=65.3  Z=150
  378  X=672.5  Y=65.3  Z=150
  379  X=722.5  Y=0  Z=150
  380  X=697.5  Y=0  Z=150
  381  X=672.5  Y=0  Z=150
  400  X=0  Y=383.8  Z=1200

RESTRAINT
  ADD=400  DOF=U1,U2,U3,R1,R2,R3

PATTERN
  NAME=TEMP
  NAME=PRES

MATERIAL
  NAME=STEEL  IDES=S  M=7.981E-06
    T=0  E=2038902  U=.3  A=.0000117  FY=2531.051
  NAME=CONC  IDES=C  M=2.448E-06  W=.0025
    T=0  E=300000  U=.2  A=.0000099

FRAME SECTION
  NAME=FSEC1 MAT=CONC SH=R T=50,30 A=7600
J=281737.1 I=312500,112500 AS=1250,1250
  NAME=CABLE MAT=STEEL SH=P T=3,1.4 A=7.037167
J=7.951999 I=3.975999,3.975999
AS=6.145792,6.145792

FRAME
  1  J=400,311  SEC=CABLE  NSEG=2  ANG=0
IREL=R2,R3
  2  J=400,332  SEC=CABLE  NSEG=2  ANG=0
IREL=R2,R3
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  3  J=400,350  SEC=CABLE  NSEG=2  ANG=0
IREL=R2,R3
  4  J=400,371  SEC=CABLE  NSEG=2  ANG=0
IREL=R2,R3

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  2  J=2,3,5,6,102,103,105,106  MAT=CONC  I=Y
  3  J=4,5,7,8,104,105,107,108  MAT=CONC  I=Y
  4  J=5,6,8,9,105,106,108,109  MAT=CONC  I=Y
  5  J=7,8,10,11,107,108,110,111  MAT=CONC  I=Y
  6  J=8,9,11,12,108,109,111,112  MAT=CONC  I=Y
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OUTPUT
; No Output Requested

END

; The following data is used for graphics, design
and pushover analysis.
; If changes are made to the analysis data above,
then the following data
; should be checked for consistency.
SAP2000 V7.10 SUPPLEMENTAL DATA
  GRID GLOBAL  X "1"  -279
  GRID GLOBAL  X "2"  0
  GRID GLOBAL  X "3"  279
  GRID GLOBAL  Y "4"  -120
  GRID GLOBAL  Y "5"  -81.9
  GRID GLOBAL  Y "6"  -38.1
  GRID GLOBAL  Y "7"  0
  GRID GLOBAL  Z "8"  0
  GRID GLOBAL  Z "9"  120
  MATERIAL STEEL FY 2531.051
  MATERIAL CONC FYREBAR 4000 FYSHEAR 2812.279 FC
400 FCSHEAR 281.2279
  CONCRETESECTION FSEC1 COLUMN  COVER 5 REBAR
RR-3-3
  STATICLOAD LOAD1 TYPE DEAD
END SUPPLEMENTAL DATA
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