Project Narratives
And Calculations

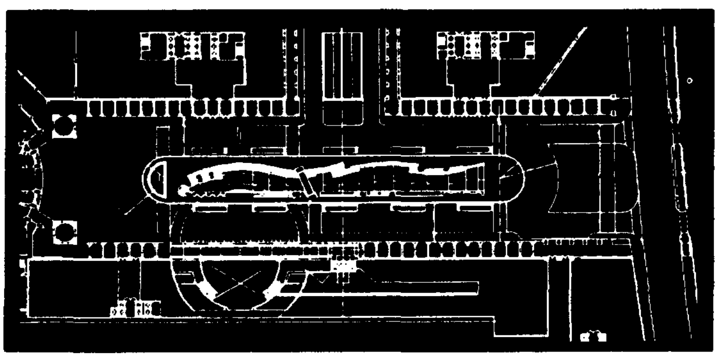
GATEWAY CENTER

Stage-1 Parking Garage
Metrorail Interface

Southern California Rapid Transit District
425 Main Street
Los Angeles, CA 90013

Catellus Development Corporation
800 North Alameda Street, Suite 101
Los Angeles, CA 90012

Charles Pankow Builders
2476 North Lake Avenue
Altadena, CA 91001



09 September 1992

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Gateway Center Stage 1
Metrorail Interface

Project Narratives and Calculations

09 September 1992

Two sets of documents and narratives have been developed by EEA and consultants to illustrate the interface between the existing Metro Rail station and the Gateway Center public transit improvements. The *access and egress* set describes fire truck access and maintaining emergency egress during phases of construction. The *new construction* set addresses the specific interfacing between the Gateway Center project and the Metro Rail station.

The Gateway Center public transit improvements consist of three separate project elements:

1. Public parking structure: Four levels of subterranean parking for 1100 cars in stage 1, 1900 cars in stage 2. The upper P1 level spans over the Metro Rail structure. The lower three levels; P2, P3 and P4 are truncated on both sides of the Metro Rail station. The structure is a combination of cast-in-place and precast reinforced concrete columns, beams and slab. The structure is Type I fire resistant with automatic fire sprinklers.

2. Metro Plaza: A landscaped bus plaza that serves as the roof of the Stage I Garage. The landscaped center median is a sloped pedestrian path connecting bus riders at plaza level to East Portal P1 level.

3. East Portal: A transit lobby connecting the Metro Rail east entrance, existing passenger tunnel and bus plaza at two levels (P1 and Plaza levels). The East Portal is located on the east side of the Metro Plaza and Garage.

Because the bus plaza and P1 level of the public garage spans over the Metro Rail station, its air intake and emergency exiting has been relocated for improved air quality and egress safety.

The following set of drawings and calculations will illustrate interfacing of mechanical systems (intake and exhaust), structural systems and emergency egress through the Gateway Center project.

Prior to and during construction of Gateway Center, some temporary construction will be required to insure the opening and operation of the Metro Rail station. This will include access roads for fire department and service, relocation of utilities and egress structure from the Metro Rail station.

The access roads will be staged to allow for uninterrupted service to the Metro Rail station. The utility relocation will occur during realignment of Vignes Street. Minimal interruption of service is anticipated during switchover. Egress routes from the Metro Rail station via temporary bridges and stairs insure safe passage through construction site.

The following set of drawings and narratives will illustrate access and egress from the Metro Rail station prior to and during construction.

Site Access & Egress Drawing List

A-1.0	*SITE UTILITIES EXISTING LOCATION*
A-1.1	*SITE UTILITIES NEW \ RELOCATED*
A-2.0	*TEMPORARY SITE ACCESS FIRST STAGE*
A-2.1	*TEMPORARY SITE ACCESS SECOND STAGE*
A-2.2	*TEMPORARY BRIDGE AND EGRESS*
A-3.0	*METRORAIL EGRESS ROUTE P1 LEVEL*
A-3.1	*METRORAIL EGRESS ROUTE PLAZA LEVEL*

New Construction Drawing List

A-1.0	*PLAZA LEVEL KEY PLAN*
A-1.1	*P1 LEVEL KEY PLAN*
A-2.0	*EMERGENCY EXIT AT EAST ENTRANCE EXISTING*
A-2.1	*EQUIPMENT HATCH \ EXHAUST SHAFT EXISTING*
A-2.2	*AIR IN-TAKE SHAFT \ EMERG. STAIR EXISTING*
A-3.0	*EMERGENCY EXIT STAIR @ E. ENTRANCE*
A-3.1	*EMERGENCY EXIT \ IN-TAKE SHAFT @ ANCILLARY SPACES*
A-3.2	*EQUIPMENT HATCH \ VERTICAL ACCESS*
A-3.3	*EXHAUST SHAFT, TUNNEL PLANS AND SECTION*
A-3.4	*EXHAUST TUNNEL SECTION*

STRUCTURAL CALCULATIONS

GATEWAY CENTER

METRO RAIL INTERFACE

SUBMITTED BY,

[signature]

JAMES S. LAI
SE 1566

MARTIN & HUANG INTERNATIONAL INC.

Architect: EHRENKRANTZ & ECKSTUT Sheet: 11.1 of ____
Project: GATEWAY CENTER Job no.: 9116
Date: 8/10/91
METRO RAIL INTERFACE Engineer: JSL

PLAZA DECK OVER EXISTING CROSSOVER STRUCTURE
ONE SUPPORTED DECK ON THE EXISTING ROOF SLAB

LOAD:

NON-STRUC. TOPPING	60		
8" CONC. SLAB	100		
BEAMS	55		
GIRDERS	30		
DUCTS & PIPING	5		
DL	250 #/SF		250
LL 250 × 0.80	200		160
	450 #/SF		510

CONC. LOAD FOR 30×40' BAY

$P = (200+250) \times 30 \times 40.83 = 612^k$

OR $(150+160)$ " $= 502^k$

Limiting capacity at top slab

$P = 500 + \frac{3100-2410}{4271-2410} \times 500 = 685^k > 612^k$

↳ interpolation from Computer Calc. OK

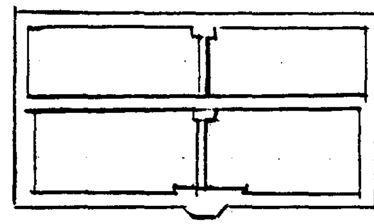
ANALYSIS BASED ON 6' SURCHARGE PLUS PASSIVE AT FOUNDATION LEVEL OF NEW STRUCTURE.

MARTIN & HUANG
MARTIN & HUANG INTERNATIONAL INC.

Architect ______ Sheet 1/12 of ____
Project METRO PLAZA & GARAGE Job no. 9116
Date 9/3/91
SCRTD CROSSOVER Engineer JBC

REF. MRTC CONTRACT A130 SHT. 201, 223

SEGMENT BTW. STA. 99+94.32 & 101+47.55



NOMINAL CAPACITY OF ROOF SLAB:-
TRANSV. DIRECTION

$d = 42.0 - 2.0 - 0.6 = 39.4''$

$+\rho = \frac{1.56}{39.4 \times 12} = 0.00330$ #8@6

$f'_c = 4.0$ ksi

$-\rho = \frac{2.00}{39.4 \times 12} = 0.00423$ #9@6 $f_y = 60$ ksi

$M_n = \left[A_s f_y d \left(1 - 0.59 \rho \frac{f_y}{f'_c} \right) \right]$

$+M_n)_x = 1.56 \times 60 (39.4)\left(1 - 0.59 \times 0.00330 \frac{60}{4}\right) = 3580 \frac{k\text{-}in}{ft}$

$= 298.3 \frac{k\text{-}ft}{ft}$

$-M_n)_x = 2.00 \times 60 (39.4)\left(1 - 0.59 \times 0.00423 \times \frac{60}{4}\right) = 4551 \frac{k\text{-}in}{ft}$

$= 379.2 \frac{k\text{-}ft}{ft}$

LONGITUDINAL DIRECTION #7@12

$d = 42.0 - 2.0 - 1.2 - 0.4 = 38.4''$

$\pm\rho = \frac{0.60}{38.4 \times 12} = 0.00130$

$M_n)_y = 0.60 \times 60 (38.4)\left(1 - 0.59 \times 0.00130 \times \frac{60}{4}\right) = 1366 \frac{k\text{-}in}{ft}$

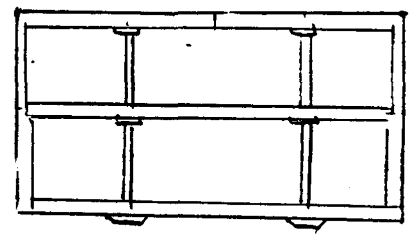
$= 113.8 \frac{k\text{-}ft}{ft}$

1800 Wilshire Boulevard, Suite 300, Los Angeles, California 90057 (213) 483-4916 Telex 67-3104 Fax 483-9757

REF. MRTC CONTRACT A130 SHT. 201, 222

SEGMENT BTW. STA. 98+69.65 TO STA 99+94.31

NOMINAL CAPACITY OF ROOF SLAB - TRANSV. DIRECTION



AT COL. SUPPORT #9@6

$-M_{n/x} = 4551 \frac{k\text{-}in}{ft} = 379.2 \frac{k\text{-}in}{ft}$

AT END SPAN #7@6 $d = 42.0 - 2.0 - 0.5 = 39.5''$

$+M_{n/x} = 1.20 \times 60 (39.5)(1 - 0.59 \times 0.00253 \times \frac{60}{4}) = 2780$ k-in/ft

$= 231.7$ k-ft/ft

AT INT. SPAN #8@6

$+M_{n/x} = 3580 \frac{k\text{-}in}{ft} = 298.3$ k-ft/ft

LONGITUDINAL DIRECTION #7@12

$\pm M_{n/y} = 1366$ k-in/ft $= 113.8$ k-ft/ft

```
pppppp    ccccc    aaaaa
p     p  c     c  a     a
p     p  c     c        a
p     p  c          aaaaaa
p     p  c     c  a     a
pppppp   c     c  a     a
p         ccccc    aaaaaa
```

```
  AAA     DDDDD      OOO      SSSSS    SSSSS
 A   A    D    D    O   O    S     S  S     S
A     A   D     D  O     O   S        S
AAAAAAA   D     D  O     O    SSSSS    SSSSS
A     A   D     D  O     O         S        S    ( ttttt mm    mm  )
A     A   D    D    O   O    S     S  S     S   (    t   m  m  m  m  )
A     A   DDDDD      OOO      SSSSS    SSSSS     (    t   m   m   m  )
```

****

Computer program for ANALYSIS AND DESIGN OF SLAB SYSTEMS

****

CHECK ORIGINAL DESIGN :—
LOADING CRITERIA - 8 FT. SOIL @ 130 PCF = 1040 #/F.
LIVE LOAD = 300 #/FT.

FILE NAME	MRTC138.IN
PROJECT ID.	RTD A130 CROSSOVER
SPAN ID.	LINE 5.5 - UNIF
ENGINEER	LAI
DATE	09-08-91
TIME	14:43
UNITS	U.S. in-lb
CODE	ACI 318-89
SLAB SYSTEM	CONTINUOUS BEAM
FRAME LOCATION	INTERIOR
DESIGN METHOD	STRENGTH DESIGN
SEISMIC RISK	NONE OR LOW
NUMBER OF SPANS	4

CONCRETE FACTORS		SLABS	BEAMS	COLUMNS
DENSITY(PCF)		150.0	150.0	150.0
TYPE		NORMAL WGT	NORMAL WGT	NORMAL WGT
f'c	(KSI)	4.0	4.0	4.0
fct	(PSI)	423.7	423.7	423.7
fr	(PSI)	474.3	474.3	474.3

REINFORCEMENT DETAILS: NON-PRESTRESSED
YIELD STRENGTH (flexural) Fy = 60.00 KSI
YIELD STRENGTH (stirrups) Fyv = 40.00 KSI
DISTANCE TO RF CENTER FROM TENSION FACE:
AT BEAM SUPPORT = 2.70 IN
IN BEAM SPAN = 2.50 IN

FLEXURAL BAR SIZES:	MINIMUM	MAXIMUM
AT BEAM SUPPORT =	# 5	#11
IN BEAM SPAN =	# 5	#11

MINIMUM SPACING:
IN BEAM = 6.00 IN

SPAN/LOADING DATA

SPAN NUMBER	LENGTH L1 (FT)	Tslab (IN)	WIDTH LEFT (FT)	L2*** RIGHT (FT)	SLAB SYSTEM	DESIGN STRIP (FT)	COLUMN STRIP** (FT)	UNIFORM_LOADS S. DL (PSF)	LIVE (PSF)
1*	1.3	42.0	10.0	10.0	5	20.0	20.0	1040.0	300.0
2	34.8	42.0	10.0	10.0	5	20.0	20.0	1040.0	300.0
3	37.0	42.0	10.0	10.0	5	20.0	20.0	1040.0	300.0
4*	1.3	42.0	10.0	10.0	5	20.0	20.0	1040.0	300.0

* -Indicates cantilever span information.
** -Strip width used for positive flexure.
***-L2 widths are 1/2 dist. to transverse column.
"E"-Indicates exterior strip.

PARTIAL LOADING DATA

SPAN No.	LOAD No.	TYPE	PARTIAL_DEAD_LOADS Wa	Wb	La	Lb	LOAD No.	TYPE	PARTIAL_LIVE_LOADS Wa	Wb	La	Lb
1*												
2	1	CONC	.0	.0	6.8	.0	1	CONC	.0	.0	6.8	.0
3	1	CONC	.0	.0	23.0	.0	1	CONC	.0	.0	23.0	.0
4*												

* -Indicates cantilever span information.

UNITS FOR:

UNIFORM LOAD: Wa.......PLF La & Lb... FT
CONCENTRATED LOAD: Wa.......KIPS La........ FT
TRAPEZOIDAL LOAD: Wa & Wb..PLF La & Lb... FT
MOMENT: Wa.......FT-K La........ FT

NOTE: Local effects of partial loadings are NOT considered by ADOSS, compute manually.

BEAMS ALONG SPAN DATA
****

SPAN NUMBER	BEAM WIDTH (IN)	BEAM DEPTHS T1_LEFT (IN)	T2_CENTER (IN)	T3_RIGHT (IN)	BEAM SPANS H1 (FT)	H2 (FT)
1	240.0	42.0	42.0	42.0	.0	.0
2	240.0	42.0	42.0	42.0	.0	.0
3	240.0	42.0	42.0	42.0	.0	.0
4	240.0	42.0	42.0	42.0	.0	.0

COLUMN/TORSIONAL DATA
****

COLUMN NUMBER	COLUMN_ABOVE_SLAB C1 (IN)	C2 (IN)	HGT (FT)	COLUMN_BELOW_SLAB C1 (IN)	C2 (IN)	HGT (FT)	CAPITAL** EXTEN. (IN)	DEPTH (IN)	COLUMN STRIP* (FT)	MIDDLE STRIP* (FT)
1	.0	.0	.0	30.0	240.0	19.0	.0	.0	20.0	.0
2	.0	.0	.0	48.0	240.0	19.0	.0	.0	20.0	.0
3	.0	.0	.0	30.0	240.0	19.0	.0	.0	20.0	.0

Columns with zero "C2" are round columns.
* -Strip width used for negative flexure.
**-Capital extension distance measured from face of column.

COLUMN NUMBER	SUPPORT FIXITY* %
1	100%
2	100%
3	100%

* -Support fixity of 0% denotes pinned condition.
Support fixity of 999% denotes fixed end condition.

LATERAL LOAD/OUTPUT DATA
****

LATERAL LOADS ARE NOT SPECIFIED

OUTPUT DATA
PATTERN LOADINGS: 1 THRU 4
PATTERN LIVE LOAD FACTOR (1-3) = 75%

LOAD FACTORS:
U = 1.40*D + 1.70*L
U = .75(1.40*D + 1.70*L + 1.70*W)
U = .90*D + 1.30*W

OUTPUT OPTION(S) FOR ANALYSIS:
1. Data Check
2. CL Moments & Shears
3. Design Moments & Shears

OUTPUT OPTION(S) FOR DESIGN:
1. *SUPRESS* Bar Sizing, Deflection, & Material Quantities

**TOTAL UNFACTORED DEAD LOAD = 2232.029 KIPS
LIVE LOAD = 445.980 KIPS

---- STATICS PRINT-OUT FOR GRAVITY LOAD ANALYSIS ----
****

J O I N T   M O M E N T S (FT - KIPS)

JOINT NUMBER	PATTERN-1 LEFT	RIGHT	TOP	BOTTOM	PATTERN-2 LEFT	RIGHT	TOP	BOTTOM
1	-28.7	2460.5	.0	-2431.7	-28.7	1958.2	.0	-1929.5
2	-8297.2	8974.3	.0	-677.1	-7292.5	8773.6	.0	-1481.1
3	-2951.6	28.7	.0	2922.8	-2948.7	22.8	.0	2925.9

JOINT NUMBER	PATTERN-3 LEFT	RIGHT	TOP	BOTTOM	PATTERN-4 LEFT	RIGHT	TOP	BOTTOM
1	-22.8	2457.5	.0	-2434.7	-30.7	2505.1	.0	-2474.4
2	-8059.9	7832.5	.0	227.4	-8707.8	9418.4	.0	-710.7
3	-2394.6	28.7	.0	2365.9	-3031.0	30.7	.0	3000.3

J O I N T   S H E A R S (KIPS)

JOINT NUMBER	PATTERN-1 LEFT	RIGHT	PATTERN-2 LEFT	RIGHT	PATTERN-3 LEFT	RIGHT	PATTERN-4 LEFT	RIGHT
1	-46.0	716.8	-46.0	591.1	-36.4	716.7	-49.1	743.8
2	-1037.2	1087.8	-887.3	1080.6	-1028.3	928.6	-1089.9	1143.0
3	-776.1	46.0	-776.0	36.4	-644.9	46.0	-808.0	49.1

N E G A T I V E   F L E X U R E

COLUMN NUMBER	PATTERN NUMBER	LOCATION @COL. FACE	TOTAL DESIGN (FT-K)	Allow M	COLUMN STRIP (FT-K)	MIDDLE STRIP (FT-K)	BEAM IN COL.STRIP (FT-K)
1	4	¦¦ R	1609.3		Not applicable		1609.3
2	4	¦¦ R	7211.1	6825	Not applicable		7211.1
3	4	L ¦¦	-2055.5	5369	Not applicable		-2055.5

P O S I T I V E   F L E X U R E

SPAN NUMBER	PATTERN NUMBER	LOCATION FROM LEFT (FT)	TOTAL DESIGN (FT-K)	Allow M	COLUMN STRIP (FT-K)	MIDDLE STRIP (FT-K)	BEAM IN COL. STRIP (FT-K)
2	4	14.8	2863.7	< 5369	Not applicable		2863.7
3	4	21.3	3290.6	< 5369	Not applicable		3290.6

@ Support 2

with 10% re-distribution

$-M = 7211 - 536 = 6675$ k-ft < 6825 k-ft

@ Span 3-4

$+M = 3290 + 536 = 3826 < 5369$

09-08-91 ADOSS(tm) 5.20 Proprietary Software of PORTLAND CEMENT ASSN. Page 9
2:46:47 PM Licensed to: Martin & Huang International, Los Angeles, Ca. 90057

S H E A R   A N A L Y S I S

NOTE--Allowable shear stress in beams = 126.49 PSI (see "CODE").

B E A M   S H E A R   R E Q U I R E M E N T S (KIPS, SQ.IN./IN., FT.)

BEAM SPAN NO.	PATT. NO.	LEFT SIDE Vu@d SHEAR	Av/s @d	Av/s .175	Av/s .375	Av/s .625	Av/s .825	Av/s @d	RIGHT SIDE Vu@d SHEAR	LEFT Vc/C. DIST.
1 * *			Span length equal to column size or zero						≈823	* *
2	4	517.8	.300*	.300*	.300*	.300*	.300*	.300*	-834.4	6.10
3	4	887.4	.300*	.300*	.300*	.300*	.300*	.300*	-581.9	13.38
4 * *		≈823	Span length equal to column size or zero							* *

NOTES: 1.) To obtain stirrup spacing, divide stirrup area by Av/s value above.
2.) To obtain stirrup area, multiply spacing by Av/s value.
3.) Local effects due to loadings applied at other segments along beam span must be calculated manually.
4.) Symbols following Av/s values:
* - minimum shear 50*bw/Fyv - based on beam dimensions.
x - Vs exceeds 2*Vc, maximum stirrup spacing must be halved.
+ - Av/s value at segment located within effective depth.

* Program completed as requested *

$$V_c = 968^k < \frac{V_u}{\phi} = \frac{887.4}{0.85} = 1044^k$$

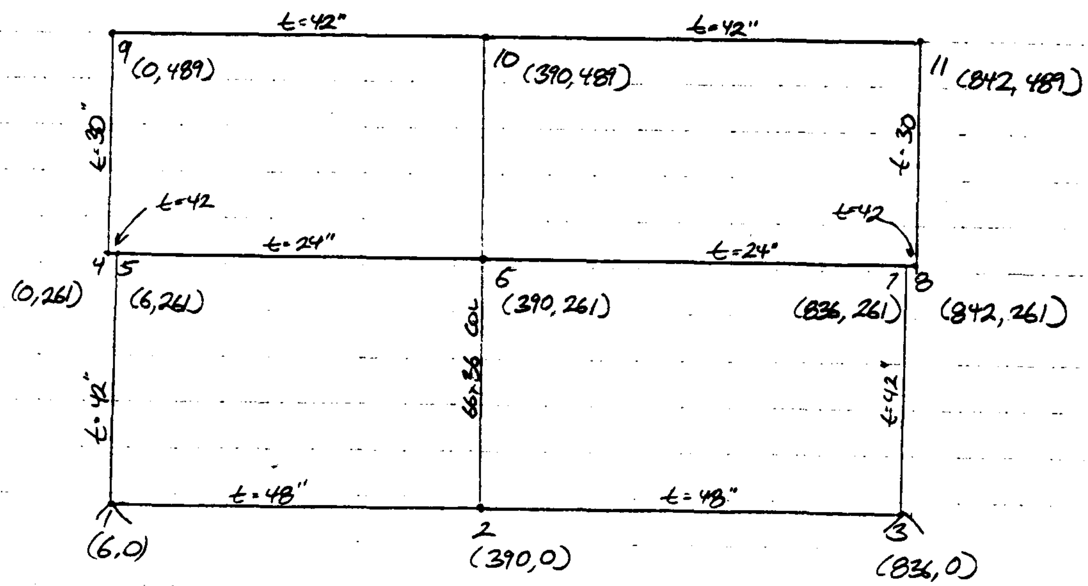
ORIGINAL DESIGN DID NOT MEET SHEAR REQD. W/O SHEAR REINF.

MARTIN & HUANG
MARTIN & HUANG INTERNATIONAL INC.

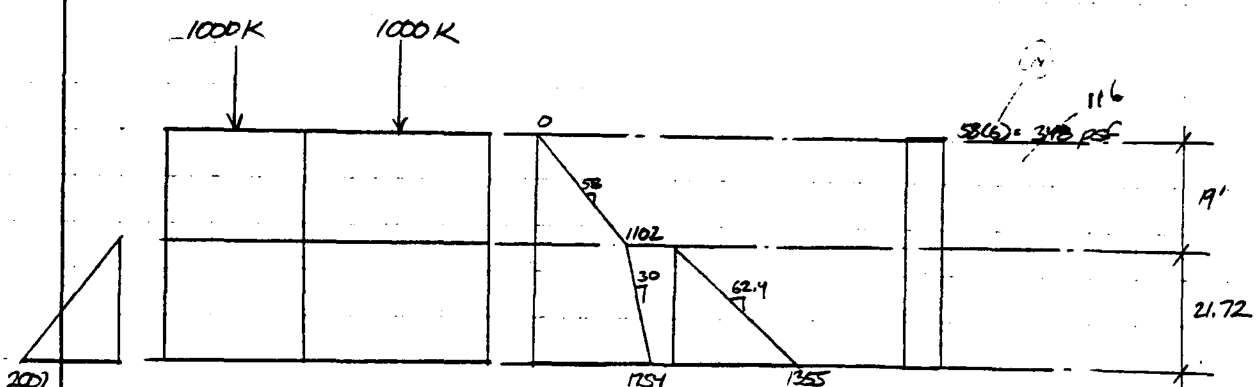
Architect ______ Sheet 11/13 of ____
Project RTD Headquarters Job no. ____
Existing Crossover Structure Date ____
Engineer KW

PRELIMINARY ANALYSIS OF RED LINE STATION

MODEL A



LOADING: LONG-TERM AT REST + HYDROSTATIC ONE SIDE ONLY. CONSIDER 6' SURCHARGE & 1000 K PT LOADS



TOTAL LATERAL LOAD = 1102(19)/2 + 1102(21.72) + 652(21.72/2)
+1355(21.72/2) + 348(40.72) = 70.37 K/ft

LESS OPPOSING AT-REST & HYDROSTATIC = 2007(21.72/2) = 21.796 K/ft
48.574 K/ft
= 1457 K/BAY

STATION SELF-WT: 30(.15)[70.167(4+2+3.5) + 21.72(3.5)2 + 19(2.5)2
+ 3(5.5)] = 4186 K/BAY

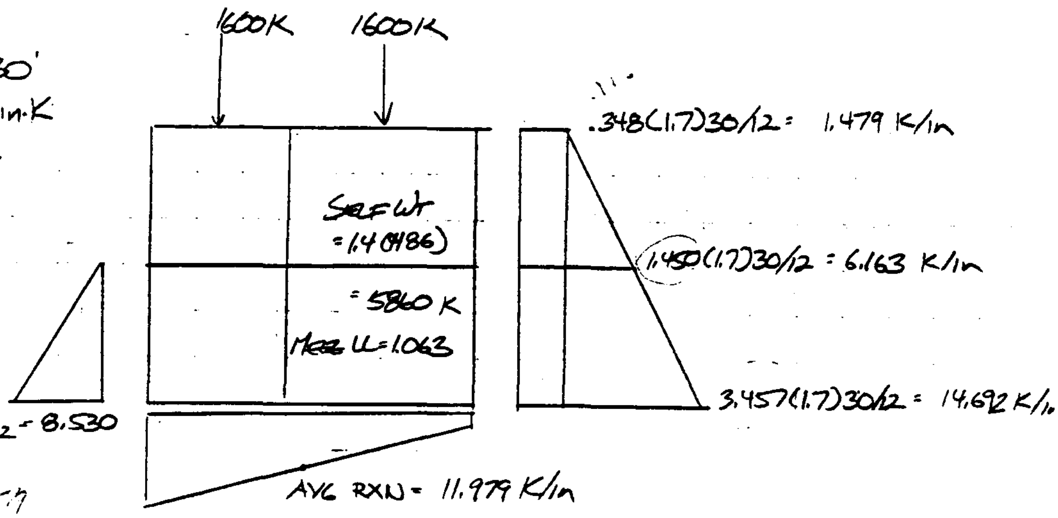
FOR BAY w/o COLUMN LOADS
REQ'D μ FOR F.S. AGAINST SLIDING = 1.33 = 1457(1.33)/4186 = 0.46

FOR BAY w/ 2000 K COLUMN LOADS
REQ'D μ FOR F.S. AGAINST SLIDING = 1.33 = 1457(1.33)/6186 = 0.31

QUESTION: WHAT IS μ @ HDPE MEMBRANE?

LOADING FOR SAP90 INPUT,

SECTION LGTH = 30'
LOADS IN K, in-K
LOAD FACTORS:
Pt LDS: 1.6
EARTH: 1.7
LL: 1.7
DL: 1.4



MARTIN & HUANG — MARTIN & HUANG INTERNATIONAL INC.

Architect ______ Sheet 11.15 of ______
Project ______ Job no. ______
______ Date ______
______ Engineer ______

TRY 2ND LOAD CASE WITH SURCHARGE REDUCED TO 2'

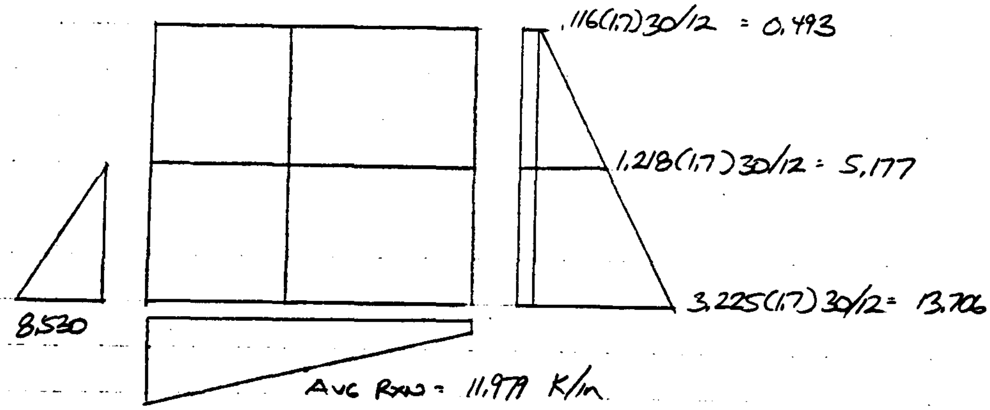
SURCHARGE = 58(2) = 116 psf

TOTAL LATERAL LOAD = 78.574 - 40.72(.348 - .116) = 39.127 K/ft = 1174 K/BAY
TOTAL STATION SELF-WT = 4186 K/BAY

FOR BAY w/o COLUMN LOADS
REQ'D μ FOR FS AGAINST SLIDING = 1.33 ∴ 1174(1.33)/4186 = 0.373

FOR BAY w/ COLUMN LOADS
REQ'D μ FOR FS AGAINST SLIDING = 1.33 ∴ 1174(1.33)/6186 = 0.252

LOADING FOR SAP90 INPUT

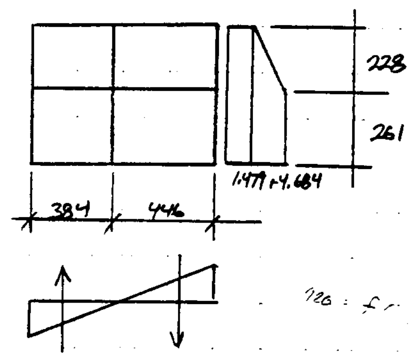


BASE REACTIONS

1. WITH FULL SURCHARGE
2. WITH 2' SURCHARGE

BASE REACTIONS:

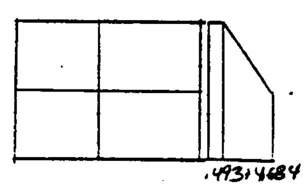
CASE 1: NET OVERTURNING



OM = 1.479(489)²/2 + 4.684(261)²/2
  + 4.684(228)/2 (337) = 516319 in-K
R = 516319/553.33 = 933.11 K
f = 933.11(2)/415 = 4.497 K/in

MIN SOIL REACTION = 11.979 - 4.497 = 7.482 K/in
MAX SOIL REACTION = 11.979 + 4.497 = 16.476 K/in
SOIL REACTION @ COL = 12.315 K/in

CASE 2: NET OVERTURNING



OM = .493(489)²/2 + 4.684(261)²/2
  + 4.684(228)/2 (337) = 398433
R = 720.1 K
f = 3.470 K/in

MIN SOIL REACTION = 11.979 - 3.470 8.509 K/in
MAX SOIL REACTION = 11.979 + 3.470 = 15.449 K/in
SOIL RXN @ COL = 12.238 K

CHECK BUOYANCY WITH & WITHOUT COL LOADS

WT OF WATER DISPLACED; FOR WATER TABLE AT ℄ MEZZANINE

= 62.4(23.72)72.667(30) = 3227 K/BAY

DEAD WEIGHT OF STRUCTURE = 4186 K/BAY OK!

MARTIN & HUANG INTERNATIONAL INC.

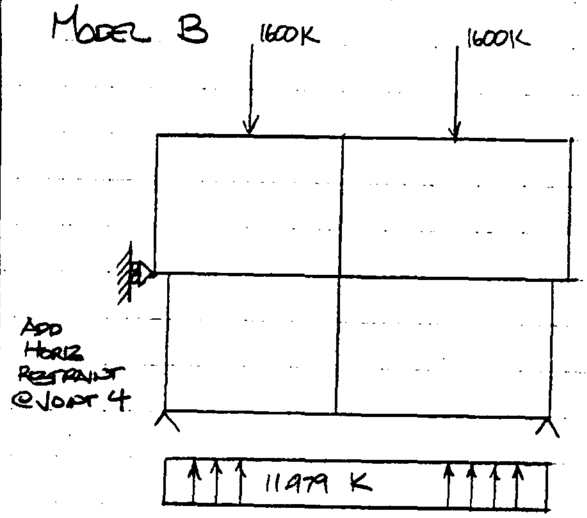
Architect ______ Sheet 11.18 of ______

Project ______ Job no. ______

______ Date ______

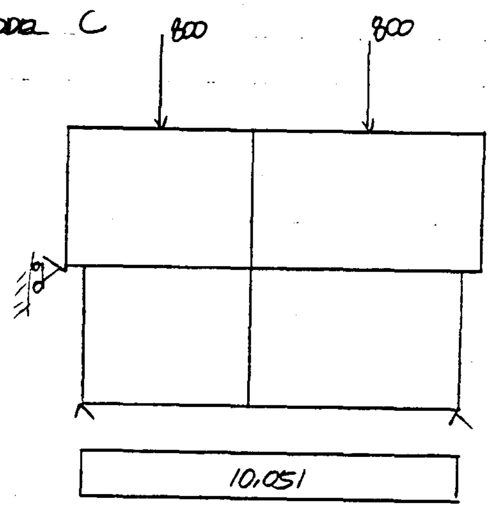
______ Engineer ______

MODEL B



USE LATERAL LOADS FROM MODEL A LOAD CASE 1; 6' SURCHARGE

MODEL C



USE LATERAL LOADS FROM MODEL A LOAD CASE 1

1800 Wilshire Boulevard, Suite 300, Los Angeles, California 90057 (213) 483-4916 Telex 67-3104 Fax 483-9757

11,19

```
        $$$$$$$$     $$$$$$$$$$    $$$$$$$        $$$$$$$$        $$$$$$$
      $$$$$$$$$$    $$$$$$$$$$    $$$$$$$$$$    $$$$$$$$$$$    $$$$$$$$$$
     $$            $$      $$    $$       $$   $$       $$    $$       $$
    $$            $$      $$    $$       $$   $$       $$    $$       $$
    $$$$$$$$     $$$$$$$$$$    $$$$$$$$$$     $$$$$$$$$$    $$       $$
          $$    $$      $$    $$                     $$    $$       $$
         $$    $$      $$    $$                     $$    $$       $$
$$$$$$$$$$    $$      $$    $$             $$$$$$$$$$     $$$$$$$$$$
$$$$$$$$     $$      $$    $$              $$$$$$$$        $$$$$$$
```

STRUCTURAL ANALYSIS PROGRAMS

VERSION 5.10

11/20

RTD HEADQUARTERS: EXISTING RED LINE STATION, MEZZANINE RESTRAINED

F R A M E   E L E M E N T   F O R C E S

ELT ID	LOAD COND	AXIAL FORCE	DIST ENDI	1-2 PLANE SHEAR	1-2 PLANE MOMENT	1-3 PLANE SHEAR	1-3 PLANE MOMENT	AXIAL TORQ
1								
	1	8.00						
			.0	-1940.22	116247.47			
			48.0	-1466.02	34497.68			
			96.0	-991.83	-24490.90			
			144.0	-517.64	-60718.26			
			192.0	-43.45	-74184.40			
			240.0	430.74	-64889.33			
			288.0	904.94	-32833.04			
			336.0	1379.13	21984.47			
			384.0	1853.32	99563.19			
2								
	1	-6.88						
			.0	-2065.19	102498.51			
			55.8	-1514.44	2716.38			
			111.5	-963.68	-66361.19			
			167.3	-412.93	-104734.23			
			223.0	137.83	-112402.71			
			278.8	688.58	-89366.64			
			334.5	1239.33	-35626.02			
			390.3	1790.09	48819.15			
			446.0	2340.84	163968.86			
3								
	1	-1298.79						
			.0	-1232.43	-40642.17			
			.8	-1233.81	-41567.00			
			1.5	-1235.18	-42492.87			
			2.3	-1236.56	-43419.78			
			3.0	-1237.94	-44347.72			
			3.8	-1239.32	-45276.69			
			4.5	-1240.70	-46206.70			
			5.3	-1242.08	-47137.74			
			6.0	-1243.45	-48069.81			
4								
	1	-1119.98						
			.0	377.74	-20802.77			
			48.0	276.32	-5105.41			
			96.0	174.89	5723.61			
			144.0	73.47	11684.27			
			192.0	-27.96	12776.58			
			240.0	-129.38	9000.53			
			288.0	-230.80	356.14			
			336.0	-332.23	-13156.61			
			384.0	-433.65	-31537.71			
5								
	1	-999.87						
			.0	506.25	-41838.23			
			55.8	388.45	-16898.33			
			111.5	270.65	1474.23			
			167.3	152.85	13279.46			
			223.0	35.05	18517.35			
			278.8	-82.75	17187.90			

— STRUT TO NEW STRUCTURE @ MEZZ LEVEL
— P = 1000K × 1.6
— 6' SURCHARGE

RTD HEADQUARTERS: EXISTING RED LINE STATION, MEZZANINE RESTRAINED

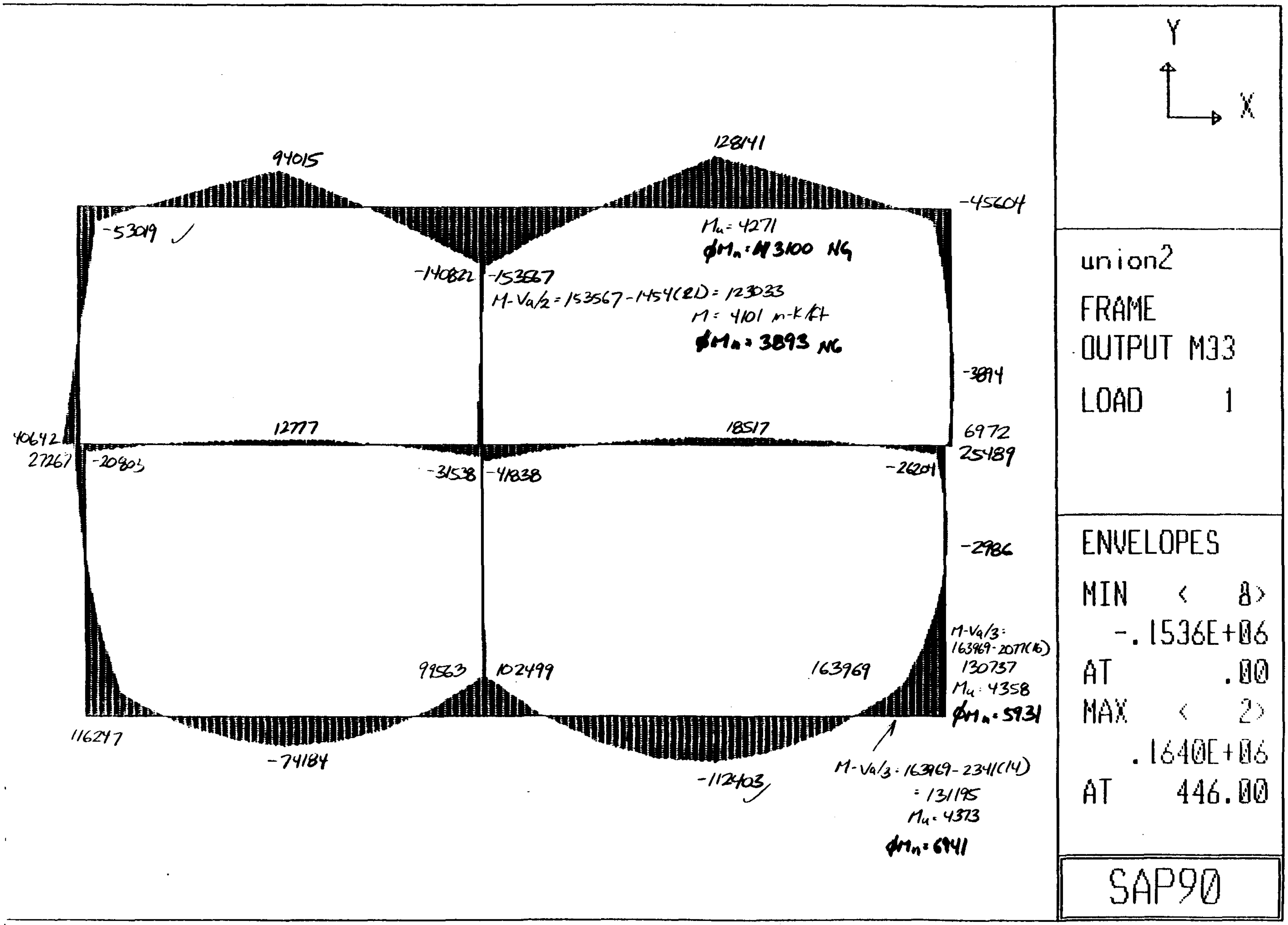
F R A M E   E L E M E N T   F O R C E S

ELT ID	LOAD COND	AXIAL FORCE	DIST ENDI	1-2 PLANE SHEAR	1-2 PLANE MOMENT	1-3 PLANE SHEAR	1-3 PLANE MOMENT	AXIAL TORQ
			334.5	-200.55	9291.12			
			390.3	-318.35	-5173.00			
			446.0	-436.15	-26204.45			
6								
	1	-355.16						
			.0	1286.69	-714.61			
			.8	1285.31	249.89			
			1.5	1283.94	1213.36			
			2.3	1282.56	2175.80			
			3.0	1281.18	3137.20			
			3.8	1279.80	4097.57			
			4.5	1278.42	5056.90			
			5.3	1277.05	6015.20			
			6.0	1275.67	6972.47			
7								
	1	-410.80						
			.0	933.18	-53019.30			
			48.8	843.60	-9710.32			
			97.5	754.02	29231.72			
			146.3	664.44	63806.83			
			195.0	-1025.13	94015.01			
			243.8	-1114.71	41856.25			
			292.5	-1204.29	-14669.44			
			341.3	-1293.87	-75562.06			
			390.0	-1383.45	-140821.62			
8								
	1	-516.03						
			.0	1454.13	-153567.07			
			56.5	1350.31	-74341.47			
			113.0	1246.49	-981.63			
			169.5	1142.68	66512.44			
			226.0	-561.14	128140.76			
			282.5	-664.96	93503.32			
			339.0	-768.78	53000.12			
			395.5	-872.60	6631.16			
			452.0	-976.42	-45603.56			
9								
	1	-1860.99						
			.0	1291.97	-116247.47			
			32.6	1031.08	-78447.29			
			65.3	804.96	-48591.46			
			97.9	613.64	-25545.07			
			130.5	457.10	-8173.21			
			163.1	335.35	4659.03			
			195.8	248.38	14086.54			
			228.4	196.20	21244.24			
			261.0	178.81	27267.04			
10								
	1	-1082.80						
			.0	-410.80	40642.17			
			28.5	-410.80	28934.48			
			57.0	-410.80	17226.80			

RTD HEADQUARTERS: EXISTING RED LINE STATION, MEZZANINE RESTRAINED

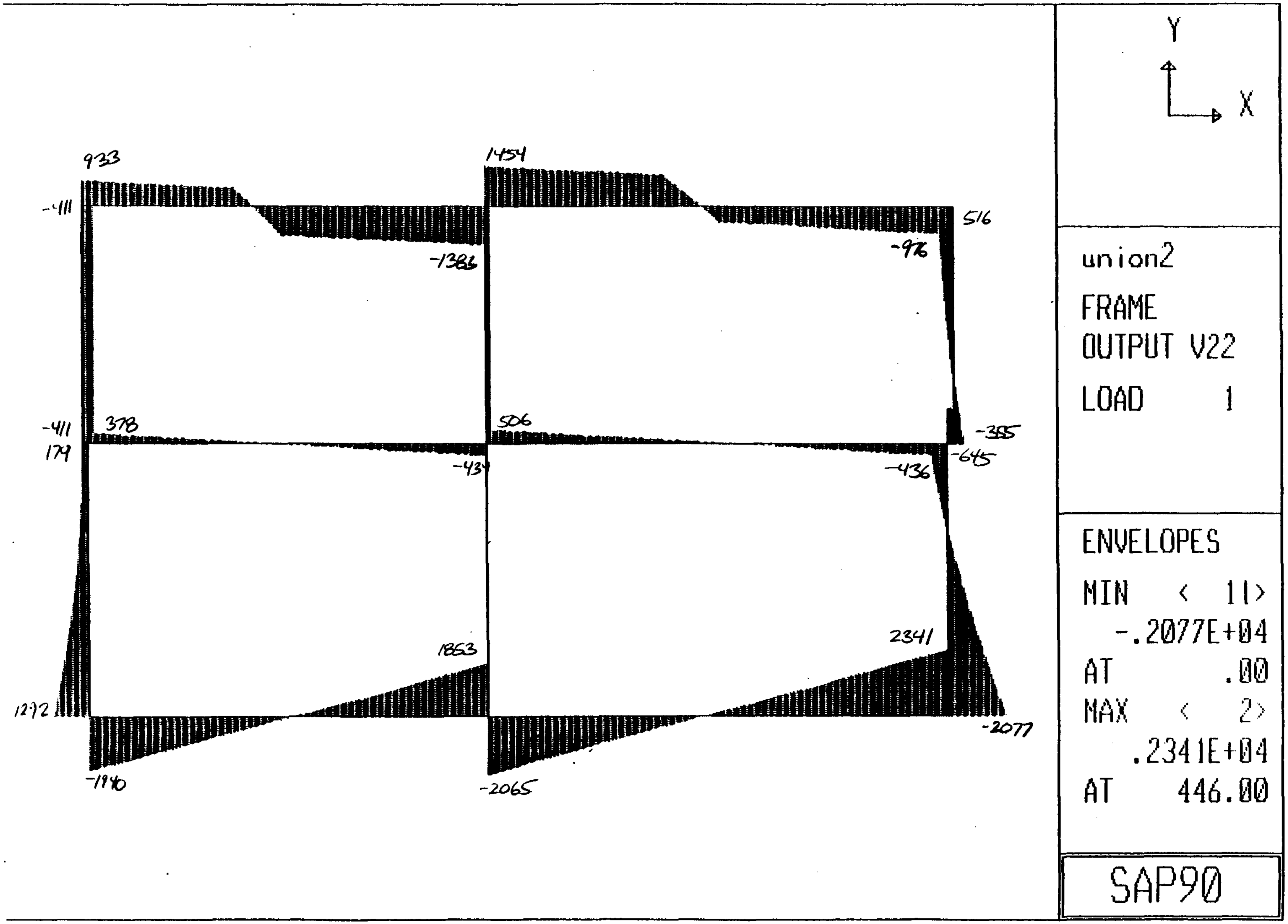
F R A M E   E L E M E N T   F O R C E S

ELT ID	LOAD COND	AXIAL FORCE	DIST ENDI	1-2 PLANE SHEAR	1-2 PLANE MOMENT	1-3 PLANE SHEAR	1-3 PLANE MOMENT	AXIAL TORQ
			85.5	-410.80	5519.12			
			114.0	-410.80	-6188.57			
			142.5	-410.80	-17896.25			
			171.0	-410.80	-29603.93			
			199.5	-410.80	-41311.61			
			228.0	-410.80	-53019.30			
11								
	1	-1962.63						
			.0	-2076.87	163968.86			
			32.6	-1614.93	103841.01			
			65.3	-1187.78	58216.42			
			97.9	-795.41	25960.30			
			130.5	-437.82	5937.89			
			163.1	-115.01	-2985.59			
			195.8	173.01	-1944.91			
			228.4	426.25	7925.16			
			261.0	644.71	25489.84			
12								
	1	-1126.04						
			.0	-355.16	6972.47			
			28.5	-187.85	-725.77			
			57.0	-37.24	-3893.69			
			85.5	96.69	-3006.86			
			114.0	213.93	1459.16			
			142.5	314.49	9028.78			
			171.0	398.36	19226.43			
			199.5	465.54	31576.55			
			228.0	516.03	45603.56			
13								
	1	-3880.87						
			.0	14.88	-2935.33			
			32.6	14.88	-2449.91			
			65.3	14.88	-1964.50			
			97.9	14.88	-1479.08			
			130.5	14.88	-993.67			
			163.1	14.88	-508.25			
			195.8	14.88	-22.84			
			228.4	14.88	462.58			
			261.0	14.88	948.00			
14								
	1	-2870.46						
			.0	-105.24	11248.52			
			28.5	-105.24	8249.28			
			57.0	-105.24	5250.03			
			85.5	-105.24	2250.78			
			114.0	-105.24	-748.46			
			142.5	-105.24	-3747.71			
			171.0	-105.24	-6746.95			
			199.5	-105.24	-9746.20			
			228.0	-105.24	-12745.45			



STRUT TO NEW STRUCTURE
6' SURCHARGE
P = 1000 K × 1.6

11/23


933
1454
-411
516
-1386
-976
-411
378
506
-355
179
-434
-436
-645
1853
2341
1292
-2077
-1940
-2065
Y
X
union2
FRAME
OUTPUT V22
LOAD 1
ENVELOPES
MIN < 11>
-.2077E+04
AT .00
MAX < 2>
.2341E+04
AT 446.00
SAP90

11.25

```
              $$$$$$$$     $$$$$$$$$$    $$$$$$$      $$$$$$$$     $$$$$$$
            $$$$$$$$$$    $$$$$$$$$$   $$$$$$$$$$   $$$$$$$$$$$   $$$$$$$$$$
           $$            $$      $$   $$        $$  $$        $$  $$        $$
          $$            $$      $$   $$        $$  $$        $$  $$        $$
         $$$$$$$$      $$$$$$$$$$   $$$$$$$$$$    $$$$$$$$$$   $$        $$
               $$     $$      $$   $$                   $$   $$        $$
              $$     $$      $$   $$                   $$   $$        $$
    $$$$$$$$$$     $$      $$   $$              $$$$$$$$$$   $$$$$$$$$$
    $$$$$$$$      $$      $$   $$              $$$$$$$$      $$$$$$$
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STRUCTURAL ANALYSIS PROGRAMS

VERSION 5.10

RTD HEADQUARTERS: EXISTING RED LINE STATION, MEZZANINE RESTRAINED

F R A M E   E L E M E N T   F O R C E S

ELT ID	LOAD COND	AXIAL FORCE	DIST ENDI	1-2 PLANE SHEAR	1-2 PLANE MOMENT	1-3 PLANE SHEAR	1-3 PLANE MOMENT	AXIAL TORQ
1								
	1	5.09						
			.0	-1632.16	105383.87			
			48.0	-1250.51	36199.88			
			96.0	-868.86	-14665.01			
			144.0	-487.21	-47210.79			
			192.0	-105.57	-61437.47			
			240.0	276.08	-57345.04			
			288.0	657.73	-34933.51			
			336.0	1039.38	5797.12			
			384.0	1421.03	64846.86			
2								
	1	-4.39						
			.0	-1593.17	66904.73			
			55.8	-1149.90	-9558.16			
			111.5	-706.63	-61308.86			
			167.3	-263.36	-88347.35			
			223.0	179.91	-90673.63			
			278.8	623.18	-68287.71			
			334.5	1066.44	-21189.58			
			390.3	1509.71	50620.75			
			446.0	1952.98	147143.29			
3								
	1	-1437.82						
			.0	-899.09	-32531.68			
			.8	-900.47	-33206.51			
			1.5	-901.84	-33882.38			
			2.3	-903.22	-34559.28			
			3.0	-904.60	-35237.21			
			3.8	-905.98	-35916.18			
			4.5	-907.36	-36596.18			
			5.3	-908.74	-37277.21			
			6.0	-910.11	-37959.28			
4								
	1	-1331.26						
			.0	367.35	-18686.42			
			48.0	265.92	-3487.95			
			96.0	164.50	6842.17			
			144.0	63.07	12303.94			
			192.0	-38.35	12897.35			
			240.0	-139.77	8622.41			
			288.0	-241.20	-520.88			
			336.0	-342.62	-14532.52			
			384.0	-444.05	-33412.52			
5								
	1	-1228.16						
			.0	512.84	-43215.23			
			55.8	395.04	-17908.00			
			111.5	277.24	831.89			
			167.3	159.44	13004.45			
			223.0	41.64	18609.67			
			278.8	-76.16	17647.56			

- STRUT TO NEW STRUCTURE @MEZZ
- P= 500K×1.6
6' SURCHARGE

11.27

RTD HEADQUARTERS: EXISTING RED LINE STATION, MEZZANINE RESTRAINED

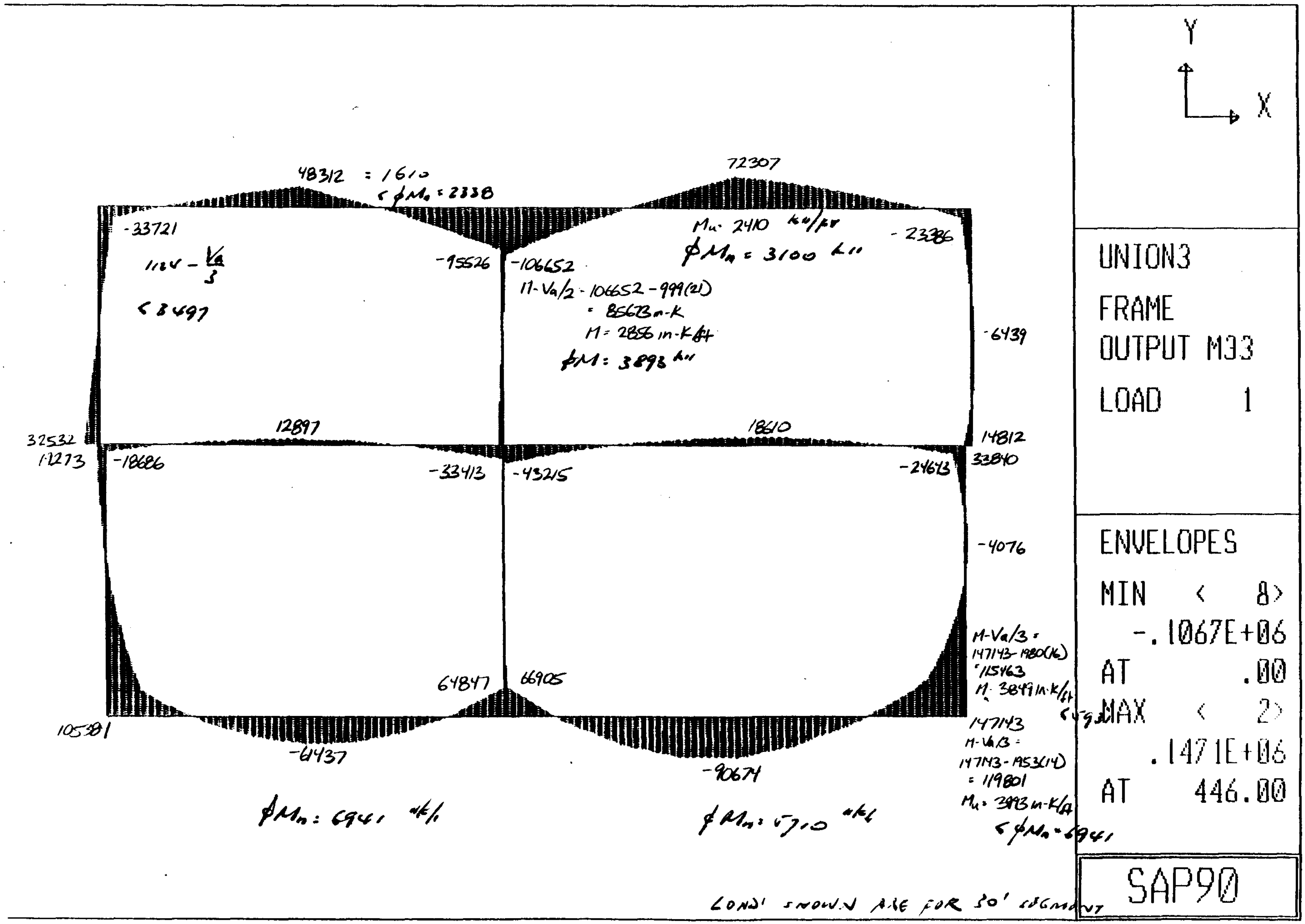
F R A M E   E L E M E N T   F O R C E S

ELT ID	LOAD COND	AXIAL FORCE	DIST ENDI	1-2 PLANE SHEAR	1-2 PLANE MOMENT	1-3 PLANE SHEAR	1-3 PLANE MOMENT	AXIAL TORQ
			334.5	-193.96	10118.11			
			390.3	-311.76	-3978.68			
			446.0	-429.56	-24642.80			
6								
	1	-486.99						
			.0	941.33	9197.36			
			.8	939.95	9902.84			
			1.5	938.58	10607.29			
			2.3	937.20	11310.71			
			3.0	935.82	12013.09			
			3.8	934.44	12714.44			
			4.5	933.06	13414.75			
			5.3	931.69	14114.03			
			6.0	930.31	14812.28			
7								
	1	-290.58						
			.0	599.84	-33720.62			
			48.8	510.26	-6661.97			
			97.5	420.68	16029.74			
			146.3	331.10	34354.52			
			195.0	-558.47	48312.36			
			243.8	-648.05	18903.27			
			292.5	-737.63	-14872.75			
			341.3	-827.21	-53015.70			
			390.0	-916.79	-95525.59			
8								
	1	-384.20						
			.0	999.49	-106651.80			
			56.5	895.67	-53113.39			
			113.0	791.85	-5440.73			
			169.5	688.04	36366.16			
			226.0	-215.78	72307.30			
			282.5	-319.60	57182.68			
			339.0	-423.42	36192.30			
			395.5	-527.24	9336.16			
			452.0	-631.06	-23385.74			
9								
	1	-1517.25						
			.0	1219.72	-105383.87			
			32.6	958.82	-69940.91			
			65.3	732.71	-42442.30			
			97.9	541.39	-21753.13			
			130.5	384.85	-6738.49			
			163.1	263.10	3736.52			
			195.8	176.13	10806.81			
			228.4	123.95	15607.29			
			261.0	106.56	19272.86			
10								
	1	-749.46						
			.0	-290.58	32531.68			
			28.5	-290.58	24250.14			
			57.0	-290.58	15968.60			

RTD HEADQUARTERS: EXISTING RED LINE STATION, MEZZANINE RESTRAINED

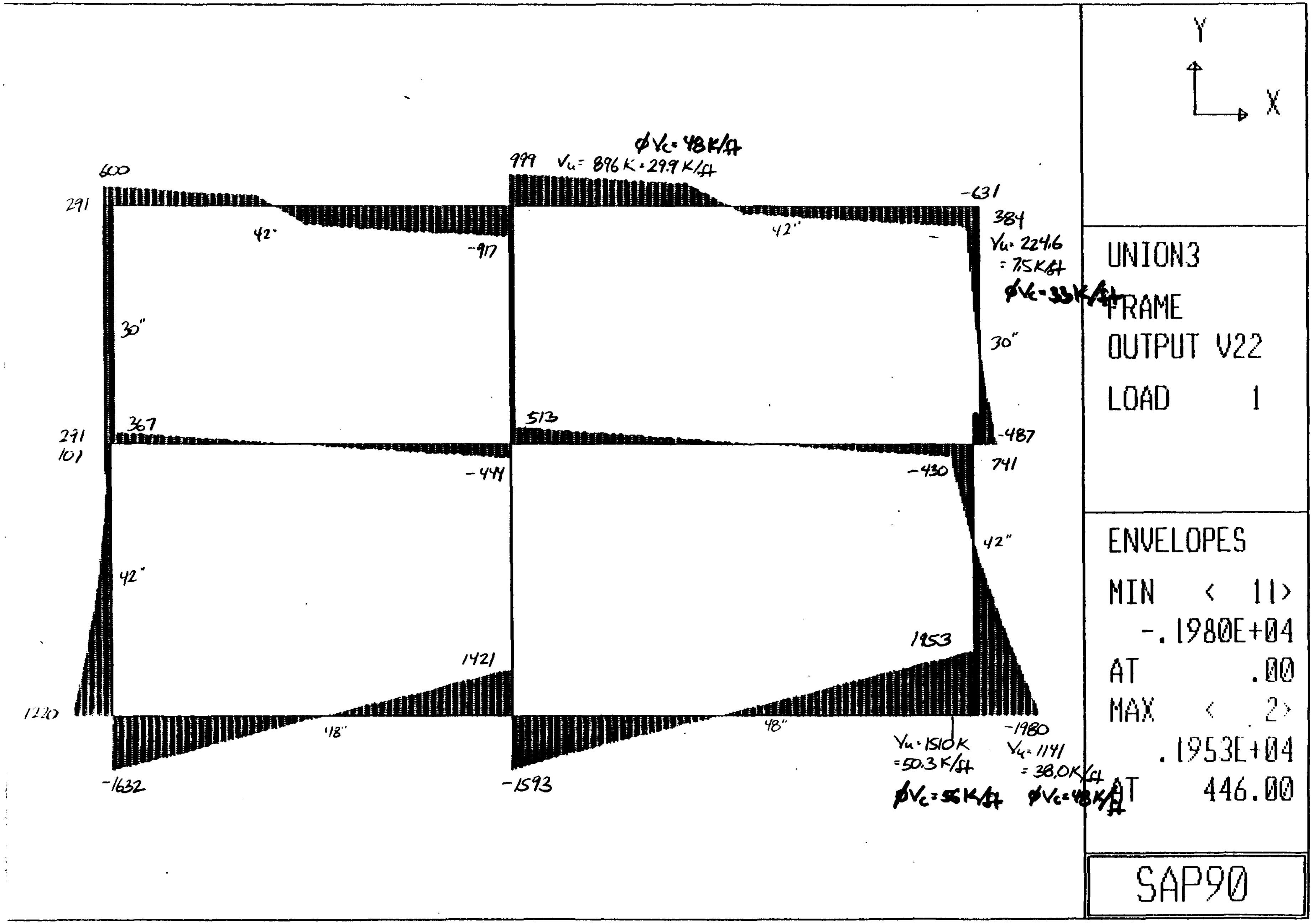
F R A M E E L E M E N T F O R C E S

ELT ID	LOAD COND	AXIAL FORCE	DIST ENDI	1-2 PLANE SHEAR	1-2 PLANE MOMENT	1-3 PLANE SHEAR	1-3 PLANE MOMENT	AXIAL TORQ
			85.5	-290.58	7687.07			
			114.0	-290.58	-594.47			
			142.5	-290.58	-8876.01			
			171.0	-290.58	-17157.54			
			199.5	-290.58	-25439.08			
			228.0	-290.58	-33720.62			
11								
	1	-1610.68						
			.0	-1980.41	147143.29			
			32.6	-1518.47	90162.42			
			65.3	-1091.32	47684.81			
			97.9	-698.95	18575.68			
			130.5	-341.36	1700.26			
			163.1	-18.55	-4076.24			
			195.8	269.47	111.43			
			228.4	522.71	13128.49			
			261.0	741.17	33840.15			
12								
	1	-780.68						
			.0	-486.99	14812.28			
			28.5	-319.68	3356.83	465		
			57.0	-169.07	-3568.29			
			85.5	-35.14	-6438.66			
			114.0	82.10	-5729.85			
			142.5	182.66	-1917.43			
			171.0	266.52	4523.02			
			199.5	333.71	13115.94			
			228.0	384.20	23385.74			
13								
	1	-2976.56						
			.0	9.48	-2057.88			
			32.6	9.48	-1748.57			
			65.3	9.48	-1439.26			
			97.9	9.48	-1129.95			
			130.5	9.48	-820.64			
			163.1	9.48	-511.33			
			195.8	9.48	-202.03			
			228.4	9.48	107.28			
			261.0	9.48	416.59			
14								
	1	-1949.16						
			.0	-93.62	10219.30			
			28.5	-93.62	7551.11			
			57.0	-93.62	4882.93			
			85.5	-93.62	2214.74			
			114.0	-93.62	-453.45			
			142.5	-93.62	-3121.64			
			171.0	-93.62	-5789.83			
			199.5	-93.62	-8458.02			
			228.0	-93.62	-11126.21			



STRUT TO NEW STRUCTURE
6' SURCHARGE
P = 500 × 1.6

1129



6' surcharge
p = 500 x 1.6

1/30

MARTIN & HUANG INTERNATIONAL, INC

Architect ______ Sheet 11.31 of ____

Project ______ Job no. 9116

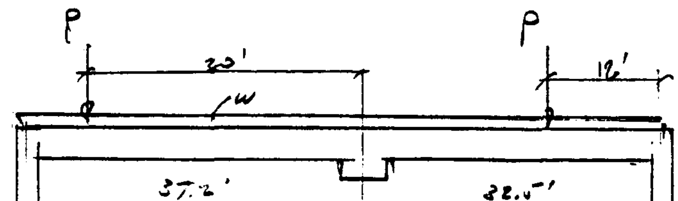
Date 9/4/91

Analysis of Conc. Load — Engineer [illegible]

LOAD CASE 1

W < D = 200 psf, L = 50

P < D = 320 k, L = 180



M: −1809 +2801 −5134 +4356 −1981 k'

V: 829 519 626 620 k

LOAD CASE 2

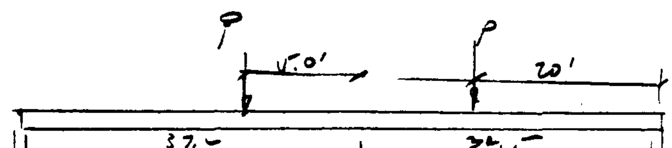
W < D = 1040 psf, L = 300 psf

P = 0

M: −1774 +1829 −5694 +2460 −1096 k'

V: 405 682 570 359 k

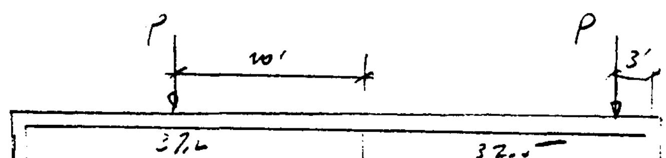
10' strip



M: −652 +885 −5544 +2602 −1123

V: 164 533 807 276

10' strip.



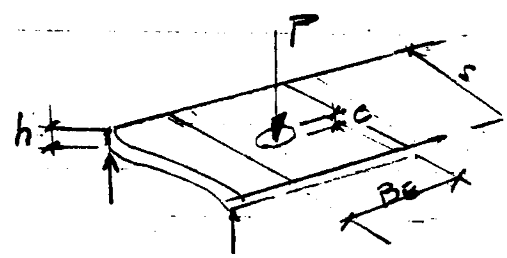
−2976 +5588 −5540 +1394

630 727 481 21

EFFECTIVE WIDTH

BUILDING CODE HAS NO SPECIFIC PROVISIONS TO CALCULATE EFFECTIVE SLAB WIDTH FOR CONCENTRATED LOAD. ENGINEERS ARE LEFT WITH A GREAT LATITUDE OF OPTIONS BASED ON EITHER ELASTIC THEORIES OR INELASTIC YIELD LINE THEORIES. THE FOLLOWING IS AN ATTEMPT TO COMPARE SEVERAL AUTHORS' RECOMMENDATIONS

1. WESTERGAARD "COMPUTATION OF STRESSES IN BRIDGE SLABS DUE TO WHEEL LOADS".



THICKNESS $h = 3.5$ FT.

SPAN $s = 32.5$ FT. AVE.

$c = 0.10 s = 3.25$

RATIO $\frac{s}{h} = \frac{32.5}{3.5} = 9.3$

FROM FIG. 7, AT $c = 0.10$

EQUIV. WIDTH $b_E = 0.81\ s = 0.81(32.5) = 26.3$ FT.

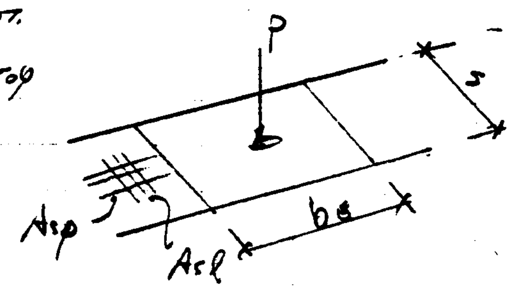
OR USING EQ (65)

EQUIV. WIDTH $b_E = 0.58 s + 2c$

$= 0.58(32.5) + 2(3.25) = 25.4$ FT.

FOR $s = 23.5'$, $b_E = 0.58(23.5) + 2(3.25) = 20.1$ FT

2. PHIL FERGUSON, "REINFORCED CONCRETE FUNDAMENTALS" CHAPTER 14 - DISTRIBUTION OF CONCENTRATED LOADS:



$A_{sp} = 0.60$ SQ IN. #7@12 BOT.

$A_{sl} = 2.00$ SQ. IN. 2-#9@12 TOP

$\mu = \frac{A_{sp}}{A_{sl}} = \frac{0.60}{2.00} = 0.30$

EQUIV. WIDTH $b_E = 2s\sqrt{\mu}$

$= 2(32.5)\sqrt{0.30}$

$= 35.6$ FT.

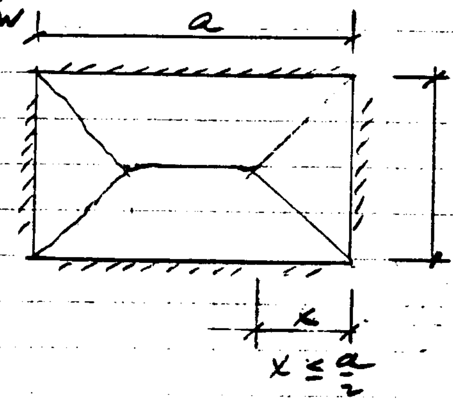
AT $s = 23.5$, $\mu = 0.30$ $b_E = 2(23.5)\sqrt{0.30} = 25.7$ FT.

3. WANG & SALMON, "REINFORCED CONCRETE DESIGN", CHAPTER 18 - YIELD LINE THEORY OF SLABS

MOMENT CAPACITY IN DIRECTION OF SPAN

$+M_{npx} = 298.3$ k-ft/ft

$-M_{nnx} = 379.2$ k-ft/ft



MOMENT CAPACITY PERPENDICULAR TO DIRECTION OF SPAN

$+M_{npy} = -M_{nny} = 113.8$ k-ft/ft

$$\frac{a^2}{b^2} = \frac{M_{nnx} + M_{npx}}{M_{nny} + M_{npy}} = \frac{298.3 + 379.2}{113.8 + 113.8} = 2.98$$

$$a = \sqrt{2.98}\,(b) = 1.72\,(32.5) = 55.9 \text{ f}$$

EQUIV. WIDTH $b_E \geq 0.75(55.9) = 41.9$ FT.

FOR b: 25.0' END SPAN

$$\frac{a^2}{b^2} = \frac{231.7 + 379.2}{113.8 + 113.8} = 2.68$$

$$a = \sqrt{2.68}\,(b) = 1.63(25.0) = 40.7 \text{ FT.}$$

EQUIV. WIDTH $b_E \geq 0.75(40.7) = 30.5$ FT.

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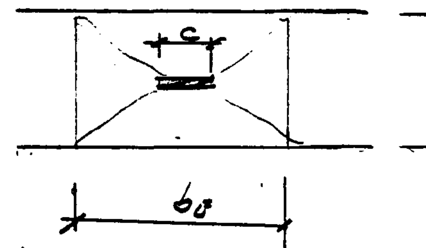
CONSIDER CONCENTRATED LOAD DISTRIBUTED TO AN EQUIV. WIDTH

$B_E = c + 4h$
$= 6. + 4(3.5) = 20$ FT.



BEAM SHEAR CAPACITY

$V_c = 2\sqrt{4000} \times 240 \times 39.4 = 1196^k$

SLAB SHEAR CAPACITY

$b_o = 2(28 + 39.4) + 2(20 + 39.4) = 253$ IN.

$d = 39.4$

$V_c = 4\sqrt{4000} \times 253 \times 39.4 = 2520$ kips.

$\frac{V_u}{\phi} = \frac{1}{0.85}(1.4 \times 320 + 1.7 \times 180) = 887^k < V_c$ OK.

MAX. BEAM SHEAR WITH CONC. LOAD @ d-DISTANC

SLAB $V_u = \left[1.4(0.525^{1.25} + 0.30) + 1.7(0.05)\right] \times \left[\frac{38.5}{2} - 3.3\right] \times 20$

$= 395^k$

CONC. LOAD $V_u = 1.4(320) + 1.7 \times (180) = 627 \times \frac{35.2}{38.5} = 573$

TOTAL $V_u = 395 + 573 = 968^k$

$\frac{V_u}{\phi} = \frac{968}{0.85} = 1139^k < V_c$ OK.

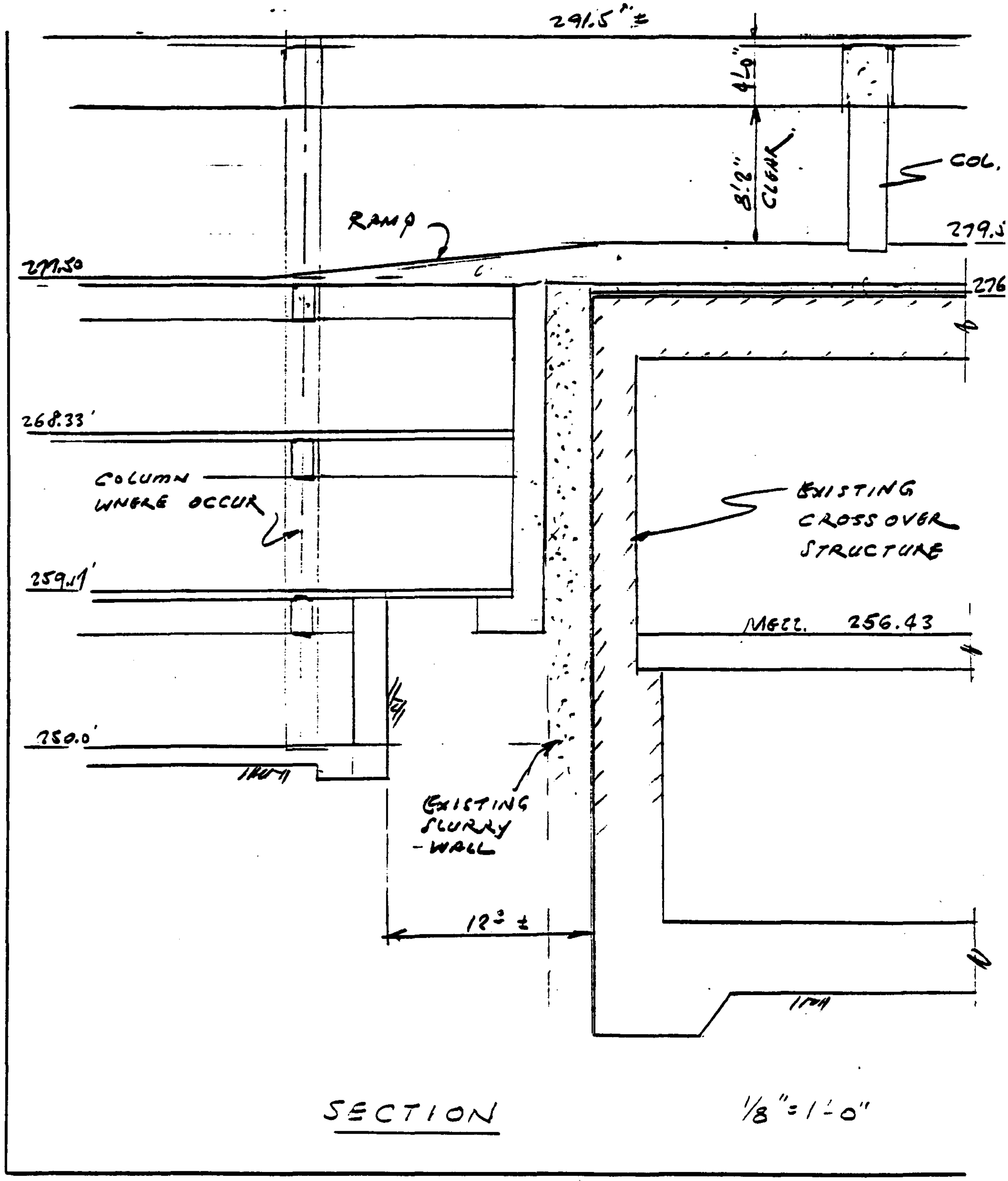
MARTIN & HUANG INTERNATIONAL, INC

Architect ______ Sheet 11.35 of ____

Project METRO PLAZA & GARAGE Job no. SK 101

Date 8/22/91

PRELIM STUDY SECTION Engineer JSL



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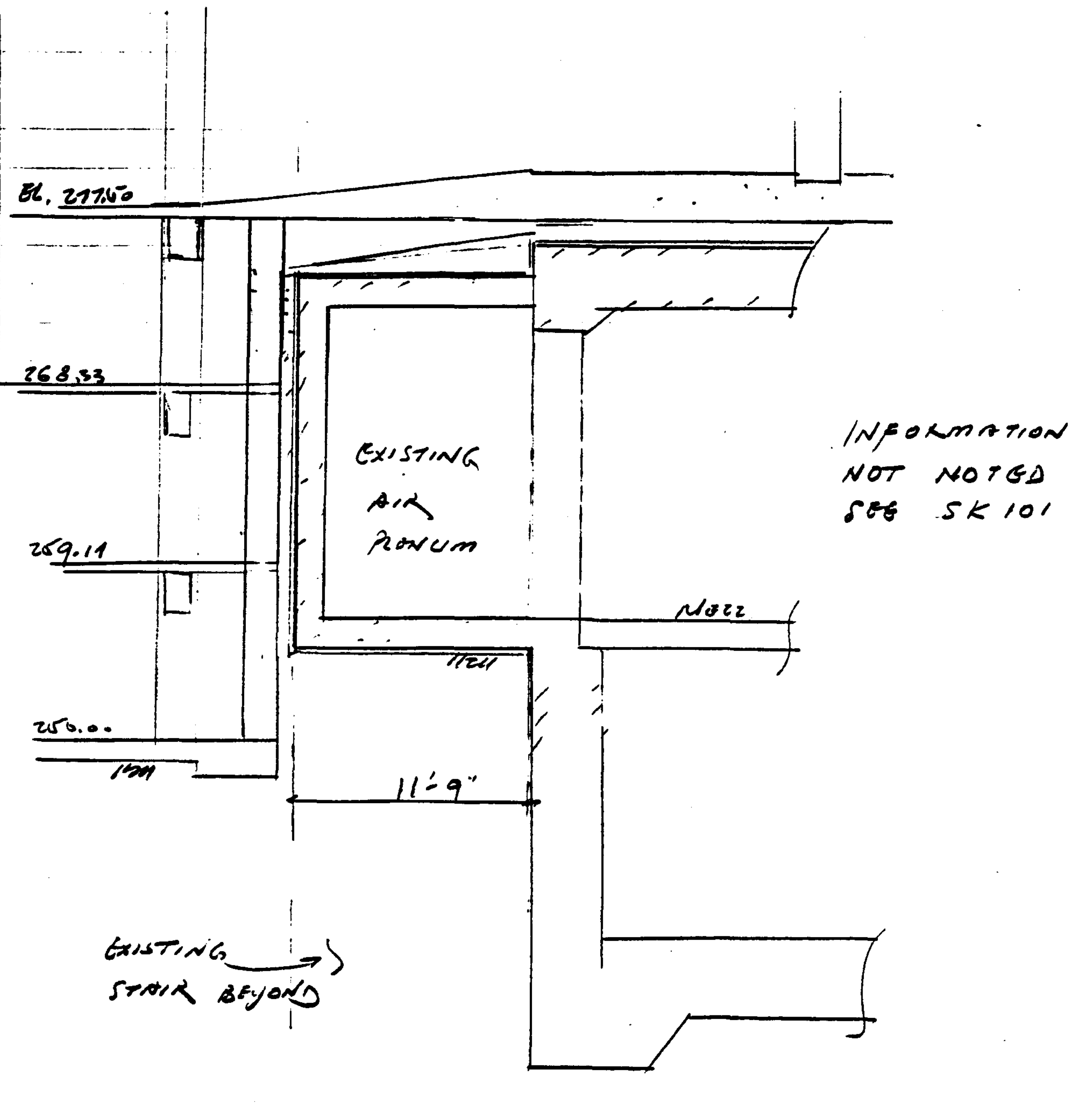
MARTIN & HUANG INTERNATIONAL, INC

Architect ______ Sheet 11/26 of ______

Project METRO PLAZA & GARAGE Job no. SK102

Date 8/22/91

PRELIM STUDY SECTION Engineer JSC



SECTION AT EXISTING FRESH AIR PLENUM 1/8"=1'-0"

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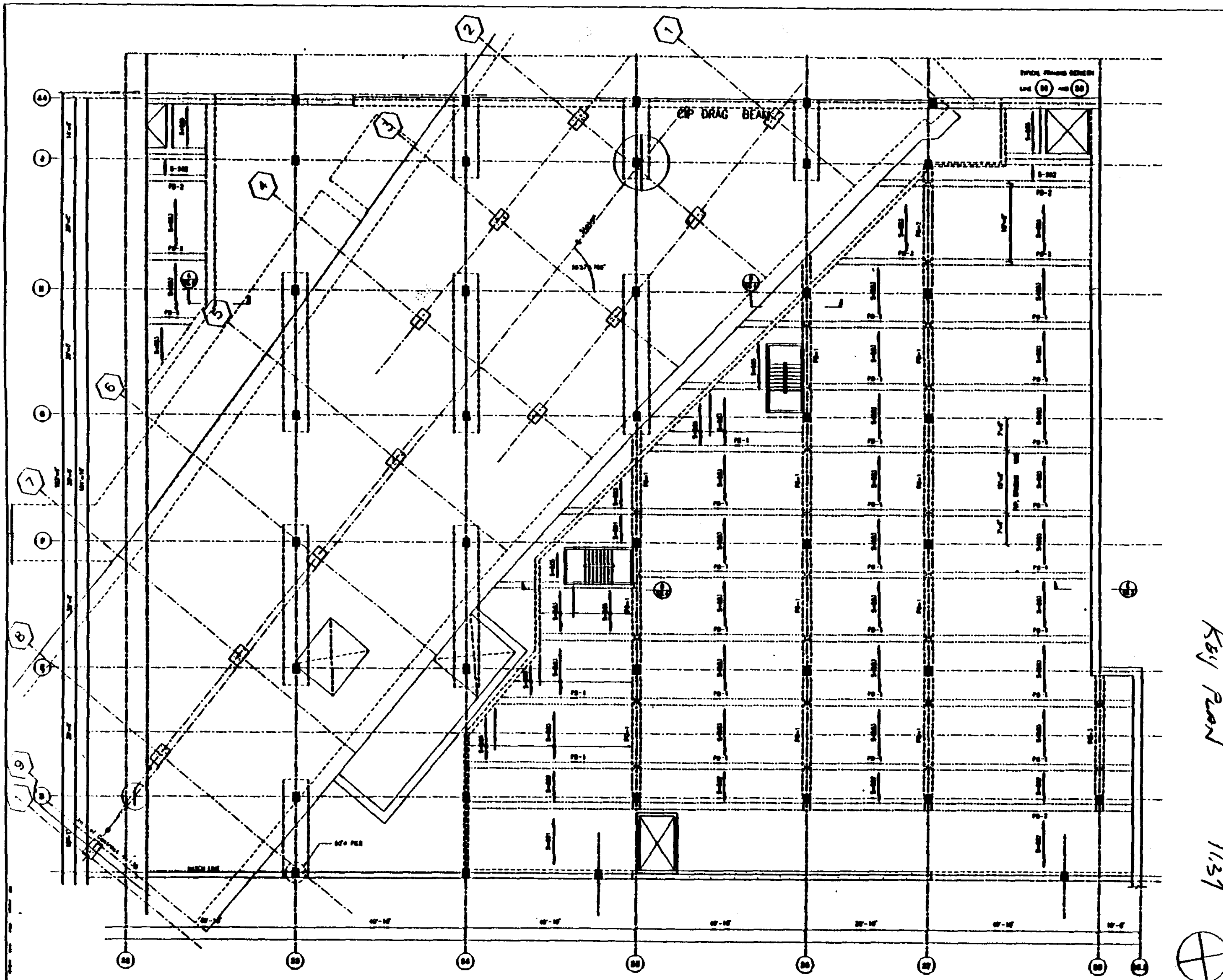


GATEWAY CENTER

TRANSIT PARKING GARAGE

Los Angeles, California

STAGE I

P1 LEVEL FRAMING PLAN ZONE IVB

S-2.24

MARTIN & HUANG INTERNATIONAL, IN

Architect ______ Sheet 1138 of ____

Project ______ Job no. ______

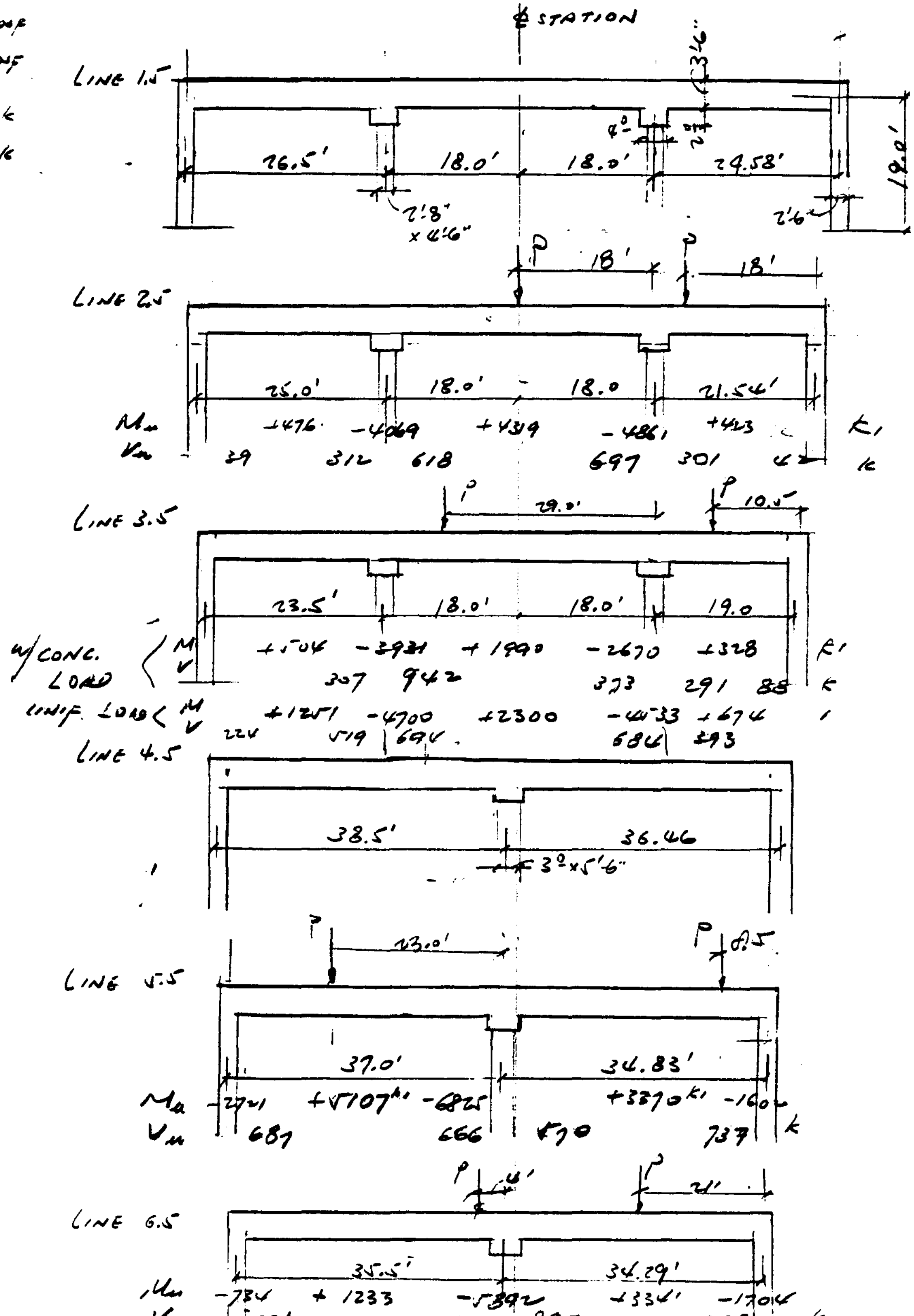
Date 9/4/91

Engineer ______

1120'

w { D = 200 psf
L = 50 psf

P { D = 320 k
L = 180 k



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351 33.0

11:39


```
                pppppp    ccccc    aaaaa
                p     p  c     c  a     a
                p     p  c     c        a
                p     p  c         aaaaaa
                p     p  c     c  a     a
                pppppp   c     c  a     a
                p         ccccc    aaaaaa


   AAA     DDDDD      OOO      SSSSS    SSSSS
  A   A    D    D    O   O    S     S  S     S
 A     A   D     D  O     O   S        S
 AAAAAAA   D     D  O     O    SSSSS    SSSSS
 A     A   D     D  O     O         S        S   ( ttttt mm    mm  )
 A     A   D    D    O   O    S     S  S     S  (   t   m m m m    )
 A     A   DDDDD      OOO      SSSSS    SSSSS    (   t   m   m   m  )
```

****

Computer program for ANALYSIS AND DESIGN OF SLAB SYSTEMS

****

MRTC 142
Line 2.5

11.40

FILE NAME MRTC142

PROJECT ID. RTD A130 CROSSOVER

SPAN ID. LINE 2.5 CONC. LD

ENGINEER jsl

DATE 09-07-91
TIME 22:45

UNITS U.S. in-lb
CODE ACI 318-89

SLAB SYSTEM CONTINUOUS BEAM
FRAME LOCATION INTERIOR

DESIGN METHOD STRENGTH DESIGN
SEISMIC RISK NONE OR LOW

NUMBER OF SPANS 5

CONCRETE FACTORS	SLABS	BEAMS	COLUMNS
DENSITY(PCF)	150.0	150.0	150.0
TYPE	NORMAL WGT	NORMAL WGT	NORMAL WGT
f'c (KSI)	4.0	4.0	4.0
fct (PSI)	423.7	423.7	423.7
fr (PSI)	474.3	474.3	474.3

REINFORCEMENT DETAILS: NON-PRESTRESSED
YIELD STRENGTH (flexural) Fy = 60.00 KSI
YIELD STRENGTH (stirrups) Fyv = 40.00 KSI
DISTANCE TO RF CENTER FROM TENSION FACE:
AT BEAM SUPPORT = 3.00 IN
IN BEAM SPAN = 2.70 IN

FLEXURAL BAR SIZES:	MINIMUM	MAXIMUM
AT BEAM SUPPORT =	# 5	#11
IN BEAM SPAN =	# 5	#11

MINIMUM SPACING:
IN BEAM = 6.00 IN

11.41

SPAN/LOADING DATA
****

SPAN NUMBER	LENGTH L1 (FT)	Tslab (IN)	WIDTH LEFT (FT)	L2*** RIGHT (FT)	SLAB SYSTEM	DESIGN STRIP (FT)	COLUMN STRIP** (FT)	UNIFORM_LOADS S. DL (PSF)	LIVE (PSF)
1*	1.3	42.0	10.0	10.0	5	20.0	20.0	200.0	50.0
2	21.5	42.0	10.0	10.0	5	20.0	20.0	200.0	50.0
3	36.0	42.0	10.0	10.0	5	20.0	20.0	200.0	50.0
4	26.0	42.0	10.0	10.0	5	20.0	20.0	200.0	50.0
5*	1.3	42.0	10.0	10.0	5	20.0	20.0	200.0	50.0

* -Indicates cantilever span information.
** -Strip width used for positive flexure.
***-L2 widths are 1/2 dist. to transverse column.
"E"-Indicates exterior strip.

PARTIAL LOADING DATA
****

SPAN No.	LOAD No.	TYPE	PARTIAL_DEAD_LOADS Wa	Wb	La	Lb	LOAD No.	TYPE	PARTIAL_LIVE_LOADS Wa	Wb	La	Lb
1*												
2	1	CONC	320.0	.0	18.0	.0	1	CONC	180.0	.0	18.0	.0
3	1	CONC	320.0	.0	18.0	.0	1	CONC	180.0	.0	18.0	.0
4	1	CONC	.0	.0	23.5	.0						
5*												

* -Indicates cantilever span information.

UNITS FOR:
UNIFORM LOAD: Wa.......PLF La & Lb... FT
CONCENTRATED LOAD: Wa.......KIPS La........ FT
TRAPEZOIDAL LOAD: Wa & Wb..PLF La & Lb... FT
MOMENT: Wa.......FT-K La........ FT
NOTE: Local effects of partial loadings are NOT considered by ADOSS, compute manually.

LATERAL LOAD/OUTPUT DATA
****

LATERAL LOADS ARE NOT SPECIFIED

OUTPUT DATA
PATTERN LOADINGS: 1 THRU 4
PATTERN LIVE LOAD FACTOR (1-3) = 75%

LOAD FACTORS:
U = 1.40*D + 1.70*L
U = .75(1.40*D + 1.70*L + 1.70*W)
U = .90*D + 1.30*W

OUTPUT OPTION(S) FOR ANALYSIS:
1. Data Check
2. CL Moments & Shears
3. Design Moments & Shears

OUTPUT OPTION(S) FOR DESIGN:
1. *SUPRESS* Bar Sizing, Deflection, & Material Quantities

**TOTAL UNFACTORED DEAD LOAD = 1751.080 KIPS
LIVE LOAD = 446.040 KIPS

---- STATICS PRINT-OUT FOR GRAVITY LOAD ANALYSIS ----

J O I N T M O M E N T S (FT - KIPS)

JOINT NUMBER	PATTERN-1 LEFT	PATTERN-1 RIGHT	PATTERN-1 TOP	PATTERN-1 BOTTOM	PATTERN-2 LEFT	PATTERN-2 RIGHT	PATTERN-2 TOP	PATTERN-2 BOTTOM
1	-5.4	22.0	.0	-16.7	-5.4	-423.2	.0	428.6
2	-5972.9	5972.9	.0	.0	-5632.2	5632.2	.0	.0
3	-4816.6	4816.6	.0	.0	-4764.8	4764.8	.0	.0
4	49.1	5.4	.0	-54.5	358.3	5.4	.0	-363.7

JOINT NUMBER	PATTERN-3 LEFT	PATTERN-3 RIGHT	PATTERN-3 TOP	PATTERN-3 BOTTOM	PATTERN-4 LEFT	PATTERN-4 RIGHT	PATTERN-4 TOP	PATTERN-4 BOTTOM
1	-4.4	26.9	.0	-22.5	-5.7	-280.3	.0	286.0
2	-4884.8	4884.8	.0	.0	-6413.6	6413.6	.0	.0
3	-3723.2	3723.2	.0	.0	-4978.9	4978.9	.0	.0
4	13.7	4.4	.0	-18.1	336.5	5.7	.0	-342.2

J O I N T S H E A R S (KIPS)

JOINT NUMBER	PATTERN-1 LEFT	PATTERN-1 RIGHT	PATTERN-2 LEFT	PATTERN-2 RIGHT	PATTERN-3 LEFT	PATTERN-3 RIGHT	PATTERN-4 LEFT	PATTERN-4 RIGHT
1	-8.6	105.0	-8.6	-3.3	-7.0	106.2	-9.1	38.9
2	-1051.8	734.9	-840.8	721.8	-988.3	592.3	-1141.2	783.5
3	-675.6	449.1	-673.6	432.3	-527.7	395.6	-703.7	461.8
4	-111.2	8.6	-47.7	8.6	-117.6	7.0	-62.4	9.1

N E G A T I V E   F L E X U R E
****

COLUMN NUMBER	PATTERN NUMBER	LOCATION @COL. FACE	TOTAL DESIGN (FT-K)	Allow Mu	COLUMN STRIP (FT-K)	MIDDLE STRIP (FT-K)	BEAM IN COL.STRIP (FT-K)
1**	4	L !!	-3.9		Not applicable		-3.9
2	4	!! R	4861.3	<6820	Not applicable		4861.3
3	4	!! R	4069.9	<6820	Not applicable		4069.9
4**	4	!! R	3.9		Not applicable		3.9

** - Positive moment encountered at support, analyze manually.

P O S I T I V E   F L E X U R E
****

SPAN NUMBER	PATTERN NUMBER	LOCATION FROM LEFT (FT)	TOTAL DESIGN (FT-K)		COLUMN STRIP (FT-K)	MIDDLE STRIP (FT-K)	BEAM IN COL. STRIP (FT-K)
2	2	.0	423.2	<4170	Not applicable		423.2
3	4	18.9	4318.6	<5369	Not applicable		4318.6
4	4	22.8	475.6	<4170	Not applicable		475.6

S H E A R   A N A L Y S I S

NOTE--Allowable shear stress in beams = 126.49 PSI (see "CODE").

B E A M   S H E A R   R E Q U I R E M E N T S (KIPS, SQ.IN./IN., FT.)

BEAM SPAN NO.	PATT. NO.	LEFT Vu@d SHEAR	SIDE Av/s @d	Av/s .175	Av/s .375	Av/s .625	Av/s .825	RIGHT Av/s @d	SIDE Vu@d SHEAR	LEFT Vc/2. DIST.
1 * *			Span length equal to column size or zero							* *
2	3	27.5	.300*	.000+	.300*	.300*	.000+	.300*	-226.9	.54
2	4	-41.7	.300*	.000+	.300*	.300*	.000+	.300*	-301.1	.54
3	4	697.4	.300*	.300*	.300*	.300*	.300*	.300*	-617.6	15.30
4	4	375.7	.300*	.000+	.300*	.300*	.300*	.300*	18.2	.65
4	3	311.7	.300*	.000+	.300*	.300*	.300*	.300*	-38.9	.65
5 * *			Span length equal to column size or zero							* *

NOTES: 1.) To obtain stirrup spacing, divide stirrup area by Av/s value above.
2.) To obtain stirrup area, multiply spacing by Av/s value.
3.) Local effects due to loadings applied at other segments along beam span must be calculated manually.
4.) Symbols following Av/s values:
* - minimum shear 50*bw/Fyv - based on beam dimensions.
x - Vs exceeds 2*Vc, maximum stirrup spacing must be halved.
+ - Av/s value at segment located within effective depth.

* Program completed as requested *

PERMISSIBLE V_u = 1196 x 0.85 = 1016 k per 20'

11.48


```
                  pppppp     ccccc     aaaaa
                  p     p  c     c  a      a
                  p     p  c     c         a
                  p     p  c           aaaaaa
                  p     p  c     c  a      a
                  pppppp    c     c  a      a
                  p          ccccc     aaaaaa

   AAA     DDDDD       OOO      SSSSS    SSSSS
  A   A    D    D     O   O    S     S  S     S
 A     A   D     D   O     O   S        S
 AAAAAAA   D     D   O     O    SSSSS    SSSSS
 A     A   D     D   O     O         S        S    ( ttttt mm    mm  )
 A     A   D    D     O   O    S     S  S     S   (   t    m m m m    )
 A     A   DDDDD       OOO      SSSSS    SSSSS     (   t    m  m   m  )
```

****

Computer program for ANALYSIS AND DESIGN OF SLAB SYSTEMS

****

Licensee stated above acknowledges that Portland Cement Association(PCA) is not and cannot be responsible for either the accuracy or adequacy of the material supplied as input for processing by the ADOSS(tm) computer program. Furthermore, PCA neither makes any warranty expressed nor implied with respect to the correctness of the output prepared by the ADOSS(tm) program. Although PCA has endeavored to produce ADOSS(tm) error free the program is not and cannot be certified infallible. The final and only responsibility for analysis, design and engineering documents is the licensees. Accordingly, PCA disclaims all responsibility in contract, negligence or other tort for any analysis, design or engineering documents prepared in connection with the use of the ADOSS(tm) program.

MRTC 141
Line 4.1

FILE NAME MRTC141.IN

PROJECT ID. RTD A130 CROSSOVER

SPAN ID. LINE 4.5 CONC. LD

ENGINEER jsl

DATE 09-07-91
TIME 22:30

UNITS U.S. in-lb
CODE ACI 318-89

SLAB SYSTEM CONTINUOUS BEAM
FRAME LOCATION INTERIOR

DESIGN METHOD STRENGTH DESIGN
SEISMIC RISK NONE OR LOW

NUMBER OF SPANS 5

CONCRETE FACTORS	SLABS	BEAMS	COLUMNS
DENSITY(PCF)	150.0	150.0	150.0
TYPE	NORMAL WGT	NORMAL WGT	NORMAL WGT
f'c (KSI)	4.0	4.0	4.0
fct (PSI)	423.7	423.7	423.7
fr (PSI)	474.3	474.3	474.3

REINFORCEMENT DETAILS: NON-PRESTRESSED
YIELD STRENGTH (flexural) Fy = 60.00 KSI
YIELD STRENGTH (stirrups) Fyv = 40.00 KSI
DISTANCE TO RF CENTER FROM TENSION FACE:
AT BEAM SUPPORT = 3.00 IN
IN BEAM SPAN = 2.70 IN

FLEXURAL BAR SIZES:	MINIMUM	MAXIMUM
AT BEAM SUPPORT =	# 5	#11
IN BEAM SPAN =	# 5	#11

MINIMUM SPACING:
IN BEAM = 6.00 IN

SPAN/LOADING DATA
****

SPAN NUMBER	LENGTH L1 (FT)	Tslab (IN)	WIDTH LEFT (FT)	L2*** RIGHT (FT)	SLAB SYSTEM	DESIGN STRIP (FT)	COLUMN STRIP** (FT)	UNIFORM_LOADS S. DL (PSF)	LIVE (PSF)
1*	1.3	42.0	10.0	10.0	5	20.0	20.0	200.0	50.0
2	17.0	42.0	10.0	10.0	5	20.0	20.0	200.0	50.0
3	36.0	42.0	10.0	10.0	5	20.0	20.0	200.0	50.0
4	22.0	42.0	10.0	10.0	5	20.0	20.0	200.0	50.0
5*	1.3	42.0	10.0	10.0	5	20.0	20.0	200.0	50.0

* -Indicates cantilever span information.
** -Strip width used for positive flexure.
***-L2 widths are 1/2 dist. to transverse column.
"E"-Indicates exterior strip.

PARTIAL LOADING DATA
****

SPAN No.	LOAD No.	TYPE	PARTIAL_DEAD_LOADS Wa	Wb	La	Lb	LOAD No.	TYPE	PARTIAL_LIVE_LOADS Wa	Wb	La	Lb
1*												
2	1	CONC	.0	.0	10.5	.0	1	CONC	.0	.0	10.5	.0
3	1	CONC	320.0	.0	10.5	.0	1	CONC	180.0	.0	10.5	.0
4	1	CONC	.0	.0	23.5	.0						
5*												

* -Indicates cantilever span information.

UNITS FOR:

UNIFORM LOAD:	Wa.......PLF	La & Lb... FT
CONCENTRATED LOAD:	Wa.......KIPS	La........ FT
TRAPEZOIDAL LOAD:	Wa & Wb..PLF	La & Lb... FT
MOMENT:	Wa.......FT-K	La........ FT

NOTE: Local effects of partial loadings are NOT considered by ADOSS, compute manually.

BEAMS ALONG SPAN DATA
****

SPAN NUMBER	BEAM WIDTH (IN)	BEAM DEPTHS T1_LEFT (IN)	T2_CENTER (IN)	T3_RIGHT (IN)	BEAM SPANS H1 (FT)	H2 (FT)
1	240.0	42.0	42.0	42.0	.0	.0
2	240.0	42.0	42.0	42.0	.0	.0
3	240.0	42.0	42.0	42.0	.0	.0
4	240.0	42.0	42.0	42.0	.0	.0
5	240.0	42.0	42.0	42.0	.0	.0

COLUMN/TORSIONAL DATA
****

COLUMN NUMBER	COLUMN_ABOVE_SLAB C1 (IN)	C2 (IN)	HGT (FT)	COLUMN_BELOW_SLAB C1 (IN)	C2 (IN)	HGT (FT)	CAPITAL** EXTEN. (IN)	DEPTH (IN)	COLUMN STRIP* (FT)	MIDDLE STRIP* (FT)
1	.0	.0	.0	30.0	240.0	19.0	.0	.0	20.0	.0
2	.0	.0	.0	48.0	240.0	19.0	.0	.0	20.0	.0
3	.0	.0	.0	48.0	240.0	19.0	.0	.0	20.0	.0
4	.0	.0	.0	30.0	240.0	19.0	.0	.0	20.0	.0

Columns with zero "C2" are round columns.
* -Strip width used for negative flexure.
**-Capital extension distance measured from face of column.

COLUMN NUMBER	SUPPORT FIXITY* %
1	100%
2	0%
3	0%
4	100%

* -Support fixity of 0% denotes pinned condition.
Support fixity of 999% denotes fixed end condition.

LATERAL LOAD/OUTPUT DATA
****

LATERAL LOADS ARE NOT SPECIFIED

OUTPUT DATA
PATTERN LOADINGS: 1 THRU 4
PATTERN LIVE LOAD FACTOR (1-3) = 75%

LOAD FACTORS:
U = 1.40*D + 1.70*L
U = .75(1.40*D + 1.70*L + 1.70*W)
U = .90*D + 1.30*W

OUTPUT OPTION(S) FOR ANALYSIS:
1. Data Check
2. CL Moments & Shears
3. Design Moments & Shears

OUTPUT OPTION(S) FOR DESIGN:
1. *SUPRESS* Bar Sizing, Deflection, & Material Quantities

**TOTAL UNFACTORED DEAD LOAD = 1307.250 KIPS
LIVE LOAD = 257.500 KIPS

---- STATICS PRINT-OUT FOR GRAVITY LOAD ANALYSIS ----
****

J O I N T   M O M E N T S (FT - KIPS)

JOINT NUMBER	PATTERN-1 LEFT	PATTERN-1 RIGHT	PATTERN-1 TOP	PATTERN-1 BOTTOM	PATTERN-2 LEFT	PATTERN-2 RIGHT	PATTERN-2 TOP	PATTERN-2 BOTTOM
1	-5.4	-608.8	.0	614.2	-5.4	-895.1	.0	900.5
2	-5617.8	5617.8	.0	.0	-5599.7	5599.7	.0	.0
3	-3602.1	3602.1	.0	.0	-3566.9	3566.9	.0	.0
4	126.0	5.4	.0	-131.4	296.8	5.4	.0	-302.1

JOINT NUMBER	PATTERN-3 LEFT	PATTERN-3 RIGHT	PATTERN-3 TOP	PATTERN-3 BOTTOM	PATTERN-4 LEFT	PATTERN-4 RIGHT	PATTERN-4 TOP	PATTERN-4 BOTTOM
1	-4.4	-606.0	.0	610.4	-5.7	-958.0	.0	963.7
2	-4357.6	4357.6	.0	.0	-6017.1	6017.1	.0	.0
3	-3059.5	3059.5	.0	.0	-3782.3	3782.3	.0	.0
4	124.7	4.4	.0	-129.1	298.9	5.7	.0	-304.6

J O I N T   S H E A R S (KIPS)

JOINT NUMBER	PATTERN-1 LEFT	PATTERN-1 RIGHT	PATTERN-2 LEFT	PATTERN-2 RIGHT	PATTERN-3 LEFT	PATTERN-3 RIGHT	PATTERN-4 LEFT	PATTERN-4 RIGHT
1	-8.6	-129.1	-8.6	-228.9	-7.0	-128.0	-9.1	-242.7
2	-537.2	907.3	-526.2	906.6	-447.0	696.9	-568.9	975.3
3	-490.2	384.6	-488.8	370.3	-423.1	353.5	-511.9	398.9
4	-73.0	8.6	-28.5	8.6	-73.4	7.0	-37.3	9.1

N E G A T I V E   F L E X U R E
****

COLUMN NUMBER	PATTERN NUMBER	LOCATION @COL. FACE	TOTAL DESIGN (FT-K)	COLUMN STRIP (FT-K)	MIDDLE STRIP (FT-K)	BEAM IN COL.STRIP (FT-K)
1**	4	L ¦¦	-3.9	Not applicable		-3.9
2	4	L ¦¦	-4893.5	Not applicable		-4893.5
3	4	¦¦ R	2999.0	Not applicable		2999.0
4**	4	¦¦ R	3.9	Not applicable		3.9

** - Positive moment encountered at support, analyze manually.

P O S I T I V E   F L E X U R E
****

SPAN NUMBER	PATTERN NUMBER	LOCATION FROM LEFT (FT)	TOTAL DESIGN (FT-K)	COLUMN STRIP (FT-K)	MIDDLE STRIP (FT-K)	BEAM IN COL. STRIP (FT-K)
2	4	.0	958.0	Not applicable		958.0
3	4	11.7	2852.4	Not applicable		2852.4
4	4	19.3	359.6	Not applicable		359.6

11.56

S H E A R   A N A L Y S I S

NOTE--Allowable shear stress in beams = 126.49 PSI (see "CODE").

B E A M   S H E A R   R E Q U I R E M E N T S (KIPS, SQ.IN./IN., FT.)

BEAM SPAN NO.	PATT. NO.	LEFT Vu@d SHEAR	SIDE Av/s @d	!--FRACTIONAL DIST. Av/s .175	ALONG Av/s .375	SPAN-! Av/s .625	Av/s .825	RIGHT Av/s @d	SIDE Vu@d SHEAR	LEFT Vc/2. DIST.
1 * *			Span length equal to column size or zero							* *
2	4	-323.3	.300*	.000+	.300*	.300*	.000+	.300*	-482.8	.43
3	4	889.2	.300*	.300*	.300*	.300*	.300*	.300*	-425.8	9.90
4	4	312.8	.300*	.000+	.300*	.300*	.000+	.300*	43.3	.55
4	3	269.6	.300*	.000+	.300*	.300*	.000+	.300*	5.3	.55
5 * *			Span length equal to column size or zero							* *

NOTES: 1.) To obtain stirrup spacing, divide stirrup area by Av/s value above.
2.) To obtain stirrup area, multiply spacing by Av/s value.
3.) Local effects due to loadings applied at other segments along beam span must be calculated manually.
4.) Symbols following Av/s values:
* - minimum shear 50*bw/Fyv - based on beam dimensions.
x - Vs exceeds 2*Vc, maximum stirrup spacing must be halved.
+ - Av/s value at segment located within effective depth.

* Program completed as requested *

$V_c = 1196^k$

$\frac{V_u}{\phi} = \frac{889}{.85} = 1045^k < V_c$ ok

```
                pppppp    ccccc    aaaaa
                p    p  c     c  a     a
                p    p  c     c        a
                p    p  c          aaaaaa
                p    p  c     c  a     a
                pppppp  c     c  a     a
                p         ccccc    aaaaaa


     AAA    DDDDD      OOO     SSSSS    SSSSS
    A   A   D    D    O   O   S     S  S     S
   A     A  D     D  O     O  S        S
   AAAAAAA  D     D  O     O   SSSSS    SSSSS
   A     A  D     D  O     O        S        S   ( ttttt mm   mm )
   A     A  D    D    O   O   S     S  S     S  (    t   m m m m  )
   A     A  DDDDD      OOO     SSSSS    SSSSS    (   t   m  m  m )
```

****

Computer program for ANALYSIS AND DESIGN OF SLAB SYSTEMS

****

FILE NAME MRTC134.IN

PROJECT ID. RTD A130 CROSSOVER

SPAN ID. LINE 5.5 CONC LD

ENGINEER jsl

DATE 09-07-91
TIME 13:50

UNITS U.S. in-lb
CODE ACI 318-89

SLAB SYSTEM CONTINUOUS BEAM
FRAME LOCATION INTERIOR

DESIGN METHOD STRENGTH DESIGN
SEISMIC RISK NONE OR LOW

NUMBER OF SPANS 4

CONCRETE FACTORS	SLABS	BEAMS	COLUMNS
DENSITY(PCF)	150.0	150.0	150.0
TYPE	NORMAL WGT	NORMAL WGT	NORMAL WGT
f'c (KSI)	4.0	4.0	4.0
fct (PSI)	423.7	423.7	423.7
fr (PSI)	474.3	474.3	474.3

REINFORCEMENT DETAILS: NON-PRESTRESSED
YIELD STRENGTH (flexural) Fy = 60.00 KSI
YIELD STRENGTH (stirrups) Fyv = 40.00 KSI
DISTANCE TO RF CENTER FROM TENSION FACE:
AT BEAM SUPPORT = 3.00 IN
IN BEAM SPAN = 2.70 IN
FLEXURAL BAR SIZES: MINIMUM ¦ MAXIMUM
AT BEAM SUPPORT = # 5 #11
IN BEAM SPAN = # 5 #11
MINIMUM SPACING:
IN BEAM = 6.00 IN

SPAN/LOADING DATA
****

SPAN NUMBER	LENGTH L1 (FT)	Tslab (IN)	WIDTH LEFT (FT)	L2*** RIGHT (FT)	SLAB SYSTEM	DESIGN STRIP (FT)	COLUMN STRIP** (FT)	UNIFORM_LOADS S. DL (PSF)	LIVE (PSF)
1*	1.3	42.0	10.0	10.0	5	20.0	20.0	200.0	50.0
2	34.8	42.2	10.0	10.0	5	20.0	20.0	200.0	50.0
3	37.0	42.0	10.0	10.0	5	20.0	20.0	200.0	50.0
4*	1.3	42.0	10.0	10.0	5	20.0	20.0	200.0	50.0

* -Indicates cantilever span information.
** -Strip width used for positive flexure.
***-L2 widths are 1/2 dist. to transverse column.
"E"-Indicates exterior strip.

PARTIAL LOADING DATA
****

SPAN No.	LOAD No.	TYPE	PARTIAL_DEAD_LOADS Wa	Wb	La	Lb	LOAD No.	TYPE	PARTIAL_LIVE_LOADS Wa	Wb	La	Lb
1*												
2	1	CONC	320.0	.0	8.5	.0	1	CONC	180.0	.0	8.5	.0
3	1	CONC	320.0	.0	23.0	.0	1	CONC	180.0	.0	23.0	.0
4*												

* -Indicates cantilever span information.

UNITS FOR:
UNIFORM LOAD: Wa.......PLF La & Lb... FT
CONCENTRATED LOAD: Wa.......KIPS La........ FT
TRAPEZOIDAL LOAD: Wa & Wb..PLF La & Lb... FT
MOMENT: Wa.......FT-K La........ FT
NOTE: Local effects of partial loadings are NOT considered by ADOSS, compute manually.

BEAMS ALONG SPAN DATA
****

SPAN NUMBER	BEAM WIDTH (IN)	BEAM DEPTHS T1_LEFT (IN)	T2_CENTER (IN)	T3_RIGHT (IN)	BEAM SPANS H1 (FT)	H2 (FT)
1	240.0	42.0	42.0	42.0	.0	.0
2	240.0	42.0	42.0	42.0	.0	.0
3	240.0	42.0	42.0	42.0	.0	.0
4	240.0	42.0	42.0	42.0	.0	.0

COLUMN/TORSIONAL DATA
****

COLUMN NUMBER	COLUMN_ABOVE_SLAB C1 (IN)	C2 (IN)	HGT (FT)	COLUMN_BELOW_SLAB C1 (IN)	C2 (IN)	HGT (FT)	CAPITAL** EXTEN. (IN)	DEPTH (IN)	COLUMN STRIP* (FT)	MIDDLE STRIP* (FT)
1	.0	.0	.0	30.0	240.0	19.0	.0	.0	20.0	.0
2	.0	.0	.0	48.0	240.0	.0	.0	.0	20.0	.0
3	.0	.0	.0	30.0	240.0	19.0	.0	.0	20.0	.0

Columns with zero "C2" are round columns.
* -Strip width used for negative flexure.
**-Capital extension distance measured from face of column.

COLUMN NUMBER	SUPPORT FIXITY* %
1	100%
2	0%
3	100%

* -Support fixity of 0% denotes pinned condition.
Support fixity of 999% denotes fixed end condition.

Tsuchiyama & Kaino

Consulting Mechanical Engineers

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Victor M. Tsuchiyama, P.E.
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August 31, 1992

Mr. Steven Nakada
EHRENKRANTZ & ECKSTUT ASSOCIATES
225 Arizona Avenue
Santa Monica, CA 90401

Subject: Gateway Center
Metro Rail Interface

Dear Steve:

Pursuant to our review of the Metro Rail design documents and plans prepared by your office we offer the following comments and questions:

PLUMBING

1. The following existing utilities which are cast in concrete will **not** be relocated: 8" Wet Standpipe (WSP), 6" Fire Sprinkler (SP) and 4" Sewage Ejector Pump (PD(S)). These utilities will be routed towards the southeast, parallel to the east wall of the Metro Rail tunnel.

HVAC

1. The TPSS exhaust located at column lines K & 24 is being routed through a shaft extension to two kiosk elements which discharge above the plaza level as indicated on the EEA drawings. The free area of the shaft is equal to the area of the discharge opening shown on the Metro Rail A-130 design documents.

2010 Main Street • Suite 450 • Irvine • California 92714 • (714) 756-0565 • FAX: (714) 756-0927

2. The TPSS and equipment yard fresh air intake located at column lines K & 21 is being integrated into the Arroyo design. The fresh air intake will be located beside a stair platform as indicated on the EEA drawings. Once again the free area of the opening is equal to the area of the intake opening shown on the Metro Rail A-130 design documents.

3. There are existing exhaust and fresh air openings shown in the Metro Rail A-135 plans. These openings are located between column lines 20 & 22 and P & Q. It appears that these openings do not occur within the limits of the parking structure or any future buildings. It is assumed that the openings will be integrated into future landscape designs. Please note if any further action is required?

4. There are indications for pipe sleeves on the Metro Rail A-135 plans, sheet M-010. These sleeves are noted for service to a future cooling tower. Although this area is currently clear from the parking structure and future buildings, direction from RCC regarding size, location and service of the cooling tower is necessary for future planning.

5. It has been noted in previous meetings that the escalator to the Metro Rail Station is used for intake air during smoke evacuation. Currently the design of the East Portal is open to the outdoors, which does not pose a problem. It should be confirmed with RCC that this is in fact the case and that further action is not required.

If there are any questions or concerns, please feel free to contact our office.

Sincerely,

TSUCHIYAMA & KAINO

Larry Sun, P.E.
Associate

Thomas S. Kaya
Senior Associate

LEVINE / SEEGEL ASSOCIATES
Consulting Engineers

Electrical Narrative for Metrorail Interfaces

A. 34.5 kV Feeders to Metrorail Station:

Two 34.5 kV existing Department of Water & Power primary feeders supply the Metrorail power service. These underground feeders run in existing Vignes Street south from Macy Street and along the Metrorail tunnel to the service point. The section of this underground run located in Vignes Street and the section near the tunnel must be abandoned to permit excavation for the underground parking.

It is proposed that DWP relocate these feeders to run in Lyons Street from Macy to an intersection with the existing feeders near the tunnel. DWP has generally agreed with this new alignment.

See Drawing No. A-1.1 of Metrorail Interface/Site Access and Egress Set.

B. Telephone Feed in Vignes Street:

An existing telephone duct bank runs in Vignes Street south to a point near the freeway. This duct bank must be abandoned to permit excavation for the underground parking. The telephone company has agreed to a relocation in Lyons Street which would parallel the 34.5 kV run.

See Drawing No. A-1.1 of Metrorail Interface/Site Access and Egress Set.

C. Metrorail Equipment Access Hatch:

An existing equipment hatch is used for access to DWP primary switching equipment and Metrorail transformers. It is proposed that the hatch cover be installed in the P1 parking level floor and that an access hatch be located above in the Plaza level slab. The Plaza level hatch will be oriented at about a 45^{0} angle to the P-1 level hatch, but the Plaza level hatch will be larger to provide required space.

See Drawing No. A-3.2 of Metrorail Interface/New Construction Set.

D. Department of Water & Power Manhole:

An existing DWP manhole is located near the Metrorail station. It is proposed that this manhole have an access cover in the P-1 parking level floor and that suitable openings be provided in the Plaza level slab to permit pulling cable in the manhole.

See Drawing No. A-1.1 of Metrorail Interface/Site Access and Egress Set.

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Rolf Jensen & Associates, Inc.

FIRE PROTECTION ENGINEERS BUILDING CODE CONSULTANTS

September 9, 1992

FACSIMILE 310/319-6516

Mr. Steve Nakada
Ehrenkrantz & Eckstut Architects, Inc.
225 Arizona Street, Suite 300
Santa Monica, CA 90401

METRO RED LINE COORDINATION

Dear Steve:

The following is a description of the approach developed to maintain fire department access and emergency egress for the east entrance of the Union Station Metro Red Line during and after construction of the RTD Gateway Center Project. These approaches have been developed through joint meetings with the Rail Construction Corporation and their consultants. These approaches are intended to address the comments and requests of the L.A. City and County Fire Department Chiefs Robert Aaron and Dick Schiehl as detailed in the attached meeting minutes.

The construction and completion of the RTD Gateway Center can be broken into three stages for the purposes of describing coordination with the Metro Red Line east entrance. The first stage consists of construction of the parking structure up to the P1 Level. The P1 Level will be at approximately the same elevation as the east entrance. The second stage consists of construction of the Bus Plaza above the parking structure. The final stage consists of completed construction or permanent conditions. A construction schedule for each of these stages has been developed by Charles Pankow Builders. The following pages contain a brief narrative description of each stage.

<u>CONSTRUCTION UP TO P1 PARKING LEVEL</u>

FIRE DEPARTMENT ACCESS

1. During construction of the parking garage up to the P1 Level, fire department access will be provided from Ramirez Street and Vignes Street leading to and above the Metro Rail Tunnel.

2. The fire department access lane will be an all-weather driving surface, 20 feet wide with a 35 foot turning radius at the end of the access road.

3. The turn-around will be located within 150 feet from the east platform emergency exit stairs.

4. The fire department access lane will be posted with signs indicating that no parking is allowed on either side.

5. Access will be provided to the mobile generator cabinet and fire department vault by means of an access road.

EMERGENCY EGRESS

1. During the first stage of construction, barricades will be provided to maintain the path of egress from the east platform emergency stairs and the emergency exit stair at the crossover.

2. The barricades from the emergency stairs will lead to the Fire Department turn-around which will be located no more than 150 feet from either of these exit stairs.

3. A temporary bridge will be constructed to connect the East Entrance to the Union Station Passenger Tunnel. This bridge will serve as a temporary means of egress until construction of the P1 level is completed.

4. A 10 foot minimum clearance will be provided at the discharge location of each emergency exit stair.

5. The minimum width of each exit stair (8 feet for the east platform emergency stair and 4 feet for the cross-over emergency stair) will be maintained to a public way via the fire department access lane.

6. The minimum lighting level provided within the barricades and bridge structure will be one footcandle measured at the floor.

7. Drawings of all egress barricades and the pedestrian tunnel bridge will be reviewed and approved by RCC prior to construction.

STAGE 2 - CONSTRUCTION OF BUS PLAZA LEVEL

FIRE DEPARTMENT ACCESS

1. During the first stage of construction a construction access road, located to the west of the parking structure between the rail yards and excavation site, will be utilized for staging of construction materials such as beams and columns. When construction of the parking structure has reached the P1 Level, the majority of construction materials will have been utilized in the construction of the parking garage. This will allow the use of the south half of the construction access road as a fire department access lane.

2. Since construction of the Plaza Level will require construction above the Metro Rail Box, the stage 1 fire department access lane to the site will be relocated from the access above the tunnel to an access road at the west end of the site.

3. The previous fire department access lane on top of the Metro Rail Box will be eliminated to accommodate construction of the Bus Plaza.

4. Access will still be provided along Vignes and Ramirez Street in addition to the new fire department access lane at the west side of the site.

5. The new fire department access lane will be an all-weather surface with a 20 foot clear width located within 150 feet of the east platform emergency exit stair and the crossover emergency stair.

6. Since there will be a significant change in elevation between the new fire department access lane and the east entrance or emergency stairs, a temporary stair will be constructed to provide access from the new fire department access lane down to the east entrance and emergency exit stairs.

7. A turn-around with a 30 foot turning radius will be provided at the end of the fire department access lane. The fire department access lane will be accessible from the MetroLink bus way during this time.

EMERGENCY EGRESS

1. During construction of the Bus Plaza Level the barricades serving the east platform emergency stairs will be re-configured to lead occupants up to the fire department access lane adjacent to the rail yard.

2. Barricades will maintain the east platform stair exit width up to the fire department access lane and will be provided with a minimum lighting level of one footcandle measured at the floor surface.

3. The crossover stairs will be rerouted to discharge to the east side of the parking structure, adjacent to Vignes Street.

4. The P1 Level slab will be completed and will be used to connect the east entrance to the Union Station Passenger tunnel.

5. A barricade will be provided to direct occupants from the east entrance to the passenger tunnel in a safe fashion.

PROJECT COMPLETION

FIRE DEPARTMENT ACCESS

1. When construction is completed, fire department access will be provided to the site at the following locations:

   a. Macy Street to the north.

   b. Vignes Street to the east.

   c. El Monte bus way to the south.

   d. Bus Plaza at the center of the site.

2. In addition to the fire hydrants serving the public streets, a private fire hydrant loop will serve the Bus Plaza.

3. The Bus Plaza will provide fire department access within 100 feet of the east entrance, east platform emergency exit stairs and the crossover emergency stairs.

4. In addition to coordination review and approval by RCC, fire department access will be reviewed and approved by Mr. Charlie Justis of the Los Angeles City Fire Department Hydrant Unit. This review and approval process is currently ongoing.

EMERGENCY EGRESS

1. When the project is completed, the east platform emergency stairs and the cross-over emergency stair will be extended up to the Bus Plaza Level and discharge into a public way.

2. The east entrance will discharge into the East Portal and up to the Bus Plaza via two 10 foot stairs.

3. The East Portal will be separated from the parking garage by a 3-hour occupancy separation.

4. In addition, any intended uses in the East Portal other than lobby will be separated from the east entrance by a 3-hour occupancy separation. These separations will serve to maintain the East Portal as a safe means of egress for occupants using the Union Station east entrance.

5. Since the East Portal and parking structure are part of a high-rise building, the project will be protected by:

    a. Automatic sprinklers throughout.

    b. Smoke control systems.

    c. Class III Standpipe system.

    d. Fire detection and alarm system.

    e. Other high-rise fire protection features.

These features will act together to increase the overall level of life safety provided to occupants using the east entrance.

Very truly yours,

Edward L. Fixen

Edward L. Fixen

ELF:gm/jrm

Enc.