

DESIGN OF A FOUR LEVEL STEEL BUILDING

1. Description of Structure and Loads

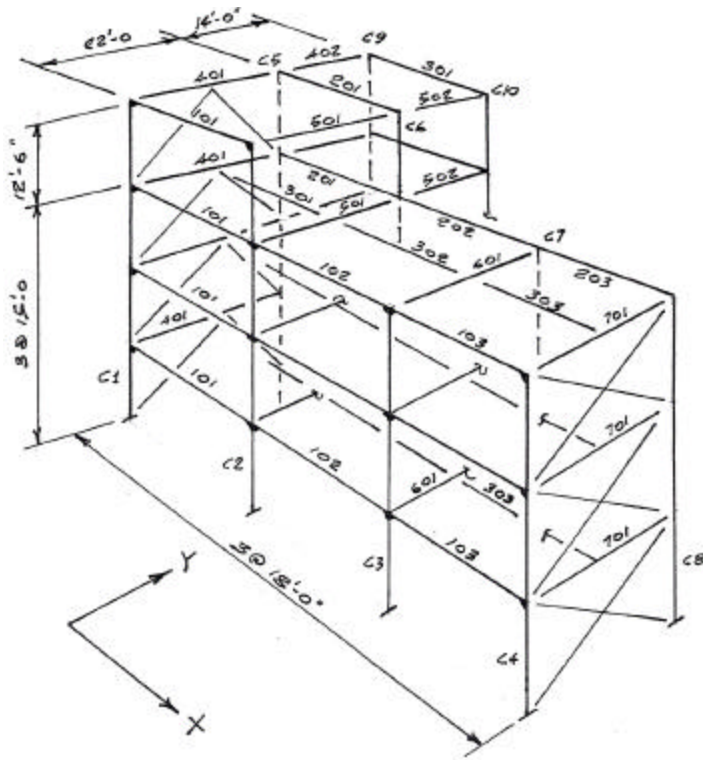


Fig. A

2. Input Command Description - see Fig. B

After the Job Title Statements, general data for entire structure is entered.

This four level Calcinary Building in an Iron Ore Concentrator plant is frames in the long direction – see Fig. A. On the lower three levels all pin connected beams are to be composite. The roof has snow load of 67 psf, while the floors have superimposed dead load of 18 psf and live load of 200 psf. The seismic region has zonal velocity ratio $V = 0.20$. 30% of live load is to be included in the mass for seismic considerations. The self-weight (dead load) of all members is computed by AMECO-17. AMECO-17 automatically generates a rigid floor diaphragm at each level, unless otherwise instructed.

The input commands for AMECO to design the structure are shown in Fig. B. It took three hours to prepare this input. No member sizes had to be input, no loads had to be manually calculated, no loading cases or combinations to be specified. Basically only loading parameters and member connectivities and member spans had to be specified.

If you wish to familiarize with the AMECO input language, it would be helpful to read the next section. Otherwise, proceed to section 3.

USE CODE NBC-95, LSD, follows the command AMECO STEEL specifying the National Building Code with LSD method for member design. This also loads the steel shape tables available in Canada. The next four lines select desired result files. CYCLE MAX 3 limits the global analysis/design cycles to 3.

The member data is entered level by level, starting from the top. The DESIGN BEAMS command requests beam size selection and sets beam spans to 18'-0. Data common to a group of members (e.g. 18'-0) is given in a command (statement stating with a verb).

USE SLAB 6, FDL 18 FLL 67 specifies floor dead and live load in psf. USE FL PROJECTION 18 extends the floor slab 18" beyond the column lines all around the floor. Beam entries consist of beam marks followed by their spans, when the spans are different from 18'-0. By default, beam end connections are hinged. ABR denotes an A-brace below a beam, e.g. B401.

Fig. B

The DESIGN COLUMNS command request size selection and sets all columns 12'-6 long, which defines the storey height. RESTRICT ...limits column depth to min 10". Column marks are prefixed with the letter C. The next two lines define connectivity between columns and beams. A column stack supporting a number of levels is given the same column mark at all levels.

LEVEL 3 TO 1 implies that data for these three levels is the same. DESIGN BEAMS, RG 1. sets beam end connections fully rigid. Next line calls for Composite design for all beams pinned at ends. USE RG 0 sets beam ends from now on pinned. The line "B401 11 301, ABRACE" states that beam 401 supports at 11' the left end of beam 301 and an "A" brace is placed below 401..

```
$      A)      JOB TITLE STATEMENTS
$
PROJECT LOREDO MINES
CLIENT ABC ENGINEERING
STRUCTURE CALCINATOR BUILDING
FILE LOREDO
JOB 76EX7
INPUT- L.D.
$      B)      GENERAL DATA FOR WHOLE STRUCTURE
$
AMECO STEEL
USE CODE NBC-95 LSD
LIST ALL
SUPPRESS LIST GEOM DATA
SUPPRESS NONLINEAR ANALYSIS CYCLE 1
LIST FRAME FORCES FOR EQ
CYCLE MAX 3
DESIGN ALL
$
$      C)      MEMBER DATA LEVEL BY LEVEL
LEVEL 4
$
DESIGN BEAMS, SPANS 18-0
RESTRICT DEFLECTIONS TO L/360
USE SLAB 6, FDL 18 FLL 67
USE BRACING SHAPES WT
B101 TO 301 RG 1
B401 22 ABR B402 14 B501 22 XBR B502 14
$
DESIGN COLUMNS, LENGTH 12-6
RESTRICT XDIM TO MIN 10
C1 TO 2 101 401
C5 TO 6 201 402
C9 TO 10 301 402R
$
LEVEL 3 TO 1
$
DESIGN BEAMS, RG 1
USE COMPOSITE IF RG LR .1
USE SLAB 8, FDL 50 FLL 200
USE FLOOR PROJECTION 18
B101 TO 103 B201 TO 203
B301 TO 303 RG 0 B801
USE RG 0, SPAN 22
B401 11 301 ABRACE, B402 14
B501 11 302, B502 14
B601 11 303
B701 11 303R XBRACE
$
DESIGN COLUMNS LENGTH 15
EQUATE COLS 3,4,7,8
C1 TO 4 101 401
C5 TO 8 201 402
C9 TO 10 801 402R
USE SUBGRADE MODULUS 200
$
COMPUTE TORSION NBC
COMPUTE EQ XFORCES NBC V .20 R 4 MF .3
COMPUTE EQ YFORCES NBC V .20 R 2 MF .3
$
EXECUTE
□
```

C1 to 4 101 401 means that columns 1 to 4 support beams starting with 101 in X-direction and beams 401 501 601 701 in Y-direction. In the USE SUBGRADE command, the modulus of 200 psi/in. represents a soil of medium strength. In AMECO-17 default subgrade is rock.

COMPUTE TORSION NBC invokes eccentricity amplification for seismic analysis as per NBC code. The last two COMPUTE commands request earthquake computation for zonal velocity ratio of 0.20. The R factor is set to 4 in the direction of rigid frames and R= 2 in the direction of the bracing. MF 0.3 sets 30% of live load to be included in the seismic mass.

3. Analyses and Design Process

Based on the input commands of Fig. B, AMECO-17 generates the geometry in 3D, initializes member sizes, models joints, calculates floor dead and live loads on each member, calculates seismic forces, sets up loading cases and combinations and through a cyclic analysis/design process designs the whole structure. For this structure the AMECO-17 design execution time was 2 seconds on a 1.3 GHz PC. To prepare the input, to execute AMECO-17 and to review the output – it took seven man-hours.

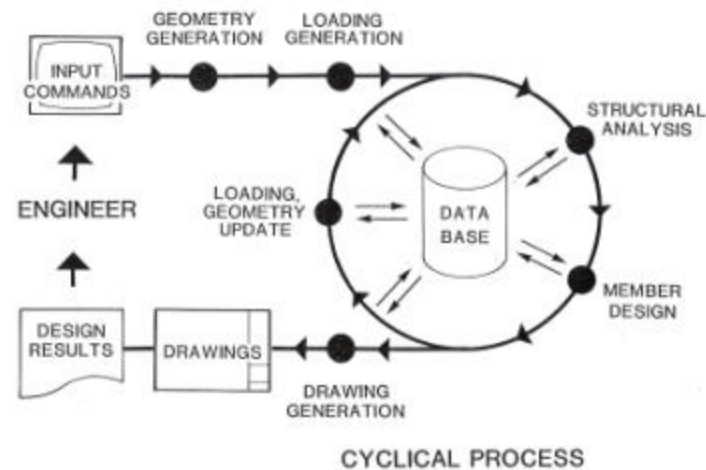


Fig. C
AMECO-17 cyclical process

4. Analysis and Design Results

In this section representative pages are displayed out of the total of 61 Design Result pages. This design was done in English units, therefore all member forces and moments are ft –kip units; floor and fire protection areas are in sq.ft., member cross-section dimensions and displacements in inches; steel shapes available in Canada are used, invoked by the NBC code.

The following results are listed level by level,

Principal Design Parameters

Beam Schedules

Frame Analysis Results for Earthquake

Beam Design Results

Column Design Tables

Bracing Design Tables

Bill of Materials

Costs of Construction

Dayfile – Execution Times

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      *
    * *
  *   *
 *     *
*       *
 *     *
  *   *
    * *
      *
* A M E C O 17 *
* VERSION WIN 3.1 *
*
* MOD. 11 JUN 2005 *
* SERIAL NO 999S0612 3 *
*
* MONTREAL CANADA *
*
* * * * *

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P R I N C I P A L D E S I G N P A R A M E T E R S

DESIGN CODE NBC -95

MEMBER DESIGN METHOD LSD

NONLINEAR ANALYSIS PERFORMED

CONSTRUCTION SIMULATION SUPPRESSED

FINITE JOINTS CONSIDERED

MEMBER CRACKING N.A.

LIVE LOAD REDUCTION NBC - HUMAN

LOAD FACTORS 1.25 1.50 1.05 1.25 1.50 1.19

LEVEL NO. - 2

B E A M S C H E D U L E

MARK	REQD	PROFILE	SPAN	WEIGHT	REACTIONS	UTIL.RATIO	REMARKS
B 101	1	W12*21	18.00	0.19	22.8 24.1	0.91	
B 102	1	W12*21	18.00	0.19	23.7 23.7	0.91	
B 103	1	W12*21	18.00	0.19	24.0 23.8	0.85	
B 201	1	W16*26	18.00	0.24	36.0 38.8	0.81	
B 202	1	W12*21	18.00	0.19	24.2 23.6	0.96	
B 203	1	W12*21	18.00	0.19	24.0 23.8	0.85	
B 301	1	W10*16	18.00	0.15	33.7 33.7	1.00	
B 302	1	W10*16	18.00	0.15	33.7 33.7	1.00	
B 303	1	W10*16	18.00	0.15	33.7 33.7	1.00	
B 801	1	W12*21	18.00	0.19	25.1 25.0	0.74	
B 401	1	W21*48	22.00	0.53	40.3 40.3	0.89	
B 402	1	W8*21	14.00	0.15	16.7 16.7	0.90	
B 501	1	W16*36	22.00	0.40	61.3 61.3	0.99	
B 502	1	S6*12.8	14.00	0.09	16.6 16.6	0.58	
B 601	1	W16*36	22.00	0.40	61.3 61.3	0.99	
B 701	1	W21*48	22.00	0.53	40.3 40.3	0.86	

BEAM "UR" ON LEVEL 2 - ALLOWED = 1.00 , MAX COMPUTED = 1.00

S T E E L TONNAGE = 4.16, LEVEL 2 FOR 16 BEAMS

NUMBER OF S H E A R S T U D S= 226 LEVEL 2 FOR 9 BEAMS

FRAME ANALYSIS RESULTS - DESIGN CYCLE 3

BASE SHEAR COMPUTATIONS BY 'NBC' CODE FOR LOAD CASE 'EQ-X'

V = 0.2000
 S = 1.1055
 F = 1.0000
 I = 1.0000
 R = 4.0000
 T = 1.8411
 U = .6000
 V/RUSIF = 0.0332

W = 595.6 TONS
 FORCE V = 39.5 KIPS

FRAME ANALYSIS RESULTS - DESIGN CYCLE 3

FRAME X- 1 LOADING CASE - LATERAL EQ-X IN X DIRECTION

LEVEL 4

MASS= 11.8 TONS

BEAM/SLAB	MOMENTS		FORCES	
	LEFT	RIGHT	SHEAR	AXIAL
101	7.15	-7.44	0.81	0.23

COLUMN	MOMENTS		FORCES		VERTICAL DISPL	HORIZONTAL JOINT LOADS	JOINT ROTATIONS
	TOP	BOT	SHEAR	AXIAL			
1	7.14	-6.54	1.09	-1.11	-0.016	1.32	0.14
2	7.45	-11.92	1.55	1.12	0.004	1.32	0.16

TOTAL SHEAR = 2.64

LEVEL 3

MASS= 77.0 TONS

BEAM/SLAB	MOMENTS		FORCES	
	LEFT	RIGHT	SHEAR	AXIAL
101	21.21	-19.12	2.24	1.31
102	16.78	-15.46	1.79	1.83
103	16.12	-18.87	1.94	0.14

COLUMN	MOMENTS		FORCES		VERTICAL DISPL	HORIZONTAL JOINT LOADS	JOINT ROTATIONS
	TOP	BOT	SHEAR	AXIAL			

LOREDOVD_FRANAL.RES

1	14.59	-10.88	1.70	-3.73	-0.015	1.91	0.15
2	23.90	-20.21	2.94	1.97	0.004	1.91	0.11
3	31.65	-22.38	3.60	-0.16	-0.001	1.91	0.08
4	19.01	-11.84	2.06	1.87	0.010	1.91	0.13

TOTAL SHEAR = 10.30

LEVEL 2

MASS= 77.1 TONS

BEAM/SLAB	MOMENTS		FORCES	
	LEFT	RIGHT	SHEAR	AXIAL
101	29.57	-27.43	3.17	0.46
102	27.75	-29.42	3.18	-0.03
103	32.44	-34.01	3.69	-0.41

COLUMN	MOMENTS		FORCES		VERTICAL DISPL	HORIZONTAL JOINT LOADS	JOINT ROTATIONS
	TOP	BOT	SHEAR	AXIAL			
1	18.63	-17.63	2.42	-7.39	-0.013	1.18	0.19
2	34.93	-34.11	4.60	1.96	0.002	1.18	0.15
3	39.49	-37.94	5.16	-0.68	-0.001	1.18	0.18
4	22.23	-20.05	2.82	5.46	0.009	1.18	0.21

FRAME ANALYSIS RESULTS - DESIGN CYCLE 3

FRAME X- 1 LOADING CASE - LATERAL EQ-X IN X DIRECTION

TOTAL SHEAR = 15.00

LEVEL 1

MASS= 77.1 TONS

BEAM/SLAB	MOMENTS		FORCES	
	LEFT	RIGHT	SHEAR	AXIAL
101	31.17	-28.92	3.34	-0.10
102	28.92	-30.68	3.31	0.85
103	34.21	-35.97	3.90	1.05

COLUMN	MOMENTS		FORCES		VERTICAL DISPL	HORIZONTAL JOINT LOADS	JOINT ROTATIONS
	TOP	BOT	SHEAR	AXIAL			
1	13.49	-33.64	3.14	-11.31	-0.009	0.63	0.20
2	23.67	-40.53	4.28	1.99	0.002	0.63	0.16
3	26.91	-56.84	5.58	-1.28	-0.001	0.63	0.19
4	15.89	-51.59	4.50	9.11	0.007	0.63	0.22

TOTAL SHEAR = 17.50

D R I F T T A B L E F O R L O A D I N G C A S E E Q - X

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LEVEL I  FORCE I  STOREY I      D R I F T      I  MAX. AMPLIF. I
      I  APPLIED I  HEIGHT I  TOTAL INTERSTORY I  DUE TO TORQUE I
-----I-----I-----I-----I-----I-----I-----I
      4      9.10      12.50      2.101      0.370      1.058 AT C 9
      3      15.19      15.00      1.730      0.591      1.010 AT C 9
      2      10.14      15.00      1.139      0.662      1.012 AT C 8
      1       5.07      15.00      0.477      0.477      1.009 AT C 10

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TOTAL HORIZONTAL FORCES APPLIED = 39.51
TOTAL BASE SHEAR DEVELOPED = 44.91

ALLOWABLE DRIFT H/ 250

***** NATURAL PERIOD OF VIBRATION IN X DIRECTION 1.863 SECONDS

EQ-X FRAME ANALYSIS COMPUTATION TIMES IN CPU-SEC

FRAME CONSTANTS 0.00
JOINT DISPLACEMENTS (RELAXATION) 0.00
MEMBER FORCES AND MOMENTS 0.00

ITERATION COUNTS

ROTATION 26
VERTICAL DISPLACEMENT 4
HORIZONTAL DISPLACEMENT 19
X-Y PLANE SWAPPING 1

F R A M E A N A L Y S I S R E S U L T S - D E S I G N C Y C L E 3

B A S E S H E A R C O M P U T A T I O N S B Y ' N B C ' C O D E F O R L O A D C A S E ' E Q - Y '

V = 0.2000
S = 2.0874
F = 1.0000

I = 1.0000
 R = 2.0000
 T = 0.5164
 U = .6000
 V/RUSIF = 0.1252

W = 595.6 TONS
 FORCE V = 149.2 KIPS

FRAME Y- 4 LOADING CASE - LATERAL EQ-Y IN Y DIRECTION

LEVEL 3

MASS= 27.5 TONS

BEAM/SLAB	MOMENTS		FORCES					
	LEFT	RIGHT	SHEAR	AXIAL				
701	0.00	0.00	0.00	0.00				

BRACING	FORCES		HORIZONTAL SHEAR	LENGTH				
	LEFT BR	RIGHT BR		LEFT BR	RIGHT BR			
701	26.89	-26.88	44.43	26.63	26.63			

COLUMN	MOMENTS		FORCES		VERTICAL DISPL	HORIZONTAL JOINT LOADS	JOINT ROTATIONS
	TOP	BOT	SHEAR	AXIAL			
4	0.01	-0.20	0.01	-14.38	-0.099	22.23	0.08
8	0.01	-0.20	0.01	14.45	0.100	22.23	0.08

TOTAL SHEAR = 44.46

LEVEL 2

MASS= 28.1 TONS

BEAM/SLAB	MOMENTS		FORCES					
	LEFT	RIGHT	SHEAR	AXIAL				
701	0.00	0.00	0.00	-0.02				

BRACING	FORCES		HORIZONTAL SHEAR	LENGTH				
	LEFT BR	RIGHT BR		LEFT BR	RIGHT BR			
701	37.20	-37.17	61.44	26.63	26.63			

COLUMN	MOMENTS		FORCES		VERTICAL DISPL	HORIZONTAL JOINT LOADS	JOINT ROTATIONS
	TOP	BOT	SHEAR	AXIAL			
4	-0.21	0.49	-0.05	-51.14	-0.092	8.45	0.07
8	-0.21	0.49	-0.05	51.37	0.092	8.45	0.07

TOTAL SHEAR = 61.35

LEVEL 1

MASS= 28.2 TONS

BEAM/SLAB	MOMENTS		FORCES	
	LEFT	RIGHT	SHEAR	AXIAL
701	0.00	0.00	0.00	-0.03

BRACING	FORCES		HORIZONTAL SHEAR	LENGTH	
	LEFT BR	RIGHT BR		LEFT BR	RIGHT BR
701	40.42	-40.37	66.75	26.63	26.63

COLUMN	MOMENTS		FORCES		VERTICAL DISPL	HORIZONTAL JOINT LOADS	JOINT ROTATIONS
	TOP	BOT	SHEAR	AXIAL			
4	0.50	-3.48	0.27	-94.90	-0.073	2.97	0.08
8	0.50	-3.48	0.27	95.22	0.073	2.97	0.08

TOTAL SHEAR = 67.28

D R I F T TABLE FOR LOADING CASE EQ-Y

LEVEL	FORCE APPLIED	STOREY HEIGHT	D R I F T TOTAL INTERSTORY	I MAX. AMPLIF. DUE TO TORQUE
4	22.16	12.50	0.611 0.084	1.017 AT C 2
3	63.47	15.00	0.527 0.200	1.013 AT C 4
2	42.38	15.00	0.327 0.182	1.070 AT C 4
1	21.18	15.00	0.145 0.145	1.082 AT C 4

TOTAL HORIZONTAL FORCES APPLIED = 149.19

TOTAL BASE SHEAR DEVELOPED = 150.90

ALLOWABLE DRIFT H/ 250

***** NATURAL PERIOD OF VIBRATION IN Y DIRECTION 0.535 SECONDS

EQ-Y FRAME ANALYSIS COMPUTATION TIMES IN CPU-SEC

B E A M D E S I G N R E S U L T S L E V E L 2

** BEAM 101 ** SPAN= 18.00 LU= 3.60 0.00 4.50 FY= 44.

** W12*21 ** SXX = 25.62 FLOOR SLAB = 8.00

LLR = 1.00 , PF = 1.00 , LUMAX= 6.17

	SHEAR		DEFLECTION		MOMENTS		AXIAL
	LEFT	RIGHT	AT 9.0	AT 0.00	9.00	18.00	FORCE
DL	8.69	9.31	0.115	-24.3	18.0	-29.2	-0.1
LL	14.06	14.77	0.178	-39.6	30.8	-48.1	-0.1
DL+LL	22.75	24.08	0.293	-63.9	48.8	-77.3	-0.1
CRIT.	22.79	24.08	0.178	-63.9	48.8	-77.3	-0.1
LOAD NO.	7	1		1	1	1	1

UTILIZATION RATIOS

BEND/AXIAL= 0.91 SHEAR= 0.42 AXIAL= 0.00 AT RITE

** BEAM 102 ** SPAN= 18.00 LU= 4.50 0.00 4.50 FY= 44.

** W12*21 ** SXX = 25.62 FLOOR SLAB = 8.00

LLR = 1.00 , PF = 1.00 , LUMAX= 6.17

	SHEAR		DEFLECTION		MOMENTS		AXIAL
	LEFT	RIGHT	AT 9.0	AT 0.00	9.00	18.00	FORCE
DL	8.95	9.05	0.084	-28.2	15.4	-28.6	-0.1
LL	14.77	14.67	0.161	-49.1	29.2	-47.0	-0.1
DL+LL	23.72	23.73	0.245	-77.4	44.6	-75.7	-0.2
CRIT.	23.72	23.73	0.161	-77.4	44.6	-75.7	-0.2
LOAD NO.	1	1		1	1	1	1

UTILIZATION RATIOS

BEND/AXIAL= 0.91 SHEAR= 0.41 AXIAL= 0.00 AT LEFT

** BEAM 103 ** SPAN= 18.00 LU= 4.50 0.00 4.50 FY= 44.

** W12*21 ** SXX = 25.62 FLOOR SLAB = 8.00

LLR = 1.00 , PF = 1.00 , LUMAX= 6.17

	SHEAR		DEFLECTION		MOMENTS		AXIAL
	LEFT	RIGHT	AT 9.0	AT 0.00	9.00	18.00	FORCE

DL	9.11	8.89	0.104	-27.6	17.1	-26.2	0.0
LL	14.30	14.41	0.158	-44.3	28.9	-43.2	-0.1
DL+LL	23.41	23.30	0.262	-71.9	46.0	-69.3	-0.1
CRIT.	23.95	23.80	0.158	-71.9	46.0	-69.3	-0.1
LOAD NO.	7	6		1	1	1	1

** BEAM 301 ** SPAN= 18.00 LU= 0.00 -0.08 0.00 FY= 44.
 ** W10*16 ** SXX = 16.34 FLOOR SLAB = 8.00

COMPOSITE BEAM IX= 641.59 SX(BOT)= 48.46 FLANGE WIDTH= 54.0
 LLR = 1.00 , PF = 1.00 , LUMAX= 5.45

	SHEAR		DEFLECTION		MOMENTS			AXIAL
	LEFT	RIGHT	AT 9.0	AT 0.00	9.00	18.00	FORCE	
DL	13.07	13.07	0.241	0.0	73.9	0.0	0.0	
LL	20.63	20.63	0.276	0.0	117.0	0.0	0.0	
DL+LL	33.70	33.70	0.516	0.0	191.0	0.0	0.0	

UTILIZATION RATIOS

MOMENT= 1.00 SHEAR= 0.65 AXIAL= 0.00 IN SPAN
 SHEAR CONNECTORS 15 STUDS-DIAM.0.750 (100 PCT. COMPOSITE)

** BEAM 302 ** SPAN= 18.00 LU= 0.00 -0.08 0.00 FY= 44.
 ** W10*16 ** SXX = 16.34 FLOOR SLAB = 8.00

COMPOSITE BEAM IX= 641.59 SX(BOT)= 48.46 FLANGE WIDTH= 54.0
 LLR = 1.00 , PF = 1.00 , LUMAX= 5.45

	SHEAR		DEFLECTION		MOMENTS			AXIAL
	LEFT	RIGHT	AT 9.0	AT 0.00	9.00	18.00	FORCE	
DL	13.07	13.07	0.241	0.0	73.9	0.0	0.0	
LL	20.63	20.63	0.276	0.0	117.0	0.0	0.0	
DL+LL	33.70	33.70	0.516	0.0	191.0	0.0	0.0	

UTILIZATION RATIOS

MOMENT= 1.00 SHEAR= 0.65 AXIAL= 0.00 IN SPAN
 SHEAR CONNECTORS 15 STUDS-DIAM.0.750 (100 PCT. COMPOSITE)

** BEAM 303 ** SPAN= 18.00 LU= 0.00 -0.08 0.00 FY= 44.
 ** W10*16 ** SXX = 16.34 FLOOR SLAB = 8.00

COMPOSITE BEAM IX= 641.59 SX(BOT)= 48.46 FLANGE WIDTH= 54.0
 LLR = 1.00 , PF = 1.00 , LUMAX= 5.45

	SHEAR		DEFLECTION		MOMENTS			AXIAL
	LEFT	RIGHT	AT 9.0	AT 0.00	9.00	18.00	FORCE	
DL	13.07	13.07	0.241	0.0	73.9	0.0	0.0	
LL	20.63	20.63	0.276	0.0	117.0	0.0	0.0	
DL+LL	33.70	33.70	0.516	0.0	191.0	0.0	0.0	

UTILIZATION RATIOS

MOMENT= 1.00 SHEAR= 0.65 AXIAL= 0.00 IN SPAN

SHEAR CONNECTORS 15 STUDS-DIAM.0.750 (100 PCT. COMPOSITE)

BEAM "UR" ON LEVEL 2 - ALLOWED = 1.00 , MAX COMPUTED = 1.00

S T E E L TONNAGE = 4.16, LEVEL 2 FOR 16 BEAMS

NUMBER OF S H E A R S T U D S= 226 LEVEL 2 FOR 9 BEAMS

BEAM F I R E PROTECTION AREA = 1127.4

C O L U M N D E S I G N T A B L E - L E V E L 2

COL	LOAD	F O R C E S				A N D		M O M E N T S				E F F E C T I V E			U T I L I Z A T I O N											
		I	P	X-DIR	Y-DIR	TOP	MOMENT	BOT	MOMENT	LLR	I	LENGTH	LX	LY	I	ALFA	I	BETA	I	COLUMN	I	FY	UA	+ UBX	+ UBY	= UR
1	DL		50.4	-12.5	-1.4	11.0	1.2	0.94	15.00	15.00	15.00								W10*45		44000	0.53	0.23	0.06	0.82	
	LL		57.1	-17.1	-2.0	14.8	1.7																			
	EQ-X 1		-7.4	17.4	0.0	-16.4	0.0																			
	EQ-X 2		7.4	-17.4	0.0	16.4	0.0																			
	EQ-Y 1		-24.1	-1.6	-0.2	1.6	0.2																			
	EQ-Y 2		24.1	1.6	0.2	-1.6	-0.2																			
	DL+LL		148.6	-24.7	-2.9	(CTR)																				
	COMB.	1																								
2	DL		80.5	0.7	-2.9	-0.4	2.0	0.79	15.00	15.00	15.00								W10*49		44000	0.55	0.11	0.08	0.75	
	LL		77.7	14.9	-3.9	-12.6	2.7																			
	EQ-X 1		2.0	32.6	0.0	-31.8	0.0																			
	EQ-X 2		-2.0	-32.6	0.0	31.8	0.0																			
	EQ-Y 1		-16.9	-1.9	-0.3	1.8	0.5																			
	EQ-Y 2		16.9	1.9	0.3	-1.8	-0.5																			
	DL+LL		217.2	14.0	-5.6	(CTR)																				
	COMB.	1																								
3	DL		70.8	0.1	-2.7	-0.4	2.0	0.99	15.00	15.00	15.00								W12*53		44000	0.54	0.10	0.08	0.72	
	LL		91.1	18.3	-3.7	-14.5	2.7																			
	EQ-X 1		-0.7	36.9	0.0	-35.4	0.0																			
	EQ-X 2		0.7	-36.9	0.0	35.4	0.0																			
	EQ-Y 1		-0.8	1.7	-0.2	-1.5	0.4																			
	EQ-Y 2		0.8	-1.7	0.2	1.5	-0.4																			
	DL+LL		225.2	16.6	-5.3	(CTR)																				
	COMB.	1																								
4	DL		40.7	15.3	-1.6	-11.9	1.2	0.80	15.00	15.00	15.00								W12*53		44000	0.27	0.18	0.04	0.49	
	LL		41.5	21.1	-2.3	-16.3	1.7																			
	EQ-X 1		5.5	20.8	0.0	-18.6	0.0																			
	EQ-X 2		-5.5	-20.8	0.0	18.6	0.0																			
	EQ-Y 1		-47.8	2.0	-0.2	-2.0	0.4																			
	EQ-Y 2		47.8	-2.0	0.2	2.0	-0.4																			
	DL+LL		113.0	30.5	-3.3	(CTR)																				
	COMB.	1																								
5	DL		74.5	-17.1	1.0	15.8	-0.7	0.83	15.00	15.00	15.00								W10*49		44000	0.51	0.27	0.04	0.82	

EQ-X 2	6.7	-17.0	0.0	16.7	0.0
EQ-Y 1	0.0	0.0	-0.1	0.0	0.2
EQ-Y 2	0.0	0.0	0.1	0.0	-0.2
DL+LL	88.8	-25.4	1.5	(CTR)	
COMB. 1					

10 DL	33.4	13.2	0.8	-12.1	-0.5	0.80	15.00	15.00	15.00	W10*39	44000	0.37	0.28	0.03	0.68
LL	31.3	17.3	1.1	-15.8	-0.7										
EQ-X 1	6.7	17.0	0.0	-16.7	0.0										
EQ-X 2	-6.7	-17.0	0.0	16.7	0.0										
EQ-Y 1	0.0	0.0	-0.1	0.0	0.2										
EQ-Y 2	0.0	0.0	0.1	0.0	-0.2										
DL+LL	88.8	25.5	1.6	(CTR)											
COMB. 1															

S T E E L TONNAGE = 4.30 FOR 10 COLUMNS

F I R E PROTECTION AREA FOR COLUMNS OF THIS LEVEL = 515.6

TOTAL FLOOR AREA THIS LEVEL= 1692.

COLUMN "UR" ON LEVEL 2 - ALLOWED = 1.00 , MAX COMPUTED = 0.82

TOTAL COLUMN LOADS THIS LEVEL DL = 600.6 LL = 633.1

B R A C I N G D E S I G N T A B L E LEVEL 2

MEMB MARK	TYPE	AXIAL FORCES			LD	ACTUAL EFFECTIVE			PROFILE	BETA	UTILIZ.			MODE	WARNING
		DL	LL	CRIT.		LENGTH	LX	LY			FY	RATIO			
401	RIGHT BRACE	7.2	13.1	99.2	4.	18.6	18.6	18.6	WT6*36	0	44000	0.93	DESIGN		
401	LEFT BRACE	12.6	17.1	104.6	5.	18.6	18.6	18.6	WT6*36	0	44000	0.98	DESIGN		
701	RIGHT BRACE	4.2	7.3	60.0	5.	26.6	13.3	26.6	WT5*22.5	0	44000	0.98	DESIGN		
701	LEFT BRACE	8.1	10.1	63.9	4.	26.6	13.3	26.6	WT5*24.5	0	44000	0.75	DESIGN		

S T E E L TONNAGE = 1.28 FOR 4 BRACING MEMBERS

BRACING "UR" ON LEVEL 2 - ALLOWED = 1.00 , MAX COMPUTED = 0.98

B I L L O F M A T E R I A L S

A N G L E S A N D T E E S

PROFILE	I I I	LENGTH I	I I I	WEIGHT I	I I I
WT4*12.1		50.61		0.306	
WT4*14.1		50.61		0.357	
WT5*16.5		26.63		0.219	
WT5*19.5		26.63		0.259	
WT6*20.2		18.60		0.187	
WT7*21.5		18.60		0.200	
WT5*22.5		26.63		0.300	
WT5*24.5		79.88		0.980	
WT6*36		37.20		0.669	
WT6*43.3		37.20		0.806	
TOTAL		372.58		4.284 (NET)	

B I L L O F M A T E R I A L S

W S M C S H A P E S

PROFILE	I I I	LENGTH I	I I I	WEIGHT I	I I I
S6*12.8		56.00		0.357	
W8*14		36.00		0.254	

LOREDOVD_BILLM.RES

W10*16	180.00	1.451
W12*21	324.00	3.375
W8*21	56.00	0.583
W14*22	44.00	0.488
W16*26	54.00	0.708
W10*30	55.00	0.832
W10*33	55.00	0.905
W16*36	110.00	1.996
W10*39	147.50	2.874
W10*45	57.50	1.294
W21*48	132.00	3.193
W10*49	60.00	1.472
W12*53	120.00	3.185
W12*65	30.00	0.978
W24*68	22.00	0.747
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TOTAL	1539.00	24.692 (NET)

GRAND TOTAL	1911.58	28.976 (NET)
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LENGTH IN FEET

WEIGHT IN TONS

***** DAYFILE 2005-10-27 *****

CPU-SEC	TIME		
0.0	11:17:28	10	BEGIN
0.0	11:17:28	11	INPUT
0.0	11:17:28	12	EDIT
0.0	11:17:28	80	STEEL BEAMS
0.0	11:17:28	81	STEEL TRUSSES
0.0	11:17:28	92	STEEL COLUMNS
1.0	11:17:29	60	FRAME CONSTANTS
1.0	11:17:29	62	COORDINATES
1.0	11:17:29	64	ITERATION
1.0	11:17:29	DL	0
1.0	11:17:29	LL-Z	0
1.0	11:17:29	EQ-X	0
1.0	11:17:29	EQ-Y	0
1.0	11:17:29	80	STEEL BEAMS
1.0	11:17:29	81	STEEL TRUSSES
1.0	11:17:29	92	STEEL COLUMNS
1.0	11:17:29	60	FRAME CONSTANTS
1.0	11:17:29	62	COORDINATES
1.0	11:17:29	64	ITERATION
1.0	11:17:29	DL	0
1.0	11:17:29	LL-Z	0
1.0	11:17:29	EQ-X	0
1.0	11:17:29	EQ-Y	0
1.0	11:17:29	80	STEEL BEAMS
1.0	11:17:29	81	STEEL TRUSSES
1.0	11:17:29	92	STEEL COLUMNS
1.0	11:17:29	60	FRAME CONSTANTS
1.0	11:17:29	62	COORDINATES
1.0	11:17:29	64	ITERATION
1.0	11:17:29	DL	0
1.0	11:17:29	LL-Z	0
1.0	11:17:29	EQ-X	0
1.0	11:17:29	EQ-Y	0
1.0	11:17:29	80	STEEL BEAMS
1.0	11:17:29	81	STEEL TRUSSES
1.0	11:17:29	92	STEEL COLUMNS
1.0	11:17:29	70	OUTPUT
1.0	11:17:29		END OF JOB