BSC

Design Calculation or Analysis Cover Sheet

Complete only applicable items.

1. QA: QA
2. Page 1

3. System	4. Document Identifier
Wet Handling Facility	050-SYC-WH00-00300-000-00B

5. Title

Wet Handling Facility (WHF) Mass Properties

ENG.20070326.0001

6. Group

Civil/Structural/Architectural

7. Document Status Designation

☐ Preliminary ☒ Committed ☐ Confirmed ☐ Cancelled/Superseded

8. Notes/Comments

DISCLAIMER

The calculations contained in this document were developed by Bechtel SAIC Company, LLC (BSC) and are intended solely for the use of BSC in its work for the Yucca Mountain Project.

Attachments	Total Number of Pages
Attachment A: List of Plant Design Drawings	1
Attachment B: Plans, Sections and Elevation Sketches of WHF	17
Attachment C: Weight Distribution Due to the Canister Transfer Machine	2

RECORD OF REVISIONS

9. No.	10. Reason For Revision	11. Total # of Pgs.	12. Last Pg. #	13. Originator (Print/Sign/Date)	14. Checker (Print/Sign/Date)	15. EGS (Print/Sign/Date)	16. Approved/Accepted (Print/Sign/Date)
00A	Initial Issue	84	B-17	Surendra K. Goel 2/1/07	Pravin Udani 02/01/07	Michael Ruben 2/1/07	Raj Rajagopal 2/2/07
00B	General Revision: Pages 1-66 and A-1 have been revised including deletion of Pages 11, 18, 25, 28, 32, 34, 39-50, 53, and 56-64. Pages C-1 and C-2 have been added. The following changes were made: 1) The floor at El. –34' was eliminated as a diaphragm as it is too small for diaphragm action 2) Masses of building walls at floor elevations 100', 80', 40', 32', 0' and –52' were recalculated based on a more realistic distribution of wall masses between floors and heights of several walls was revisited for accuracy. 3) Loads due to the Canister Transfer Machine were added. 4) Pages 39 to 50, 53, and 56 to 64 of the calculation without water in the pool were exact duplicates of the case with the water in the pool and have been deleted.	86	~~B-17~~ C-2 SKG 3/28/07	Surendra K. Goel [signature] 3/24/07	Pravin Udani [signature] 03/24/07	Michael Ruben Thomas Frankert for M.R [signature] 3/24/07	Raj Rajagopal [signature] 3/24/07

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FIGURES

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1. PURPOSE

The purpose of this calculation is to compute the mass properties of the Wet Handling Facility (WHF) concrete shear wall structure for the condition when the below grade water pit of the WHF is filled with water and when it is empty.

The basis of design for the WHF is defined in *the Basis of Design for the TAD Canister-Based Repository Design Concept*, 000-3DR-MGR0-00300-000-000, (Ref. 2.2.3)

2. REFERENCES

2.1 PROJECT PROCEDURES/DIRECTIVES

2.1.1 BSC 2006. EG-PRO-3DP-G04B-00037, Rev.7, *Calculations and Analyses.* Las Vegas, Nevada. Bechtel SAIC Company. ACC: ENG.20070122.0010

2.1.2 IT-PRO-0011, Rev. 3, ICN 0. *Software Management.* Las Vegas, Nevada. Bechtel SAIC Company. ACC: DOC.20061221.0003

2.1.3 ORD (Office of Repository Management) 2006, *Repository Project Management Automation Plan,* 000-PLN-MGR0-00200-000, Rev. 00D. Las Vegas, Nevada. Bechtel SAIC Company. ACC: ENG.20060703.0001.(DIRS 178400)

2.2 DESIGN INPUTS

2.2.1 BSC (Bechtel SAIC Company) 2006. *Project Design Criteria Document*. 000-3DR-MGR0-00100-000-006. Las Vegas, Nevada: Bechtel SAIC Company. ACC: ENG.20061201.0005 (DIRS 178308)

2.2.2 Clough, R.W. and Penzien, J. 1975, *Dynamics of Structures*. New York, New York: McGraw-Hill. TIC: 254783, [DIRS 164683]

2.2.3 BSC (Bechtel SAIC Company) 2006, *Basis of Design for the TAD Canister-Based Repository Design Concept* 000-3DR-MGR0-00300-000-000. Las Vegas, Nevada: Bechtel SAIC Company. ACC: ENG.20061023.0002. (DIRS 177636)

2.2.4 BSC (Bechtel SAIC Company) 2006. *Seismic Analysis and Design Approach Document.* 000-30R-MGR0-02000-000-000. Las Vegas, Nevada: Bechtel SAIC Company. ACC: ENG.20061214.0008.

2.2.5 BSC (Bechtel SAIC Company) *2006 Wet Handling Facility Preliminary Layout Ground Floor* Plan. 050-P0K-WH00-10301-000-00A. Las Vegas, Nevada: Bechtel SAIC Company. ACC: ENG.20060920.0004.

2.2.6 BSC (Bechtel SAIC Company) 2006. *Wet Handling Facility Preliminary Layout Second Floor Plan*. 050-P0K-WH00-10401-000-00A. Las Vegas, Nevada: Bechtel SAIC Company. ACC: ENG.20060920.0005.

2.2.7 BSC (Bechtel SAIC Company) 2006. *Wet Handling Facility Preliminary Layout Section A* 050-P0K-WH00-10501-000-00A .Las Vegas, Nevada: Bechtel SAIC Company. ACC: ENG.20060920.0006.

2.2.8 BSC (Bechtel SAIC Company) 2006. *Wet Handling Facility Preliminary Layout Section B* 050-P0K-WH00-10601-000-00A. Las Vegas, Nevada: Bechtel SAIC Company. ACC: ENG.20060920.0007.

2.2.9 BSC (Bechtel SAIC Company) *2007 Wet Handling Facility Preliminary Layout Ground Floor and Pool Basement Plans,* 050-P0K-WH00-10101-000-00A. Las Vegas, Nevada: Bechtel SAIC Company. ACC: ENG.2070221.0002.

2.2.10 BSC (Bechtel SAIC Company) 2007. *Wet Handling Facility Preliminary Layout Second Floor Plan*. 050-P0K-WH00-10102-000-00A. Las Vegas, Nevada: Bechtel SAIC Company. ACC: ENG.20070221.0003.

2.2.11 BSC (Bechtel SAIC Company) 2007. *Wet Handling Facility Preliminary Layout Section A* 050-P0K-WH00-10103-000-00A .Las Vegas, Nevada: Bechtel SAIC Company. ACC: ENG.20070221.0004.

2.2.12 BSC (Bechtel SAIC Company) 2007. *Wet Handling Facility Preliminary Layout Section B* 050-P0K-WH00-10104-000-00A. Las Vegas, Nevada: Bechtel SAIC Company. ACC: ENG.20070221.0005.

2.2.13 BSC (Bechtel SAIC Company) 2007. *CRCF, IHF, RF, and Canister Transfer Machine Mechanical Equipment Envelope,* 000-MJO-HTC0-00201-000-00A. Las Vegas, Nevada: Bechtel SAIC Company. ACC: ENG.20061120.0011.

2.3 DESIGN CONSTRAINTS

None

2.4 DESIGN OUTPUTS

The mass properties generated herein will be used in the development of a “beam/column” lumped mass stick model for the Tier 1 seismic analysis of the WHF structure in the following calculation:

2.4.1 050-SYC-WH00-00200-000-00A, Tier 1 Seismic Analysis Using a Multiple Stick Model of the WHF.

3. ASSUMPTIONS

3.1 ASSUMPTIONS REQUIRING VERIFICATION

3.1.1 Structural Steel Framing Dead Loads are assumed as follows.

Roofs at El. 80’ and 100’, Floors at El -52’, 32’ and 40’…………………@ 40 lbs/ft^2

Base Slab at EL 0' and EL 20'…………………………………………… @ 10 lbs/ft^2

Rationale: Structural steel represents a small fraction of the total mass of the WHF structure. Actual steel weights will be used as the design matures in the detailed design phase of the project. This assumption is being tracked in CalcTrac.

3.1.2 Equipment dead loads on floors are assumed as 100 lbs/ft^2 at EL. –52', +0', 32', and 40'. Equipment dead loads on Roof El. 80' & 100' are taken as 10 lbs/ft^2. Equipment dead loads include cranes less than 50-ton capacity, HVAC equipment, and electrical equipment, etc.

Rationale: The 10 lbs/ft^2 and 100 lbs/ft^2 dead loads are conservative assumptions for this type of structure. Actual equipment weights will be used as the design matures in the detailed design phase of the project. This assumption is being tracked in CalcTrac.

3.1.3 Roofing Dead Load @ Roof El. 80' & 100'is assumed as 55 lbs/ft^2.

Rationale: This is a reasonable assumption for a lightweight concrete fill material with an average thickness of 6 inches as well as membrane roofing material to be applied over the concrete slab. This assumption is being tracked in CalcTrac.

3.1.4 The dead load of the 200-ton capacity crane is assumed to be 400 kips.

Rationale: The 400 kip load is a conservative weight, bounding weights given in industry standards for a 200-ton crane with a 100-ft span. This assumption is being tracked in CalcTrac.

3.1.5 The floor slab for the 200-ton crane maintenance area between column lines B/C and 1/2, shown at El. +50' on Sketch Page B-14 is relocated to El. +40'. Likewise, the floor slab supporting the pool equipment is relocated from El. +30' as shown in the sketch to El. +20'. The El. +20' slab is considered in the mass and moment of inertia calculations by simply adding it to the slab at El. +0'. Relocation of the two slabs will be incorporated in the plant design drawings.

Rationale: Relocating the crane maintenance slab to El. +40' is to provide continuity to the frame diaphragm resulting in a more stable building structure. Crane maintenance function will not be impacted by this relocation. The pool equipment floor is then conveniently relocated in the middle of the crane maintenance floor and the ground floor at El. +0'. It is conservatively added to the weight of the slab at El. +0' for the mass and moment of inertia calculation. This assumption is being tracked in CalcTrac.

3.1.6 Live load is assumed to be 100 lbs/ft^2 for the floors and 40-lbs/ft^2 for the roof. Twenty five percent (25 lbs/ft^2 and 10 lbs/ft^2) of these loads will be included during an earthquake for calculating the mass properties for use in the seismic analysis.

Rationale: 100 lbs/ft^2 Live load for floor live load and 40 lbs/ft^2 live load for roof is the standard engineering practice for heavy industrial buildings. Consideration of 25% of live load during seismic event is consistent with Section 8.3.1 of Ref. 2.2.4. This assumption is being tracked in CalcTrac.

3.1.7 The concrete walls between column lines B to C and 1 to 2 are 12 inches and 18 inches thick. These walls are supporting the slab at El. 20' and rest on the ground floor mat at El. 0'. The wall locations are taken from the Plant Design Software (PDS) model.

Rationale: The WHF sketch in Attachment B (Page B-3) shows the locations of these walls different from those used in this calculation and do not show their thicknesses. They were added after issuance of the sketches during design development. The wall locations and their thickness will be validated with the issuance of final WHF general arrangement drawings. This assumption is being tracked in CalcTrac.

3.1.8 This calculation continues to be based on WHF plans and sections shown in references 2.2.5, 2.2.6, 2.2.7, and 2.2.8 even though they have been superseded by references 2.2.9, 2.2.10, 2.2.11, and 2.2.12.

Rationale: The main difference between the two sets of drawings is the changing column lines and wall openings in the revised WHF floor plans. These changes do not impact the mass properties and the stick model results. A soil-structure interaction analysis using SASSI and detailed FEM using References 2.2.9, 2.2.10, 2.2.11, and 2.2.12 will supersede the results of this preliminary analysis. This assumption is being tracked in CalcTrac.

3.1.9 The estimated total weight of the canister transfer machine (CTM) is 400 tons. It includes the weight of the machine, hoist, all appurtenances, and the canister.

Rationale: Reference 2.2.13 lists the weight of the machine as estimated weight. The actual weight shall be tracked in CalcTrac.

3.2 ASSUMPTIONS NOT REQUIRING VERIFICATION

3.2.1 Wall openings were not considered in the mass calculation.

Rationale: Most major wall openings have a shield door, which is approximately equal to the weight of the concrete removed to form the opening. Neglecting other types of door openings is conservative since a larger mass will result in a larger load to be carried by the walls.

3.2.2 The mass of any moving crane weighing more than 50 tons is assumed as a concentrated mass acting at location giving maximum eccentricity.

Rationale: Using concentrated mass instead of distributed mass is conservative. Taking mass acting at location giving max eccentricity is bounding.

3.2.3 The pool mass (with water) includes the weight of four casks weighing 200 tons each.

Rationale: Section 5.2.1.8 of Reference 2.2.3 gives the maximum rail cask weight of 200 tons that will be in the WHF. There is enough space in the pool for four casks. This is a bounding assumption not requiring verification.

3.2.4 Plans, elevations, and sections of the WHF shown in Attachment B form the basis for computation of the mass properties of the WHF.

Rationale: The WHF plans, elevations and sections in Attachment B are taken from the approved plant design sketches listed in Attachment A (Ref 2.2.5 through Ref. 2.2.8)

3.2.5 The slab at El. –34’ is eliminated from the model as a diaphragm. And its weight is combined with the slab at El. –52’.

Rationale: The slab at El. –34’ is relatively small as compared to the rest of the concrete in its vicinity and is not suitable for diaphragm action. Combining its weight with the base slab at El. –52’ leads to a more realistic model of the structure.

4 METHODOLOGY

4.1 QUALITY ASSURANCE

This calculation was prepared in accordance with procedure EG-PRO-3DP-G04B-00037, *Calculations and Analyses*, (Ref. 2.1.1). Section 5.1.2 of the *Basis of Design for the TAD Canister-Based Repository Design Concept* (Ref. 2.2.3) classifies the WHF structure as ITS. The approved version of this calculation is designated QA:QA.

4.2 USE OF SOFTWARE

Word and Excel, which are a part of the Microsoft Office 2000 suite of programs, were used in this calculation. Word and Excel are classified as Level 2 software usage and are not required to be qualified under the procedure of *Software Management* (Ref. 2.1.2, Section 4).

The calculation process and equations are documented in Section 6 of the document for checking by manual calculations.

The numbers shown in the spreadsheet calculations have been rounded off in Excel. Computations performed within Excel are based on actual numbers stored in Excel.

4.3 DESIGN APPROACH

The sketches in Attachment B were developed using the plant design sketches list in Attachment A (Ref. 2.2.5 through 2.2.8). The plans, sections and elevations with wall/slab thickness and dimensions shown in Attachment B will be used as the basis for computation of the mass properties of the WHF (Assumption 3.2.4)

The masses of the structure are combined at the diaphragm (floor/roof) elevation of the structure. For the WHF, the diaphragm elevations are located at elevation –52’, 0’, 32’, 40’, 80’, and 100’.

See Attachment B. Masses of the walls are combined with the diaphragms by considering half of the wall mass as tributary to the floor/roof at the bottom of the wall and half of the mass as tributary to the floor/roof at the top of the wall. The masses, centers of mass, and mass moments of inertia of the structure are computed for the various diaphragm (floor/roof) elevations of the structure using basic principles of Mechanics of Materials.

5 LIST OF ATTACHMENTS

		Number of Pages
Attachment A	List of Plant Design Drawings	1
Attachment B	Plan, Section, and Elevation Sketches of WHF	17
Attachment C	Weight distribution due to the Canister Transfer Machine	2

6 BODY OF CALCULATIONS

In this section of the calculation, the masses, centers of mass, and mass moments of inertia of the structure are computed. The following two scenarios are considered in the calculations:

- The pool in the basement of the WHF is filled with water to a depth of 48’-0”. Concurrently, four casks weighing 200 tons each are located in the farthest corner of the pool. This will give the maximum moment of inertias.
- There is neither the water nor the casks in the pool

The slab elevations are located at –52’, 0’, 32’, 40’, 80’ and 100’ are considered the diaphragm locations. As discussed in Section 4.3, masses of the walls are combined at the diaphragms by considering that half of the wall mass as tributary to the floor at the bottom of the wall and half of the mass is tributary to the floor at the top of the wall. This methodology is consistent with the methodology commonly used in the development of lumped mass stick models of structures. Distribution of the 400-ton weight of the Canister Transfer Machine (CTM) in Room 2004 of the WHF is given in Attachment C.

The following spreadsheets are used to compute the masses, mass moments of inertia, and centers of gravity for slabs and walls for each diaphragm elevation. Spreadsheets have been created to compute masses, mass moments of inertia, and centers of gravity of each floor when the pool is filled with water. Four casks each weighing 200 tons are included in the weight of the water. Additional sheets have been created for the case when there is no water or casks in the pool. Concrete density is used as 150 Pcf. (Ref. 2.2.1, Section 4.2.11.6.6). Gravity (g) is taken as 32.2 ft/sec^2. Ref 2.2.2 [DIRS 164683] has been used in the computing the mass moments of inertia. Citations are given on the appropriate sheets.

Assumptions listed in Section 3.1 are used in this calculation on the following pages:

Assumption 3.1.1 is used on Pages 10, 12 through 16 and 38
Assumption 3.1.2 is used on Pages 10, 12 through 16 and 38
Assumption 3.1.3 is used on Pages 15 and 16
Assumption 3.1.4 is used on Page 15
Assumption 3.1.5 is used on Pages 12, 14, B-14 and B-15
Assumption 3.1.6 is used on Pages 10, 12 through 16 and 38
Assumption 3.1.7 is used on Pages 19, 29, and B-3
Assumption 3.1.8 is used on Pages 10, 12-17, 19-24, 26-27, 29-31, 33, 35-38, 51-52, 54-55 & 65
Assumption 3.1.9 is used on Pages 13, 15, 16, C-1, and C-2

The coordinate system used in computing the mass moments of inertia of WHF is shown in Figure 1. For seismic analyses (Ref. Sections 2.4.1 and 2.4.2), the coordinates should be appropriately transferred to the axis system used in those analyses.

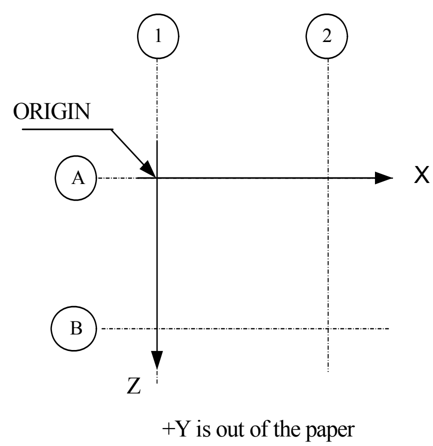

Figure 1

Coordinate System Showing Origin

Weight and Centroid of Basement Floor Slab @ Elev. - 52' (Pool with Water):

(Refer to: Att.-B , Sht.B-2, B-9, and B-17)

Slab [2]	Width (W) (Xdim) (ft)	Len.(L) (Zdim) (ft)	Thick $t^{(10)}$ (ft)	Weight = (Wt) L*W*t*(#) (kips)	CG Xi [1] (ft)	CG Zi [1] (ft)	Wt * CG Xi (ft-kips)	Wt * CG Zi (ft-kips)	Struct'l. Steel Load (40 psf) W1 (kips)	Equipment Dead Load (100 psf) W2 (kips)	Live Load (25psf) W3 (kips)	(Wi) * CG Xi (See Note 6) (ft-kips)	(Wi) * CG Zi (See Note 6) (ft-kips)	Total Weight (W_{total}) (kips)	(See Note 9) W_{total} *CG Xi (ft-kips)	W_{total} * CGZi (ft-kips)
(a) Conc.Slab [7]:																
B-C/2.4-5	114.00	116.00	8.00	15,868.80	127.00	105.00	2,015,337.60	1,666,224.00	528.96	1,322.40	330.60	277,108.92	229,105.80	18,050.76	2,292,446.52	1,895,329.80
B.2-B.8/3.7-4.2[10]	18.00	65.00	2.00	351.00	146.00	105.00	51,246.00	36,855.00	46.80	117.00	29.25	28,185.30	20,270.25	544.05	79,431.30	57,125.25
			Σ =	16,219.80			2,066,583.60	1,703,079.00	575.76	1,439.40	359.85	305,294.22	249,376.05	18,594.81	2,371,877.82	1,952,455.05
					xbar	zbar										
		Center of Concrete Slab =			127.41	105.00		xbar = Σ (Wt * CGXi)/Σ Wt				zbar = Σ (Wt * CGZi)/Σ Wt				
		Center of other Applied Loads =			128.54	105.00		xbar = Σ {(Wi) * CGXi}/Σ (Wi)				zbar=Σ {(Wi)*CGZi}/Σ (Wi)				
		Centroid of All Loads =			127.56	105.00		xbar = Σ (W_{total} * CGXi)/Σ W_{total}				zbar = Σ (W_{total} * CGZi)/Σ W_{total}				
(b) Water in the Pool :																
Water Wt	75.00	61.00	48.00	13,703.04	115.50	105.00	1,582,701.12	1,438,819.20	0.00	0.00	0.00	0.00	0.00	13,703.04	1,582,701.12	1,438,819.20
(B-C/2.4-4.2)																
(-) step Area	18.00	65.00	-18.00	-1,314.14	144.50	105.00	-189,893.81	-137,985.12	0.00	0.00	0.00	0.00	0.00	-1,314.14	-189,893.81	-137,985.12
			Σ =	12,388.90			1,392,807.31	1,300,834.08	0.00	0.00	0.00	0.00	0.00	12,388.90	1,392,807.31	130083408%
					xbar	zbar										
		Center of Pool Water =			112.42	105.00		xbar = Σ (Wt * CGXi)/Σ Wt				zbar = Σ (Wt * CGZi)/Σ Wt				
		Center of other Applied Loads =			0.00	0.00		xbar = Σ {(Wi) * CGXi}/Σ (Wi)				zbar=Σ {(Wi)*CGZi}/Σ (Wi)				
		Centroid of All Pool Water Loads =			112.42	105.00		xbar = Σ (W_{total} * CGXi)/Σ W_{total}				zbar = Σ (W_{total} * CGZi)/Σ W_{total}				
(c) Four Casks			Σ =	1,600.00 (see Note 8)	148.00	105.00	236,800.00	168,000.00	0.00	0.00	0.00	0.00	0.00	1,600.00	236,800.00	168,000.00
					xbar	zbar										
		Center of Pool Water =			148.00	105.00		xbar = Σ (Wt * CGXi)/Σ Wt				zbar = Σ (Wt * CGZi)/S Wt				
		Center of other Applied Loads =			0.00	0.00		xbar = Σ {(Wi) * CGXi}/Σ (Wi)				zbar=Σ {(Wi)*CGZi}/Σ (Wi)				
		Centroid of All Pool Water Loads =			148.00	105.00		xbar = Σ (W_{total} * CGXi)/Σ W_{total}				zbar = Σ (W_{total} * CGZi)/Σ W_{total}				

Notes:

1 For coordinate system definition see Section 6.

2 Numbers and letters are in reference to the column grid lines for the building.

3 W1: Structural steel framing + Platforms & misc steel per floor or roof (see Section 3.0).

4 W2: Floor equipment load including cranes weighing less than 50 tons, mechanical, electrical & piping (see Section 3.0).

5 W3: 25% of the specified live load (see Section 3.0).

6. Applied Loads = Wi = (W1+ W2+W3)

7. (#) = Unit Wt. Of Concrete=0.150 Kips/ Cft and Water = 0.0624 Kips/ Cft .

8. Postulated four casks @ 200 tons each conservatively located in the farthest corner of the pool (Refer to Assumption 3.2.3)

9. $W_{(Total)}$ = (Wt+W1+W2+W3)

10. Weight of slab at El. -34' combined with the slab at El. -52'

Weight and Centroid of Floor Slab @ Elev. - 34' (Pool with Water) :

This page is deleted. Weight of slab at EL. -34' is combined with slab at El. -52'

Weight and Centroid of Floor Slab @ Elev. + 0' (Pool with Water) :

(Refer to: Att.-B , Sht.B-3, B-15 and B-17)

Slab [2]	Width (W) (Xdim) (ft)	Length (L) (Zdim) (ft)	Thick t (ft)	(See Note 7) Weight=(Wt) L*W*t*0.15 (kips)	CG Xi [1] (ft)	CG Zi [1] (ft)	Wt * CG Xi (ft-kips)	Wt * CG Zi (ft-kips)	Struct'l. Steel Load (10 psf) W1 (kips)	Equipment Dead Load (100 psf) W2 (kips)	Live Load (25psf) W3 (kips)	(See Note 6) (Wi) * CG Xi (ft-kips)	(See Note 6) (Wi) * CG Zi (ft-kips)	(See Note 8) Total Weight (W_{total}) (kips)	W_{total} *CG Xi (ft-kips)	W_{total} * CGZi (ft-kips)
A-D/1-7	270.00	214.00	6.00	52,002.00	133.00	105.00	6,916,266.00	5,460,210.00	577.80	5,778.00	1,444.50	1,037,439.90	819,031.50	59,802.30	7,953,705.90	6,279,241.50
B-C/1-2	55.00	84.00	1.50	1,039.50	28.50	97.00	29,625.75	100,831.50	46.20	462.00	115.50	17,775.45	60,498.90	1,663.20	47,401.20	161,330.40
at EL 20'																
B-C/2-4	75.00	61.00	-6.00	-4,117.50	115.50	105.00	-475,571.25	-432,337.50	-45.75	-457.50	-114.38	-71,335.69	-64,850.63	-4,735.13	-546,906.94	-497,188.13
(Pool area deduction)																
			Σ =	48,924.00			6,470,320.50	5,128,704.00	578.25	5,782.50	1,445.63	983,879.66	814,679.78	56,730.38	7,454,200.16	5,943,383.78
					xbar	zbar										
		Center of Concrete Slab=			132.25	104.83		xbar = Σ (Wt * CGXi)/Σ Wt				zbar = Σ (Wt * CGZi)/Σ Wt				
		Center of Other Applied Loads =			126.04	104.36		xbar = Σ {(Wi) * CGXi}/Σ (Wi)				zbar=Σ {(Wi)*CGZi}/Σ (Wi)				
		Centroid of All Loads =			131.40	104.77		xbar = Σ (W_{total} * CGXi)/Σ W_{total}				zbar = Σ (W_{total} * CGZi)/Σ W_{total}				

Notes:

1 For coordinate system definition see Section 6.

2 Numbers and letters are in reference to the column grid lines for the building.

3 W1: Structural steel framing + Platforms & misc steel per floor or roof (see Section 3.0).

4 W2: Floor equipment load including cranes wieghing less than 50 tons, mechanical, electrical & piping (seee Section 3.0).

5 W3: 25% of the specified live load (see Section 3.0).

6. Applied Loads = Wi = (W1+ W2+W3)

7. Unit Wt of Concrete= 0.150 Kips /Cft

8. $W_{(Total)}$ = (Wt+W1+W2+W3)

Weight and Centroid of Floor Slab @ Elev. + 32' (Pool with Water):

(Refer to: Att.-B , Sht.B-4)

Slab [2]	Width (W) (Xdim) (ft)	Length (L) (Zdim) (ft)	Thickness t (ft)	(See Note 7) Weight=(Wt) L*W*t*0.15 (kips)	CG Xi [1] (ft)	CG Zi [1] (ft)	Wt * CG Xi (ft-kips)	Wt * CG Zi (ft-kips)	Struct'l. Steel Load (40 psf) W1 (kips)	Canister Transfer Machine Wctm (kips)	Equipment Dead Load (100 psf) W2 (kips)	Live Load (25psf) W3 (kips)	(See Note 6) (Wi) * CG Xi (ft-kips)	(See Note 6) (Wi) * CG Zi (ft-kips)	(See Note 8) Total Weight (W_{total}) (kips)	W_{total} *CG Xi (ft-kips)	W_{total} * CGZi (ft-kips)
A-B/4-7	122.0	57.0	4.0	4,172.4	207.0	26.5	863,686.8	110,568.6	278.2		695.4	173.9	237,513.9	30,406.4	5,319.8	1,101,200.7	140,975.0
(at EL 32')																	
Canister Transfer M/C [9]					170.0	0.0				222.0			37,740.0	0.0	222.0	37,740.0	0.0
					170.0	53.0				176.1			29,937.0	9,333.3	176.1	29,937.0	9,333.3
			Σ =	4,172.4			863,686.8	110,568.6	278.2	398.1	695.4	173.9	305,190.9	39,739.7	5,717.9	1,168,877.7	150,308.3
					xbar	zbar											
		Center of Concrete Slab=			207.0	26.5		xbar = Σ (Wt * CGXi)/Σ Wt					zbar = Σ (Wt * CGZi)/Σ Wt				
		Center of Other Applied Loads =			266.0	34.6		xbar = Σ {(Wi) * CGXi}/Σ (Wi)					zbar=Σ {(Wi)*CGZi}/Σ (Wi)				
		Centroid of All Loads =			204.4	26.3		xbar = Σ (W_{total} * CGXi)/Σ W_{total}					zbar = Σ (W_{total} * CGZi)/Σ W_{total}				

Notes:

1 For coordinate system definition see Section 6.

2 Numbers and letters are in reference to the column grid lines for the building.

3 W1: Structural steel framing + Platforms & misc steel per floor or roof (see Section 3.0).

4 W2: Floor equipment load including cranes wieghing less than 50 tons, mechanical, electrical & piping (seee Section 3.0).

5 W3: 25% of the specified live load (see Section 3.0).

6. Applied Loads = Wi = (W1+ W2+W3)

7. Unit Wt of Concrete= 0.150 Kips /Cft

8. $W_{(Total)}$ = (Wt+W1+W2+W3+Wctm)

9. Wctm = Weights due to the Canister Transfer Machine, see Attachment C

Weight and Centroid of Second Floor Slab @ Elev. + 40' (Pool with Water):

(Refer to: Att.-B , Sht.B-4)

Slab [2]	Width (W) (Xdim) (ft)	Length (L) (Zdim) (ft)	Thickness t (ft)	(See Note 7) Weight=(Wt) L*W*t*0.15 (kips)	CG Xi [1] (ft)	CG Zi [1] (ft)	Wt * CG Xi (ft-kips)	Wt * CG Zi (ft-kips)	Struct'l. Steel Load (40 psf) W1 (kips)	Equipment Dead Load (100 psf) W2 (kips)	Live Load (25psf) W3 (kips)	(See Note 6) (Wi) * CG Xi (ft-kips)	(See Note 6) (Wi) * CG Zi (ft-kips)	(See Note 8) Total Weight (W_{total}) (kips)	W_{total} *CG Xi (ft-kips)	W_{total} * CGZi (ft-kips)
A-B/1-4	152.0	55.0	2.0	2,508.0	74.0	26.5	185,592.0	66,462.0	334.4	836.0	209.0	102,075.6	27,692.5	3,887.4	287,667.6	103,016.1
C-D/1-6	216.0	55.0	2.0	3,564.0	106.0	183.5	377,784.0	653,994.0	475.2	1,188.0	297.0	207,781.2	272,497.5	5,524.2	585,565.2	1,013,690.7
B-C/1-2	61.0	104.0	1.5	1,427.4	30.0	105.0	42,822.0	149,877.0	253.8	634.4	158.6	31,402.8	83,265.0	2,474.2	74,224.8	259,786.8
			Σ =	7,499.4			606,198.0	870,333.0	1,063.4	2,658.4	664.6	341,259.6	383,455.0	11,885.8	947,457.6	1,376,493.6
					xbar	zbar										
		Center of Concrete Slab=			80.8	116.1		xbar = Σ (Wt * CGXi)/Σ Wt				zbar = Σ (Wt * CGZi)/Σ Wt				
		Center of Other Applied Loads =			77.8	87.4		xbar = Σ {(Wi) * CGXi}/Σ (Wi)				zbar=Σ {(Wi)*CGZi}/Σ (Wi)				
		Centroid of All Loads =			79.7	115.8		xbar = Σ (W_{total} * CGXi)/Σ W_{total}				zbar = Σ (W_{total} * CGZi)/Σ W_{total}				

Notes:

1 For coordinate system definition see Section 6.

2 Numbers and letters are in reference to the column grid lines for the building.

3 W1: Structural steel framing + Platforms & misc steel per floor or roof (see Section 3.0).

4 W2: Floor equipment load including cranes wieghing less than 50 tons, mechanical, electrical & piping (seee Section 3.0).

5 W3: 25% of the specified live load (see Section 3.0).

6. Applied Loads = Wi = (W1+ W2+W3)

7. Unit Weight of Concrete= 0.150 Kips /Cft

8. $W_{(Total)}$ = (Wt+W1+W2+W3)

Weight and Centroid For Roof Slab @ Elev. + 80' (Pool with Water):

(Refer to: Att.-B , Sht.B-5)

Slab [2]	Width (Xdim) (ft)	Length (Zdim) (ft)	Thick (ft)	(See Note 9) Weight (Wt)= L*W*t*(#) (kips)	CG Xi [1] (ft)	CG Zi [1] (ft)	Wt * CG Xi (ft-kips)	Wt * CG Zi (ft-kips)	Struct'l. Steel Load (40 psf) W1 (kips)	Crane Load or Canister Transfer m/c W2 or Wctm (kips)	Roof Live Load (10 psf) W3 (kips)	Roofing Dead load (55 psf) W4 (kips)	Roof Equipment Dead Load (10 psf) W5 (kips)	Wi* CGXi (ft-kips)	Wi* CGZi (ft-kips)	Total Weight (W_{total}) (kips)	(See Note 10) W_{total} * CGXi (ft-kips)	W_{total} * CGZi (ft-kips)
A-D/1-7	270.0	214.0	2.0	19,876.3	133.0	105.0	2,643,550.6	2,087,013.6	2,311.2		577.8	3,177.9	577.8	883,745.1	697,693.5	26,521.0	3,527,295.7	2,784,707.1
Crane 200 T:					260.0	60.0				400.0				104,000.0	24,000.0	400.0	104,000.0	24,000.0
Ded A-B/4-7 (Slab @80' deduction)	114.0	49.0	-2.0	-1,921.6	207.0	26.5	-397,767.9	-50,922.0	-223.4		-55.9	-307.2	-55.9	-132,974.7	-17,023.3	-2,564.0	-530,742.6	-67,945.3
Canister Transfer M/C [11]					170.0	53.0				246.5				41,905.0	13,064.5	246.5	41,905.0	13,064.5
			Σ =	17,954.7			2,245,782.7	2,036,091.6	2,087.8	646.5	521.9	2,870.7	521.9	896,675.4	717,734.7	24,603.5	3,142,458.0	2,753,826.3
					xbar	zbar												
	Center of Concrete Slab=				125.1	113.4		xbar = Σ (Wt * CGXi)/Σ Wt			zbar = Σ (Wt * CGZi)/Σ Wt							
	Center of Other Applied Loads =				149.4	119.6		xbar = Σ (Wi * CGXi)/Σ Wi			zbar = Σ (Wi * CGZi)/Σ Wi			where Wi = (W1+W3+W4+W5) =			6,002.3	
	Centroid of All Loads =				127.7	111.9		xbar = Σ (W_{total} * CGXi)/Σ W_{total}			zbar = Σ (W_{total} * CGZi)/Σ W_{total}							

Notes:

1 For coordinate system definition see Section 6.

2 Numbers and letters are in reference to the column grid lines for the building.

3 W1 = Structural steel framing + Platforms & misc steel per floor or roof (see Section 3.0).

4 W2 = Over head traveling crane or Canister Transfer Machine load.

5 W3 = 25% of the specified live load (see Section 3.0).

6 W4 = Roofing Dead load of 55 psf is the weigth of a lightweigth concrete topping.

7 W5 = Roof equipment load including cranes, mechanical, electrical & piping (seee Section 3.0).

8. Wi = (W1+W3+W4+W5)

9. (#) = Slab Weight Computation as follows:

Weight = Length*Width*thickness*(.150+.022);

concrete in the metal decking valley of a three inch metal deck which weighs approximately 22 psf.

10. $W_{(Total)}$ = (Wt+W1+W2+W3+W4+W5)

11. For input due to the Canister Transfer Machine, see Attachment C

Weight and Centroid of Roof Slab @ Elev. + 100' (Pool with Water):

(Refer to: Att.-B , Sht.B-4, B-5 and B-9)

Slab (2)	Width (Xdim) (ft)	Length (Zdim) (ft)	Thick (ft)	(See Note 9) Weight (Wt)= L*W*t*(#) (kips)	CG Xi (1) (ft)	CG Zi (1) (ft)	Wt * CG Xi (ft-kips)	Wt * CG Zi (ft-kips)	Struct'L Steel Load (40 psf) W1 (kips)	Canister Transfer Machine Wctm (kips)	Equipment Dead Load (0 psf) W2 (kips)	Roof Live Load (10 psf) W3 (kips)	Roofing Dead load (55 psf) W4 (kips)	Roof Equipment Dead Load (10 psf) W5 (kips)	(See Note 8) (Wi) * CG Xi (ft-kips)	(See Note 8) (Wi) * CG Zi (ft-kips)	(See Note 10) Total Weight (W_{total}) (kips)	W_{total} * CGXi (ft-kips)	W_{total} * CGZi (ft-kips)
A-B/4-7	122.0	57.0	2.0	2,392.2	207.0	26.5	495,180.4	63,392.7	278.2		0.0	69.5	382.5	69.5	165,540.0	21,192.3	3,191.9	660,720.4	84,585.0
Canister Transfer M/C					170.0	0.0				155.4					26,418.0	0.0	155.4	26,418.0	0.0
			Σ =	**2,392.2**			**495,180.4**	**63,392.7**	**278.2**	**155.4**	**0.0**	**69.5**	**382.5**	**69.5**	**191,958.0**	**21,192.3**	**3,347.3**	**687,138.4**	**84,585.0**
					xbar	**zbar**													
	Center of Concrete Slab=				**207.0**	**26.5**		xbar = Σ (Wt * CGXi)/Σ Wt				zbar = Σ (Wt * CGZi)/Σ Wt							
	Center of Other Applied Loads =				**201.0**	**22.2**		xbar = Σ (Wi * CGXi)/Σ Wi				zbar = Σ (Wi * CGZi)/Σ Wi			where Wi = (W1+W2+W3+W4+W5) =			799.7	
	Centroid of All Loads =				**205.3**	**25.3**		xbar = Σ (W_{total} * CGXi)/Σ W_{total}				zbar = Σ (W_{total} * CGZi)/Σ W_{total}							

Notes:

1 For coordinate system definition see Section 6.
2 Numbers and letters are in reference to the column grid lines for the building.
3 W1 Structural steel framing + Platforms & misc steel per floor or roof (see Section 3.0).
4 W2 Floor equipment load including cranes, mechanical, electrical & piping (seee Section 3.0).
5 W3 25% of the specified live load (see Section 3.0).
6 W4 Roofing load of 55 psf is the weigth of a lightweigth concrete topping.
7 W5 Roof equipment load including cranes, mechanical, electrical & piping (seee Section 3.0).
8. Wi = (W1+W2+W3+W4+W5)
9. (#) = Slab Weight Computation as follows:
Weight = Length*Width*thickness*(.150+.022);
concrete in the metal decking valley of a three inch metal deck which weighs approximately 22 psf.
10. $W_{(Total)}$ = (Wt+W1+W2+W3+W4+W5+Wctm)
11. For input due to the Canister Transfer Machine, see Attachment C

Weight and Centroid of Walls on Floor Slab @ Elev. - 52' (Pool with Water):										
(Refer to: Att.-B , Sht.B-2, B-7, B-8, B-10, B-14 and B-15)										
WALL (2)	start (3)	end (3)	Length	Height	Thickness	Weight4	CGxi (1)	CGzi (1)	W*CGxi	W*CGzi
	(ft)	(ft)	=end-start	H	T	=L*H/2*T*0.15	(ft)	(ft)	ft-kips	ft-kips
			L (ft)	(ft)	(ft)	W (kips)				
N/S WALLS EL. -52' TO 0' (4)										
2.4/B-C	51.0	159.0	108.0	52.0	8.0	3,369.6	74.0	105.0	249,350.4	353,808.0
3.2 /B-B.2	51.0	72.5	21.5	52.0	4.0	335.4	115.5	64.8	38,738.7	21,717.2
3.2/B.8-C	137.5	159.0	21.5	52.0	4.0	335.4	115.5	148.3	38,738.7	49,723.1
4.2/B-C	51.0	159.0	108.0	52.0	4.0	1,684.8	155.0	105.0	261,144.0	176,904.0
4.9/B-C	51.0	159.0	108.0	52.0	8.0	3,369.6	180.0	105.0	606,528.0	353,808.0
E/W WALLS EL. -52' TO 0' (4)										
B/2.4-4.9	74.0	180.0	106.0	52.0	8.0	3,307.2	127.0	51.0	420,014.4	168,667.2
B.2/2.4-4.9	74.0	180.0	106.0	52.0	4.0	1,653.6	127.0	72.5	210,007.2	119,886.0
B.5/4.2-4.9	155.0	180.0	25.0	52.0	4.0	390.0	127.0	137.5	49,530.0	53,625.0
B.8/2.4-4.9	74.0	180.0	106.0	52.0	4.0	1,653.6	167.5	105.9	276,978.0	175,165.8
C/2.4-4.9	74.0	180.0	106.0	52.0	8.0	3,307.2	127.0	159.0	420,014.4	525,844.8
				TOTAL WEIGHT =		19,406.4	kips		2,571,043.8	1,999,149.0
				XBAR =		132.5	ft	XBAR = Σ (W*CGxi)/Σ W		
				ZBAR =		103.0	ft	ZBAR = Σ (W*CGzi)/Σ W		
N/S WALL EL. -52' To -34' (5)										
WALL (2)	start (3)	end (3)	Length	Height	Thickness	Weight	CGxi (1)	CGzi (1)	W*CGxi	W*CGzi
	(ft)	(ft)	=end-start	H	T	`=L*H*T*0.15	(ft)	(ft)	ft-kips	ft-kips
			L (ft)	(ft)	(ft)	W (kips)				
3.7/B.2-B.8	72.5	137.5	65.0	18.0	2.0	351.0	137.0	105.0	48,087.0	36,855.0
				TOTAL WEIGHT =		351.0	kips		48,087.0	36,855.0
				XBAR =		137.0	ft	XBAR = Σ (W*CGxi)/Σ W		
				ZBAR =		105.0	ft	ZBAR = Σ (W*CGzi)/Σ W		

Notes:

1 For coordinate system definition see Section 6.

2 Numbers and letters are in reference to the column grid lines for the building.

3 The start and end dimensions refer to the axis parallel with the wall. For example, the x-axis is parallel with the East/West walls (E/W). CGxi would be calculated as the start plus half the length, and CGzi would simply be the perpendicular distance from the wall to the origin. The opposite is true for the North/South wall (N/S).

4. Half the weight of the walls is combined with the floor below and half with floor above

5. All the weight of the wall is combined with the floor below.

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Weight and Centroid of Wall on Floor Slab above Elev. + 0' (Pool with Water):										
(Refer to: Att.-B , Sht.B-3 and B-6 through B-17)										
WALL (2)	start (3)	end (3)	Length	Height	Thickness	Weight[4]	CGxi (1)	CGzi (1)	W*CGxi	W*CGzi
	(ft)	(ft)	=end-start	H	T	=L*H/2*T*0.15	(ft)	(ft)	ft-kips	ft-kips
			L (ft)	(ft)	(ft)	W (kips)				
N/S WALLS EL. 0' to EL.32'(4)										
4/AB	0.00	53.00	53.00	32.00	4.00	508.80	148.00	26.50	75,302.40	13,483.20
5/AB	0.00	53.00	53.00	32.00	4.00	508.80	185.00	26.50	94,128.00	13,483.20
6/AB	0.00	53.00	53.00	32.00	4.00	508.80	212.00	26.50	107,865.60	13,483.20
7/AB	0.00	53.00	53.00	32.00	4.00	508.80	266.00	26.50	135,340.80	13,483.20
E/W WALLS EL. 0' to 32'(4)										
A/4-7	148.00	266.00	118.00	32.00	4.00	1,132.80	207.00	0.00	234,489.60	0.00
B/4-7	148.00	266.00	118.00	32.00	4.00	1,132.80	207.00	53.00	234,489.60	60,038.40
				TOTAL WEIGHT =		4,300.80	kips		881,616.00	113,971.20
				XBAR =		204.99	ft	XBAR = S (W*CGxi)/S W		
				ZBAR =		26.50	ft	ZBAR = S (W*CGzi)/S W		
N/S WALLS EL. 0' to EL.40'(4)										
1/AD	0.00	210.00	210.00	40.00	4.00	2,520.00	0.00	105.00	0.00	264,600.00
2/AB	0.00	53.00	53.00	40.00	4.00	636.00	54.00	26.50	34,344.00	16,854.00
3/AB	0.00	53.00	53.00	40.00	4.00	636.00	108.00	26.50	68,688.00	16,854.00
2/CD	157.00	210.00	53.00	40.00	4.00	636.00	54.00	183.50	34,344.00	116,706.00
3/CD	157.00	210.00	53.00	40.00	4.00	636.00	108.00	183.50	68,688.00	116,706.00
4/CD	157.00	210.00	53.00	40.00	4.00	636.00	148.00	183.50	94,128.00	116,706.00
6/CD	157.00	210.00	53.00	40.00	4.00	636.00	212.00	183.50	134,832.00	116,706.00
2.1/BC	53.00	157.00	104.00	40.00	2.00	624.00	57.50	105.00	35,880.00	65,520.00
E/W WALLS EL. 0' to 40'(4)										
A/1-4	0.00	148.00	148.00	40.00	4.00	1,776.00	74.00	0.00	131,424.00	0.00
B/1-4	0.00	148.00	148.00	40.00	4.00	1,776.00	74.00	53.00	131,424.00	94,131.73
C/1-6	0.00	212.00	212.00	40.00	4.00	2,544.00	109.50	157.00	278,568.00	399,408.00
D/1-6	0.00	212.00	212.00	40.00	4.00	2,544.00	106.00	210.00	269,664.00	534,240.00
				TOTAL WEIGHT =		15,600.00	kips		1,281,984.00	1,858,431.73
				XBAR =		82.18	ft	XBAR = S (W*CGxi)/S W		
				ZBAR =		119.13	ft	ZBAR = S (W*CGzi)/S W		
N/S WALLS EL. 0' to EL.80'(4)										
7/BD	53.00	210.00	157.00	80.00	4.00	3,768.00	266.00	131.50	1,002,288.00	495,492.00
				TOTAL WEIGHT =		3,768.00	kips		1,002,288.00	495,492.00
				XBAR =		266.00	ft	XBAR = S (W*CGxi)/S W		
				ZBAR =		131.50	ft	ZBAR = S (W*CGzi)/S W		
WALL (2)	start (3)	end (3)	Length	Height	Thickness	Weight	CGxi (1)	CGzi (1)	W*CGxi	W*CGzi
	(ft)	(ft)	=end-start	H	T	=L*H*T*0.15	(ft)	(ft)	ft-kips	ft-kips
			L (ft)	(ft)	(ft)	W (kips)				
N/S WALLS EL. 0' to EL.20' (5)										
1.1/B-B.1	53.00	73.75	20.75	20.00	1.00	62.25	17.00	63.75	1,058.25	3,968.44
1.2/B-B.1	53.00	73.75	20.75	20.00	1.00	62.25	31.50	63.75	1,960.88	3,968.44
1.3/B-B.1	53.00	73.75	20.75	20.00	1.50	93.38	47.25	63.75	4,411.97	5,952.66
1.1/B.2-B.3	82.50	111.25	28.75	20.00	1.00	86.25	17.00	97.25	1,466.25	8,387.81
1.2/B.2-B.3	82.50	111.25	28.75	20.00	1.00	86.25	31.50	97.25	2,716.88	8,387.81
1.3/B.2-B.3	82.50	111.25	28.75	20.00	1.50	129.38	47.25	97.25	6,112.97	12,581.72
1.3/B.4-B.5	120.75	138.25	17.50	20.00	1.50	78.75	44.00	129.50	3,465.00	10,198.13
E/W WALLS EL. 0' to 20'(5)										
B.1	0.00	47.25	47.25	20.00	1.50	212.63	23.63	73.75	5,023.27	15,681.09
B.2	0.00	47.25	47.25	20.00	1.50	212.63	23.63	83.25	5,023.27	17,701.03
B.3	0.00	47.25	47.25	20.00	1.50	212.63	23.63	111.25	5,023.27	23,654.53
B.4	0.00	44.00	44.00	20.00	1.50	198.00	22.00	120.75	4,356.00	23,908.50
B.5	0.00	44.00	44.00	20.00	1.50	198.00	22.00	138.25	4,356.00	27,373.50
				TOTAL WEIGHT =		1,632.38	kips		44,973.98	161,763.66
				XBAR =		27.55	ft	XBAR = S (W*CGxi)/S W		
				ZBAR =		99.10	ft	ZBAR = S (W*CGzi)/S W		

Notes:

1 For coordinate system definition see Section 6.

2 Numbers and letters are in reference to the column grid lines for the building

3 The start and end dimensions refer to the axis parallel with the wall. For example, the x-axis is parallel with the East/West walls (E/W). CGxi would be calculated as the start plus half the length, and CGzi would simply be the perpendicular distance from the wall to the orgin. The opposite is true for the N/S walls.

4. Half the weight of the walls is combined with the floor below and half with floor above

5. All the weight of the wall is combined with the floor below.

Weight and Centroid of Walls on Elev.+ 32' (Pool with Water):

(Refer to: Att.-B , Sht.B-4, B-9, and B-12 through B-14)

WALL [2]	start [3] (ft)	end [3] (ft)	Length =end-start L (ft)	Height H (ft)	Thick T (ft)	Weight[4] =L*H/2*T*0.15 W (kips)	CGxi [1] (ft)	CGzi [1] (ft)	W*CGxi ft-kips	W*CGzi ft-kips
N/S WALLS EL. 32' to 40' [4]										
4/AB	0.00	53.00	53.00	8.00	4.00	127.20	148.00	26.50	18,825.60	3,370.80
				TOTAL WEIGHT =		**127.20**	kips		**18,825.60**	**3,370.80**
				XBAR =		**148.00**	ft	XBAR = Σ (W*CGxi)/Σ W		
				ZBAR =		**26.50**	ft	ZBAR = Σ (W*CGzi)/Σ W		
N/S WALLS EL. 32' to 100' [4]										
7/AB	0.00	53.00	53.00	68.00	4.00	1,081.20	266.00	26.50	287,599.20	28,651.80
				TOTAL WEIGHT =		**1,081.20**	kips		**287,599.20**	**28,651.80**
				XBAR =		**266.00**	ft	XBAR = Σ (W*CGxi)/Σ W		
				ZBAR =		**26.50**	ft	ZBAR = Σ (W*CGzi)/Σ W		
E/W WALLS EL. 32' to 80' [4]										
B/4-7	148.00	266.00	118.00	48.00	4.00	1,699.20	207.00	53.00	351,734.40	90,057.60
				TOTAL WEIGHT =		**1,699.20**	kips		**351,734.40**	**90,057.60**
				XBAR =		**207.00**	ft	XBAR = Σ (W*CGxi)/Σ W		
				ZBAR =		**53.00**	ft	ZBAR = Σ (W*CGzi)/Σ W		
E/W WALLS EL. 32' to 100' [4]										
A/4-7	148.00	266.00	118.00	68.00	4.00	2,407.20	207.00	0.00	498,290.40	0.00
				TOTAL WEIGHT =		**2,407.20**	kips		**498,290.40**	**0.00**
				XBAR =		**207.00**	ft	XBAR = Σ (W*CGxi)/Σ W		
				ZBAR =		**0.00**	ft	ZBAR = Σ (W*CGzi)/Σ W		

Notes:

1 For coordinate system definition see Section 6.

2 Numbers and letters are in reference to the column grid lines for the building

3 The start and end dimensions refer to the axis parallel with the wall. For example, the x-axis is parallel with the East/West walls (E/W). CGxi would be calculated as the start plus half the length, and CGzi would simply be the perpendicular distance from the wall to the orgin. The opposite is true for the N/S walls.

4. Half the weight of the walls is combined with the floor below and half with floor above

Weight and Centroid of Walls on Floor Slab @ Elev. + 40'(Pool with Water):

(Refer to: Att.-B , Sht.B-4, B-6 through B-16)

WALL [(2)]	start [(3)] (ft)	end [(3)] (ft)	Length =end-start L (ft)	Height H (ft)	Thickness T (ft)	Weight[4] =L*H/2*T*0.15 W (kips)	CGxi [(1)] (ft)	CGzi [(1)] (ft)	W*CGxi ft-kips	W*CGzi ft-kips
N/S WALLS EL. 40' to 80'[(4)]										
1/A-D	0.0	210.0	210.0	40.0	4.0	2,520.0	0.0	105.0	0.0	264,600.0
2/AB	0.0	53.0	53.0	40.0	4.0	636.0	54.0	26.5	34,344.0	16,854.0
3/AB	0.0	53.0	53.0	40.0	4.0	636.0	108.0	26.5	68,688.0	16,854.0
4/AB	0.0	53.0	53.0	40.0	4.0	636.0	148.0	26.5	94,128.0	16,854.0
2/CD	157.0	210.0	53.0	40.0	4.0	636.0	212.0	183.5	134,832.0	116,706.0
3/CD	157.0	210.0	53.0	40.0	4.0	636.0	54.0	183.5	34,344.0	116,706.0
4/CD	157.0	210.0	53.0	40.0	4.0	636.0	108.0	183.5	68,688.0	116,706.0
6/CD	157.0	210.0	53.0	40.0	4.0	636.0	185.0	183.5	117,660.0	116,706.0
E/W WALLS EL 40' to 80' [(4)]										
A/1-4	0.0	148.0	148.0	40.0	4.0	1,776.0	74.0	0.0	131,424.0	0.0
B/1-4	0.0	148.0	148.0	40.0	4.0	1,776.0	74.0	53.0	131,424.0	94,131.7
C/1-7	0.0	270.0	270.0	40.0	4.0	3,240.0	135.0	157.0	437,400.0	508,680.0
D/1-7	0.0	270.0	270.0	40.0	4.0	3,240.0	135.0	210.0	437,400.0	680,400.0
				TOTAL WEIGHT =		**17,004.0**	kips		**1,690,332.0**	**2,065,197.7**
				XBAR =		**99.4**	ft	XBAR = Σ (W*CGxi)/Σ W		
				ZBAR =		**121.5**	ft	ZBAR = Σ (W*CGzi)/Σ W		

Notes

1 For coordinate system definition see Section 6.

2 Numbers and letters are in reference to the column grid lines for the building

3 The start and end dimensions refer to the axis parallel with the wall. For example, the x-axis is parallel with the East/West walls (E/W). CGxi would be calculated as the start plus half the length, and CGzi would simply be the perpendicular distance from the wall to the orgin. The opposite is true for the N/S walls.

4. Half the weight of the wall is combined with floor below and half with the floor above

Weight and Centroid of Walls on @ Elev. + 80' (Pool with Water):										
(Refer to: Att.-B , Sht.B-5, B-9, and B-14)										
	start (3)	**end (3)**	**Length**	**Height**	**Thickness**	**Weight4**	**CGxi (1)**	**CGzi (1)**	**W*CGxi**	**W*CGzi**
WALL (2)	**(ft)**	**(ft)**	**=end-start**	**H**	**T**	**=L*H/2*T*0.15**	**(ft)**	**(ft)**	**ft-kips**	**ft-kips**
			L (ft)	**(ft)**	**(ft)**	**W (kips)**				
N/S WALLS EL. 80' to 100' (4)										
4/A-B	0.0	53.0	53.0	20.0	4.0	318.0	148.0	26.5	47,064.0	8,427.0
E/W WALLS EL. 80' to 100' (4)										
B/4-7	148.0	266.0	118.0	20.0	4.0	708.0	207.0	53.0	146,556.0	37,524.0
				TOTAL WEIGHT =		**1,026.0**	kips		**193,620.0**	**45,951.0**
				XBAR =		**188.7**	ft	XBAR = Σ (W*CGxi)/Σ W		
				ZBAR =		**44.8**	ft	ZBAR = Σ (W*CGzi)/Σ W		
Notes:										
1 For coordinate system definition see Section 6.										
2 Numbers and letters are in reference to the column grid lines for the building										
(E/W). CGxi would be calculated as the start plus half the length, and CGzi would simply be the perpendicular distance from the										
4. Half the weight of the wall is combined with floor below and half with the floor above										

DDR LUMPED WEIGHTS (Pool with Water):					
(WEGHTS AND THEIR CENTERS)					
BASEMENT FLOOR SLAB @ - 52' :					
BASE SLAB + WATER + WALLS	**Weight W (kips)**	**xbar (ft)**	**zbar (ft)**	**W*xbar (ft - kips)**	**W*zbar (ft - kips)**
a) BASEMENT FLOOR SLAB @ El. -52 (Page 10)	18,594.8	127.6	105.0	2,371,877.8	1,952,455.1
b) Wt. Of WATER (Page 10)	12,388.9	112.4	105.0	1,392,807.3	1,300,834.1
c) FOUR CASKS IN THE POOL (Page 10)	1,600.0	148.0	105.0	236,800.0	168,000.0
d) Wt. Of 1/2 WALLS El. -52' to El. 0' (Page 17)	19,406.4	132.5	103.0	2,571,043.8	1,999,149.0
e) Full Wt. Of Walls El.-52' to El.-34' (Page 17)	351.0	137.0	105.0	48,087.0	36,855.0
SUM	**52,341.1**			**6,620,615.9**	**5,457,293.2**
		XBAR =	**126.5**	ft	XBAR = S(W*xbar)/S(W)
	Floor Slab@-52	**ZBAR =**	**104.3**	ft	ZBAR = S(W*zbar)/S(W)
		WEIGHT=	**52,341.1**	kips	WEIGHT = S(Weight)
FLOOR SLAB @ + 0':					
BASE SLAB @ 0' + WALLS	**Weight W (kips)**	**xbar (ft)**	**zbar (ft)**	**W*xbar (ft - kips)**	**W*zbar (ft - kips)**
a) FLOOR SLAB @0' (Page 12)	56,730.4	131.4	104.8	7,454,200.2	5,943,383.8
b) 1/2 Wt. Of Walls below El. 0' (Page 17)	19,406.4	132.5	103.0	2,571,043.8	1,999,149.0
c) 1/2 Wt. of Walls above El. 0' as follows:					
0'-32' (Page 19)	4,300.8	205.0	26.5	881,616.0	113,971.2
0'-40' (Page 19)	15,600.0	82.2	119.1	1,281,984.0	1,858,431.7
0'-80' (Page 19)	3,768.0	266.0	131.5	1,002,288.0	495,492.0
d) Full Wt. of Walls El. 0' to El. 20' (Page 19)	1,632.4	27.6	99.1	44,974.0	161,763.7
SUM	**101,438.0**			**13,236,105.9**	**10,572,191.4**
		XBAR =	**130.5**	ft	XBAR = S(W*xbar)/S(W)
	0' BASE SLAB	**ZBAR =**	**104.2**	ft	ZBAR = S(W*zbar)/S(W)
		WEIGHT	**101,438.0**	kips	WEIGHT = S(Weight)
FLOOR SLAB @ 32':					
FLOOR SLAB @ 32' + WALLS	**Weight W (kips)**	**xbar (ft)**	**zbar (ft)**	**W*xbar (ft - kips)**	**W*zbar (ft - kips)**
a) FLOOR SLAB @32' (Page 13)	5,717.9	204.4	26.3	1,168,877.7	150,308.3
b) 1/2 Wt. Of Walls below El. 32'					
0'-32' (Page 19)	4,300.8	205.0	26.5	881,616.0	113,971.2
c) 1/2 Wt. Of Walls above El. 32' as follows:					
32'-40' (Page 20) 4/A-B	127.2	148.0	26.5	18,825.6	3,370.8
32'-100' (Page 20) 7/A-B	1,081.2	266.0	26.5	287,599.2	28,651.8
32'-80' (Page 20) B/4-7	1,699.2	207.0	53.0	351,734.4	90,057.6
32'-100' (Page 20) A/4-7	2,407.2	207.0	0.0	498,290.4	0.0
SUM	**15,333.5**			**3,206,943.3**	**386,359.7**
		XBAR =	**209.1**	ft	XBAR = S(W*xbar)/S(W)
	32' BASE SLAB	**ZBAR =**	**25.2**	ft	ZBAR = S(W*zbar)/S(W)
		WEIGHT	**15,333.5**	kips	WEIGHT = S(Weight)

DDR LUMPED WEIGHTS (Pool with Water):					
(WEGHTS AND THEIR CENTERS)					
FLOOR SLAB @ + 40' :					
Base Slab+Walls					
FLOOR SLAB @ 40' + WALLS	**Weight W (kips)**	**xbar (ft)**	**zbar (ft)**	**W*xbar (ft - kips)**	**W*zbar (ft - kips)**
a) FLOOR SLAB @ 40' (Page 14)	11,885.8	79.7	115.8	947,457.6	1,376,493.6
b) 1/2 wt. Of Walls below El.40'					
0'-40' (Page 19)	15,600.0	82.2	119.1	1,281,984.0	1,858,431.7
32'-40' (Page 20) 4/A-B	127.2	148.0	26.5	18,825.6	3,370.8
c) 1/2 Wt of Walls above El.40'					
40'-80' (Page 21)	17,004.0	99.4	121.5	1,690,332.0	2,065,197.7
SUM	**44,617.0**			**3,938,599.2**	**5,303,493.9**
		XBAR =	**88.3**	ft	XBAR = S(W*xbar)/S(W)
	40' SLAB	**ZBAR =**	**118.9**	ft	ZBAR = S(W*zbar)/S(W)
		WEIGHT	**44,617.0**	kips	WEIGHT = S(Weight)
ROOF SLAB @ + 80':					
Roof/Roof Slab+Walls					
ROOF SLAB @ 80' + WALLS	**Weight W (kips)**	**xbar (ft)**	**zbar (ft)**	**W*xbar (ft - kips)**	**W*zbar (ft - kips)**
a) ROOF SLAB @ 80' (Page 15)	24,603.5	127.7	111.9	3,142,458.0	2,753,826.3
including roof slab @80' deduction and crane wt.					
b) 1/2 wt. Of Walls below El.80'					
0'-80' (Page 19) 7/B-D	3,768.0	266.0	131.5	1,002,288.0	495,492.0
32'-80' (Page 20) B/4-7	1,699.2	207.0	53.0	351,734.4	90,057.6
40'-80' (Page 21)	17,004.0	99.4	121.5	1,690,332.0	2,065,197.7
c) 1/2 Wt of Walls above El.80'					
80'-100' (Page 22) 4/A-B, B/4-7	1,026.0	188.7	44.8	193,620.0	45,951.0
SUM	**48,100.7**			**6,380,432.4**	**5,450,524.6**
		XBAR =	**132.6**	ft	XBAR = S(W*xbar)/S(W)
	80' ROOF	**ZBAR =**	**113.3**	ft	ZBAR = S(W*zbar)/S(W)
		WEIGHT	**48,100.7**	kips	WEIGHT = S(Weight)
ROOF SLAB @ 100' :					
Roof Slab+Walls					
ROOF SLAB @ 100' + WALLS	**Weight W (kips)**	**xbar (ft)**	**zbar (ft)**	**W*xbar (ft - kips)**	**W*zbar (ft - kips)**
a) ROOF SLAB @ 100' (Page 16)	3,347.3	205.3	25.3	687,138.4	84,585.0
b) 1/2 wt. Of Walls below El.100'					
32'-100' - Wall A/4-7 (Page 20)	2,407.2	207.0	0.0	498,290.4	0.0
32'-100' - Wall 7/A-B (Page 20)	1,081.2	266.0	26.5	287,599.2	28,651.8
80'-100' - Walls 4/A-B + B/4-7 (Page 22)	1,026.0	188.7	44.8	193,620.0	45,951.0
SUM	**7,861.7**			**1,666,648.0**	**159,187.8**
		XBAR =	**212.0**	ft	XBAR = S(W*xbar)/S(W)
	100' ROOF	**ZBAR =**	**20.2**	ft	ZBAR = S(W*zbar)/S(W)
		WEIGHT	**7,861.7**	kips	WEIGHT = S(Weight)

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TABLE - SUMMARY OF MASS & CENTERS OF MASS (Pool with Water):

(For WEIGHT, XBAR and ZBAR, see Pgs. 23 and 24)

LOCATIONS	WEIGHT (W) (kips)	MASS (W/g) (kip-sec^2/ft)	CGx (ft) *	CGz (ft) *
BASEMENT SLAB @ -52' + WALLS (+ Wt. Of Water in Pool + Four Casks)	52,341.1	1,625.5	126.5	104.3
FLOOR SLAB @ 0' + WALLS	101,438.0	3,150.2	130.5	104.2
FLOOR SLAB @ 32' + WALLS	15,333.5	476.2	209.1	25.2
FLOOR SLAB @ 40' + WALLS	44,617.0	1,385.6	88.3	118.9
ROOF @ 80' + WALLS	48,100.7	1,493.8	132.6	113.3
UPPER ROOF @ 100' + WALLS	7,861.7	244.2	212.0	20.2
TOTAL =	**269,692.0**	**8,375.5**		

* for coordinate system definition see Pg.# 9.

MASS MOMENTS OF INERTIA @ BASEMENT FLOOR EL. - 52' (Pool with Water):									
Ref 2.2.2, "Dynamics of Structures" by Clough and Penzien, 1975, Pg. 24									
(Note: For coordinate System defination see page 9)									
Basement Floor EL. @ -52' + WALLS -52' to -34' and -52' to 0'									
				CGx =	**126.5**	**CGz =**	**104.3**		
Area Description	**Len. x Lx (ft)**	**Len. z Lz (ft)**	**Wt. (W) (kips)**	**CGxi (ft)**	**CGzi (ft)**	**Iox W*Lz^2/12g (kip-ft-sec^2)**	**mdz^2 W*(CGz-CGzi)^2/g (kip-ft-sec^2)**	**Ioz W*Lx^2/12g (kip-ft-sec^2)**	**mdx^2 W*(CGx-CGxi)^2/g (kip-ft-sec^2)**
FLOOR SLAB @ -52' (From Pg. 10)									
B-C/2.4-5	114.0	116.0	18,050.8	127.0	105.0	628,600.0	303.7	607,111.0	145.9
B.2-B.8/3.7-4.2	18.0	65.0	544.1	146.0	105.0	5,948.8	9.2	456.2	6,431.4
ADD WATER (From Pg. 10)									
(B-C/2.4-4.2)	75.0	61.0	13,703.0	115.5	105.0	131,959.1	230.5	199,481.4	51,397.3
(-) step Area	18.0	65.0	-1,314.1	144.5	105.0	-14,369.2	-22.1	-1,101.9	-13,238.1
ADD FOUR CASKS (From Pg. 10)									
			1,600.0	148.0	105.0	0.0	26.9	0.0	22,990.7
N/S WALLS EL. -52' to 0' (From Pg. 17)									
2.4/B-C		108.0	3,369.6	74.0	105.0	101,715.9	56.7	0.0	288,318.3
3.2 /B-B.2		21.5	335.4	115.5	64.8	401.2	16,263.3	0.0	1,258.0
3.2/B.8-C		21.5	335.4	115.5	148.3	401.2	20,152.8	0.0	1,258.0
4.2/B-C		108.0	1,684.8	155.0	105.0	50,857.9	28.3	0.0	42,529.8
4.9/B-C		108.0	3,369.6	180.0	105.0	101,715.9	56.7	0.0	299,637.1
E/W WALLS EL. -52' to 0' (From Pg. 17)									
B/2.4-4.9	106.0		3,307.2	127.0	51.0	0.0	291,388.3	96,169.0	26.7
B.2/2.4-4.9	106.0		1,653.6	127.0	72.5	0.0	51,813.7	48,084.5	13.4
B.5/4.2-4.9	25.0		390.0	127.0	137.5	0.0	13,379.1	630.8	3.2
B.8/2.4-4.9	106.0		1,653.6	167.5	105.9	0.0	142.5	48,084.5	86,369.1
C/2.4-4.9	106.0		3,307.2	127.0	159.0	0.0	307,716.4	96,169.0	26.7
N/S WALLS EL. -52' to -34' (from Pg. 17)									
3.7/B.2-B.8		65.0	351.0	137.0	105.0	3,837.9	5.9	0.0	1,204.1
					Σ	**1,011,068.8**	**701,552.0**	**1,095,084.4**	**788,371.9**
Mass Moment of Inertia about centroidal x-axis Ix =					**1,712,620.8**	kip-ft-sec^2			(Iox + mdz^2)
Mass Moment of Inertia about centroidal z-axis Iz =					**1,883,456.3**	kip-ft-sec^2			(Ioz + mdx^2)
Mass Moment of Inertia about centroidal y-axis Iy =					**3,596,077.1**	kip-ft-sec^2			(Ix+Iz)

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MASS MOMENTS OF INERTIA @ FLOOR EL. + 0' (Pool with Water):									
Ref 2.2.2, "Dynamics of Structures" by Clough and Penzien, 1975, Pg. 24									
Slab @ 0' and WALLS -52' to 0' + WALLS 0' -32' + WALLS 0'-20' + WALLS 0'-40' + WALLS 0'-80'									
				CGx =	130.5	CGz =	104.2		
Area	**Length**	**Length**	**Weight**	**CGxi**	**CGzi**	**Iox**	**mdz^2**	**Ioz**	**mdx^2**
Description	**Lx**	**Lz**	**(W)**			**W*Lz^2/12g**	**W*(CGz-CGzi)^2/g**	**W*Lx^2/12g**	**W*(CGx-CGxi)^2/g**
	(ft)	**(ft)**	**(kips)**	**(ft)**	**(ft)**	**(kip-ft-sec^2)**	**(kip-ft-sec^2)**	**(kip-ft-sec^2)**	**(kip-ft-sec^2)**
Slab @ 0' (From Pg. 12):									
A-D/1-7	270.0	214.0	59,802.3	133.0	105.0	7,087,748.8	1,120.6	11,282,576.8	11,749.6
B-C/1-2	55.0	84.0	1,663.2	28.5	97.0	30,371.5	2,695.0	13,020.7	537,228.6
B-C/2-4	75.0	61.0	-4,735.1	115.5	105.0	-45,598.9	-88.7	-68,931.4	-33,019.8
(Pool area deduction)									
N/S WALLS EL. 0' to 32' (From Pg. 19)									
4/AB		53.0	508.8	148.0	26.5	3,698.8	95,453.7	0.0	4,847.6
5/AB		53.0	508.8	185.0	26.5	3,698.8	95,453.7	0.0	46,959.9
6/AB		53.0	508.8	212.0	26.5	3,698.8	95,453.7	0.0	104,995.1
7/AB		53.0	508.8	266.0	26.5	3,698.8	95,453.7	0.0	290,180.0
E/W WALLS EL 0' to 32' (From Pg. 19)									
A/4-7	118.0		1,132.8	207.0	0.0	0.0	382,143.5	40,820.7	205,965.0
B/4-7	118.0		1,132.8	207.0	53.0	0.0	92,306.3	40,820.7	205,965.0
N/S WALLS EL. 0' to 20' (from Pg. 19)									
1.1/B-B.1		20.8	62.3	17.0	63.8	69.4	3,166.8	0.0	24,897.7
1.2/B-B.1		20.8	62.3	31.5	63.8	69.4	3,166.8	0.0	18,941.7
1.3/B-B.1		20.8	93.4	47.3	63.8	104.0	4,750.2	0.0	20,090.2
1.1/B.2-B.3		28.8	86.3	17.0	97.3	184.5	130.2	0.0	34,496.8
1.2/B.2-B.3		28.8	86.3	31.5	97.3	184.5	130.2	0.0	26,244.6
1.3/B.2-B.3		28.8	129.4	47.3	97.3	276.8	195.4	0.0	27,835.8
1.3/B.4-B.5		17.5	78.8	44.0	129.5	62.4	1,562.6	0.0	18,292.5
E/W WALLS EL. 0' to 20' (from Pg. 19)									
B.1	47.3		212.6	23.6	73.8	0.0	6,131.9	1,228.5	75,402.7
B.2	47.3		212.6	23.6	83.3	0.0	2,904.6	1,228.5	75,402.7
B.3	47.3		212.6	23.6	111.3	0.0	326.0	1,228.5	75,402.7
B.4	44.0		198.0	22.0	120.8	0.0	1,679.5	992.0	72,368.0
B.5	44.0		198.0	22.0	138.3	0.0	7,119.5	992.0	72,368.0
N/S WALLS EL. 0' to 40' (From Pg. 19)									
1/AD		210.0	2,520.0	0.0	105.0	287,608.7	47.2	0.0	1,332,490.8
2/AB		53.0	636.0	54.0	26.5	4,623.5	119,317.2	0.0	115,545.0
3/AB		53.0	636.0	108.0	26.5	4,623.5	119,317.2	0.0	9,985.7
2/CD		53.0	636.0	54.0	183.5	4,623.5	124,134.7	0.0	115,545.0
3/CD		53.0	636.0	108.0	183.5	4,623.5	124,134.7	0.0	9,985.7
4/CD		53.0	636.0	148.0	183.5	4,623.5	124,134.7	0.0	6,059.5
6/CD		53.0	636.0	212.0	183.5	4,623.5	124,134.7	0.0	131,243.8
2.1/BC		104.0	624.0	57.5	105.0	17,466.8	11.7	0.0	103,226.9

MASS MOMENTS OF INERTIA @ FLOOR EL. + 0' (Pool with Water):									
Ref 2.2.2, "Dynamics of Structures" by Clough and Penzien, 1975, Pg. 24									
Slab @ 0' and WALLS -52' to 0' + WALLS 0' -32' + WALLS 0'-20' + WALLS 0'-40' + WALLS 0'-80'									
				CGx =	**130.5**	**CGz =**	**104.2**		
Area	**Length**	**Length**	**Weight**	**CGxi**	**CGzi**	**Iox**	**mdz^2**	**Ioz**	**mdx^2**
Description	**Lx**	**Lz**	**(W)**			**W*Lz^2/12g**	**W*(CGz-CGzi)^2/g**	**W*Lx^2/12g**	**W*(CGx-CGxi)^2/g**
	(ft)	**(ft)**	**(kips)**	**(ft)**	**(ft)**	**(kip-ft-sec^2)**	**(kip-ft-sec^2)**	**(kip-ft-sec^2)**	**(kip-ft-sec^2)**
E/W WALLS EL 0' to 40' (From Pg. 19)									
A/1-4	148.0		1,776.0	74.0	0.0	0.0	599,123.3	100,676.8	175,974.4
B/1-4	148.0		1,776.0	74.0	53.0	0.0	144,705.7	100,676.8	175,974.4
C/1-6	212.0		2,544.0	109.5	157.0	0.0	220,062.9	295,904.6	34,791.2
D/1-6	212.0		2,544.0	106.0	210.0	0.0	883,978.7	295,904.6	47,364.5
N/S WALLS EL 0' to 80' (From Pg. 19)									
7/BD		157.0	3,768.0	266.0	131.5	240,366.0	87,064.4	0.0	2,148,974.9
N/S WALLS EL. -52' to 0' (From Pg. 17)									
2.4/B-C		108.0	3,369.6	74.0	105.0	101,715.9	63.1	0.0	333,875.8
3.2 /B-B.2		21.5	335.4	115.5	64.8	401.2	16,229.8	0.0	2,338.9
3.2/B.8-C		21.5	335.4	115.5	148.3	401.2	20,190.2	0.0	2,338.9
4.2/B-C		108.0	1,684.8	155.0	105.0	50,857.9	31.6	0.0	31,446.0
4.9/B-C		108.0	3,369.6	180.0	105.0	101,715.9	63.1	0.0	256,566.7
E/W WALLS EL. -52' to 0' (From Pg. 17)									
B/2.4-4.9	106.0		3,307.2	127.0	51.0	0.0	290,942.5	96,169.0	1,247.2
B.2/2.4-4.9	106.0		1,653.6	127.0	72.5	0.0	51,680.8	48,084.5	623.6
B.5/4.2-4.9	25.0		390.0	127.0	137.5	0.0	13,411.9	630.8	147.1
B.8/2.4-4.9	106.0		1,653.6	167.5	105.9	0.0	149.6	48,084.5	70,361.6
C/2.4-4.9	106.0		3,307.2	127.0	159.0	0.0	308,174.9	96,169.0	1,247.2
					Σ	**7,916,542.4**	**4,262,359.8**	**12,396,277.6**	**7,023,969.0**
Mass Moment of Inertia about centroidal x-axis Ix =						**12,178,902.2**	**kip-ft-sec^2**		($Iox + mdz^2$)
Mass Moment of Inertia about centroidal z-axis Iz =						**19,420,246.6**	**kip-ft-sec^2**		($Ioz + mdx^2$)
Mass Moment of Inertia about centroidal y-axis Iy =						**31,599,148.8**	**kip-ft-sec^2**		(Ix+Iz)

MASS MOMENTS OF INERTIA @ FLOOR EL. + 32' (Pool with Water):									
Ref 2.2.2, "Dynamics of Structures" by Clough and Penzien, 1975, Pg. 24									
Slab @ 32'+ WALLS 0'-32' + WALLS 32'-40' + WALLS 32'- 100':									
				CGx =	**209.1**		CGz =	**25.2**	
Area	**Length x**	**Length z**	**Wt.**	**CGxi**	**CGzi**	**Iox**	**mdz^2**	**Ioz**	**mdx^2**
Description	**Lx**	**Lz**	**(W)**			**W*Lz^2/12g**	**W*(CGz-CGzi)^2/g**	**W*Lx^2/12g**	**W*(CGx-CGxi)^2/g**
	(ft)	**(ft)**	**(kips)**	**(ft)**	**(ft)**	**(kip-ft-sec^2)**	**(kip-ft-sec^2)**	**(kip-ft-sec^2)**	**(kip-ft-sec^2)**
Slab @ EL. 32' (From Pg. 13):									
A-B/4-7	122.0	57.0	5,319.8	207.0	26.5	44,731.0	280.5	204,917.3	760.9
(at EL 32')									
Canister Transfer M/c			222.0	170.0	0.0	0.0	4,377.2	0.0	10,565.1
			176.1	170.0	53.0	0.0	4,227.5	0.0	8,380.7
N/S WALLS EL. 0' to 32' (From Pg. 19)									
4/AB	0.0	53.0	508.8	148.0	26.5	3,698.8	26.8	0.0	59,078.3
5/AB	0.0	53.0	508.8	185.0	26.5	3,698.8	26.8	0.0	9,212.6
6/AB	0.0	53.0	508.8	212.0	26.5	3,698.8	26.8	0.0	128.7
7/AB	0.0	53.0	508.8	266.0	26.5	3,698.8	26.8	0.0	51,075.5
E/W WALLS EL 0' to 32' (From Pg. 19)									
A/4-7	118.0	0.0	1,132.8	207.0	0.0	0.0	22,335.6	40,820.7	162.0
B/4-7	118.0	0.0	1,132.8	207.0	53.0	0.0	27,194.3	40,820.7	162.0
N/S WALLS EL 32' to 40' (From Pg. 20)									
4/AB	0.0	53.0	127.2	148.0	26.5	924.7	6.7	0.0	14,769.6
E/W WALLS EL 32' to 80' (From Pg. 20)									
B/4-7	118.0	0.0	1,699.2	207.0	53.0	0.0	40,791.5	61,231.0	243.0
N/S WALLS EL. 32' to 100' (From Pg. 20)									
7/AB	0.0	53.0	1,081.2	266.0	26.5	7,860.0	57.0	0.0	108,535.4
E/W WALLS EL. 32' to 100' (From Pg. 20)									
A/4-7	118.0	0.0	2,407.2	207.0	0.0	0.0	47,463.2	86,743.9	344.3
					Σ=	**68,310.9**	**146,840.8**	**434,533.6**	**263,418.1**
Mass Moment of Inertia about centroidal x-axis Ix =						**215,151.7**	kip-ft-sec^2		(Iox + mdz^2)
Mass Moment of Inertia about centroidal z-axis Iz =						**697,951.7**	kip-ft-sec^2		(Ioz + mdx^2)
Mass Moment of Inertia about centroidal y-axis Iy =						**913,103.4**	kip-ft-sec^2		(Ix+Iz)

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MASS MOMENTS OF INERTIA @ FLOOR EL. + 40' (Pool with Water):									
Ref 2.2.2, "Dynamics of Structures" by Clough and Penzien, 1975, Pg. 24									
Slab @+40' + WALLS 32' to 40' and 40' to 80':									
					CGx =	**88.3**	**CGz =**	**118.9**	
Area	**Length x**	**Length z**	**Wt.**	**CGxi**	**CGzi**	**Iox**	**mdz^2**	**Ioz**	**mdx^2**
Description	**Lx**	**Lz**	**(W)**			**W*Lz^2/12g**	**W*(CGz-CGzi)^2/g**	**W*Lx^2/12g**	**W*(CGx-CGxi)^2/g**
	(ft)	**(ft)**	**(kips)**	**(ft)**	**(ft)**	**(kip-ft-sec^2)**	**(kip-ft-sec^2)**	**(kip-ft-sec^2)**	**(kip-ft-sec^2)**
Slab @ 40' (From Pg. 14):									
A-B/1-4	152.0	55.0	3,887.4	74.0	26.5	30,433.2	1,030,004.4	232,439.2	24,604.0
C-D/1-6	216.0	55.0	5,524.2	106.0	183.5	43,247.2	716,670.0	667,021.4	53,894.6
B-C/1-2	61.0	104.0	2,474.2	30.0	105.0	69,256.0	14,775.8	23,826.0	260,944.9
N/S WALLS EL. 32' to 40' (From Pg. 20)									
4/AB	0.0	53.0	127.2	148.0	26.5	924.7	33,702.9	0.0	14,090.7
E/W WALLS EL. 32' to 40' (From Pg. 20)									
NONE									
N/S WALLS EL. 40' to 80' (From Pg. 21)									
1/A-D	0.0	210.0	2,520.0	0.0	105.0	287,608.7	15,049.5	0.0	609,857.4
2/AB	0.0	53.0	636.0	54.0	26.5	4,623.5	168,514.4	0.0	23,204.8
3/AB	0.0	53.0	636.0	108.0	26.5	4,623.5	168,514.4	0.0	7,684.2
4/AB	0.0	53.0	636.0	148.0	26.5	4,623.5	168,514.4	0.0	70,453.3
2/CD	0.0	53.0	636.0	212.0	183.5	4,623.5	82,510.1	0.0	302,350.3
3/CD	0.0	53.0	636.0	54.0	183.5	4,623.5	82,510.1	0.0	23,204.8
4/CD	0.0	53.0	636.0	108.0	183.5	4,623.5	82,510.1	0.0	7,684.2
6/CD	0.0	53.0	636.0	185.0	183.5	4,623.5	82,510.1	0.0	184,786.9
E/W WALLS EL 40' to 80' (From Pg. 21)									
A/1-4	148.0	0.0	1,776.0	74.0	0.0	0.0	779,311.8	100,676.8	11,240.6
B/1-4	148.0	0.0	1,776.0	74.0	53.0	0.0	239,275.4	100,676.8	11,240.6
C/1-7	270.0	0.0	3,240.0	135.0	157.0	0.0	146,314.1	611,273.3	219,670.8
D/1-7	270.0	0.0	3,240.0	135.0	210.0	0.0	835,676.9	611,273.3	219,670.8
					Σ=	**463,834.3**	**4,646,364.3**	**2,347,186.7**	**2,044,582.9**
Mass Moment of Inertia about centroidal x-axis Ix =						**5,110,198.6**	kip-ft-sec^2		(Iox + mdz^2)
Mass Moment of Inertia about centroidal z-axis Iz =						**4,391,769.5**	kip-ft-sec^2		(Ioz + mdx^2)
Mass Moment of Inertia about centroidal y-axis Iy =						**9,501,968.1**	kip-ft-sec^2		(Ix+Iz)

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MASS MOMENTS OF INERTIA Slab and Walls @ EL. + 80' (Pool with Water):

Ref 2.2.2, "Dynamics of Structures" by Clough and Penzien, 1975, Pg. 24

Slab @80+ WALLS + walls 40' to 80' + walls 80' to 100'

				CGx =	132.6	CGz =	113.3		
Area Description	**Leng. x Lx (ft)**	**Leng. z Lz (ft)**	**Weight (W) (kips)**	**CGxi (ft)**	**CGzi (ft)**	**Iox W*Lz^2/12g (kip-ft-sec^2)**	**mdz^2 W*(CGz-CGzi)^2/g (kip-ft-sec^2)**	**Ioz W*Lx^2/12g (kip-ft-sec^2)**	**mdx^2 W*(CGx-CGxi)^2/g (kip-ft-sec^2)**
Slab:@ EL. 80' (From PG. 15)									
A-D/1-7	270.0	214.0	26,521.0	133.0	105.0	3,143,262.5	56,942.2	5,003,577.5	102.5
Ded A-B/4-7	114.0	49.0	-2,564.0	207.0	26.5	-15,931.9	-600,129.4	-86,235.5	-440,201.6
Crane 200 T:			400.0	260.0	60.0	0.0	35,310.1	0.0	201,474.8
Canister Transfer M/c			246.5	170.0	53.0	0.0	27,848.9	0.0	10,680.9
N/S WALLS EL. 80' to 100' (From Pg. 22)									
4/A-B		53.0	318.0	148.0	26.5	2,311.8	74,431.8	0.0	2,327.8
E/W WALLS EL. 80' to 100' (From Pg. 22)									
B/4-7	118.0		708.0	207.0	53.0	0.0	79,988.0	25,512.9	121,554.6
N/S WALLS EL. 40' to 80' (From Pg. 21)									
1/A-D	0.0	210.0	2,520.0	0.0	105.0	287,608.7	5,410.6	0.0	1,377,023.3
2/AB	0.0	53.0	636.0	54.0	26.5	4,623.5	148,863.6	0.0	122,171.1
3/AB	0.0	53.0	636.0	108.0	26.5	4,623.5	148,863.6	0.0	11,998.8
4/AB	0.0	53.0	636.0	148.0	26.5	4,623.5	148,863.6	0.0	4,655.6
2/CD	0.0	53.0	636.0	212.0	183.5	4,623.5	97,295.5	0.0	124,372.7
3/CD	0.0	53.0	636.0	54.0	183.5	4,623.5	97,295.5	0.0	122,171.1
4/CD	0.0	53.0	636.0	108.0	183.5	4,623.5	97,295.5	0.0	11,998.8
6/CD	0.0	53.0	636.0	185.0	183.5	4,623.5	97,295.5	0.0	54,135.2
E/W WALLS EL. 40' to 80' (From Pg. 21)									
A/1-4	148.0	0.0	1,776.0	74.0	0.0	0.0	708,206.8	100,676.8	189,706.7
B/1-4	148.0	0.0	1,776.0	74.0	53.0	0.0	200,633.8	100,676.8	189,706.7
C/1-7	270.0	0.0	3,240.0	135.0	157.0	0.0	192,025.3	611,273.3	557.0
D/1-7	270.0	0.0	3,240.0	135.0	210.0	0.0	940,609.7	611,273.3	557.0
N/S WALLS EL. 0' to EL.80' (From Pg. 19)									
7/BD	0.0	157.0	3,768.0	266.0	131.5	240,366.0	38,698.4	0.0	2,080,936.7
					Σ=	**3,689,981.6**	**2,595,748.9**	**6,366,755.1**	**4,185,929.5**
Mass Moment of Inertia about centroidal x-axis Ix =					**6,285,730.5**	kip-ft-sec^2			(Iox + mdz^2)
Mass Moment of Inertia about centroidal z-axis Iz =					**10,552,684.5**	kip-ft-sec^2			(Ioz + mdx^2)
Mass Moment of Inertia about centroidal y-axis Iy =					**16,838,415.0**	kip-ft-sec^2			(Ix+Iz)

MASS MOMENTS OF INERTIA OF ROOF SLAB @ EL. + 100' (Pool with Water):									
Ref 2.2.2, "Dynamics of Structures" by Clough and Penzien, 1975, Pg. 24									
Slab @100' + WALLS EL. 80' to 100' and EL. 32' to 100'									
				CGx =	212.0	CGz =	20.2		
Area	Length x	Length z	Weight	CGxi	CGzi	Iox	mdz^2	Ioz	mdx^2
Description	Lx	Lz	(W)			W*Lz^2/12g	W*(CGz-CGzi)^2/g	W*Lx^2/12g	W*(CGx-CGxi)^2/g
	(ft)	(ft)	(kips)	(ft)	(ft)	(kip-ft-sec^2)	(kip-ft-sec^2)	(kip-ft-sec^2)	(kip-ft-sec^2)
Slab @ EL 100' (From Pg.16):									
A-B/4-7	122.0	57.0	3,191.9	207.0	26.5	26,838.6	3,873.9	122,950.4	2,474.5
Canister Transfer M/c			155.4	170.0	0.0	0.0	1,978.7	0.0	8,511.7
N/S WALLS EL. 80' to 100' (From Pg. 22)									
4/A-B	0.0	53.0	318.0	148.0	26.5	2,311.8	386.0	0.0	40,446.4
E/W WALLS EL. 80' to 100' (FromPg. 22)									
B/4-7	118.0	0.0	708.0	207.0	53.0	0.0	23,585.1	25,512.9	548.9
N/S WALLS EL. 32' to 100' (From Pg. 20)									
7/AB	0.0	53.0	1,081.2	266.0	26.5	7,860.0	1,312.2	0.0	97,926.0
E/W WALLS AT EL. 32' to 100' (From Pg. 20)									
A/4-7	118.0	0.0	2,407.2	207.0	0.0	0.0	30,651.0	86,743.9	1,866.1
					Σ=	37,010.3	61,786.9	235,207.2	151,773.6
Mass Moment of Inertia about centroidal x-axis Ix =						**98,797.3**	kip-ft-sec^2		(Iox + mdz^2)
Mass Moment of Inertia about centroidal z-axis Iz =						**386,980.8**	kip-ft-sec^2		(Ioz + mdx^2)
Mass Moment of Inertia about centroidal y-axis Iy =						**485,778.1**	kip-ft-sec^2		(Ix+Iz)

Table Showing Summary Of Mass Momment Of Inertia (Pool with Water):

	Ix	Iz	Iy (=Ix+Iz)	MASS(W/g)	h	mh^2	Ix+mh^2	Iz+mh^2
	(kip-sec^2/ft)	(kip-sec^2/ft)	kip-ft-sec^2	(kip-sec^2/ft)	(ft)	kip-ft-sec^2	kip-ft-sec^2	kip-ft-sec^2
BASE SLAB @ -52' + WALLS	1,712,620.8	1,883,456.3	3,596,077.1	1,625.5	-52.0	4,395,352.5	6,107,973.3	6,278,808.8
(WITH WEIGHT OF WATER								
+ 4 CASKS)								
BASE SLAB @ 0' + WALLS	12,178,902.2	19,420,246.6	31,599,148.8	3,150.2	0.0	0.0	12,178,902.2	19,420,246.6
FLOOR SLAB @ 32' + WALLS	215,151.7	697,951.7	913,103.4	476.2	32.0	487,624.7	702,776.3	1,185,576.4
FLOOR SLAB @ 40' + WALLS	5,110,198.6	4,391,769.5	9,501,968.1	1,385.6	40.0	2,216,991.8	7,327,190.4	6,608,761.3
ROOF SLAB @ 80' + WALLS	6,285,730.5	10,552,684.5	16,838,415.0	1,493.8	80.0	9,560,396.7	15,846,127.2	20,113,081.2
UPPER ROOF @ 100' + WALLS	98,797.3	386,980.8	485,778.1	244.2	100.0	2,441,517.4	2,540,314.7	2,828,498.2
TOTAL =			**62,934,490.5**	**8,375.5**			**44,703,284.1**	**56,434,972.5**
			6.29E+07				**4.47E+07**	**5.64E+07**

Note:
Ix, Iy, and Iz are floor mass moments of inertia at the floor centroidal axes.
For using these results, see a cautionary note on Page 9 about the axis system.

Weight and Centroid of Basement Floor Slab @ Elev. - 52' (Pool without Water):

(Refer to: Att.-B , Sht. B-2, B-9, and B-17)

Slab [2]	Width (W) (Xdim) (ft)	Len.(L) (Zdim) (ft)	Thick $t^{(10)}$ (ft)	Weight = (Wt) L*W*t*(#) (kips)	CG Xi [1] (ft)	CG Zi [1] (ft)	Wt * CG Xi (ft-kips)	Wt * CG Zi (ft-kips)	Struct'l. Steel Load (40 psf) W1 (kips)	Equipment Dead Load (100 psf) W2 (kips)	Live Load (25psf) W3 (kips)	(Wi) * CG Xi (See Note 6) (ft-kips)	(Wi) * CG Zi (See Note 6) (ft-kips)	(W_{total}) Total Weight (See Note 9) (kips)	W_{total} *CG Xi (ft-kips)	W_{total} * CGZi (ft-kips)
(a) Conc.Slab [7]:																
B-C/2.4-5	114.0	116.0	8.0	15,868.8	127.0	105.0	2,015,337.6	1,666,224.0	529.0	1,322.4	330.6	277,108.9	229,105.8	18,050.8	2,292,446.5	1,895,329.8
B.2-B.8/3.7-4.2	18.0	65.0	2.0	351.0	146.0	105.0	51,246.0	36,855.0	46.8	117.0	29.3	28,185.3	20,270.3	544.1	79,431.3	57,125.3
			Σ =	16,219.8			2,066,583.6	1,703,079.0	575.8	1,439.4	359.9	305,294.2	249,376.1	18,594.8	2,371,877.8	1,895,329.8
					xbar	zbar										
		Center of Concrete Slab =			127.4	105.0		xbar = Σ (Wt * CGXi)/Σ Wt				zbar = Σ (Wt * CGZi)/Σ Wt				
		Center of other Applied Loads =			128.5	105.0		xbar = Σ {(Wi) * CGXi}/Σ (Wi)				zbar=Σ {(Wi)*CGZi}/Σ (Wi)				
		Centroid of All Loads =			127.6	101.9		xbar = Σ (W_{total} * CGXi)/Σ W_{total}				zbar = Σ (W_{total} * CGZi)/Σ W_{total}				
(b) Water in the Pool :																
Water Wt	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
(B-C/2.4-4.2)																
(-) step Area	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
			Σ =	0.0			0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
					xbar	zbar										
		Center of Pool Water =			0.0	0.0		xbar = Σ (Wt * CGXi)/Σ Wt				zbar = Σ (Wt * CGZi)/Σ Wt				
		Center of other Applied Loads =			0.0	0.0		xbar = Σ {(Wi) * CGXi}/Σ (Wi)				zbar=Σ {(Wi)*CGZi}/Σ (Wi)				
		Centroid of All Pool Water Loads =			0.0	0.0		xbar = Σ (W_{total} * CGXi)/Σ W_{total}				zbar = Σ (W_{total} * CGZi)/Σ W_{total}				
(c) Four Casks			Σ =	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
				(see Note 8)												
					xbar	zbar										
		Center of Pool Water =			0.0	0.0		xbar = Σ (Wt * CGXi)/Σ Wt				zbar = Σ (Wt * CGZi)/Σ Wt				
		Center of other Applied Loads =			0.0	0.0		xbar = Σ {(Wi) * CGXi}/Σ (Wi)				zbar=Σ {(Wi)*CGZi}/Σ (Wi)				
		Centroid of All Pool Water Loads =			0.0	0.0		xbar = Σ (W_{total} * CGXi)/Σ W_{total}				zbar = Σ (W_{total} * CGZi)/Σ W_{total}				

Notes:
1 For coordinate system definition see Section 6.
2 Numbers and letters are in reference to the column grid lines for the building.
3 W1: Structural steel framing + Platforms & misc steel per floor or roof (see Section 3.0).
4 W2: Floor equipment load including cranes weighing less than 50 tons, mechanical, electrical & piping (see Section 3.0).
5 W3: 25% of the specified live load (see Section 3.0).
6. Applied Loads = Wi = (W1+ W2+W3)
7. (#) = Unit Wt. Of Concrete=0.150 Kips/ Cft and Water = 0.0624 Kips/ Cft .
8. Postulated four casks @ 200 tons each conservatively located in the farthest corner of the pool (Refer to Assumption 3.2.3)
9. $W_{(Total)}$ = (Wt+W1+W2+W3)
10. Weight of slab at El. -34' included with the slab at El. -52'

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DDR LUMPED WEIGHTS (Pool without Water):					
(WEGHTS AND THEIR CENTERS)					
BASEMENT FLOOR SLAB @ - 52' :					
	Weight W	**xbar**	**zbar**	**W*xbar**	**W*zbar**
BASE SLAB + WATER + WALLS	**(kips)**	**(ft)**	**(ft)**	**(ft - kips)**	**(ft - kips)**
a) BASEMENT SLAB @ El. -52 (Page 38)	18,594.8	127.6	105.0	2,371,877.8	1,952,455.1
b) Wt. Of WATER (Page 38)	0.0	0.0	0.0	0.0	0.0
c) FOUR CASKS IN THE POOL (Page 38)	0.0	0.0	0.0	0.0	0.0
d) Wt. Of 1/2 WALLS El. -52' to El. 0' (Page 17)	19,406.4	132.5	103.0	2,571,043.8	1,999,149.0
e) Full Wt. Of Walls El.-52' to El.-34' (Page 17)	351.0	137.0	105.0	48,087.0	36,855.0
SUM	**38,352.2**			**4,991,008.6**	**3,988,459.1**
		XBAR =	**130.1**	ft	XBAR = Σ(W*xbar)/Σ(W)
	Floor Slab@-52	**ZBAR =**	**104.0**	ft	ZBAR = Σ(W*zbar)/Σ(W)
		WEIGHT	**38,352.2**	kips	WEIGHT = Σ(Weight)
FLOOR SLAB @ + 0':					
	Weight W	**xbar**	**zbar**	**W*xbar**	**W*zbar**
	(kips)	**(ft)**	**(ft)**	**(ft - kips)**	**(ft - kips)**
a) FLOOR SLAB @0' (Page 12)	56,730.4	131.4	104.8	7,454,200.2	5,943,383.8
b)1/2 Wt. Of Walls below El. 0' (Page 17)	19,406.4	132.5	103.0	2,571,043.8	1,999,149.0
c)1/2 Wt. of Walls above El. 0' as follows:					
0'-32' (Page 19)	4,300.8	205.0	26.5	881,616.0	113,971.2
0'-40' (Page 19)	15,600.0	82.2	119.1	1,281,984.0	1,858,431.7
0'-80' (Page 19)	3,768.0	266.0	131.5	1,002,288.0	495,492.0
d) Full Wt. of Walls El. 0' to El. 20' (Page 19)	1,632.4	27.6	99.1	44,974.0	161,763.7
SUM	**101,438.0**			**13,236,105.9**	**10,572,191.4**
		XBAR =	**130.5**	ft	XBAR = Σ(W*xbar)/Σ(W)
	0' BASE SLAB	**ZBAR =**	**104.2**	ft	ZBAR = Σ(W*zbar)/Σ(W)
		WEIGHT	**101,438.0**	kips	WEIGHT = Σ(Weight)
FLOOR SLAB @ + 32':					
	Weight W	**xbar**	**zbar**	**W*xbar**	**W*zbar**
	(kips)	**(ft)**	**(ft)**	**(ft - kips)**	**(ft - kips)**
a) FLOOR SLAB @32' (Page 13)	5,717.9	204.4	26.3	1,168,877.7	150,308.3
b) 1/2 Wt. Of Walls below El. 32'					
0'-32' (Page 19)	4,300.8	205.0	26.5	881,616.0	113,971.2
c) 1/2 Wt. Of Walls above El. 32' as follows:					
32'-40' (Page 20) 4/A-B	127.2	148.0	26.5	18,825.6	3,370.8
32'-100' (Page 20) 7/A-B	1,081.2	266.0	26.5	287,599.2	28,651.8
32'-80' (Page 20) B/4-7	1,699.2	207.0	53.0	351,734.4	90,057.6
32'-100' (Page 20) A/4-7	2,407.2	207.0	0.0	498,290.4	0.0
SUM	**15,333.5**			**3,206,943.3**	**386,359.7**
		XBAR =	**209.1**	ft	XBAR = Σ(W*xbar)/Σ(W)
	32' BASE SLAB	**ZBAR =**	**25.2**	ft	ZBAR = Σ(W*zbar)/Σ(W)
		WEIGHT	**15,333.5**	kips	WEIGHT = Σ(Weight)

DDR LUMPED WEIGHTS (Pool without Water):					
(WEGHTS AND THEIR CENTERS)					
FLOOR SLAB @ + 40' :					
Base Slab+Walls					
40' FLOOR SLAB	**Weight W**	**xbar**	**zbar**	**W*xbar**	**W*zbar**
	(kips)	**(ft)**	**(ft)**	**(ft - kips)**	**(ft - kips)**
a) FLOOR SLAB @ 40' (Page 14)	11,885.8	79.7	115.8	947,457.6	1,376,493.6
b) 1/2 wt. Of Walls below El.40'					
0'-40' (Page 19)	15,600.0	82.2	119.1	1,281,984.0	1,858,431.7
32'-40' Page 20 4/A-B	127.2	148.0	26.5	18,825.6	3,370.8
c) 1/2 Wt of Walls above El.40'					
40'-80' (Page 21)	17,004.0	99.4	121.5	1,690,332.0	2,065,197.7
SUM	**44,617.0**			**3,938,599.2**	**5,303,493.9**
		XBAR =	**88.3**	ft	XBAR = Σ(W*xbar)/Σ(W)
	40' SLAB	**ZBAR =**	**118.9**	ft	ZBAR = Σ(W*zbar)/Σ(W)
		WEIGHT	**44,617.0**	kips	WEIGHT = Σ(Weight)
ROOF SLAB @ + 80':					
Roof/Roof Slab+Walls					
	Weight W	**xbar**	**zbar**	**W*xbar**	**W*zbar**
	(kips)	**(ft)**	**(ft)**	**(ft - kips)**	**(ft - kips)**
a) ROOF SLAB @ 80' (Page 15)	24,603.5	127.7	111.9	3,142,458.0	2,753,826.3
wt.					
b) 1/2 wt. Of Walls below El.80'					
0'-80' (Page 19)	3,768.0	266.0	131.5	1,002,288.0	495,492.0
32'-80' (Page 20)	1,699.2	207.0	53.0	351,734.4	90,057.6
40'-80' (Page 21)	17,004.0	99.4	121.5	1,690,332.0	2,065,197.7
c) 1/2 Wt of Walls above El.80'					
80'-100' (Page 22)	1,026.0	188.7	44.8	193,620.0	45,951.0
SUM	**48,100.7**			**6,380,432.4**	**5,450,524.6**
		XBAR =	**132.6**	ft	XBAR = Σ(W*xbar)/Σ(W)
	80' ROOF	**ZBAR =**	**113.3**	ft	ZBAR = Σ(W*zbar)/Σ(W)
		WEIGHT	**48,100.7**	kips	WEIGHT = Σ(Weight)
FLR. SLAB @ 100' :					
Roof Slabs+Walls					
100' ROOF	**Weight W**	**xbar**	**zbar**	**W*xbar**	**W*zbar**
	(kips)	**(ft)**	**(ft)**	**(ft - kips)**	**(ft - kips)**
a) ROOF SLAB @ 100' (Page 16)	3,347.3	205.3	25.3	687,138.4	84,585.0
b) 1/2 wt. Of Walls below El.100'					
32'-100' - Wall A/4-7 (Page 20)	2,407.2	207.0	0.0	498,290.4	0.0
32'-100' - Wall 7/A-B (Page 20)	1,081.2	266.0	26.5	287,599.2	28,651.8
80'-100' - Walls 4/A-B + B/4-7 (Page 22)	1,026.0	188.7	44.8	193,620.0	45,951.0
SUM	**7,861.7**			**1,666,648.0**	**159,187.8**
		XBAR =	**212.0**	ft	XBAR = Σ(W*xbar)/Σ(W)
	100' ROOF	**ZBAR =**	**20.2**	ft	ZBAR = Σ(W*zbar)/Σ(W)
		WEIGHT	**7,861.7**	kips	WEIGHT = Σ(Weight)

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TABLE - SUMMARY OF MASS & CENTERS OF MASS (Pool without Water):				
(For WEIGHT, XBAR and ZBAR, see Pgs. 51 and 52)				
	WEIGHT (W)	**MASS (W/g)**	**CGx**	**CGz**
LOCATIONS	(kips)	(kip-sec^2/ft)	(ft)	(ft)
			*	*
BASEMENT SLAB @ -52' + WALLS	38,352.2	1,191.1	130.1	104.0
FLOOR SLAB @ 0' + WALLS	101,438.0	3,150.2	130.5	104.2
FLOOR SLAB @ 32' + WALLS	15,333.5	476.2	209.1	25.2
FLOOR SLAB @ 40' + WALLS	44,617.0	1,385.6	88.3	118.9
ROOF @ 80' + WALLS	48,100.7	1,493.8	132.6	113.3
UPPER ROOF @ 100' + WALLS	7,861.7	244.2	212.0	20.2
TOTAL =	**255,703.1**	**7,941.1**		

* for coordinate system definition see Pg.# 9.

MASS MOMENTS OF INERTIA @ FLOOR EL. - 52' (Pool without Water):									
Ref 2.2.2, "Dynamics of Structures" by Clough and Penzien, 1975, Pg. 24									
(Note: For coordinate System defination see page 9)									
POOL Floor EL. @ -52' + WALLS -52' to -43'									
				CGx =	**130.1**		**CGz =**	**104.0**	
Area	**Len. x**	**Len. z**	**Wt.**	**CGxi**	**CGzi**	**Iox**	**mdz^2**	**Ioz**	**mdx^2**
Description	**Lx**	**Lz**	**(W)**			**W*Lz^2/12g**	**W*(CGz-CGzi)^2/g**	**W*Lx^2/12g**	**W*(CGx-CGxi)^2/g**
	(ft)	**(ft)**	**(kips)**	**(ft)**	**(ft)**	**(kip-ft-sec^2)**	**(kip-ft-sec^2)**	**(kip-ft-sec^2)**	**(kip-ft-sec^2)**
FLOOR SLAB @ -52' (From Pg. 38)									
B-C/2.4-5	114.0	116.0	18,050.8	127.0	105.0	628,600.0	565.6	607,111.0	5,513.5
B.2-B.8/3.7-4.2	18.0	65.0	544.1	146.0	105.0	5,948.8	186,278.0	456.2	360,154.3
NO WATER (From Pg. 38)									
NO CASKS (From Pg. 38)									
N/S WALLS EL. -52' to 0' (From Pg. 17)									
2.4/B-C		108.0	3,369.6	74.0	105.0	101,715.9	105.6	0.0	329,767.3
3.2 /B-B.2		21.5	335.4	115.5	64.8	401.2	16,043.1	0.0	2,231.3
3.2/B.8-C		21.5	335.4	115.5	148.3	401.2	20,399.6	0.0	2,231.3
4.2/B-C		108.0	1,684.8	155.0	105.0	50,857.9	52.8	0.0	32,346.7
4.9/B-C		108.0	3,369.6	180.0	105.0	101,715.9	105.6	0.0	260,192.2
E/W WALLS EL. -52' to 0' (From Pg. 17)									
B/2.4-4.9	106.0		3,307.2	127.0	51.0	0.0	288,458.5	96,169.0	1,010.2
B.2/2.4-4.9	106.0		1,653.6	127.0	72.5	0.0	50,941.6	48,084.5	505.1
B.5/4.2-4.9	25.0		390.0	127.0	137.5	0.0	13,596.1	630.8	119.1
B.8/2.4-4.9	106.0		1,653.6	167.5	105.9	0.0	192.2	48,084.5	71,693.2
C/2.4-4.9	106.0		3,307.2	127.0	159.0	0.0	310,742.2	96,169.0	1,010.2
N/S WALLS EL. -52' to -34' (from Pg. 17)									
3.7/B.2-B.8		65.0	351.0	137.0	105.0	3,837.9	11.0	0.0	513.6
					Σ=	**893,478.8**	**887,491.8**	**896,705.0**	**1,067,288.0**
Mass Moment of Inertia about centroidal x-axis Ix =					**1,780,970.7**	kip-ft-sec^2			(Iox + mdz^2)
Mass Moment of Inertia about centroidal z-axis Iz =					**1,963,992.9**	kip-ft-sec^2			(Ioz + mdx^2)
Mass Moment of Inertia about centroidal y-axis Iy =					**3,744,963.6**	kip-ft-sec^2			(Ix+Iz)

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Table Showing Summary Of Mass Momment Of Inertia (Pool without Water):

	Ix (kip-sec^2/ft)	Iz (kip-sec^2/ft)	Iy (=Ix+Iy) kip-ft-sec^2	MASS(W/g) (kip-sec^2/ft)	h (ft)	mh^2 kip-ft-sec^2	Ix+mh^2 kip-ft-sec^2	Iz+mh^2 kip-ft-sec^2
BASE SLAB @ -52' + WALLS	1,780,970.7	1,963,992.9	3,744,963.6	1,191.1	-52.0	3,220,632.8	5,001,603.5	5,184,625.7
(WITHOUT WATER OR CASKS)								
FLOOR SLAB @ 0' + WALLS	12,178,902.2	19,420,246.6	31,599,148.8	3,150.2	0.0	0.0	12,178,902.2	19,420,246.6
FLOOR SLAB @ 32' + WALLS	215,151.7	697,951.7	913,103.4	476.2	32.0	487,624.7	702,776.3	1,185,576.4
FLOOR SLAB @ 40' + WALLS	5,110,198.6	4,391,769.5	9,501,968.1	1,385.6	40.0	2,216,991.8	7,327,190.4	6,608,761.3
ROOF SLAB @ 80' + WALLS	6,285,730.5	10,552,684.5	16,838,415.0	1,493.8	80.0	9,560,396.7	15,846,127.2	20,113,081.2
UPPER ROOF @ 100' + WALLS	98,797.3	386,980.8	485,778.1	244.2	100.0	2,441,517.4	2,540,314.7	2,828,498.2
TOTAL =			**63,083,377.0**	**7,941.1**			**43,596,914.2**	**55,340,789.5**
			6.31E+07				**4.36E+07**	**5.53E+07**

Note:

Ix, Iy, and Iz are floor mass moments of inertia at the floor centroidal axes.

For using these results, see a cautionary note on Page 9 about the axis system.

7 RESULTS AND CONCLUSIONS

7.1 RESULTS

Results from this calculation will be mass inputs to the lumped mass stick model used in the seismic analysis of the Wet Handling Facility (WHF).

The primary outputs from this calculation are

- Finite element model properties including mass and mass moments of inertia
- Coordinates for the centers of mass of each floor and roof level

All results are shown in Section 6 of this calculation. The outputs are reasonable based on the inputs.

7.2 CONCLUSIONS

The results of the calculation are adequate for use in the structural calculations being performed as part of the Tier 1 seismic analysis. A more refined finite element analysis will be generated for Tier 2 seismic analysis.

Attachment A
LIST OF PLANT DESIGN DRAWINGS

1. Wet Handling Facility Preliminary Layout Ground Floor Plan. 050-P0K-WH00-10301-000-00A. (Ref. 2.2.5)

2. Wet Handling Facility Preliminary Layout Second Floor Plan. 050-P0K-WH00-10401-000-00A. (Ref. 2.2.6)

3. Wet Handling Facility Preliminary Layout Section A. 050-P0K-WH00-10501-000-00A. (Ref. 2.2.7)

4. Wet Handling Facility Preliminary Layout Section B. 050-P0K-WH00-10601-000-00A. (Ref. 2.2.8)

5. Wet Handling Facility Preliminary Layout Ground Floor and Pool Basement Plans. 050-P0K-WH00-10101-000-00A. (Ref. 2.2.9)

6. Wet Handling Facility Preliminary Layout Second Floor Plan. 050-P0K-WH00-10102-000-00A. (Ref. 2.2.10)

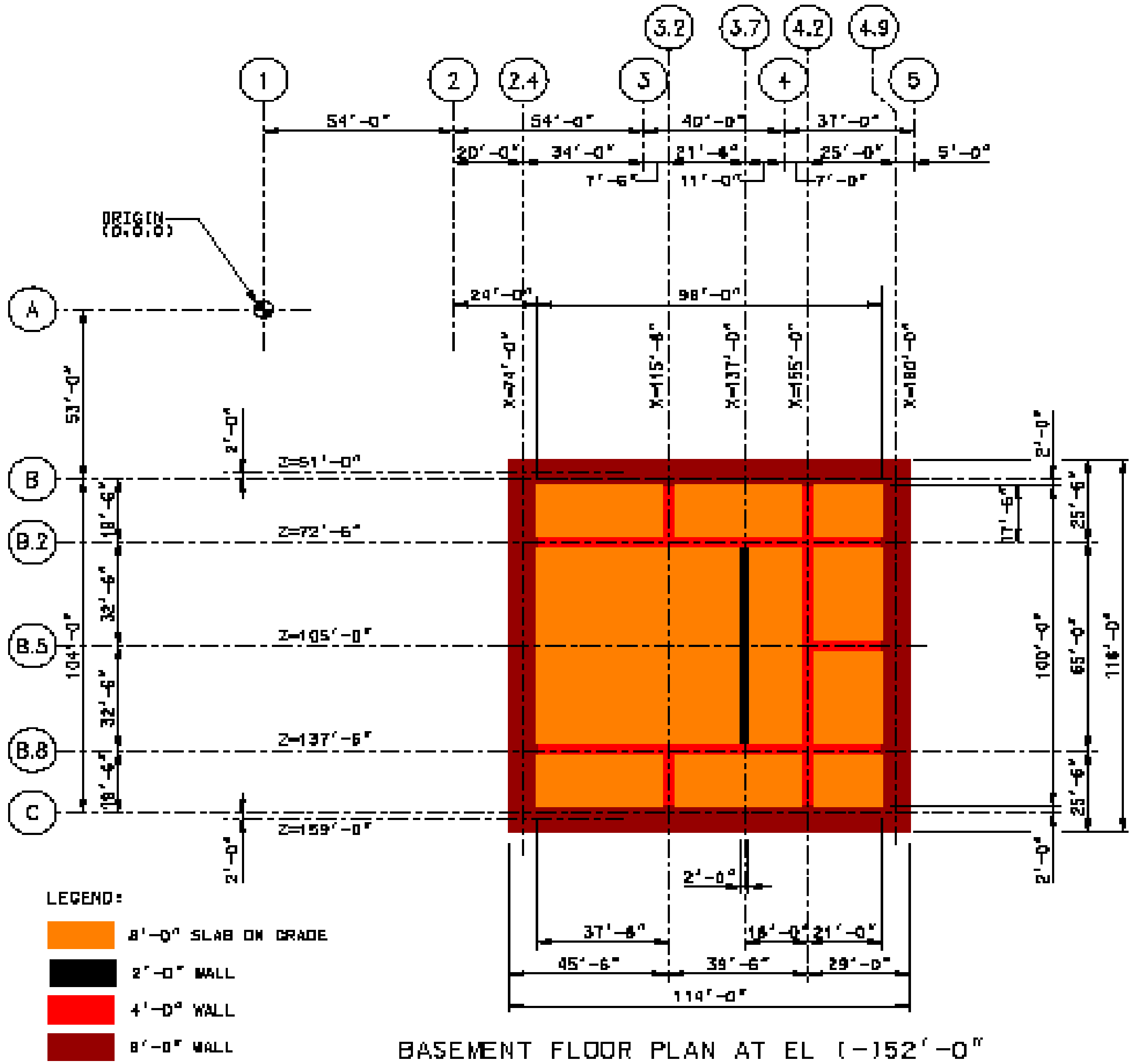
7. Wet Handling Facility Preliminary Layout Section A. 050-P0K-WH00-10103-000-00A. (Ref. 2.2.11)

8. Wet Handling Facility Preliminary Layout Section B. 050-P0K-WH00-10104-000-00A. (Ref. 2.2.12)

9. CRCF, IHF, RF, and Canister Transfer Machine Mechanical Equipment Envelope 000-MJO-HTC0-00201-000-00A (Ref. 2.2.13)

Attachment B

PLAN, SECTION, AND ELEVATION SKETCHES OF WHF



BASEMENT FLOOR PLAN AT EL (-152'-0")

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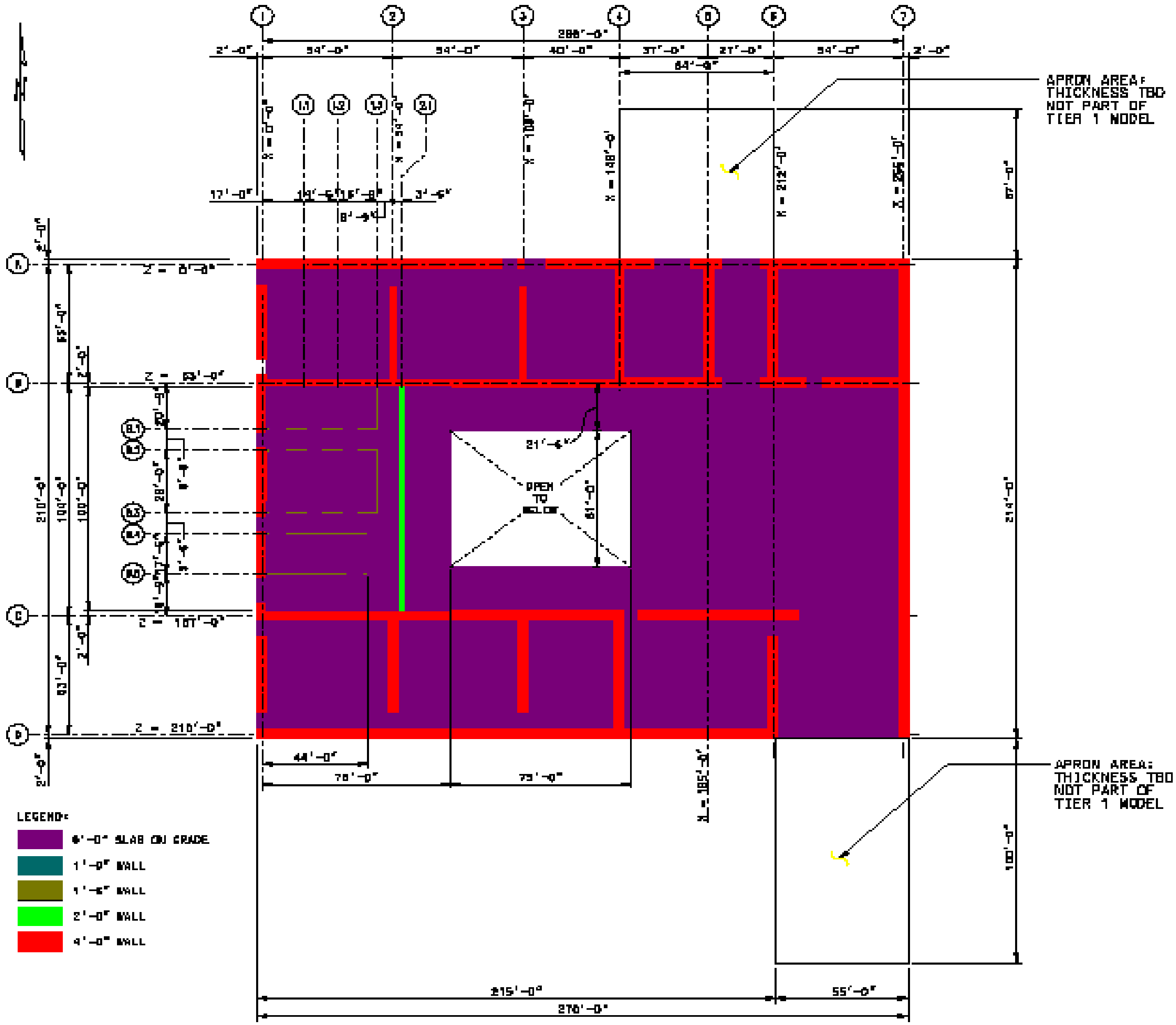

GROUND FLOOR PLAN AT EL 0'-0"

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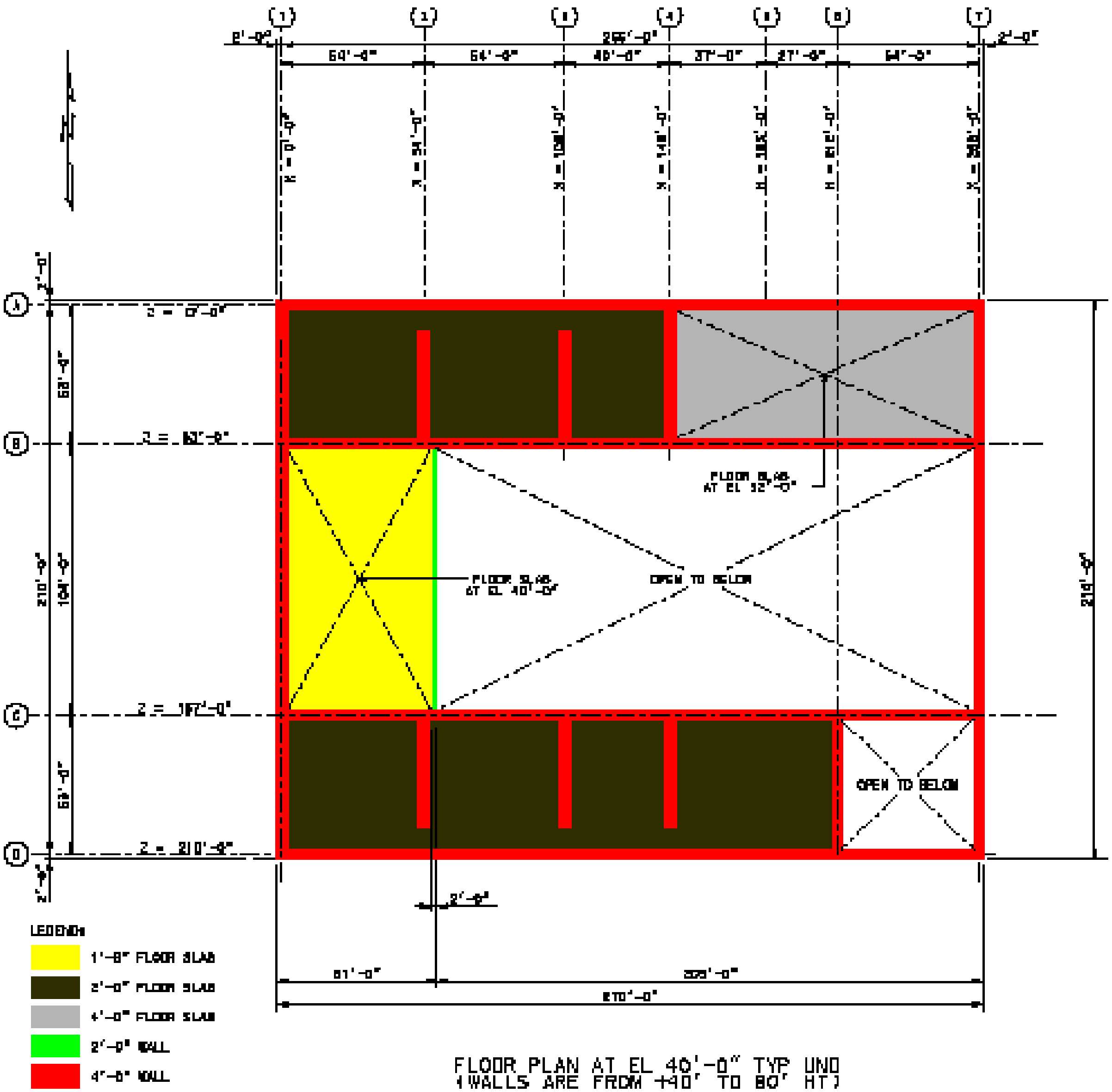
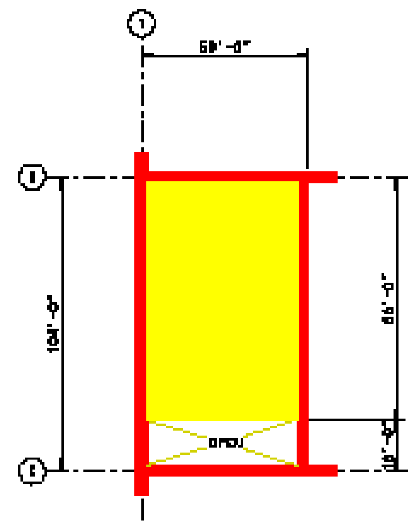
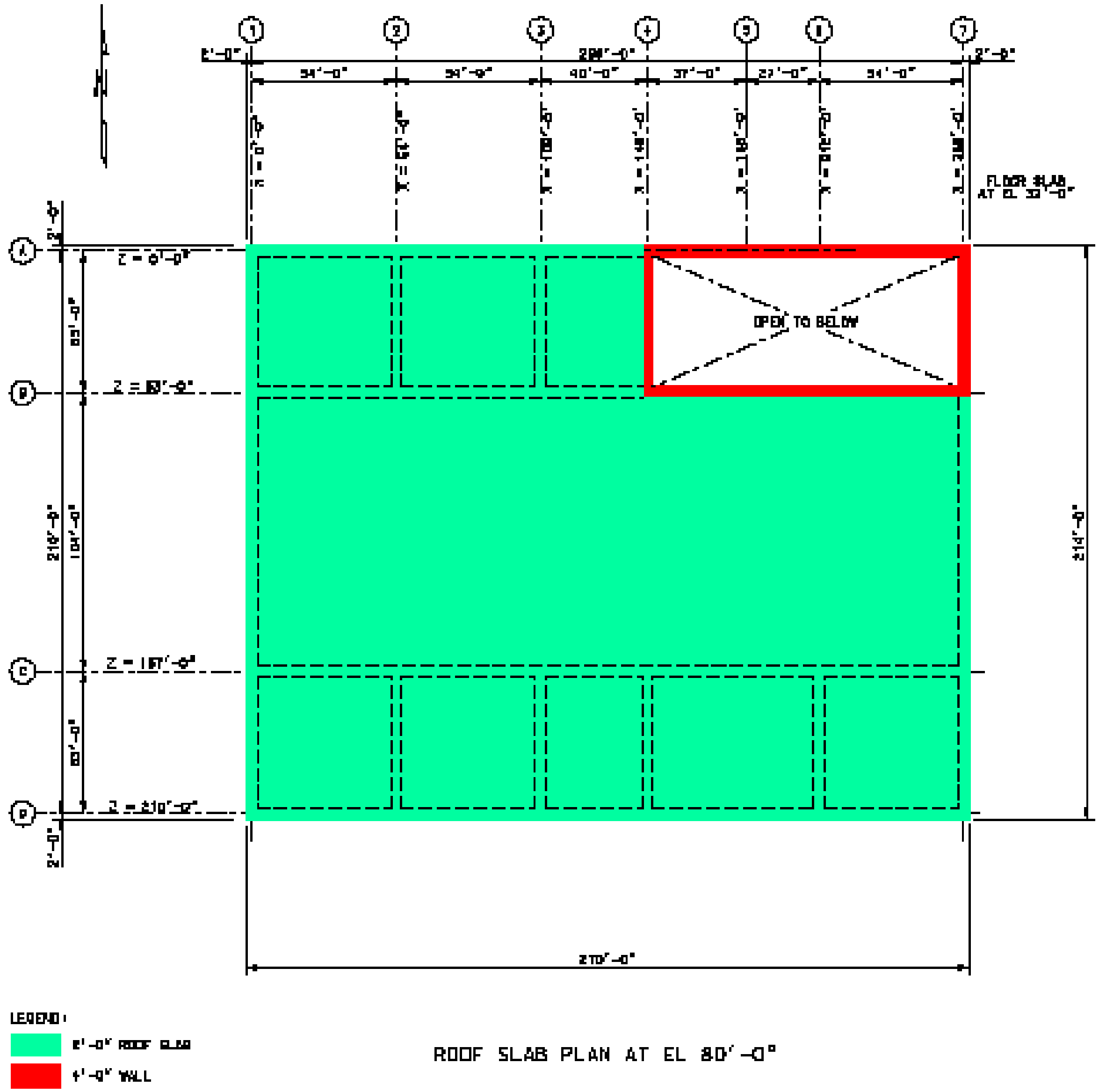


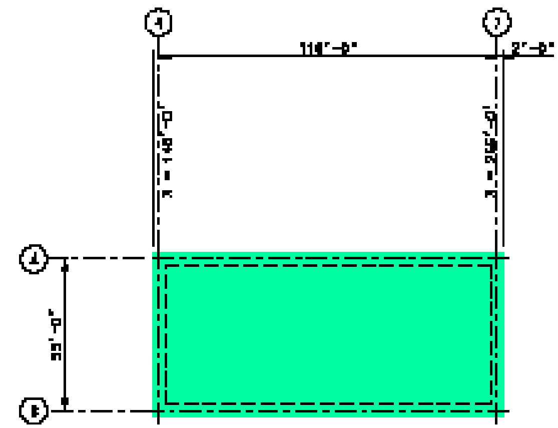
FLOOR PLAN AT EL 40'-0" TYP UNO
(WALLS ARE FROM +40' TO 80' HT)



FLOOR SLAB PLAN AT EL 20'-0"



ROOF SLAB PLAN AT EL 80'-0"



ROOF SLAB PLAN AT EL 100'-0"

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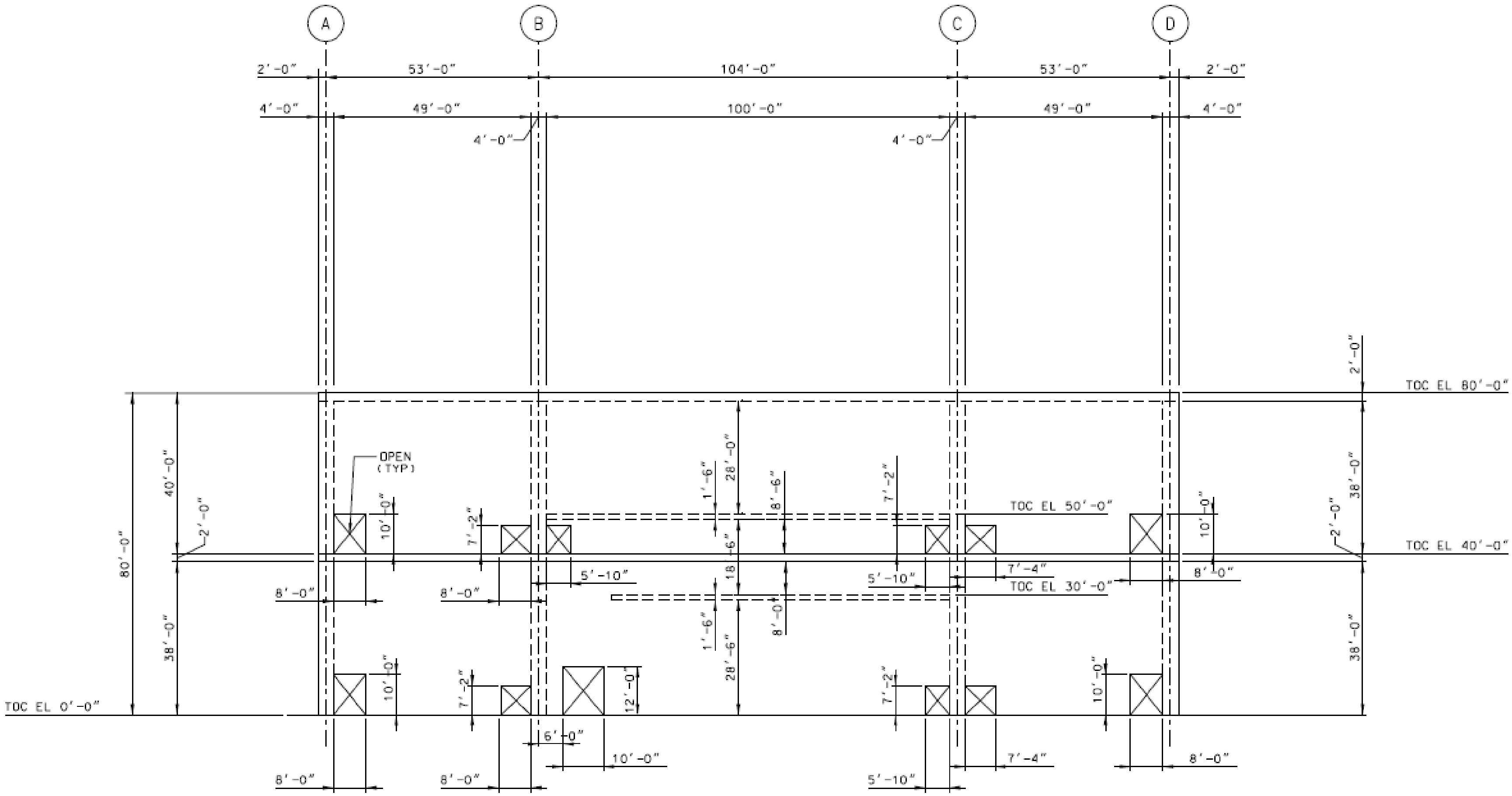
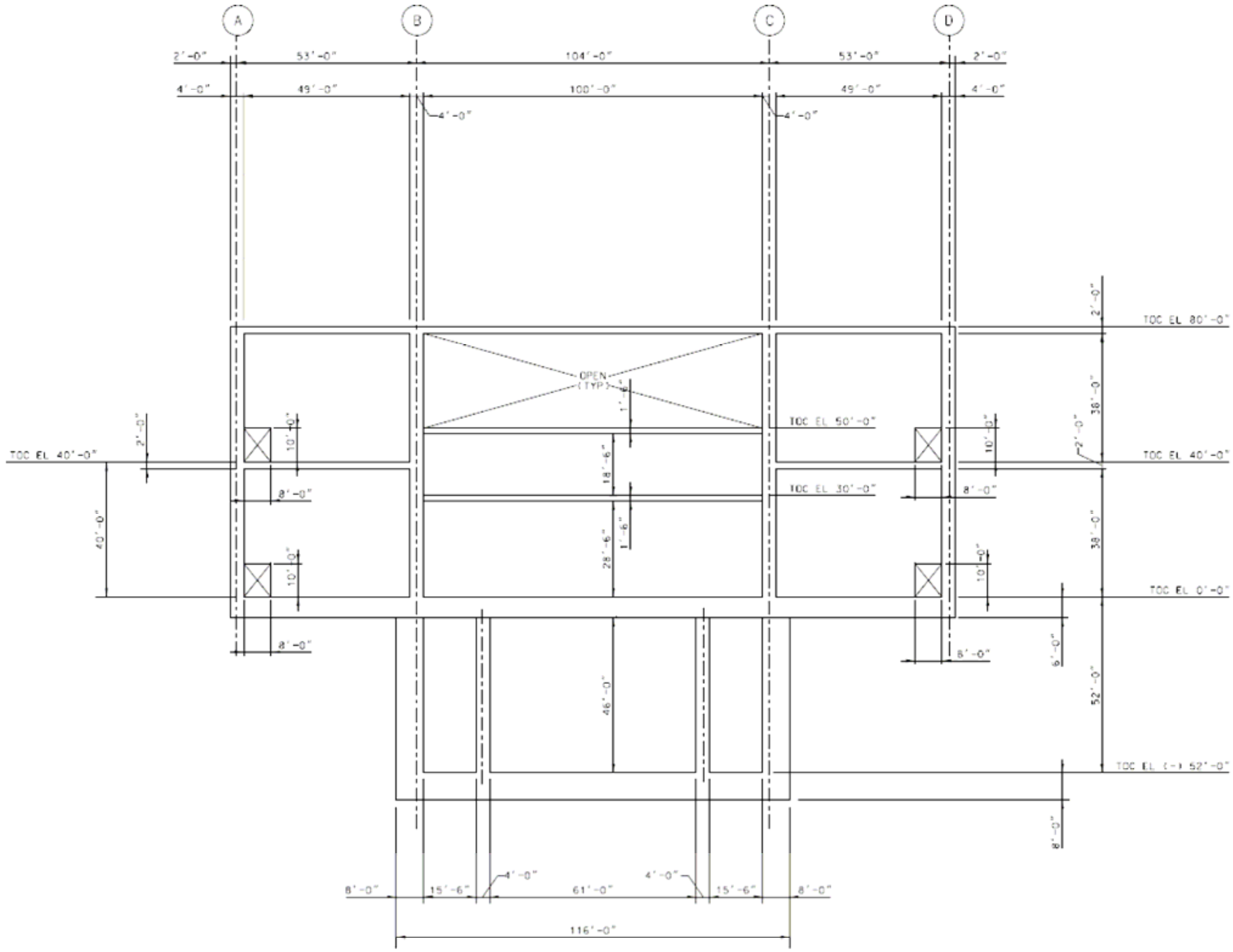
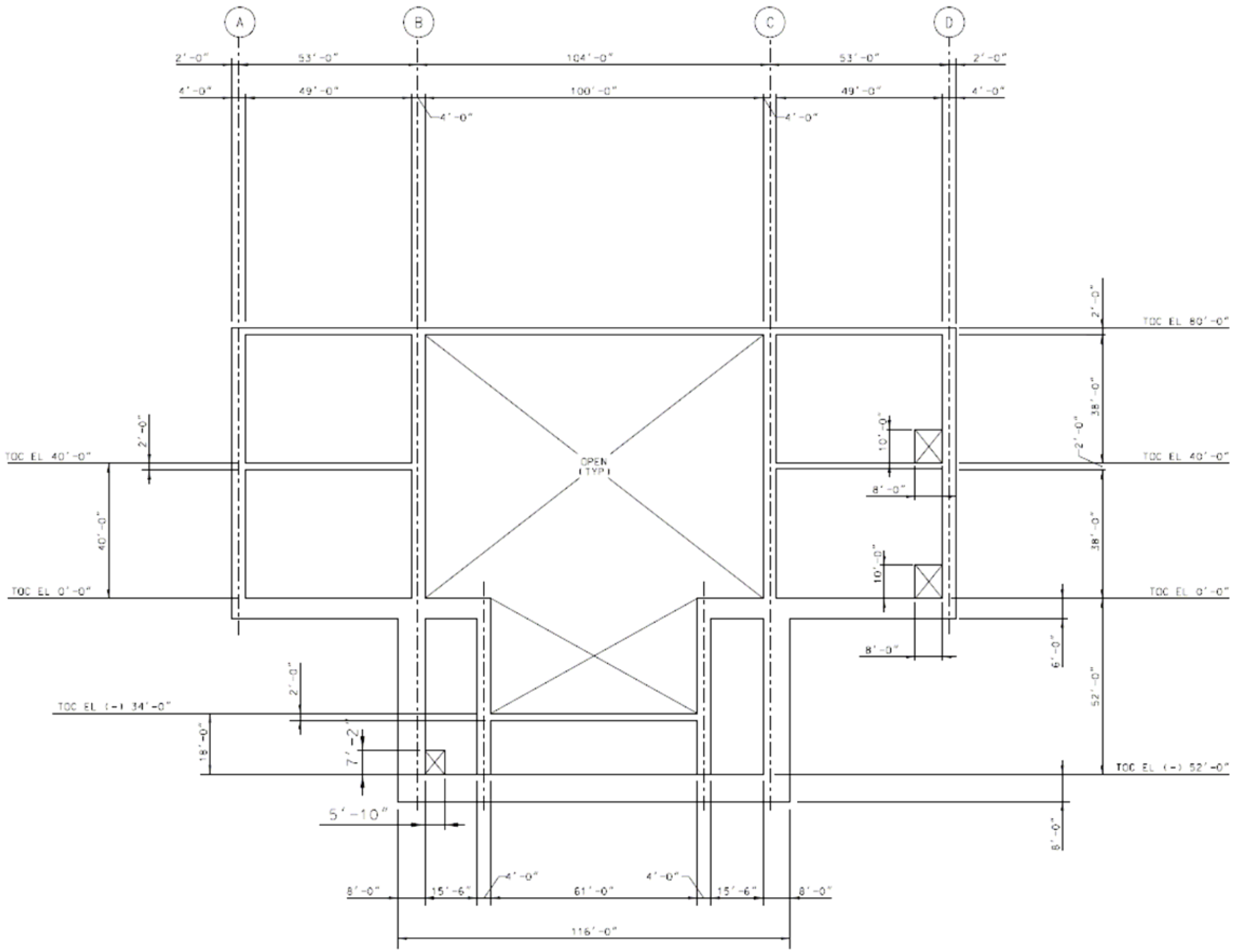


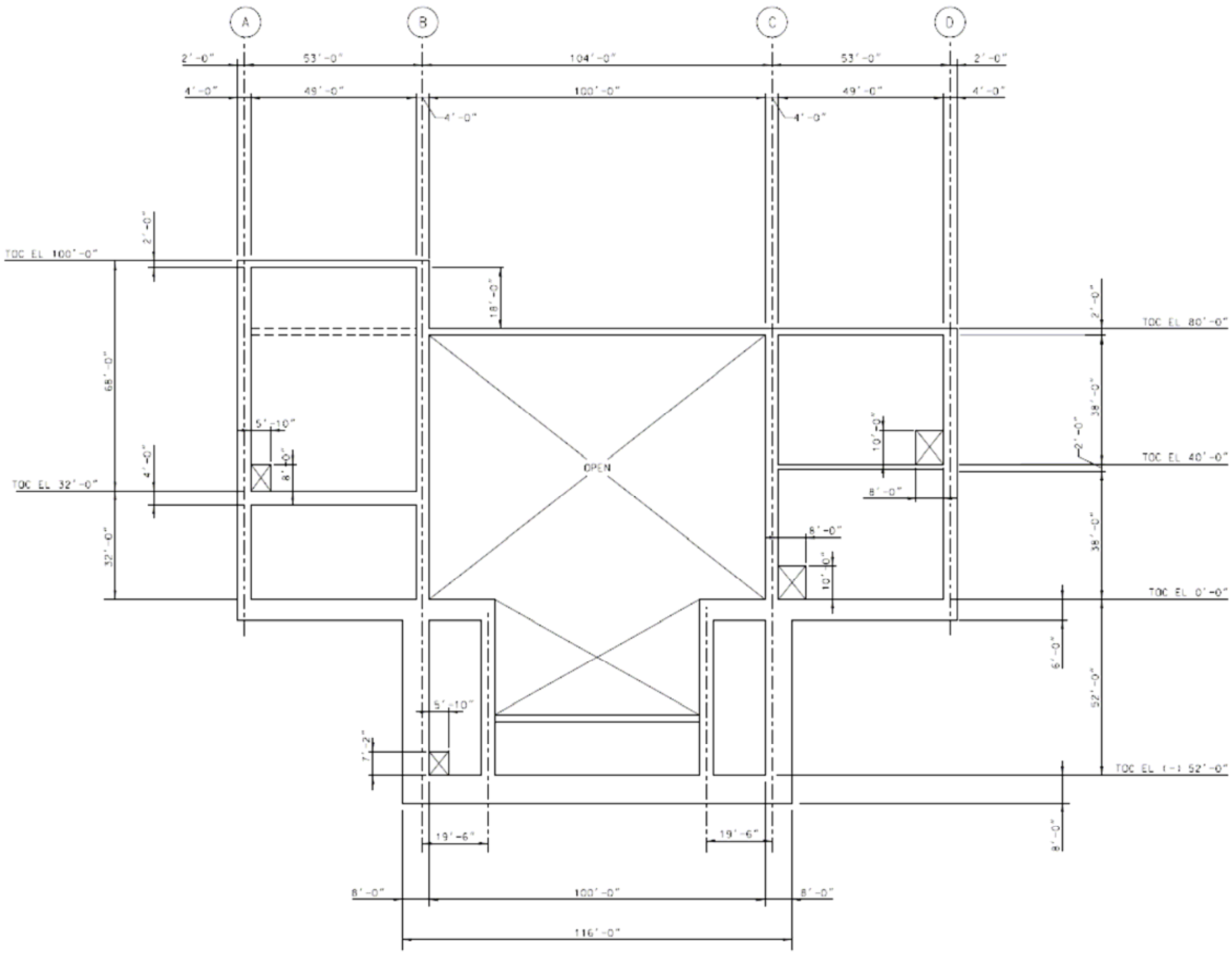
ELEVATION ALONG COL LINE "1"
(LOOKING EAST)



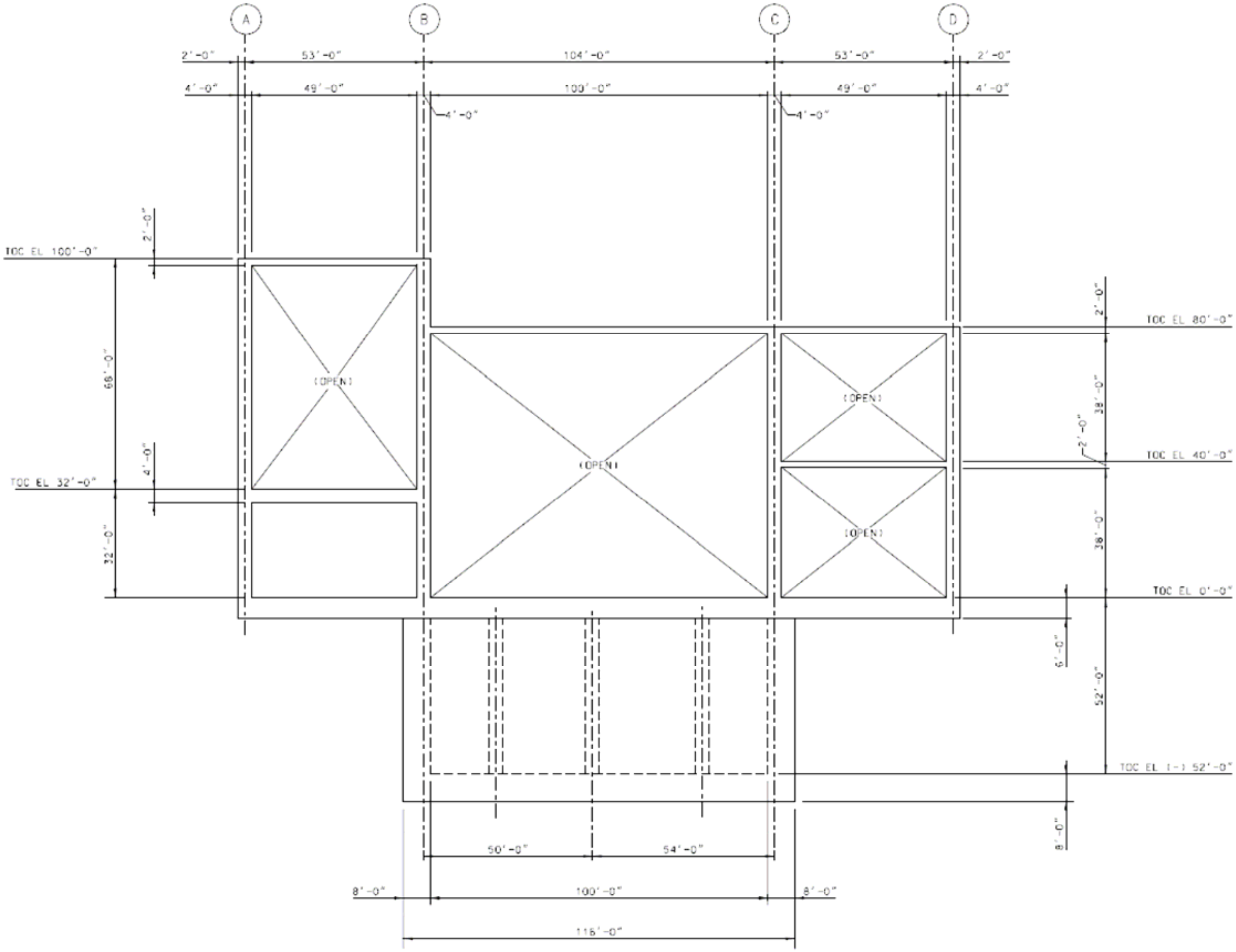
ELEVATION ALONG COL "2"
(LOOKING EAST)



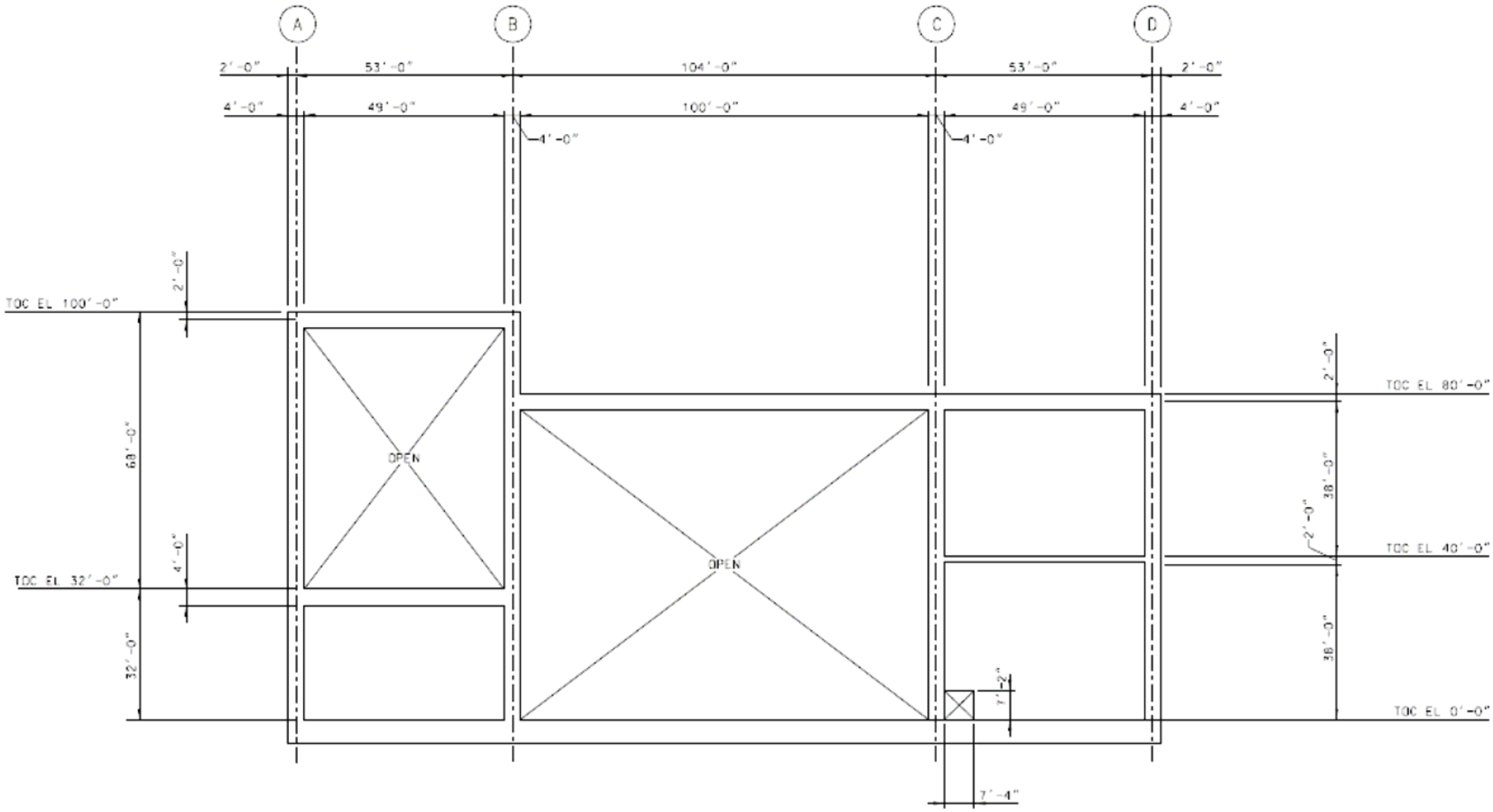
ELEVATION ALONG COL "3"
(LOOKING EAST)



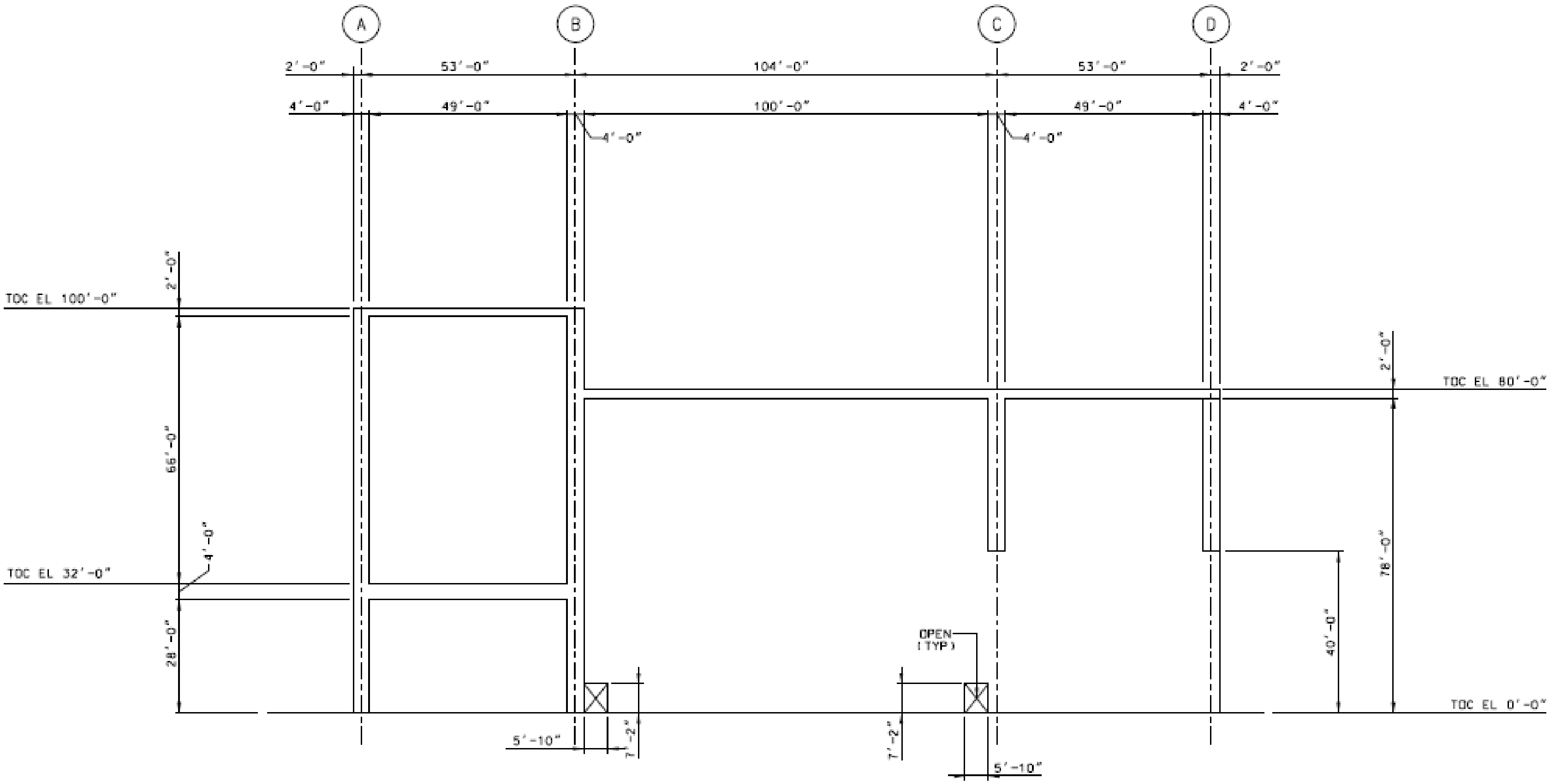
ELEVATION ALONG COL "4"
(LOOKING EAST)



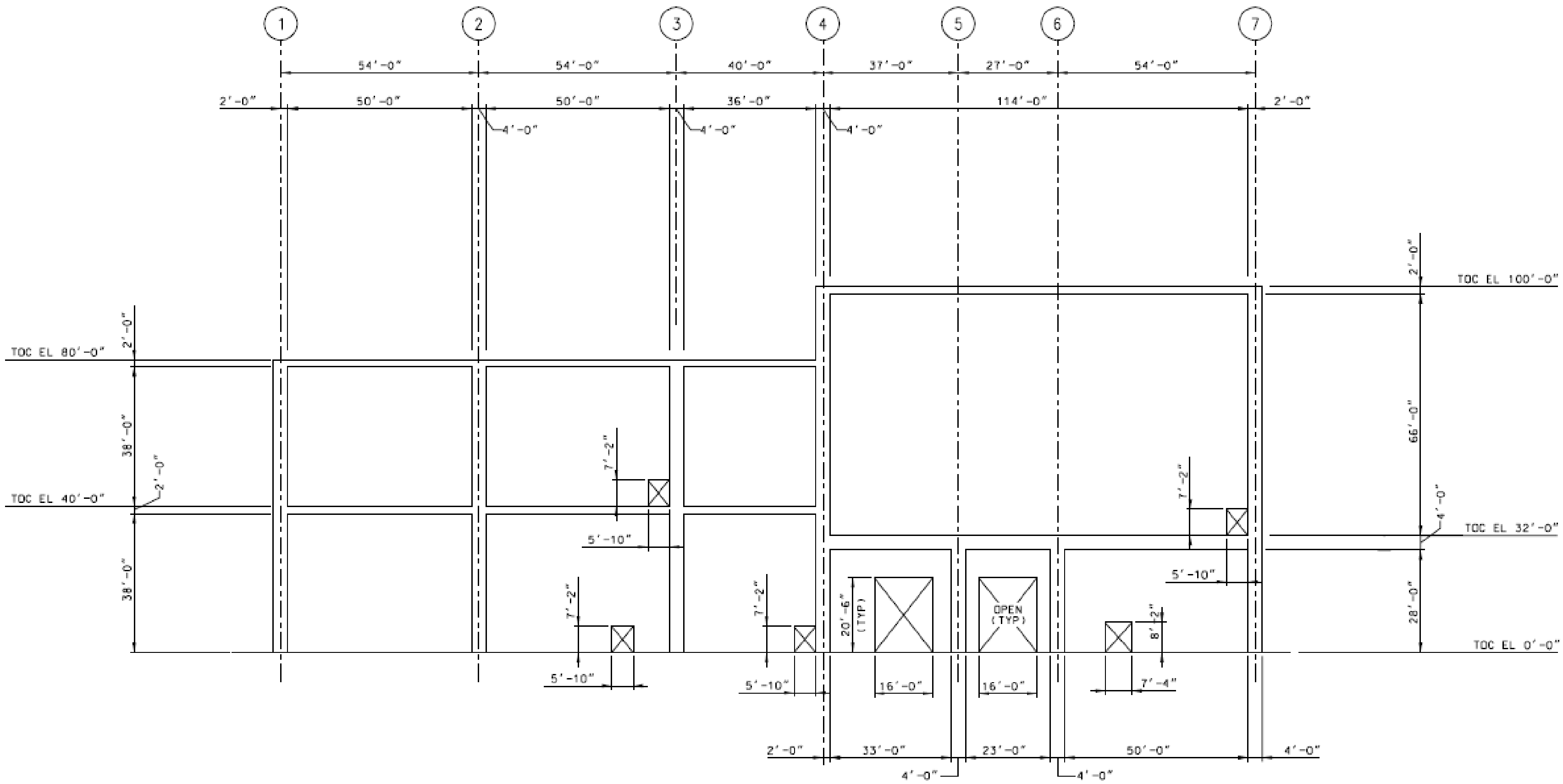
ELEVATION ALONG COL "5"
(LOOKING EAST)



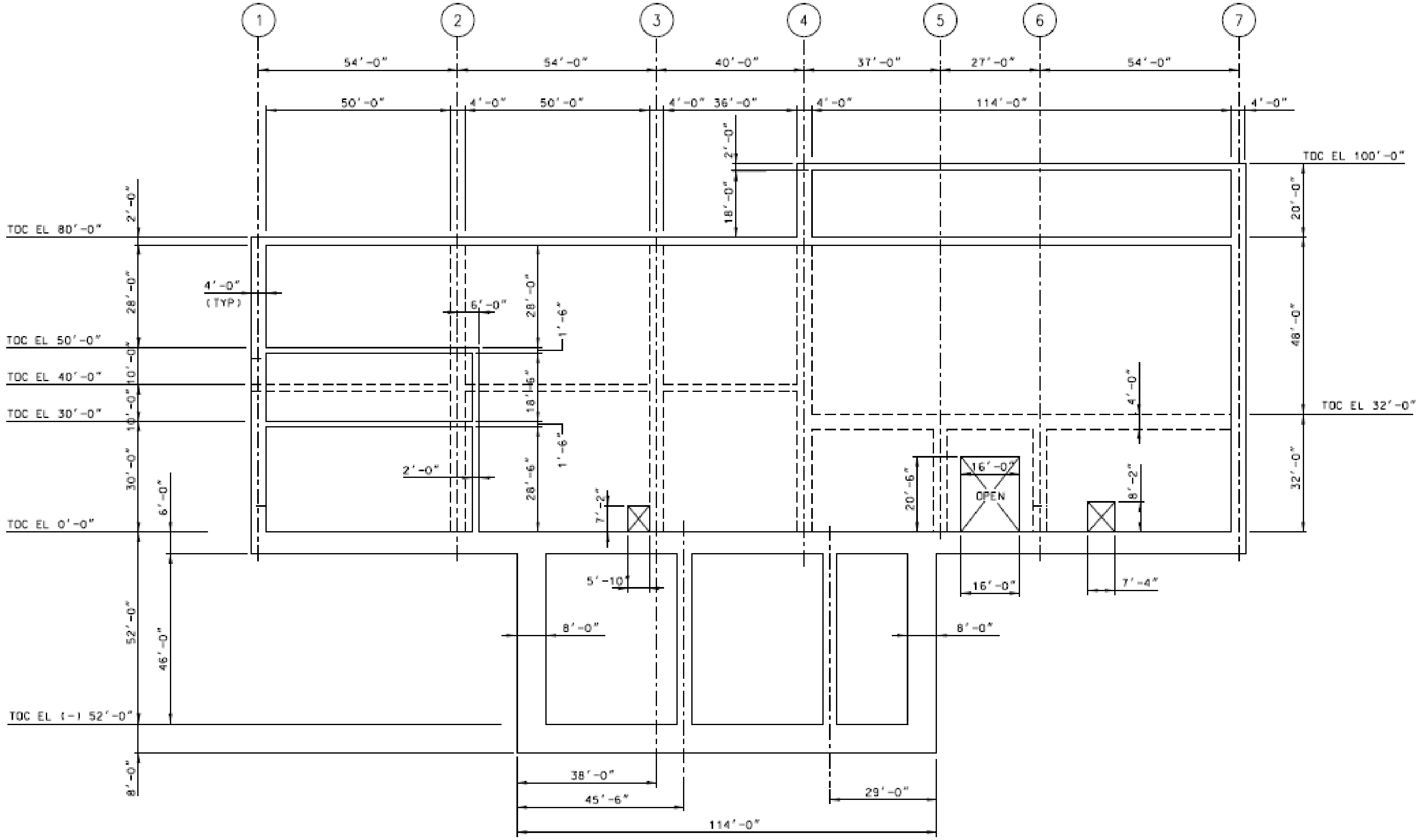
ELEVATION ALONG COL "6"
(LOOKING EAST)



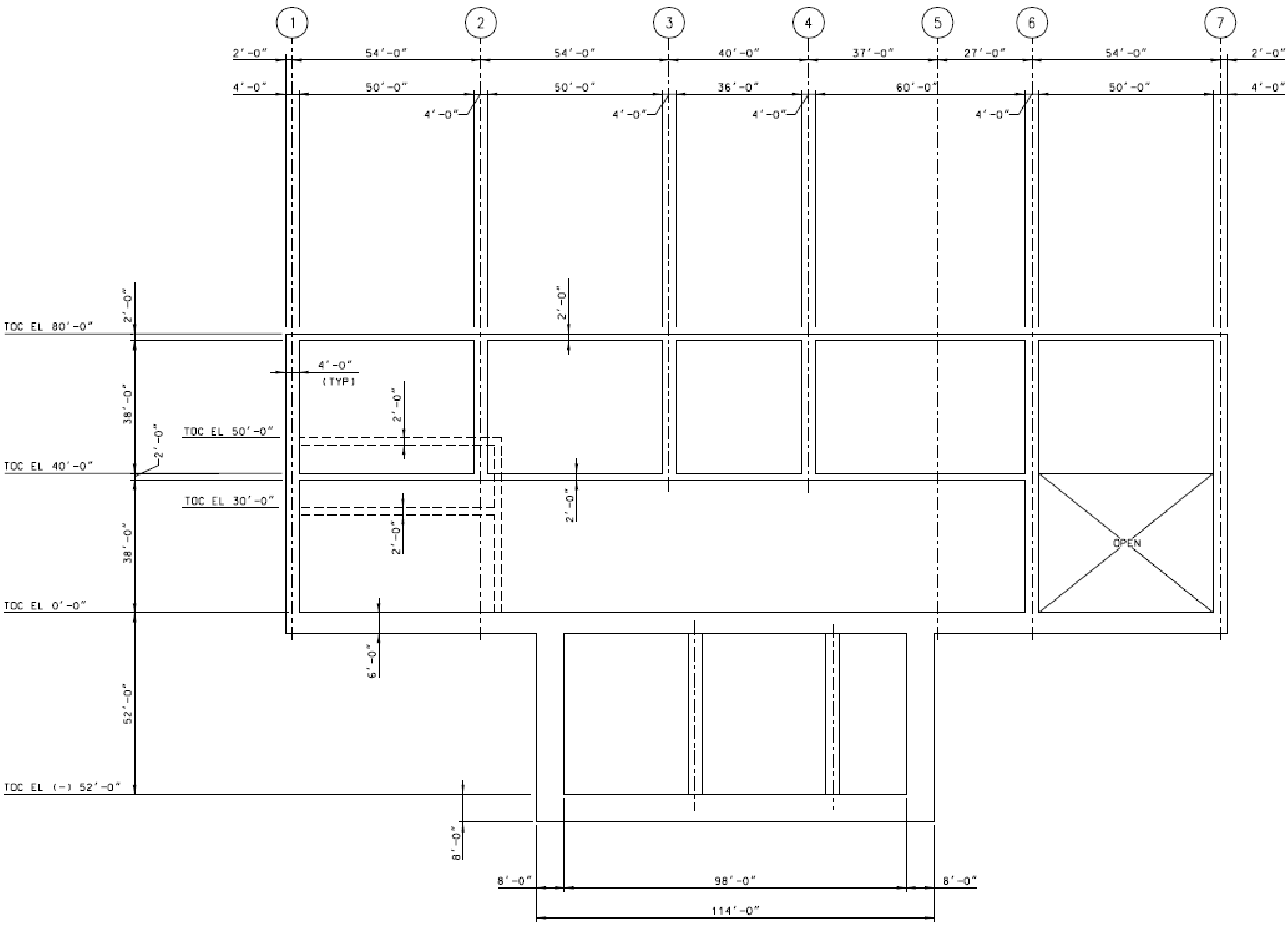
EAST WALL-ELEVATION ALONG COL LINE "7"
(LOOKING EAST)



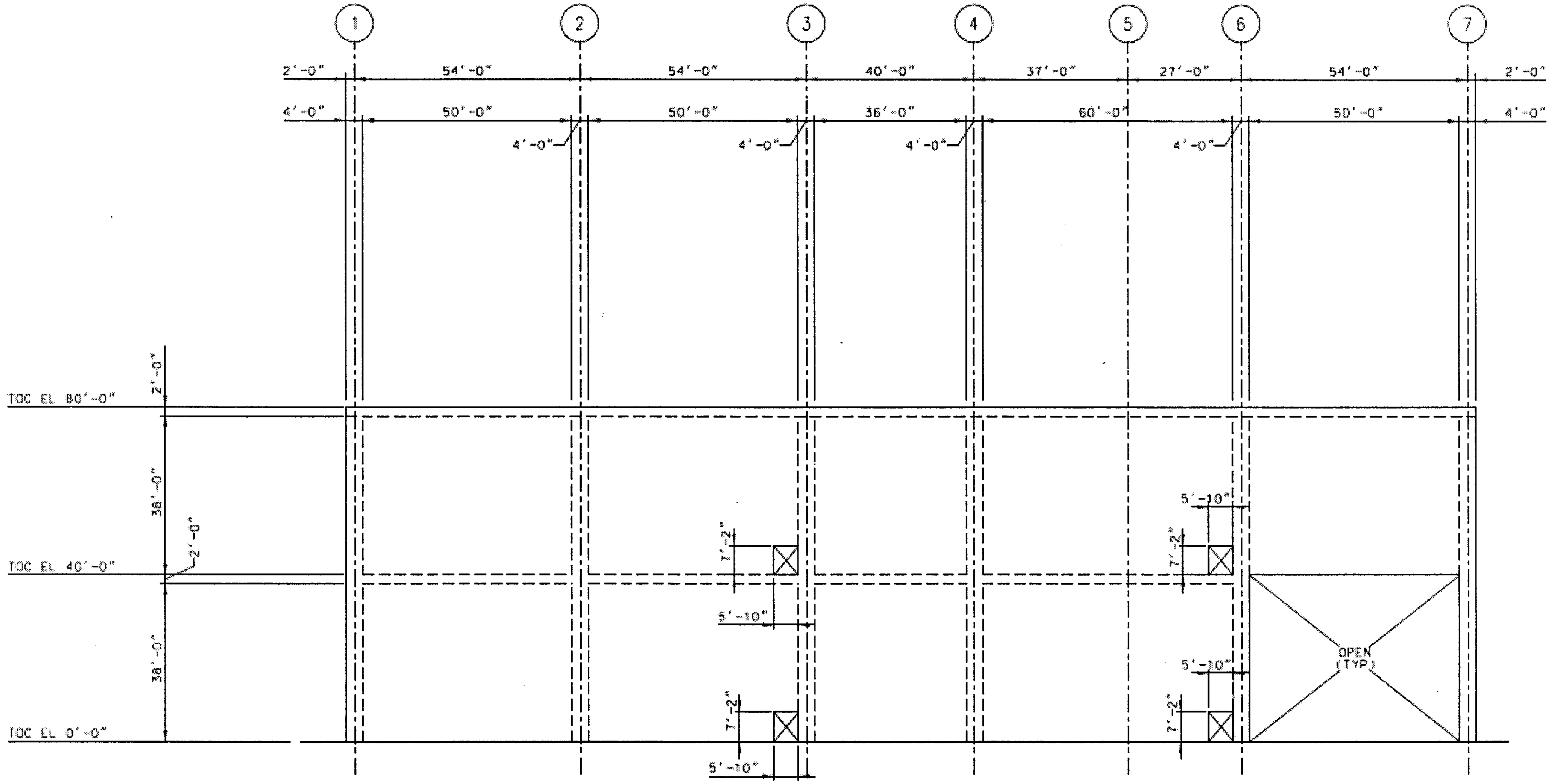
ELEVATION ALONG COL LINE "A"
(LOOKING NORTH)



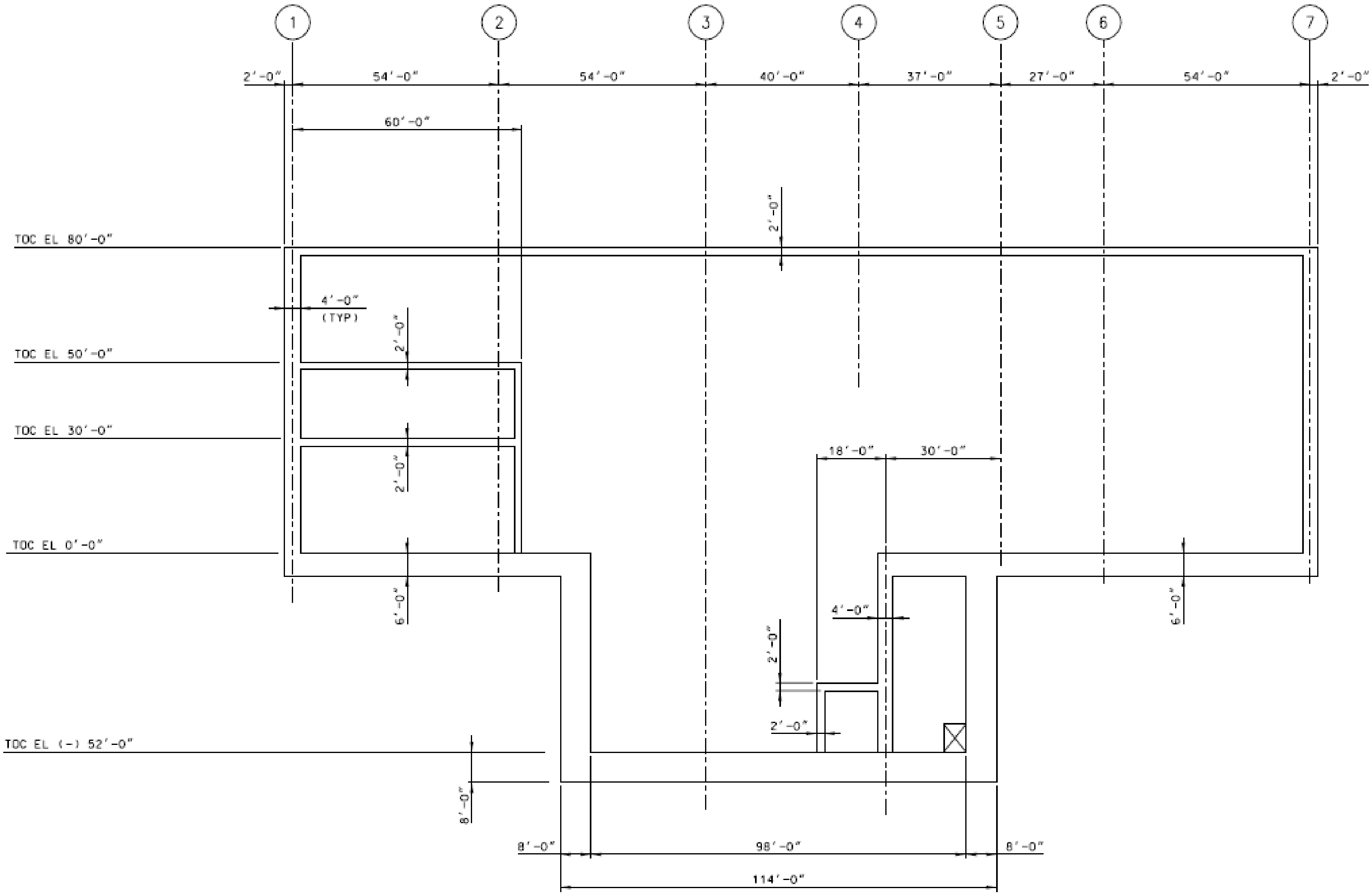
ELEVATION ALONG COL "B"
(LOOKING NORTH)



ELEVATION ALONG COL "C"
(LOOKING NORTH)



SOUTH WALL-ELEVATION ALONG COL LINE "D"
(LOOKING NORTH)



LONGITUDINAL SECTION BETWEEN COL 'B' & 'C'
LOOKING NORTH

Attachment C

WEIGHT DISTRIBUTION DUE TO THE CANISTER TRANFER MACHINE

The Canister Transfer Room of the Wet Handling Facility (WHF), Room Number 2004, floor elevation 32’, lies between Column Rows 4-7 and A-B (Figure C-1). This attachment calculates the loads on the WHF structure due to the Canister Transfer Machine.

The Canister Transfer Machine consists of a crane bridge spanning between the walls at Column Rows A and B within Room No. 2004. The floor of the Canister Transfer Room (El. 32’) has openings between Column Rows 4 and 5 Rows 5 and 6 for lifting and lowering of the canisters. The main function of the canister transfer machine is to lift canisters from the floor opening between column rows 5 and 6 and lower them through the opening between column rows 4 and 5. The estimated weight of the equipment is 400 tons (Ref. 2.2.13). From the point of view of loading on the structure, the most critical location of the crane would be when the loaded crane is over the eastern floor opening (i.e. between Rows 4 and 5) because at that location, the load would have the maximum eccentricity on the diaphragm floor slab at elevation 32’. .

With reference to Figure C-2, the distribution of the canister transfer machine weight on Walls A and B is as follows:

Weight of the canister transfer Machine = 400 tons = 800 kips

Weight on the wall at Column Line A = 800 x 25/53 = 377.4 kips

Weight on the wall at Column Line B = 800 x (53 – 25)/53 = 422.6 kips

The corbels on the wall for the cask transfer machine are located at Elevation 60’ (Reference 2.2.13). Therefore, the walls are considered loaded at that location. The wall weight, in turn, is distributed to the floor slabs above and below the loading point. Thus, reactions at the floor slab level, per Figure C-2, are as follows:

Reaction R_{A32} = 377.4 x (100-60)/(100-32) = 222 kips at x = 170’, z = 0’

Reaction R_{A100}= 377.4 x (60-32)/(100-32) = 155.4 kips at x = 170’, z = 0’

Reaction R_{B32} = 422.6 x (80-60)/(80-32) = 176.1 kips at x = 170’, z = 53’

Reaction R_{B80} = 422.6 x (60-32)/(80-32) = 246.5 kips at x = 170’, z = 53’

These weights are applied to the respective floors at the locations identified above in the mass properties calculation.

ET HANDLING FACILITY
CANISTER HANDLING ROOM
ELEVATION 32'

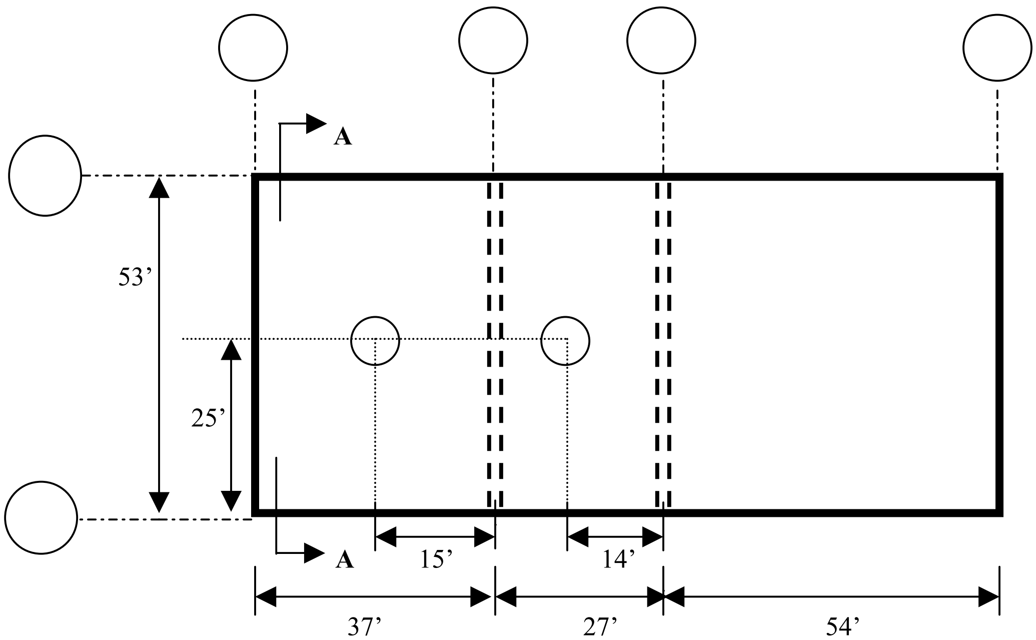


FIGURE C-1 (Plan at EL. +32')

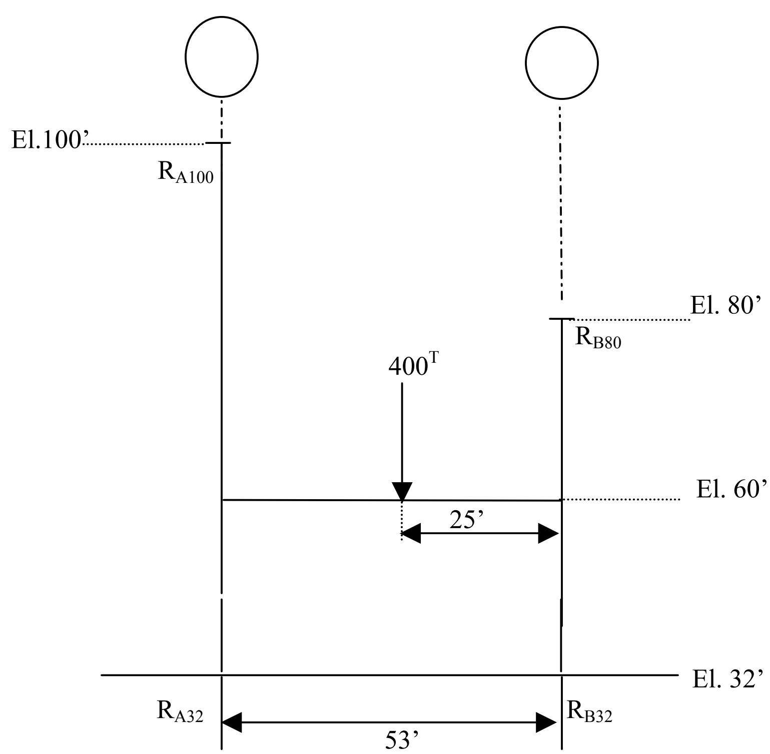


FIGURE C-2 (Section A-A)